WebSphere MQ

System Administration Guide

Version 7.0

SC34-6928-00

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Note

Before using this information and the product it supports, be sure to read the general information under notices at the back of this book.

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This edition of the book applies to the following:
- IBM WebSphere MQ, Version 7.0

and to any subsequent releases and modifications until otherwise indicated in new editions.

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Chapter 1. Introduction

Introduction to WebSphere MQ

This chapter introduces WebSphere® MQ Version 7 from an administrator's perspective, and describes the basic concepts of WebSphere MQ and messaging. It contains these sections:

- "WebSphere MQ and message queuing"
- "Messages and queues"
- "Objects" on page 3
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WebSphere MQ and message queuing

WebSphere MQ allows application programs to use *message queuing* to participate in message-driven processing. Application programs can communicate across different platforms by using the appropriate message queuing software products. For example, HP-UX and z/OS® applications can communicate through WebSphere MQ for HP-UX and WebSphere MQ for z/OS respectively. The applications are shielded from the mechanics of the underlying communications.

WebSphere MQ implements a common application programming interface known as the *message queue interface* (or MQI) wherever the applications run. This makes it easier for you to port application programs from one platform to another.

The MQI is described in detail in the WebSphere MQ Application Programming Reference.

Time-independent applications

With message queuing, the exchange of messages between the sending and receiving programs is independent of time. This means that the sending and receiving application programs are decoupled; the sender can continue processing without having to wait for the receiver to acknowledge receipt of the message. The target application does not even have to be running when the message is sent. It can retrieve the message after it is has been started.

Message-driven processing

When messages arrive on a queue, they can automatically start an application using *triggering*. If necessary, the applications can be stopped when the message (or messages) have been processed.

Messages and queues

Messages and queues are the basic components of a message queuing system.

What is a message?

A *message* is a string of bytes that is meaningful to the applications that use it. Messages are used to transfer information from one application program to another (or between different parts of the same application). The applications can be running on the same platform, or on different platforms.

WebSphere MQ messages have two parts:

- *The application data.* The content and structure of the application data is defined by the application programs that use it.
- *A message descriptor.* The message descriptor identifies the message and contains additional control information, such as the type of message and the priority assigned to the message by the sending application.

  The format of the message descriptor is defined by WebSphere MQ. For a complete description of the message descriptor, see the WebSphere MQ Application Programming Reference manual.

Message lengths:

The default maximum message length is 4 MB, although you can increase this to a maximum length of 100 MB (where 1 MB equals 1 048 576 bytes). In practice, the message length might be limited by:

- The maximum message length defined for the receiving queue
- The maximum message length defined for the queue manager
- The maximum message length defined by the queue
- The maximum message length defined by either the sending or receiving application
- The amount of storage available for the message

It might take several messages to send all the information that an application requires.

How do applications send and receive messages?:

Application programs send and receive messages using **MQI calls**.

For example, to put a message onto a queue, an application:

1. Opens the required queue by issuing an MQI **MQOPEN** call
2. Issues an MQI **MQPUT** call to put the message onto the queue

Another application can retrieve the message from the same queue by issuing an MQI **MQGET** call

For more information about MQI calls, see the WebSphere MQ Application Programming Reference.

What is a queue?

A *queue* is a data structure used to store messages.

Each queue is owned by a *queue manager*. The queue manager is responsible for maintaining the queues it owns, and for storing all the messages it receives onto the appropriate queues. The messages might be put on the queue by application programs, or by a queue manager as part of its normal operation.

WebSphere MQ Version 7.0 supports queues over 2 GB in size; "Enabling large queues" on page 43 discusses this in more detail. For information about planning the amount of storage you need for queues, see the *Quick Beginnings* guide for your platform, or visit the WebSphere MQ Web site for platform-specific performance reports:

`http://www.ibm.com/software/integration/ts/mqseries/`

Predefined queues and dynamic queues:

Queues can be characterized by the way they are created:

- **Predefined queues** are created by an administrator using the appropriate MQSC or PCF commands. Predefined queues are permanent; they exist independently of the applications that use them and survive WebSphere MQ restarts.
- **Dynamic queues** are created when an application issues an **MQOPEN** request specifying the name of a *model queue*. The queue created is based on a *template queue definition*, which is called a model queue. You can create a model queue using the MQSC command DEFINE QMODEL. The attributes of a model queue (for example, the maximum number of messages that can be stored on it) are inherited by any dynamic queue that is created from it.

  Model queues have an attribute that specifies whether the dynamic queue is to be permanent or temporary. Permanent queues survive application and queue manager restarts; temporary queues are lost on restart.

Retrieving messages from queues:

Suitably authorized applications can retrieve messages from a queue according to the following retrieval algorithms:

- First-in-first-out (FIFO).
- Message priority, as defined in the message descriptor. Messages that have the same priority are retrieved on a FIFO basis.
- A program request for a specific message.

The **MQGET** request from the application determines the method used.

Objects

Many of the tasks described in this book involve manipulating WebSphere MQ **objects**. The object types are queue managers, queues, process definitions, namelists, channels, client connection channels, listeners, services, and authentication information objects.

The manipulation or *administration* of objects includes:

- Starting and stopping queue managers.
- Creating objects, particularly queues, for applications.
- Working with channels to create communication paths to queue managers on other (remote) systems. This is described in detail in WebSphere MQ Intercommunication.
- Creating *clusters* of queue managers to simplify the overall administration process, and to balance workload.

This book contains detailed information about administration in the following chapters:

- "An introduction to WebSphere MQ administration" on page 13

- "Managing queue managers" on page 19
- "Administering local WebSphere MQ objects" on page 28
- "Automating administration tasks" on page 54
- "Administering remote WebSphere MQ objects" on page 57
- "Administration using the WebSphere MQ Explorer" on page 71

Object names

The naming convention adopted for WebSphere MQ objects depends on the object.

Each instance of a queue manager is known by its name. This name must be unique within the network of interconnected queue managers, so that one queue manager can unambiguously identify the target queue manager to which any given message is sent.

For the other types of object, each object has a name associated with it and can be referred to by that name. These names must be unique within one queue manager and object type. For example, you can have a queue and a process with the same name, but you cannot have two queues with the same name.

In WebSphere MQ, names can have a maximum of 48 characters, with the exception of *channels* which have a maximum of 20 characters. For more information about names, see "Names of WebSphere MQ objects" on page 273.

Managing objects

You can create, alter, display, and delete objects using:

- Control commands, which are typed in from a keyboard
- MQSC commands, which can be typed in from a keyboard or read from a file
- Programmable Command Format (PCF) messages, which can be used in an automation program
- WebSphere MQ Administration Interface (MQAI) calls in a program
- The WebSphere MQ Explorer
- WebSphere MQ for Windows® only:
  - MQAI Component Object Model (COM) calls in a program
  - Active Directory Service interface (ADSI) calls in a program
  - The Windows Default Configuration Application

For more information about these methods, see "An introduction to WebSphere MQ administration" on page 13.

Object attributes

The properties of an object are defined by its attributes. Some you can specify, others you can only view. For example, the maximum message length that a queue can accommodate is defined by its *MaxMsgLength* attribute; you can specify this attribute when you create a queue. The *DefinitionType* attribute specifies how the queue was created; you can only display this attribute.

In WebSphere MQ, there are two ways of referring to an attribute:

- Using its PCF name, for example, *MaxMsgLength*.
- Using its MQSC command name, for example, MAXMSGL.

This book mainly describes how to specify attributes using MQSC commands, and so it refers to most attributes using their MQSC command names, rather than their PCF names.

WebSphere MQ queues

There are four types of queue object available in WebSphere MQ; the local queue object, the remote queue object, the alias queue object, and the model queue object.

These four types of queue object are described in the following section.

Local queue object

A local queue object identifies a local queue belonging to the queue manager to which the application is connected. All queues are local queues in the sense that each queue belongs to a queue manager and, for that queue manager, the queue is a local queue.

Remote queue object

A remote queue object identifies a queue belonging to another queue manager. This queue must be defined as a local queue to that queue manager. The information you specify when you define a remote queue object allows the local queue manager to find the remote queue manager, so that any messages destined for the remote queue go to the correct queue manager.

Before applications can send messages to a queue on another queue manager, you must have defined a transmission queue and channels between the queue managers, **unless** you have grouped one or more queue managers together into a *cluster*. For more information about clusters, see "Remote administration using clusters" on page 58.

Alias queue object

An alias queue allows applications to access a queue by referring to it indirectly in MQI calls. When an alias queue name is used in an MQI call, the name is resolved to the name of either a local or a remote queue at run time. This allows you to change the queues that applications use without changing the application in any way; you merely change the alias queue definition to reflect the name of the new queue to which the alias resolves.

An alias queue is not a queue, but an object that you can use to access another queue.

Model queue object

A model queue defines a set of queue attributes that are used as a template for creating a dynamic queue. Dynamic queues are created by the queue manager when an application issues an **MQOPEN** request specifying a queue name that is the name of a model queue. The dynamic queue that is created in this way is a local queue whose attributes are taken from the model queue definition. The dynamic queue name can be specified by the application, or the queue manager can generate the name and return it to the application.

Dynamic queues defined in this way can be temporary queues, which do not survive product restarts, or permanent queues, which do.

Defining queues:

Queues are defined to WebSphere MQ using:
- The MQSC command DEFINE
- The PCF Create Queue command

The commands specify the type of queue and its attributes. For example, a local queue object has attributes that specify what happens when applications reference that queue in MQI calls. Examples of attributes are:

- Whether applications can retrieve messages from the queue (GET enabled)
- Whether applications can put messages on the queue (PUT enabled)
- Whether access to the queue is exclusive to one application or shared between applications
- The maximum number of messages that can be stored on the queue at the same time (maximum queue depth)
- The maximum length of messages that can be put on the queue

For further details about defining queue objects, see the WebSphere MQ Script (MQSC) Command Reference or WebSphere MQ Programmable Command Formats and Administration Interface.

Queues used by WebSphere MQ:

WebSphere MQ uses some local queues for specific purposes related to its operation. You **must** define these queues before WebSphere MQ can use them.

Initiation queues

Initiation queues are queues that are used in triggering. A queue manager puts a trigger message on an initiation queue when a trigger event occurs. A trigger event is a logical combination of conditions that is detected by a queue manager. For example, a trigger event might be generated when the number of messages on a queue reaches a predefined depth. This event causes the queue manager to put a trigger message on a specified initiation queue. This trigger message is retrieved by a *trigger monitor*, a special application that monitors an initiation queue. The trigger monitor then starts the application program that was specified in the trigger message.

If a queue manager is to use triggering, at least one initiation queue must be defined for that queue manager. See "Managing objects for triggering" on page 52 and "runmqtrm (start trigger monitor)" on page 356. For more information about triggering, see the WebSphere MQ Application Programming Guide.

Transmission queues

Transmission queues are queues that temporarily store messages that are destined for a remote queue manager. You must define at least one transmission queue for each remote queue manager to which the local queue manager is to send messages directly. These queues are also used in remote administration; see "Remote administration from a local queue manager" on page 59. For information about the use of transmission queues in distributed queuing, see WebSphere MQ Intercommunication.

Each queue manager can have a default transmission queue. When a queue manager that is not part of a cluster puts a message onto a remote queue, the default action, if there is no transmission queue with the same name as the destination queue manager, is to use the default transmission queue.

Cluster transmission queues

Each queue manager within a cluster has a cluster transmission queue called SYSTEM.CLUSTER.TRANSMIT.QUEUE. A definition of this queue is created by default when you define a queue manager.

A queue manager that is part of the cluster can send messages on the cluster transmission queue to any other queue manager that is in the same cluster.

During name resolution, the cluster transmission queue takes precedence over the default transmission queue.

When a queue manager is part of a cluster, the default action is to use the SYSTEM.CLUSTER.TRANSMIT.QUEUE, except when the destination queue manager is not part of the cluster.

Dead-letter queues

A dead-letter (undelivered-message) queue is a queue that stores messages that cannot be routed to their correct destinations. This occurs when, for example, the destination queue is full. The supplied dead-letter queue is called SYSTEM.DEAD.LETTER.QUEUE.

For distributed queuing, define a dead-letter queue on each queue manager involved.

Command queues

The command queue, SYSTEM.ADMIN.COMMAND.QUEUE, is a local queue to which suitably authorized applications can send MQSC commands for processing. These commands are then retrieved by a WebSphere MQ component called the command server. The command server validates the commands, passes the valid ones on for processing by the queue manager, and returns any responses to the appropriate reply-to queue.

A command queue is created automatically for each queue manager when that queue manager is created.

Reply-to queues

When an application sends a request message, the application that receives the message can send back a reply message to the sending application. This message is put on a queue, called a reply-to queue, which is normally a local queue to the sending application. The name of the reply-to queue is specified by the sending application as part of the message descriptor.

Event queues

Instrumentation events can be used to monitor queue managers independently of MQI applications.

When an instrumentation event occurs, the queue manager puts an event message on an event queue. This message can then be read by a monitoring application, which might inform an administrator or initiate some remedial action if the event indicates a problem.

Note: Trigger events are quite different from instrumentation events in that trigger events are not caused by the same conditions, and do not generate event messages.

For more information about instrumentation events, see Monitoring WebSphere MQ.

WebSphere MQ queue managers

A *queue manager* provides queuing services to applications, and manages the queues that belong to it. It ensures that:

- Object attributes are changed according to the commands received.

- Special events such as trigger events or instrumentation events are generated when the appropriate conditions are met.
- Messages are put on the correct queue, as requested by the application making the **MQPUT** call. The application is informed if this cannot be done, and an appropriate reason code is given.

Each queue belongs to a single queue manager and is said to be a *local queue* to that queue manager. The queue manager to which an application is connected is said to be the *local queue manager* for that application. For the application, the queues that belong to its local queue manager are local queues.

A *remote queue* is a queue that belongs to another queue manager. A *remote queue manager* is any queue manager other than the local queue manager. A remote queue manager can exist on a remote machine across the network, or might exist on the same machine as the local queue manager. WebSphere MQ supports multiple queue managers on the same machine.

A queue manager object can be used in some MQI calls. For example, you can inquire about the attributes of the queue manager object using the MQI call **MQINQ**.

Process definitions

A *process definition* object defines an application that starts in response to a trigger event on a WebSphere MQ queue manager. See the "Initiation queues" entry under "Queues used by WebSphere MQ" on page 6 for more information.

The process definition attributes include the application ID, the application type, and data specific to the application.

Clusters

In a traditional WebSphere MQ network using distributed queuing, every queue manager is independent. If one queue manager needs to send messages to another queue manager, it must define a transmission queue, a channel to the remote queue manager, and a remote queue definition for every queue to which it wants to send messages.

A *cluster* is a group of queue managers set up in such a way that the queue managers can communicate directly with one another over a single network, without the need for transmission queue, channel, and remote queue definitions.

For information about clusters, see "Administering remote WebSphere MQ objects" on page 57, and WebSphere MQ Queue Manager Clusters.

Namelists

A namelist is a WebSphere MQ object that contains a list of other WebSphere MQ objects. Typically, namelists are used by applications such as trigger monitors, where they are used to identify a group of queues. The advantage of using a namelist is that it is maintained independently of applications; it can be updated without stopping any of the applications that use it. Also, if one application fails, the namelist is not affected and other applications can continue using it.

Namelists are also used with queue manager clusters to maintain a list of clusters referred to by more than one WebSphere MQ object.

Authentication information objects

The queue manager authentication information object forms part of WebSphere MQ support for Secure Sockets Layer (SSL) security. It provides the definitions needed to check certificate revocation lists (CRLs) using LDAP servers. CRLs allow Certification Authorities to revoke certificates that can no longer be trusted.

This book describes using the **setmqaut**, **dspmqaut**, **dmpmqaut**, **rcrmqobj**, **rcdmqimg**, and **dspmqfls** commands with the authentication information object. For an overview of SSL and the use of the authentication information objects, see WebSphere MQ Security.

Channels

Channels are objects that provide a communication path from one queue manager to another. Channels are used in distributed queuing to move messages from one queue manager to another. They shield applications from the underlying communications protocols. The queue managers might exist on the same, or different, platforms. For queue managers to communicate with one another, you must define one channel object at the queue manager that is to send messages, and another, complementary one, at the queue manager that is to receive them.

For information on channels and how to use them, see WebSphere MQ Intercommunication.

Client connection channels

Client connection channels are objects that provide a communication path from a WebSphere MQ client to a queue manager. Client connection channels are used in distributed queuing to move messages between a queue manager and a client. They shield applications from the underlying communications protocols. The client might exist on the same, or different, platform to the queue manager.

For information on client connection channels and how to use them, see WebSphere MQ Intercommunication.

Listeners

Listeners are processes that accept network requests from other queue managers, or client applications, and start associated channels. Listener processes can be started using the **runmqlsr** control command.

Listener objects are WebSphere MQ objects that allow you to manage the starting and stopping of listener processes from within the scope of a queue manager. By defining attributes of a listener object you do the following:

- Configure the listener process.
- Specify whether the listener process automatically starts and stops when the queue manager starts and stops.

Services

Service objects are a way of defining programs to be executed when a queue manager starts or stops. The programs can be split into the following types:

Servers

A *server* is a service object that has the parameter SERVTYPE specified as SERVER. A server service object is the definition of a program that will be executed when a specified queue manager is started. Only one instance of a server process can be executed concurrently. While running, the status of a server process can be monitored using the MQSC command, DISPLAY SVSTATUS. Typically server service objects are definitions of programs such as dead letter handlers or trigger monitors, however the programs that can be run are not limited to those supplied with WebSphere MQ. Additionally, a server service object can be defined to include a command that will be run when the specified queue manager is shutdown to end the program.

Commands
A *command* is a service object that has the parameter SERVTYPE specified as COMMAND. A command service object is the definition of a program that will be executed when a specified queue manager is started or stopped. Multiple instances of a command process can be executed concurrently. Command service objects differ from server service objects in that once the program is executed the queue manager will not monitor the program. Typically command service objects are definitions of programs that are short lived and will perform a specific task such as starting one, or more, other tasks.

System default objects

The *system default objects* are a set of object definitions that are created automatically whenever a queue manager is created. You can copy and modify any of these object definitions for use in applications at your installation.

Default object names have the stem SYSTEM; for example, the default local queue is SYSTEM.DEFAULT.LOCAL.QUEUE, and the default receiver channel is SYSTEM.DEF.RECEIVER. You cannot rename these objects; default objects of these names are required.

When you define an object, any attributes that you do not specify explicitly are copied from the appropriate default object. For example, if you define a local queue, those attributes that you do not specify are taken from the default queue SYSTEM.DEFAULT.LOCAL.QUEUE.

See Chapter 8, “System and default objects,” on page 525 for more information about system defaults.

Clients and servers

WebSphere MQ supports client-server configurations for its applications.

A WebSphere MQ *client* is a component that allows an application running on a system to issue MQI calls to a queue manager running on another system. The output from the call is sent back to the client, which passes it back to the application.

A WebSphere MQ *server* is a queue manager that provides queuing services to one or more clients. All the WebSphere MQ objects, for example queues, exist only on the queue manager machine (the WebSphere MQ server machine), and not on the client. A WebSphere MQ server can also support local WebSphere MQ applications.

The difference between a WebSphere MQ server and an ordinary queue manager is that a server has a dedicated communications link with each client. For more information about creating channels for clients and servers, see WebSphere MQ Intercommunication.

For information about client support in general, see WebSphere MQ Clients.

WebSphere MQ applications in a client-server environment

When linked to a server, client WebSphere MQ applications can issue most MQI calls in the same way as local applications. The client application issues an **MQCONN** call to connect to a specified queue manager. Any additional MQI calls that specify the connection handle returned from the connect request are then processed by this queue manager.

You must link your applications to the appropriate client libraries. See WebSphere MQ Clients for further information.

Extending queue manager facilities

The facilities provided by a queue manager can be extended by:
- User exits
- API exits
- Installable services

See "Installable services and components" on page 391 for more information about the installable services.

User exits

User exits provide a mechanism for you to insert your own code into a queue manager function. The user exits supported include:

Channel exits
These exits change the way that channels operate. Channel exits are described in WebSphere MQ Intercommunication.

Data conversion exits
These exits create source code fragments that can be put into application programs to convert data from one format to another. Data conversion exits are described in the WebSphere MQ Application Programming Guide.

The cluster workload exit
The function performed by this exit is defined by the provider of the exit. Call definition information is given in WebSphere MQ Queue Manager Clusters.

API exits

API exits let you write code that changes the behavior of WebSphere MQ API calls, such as MQPUT and MQGET, and then insert that code immediately before or immediately after those calls. The insertion is automatic; the queue manager drives the exit code at the registered points. For more information about API exits, see "API exits" on page 478 and the WebSphere MQ Application Programming Guide.

Installable services

Installable services have formalized interfaces (an API) with multiple entry points.

An implementation of an installable service is called a *service component*. You can use the components supplied with WebSphere MQ, or you can write your own component to perform the functions that you require.

Currently, the following installable services are provided:

Authorization service
: The authorization service allows you to build your own security facility.

  The default service component that implements the service is the Object Authority Manager (OAM). By default, the OAM is active, and you do not have to do anything to configure it. You can use the authorization service interface to create other components to replace or augment the OAM. For more information about the OAM, see "WebSphere MQ security" on page 122.

Name service
: The name service enables applications to share queues by identifying remote queues as though they were local queues.

  You can write your own name service component. You might want to do this if you intend to use the name service with WebSphere MQ, for example. To use the name service you must have either a component that is either user-written, or supplied by a different software vendor. By default, the name service is inactive.

Security

In WebSphere MQ, there are three methods of providing security:
- The Object Authority Manager (OAM) facility
- User-written, or third party, channel exits
- Channel security using Secure Sockets Layer (SSL)

Object Authority Manager (OAM) facility

Authorization for using MQI calls, commands, and access to objects is provided by the **Object Authority Manager** (OAM), which by default is enabled. Access to WebSphere MQ entities is controlled through WebSphere MQ user groups and the OAM. We provide a command line interface to enable administrators to grant or revoke authorizations as required.

For more information about creating authorization service components, see "WebSphere MQ security" on page 122.

User-written or third party channel exits

Channels can use user-written or third party channel exits. For more information, see WebSphere MQ Intercommunication.

Channel security using SSL

The Secure Sockets Layer (SSL) protocol provides industry-standard channel security, with protection against eavesdropping, tampering, and impersonation.

SSL uses public key and symmetric techniques to provide message privacy and integrity and mutual authentication.

For a comprehensive review of security in WebSphere MQ including detailed information on SSL, see WebSphere MQ Security. For an overview of SSL, including pointers to the commands described in this book, see "Protecting channels with SSL" on page 141.

Transactional support

An application program can group a set of updates into a *unit of work*. These updates are usually logically related and must all be successful for data integrity to be preserved. If one update succeeds while another fails, data integrity is lost.

When a unit of work completes successfully, it is said to *commit*. Once committed, all updates made within that unit of work are made permanent and irreversible. However, if the unit of work fails, all updates are instead *backed out*. This process, where units of work are either committed or backed out with integrity, is known as *syncpoint coordination*.

A *local* unit of work is one in which the only resources updated are those of the WebSphere MQ queue manager. Here syncpoint coordination is provided by the queue manager itself using a single-phase commit process.

A *global* unit of work is one in which resources belonging to other resource managers, such as XA-compliant databases, are also updated. Here, a two-phase commit procedure must be used and the unit of work can be coordinated by the queue manager itself, or externally by another XA-compliant transaction manager such as IBM® TXSeries®, or BEA Tuxedo.

For more information, see "Transactional support" on page 158.

WebSphere MQ also provides support for the Microsoft® Transaction Server (COM+). "Using the Microsoft Transaction Server (COM+)" on page 191 provides information on how to set up WebSphere MQ to take advantage of COM+ support.

An introduction to WebSphere MQ administration

This chapter introduces WebSphere MQ administration.

Administration tasks include creating, starting, altering, viewing, stopping, and deleting clusters, processes and WebSphere MQ objects (queue managers, queues, namelists, process definitions, channels, client connection channels, listeners, services, and authentication information objects).

The chapter contains the following sections:
- "Local and remote administration"
- "Performing administration tasks using commands" on page 14
- "Further methods of administration" on page 15
- "Understanding WebSphere MQ file names" on page 16

Local and remote administration

You administer WebSphere MQ objects locally or remotely.

Local administration means carrying out administration tasks on any queue managers you have defined on your local system. You can access other systems, for example through the TCP/IP terminal emulation program **telnet**, and carry out administration there. In WebSphere MQ, you can consider this as local administration because no channels are involved, that is, the communication is managed by the operating system.

WebSphere MQ supports administration from a single point of contact through what is known as *remote administration*. This allows you to issue commands from your local system that are processed on another system. For example, you can issue a remote command to change a queue definition on a remote queue manager. You do not have to log on to that system, although you do need to have the appropriate channels defined. The queue manager and command server on the target system must be running.

Some commands cannot be issued in this way, in particular, creating or starting queue managers and starting command servers. To perform this type of task, you must either log onto the remote system and issue the commands from there or create a process that can issue the commands for you.

"Administering remote WebSphere MQ objects" on page 57 describes the subject of remote administration in greater detail.

Performing administration tasks using commands

There are three sets of commands that you can use to administer WebSphere MQ: control commands, MQSC commands, and PCF commands. These command sets are available on all platforms covered by this book.

Control commands

Control commands allow you to perform administrative tasks on queue managers themselves.

They are described in "Managing queue managers" on page 19.

WebSphere MQ Script (MQSC) commands

Use MQSC commands to manage queue manager objects, including the queue manager itself, queues, process definitions, namelists, channels, client connection channels, listeners, services, and authentication information objects.

You issue MQSC commands to a queue manager using the **runmqsc** command. You can do this interactively, issuing commands from a keyboard, or you can redirect the standard input device (stdin) to run a sequence of commands from an ASCII text file. In both cases, the format of the commands is the same.

You can run the **runmqsc** command in three modes, depending on the flags set on the command:

- *Verification mode*, where the MQSC commands are verified on a local queue manager, but are not actually run
- *Direct mode*, where the MQSC commands are run on a local queue manager
- *Indirect mode*, where the MQSC commands are run on a remote queue manager

Object attributes specified in MQSC commands are shown in this book in uppercase (for example, RQMNAME), although they are not case sensitive. MQSC command attribute names are limited to eight characters.

MQSC commands are available on other platforms, including i5/OS®, and z/OS. MQSC commands are summarized in Chapter 13, "Comparing command sets," on page 555.

The WebSphere MQ Script (MQSC) Command Reference contains a description of each MQSC command and its syntax.

See "Performing local administration tasks using MQSC commands" on page 29 for more information about using MQSC commands in local administration.

PCF commands

WebSphere MQ programmable command format (PCF) commands allow administration tasks to be programmed into an administration program. In this way you can create queues and process definitions, and change queue managers, from a program.

PCF commands cover the same range of functions provided by the MQSC commands. See "PCF commands" on page 54 for more information.

You can use the WebSphere MQ Administration Interface (MQAI) to obtain easier programming access to PCF messages. This is described in greater detail in "Using the MQAI to simplify the use of PCFs" on page 55.

Further methods of administration

In addition to the available command sets, there are further methods of administration:

- The WebSphere MQ Explorer
- The Windows Default Configuration application (WebSphere MQ for Windows only)
- Use of the Microsoft Cluster Service (MSCS) (WebSphere MQ for Windows only)

Using the WebSphere MQ Explorer

The WebSphere MQ Explorer is an application that runs under the Eclipse platform and is available with WebSphere MQ for Windows and WebSphere MQ for Linux® (x86 platform). The WebSphere MQ Explorer can be used to administer local queue managers, or used to administer remote queue managers on any supported platform. It provides a graphical user interface for controlling resources in a network. Using the WebSphere MQ Explorer, you can:

- Define and control various resources including queue managers, queues, process definitions, namelists, channels, client connection channels, listeners, services, and clusters.
- Start or stop a local queue manager and its associated processes.
- View queue managers and their associated objects on your workstation or from other workstations.
- Check the status of queue managers, clusters, and channels.
- Check to see which applications, users, or channels have a particular queue open, from the queue status.

You can invoke the WebSphere MQ Explorer using the **strmqcfg** command, and on Windows from the WebSphere MQ Taskbar application, or from the Windows Start prompt.

On Linux, the WebSphere MQ Explorer might fail to start if you have more than one Eclipse installation. If this happens, start the WebSphere MQ Explorer using a different user ID to the one you use for the other Eclipse installation.

See "Administration using the WebSphere MQ Explorer" on page 71 for more information.

Using the Windows Default Configuration application

You can use the Windows Default Configuration program from the **Prepare WebSphere MQ Wizard** to create a *starter* (or default) set of WebSphere MQ objects. A summary of the default objects created is listed in Table 39 on page 528.

Using the Microsoft Cluster Service (MSCS)

Microsoft Cluster Service (MSCS) enables you to connect servers into a *cluster*, giving higher availability of data and applications, and making it easier to manage the system. MSCS can automatically detect and recover from server or application failures.

It is important not to confuse clusters in the MSCS sense with WebSphere MQ clusters. The distinction is:

WebSphere MQ clusters
are groups of two or more queue managers on one or more computers, providing automatic interconnection, and allowing queues to be shared amongst them for load balancing and redundancy.

MSCS clusters
are groups of computers, connected together and configured in such a way that, if one fails, MSCS performs a *failover*, transferring the state data of applications from the failing computer to another computer in the cluster and reinitiating their operation there.

"Supporting the Microsoft Cluster Service (MSCS)" on page 202 provides detailed information on how to configure your WebSphere MQ for Windows system to use MSCS.

Understanding WebSphere MQ file names

Each WebSphere MQ queue manager, queue, process definition, namelist, channel, client connection channel, listener, service, and authentication information object is represented by a file. Because object names are not necessarily valid file names, the queue manager converts the object name into a valid file name where necessary.

The default path to a queue manager directory is as follows:

- A prefix, which is defined in the WebSphere MQ configuration information:
  - On Windows 32-bit systems the default prefix is `C:\Program Files\IBM\WebSphere MQ`. On Windows 64-bit systems the default prefix is, C:\Program Files\IBM\WebSphere MQ (x86)\ This is configured in the Windows Registry.

  - On UNIX® systems the default prefix is `/var/mqm`. This is configured in the `DefaultPrefix` stanza of the mqs.ini configuration file.

  Where available, the prefix can be changed using the WebSphere MQ properties page in the WebSphere MQ Explorer, otherwise edit the mqs.ini configuration file manually.
- The queue manager name is transformed into a valid directory name. For example, the queue manager:
  ```
  queue.manager
  ```
  would be represented as:
  ```
  queue!manager
  ```
  This process is referred to as *name transformation*.

Queue manager name transformation

In WebSphere MQ, you can give a queue manager a name containing up to 48 characters.

For example, you could name a queue manager:

```
QUEUE.MANAGER.ACCOUNTING.SERVICES
```

However, each queue manager is represented by a file and there are limitations on the maximum length of a file name, and on the characters that can be used in the name. As a result, the names of files representing objects are automatically transformed to meet the requirements of the file system.

The rules governing the transformation of a queue manager name are as follows:
1. Transform individual characters:
   - . becomes !
   - / becomes &
2. If the name is still not valid:
   a. Truncate it to eight characters
   b. Append a three-character numeric suffix

For example, assuming the default prefix and a queue manager with the name `queue.manager`:
- In WebSphere MQ for Windows with NTFS or FAT32, the queue manager name becomes:
  ```
  c:\Program Files\IBM\WebSphere MQ\qmgrs\queue!manager
  ```
- In WebSphere MQ for Windows with FAT, the queue manager name becomes:
  ```
  c:\Program Files\IBM\WebSphere MQ\qmgrs\queue!ma
  ```
- In WebSphere MQ for UNIX systems, the queue manager name becomes:
  ```
  /var/mqm/qmgrs/queue!manager
  ```

The transformation algorithm also distinguishes between names that differ only in case on file systems that are not case sensitive.

Object name transformation

Object names are not necessarily valid file system names. You might need to transform your object names. The method used is different from that for queue manager names because, although there are only a few queue manager names on each machine, there can be a large number of other objects for each queue manager. Queues, process definitions, namelists, channels, client connection channels, listeners, services, and authentication information objects are represented in the file system.

When a new name is generated by the transformation process, there is no simple relationship with the original object name. You can use the **dspmqfls** command to convert between real and transformed object names.

Chapter 2. Administration using WebSphere MQ commands

Managing queue managers

This chapter tells you how to perform operations on queue managers using control commands and the WebSphere MQ Explorer.

It contains the following topics:

Using control commands

Control commands can be divided into three categories, as shown in Table 1.

Table 1. Categories of control commands

Category	**Description**
Queue manager commands	Queue manager control commands include commands for creating, starting, stopping, and deleting queue managers and command servers
Channel commands	Channel commands include commands for starting and ending channels and channel initiators
Utility commands	Utility commands include commands associated with: • Running MQSC commands • Conversion exits • Authority management • Recording and recovering media images of queue manager resources • Displaying and resolving transactions • Trigger monitors • Displaying the file names of WebSphere MQ objects • The File Transfer Application

For information about administration tasks for channels, see WebSphere MQ Intercommunication.

Using control commands on Windows systems

In WebSphere MQ for Windows, you enter control commands at a command prompt. In these environments, control commands and their flags are not case sensitive, but arguments to those commands (such as queue names and queue-manager names) are case sensitive.

For example, in the command:

```
crtmqm /u SYSTEM.DEAD.LETTER.QUEUE jupiter.queue.manager
```

- The command name can be entered in uppercase or lowercase, or a mixture of the two. These are all valid: `crtmqm`, `CRTMQM`, and `CRTmqm`.
- The flag can be entered as `-u`, `-U`, `/u`, or `/U`.
- `SYSTEM.DEAD.LETTER.QUEUE` and `jupiter.queue.manager` must be entered exactly as shown.

For more information, see “How to use WebSphere MQ control commands” on page 273.

Using control commands on UNIX systems

In WebSphere MQ for UNIX systems, you enter control commands in a shell window. In these environments, control commands, including the command name itself, the flags, and any arguments, are case sensitive. For example, in the command:

```
crtmqm -u SYSTEM.DEAD.LETTER.QUEUE jupiter.queue.manager
```

- The command name must be `crtmqm`, not `CRTMQM`.
- The flag must be `-u`, not `-U`.
- The dead-letter queue is called `SYSTEM.DEAD.LETTER.QUEUE`.
- The argument is specified as `jupiter.queue.manager`, which is different from `JUPITER.queue.manager`.

Take care to type the commands exactly as you see them in the examples.

For more information about the **crtmqm** command, see “crtmqm (create queue manager)” on page 293.

Using the WebSphere MQ Explorer

The WebSphere MQ Explorer is available on Windows and WebSphere MQ for Linux (x86 platform) systems only.

You can use the WebSphere MQ Explorer to perform the operations described in this chapter, except for a preemptive shutdown.

Creating a queue manager

A queue manager manages the resources associated with it, in particular the queues that it owns. It provides queuing services to applications for Message Queuing Interface (MQI) calls and commands to create, modify, display, and delete WebSphere MQ objects.

Before you can do anything with messages and queues, you must create and start at least one queue manager and its associated objects. To create a queue manager, use the WebSphere MQ control command **crtmqm** (described in “crtmqm (create queue manager)” on page 293). The **crtmqm** command automatically creates the required default objects and system objects (described in “System default objects” on page 10). Default objects form the basis of any object definitions that you make; system objects are required for queue manager operation. When you have created a queue manager and its objects, use the **strmqm** command to start the queue manager.

Note: WebSphere MQ does not support machine names that contain spaces. If you install WebSphere MQ on a computer with a machine name that contains spaces, you cannot create any queue managers.

Guidelines for creating queue managers

Before you can create a queue manager, there are several points you need to consider (especially in a production environment). Work through the following checklist:

Naming conventions

Use uppercase names so that you can communicate with queue managers on all platforms. Remember that names are assigned exactly as you enter them. To avoid the inconvenience of lots of typing, do not use unnecessarily long names.

Specify a unique queue manager name

When you create a queue manager, ensure that no other queue manager has the same name *anywhere* in your network. Queue manager names are not checked when the queue manager is created, and names that are not unique prevent you from creating channels for distributed queuing.

One way of ensuring uniqueness is to prefix each queue manager name with its own unique node name. For example, if a node is called `ACCOUNTS`, you can name your queue manager `ACCOUNTS.SATURN.QUEUE.MANAGER`, where `SATURN` identifies a particular queue manager and `QUEUE.MANAGER` is an extension you can give to all queue managers. Alternatively, you can omit this, but note that `ACCOUNTS.SATURN` and `ACCOUNTS.SATURN.QUEUE.MANAGER` are *different* queue manager names.

If you are using WebSphere MQ for communication with other enterprises, you can also include your own enterprise name as a prefix. This is not done in the examples, because it makes them more difficult to follow.

Note: Queue manager names in control commands are case-sensitive. This means that you are allowed to create two queue managers with the names `jupiter.queue.manager` and `JUPITER.queue.manager`. However, it is better to avoid such complications.

Limit the number of queue managers

You can create as many queue managers as resources allow. However, because each queue manager requires its own resources, it is generally better to have one queue manager with 100 queues on a node than to have ten queue managers with ten queues each.

In production systems, many processors can be exploited with a single queue manager, but larger server machines might run more effectively with multiple queue managers.

Specify a default queue manager

Each node should have a default queue manager, though it is possible to configure WebSphere MQ on a node without one. The default queue manager is the queue manager that applications connect to if they do not specify a queue manager name in an **MQCONN** call. It is also the queue manager that processes MQSC commands when you invoke the **runmqsc** command without specifying a queue manager name.

Specifying a queue manager as the default *replaces* any existing default queue manager specification for the node.

Changing the default queue manage can affect other users or applications. The change has no effect on currently-connected applications, because they can use the handle from their original connect call in any further MQI calls. This handle ensures that the calls are directed to the same queue manager. Any applications connecting *after* you have changed the default queue manager connect to the new default queue manager. This might be what you intend, but you should take this into account before you change the default.

Creating a default queue manager is described in "Creating a default queue manager" on page 23.

Specify a dead-letter queue

The dead-letter queue is a local queue where messages are put if they cannot be routed to their intended destination.

It is important to have a dead-letter queue on each queue manager in your network. If you do not define one, errors in application programs might cause channels to be closed, and replies to administration commands might not be received.

For example, if an application tries to put a message on a queue on another queue manager, but gives the wrong queue name, the channel is stopped and the message remains on the transmission queue. Other applications cannot then use this channel for their messages.

The channels are not affected if the queue managers have dead-letter queues. The undelivered message is simply put on the dead-letter queue at the receiving end, leaving the channel and its transmission queue available.

When you create a queue manager, use the -u flag to specify the name of the dead-letter queue. You can also use an MQSC command to alter the attributes of a queue manager that you have already defined to specify the dead-letter queue to be used. See "Altering queue manager attributes" on page 37 for an example of the MQSC command ALTER.

Specify a default transmission queue

A transmission queue is a local queue on which messages in transit to a remote queue manager are queued before transmission. The default transmission queue is the queue that is used when no transmission queue is explicitly defined. Each queue manager can be assigned a default transmission queue.

When you create a queue manager, use the -d flag to specify the name of the default transmission queue. This does not actually create the queue; you have to do this explicitly later on. See "Working with local queues" on page 38 for more information.

Specify the logging parameters you require

You can specify logging parameters on the **crtmqm** command, including the type of logging, and the path and size of the log files.

In a development environment, the default logging parameters should be adequate. However, you can change the defaults if, for example:

- You have a low-end system configuration that cannot support large logs.
- You anticipate a large number of long messages being on your queues at the same time.
- You anticipate a lot of persistent messages passing through the queue manager.

Once you have set the logging parameters, some of them can only be changed by deleting the queue manager and recreating it with the same name but with different logging parameters.

For more information about logging parameters, see “Recovery and restart” on page 217.

Creating a default queue manager

You create a default queue manager using the **crtmqm** command with the **-q** flag. The following **crtmqm** command:

- Creates a default queue manager called `SATURN.QUEUE.MANAGER`
- Creates the default and system objects
- Specifies the names of both a default transmission queue and a dead-letter queue

```
crtmqm -q -d MY.DEFAULT.XMIT.QUEUE -u SYSTEM.DEAD.LETTER.QUEUE  SATURN.QUEUE.MANAGER
```

where:

-q
Indicates that this queue manager is the default queue manager.

-d MY.DEFAULT.XMIT.QUEUE
Is the name of the default transmission queue to be used by this queue manager.

Note: WebSphere MQ does not create a default transmission queue for you; you have to define it yourself.

-u SYSTEM.DEAD.LETTER.QUEUE
Is the name of the default dead-letter queue created by WebSphere MQ on installation.

SATURN.QUEUE.MANAGER
Is the name of this queue manager. This must be the last parameter specified on the **crtmqm** command.

The complete syntax of the **crtmqm** command is shown in “crtmqm (create queue manager)” on page 293.

The system and default objects are listed in Chapter 8, “System and default objects,” on page 525.

For WebSphere MQ for UNIX systems only

You can create the queue manager directory `/var/mqm/qmgrs/<qmgr>`, even on a separate local file system, before you use the **crtmqm** command. When you use **crtmqm**, if the `/var/mqm/qmgrs/<qmgr>` directory exists, is empty, and is owned by mqm, it is used for the queue manager data. If the directory is not owned by mqm, the creation fails with a First Failure Support Technology™ (FFST™) message. If the directory is not empty, a new directory is created.

Making an existing queue manager the default

You can make an existing queue manager the default queue manager. The way you do this depends on the platform you are using.

WebSphere MQ for Windows and WebSphere MQ for Linux (x86 platform) systems:

On WebSphere MQ for Windows and WebSphere MQ for Linux (x86 platform) systems, you can make an existing queue manager the default queue manager as follows:

1. Open the WebSphere MQ Explorer.
2. Right-click **IBM WebSphere MQ**, then select **Properties...**. The Properties for WebSphere MQ panel is displayed.
3. Type the name of the default queue manager into the Default queue manager name field.
4. Click OK.

UNIX systems:

When you create a default queue manager, its name is inserted in the `Name` attribute of the `DefaultQueueManager` stanza in the WebSphere MQ configuration file (mqs.ini). The stanza and its contents are automatically created if they do not exist.

- To make an existing queue manager the default, change the queue manager name on the `Name` attribute to the name of the new default queue manager. You can do this manually, using a text editor.
- If you do not have a default queue manager on the node, and you want to make an existing queue manager the default, create the *`DefaultQueueManager`* stanza with the required name yourself.
- If you accidentally make another queue manager the default and want to revert to the original default queue manager, edit the `DefaultQueueManager` stanza in mqs.ini, replacing the unwanted default queue manager with that of the one you want.

See “Configuring WebSphere MQ” on page 93 for information about configuration files.

Backing up configuration files after creating a queue manager

WebSphere MQ configuration information is stored in the Registry for Windows systems, and in configuration files on UNIX systems.

Windows and WebSphere MQ for Linux (x86 platform) systems:

If you use WebSphere MQ for Windows, configuration information is stored in the Windows Registry. Use the WebSphere MQ Explorer (see “Changing configuration information on Windows systems” on page 93) or the **amqmdain** command (see “amqmdain (WebSphere MQ services control)” on page 280) to make changes to the Registry.

If you use WebSphere MQ for Linux (x86 platform), configuration information is stored in configuration files. You can use the WebSphere MQ Explorer (see “Changing configuration information on Windows systems” on page 93).

UNIX systems:

There are two types of configuration file:

- When you install the product, the WebSphere MQ configuration file (mqs.ini) is created. It contains a list of queue managers that is updated each time you create or delete a queue manager. There is one mqs.ini file per node.

- When you create a new queue manager, a new queue manager configuration file (qm.ini) is automatically created. This contains configuration parameters for the queue manager.

After creating a queue manager, we recommend that you back up your configuration files.

If, later on, you create another queue manager that causes you problems, you can reinstate the backups when you have removed the source of the problem. As a general rule, back up your configuration files each time you create a new queue manager.

For more information about configuration files, see "Configuring WebSphere MQ" on page 93.

Starting a queue manager

Although you have created a queue manager, it cannot process commands or MQI calls until you start it. You do this using the **strmqm** command as follows:

```
strmqm saturn.queue.manager
```

On WebSphere MQ for Windows and WebSphere MQ for Linux (x86 platform) systems, you can start a queue manager as follows:

1. Open the WebSphere MQ Explorer.
2. Select the queue manager from the Navigator View.
3. Click **Start**. The queue manager starts.

If the queue manager start up takes more than a few seconds WebSphere MQ will issue information messages intermittently detailing the start up progress. For more information on these messages see WebSphere MQ Messages.

The **strmqm** command does not return control until the queue manager has started and is ready to accept connect requests.

Starting a queue manager automatically

In WebSphere MQ for Windows you can start a queue manager automatically when the system starts using the WebSphere MQ Explorer. For more information, see "Administration using the WebSphere MQ Explorer" on page 71.

Stopping a queue manager

Use the **endmqm** command to stop a queue manager. For example, to stop a queue manager called `saturn.queue.manager`, type:

```
endmqm saturn.queue.manager
```

On WebSphere MQ for Windows and WebSphere MQ for Linux (x86 platform) systems, you can stop a queue manager as follows:

1. Open the WebSphere MQ Explorer.
2. Select the queue manager from the Navigator View.
3. Click **Stop...**. The End Queue Manager panel is displayed.
4. Select Controlled, or Immediate.
5. Click **OK**. The queue manager stops.

Quiesced shutdown

By default, the **endmqm** command performs a *quiesced* shutdown of the specified queue manager. This might take a while to complete. A quiesced shutdown waits until *all* connected applications have disconnected.

Use this type of shutdown to notify applications to stop. If you issue:

```
endmqm -c saturn.queue.manager
```

you are not told when all applications have stopped. (An `endmqm -c saturn.queue.manager` command is equivalent to an `endmqm saturn.queue.manager` command.)

However, if you issue:

```
endmqm -w saturn.queue.manager
```

the command waits until all applications have stopped and the queue manager has ended.

Immediate shutdown

For an *immediate shutdown* any current MQI calls are allowed to complete, but any new calls fail. This type of shutdown does not wait for applications to disconnect from the queue manager.

For an immediate shutdown, type:

```
endmqm -i saturn.queue.manager
```

Preemptive shutdown

Attention!

Do not use this method unless all other attempts to stop the queue manager using the **endmqm** command have failed. This method can have unpredictable consequences for connected applications.

If an immediate shutdown does not work, you must resort to a *preemptive* shutdown, specifying the `-p` flag. For example:

```
endmqm -p saturn.queue.manager
```

This stops the queue manager immediately.

If this method still does not work, see "Stopping a queue manager manually" on page 539 for an alternative solution.

For a detailed description of the **endmqm** command and its options, see "endmqm (end queue manager)" on page 326.

If you have problems shutting down a queue manager

Problems in shutting down a queue manager are often caused by applications. For example, when applications:

- Do not check MQI return codes properly
- Do not request notification of a quiesce

- Terminate without disconnecting from the queue manager (by issuing an **MQDISC** call)

If a problem occurs when you stop the queue manager, you can break out of the **endmqm** command using Ctrl-C.

You can then issue another **endmqm** command, but this time with a flag that specifies the type of shutdown that you require.

Restarting a queue manager

To restart a queue manager, type:

```
strmqm saturn.queue.manager
```

On WebSphere MQ for Windows and WebSphere MQ for Linux (x86 platform) systems, you can restart a queue manager is the same way as starting it, as follows:

1. Open the WebSphere MQ Explorer.
2. Select the queue manager from the Navigator View.
3. Click **Start**. The queue manager restarts.

If the queue manager restart takes more than a few seconds WebSphere MQ will issue information messages intermittently detailing the start up progress. For more information on these messages see WebSphere MQ Messages.

Deleting a queue manager

You can delete a queue manager using the dltmqm command or using the Explorer.

Stop the queue manager.

Issue the following command: `dltmqm saturn.queue.manager`

On WebSphere MQ for Windows and WebSphere MQ for Linux (x86 platform) systems, you can delete a queue manager as follows:

1. Open the WebSphere MQ Explorer.
2. In the Navigator view, select the queue manager.
3. If the queue manager is not stopped, stop it.
    a. Right-click the queue manager.
    b. Click **Stop**.
4. Right-click the queue manager.
5. Click **Delete**.

The queue manager is deleted.

Attention:

- Deleting a queue manager is a drastic step, because you also delete all resources associated with the queue manager, including all queues and their messages and all object definitions. If you use the dltmqm command, there is no displayed prompt that allows you to change your mind; when you press the Enter key all the associated resources are lost.
- In WebSphere MQ for Windows, deleting a queue manager also removes the queue manager from the automatic startup list (described in "Starting a queue manager automatically" on page 25). When the command has completed, a `WebSphere MQ queue manager ending` message is displayed; you are not told that the queue manager has been deleted.
- Deleting a cluster queue manager does not remove it from the cluster. See the note in the description of dltmqm for more information.

For a description of the dltmqm command and its options, see "dltmqm (delete queue manager)" on page 298. Ensure that only trusted administrators have the authority to use this command. (For information about security, see "WebSphere MQ security" on page 122.)

If this method for deleting a queue manager does not work, see "Removing queue managers manually" on page 540 for an alternative.

Administering local WebSphere MQ objects

This chapter tells you how to administer local WebSphere MQ objects to support application programs that use the Message Queue Interface (MQI). In this context, local administration means creating, displaying, changing, copying, and deleting WebSphere MQ objects. In addition to the approaches detailed in this chapter you can use the WebSphere MQ Explorer to administer local WebSphere MQ objects, see "Administration using the WebSphere MQ Explorer" on page 71.

This chapter contains the following sections:

- "Supporting application programs that use the MQI"
- "Performing local administration tasks using MQSC commands" on page 29
- "Working with queue managers" on page 36
- "Working with local queues" on page 38
- "Working with alias queues" on page 43
- "Working with model queues" on page 45
- "Working with services" on page 46
- "Managing objects for triggering" on page 52

Supporting application programs that use the MQI

WebSphere MQ application programs need certain objects before they can run successfully. For example, Figure 1 on page 29 shows an application that removes messages from a queue, processes them, and then sends some results to another queue on the same queue manager.

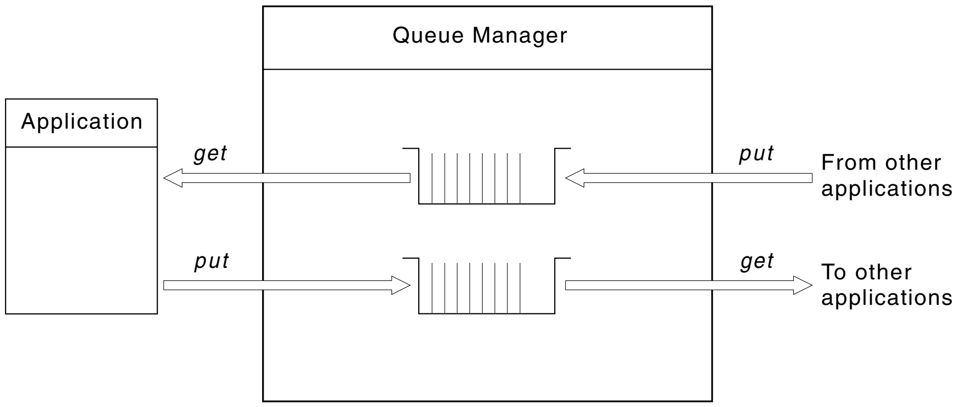


Figure 1. Queues, messages, and applications

Whereas applications can put messages onto local or remote queues (using **MQPUT**), they can only get messages directly from local queues (using **MQGET**).

Before this application can run, the following conditions must be satisfied:

- The queue manager must exist and be running.
- The first application queue, from which the messages are to be removed, must be defined.
- The second queue, on which the application puts the messages, must also be defined.
- The application must be able to connect to the queue manager. To do this it must be linked to WebSphere MQ. See the WebSphere MQ Application Programming Guide for more information.
- The applications that put the messages on the first queue must also connect to a queue manager. If they are remote, they must also be set up with transmission queues and channels. This part of the system is not shown in Figure 1.

Performing local administration tasks using MQSC commands

This section introduces you to MQSC commands and tells you how to use them for some common tasks. If you use WebSphere MQ for Windows or WebSphere MQ for Linux (x86 platform), you can also perform the operations described in this section using the WebSphere MQ Explorer. See "Administration using the WebSphere MQ Explorer" on page 71 for more information.

You can use MQSC commands to manage queue manager objects, including the queue manager itself, queues, process definitions, channels, client connection channels, listeners, services, namelists, clusters, and authentication information objects. This section deals with queue managers, queues, and process definitions; for information about administering channel, client connection channel, and listener objects, see WebSphere MQ Intercommunication. For information about all the MQSC commands for managing queue manager objects, see WebSphere MQ Script (MQSC) Command Reference.

You issue MQSC commands to a queue manager using the **runmqsc** command. (For details of this command, see "runmqsc (run MQSC commands)" on page 353.) You can do this interactively, issuing commands from a keyboard, or you can redirect the standard input device (`stdin`) to run a sequence of commands from an

ASCII text file. In both cases, the format of the commands is the same. (For information about running the commands from a text file, see "Running MQSC commands from text files" on page 32.)

You can run the **runmqsc** command in three ways, depending on the flags set on the command:

- Verify a command without running it, where the MQSC commands are verified on a local queue manager, but are not actually run.
- Run a command on a local queue manager, where the MQSC commands are run on a local queue manager.
- Run a command on a remote queue manager, where the MQSC commands are run on a remote queue manager.

You can also run the command followed by a question mark to display the syntax.

Object attributes specified in MQSC commands are shown in this book in uppercase (for example, RQMNAME), although they are not case sensitive. MQSC command attribute names are limited to eight characters. MQSC commands are available on other platforms, including i5/OS and z/OS.

MQSC commands are summarized in Chapter 13, "Comparing command sets," on page 555.The WebSphere MQ Script (MQSC) Command Reference contains a description of each MQSC command and its syntax.

WebSphere MQ object names

In examples, we use some long names for objects. This is to help you identify the type of object you are dealing with.

When you issue MQSC commands, you need specify only the local name of the queue. In our examples, we use queue names such as:

```
ORANGE.LOCAL.QUEUE
```

The `LOCAL.QUEUE` part of the name is simply to illustrate that this queue is a local queue. It is ***not*** required for the names of local queues in general.

We also use the name `saturn.queue.manager` as a queue manager name. The `queue.manager` part of the name is simply to illustrate that this object is a queue manager. It is *not* required for the names of queue managers in general.

Case-sensitivity in MQSC commands:

MQSC commands, including their attributes, can be written in uppercase or lowercase. Object names in MQSC commands are folded to uppercase (that is, QUEUE and queue are not differentiated), unless the names are enclosed within single quotation marks. If quotation marks are not used, the object is processed with a name in uppercase. See the WebSphere MQ Script (MQSC) Command Reference for more information.

The **runmqsc** command invocation, in common with all WebSphere MQ control commands, is case sensitive in some WebSphere MQ environments. See "Using control commands" on page 19 for more information.

Standard input and output

The *standard input device*, also referred to as `stdin`, is the device from which input to the system is taken. Typically this is the keyboard, but you can specify that input is to come from a serial port or a disk file, for example. The *standard output device*, also referred to as `stdout`, is the device to which output from the system is sent. Typically this is a display, but you can redirect output to a serial port or a file.

On operating-system commands and WebSphere MQ control commands, the < operator redirects input. If this operator is followed by a file name, input is taken from the file. Similarly, the > operator redirects output; if this operator is followed by a file name, output is directed to that file.

Using MQSC commands interactively

To use MQSC commands interactively, open a command window or shell and enter:

```
runmqsc
```

In this command, a queue manager name has not been specified, so the MQSC commands are processed by the default queue manager. If you want to use a different queue manager, specify the queue manager name on the **runmqsc** command. For example, to run MQSC commands on queue manager `jupiter.queue.manager`, use the command:

```
runmqsc jupiter.queue.manager
```

After this, all the MQSC commands you type in are processed by this queue manager, assuming that it is on the same node and is already running.

Now you can type in any MQSC commands, as required. For example, try this one:

```
DEFINE QLOCAL (ORANGE.LOCAL.QUEUE)
```

For commands that have too many parameters to fit on one line, use continuation characters to indicate that a command is continued on the following line:

- A minus sign (-) indicates that the command is to be continued from the start of the following line.
- A plus sign (+) indicates that the command is to be continued from the first nonblank character on the following line.

Command input terminates with the final character of a nonblank line that is not a continuation character. You can also terminate command input explicitly by entering a semicolon (;). (This is especially useful if you accidentally enter a continuation character at the end of the final line of command input.)

Feedback from MQSC commands:

When you issue MQSC commands, the queue manager returns operator messages that confirm your actions or tell you about the errors you have made. For example:

```
AMQ8006: WebSphere MQ queue created.
```

This message confirms that a queue has been created.

```
AMQ8405: Syntax error detected at or near end of command segment below:-

AMQ8426: Valid MQSC commands are:


    ALTER
    CLEAR
    DEFINE
    DELETE
    DISPLAY
    END
    PING
    REFRESH
    RESET
    RESOLVE
    RESUME
    START
    STOP
    SUSPEND
     4 : end
```

This message indicates that you have made a syntax error.

These messages are sent to the standard output device. If you have not entered the command correctly, refer to the WebSphere MQ Script (MQSC) Command Reference for the correct syntax.

Ending interactive input of MQSC commands:

To stop working with MQSC commands, enter the END command.

Alternatively, you can use the EOF character for your operating system.

Running MQSC commands from text files

Running MQSC commands interactively is suitable for quick tests, but if you have very long commands, or are using a particular sequence of commands repeatedly, consider redirecting `stdin` from a text file. (See "Standard input and output" on page 31 for information about `stdin` and `stdout`.) To do this, first create a text file containing the MQSC commands using your usual text editor. When you use the **runmqsc** command, use the redirection operators. For example, the following command runs a sequence of commands contained in the text file `myprog.in`:

```
runmqsc < myprog.in
```

Similarly, you can also redirect the output to a file. A file containing the MQSC commands for input is called an *MQSC command file*. The output file containing replies from the queue manager is called the *output file*.

To redirect both `stdin` and `stdout` on the **runmqsc** command, use this form of the command:

```
runmqsc < myprog.in > myprog.out
```

This command invokes the MQSC commands contained in the MQSC command file `myprog.in.` Because we have not specified a queue manager name, the MQSC commands run against the default queue manager. The output is sent to the text file `myprog.out`. Figure 2 on page 33 shows an extract from the MQSC command file `myprog.in` and Figure 3 on page 34 shows the corresponding extract of the output in `myprog.out`.

To redirect `stdin` and `stdout` on the **runmqsc** command, for a queue manager (`saturn.queue.manager`) that is not the default, use this form of the command:

```
runmqsc saturn.queue.manager < myprog.in > myprog.out
```

MQSC command files:

MQSC commands are written in human-readable form, that is, in ASCII text. Figure 2 is an extract from an MQSC command file showing an MQSC command (DEFINE QLOCAL) with its attributes. The WebSphere MQ Script (MQSC) Command Reference contains a description of each MQSC command and its syntax.

```
 .
 .
 .
DEFINE QLOCAL(ORANGE.LOCAL.QUEUE) REPLACE  +
       DESCR(' ') +
       PUT(ENABLED) +
       DEFPRTY(0) +
       DEFPSIST(NO) +
       GET(ENABLED) +
       MAXDEPTH(5000) +
       MAXMSGL(1024) +
       DEFSOPT(SHARED) +
       NOHARDENBO +
       USAGE(NORMAL) +
       NOTRIGGER;
 .
 .
 .
```

Figure 2. Extract from an MQSC command file

For portability among WebSphere MQ environments, we recommend that you limit the line length in MQSC command files to 72 characters. The plus sign indicates that the command is continued on the next line.

MQSC command reports:

The **runmqsc** command returns a *report*, which is sent to `stdout`. The report contains:

- A header identifying MQSC commands as the source of the report:

  ```
  Starting MQSC for queue manager jupiter.queue.manager.
  ```

  Where `jupiter.queue.manager` is the name of the queue manager.
- An optional numbered listing of the MQSC commands issued. By default, the text of the input is echoed to the output. Within this output, each command is prefixed by a sequence number, as shown in Figure 3 on page 34. However, you can use the -e flag on the **runmqsc** command to suppress the output.
- A syntax error message for any commands found to be in error.
- An *operator message* indicating the outcome of running each command. For example, the operator message for the successful completion of a DEFINE QLOCAL command is:

  ```
  AMQ8006: WebSphere MQ queue created.
  ```
- Other messages resulting from general errors when running the script file.

- A brief statistical summary of the report indicating the number of commands read, the number of commands with syntax errors, and the number of commands that could not be processed.

  Note: The queue manager attempts to process only those commands that have no syntax errors.

```
Starting MQSC for queue manager jupiter.queue.manager.
 .
 .
     12:     DEFINE QLOCAL('ORANGE.LOCAL.QUEUE') REPLACE  +
       :            DESCR(' ') +
       :            PUT(ENABLED) +
       :            DEFPRTY(0) +
       :            DEFPSIST(NO) +
       :            GET(ENABLED) +
       :            MAXDEPTH(5000) +
       :            MAXMSGL(1024) +
       :            DEFSOPT(SHARED) +
       :            NOHARDENBO +
       :            USAGE(NORMAL) +
       :            NOTRIGGER;
AMQ8006: WebSphere MQ queue created.
       :
 .
 .
```

Figure 3. Extract from an MQSC command report file

Running the supplied MQSC command files:

These MQSC command files are supplied with WebSphere MQ:

amqscos0.tst
Definitions of objects used by sample programs.

amqscic0.tst
Definitions of queues for CICS® transactions.

In WebSphere MQ for Windows, these files are located in the directory `c:\Program Files\IBM\WebSphere MQ\tools\mqsc\samples`.

On UNIX systems these files are located in the directory `opt/mqm/samp` (`usr/mqm/samp` on AIX®).

The command that runs them is:

```
 runmqsc < amqscos0.tst >test.out
```

Using runmqsc to verify commands:

You can use the **runmqsc** command to verify MQSC commands on a local queue manager without actually running them. To do this, set the -v flag in the **runmqsc** command, for example:

```
runmqsc -v < myprog.in > myprog.out
```

When you invoke **runmqsc** against an MQSC command file, the queue manager verifies each command and returns a report without actually running the MQSC commands. This allows you to check the syntax of the commands in your command file. This is particularly important if you are:

- Running a large number of commands from a command file.
- Using an MQSC command file many times over.

The returned report is similar to that shown in Figure 3 on page 34.

You cannot use this method to verify MQSC commands remotely. For example, if you attempt this command:

```
runmqsc -w 30 -v jupiter.queue.manager < myprog.in > myprog.out
```

the -w flag, which you use to indicate that the queue manager is remote, is ignored, and the command is run locally in verification mode. 30 is the number of seconds that WebSphere MQ waits for replies from the remote queue manager.

Running MQSC commands from batch files

If you have very long commands, or are using a particular sequence of commands repeatedly, consider redirecting `stdin` from a batch file. To do this, first create a batch file containing the MQSC commands using your usual text editor. When you use the **runmqsc** command, use the redirection operators. The following example:

1. Creates a test queue manager, TESTQM
2. Creates a matching CLNTCONN and listener set to use TCP/IP port 1600
3. Creates a test queue, TESTQ
4. Puts a message on the queue, using the amqsputc sample program

```
export MYTEMPQM=TESTQM
export MYPORT=1600
export MQCHLLIB=/var/mqm/qmgrs/$MQTEMPQM/@ipcc

crtmqm $MYTEMPQM
strmqm $MYTEMPQM
runmqlsr -m $MYTEMPQM -t TCP -p $MYPORT &

runmqsc $MYTEMPQM << EOF
  DEFINE CHANNEL(NTLM) CHLTYPE(SVRCONN) TRPTYPE(TCP)
  DEFINE CHANNEL(NTLM) CHLTYPE(CLNTCONN) QMNAME('$MYTEMPQM') CONNAME('hostname($MYPORT)')
  ALTER  CHANNEL(NTLM) CHLTYPE(CLNTCONN)
  DEFINE QLOCAL(TESTQ)
EOF

amqsputc TESTQ $MYTEMPQM << EOF
hello world
EOF

endmqm -i $MYTEMPQM
```

Figure 4. Example script for running MQSC commands from a batch file

Resolving problems with MQSC commands

If you cannot get MQSC commands to run, use the following information to see if any of these common problems apply to you. It is not always obvious what the problem is when you read the error generated.

When you use the **runmqsc** command, remember the following:

- Use the < operator to redirect input from a file. If you omit this operator, the queue manager interprets the file name as a queue manager name, and issues the following error message:

```
AMQ8118: WebSphere MQ queue manager does not exist.
```

- If you redirect output to a file, use the > redirection operator. By default, the file is put in the current working directory at the time **runmqsc** is invoked. Specify a fully-qualified file name to send your output to a specific file and directory.
- Check that you have created the queue manager that is going to run the commands, by using the following command to display all queue managers:

  ```
  dspmq
  ```
- The queue manager must be running. If it is not, start it; (see “Starting a queue manager” on page 25). You get an error message if you try to start a queue manager that is already running.
- Specify a queue manager name on the **runmqsc** command if you have not defined a default queue manager, or you get this error:

  ```
  AMQ8146: WebSphere MQ queue manager not available.
  ```
- You cannot specify an MQSC command as a parameter of the **runmqsc** command. For example, this is not valid:

  ```
  runmqsc DEFINE QLOCAL(FRED)
  ```
- You cannot enter MQSC commands before you issue the **runmqsc** command.
- You cannot run control commands from **runmqsc**. For example, you cannot issue the **strmqm** command to start a queue manager while you are running MQSC commands interactively. If you do this, you receive error messages similar to the following:

  ```
  runmqsc
   .
   .
  Starting MQSC for queue manager jupiter.queue.manager.

      1 : strmqm saturn.queue.manager
  AMQ8405: Syntax error detected at or near end of cmd segment below:-s

  AMQ8426: Valid MQSC commands are:
      ALTER
      CLEAR
      DEFINE
      DELETE
      DISPLAY
      END
      PING
      REFRESH
      RESET
      RESOLVE
      RESUME
      START
      STOP
      SUSPEND
       2 : end
  ```

Working with queue managers

This section contains examples of some MQSC commands that you can use to display or alter queue manager attributes. See the WebSphere MQ Script (MQSC) Command Reference for detailed information about these commands.

Displaying queue manager attributes

To display the attributes of the queue manager specified on the **runmqsc** command, use the following MQSC command:

```
DISPLAY QMGR
```

Typical output from this command is shown in Figure 5.

```
DISPLAY QMGR
     1 : DISPLAY QMGR
AMQ8408: Display Queue Manager details.
   QMNAME(SATURN)                          ACCTCONO(DISABLED)
   ACCTINT(1800)                           ACCTMQI(OFF)
   ACCTQ(OFF)                              ACTIVREC(MSG)
   ALTDATE(2005-02-09)                     ALTTIME(17.21.40)
   AUTHOREV(DISABLED)                      CCSID(850)
   CHAD(DISABLED)                          CHADEV(DISABLED)
   CHADEXIT( )                             CHLEV(DISABLED)
   CLWLDATA( )                             CLWLEXIT( )
   CLWLLEN(100)                            CLWLMRUC(999999999)
   CLWLUSEQ(LOCAL)                         CMDLEVEL(600)
   COMMANDQ(SYSTEM.ADMIN.COMMAND.QUEUE)    CRDATE(2005-02-09)
   CRTIME(17.21.40)                        DEADQ()
   DEFXMITQ( )                             DESCR( )
   DISTL(YES)                              INHIBTEV(DISABLED)
   IPADDRV(IPV4)                           LOCALEV(DISABLED)
   LOGGEREV(DISABLED)                      MAXHANDS(256)
   MAXMSGL(4194304)                        MAXPRTY(9)
   MAXUMSGS(10000)                         MONACLS(QMGR)
   MONCHL(OFF)                             MONQ(OFF)
   PERFMEV(DISABLED)                       PLATFORM(WINDOWSNT)
   QMID(SATURN_2005-02-09_02.00.31)        REMOTEEV(DISABLED)
   REPOS( )                                REPOSNL( )
   ROUTEREC(MSG)                           SCHINIT(QMGR)
   SCMDSERV(QMGR)                          SSLCRLNL( )
   SSLCRYP( )                              SSLEV(DISABLED)
   SSLFIPS(NO)
   SSLKEYR(C:\Program Files\IBM\WebSphere MQ\Qmgrs\saturn\ssl\key)
   SSLRKEYC(0)                             STATACLS(QMGR)
   STATCHL(OFF)                            STATINT(1800)
   STATMQI(OFF)                            STATQ(OFF)
   STRSTPEV(ENABLED)                       SYNCPT
   TRIGINT(999999999)
```

Figure 5. Typical output from a DISPLAY QMGR command

The ALL parameter (the default) on the DISPLAY QMGR command displays all the queue manager attributes. In particular, the output tells you the default queue manager name (`saturn.queue.manager`), the dead-letter queue name (SYSTEM.DEAD.LETTER.QUEUE), and the command queue name (SYSTEM.ADMIN.COMMAND.QUEUE).

You can confirm that these queues exist by entering the command:

```
DISPLAY QUEUE (SYSTEM.*)
```

This displays a list of queues that match the stem `SYSTEM.*`. The parentheses are required.

Altering queue manager attributes

To alter the attributes of the queue manager specified on the **runmqsc** command, use the MQSC command ALTER QMGR, specifying the attributes and values that you want to change. For example, use the following commands to alter the attributes of `jupiter.queue.manager`:

```
runmqsc jupiter.queue.manager

ALTER QMGR DEADQ (ANOTHERDLQ) INHIBTEV (ENABLED)
```

The ALTER QMGR command changes the dead-letter queue used, and enables inhibit events.

Working with local queues

This section contains examples of some MQSC commands that you can use to manage local, model, and alias queues. See the WebSphere MQ Script (MQSC) Command Reference for detailed information about these commands.

Defining a local queue

For an application, the local queue manager is the queue manager to which the application is connected. Queues managed by the local queue manager are said to be local to that queue manager.

Use the MQSC command DEFINE QLOCAL to create a local queue. You can also use the default defined in the default local queue definition, or you can modify the queue characteristics from those of the default local queue.

Note: The default local queue is named SYSTEM.LOCAL.DEFAULT.QUEUE and it was created on system installation.

Using the MQSC command shown below, we define a queue called ORANGE.LOCAL.QUEUE, with the following characteristics:

- It is enabled for gets, enabled for puts, and operates on a priority order basis.
- It is an *normal* queue; it is not an initiation queue or transmission queue, and it does not generate trigger messages.
- The maximum queue depth is 5000 messages; the maximum message length is 4194304 bytes.

```
DEFINE QLOCAL (ORANGE.LOCAL.QUEUE) +
       DESCR('Queue for messages from other systems') +
       PUT (ENABLED) +
       GET (ENABLED) +
       NOTRIGGER +
       MSGDLVSQ (PRIORITY) +
       MAXDEPTH (5000) +
       MAXMSGL (4194304) +
       USAGE (NORMAL);
```

Note:

1. With the exception of the value for the description, all the attribute values shown are the default values. We have shown them here for purposes of illustration. You can omit them if you are sure that the defaults are what you want or have not been changed. See also “Displaying default object attributes” on page 39.
2. USAGE (NORMAL) indicates that this queue is not a transmission queue.
3. If you already have a local queue on the same queue manager with the name ORANGE.LOCAL.QUEUE, this command fails. Use the REPLACE attribute if you want to overwrite the existing definition of a queue, but see also “Changing local queue attributes” on page 40.

Defining a dead-letter queue:

We recommend that each queue manager has a local queue to be used as a dead-letter queue so that messages that cannot be delivered to their correct destination can be stored for later retrieval. You must tell the queue manager about the dead-letter queue. You do this by specifying a dead-letter queue name on the **crtmqm** command (`crtmqm -u DEAD.LETTER.QUEUE`, for example), or by using the DEADQ attribute on the ALTER QMGR command to specify one later. You must define the dead-letter queue before using it.

We supply a sample dead-letter queue called SYSTEM.DEAD.LETTER.QUEUE with the product. This queue is automatically created when you create the queue manager. You can modify this definition if required, and rename it.

A dead-letter queue has no special requirements except that:
- It must be a local queue
- Its MAXMSGL (maximum message length) attribute must enable the queue to accommodate the largest messages that the queue manager has to handle **plus** the size of the dead-letter header (MQDLH)

WebSphere MQ provides a dead-letter queue handler that allows you to specify how messages found on a dead-letter queue are to be processed or removed. For further information, see “The WebSphere MQ dead-letter queue handler” on page 192.

Displaying default object attributes

When you define a WebSphere MQ object, it takes any attributes that you do not specify from the default object. For example, when you define a local queue, the queue inherits any attributes that you omit in the definition from the default local queue, which is called SYSTEM.DEFAULT.LOCAL.QUEUE. To see exactly what these attributes are, use the following command:

```
DISPLAY QUEUE (SYSTEM.DEFAULT.LOCAL.QUEUE)
```

The syntax of this command is different from that of the corresponding DEFINE command. On the DISPLAY command you can give just the queue name, whereas on the DEFINE command you have to specify the type of the queue, that is, QLOCAL, QALIAS, QMODEL, or QREMOTE.

You can selectively display attributes by specifying them individually. For example:

```
DISPLAY QUEUE (ORANGE.LOCAL.QUEUE) +
        MAXDEPTH +
        MAXMSGL +
        CURDEPTH;
```

This command displays the three specified attributes as follows:

```
AMQ8409: Display Queue details.
   QUEUE(ORANGE.LOCAL.QUEUE)               TYPE(QLOCAL)
   CURDEPTH(0)                             MAXDEPTH(5000)
   MAXMSGL(4194304)
```

CURDEPTH is the current queue depth, that is, the number of messages on the queue. This is a useful attribute to display, because by monitoring the queue depth you can ensure that the queue does not become full.

Copying a local queue definition

You can copy a queue definition using the LIKE attribute on the DEFINE command. For example:

```
DEFINE QLOCAL (MAGENTA.QUEUE) +
       LIKE (ORANGE.LOCAL.QUEUE)
```

This command creates a queue with the same attributes as our original queue ORANGE.LOCAL.QUEUE, rather than those of the system default local queue. Enter the name of the queue to be copied ***exactly*** as it was entered when you created the queue. If the name contains lower case characters, enclose the name in single quotation marks.

You can also use this form of the DEFINE command to copy a queue definition, but substitute one or more changes to the attributes of the original. For example:

```
DEFINE QLOCAL (THIRD.QUEUE) +
       LIKE (ORANGE.LOCAL.QUEUE) +
       MAXMSGL(1024);
```

This command copies the attributes of the queue ORANGE.LOCAL.QUEUE to the queue THIRD.QUEUE, but specifies that the maximum message length on the new queue is to be 1024 bytes, rather than 4194304.

Note:

1. When you use the LIKE attribute on a DEFINE command, you are copying the queue attributes only. You are not copying the messages on the queue.
2. If you a define a local queue, without specifying LIKE, it is the same as DEFINE LIKE(SYSTEM.DEFAULT.LOCAL.QUEUE).

Changing local queue attributes

You can change queue attributes in two ways, using either the ALTER QLOCAL command or the DEFINE QLOCAL command with the REPLACE attribute. In "Defining a local queue" on page 38, we defined the queue called ORANGE.LOCAL.QUEUE. Suppose, for example, you want to decrease the maximum message length on this queue to 10 000 bytes.

- Using the ALTER command:

  ```
  ALTER QLOCAL (ORANGE.LOCAL.QUEUE) MAXMSGL(10000)
  ```

  This command changes a single attribute, that of the maximum message length; all the other attributes remain the same.
- Using the DEFINE command with the REPLACE option, for example:

  ```
  DEFINE QLOCAL (ORANGE.LOCAL.QUEUE) MAXMSGL(10000) REPLACE
  ```

  This command changes not only the maximum message length, but also all the other attributes, which are given their default values. The queue is now put enabled whereas previously it was put inhibited. Put enabled is the default, as specified by the queue SYSTEM.DEFAULT.LOCAL.QUEUE.

  If you ***decrease*** the maximum message length on an existing queue, existing messages are not affected. Any new messages, however, must meet the new criteria.

Clearing a local queue

To delete all the messages from a local queue called MAGENTA.QUEUE, use the following command:

```
CLEAR QLOCAL (MAGENTA.QUEUE)
```

Note: There is no prompt that enables you to change your mind; once you press the Enter key the messages are lost.

You cannot clear a queue if:

- There are uncommitted messages that have been put on the queue under syncpoint.
- An application currently has the queue open.

Deleting a local queue

Use the MQSC command DELETE QLOCAL to delete a local queue. A queue cannot be deleted if it has uncommitted messages on it. However, if the queue has one or more committed messages and no uncommitted messages, it can be deleted only if you specify the PURGE option. For example:

```
DELETE QLOCAL (PINK.QUEUE) PURGE
```

Specifying NOPURGE instead of PURGE ensures that the queue is not deleted if it contains any committed messages.

Browsing queues

WebSphere MQ provides a sample queue browser that you can use to look at the contents of the messages on a queue. The browser is supplied in both source and executable formats.

In WebSphere MQ for Windows, the default file names and paths are:

Source
: `c:\Program Files\IBM\WebSphere MQ\tools\c\samples\`

Executable
: `c:\Program files\IBM\WebSphere MQ\tools\c\samples\bin\amqsbcg.exe`

In WebSphere MQ for UNIX, the default file names and paths are:

Source
: `/opt/mqm/samp/amqsbcg0.c` (`/usr/mqm/samp/amqsbcg0.c` on AIX)

Executable
: `/opt/mqm/samp/bin/amqsbcg` (`/usr/mqm/samp/bin/amqsbcg` on AIX)

The sample requires two input parameters, the queue name and the queue manager name. For example:

```
amqsbcg SYSTEM.ADMIN.QMGREVENT.tpp01 saturn.queue.manager
```

Typical results from this command are shown in Figure 6 on page 42.

```
AMQSBCG0 - starts here
**********************

 MQOPEN - 'SYSTEM.ADMIN.QMGR.EVENT'


 MQGET of message number 1
****Message descriptor****

  StrucId  : 'MD  '  Version : 2
  Report   : 0  MsgType : 8
  Expiry   : -1  Feedback : 0
  Encoding : 546  CodedCharSetId : 850
  Format : 'MQEVENT '
  Priority : 0  Persistence : 0
  MsgId : X'414D512073617475726E2E71756575650005D30033563DB8'
  CorrelId : X'000000000000000000000000000000000000000000000000'
  BackoutCount : 0
  ReplyToQ       : '                                                '
  ReplyToQMgr    : 'saturn.queue.manager                            '
  ** Identity Context
  UserIdentifier : '            '
  AccountingToken :
   X'0000000000000000000000000000000000000000000000000000000000000000'
  ApplIdentityData : '                                '
  ** Origin Context
  PutApplType    : '7'
  PutApplName    : 'saturn.queue.manager        '
  PutDate  : '19970417'    PutTime  : '15115208'
  ApplOriginData : '    '

  GroupId : X'000000000000000000000000000000000000000000000000'
  MsgSeqNumber   : '1'
  Offset         : '0'
  MsgFlags       : '0'
  OriginalLength : '104'

****   Message      ****

 length - 104 bytes

00000000:  0700 0000 2400 0000 0100 0000 2C00 0000 '....→.......,...'
00000010:  0100 0000 0100 0000 0100 0000 AE08 0000 '................'
00000020:  0100 0000 0400 0000 4400 0000 DF07 0000 '........D.......'
00000030:  0000 0000 3000 0000 7361 7475 726E 2E71 '....0...saturn.q'
00000040:  7565 7565 2E6D 616E 6167 6572 2020 2020 'ueue.manager    '
00000050:  2020 2020 2020 2020 2020 2020 2020 2020 '                '
00000060:  2020 2020 2020 2020                     '                '

 No more messages
 MQCLOSE
 MQDISC
```

Figure 6. Typical results from queue browser

Monitoring local queues with the Windows Performance Monitor

Administrators of WebSphere MQ for Windows can monitor the performance of local queues using the Windows Performance Monitor. For more information on the Windows Performance Monitor see the Monitoring WebSphere MQ book.

Enabling large queues

WebSphere MQ supports queues larger than 2 GB. On Windows systems, support for large files is available without any additional enablement. On AIX, HP-UX, Linux, and Solaris systems, you need to explicitly enable large file support before you can create queue files larger than 2 GB. See your operating system documentation for information on how to do this.

Some utilities, such as tar, cannot cope with files greater than 2 GB. Before enabling large file support, check your operating system documentation for information on restrictions on utilities you use.

Working with alias queues

An alias queue provides a way of referring indirectly to another queue. The other queue can be either:
- A local queue (see “Defining a local queue” on page 38).
- A local definition of a remote queue (see “Creating a local definition of a remote queue” on page 65).
- A topic.

An alias queue is not a real queue, but a definition that resolves to a real (or target) queue at run time. The alias queue definition specifies the target queue. When an application makes an **MQOPEN** call to an alias queue, the queue manager resolves the alias to the target queue name. An alias queue cannot resolve to another alias queue.

Alias queues are useful for:
- Giving different applications different levels of access authorities to the target queue.
- Allowing different applications to work with the same queue in different ways. (Perhaps you want to assign different default priorities or different default persistence values.)
- Simplifying maintenance, migration, and workload balancing. (Perhaps you want to change the target queue name without having to change your application, which continues to use the alias.)

For example, assume that an application has been developed to put messages on a queue called MY.ALIAS.QUEUE. It specifies the name of this queue when it makes an **MQOPEN** request and, indirectly, if it puts a message on this queue. The application is not aware that the queue is an alias queue. For each MQI call using this alias, the queue manager resolves the real queue name, which could be either a local queue or a remote queue defined at this queue manager.

By changing the value of the TARGQ attribute, you can redirect MQI calls to another queue, possibly on another queue manager. This is useful for maintenance, migration, and load-balancing.

Defining an alias queue

The following command creates an alias queue:

```
DEFINE QALIAS (MY.ALIAS.QUEUE) TARGET (YELLOW.QUEUE)
```

This command redirects MQI calls that specify MY.ALIAS.QUEUE to the queue YELLOW.QUEUE. The command does not create the target queue; the MQI calls fail if the queue YELLOW.QUEUE does not exist at run time.

If you change the alias definition, you can redirect the MQI calls to another queue. For example:

```
ALTER QALIAS (MY.ALIAS.QUEUE) TARGQ (MAGENTA.QUEUE)
```

This command redirects MQI calls to another queue, MAGENTA.QUEUE.

You can also use alias queues to make a single queue (the target queue) appear to have different attributes for different applications. You do this by defining two aliases, one for each application. Suppose there are two applications:

- Application ALPHA can put messages on YELLOW.QUEUE, but is not allowed to get messages from it.
- Application BETA can get messages from YELLOW.QUEUE, but is not allowed to put messages on it.

The following command defines an alias that is put enabled and get disabled for application ALPHA:

```
DEFINE QALIAS (ALPHAS.ALIAS.QUEUE) +
       TARGQ (YELLOW.QUEUE) +
       PUT (ENABLED) +
       GET (DISABLED)
```

The following command defines an alias that is put disabled and get enabled for application BETA:

```
DEFINE QALIAS (BETAS.ALIAS.QUEUE) +
       TARGQ (YELLOW.QUEUE) +
       PUT (DISABLED) +
       GET (ENABLED)
```

ALPHA uses the queue name ALPHAS.ALIAS.QUEUE in its MQI calls; BETA uses the queue name BETAS.ALIAS.QUEUE. They both access the same queue, but in different ways.

You can use the LIKE and REPLACE attributes when you define queue aliases, in the same way that you use these attributes with local queues.

Using other commands with alias queues

You can use the appropriate MQSC commands to display or alter alias queue attributes, or to delete the alias queue object. For example:

Use the following command to display the alias queue's attributes:

```
DISPLAY QUEUE (ALPHAS.ALIAS.QUEUE)
```

Use the following command to alter the base queue name, to which the alias resolves, where the `force` option forces the change even if the queue is open:

```
ALTER QALIAS (ALPHAS.ALIAS.QUEUE) TARGQ(ORANGE.LOCAL.QUEUE) FORCE
```

Use the following command to delete this queue alias:

```
DELETE QALIAS (ALPHAS.ALIAS.QUEUE)
```

You cannot delete an alias queue if an application currently has the queue open. See the WebSphere MQ Script (MQSC) Command Reference for more information about this and other alias queue commands.

Working with model queues

A queue manager creates a *dynamic queue* if it receives an MQI call from an application specifying a queue name that has been defined as a model queue. The name of the new dynamic queue is generated by the queue manager when the queue is created. A *model queue* is a template that specifies the attributes of any dynamic queues created from it.

Model queues provide a convenient method for applications to create queues as required.

Defining a model queue

You define a model queue with a set of attributes in the same way that you define a local queue. Model queues and local queues have the same set of attributes, except that on model queues you can specify whether the dynamic queues created are temporary or permanent. (Permanent queues are maintained across queue manager restarts, temporary ones are not.) For example:

```
DEFINE QMODEL (GREEN.MODEL.QUEUE) +
       DESCR('Queue for messages from application X') +
       PUT (DISABLED) +
       GET (ENABLED) +
       NOTRIGGER +
       MSGDLVSQ (FIFO) +
       MAXDEPTH (1000) +
       MAXMSGL (2000) +
       USAGE (NORMAL) +
       DEFTYPE (PERMDYN)
```

This command creates a model queue definition. From the DEFTYPE attribute, you can see that the actual queues created from this template are permanent dynamic queues. Any attributes not specified are automatically copied from the SYSYTEM.DEFAULT.MODEL.QUEUE default queue.

You can use the LIKE and REPLACE attributes when you define model queues, in the same way that you use them with local queues.

Using other commands with model queues

You can use the appropriate MQSC commands to display or alter a model queue's attributes, or to delete the model queue object. For example:

Use the following command to display the model queue's attributes:

```
DISPLAY QUEUE (GREEN.MODEL.QUEUE)
```

Use the following command to alter the model to enable puts on any dynamic queue created from this model:

```
ALTER QMODEL (BLUE.MODEL.QUEUE) PUT(ENABLED)
```

Use the following command to delete this model queue:

```
DELETE QMODEL (RED.MODEL.QUEUE)
```

Working with services

Service objects are a means by which additional processes can be managed as part of a queue manager. With services you can define programs that are started and stopped when the queue manager starts and ends.

Service objects can be either of the following types:

Server A server is a service object that has the parameter SERVTYPE specified as SERVER. A server service object is the definition of a program that will be executed when a specified queue manager is started. Server service objects define programs that typically run for a long period of time. For example, a server service object can be used to execute a trigger monitor process, such as **runmqtrm**.

Only one instance of a server service object can run concurrently. The status of running server service objects can be monitored using the MQSC command, DISPLAY SVSTATUS.

Command
A command is a service object that has the parameter SERVTYPE specified as COMMAND. Command service objects are similar to server service objects, however multiple instances of a command service object can run concurrently and their status can not be monitored using the MQSC command DISPLAY SVSTATUS.

If the MQSC command, STOP SERVICE, is executed no check is made to determine whether the program started by the MQSC command, START SERVICE, is still active before executing the stop program.

Defining a service object

The attributes used to define a service object are:

SERVTYPE
Defines the type of the service object. Possible values are:

SERVER
A server service object.

Only one instance of a server service object can be executed at a time. The status of server service objects can be monitored using the MQSC command, DISPLAY SVSTATUS.

COMMAND
A command service object.

Multiple instances of a command service object can be executed concurrently. The status of a command service objects cannot be monitored.

STARTCMD
The program that is executed to start the service. A fully qualified path to the program must be specified.

STARTARG
Arguments passed to the start program.

STDERR
Specifies the path to a file to which the standard error (stderr) of the service program should be redirected.

STDOUT
Specifies the path to a file to which the standard output (stdout) of the service program should be redirected.

STOPCMD
The program that is executed to stop the service. A fully qualified path to the program must be specified.

STOPARG
Arguments passed to the stop program.

CONTROL
Specifies how the service is to be started and stopped:

MANUAL
The service is not to be started automatically or stopped automatically. It is controlled by use of the START SERVICE and STOP SERVICE commands. This is the default value.

QMGR
The service being defined is to be started and stopped at the same time as the queue manager is started and stopped.

STARTONLY
The service is to be started at the same time as the queue manager is started, but is not requested to stop when the queue manager is stopped.

Managing services

By using the CONTROL parameter, an instance of a service object can be either started and stopped automatically by the queue manager, or started and stopped using the MQSC commands START SERVICE and STOP SERVICE.

When an instance of a service object is started, a message is written to the queue manager error log containing the name of the service object and the process id of the started process. An example log entry for a server service object starting follows:

```
02/15/2005 11:54:24 AM - Process(10363.1) User(mqm) Program(amqzmgr0)
AMQ5028: The Server 'S1' has started. ProcessId(13031).

EXPLANATION:
The Server process has started.
ACTION:
None.
```

An example log entry for a command service object starting follows:

```
02/15/2005 11:53:55 AM - Process(10363.1) User(mqm) Program(amqzmgr0)
AMQ5030: The Command 'C1' has started. ProcessId(13030).

EXPLANATION:
The Command has started.
ACTION:
None.
```

When an instance server service stops, a message is written to the queue manager error logs containing the name of the service and the process id of the ending process. An example log entry for a server service object stopping follows:

```
02/15/2005 11:54:54 AM - Process(10363.1) User(mqm) Program(amqzmgr0)
AMQ5029: The Server 'S1' has ended. ProcessId(13031).
```

```
EXPLANATION:
The Server process has ended.
ACTION:
None.
```

Additional environment variables

When a service is started, the environment in which the service process is started is inherited from the environment of the queue manager. It is possible to define additional environment variables to be set in the environment of the service process by adding the variables you want to define to one of the `service.env` environment override files.

There are two possible files to which you can add environment variables:
- The machine scope `service.env` file, which is located in `/var/mqm` on UNIX systems, or in the data directory selected during installation on Windows systems.
- The queue manager scope `service.env` file, which is located in the queue manager data directory. For example, the location of the environment override file for a queue manager named `QMNAME` is:
  - On UNIX systems, `/var/mqm/qmgrs/QMNAME/service.env`.
  - On Windows systems, `C:\Program Files\IBM\WebSphere MQ\qmgrs\QMNAME\service.env`.

Both files are processed, if available, with definitions in the queue manager scope file taking precedence over those in the machine scope file.

The format of the variables defined in the file, service.env, is a list of name and value variable pairs. Each variable must be defined on a new line, and each variable is taken as it is explicitly defined, including white space. An example of the file, service.env, follows:

```
#*******************************************************************#
#*                                                                 *#
#* <N_OCO_COPYRIGHT>                                               *#
#* Licensed Materials - Property of IBM                            *#
#*                                                                 *#
#* 63H9336                                                         *#
#* (C) Copyright IBM Corporation 2005                              *#
#*                                                                 *#
#* <NOC_COPYRIGHT>                                                 *#
#*                                                                 *#
#*******************************************************************#
#********************************************************************#
#* Module Name: service.env                                         *#
#* Type       : WebSphere MQ service environment file               *#
#* Function   : Define additional environment variables to be set   *#
#*              for SERVICE programs.                               *#
#* Usage      : <VARIABLE>=<VALUE>                                  *#
#*                                                                  *#
#********************************************************************#
MYLOC=/opt/myloc/bin
MYTMP=/tmp
TRACEDIR=/tmp/trace
MYINITQ=ACCOUNTS.INITIATION.QUEUE
```

Replaceable inserts on service definitions

In the definition of a service object, it is possible to substitute tokens. Tokens that are substituted will automatically be replaced with their expanded text when the service program is executed. Substitute tokens can be taken from the following list of common tokens, or from any variables that are defined in the file, service.env.

Common tokens:

The following are common tokens that can be used to substitute tokens in the definition of a service object:

MQ_INSTALL_PATH
: The install location of WebSphere MQ:
  - On AIX systems, the install location is `/usr/mqm/`
  - On Solaris, HP-UX, or Linux systems, the install location is `/opt/mqm/`
  - On Windows systems, the install location is the install directory selected during the installation of WebSphere MQ

MQ_DATA_PATH
: The location of the WebSphere MQ data directory:
  - On UNIX systems, the WebSphere MQ data directory location is `/var/mqm/`
  - On Windows systems, the location of the WebSphere MQ data directory is the data directory selected during the installation of WebSphere MQ

QMNAME
: The current queue manager name.

MQ_SERVICE_NAME
: The name of the service.

MQ_SERVER_PID
: This token can only be used by the STOPARG and STOPCMD arguments.

  For server service objects this token is replaced with the process id of the process started by the STARTCMD and STARTARG arguments. Otherwise, this token is replaced with 0.

MQ_Q_MGR_DATA_PATH
: The location of the queue manager data directory.

MQ_Q_MGR_DATA_NAME
: The transformed name of the queue manager. For more information on name transformation, see "Understanding WebSphere MQ file names" on page 16.

To use replaceable inserts, insert the token within + characters into any of the STARTCMD, STARTARG, STOPCMD, STOPARG, STDOUT or STDERR strings. For examples of this, see "Examples on using service objects."

Examples on using service objects

The following services are written with UNIX style path separator characters, except where otherwise stated.

Using a server service object:

This example shows how to define, use, and alter, a server service object to start a trigger monitor.

1. A server service object is defined, using the following MQSC command:

```
DEFINE SERVICE(S1) +
       CONTROL(QMGR) +
       SERVTYPE(SERVER) +
       STARTCMD('+MQ_INSTALL_PATH+ bin/runmqtrm') +
       STARTARG('-m +QMNAME+ -q ACCOUNTS.INITIATION.QUEUE') +
       STOPCMD('+MQ_INSTALL_PATH+ bin/amqsstop') +
       STOPARG('-m +QMNAME+ -p +MQ_SERVER_PID+')
```

Where:

`+MQ_INSTALL_PATH+` is a token representing the installation directory.

`+QMNAME+` is a token representing the name of the queue manager.

`ACCOUNTS.INITIATION.QUEUE` is the initiation queue.

`amqsstop` is a sample program provided with WebSphere MQ which requests the queue manager to break all connections for the process id. `amqsstop` generates PCF commands, therefore the command server must be running.

`+MQ_SERVER_PID+` is a token representing the process id passed to the stop program.

2. An instance of the server service object will execute when the queue manager is next started. However, we will start an instance of the server service object immediately with the following MQSC command:

   ```
   START SERVICE(S1)
   ```
3. The status of the server service process is displayed, using the following MQSC command:

   ```
   DISPLAY SVSTATUS(S1)
   ```
4. This example now shows how to alter the server service object and have the updates picked up by manually restarting the server service process. The server service object is altered so that the initiation queue is specified as `JUPITER.INITIATION.QUEUE`. The following MQSC command is used:

   ```
   ALTER SERVICE(S1) +
         STARTARG('-m +QMNAME+ -q JUPITER.INITIATION.QUEUE')
   ```

   Note: A running service will not pick up any updates to its service definition until it is restarted.
5. The server service process is restarted so that the alteration is picked up, using the following MQSC commands:

   ```
   STOP SERVICE(S1)
   ```

   Followed by:

   ```
   START SERVICE(S1)
   ```

   The server service process is restarted and picks up the alterations made in 4.

   Note: The MQSC command, `STOP SERVICE`, can only be used if a STOPCMD argument is specified in the service definition.

Using a command service object:

This example shows how to define a command service object to start a program that writes entries to the operating system's system log when a queue manager is started or stopped:

1. The command service object is defined, using the following MQSC command:

```
DEFINE SERVICE(S2) +
       CONTROL(QMGR) +
       SERVTYPE(COMMAND) +
       STARTCMD('/usr/bin/logger') +
       STARTARG('Queue manager +QMNAME+ starting') +
       STOPCMD('/usr/bin/logger') +
       STOPARG('Queue manager +QMNAME+ stopping')
```

Where:

`logger` is the UNIX supplied command to write to the system log.

`+QMNAME+` is a token representing the name of the queue manager.

Using a command service object when a queue manager ends only:

This example shows how to define a command service object to start a program that writes entries to the operating system's system log when a queue manager is stopped only:

1. The command service object is defined, using the following MQSC command:

```
DEFINE SERVICE(S3) +
       CONTROL(QMGR) +
       SERVTYPE(COMMAND) +
       STOPCMD('/usr/bin/logger') +
       STOPARG('Queue manager +QMNAME+ stopping')
```

Where:

`logger` is a sample program provided with WebSphere MQ that can write entries to the operating system's system log.

`+QMNAME+` is a token representing the name of the queue manager.

More on passing arguments:

This example is written with Windows style path separator characters.

This example shows how to define a server service object to start a program called `runserv` when a queue manager is started. One of the arguments that is to be passed to the starting program is a string containing a space. This argument needs to be passed as a single string. To achieve this, double quotes are used as shown in the following command to define the command service object:

1. The server service object is defined, using the following MQSC command:

```
DEFINE SERVICE(S1) SERVTYPE(SERVER) CONTROL(QMGR) +
  STARTCMD('C:\Program Files\Tools\runserv.exe') +
  STARTARG('-m +QMNAME+ -d "C:\Program Files\Tools\"') +
  STDOUT('C:\Program Files\Tools\+MQ_SERVICE_NAME+.out')
```

```
DEFINE SERVICE(S4) +
       CONTROL(QMGR) +
       SERVTYPE(SERVER) +
       STARTCMD('C:\Program Files\Tools\runserv.exe') +
       STARTARG('-m +QMNAME+ -d "C:\Program Files\Tools\"') +
       STDOUT('C:\Program Files\Tools\+MQ_SERVICE_NAME+.out')
```

Where:

`+QMNAME+` is a token representing the name of the queue manager.

`"C:\Program Files\Tools\"` is a string containing a space, which will be passed as a single string.

Autostarting a Service:

This example shows how to define a server service object that can be used to automatically start the Trigger Monitor when the queue manager starts.

1. The server service object is defined, using the following MQSC command:

   ```
   DEFINE SERVICE(TRIG_MON_START) +
          CONTROL(QMGR) +
          SERVTYPE(SERVER) +
          STARTCMD('runmqtrm') +
          STARTARG('-m +QMNAME+ -q +IQNAME+')
   ```

   Where:

   `+QMNAME+` is a token representing the name of the queue manager.

   `+IQNAME+` is an environment variable defined by the user in one of the service.env files representing the name of the initiation queue.

Managing objects for triggering

WebSphere MQ enables you to start an application automatically when certain conditions on a queue are met. For example, you might want to start an application when the number of messages on a queue reaches a specified number. This facility is called *triggering* and is described in detail in the WebSphere MQ Application Programming Guide.

This section tells you how to set up the required objects to support triggering on WebSphere MQ.

Defining an application queue for triggering

An application queue is a local queue that is used by applications for messaging, through the MQI. Triggering requires a number of queue attributes to be defined on the application queue. Triggering itself is enabled by the *Trigger* attribute (TRIGGER in MQSC commands).

In this example, a trigger event is to be generated when there are 100 messages of priority 5 or greater on the local queue MOTOR.INSURANCE.QUEUE, as follows:

```
DEFINE QLOCAL (MOTOR.INSURANCE.QUEUE) +
       PROCESS (MOTOR.INSURANCE.QUOTE.PROCESS) +
       MAXMSGL (2000) +
       DEFPSIST (YES) +
       INITQ (MOTOR.INS.INIT.QUEUE) +
       TRIGGER +
       TRIGTYPE (DEPTH) +
       TRIGDPTH (100)+
       TRIGMPRI (5)
```

where:

QLOCAL (MOTOR.INSURANCE.QUEUE)
Is the name of the application queue being defined.

PROCESS (MOTOR.INSURANCE.QUOTE.PROCESS)
Is the name of the process definition that defines the application to be started by a trigger monitor program.

MAXMSGL (2000)
Is the maximum length of messages on the queue.

DEFPSIST (YES)
: Specifies that messages on this queue are persistent by default.

INITQ (MOTOR.INS.INIT.QUEUE)
: Is the name of the initiation queue on which the queue manager is to put the trigger message.

TRIGGER
: Is the trigger attribute value.

TRIGTYPE (DEPTH)
: Specifies that a trigger event is generated when the number of messages of the required priority (TRIGMPRI) reaches the number specified in TRIGDPTH.

TRIGDPTH (100)
: Is the number of messages required to generate a trigger event.

TRIGMPRI (5)
: Is the priority of messages that are to be counted by the queue manager in deciding whether to generate a trigger event. Only messages with priority 5 or higher are counted.

Defining an initiation queue

When a trigger event occurs, the queue manager puts a trigger message on the initiation queue specified in the application queue definition. Initiation queues have no special settings, but you can use the following definition of the local queue MOTOR.INS.INIT.QUEUE for guidance:

```
DEFINE QLOCAL(MOTOR.INS.INIT.QUEUE) +
       GET (ENABLED) +
       NOSHARE +
       NOTRIGGER +
       MAXMSGL (2000) +
       MAXDEPTH (1000)
```

Defining a process

Use the DEFINE PROCESS command to create a process definition. A process definition defines the application to be used to process messages from the application queue. The application queue definition names the process to be used and thereby associates the application queue with the application to be used to process its messages. This is done through the PROCESS attribute on the application queue MOTOR.INSURANCE.QUEUE. The following MQSC command defines the required process, MOTOR.INSURANCE.QUOTE.PROCESS, identified in this example:

```
DEFINE PROCESS (MOTOR.INSURANCE.QUOTE.PROCESS) +
               DESCR ('Insurance request message processing') +
               APPLTYPE (UNIX) +
               APPLICID ('/u/admin/test/IRMP01') +
               USERDATA ('open, close, 235')
```

Where:

MOTOR.INSURANCE.QUOTE.PROCESS
: Is the name of the process definition.

DESCR ('Insurance request message processing')
: Describes the application program to which this definition relates. This text is displayed when you use the DISPLAY PROCESS command. This can

help you to identify what the process does. If you use spaces in the string, you must enclose the string in single quotation marks.

APPLTYPE (UNIX)
Is the type of application to be started.

APPLICID ('/u/admin/test/IRMP01')
Is the name of the application executable file, specified as a fully qualified file name. In Windows systems, a typical APPLICID value would be c:\appl\test\irmp01.exe.

USERDATA ('open, close, 235')
Is user-defined data, which can be used by the application.

Displaying attributes of a process definition

Use the DISPLAY PROCESS command to examine the results of your definition. For example:

```
DISPLAY PROCESS (MOTOR.INSURANCE.QUOTE.PROCESS)
```

```
    24 : DISPLAY PROCESS (MOTOR.INSURANCE.QUOTE.PROCESS) ALL
AMQ8407: Display Process details.
    DESCR ('Insurance request message processing')
    APPLICID ('/u/admin/test/IRMP01')
    USERDATA (open, close, 235)
    PROCESS (MOTOR.INSURANCE.QUOTE.PROCESS)
    APPLTYPE (UNIX)
```

You can also use the MQSC command ALTER PROCESS to alter an existing process definition, and the DELETE PROCESS command to delete a process definition.

Automating administration tasks

This chapter assumes that you have experience of administering WebSphere MQ objects.

You might decide that it would be beneficial to your installation to automate some administration and monitoring tasks. You can automate administration tasks for both local and remote queue managers using programmable command format (PCF) commands.

This chapter describes:
- How to use programmable command formats to automate administration tasks in “PCF commands.”
- Support for Microsoft’s Active Directory Service Interfaces (ADSI) in “Active Directory Services Interfaces” on page 56.

PCF commands

The purpose of WebSphere MQ programmable command format (PCF) commands is to allow administration tasks to be programmed into an administration program. In this way, from a program you can manipulate queue manager objects (queues, process definitions, namelists, channels, client connection channels, listeners, services, and authentication information objects), and even manipulate the queue managers themselves.

PCF commands cover the same range of functions provided by MQSC commands. You can write a program to issue PCF commands to any queue manager in the network from a single node. In this way, you can both centralize and automate administration tasks.

Each PCF command is a data structure that is embedded in the application data part of a WebSphere MQ message. Each command is sent to the target queue manager using the MQI function **MQPUT** in the same way as any other message. Providing the command server is running on the queue manager receiving the message, the command server interprets it as a command message and runs the command. To get the replies, the application issues an **MQGET** call and the reply data is returned in another data structure. The application can then process the reply and act accordingly.

Note: Unlike MQSC commands, PCF commands and their replies are not in a text format that you can read.

Briefly, these are some of the things needed to create a PCF command message:

Message descriptor
This is a standard WebSphere MQ message descriptor, in which:
- Message type (*MsgType*) is MQMT_REQUEST.
- Message format (*Format*) is MQFMT_ADMIN.

Application data
Contains the PCF message including the PCF header, in which:
- The PCF message type (*Type*) specifies MQCFT_COMMAND.
- The command identifier specifies the command, for example, *Change Queue* (MQCMD_CHANGE_Q).

For a complete description of the PCF data structures and how to implement them, see WebSphere MQ Programmable Command Formats and Administration Interface.

PCF object attributes

Object attributes in PCF are not limited to eight characters as they are for MQSC commands. They are shown in this book in italics. For example, the PCF equivalent of RQMNAME is *RemoteQMgrName*.

Escape PCFs

Escape PCFs are PCF commands that contain MQSC commands within the message text. You can use PCFs to send commands to a remote queue manager. For more information about using escape PCFs, see WebSphere MQ Programmable Command Formats and Administration Interface.

Using the MQAI to simplify the use of PCFs

The MQAI is an administration interface to WebSphere MQ that is available on the AIX, HP-UX, Linux, Solaris, and Windows platforms.

It performs administration tasks on a queue manager through the use of *data bags*. Data bags allow you to handle properties (or parameters) of objects in a way that is easier than using PCFs.

Use the MQAI:

To simplify the use of PCF messages

The MQAI is an easy way to administer WebSphere MQ; you do not have to write your own PCF messages, avoiding the problems associated with complex data structures.

To pass parameters in programs written using MQI calls, the PCF message must contain the command and details of the string or integer data. To do this, you need several statements in your program for every structure, and memory space must be allocated. This task can be long and laborious.

Programs written using the MQAI pass parameters into the appropriate data bag and you need only one statement for each structure. The use of MQAI data bags removes the need for you to handle arrays and allocate storage, and provides some degree of isolation from the details of the PCF.

To implement self-administering applications and administration tools

For example, the Active Directory Services Interfaces provided by WebSphere MQ for Windows use the MQAI.

To handle error conditions more easily

It is difficult to get return codes back from PCF commands, but the MQAI makes it easier for the program to handle error conditions.

After you have created and populated your data bag, you can send an administration command message to the command server of a queue manager, using the **mqExecute** call, which waits for any response messages. The **mqExecute** call handles the exchange with the command server and returns responses in a *response bag*.

For more information about using the MQAI, and PCFs in general, see WebSphere MQ Programmable Command Formats and Administration Interface.

Active Directory Services Interfaces

Active Directory Service Interfaces (ADSI) support allows client applications to use a common set of Component Object Model (COM) interfaces to communicate with, and control, any application that implements them.

Unlike tools written using other WebSphere MQ administration interfaces, those that use the ADSI are not limited to manipulating WebSphere MQ servers. The same tool can control Windows, Lotus Notes®, or any application implementing the ADSI.

WebSphere MQ support for the ADSI is implemented through the use of the **IBMMQSeries namespace**.

Any programming language that supports the COM interfaces can be used to implement ADSI clients.

For more information about the ADSI, visit the Microsoft web site at:

`www.microsoft.com`

For more information about Component Object Model (COM) interfaces, see WebSphere MQ Using the Component Object Model Interface.

Client connection channels in the Active Directory:

On Windows systems that support the Active Directory, WebSphere MQ publishes client connection channels in the Active Directory to provide dynamic client-server binding.

When client connection channel objects are defined, they are written into a client channel definition file, called AMQCLCHL.TAB by default. If the client connection channels use the TCP/IP protocol, the WebSphere MQ server also publishes them in the Active Directory. When the WebSphere MQ client determines how to connect to the server, it looks for a relevant client connection channel object definition using the following search order:

1. MQCONNX MQCD data structure
2. MQSERVER environment variable
3. client channel definition file
4. Active Directory

This order means that any current applications are not affected by any change. You can think of these entries in the Active Directory as records in the client channel definition file, and the WebSphere MQ client processes them in the same way. To configure and administer support for publishing client connection channel definitions in the Active Directory, use the **setmqscp** command, as described in "setmqscp (set service connection points)" on page 365.

Administering remote WebSphere MQ objects

This chapter tells you how to administer WebSphere MQ objects on a remote queue manager using MQSC commands, and how to use remote queue objects to control the destination of messages and reply messages.

This chapter describes:

- "Channels, clusters, and remote queuing"
- "Remote administration from a local queue manager" on page 59
- "Creating a local definition of a remote queue" on page 65
- "Using remote queue definitions as aliases" on page 68
- "Data conversion" on page 69

Channels, clusters, and remote queuing

A queue manager communicates with another queue manager by sending a message and, if required, receiving back a response. The receiving queue manager could be:

- On the same machine
- On another machine in the same location (or even on the other side of the world)
- Running on the same platform as the local queue manager
- Running on another platform supported by WebSphere MQ

These messages might originate from:

- User-written application programs that transfer data from one node to another
- User-written administration applications that use PCF commands, the MQAI, or the ADSI
- The WebSphere MQ Explorer.

- Queue managers sending:
  - Instrumentation event messages to another queue manager
  - MQSC commands issued from a **runmqsc** command in indirect mode (where the commands are run on another queue manager)

Before a message can be sent to a remote queue manager, the local queue manager needs a mechanism to detect the arrival of messages and transport them consisting of:

- At least one channel
- A transmission queue
- A channel initiator

For a remote queue manager to received a message, a listener is required.

A channel is a one-way communication link between two queue managers and can carry messages destined for any number of queues at the remote queue manager.

Each end of the channel has a separate definition. For example, if one end is a sender or a server, the other end must be a receiver or a requester. A simple channel consists of a *sender channel definition* at the local queue manager end and a *receiver channel definition* at the remote queue manager end. The two definitions must have the same name and together constitute a single message channel.

If you want the remote queue manager to respond to messages sent by the local queue manager, set up a second channel to send responses back to the local queue manager.

Use the MQSC command DEFINE CHANNEL to define channels. In this chapter, the examples relating to channels use the default channel attributes unless otherwise specified.

There is a message channel agent (MCA) at each end of a channel, controlling the sending and receiving of messages. The MCA takes messages from the transmission queue and puts them on the communication link between the queue managers.

A transmission queue is a specialized local queue that temporarily holds messages before the MCA picks them up and sends them to the remote queue manager. You specify the name of the transmission queue on a *remote queue definition*.

You can allow an MCA to transfer messages using multiple threads. This process is known as *pipelining*. Pipelining enables the MCA to transfer messages more efficiently, improving channel performance. See “Attributes of channels” on page 112 for details of how to configure a channel to use pipelining.

“Preparing channels and transmission queues for remote administration” on page 60 tells you how to use these definitions to set up remote administration.

For more information about setting up distributed queuing in general, see WebSphere MQ Intercommunication.

Remote administration using clusters

In a WebSphere MQ network using distributed queuing, every queue manager is independent. If one queue manager needs to send messages to another queue manager, it must define a transmission queue, a channel to the remote queue manager, and a remote queue definition for every queue to which it wants to send messages.

A *cluster* is a group of queue managers set up in such a way that the queue managers can communicate directly with one another over a single network without complex transmission queue, channel, and queue definitions. Clusters can be set up easily, and typically contain queue managers that are logically related in some way and need to share data or applications. Even the smallest cluster reduces system administration overheads.

Establishing a network of queue managers in a cluster involves fewer definitions than establishing a traditional distributed queuing environment. With fewer definitions to make, you can set up or change your network more quickly and easily, and reduce the risk of making an error in your definitions.

To set up a cluster, you need one cluster sender (CLUSSDR) and one cluster receiver (CLUSRCVR) definition for each queue manager. You do not need any transmission queue definitions or remote queue definitions. The principles of remote administration are the same when used within a cluster, but the definitions themselves are greatly simplified.

For more information about clusters, their attributes, and how to set them up, refer to WebSphere MQ Queue Manager Clusters.

Remote administration from a local queue manager

This section tells you how to administer a remote queue manager from a local queue manager using MQSC and PCF commands.

Preparing the queues and channels is essentially the same for both MQSC and PCF commands. In this book, the examples show MQSC commands, because they are easier to understand. For more information about writing administration programs using PCF commands, see WebSphere MQ Programmable Command Formats and Administration Interface.

You send MQSC commands to a remote queue manager either interactively or from a text file containing the commands. The remote queue manager might be on the same machine or, more typically, on a different machine. You can remotely administer queue managers in other WebSphere MQ environments, including UNIX systems, Windows systems, i5/OS, and z/OS.

To implement remote administration, you must create specific objects. Unless you have specialized requirements, you should find that the default values (for example, for maximum message length) are sufficient.

Preparing queue managers for remote administration

Figure 7 on page 60 shows the configuration of queue managers and channels that you need for remote administration using the **runmqsc** command. The object `source.queue.manager` is the source queue manager from which you can issue MQSC commands and to which the results of these commands (operator messages) are returned. The object `target.queue.manager` is the name of the target queue manager, which processes the commands and generates any operator messages.

Note: If you are using **runmqsc** with the -w option, `source.queue.manager` ***must*** be the default queue manager. For further information on creating a queue manager, see "crtmqm (create queue manager)" on page 293.

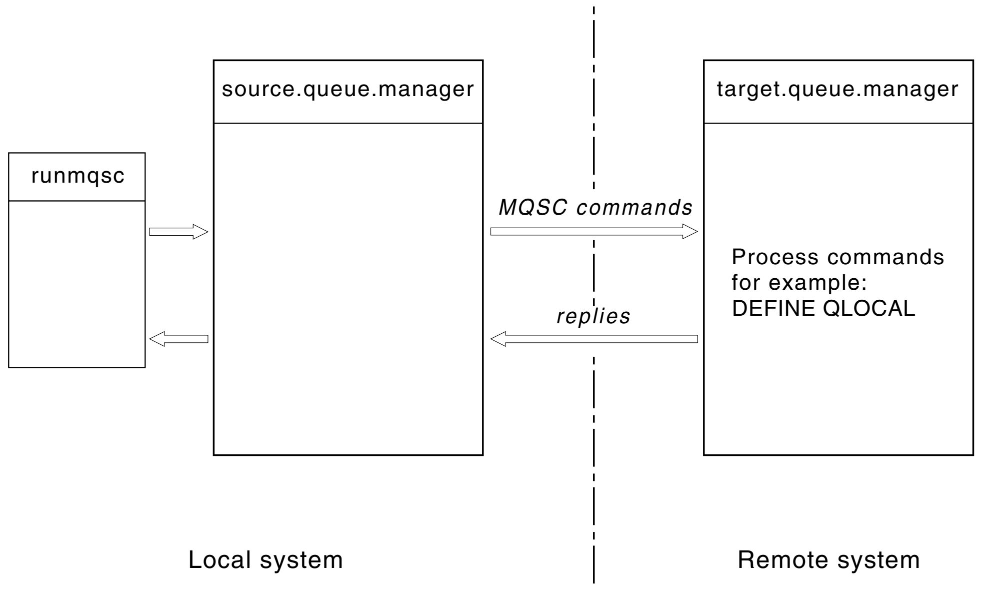


Figure 7. Remote administration using MQSC commands

On both systems, if you have not already done so:

- Create the queue manager and the default objects, using the **crtmqm** command.
- Start the queue manager, using the **strmqm** command.

On the target queue manager:

- The command queue, SYSTEM.ADMIN.COMMAND.QUEUE, must be present. This queue is created by default when a queue manager is created.

You have to run these commands locally or over a network facility such as Telnet.

Preparing channels and transmission queues for remote administration

To run MQSC commands remotely, set up two channels, one for each direction, and their associated transmission queues. This example assumes that you are using TCP/IP as the transport type and that you know the TCP/IP address involved.

The channel `source.to.target` is for sending MQSC commands from the source queue manager to the target queue manager. Its sender is at `source.queue.manager` and its receiver is at `target.queue.manager`. The channel `target.to.source` is for returning the output from commands and any operator messages that are generated to the source queue manager. You must also define a transmission queue for each channel. This queue is a local queue that is given the name of the receiving queue manager. The XMITQ name must match the remote queue manager name in order for remote administration to work, unless you are using a queue manager alias. Figure 8 on page 61 summarizes this configuration.

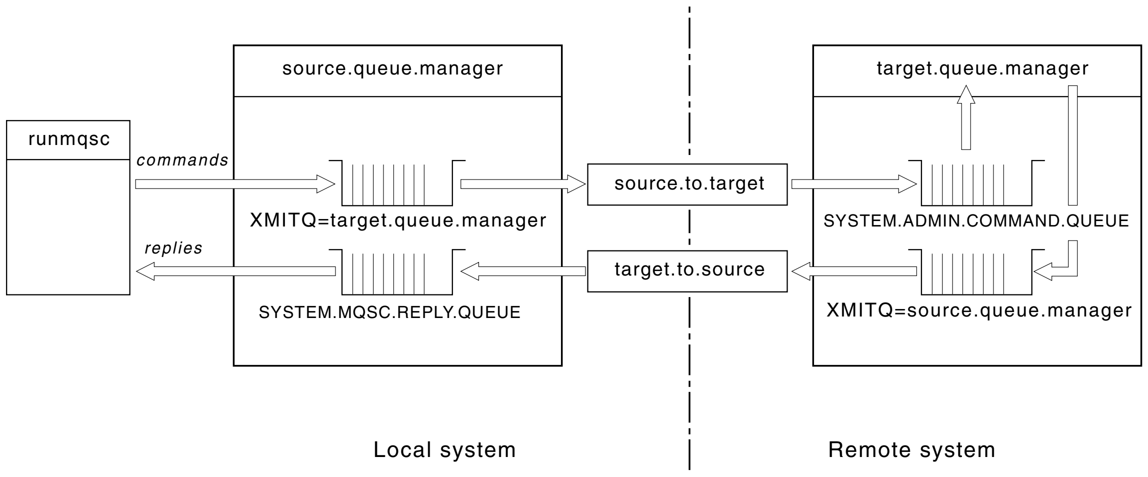


Figure 8. Setting up channels and queues for remote administration

See WebSphere MQ Intercommunication for more information about setting up channels.

Defining channels, listeners, and transmission queues:

On the source queue manager (`source.queue.manager`), issue the following MQSC commands to define the channels, listener, and the transmission queue:

1. Define the sender channel at the source queue manager:
   ```
   DEFINE CHANNEL ('source.to.target') +
          CHLTYPE(SDR) +
          CONNAME (RHX5498) +
          XMITQ ('target.queue.manager') +
          TRPTYPE(TCP)
   ```
2. Define the receiver channel at the source queue manager:
   ```
   DEFINE CHANNEL ('target.to.source') +
          CHLTYPE(RCVR) +
          TRPTYPE(TCP)
   ```
3. Define the listener on the source queue manager:
   ```
   DEFINE LISTENER ('source.queue.manager') +
          TRPTYPE (TCP)
   ```
4. Define the transmission queue on the source queue manager:
   ```
   DEFINE QLOCAL ('target.queue.manager') +
          USAGE (XMITQ)
   ```

Issue the following commands on the target queue manager (`target.queue.manager`), to create the channels, listener, and the transmission queue:

1. Define the sender channel on the target queue manager:
   ```
   DEFINE CHANNEL ('target.to.source') +
          CHLTYPE(SDR) +
          CONNAME (RHX7721) +
          XMITQ ('source.queue.manager') +
          TRPTYPE(TCP)
   ```
2. Define the receiver channel on the target queue manager:
   ```
   DEFINE CHANNEL ('source.to.target') +
          CHLTYPE(RCVR) +
          TRPTYPE(TCP)
   ```
3. Define the listener on the target queue manager:

```
DEFINE LISTENER ('target.queue.manager') +
       TRPTYPE (TCP)
```

4. Define the transmission queue on the target queue manager:

```
DEFINE QLOCAL ('source.queue.manager') +
       USAGE (XMITQ)
```

Note: The TCP/IP connection names specified for the CONNAME attribute in the sender channel definitions are for illustration only. This is the network name of the machine at the *other* end of the connection. Use the values appropriate for your network.

Starting the listeners and channels:

Start both listeners by using the following MQSC commands:

1. Start the listener on the source queue manager, `source.queue.manager`, by issuing the following MQSC command:

```
START LISTENER ('source.queue.manager')
```

2. Start the listener on the target queue manager, `target.queue.manager`, by issuing the following MQSC command:

```
START LISTENER ('target.queue.manager')
```

Start both sender channels by using the following MQSC commands:

1. Start the sender channel on the source queue manager, `source.queue.manager`, by issuing the following MQSC command:

```
START CHANNEL ('source.to.target')
```

2. Start the sender channel on the target queue manager, `target.queue.manager`, by issuing the following MQSC command:

```
START CHANNEL ('target.to.source')
```

Automatic definition of channels:

If WebSphere MQ receives an inbound attach request and cannot find an appropriate receiver or server-connection channel, it creates a channel automatically. Automatic definitions are based on two default definitions supplied with WebSphere MQ: SYSTEM.AUTO.RECEIVER and SYSTEM.AUTO.SVRCONN.

You enable automatic definition of receiver and server-connection definitions by updating the queue manager object using the MQSC command, ALTER QMGR (or the PCF command Change Queue Manager).

For more information about creating channel definitions automatically, see WebSphere MQ Intercommunication. For information about automatically defining channels for clusters, see WebSphere MQ Queue Manager Clusters.

Managing the command server for remote administration

Each queue manager can have a command server associated with it. A command server processes any incoming commands from remote queue managers, or PCF commands from applications. It presents the commands to the queue manager for processing and returns a completion code or operator message depending on the origin of the command.

A command server is mandatory for all administration involving PCF commands, the MQAI, and also for remote administration.

Note: For remote administration, ensure that the target queue manager is running. Otherwise, the messages containing commands cannot leave the queue manager from which they are issued. Instead, these messages are queued in the local transmission queue that serves the remote queue manager. Avoid this situation.

There are separate control commands for starting and stopping the command server. Providing the command server is running, users of WebSphere MQ for Windows or WebSphere MQ for Linux (x86 platform) can perform the operations described in the following sections using the WebSphere MQ Explorer. For more information, see "Administration using the WebSphere MQ Explorer" on page 71.

Starting the command server:

Depending on the value of the queue manager attribute, *SCMDSERV*, the command server is either started automatically when the queue manager starts, or must be started manually. The value of the queue manager attribute can be altered using the MQSC command `ALTER QMGR` specifying the parameter `SCMDSERV`. By default, the command server is started automatically.

If *SCMDSERV* is set to MANUAL, start the command server using the command:

```
strmqcsv saturn.queue.manager
```

where `saturn.queue.manager` is the queue manager for which the command server is being started.

Displaying the status of the command server:

For remote administration, ensure that the command server on the target queue manager is running. If it is not running, remote commands cannot be processed. Any messages containing commands are queued in the target queue manager's command queue.

To display the status of the command server for a queue manager, issue the following MQSC command:

```
DISPLAY QMSTATUS CMDSERV
```

Stopping a command server:

To end the command server started by the previous example use the following command:

```
endmqcsv saturn.queue.manager
```

You can stop the command server in two ways:

- For a controlled stop, use the **endmqcsv** command with the -c flag, which is the default.
- For an immediate stop, use the **endmqcsv** command with the -i flag.

Note: Stopping a queue manager also ends the command server associated with it.

Issuing MQSC commands on a remote queue manager

The command server ***must*** be running on the target queue manager, if it is going to process MQSC commands remotely. (This is not necessary on the source queue manager). For information on how to start the command server on a queue manager, see "Starting the command server."

On the source queue manager, you can then run MQSC commands interactively in indirect mode by typing:

```
runmqsc -w 30 target.queue.manager
```

This form of the **runmqsc** command, with the -w flag, runs the MQSC commands in indirect mode, where commands are put (in a modified form) on the command server input queue and executed in order.

When you type in an MQSC command, it is redirected to the remote queue manager, in this case, `target.queue.manager`. The timeout is set to 30 seconds; if a reply is not received within 30 seconds, the following message is generated on the local (source) queue manager:

```
AMQ8416: MQSC timed out waiting for a response from the command server.
```

When you stop issuing MQSC commands, the local queue manager displays any timed-out responses that have arrived and discards any further responses.

In indirect mode, you can also run an MQSC command file on a remote queue manager. For example:

```
runmqsc -w 60 target.queue.manager < mycomds.in > report.out
```

where `mycomds.in` is a file containing MQSC commands and `report.out` is the report file.

Working with queue managers on z/OS:

You can issue MQSC commands to a z/OS queue manager from a queue manager on the platforms described in this book. However, to do this, you must modify the **runmqsc** command and the channel definitions at the sender.

In particular, you add the -x flag to the **runmqsc** command on the source node to specify that the target queue manager is running under z/OS:

```
runmqsc -w 30 -x target.queue.manager
```

Recommendations for issuing commands remotely

When you are issuing commands on a remote queue manager:

1. Put the MQSC commands to be run on the remote system in a command file.
2. Verify your MQSC commands locally, by specifying the -v flag on the **runmqsc** command.

   You cannot use **runmqsc** to verify MQSC commands on another queue manager.
3. Check that the command file runs locally without error.
4. Run the command file against the remote system.

If you have problems using MQSC commands remotely

If you have difficulty in running MQSC commands remotely, make sure that you have:

- Started the command server on the target queue manager.
- Defined a valid transmission queue.
- Defined the two ends of the message channels for both:
  – The channel along which the commands are being sent.

  - The channel along which the replies are to be returned.
- Specified the correct connection name (CONNAME) in the channel definition.
- Started the listeners before you started the message channels.
- Checked that the disconnect interval has not expired, for example, if a channel started but then shut down after some time. This is especially important if you start the channels manually.
- Sent requests from a source queue manager that do not make sense to the target queue manager (for example, requests that include parameters that are not supported on the remote queue manager).

See also "Resolving problems with MQSC commands" on page 35.

Creating a local definition of a remote queue

A local definition of a remote queue is a definition on a local queue manager that refers to a queue on a remote queue manager.

You do not have to define a remote queue from a local position, but the advantage of doing so is that applications can refer to the remote queue by its locally-defined name instead of having to specify a name that is qualified by the ID of the queue manager on which the remote queue is located.

Understanding how local definitions of remote queues work

An application connects to a local queue manager and then issues an **MQOPEN** call. In the open call, the queue name specified is that of a remote queue definition on the local queue manager. The remote queue definition supplies the names of the target queue, the target queue manager, and optionally, a transmission queue. To put a message on the remote queue, the application issues an **MQPUT** call, specifying the handle returned from the **MQOPEN** call. The queue manager uses the remote queue name and the remote queue manager name in a transmission header at the start of the message. This information is used to route the message to its correct destination in the network.

As administrator, you can control the destination of the message by altering the remote queue definition.

Example:

Purpose:

An application needs to put a message on a queue owned by a remote queue manager.

How it works:

The application connects to a queue manager, for example, `saturn.queue.manager`. The target queue is owned by another queue manager.

On the **MQOPEN** call, the application specifies these fields:

Field value	Description
ObjectName CYAN.REMOTE.QUEUE	Specifies the local name of the remote queue object. This defines the target queue and the target queue manager.
ObjectType (Queue)	Identifies this object as a queue.
ObjectQmgrName Blank or `saturn.queue.manager`	This field is optional. If blank, the name of the local queue manager is assumed. (This is the queue manager on which the remote queue definition exists.)

After this, the application issues an **MQPUT** call to put a message onto this queue.

On the local queue manager, you can create a local definition of a remote queue using the following MQSC commands:

```
DEFINE QREMOTE (CYAN.REMOTE.QUEUE) +
       DESCR ('Queue for auto insurance requests from the branches') +
       RNAME (AUTOMOBILE.INSURANCE.QUOTE.QUEUE) +
       RQMNAME (jupiter.queue.manager) +
       XMITQ (INQUOTE.XMIT.QUEUE)
```

where:

`QREMOTE (CYAN.REMOTE.QUEUE)`
: Specifies the local name of the remote queue object. This is the name that applications connected to this queue manager must specify in the **MQOPEN** call to open the queue AUTOMOBILE.INSURANCE.QUOTE.QUEUE on the remote queue manager `jupiter.queue.manager`.

`DESCR ('Queue for auto insurance requests from the branches')`
: Provides additional text that describes the use of the queue.

`RNAME (AUTOMOBILE.INSURANCE.QUOTE.QUEUE)`
: Specifies the name of the target queue on the remote queue manager. This is the real target queue for messages sent by applications that specify the queue name CYAN.REMOTE.QUEUE. The queue AUTOMOBILE.INSURANCE.QUOTE.QUEUE must be defined as a local queue on the remote queue manager.

`RQMNAME (jupiter.queue.manager)`
: Specifies the name of the remote queue manager that owns the target queue AUTOMOBILE.INSURANCE.QUOTE.QUEUE.

`XMITQ (INQUOTE.XMIT.QUEUE)`
: Specifies the name of the transmission queue. This is optional; if the name of a transmission queue is not specified, a queue with the same name as the remote queue manager is used.

  In either case, the appropriate transmission queue must be defined as a local queue with a *Usage* attribute specifying that it is a transmission queue (USAGE(XMITQ) in MQSC commands).

An alternative way of putting messages on a remote queue

Using a local definition of a remote queue is not the only way of putting messages on a remote queue. Applications can specify the full queue name, including the remote queue manager name, as part of the **MQOPEN** call. In this case, you do not need a local definition of a remote queue. However, this means that applications must either know, or have access to, the name of the remote queue manager at run time.

Using other commands with remote queues

You can use MQSC commands to display or alter the attributes of a remote queue object, or you can delete the remote queue object. For example:

- To display the remote queue's attributes:
  ```
  DISPLAY QUEUE (CYAN.REMOTE.QUEUE)
  ```
- To change the remote queue to enable puts. This does not affect the target queue, only applications that specify this remote queue:
  ```
  ALTER QREMOTE (CYAN.REMOTE.QUEUE) PUT(ENABLED)
  ```
- To delete this remote queue. This does not affect the target queue, only its local definition:
  ```
    DELETE QREMOTE (CYAN.REMOTE.QUEUE)
  ```

Note: When you delete a remote queue, you delete only the local representation of the remote queue. You do not delete the remote queue itself or any messages on it.

Defining a transmission queue

A transmission queue is a local queue that is used when a queue manager forwards messages to a remote queue manager through a message channel.

The channel provides a one-way link to the remote queue manager. Messages are queued at the transmission queue until the channel can accept them. When you define a channel, you must specify a transmission queue name at the sending end of the message channel.

The MQSC command attribute USAGE defines whether a queue is a transmission queue or a normal queue.

Default transmission queues:

When a queue manager sends messages to a remote queue manager, it identifies the transmission queue using the following sequence:

1. The transmission queue named on the XMITQ attribute of the local definition of a remote queue.
2. A transmission queue with the same name as the target queue manager. (This value is the default value on XMITQ of the local definition of a remote queue.)
3. The transmission queue named on the DEFXMITQ attribute of the local queue manager.

For example, the following MQSC command creates a default transmission queue on `source.queue.manager` for messages going to `target.queue.manager`:

```
DEFINE QLOCAL ('target.queue.manager') +
       DESCR ('Default transmission queue for target qm') +
       USAGE (XMITQ)
```

Applications can put messages directly on a transmission queue, or indirectly through a remote queue definition. See also "Creating a local definition of a remote queue" on page 65.

Using remote queue definitions as aliases

In addition to locating a queue on another queue manager, you can also use a local definition of a remote queue for both:

- Queue manager aliases
- Reply-to queue aliases

Both types of alias are resolved through the local definition of a remote queue.

You must set up the appropriate channels for the message to arrive at its destination.

Queue manager aliases

An alias is the process by which the name of the target queue manager, as specified in a message, is modified by a queue manager on the message route. Queue manager aliases are important because you can use them to control the destination of messages within a network of queue managers.

You do this by altering the remote queue definition on the queue manager at the point of control. The sending application is not aware that the queue manager name specified is an alias.

For more information about queue manager aliases, see WebSphere MQ Intercommunication.

Reply-to queue aliases

Optionally, an application can specify the name of a reply-to queue when it puts a *request message* on a queue.

If the application that processes the message extracts the name of the reply-to queue, it knows where to send the *reply message*, if required.

A reply-to queue alias is the process by which a reply-to queue, as specified in a request message, is altered by a queue manager on the message route. The sending application is not aware that the reply-to queue name specified is an alias.

A reply-to queue alias lets you alter the name of the reply-to queue and optionally its queue manager. This in turn lets you control which route is used for reply messages.

For more information about request messages, reply messages, and reply-to queues, see the WebSphere MQ Application Programming Guide.

For more information about reply-to queue aliases, see WebSphere MQ Intercommunication.

Data conversion

Message data in WebSphere MQ defined formats (also known as *built-in formats*) can be converted by the queue manager from one coded character set to another, provided that both character sets relate to a single language or a group of similar languages.

For example, conversion between coded character sets with identifiers (CCSIDs) 850 and 500 is supported, because both apply to Western European languages.

For EBCDIC new line (NL) character conversions to ASCII, see “All queue managers” on page 99.

Supported conversions are defined in the WebSphere MQ Application Programming Reference.

When a queue manager cannot convert messages in built-in formats

The queue manager cannot automatically convert messages in built-in formats if their CCSIDs represent different national-language groups. For example, conversion between CCSID 850 and CCSID 1025 (which is an EBCDIC coded character set for languages using Cyrillic script) is not supported because many of the characters in one coded character set cannot be represented in the other. If you have a network of queue managers working in different national languages, and data conversion among some of the coded character sets is not supported, you can enable a default conversion. Default data conversion is described in “Default data conversion.”

File ccsid.tbl

The file ccsid.tbl is used for the following purposes:

- In WebSphere MQ for Windows it records all the supported code sets. In UNIX systems the supported code sets are held internally by the operating system.
- It specifies any additional code sets. To specify additional code sets, you need to edit ccsid.tbl (guidance on how to do this is provided in the file).
- It specifies any default data conversion.

You can update the information recorded in ccsid.tbl; you might want to do this if, for example, a future release of your operating system supports additional coded character sets.

In WebSphere MQ for Windows, ccsid.tbl is located in directory `C:\Program Files\IBM\WebSphere MQ\conv\table` by default.

In WebSphere MQ for UNIX systems, ccsid.tbl is located in directory `/var/mqm/conv/table`.

Default data conversion:

If you set up channels between two machines on which data conversion is not normally supported, you must enable default data conversion for the channels to work.

To enable default data conversion, edit the ccsid.tbl file to specify a default EBCDIC CCSID and a default ASCII CCSID. Instructions on how to do this are included in the file. You must do this on all machines that will be connected using the channels. Restart the queue manager for the change to take effect.

The default data-conversion process is as follows:

- If conversion between the source and target CCSIDs is not supported, but the CCSIDs of the source and target environments are either both EBCDIC or both ASCII, the character data is passed to the target application without conversion.
- If one CCSID represents an ASCII coded character set, and the other represents an EBCDIC coded character set, WebSphere MQ converts the data using the default data-conversion CCSIDs defined in ccsid.tbl.

Note: Try to restrict the characters being converted to those that have the same code values in the coded character set specified for the message and in the default coded character set. If you use only the set of characters that is valid for WebSphere MQ object names (as defined in "Names of WebSphere MQ objects" on page 273) you will, in general, satisfy this requirement. Exceptions occur with EBCDIC CCSIDs 290, 930, 1279, and 5026 used in Japan, where the lowercase characters have different codes from those used in other EBCDIC CCSIDs.

Converting messages in user-defined formats

The queue manager cannot convert messages in user-defined formats from one coded character set to another. If you need to convert data in a user-defined format, you must supply a data-conversion exit for each such format. Do **not** use default CCSIDs to convert character data in user-defined formats. For more information about converting data in user-defined formats and about writing data conversion exits, see the WebSphere MQ Application Programming Guide.

Changing the queue manager CCSID

When you have used the CCSID attribute of the ALTER QMGR command to change the CCSID of the queue manager, stop and restart the queue manager to ensure that all running applications, including the command server and channel programs, are stopped and restarted.

This is necessary, because any applications that are running when the queue manager CCSID is changed continue to use the existing CCSID.

Chapter 3. Administration using the WebSphere MQ Explorer

Administration using the WebSphere MQ Explorer

WebSphere MQ Explorer runs on all supported Windows platforms, and Linux (x86 platform only). If used in a 64-bit Windows environment, it runs only in 32-bit mode.

WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) provide an administration interface called the WebSphere MQ Explorer to perform administration tasks as an alternative to using control or MQSC commands. Chapter 13, “Comparing command sets,” on page 555 shows you what you can do using the WebSphere MQ Explorer.

The WebSphere MQ Explorer allows you to perform local or remote administration of your network from a computer running Windows, or Linux (x86 platform), by pointing the WebSphere MQ Explorer at the queue managers and clusters you are interested in. The platforms and levels of WebSphere MQ that can be administered using the WebSphere MQ Explorer are described in “Remote queue managers” on page 72.

To configure remote WebSphere MQ queue managers so that WebSphere MQ Explorer can administer them, see “Required definitions for administration” on page 73.

It allows you to perform tasks, typically associated with setting up and fine tuning the working environment for WebSphere MQ, either locally or remotely within a Windows or Linux (x86 platform) system domain.

On Linux, the WebSphere MQ Explorer might fail to start if you have more than one Eclipse installation. If this happens, start the WebSphere MQ Explorer using a different user ID to the one you use for the other Eclipse installation.

This chapter describes:
- “What you can do with the WebSphere MQ Explorer”
- “Setting up the WebSphere MQ Explorer” on page 73
- “Using the WebSphere MQ Explorer” on page 79
- “Security on Windows” on page 80

What you can do with the WebSphere MQ Explorer

With the WebSphere MQ Explorer, you can:
- Create and delete a queue manager (on your local machine only).
- Start and stop a queue manager (on your local machine only).
- Define, display, and alter the definitions of WebSphere MQ objects such as queues and channels.
- Browse the messages on a queue.
- Start and stop a channel.
- View status information about a channel, listener, queue, or service objects.

- View queue managers in a cluster.
- Check to see which applications, users, or channels have a particular queue open.
- Create a new queue manager cluster using the *Create New Cluster* wizard.
- Add a queue manager to a cluster using the *Add Queue Manager to Cluster* wizard.
- Manage the authentication information object, used with Secure Sockets Layer (SSL) channel security.
- Create and delete channel initiators, trigger monitors, and listeners.
- Start or stop the command servers, channel initiators, trigger monitors, and listeners.
- Set specific services to start up automatically when a queue manager is started.
- Modify the properties of queue managers.
- Change the local default queue manager.
- Invoke the ikeyman GUI to manage secure sockets layer (SSL) certificates, associate certificates with queue managers, and configure and setup certificate stores (on your local machine only).
- Create JMS objects from WebSphere MQ objects, and WebSphere MQ objects from JMS objects.
- Create a JMS Connection Factory for any of the currently supported types.
- Modify the parameters for any service, such as the TCP port number for a listener, or a channel initiator queue name.
- Start or stop the service trace.

You perform administration tasks using a series of *Content Views* and *Property dialogs*.

Content View
A Content View is a panel that can display the following:
- Attributes, and administrative options relating to WebSphere MQ itself.
- Attributes, and administrative options relating to one or more related objects.
- Attributes, and administrative options for a cluster.

Property dialogs
A property dialog is a panel that displays attributes relating to an object in a series of fields, some of which you can edit.

You navigate through the WebSphere MQ Explorer using the *Navigator view*. The Navigator allows you to select the Content View you require.

Remote queue managers

From a Windows or Linux (x86 platform) system, the WebSphere MQ Explorer can connect to all supported queue managers with the following exceptions:
- WebSphere MQ for z/OS queue managers prior to Version 6.0.
- Currently supported MQSeries® V2 queue managers.

The WebSphere MQ Explorer handles the differences in the capabilities between the different command levels and platforms. However, if it encounters an attribute that it does not recognize, the attribute will not be visible.

If you intend to remotely administer a V6.0 or later queue manager on Windows using the WebSphere MQ Explorer on a WebSphere MQ V5.3 computer, you must install Fix Pack 9 (CSD9) or later on your WebSphere MQ for Windows V5.3 computer.

If you intend to remotely administer a V5.3 queue manager on iSeries® using the WebSphere MQ Explorer on a WebSphere MQ V6.0 or later computer, you must install Fix Pack 11 (CSD11) or later on your WebSphere MQ for iSeries V5.3 computer. This fix pack corrects connection problems between the WebSphere MQ Explorer and the iSeries queue manager.

Deciding whether to use the WebSphere MQ Explorer

When deciding whether to use the WebSphere MQ Explorer at your installation, bear the following points in mind:

Object names
: If you use lowercase names for queue managers and other objects with the WebSphere MQ Explorer, when you work with the objects using MQSC commands, you must enclose the object names in single quotes, or WebSphere MQ will not recognize them.

Large queue managers
: The WebSphere MQ Explorer works best with small queue managers. If you have a large number of objects on a single queue manager, you might experience delays while the WebSphere MQ Explorer extracts the required information to present in a view.

Clusters
: WebSphere MQ clusters can potentially contain hundreds or thousands of queue managers. The WebSphere MQ Explorer presents the queue managers in a cluster using a tree structure. The physical size of a cluster does not affect the speed of the WebSphere MQ Explorer dramatically because the explorer does not connect to the queue managers in the cluster until you select them.

Setting up the WebSphere MQ Explorer

This section outlines the steps you need to take to set up the WebSphere MQ Explorer.

Prerequisite software

Before you can use the WebSphere MQ Explorer, you must have the following installed on your computer:

- The Eclipse platform (installed as part of WebSphere MQ for Windows or WebSphere MQ for Linux (x86 platform))

The WebSphere MQ Explorer can connect to remote queue managers using the TCP/IP communication protocol only.

Required definitions for administration

Ensure that you have satisfied the following requirements before trying to use the WebSphere MQ Explorer. Check that:

1. A command server is running on every remotely administered queue manager.

2. A suitable TCP/IP listener object must be running on every remote queue manager. This can be the WebSphere MQ listener or, on UNIX systems, the inetd daemon.
3. A server-connection channel, by default named SYSTEM.ADMIN.SVRCONN, exists on all remote queue managers.

   You can create the channel using the following MQSC command:

   ```
   DEFINE CHANNEL(SYSTEM.ADMIN.SVRCONN) CHLTYPE(SVRCONN)
   ```

   This command creates a basic channel definition. If you want a more sophisticated definition (to set up security, for example), you need additional parameters.

   If you require more than five attaches of the WebSphere MQ Explorer you need to install the Client Attachment feature (CAF). With the CAF installed, you can set the MAXINST attribute on the SYSTEM.ADMIN.SVRCONN channel from zero through 999 999 999.

   If you do not have the Client Attachment feature (CAF) installed, the MAXINST attribute can be set from zero to five only on the SYSTEM.ADMIN.SVRCONN channel. A value greater than five is interpreted as zero without the CAF installed.
4. The system queue, SYSTEM.MQEXPLORER.REPLY.MODEL, must exist.

Cluster membership

If a queue manager is a member of a cluster, then the cluster tree node will be populated automatically.

If queue managers become members of clusters while the WebSphere MQ Explorer is running, then you must maintain the WebSphere MQ Explorer with up-to-date administration data about clusters so that it can communicate effectively with them and display correct cluster information when requested. In order to do this, the WebSphere MQ Explorer needs the following information:
- The name of a repository queue manager
- The connection name of the repository queue manager if it is on a remote queue manager

With this information, the WebSphere MQ Explorer can:
- Use the repository queue manager to obtain a list of queue managers in the cluster.
- Administer the queue managers that are members of the cluster and are on supported platforms and command levels.

Administration is not possible if:
- The chosen repository becomes unavailable. The WebSphere MQ Explorer does not automatically switch to an alternative repository.
- The chosen repository cannot be contacted over TCP/IP.
- The chosen repository is running on a queue manager that is running on a platform and command level not supported by the WebSphere MQ Explorer.

The cluster members that can be administered can be local, or they can be remote if they can be contacted using TCP/IP. The WebSphere MQ Explorer connects to local queue managers that are members of a cluster directly, without using a client connection.

Security

If you are using WebSphere MQ in an environment where it is important for you to control user access to particular objects, you might need to consider the security aspects of using the WebSphere MQ Explorer.

Authorization to use the WebSphere MQ Explorer:

Any user can use the WebSphere MQ Explorer, however certain authorities are required to connect, access, and manage queue managers.

To perform local administrative tasks using the WebSphere MQ Explorer, a user is required to have the necessary authority to perform the administrative tasks. If the user is a member of the mqm group, the user has authority to perform all local administrative tasks.

To connect to a remote queue manager and perform remote administrative tasks using the WebSphere MQ Explorer, the user executing the WebSphere MQ Explorer is required to have the following authorities:
- CONNECT authority on the target queue manager object
- INQUIRE authority on the target queue manager object
- DISPLAY authority to the target queue manager object
- INQUIRE authority to the queue, SYSTEM.MQEXPLORER.REPLY.MODEL
- DISPLAY authority to the queue, SYSTEM.MQEXPLORER.REPLY.MODEL
- INPUT authority to the queue, SYSTEM.MQEXPLORER.REPLY.MODEL
- OUTPUT authority to the queue, SYSTEM.ADMIN.COMMAND.QUEUE
- Authority to perform the action selected

To connect to a remote queue manager on WebSphere MQ for z/OS and perform remote administrative tasks using the WebSphere MQ Explorer, the following must be provided:
- A RACF® profile for the system queue, SYSTEM.MQEXPLORER.REPLY.MODEL
- A RACF profile for the queues, AMQ.MQEXPLORER.*

In addition, the user executing the WebSphere MQ Explorer is required to have the following authorities:
- RACF UPDATE authority to the system queue, SYSTEM.MQEXPLORER.REPLY.MODEL
- RACF UPDATE authority to the queues, AMQ.MQEXPLORER.*
- CONNECT authority on the target queue manager object
- Authority to perform the action selected
- READ authority to all the hlq.DISPLAY.object profiles in the MQCMDS class

For information on how to grant authority to WebSphere MQ objects, see "Authority to work with WebSphere MQ objects" on page 123.

If a user attempts to perform an operation that they are not authorized to perform, the target queue manager invokes authorization failure procedures and the operation fails.

The default filter in the WebSphere MQ Explorer is to display all WebSphere MQ objects. If there are any WebSphere MQ objects that a user does not have DISPLAY authority to, authorization failures are generated. If authority events are being recorded, restrict the range of objects that are displayed to those that the user has DISPLAY authority to.

Security for connecting to remote queue managers:

The WebSphere MQ Explorer connects to remote queue managers as an MQI client application. This means that each remote queue manager must have a definition of a server-connection channel and a suitable TCP/IP listener. If you do not specify a non-blank value for the MCAUSER attribute of the channel, or use a security exit, it is possible for a malicious application to connect to the same server connection channel and gain access to the queue manager objects with unlimited authority.

The default value of the MCAUSER attribute is the local userId. If you specify a non-blank user name as the MCAUSER attribute of the server connection channel, all programs connecting to the queue manager using this channel run with the identity of the named user and have the same level of authority.

Using a security exit with the WebSphere MQ Explorer:

You can specify a default security exit and queue manager specific security exits using the WebSphere MQ Explorer.

You can define a default security exit, which can be used for all new client connections from the WebSphere MQ Explorer. This default exit can be overridden at the time a connection is made. You can also define a security exit for a single queue manager or a set of queue managers, which takes effect when a connection is made. You specify exits using the WebSphere MQ Explorer. For more information, see the WebSphere MQ Help Center.

Using SSL security:

The WebSphere MQ Explorer connects to remote queue managers using an MQI channel. If you want to secure the MQI channel using SSL security, you must establish the channel using a client channel definition table. For information how to establish an MQI channel using a client channel definition table, see the WebSphere MQ Clients book.

Using the WebSphere MQ Explorer to connect to a remote queue manager using SSL enabled MQI channels:

On the system hosting the remote queue manager:

1. Define a server connection and client connection pair of channels, and specify the appropriate value for the *SSLCIPH* variable on the server connection channel. For more information on the *SSLCIPH* variable, see "Protecting channels with SSL" on page 141
2. Send the channel definition table `AMQCLCHL.TAB`, which is found in the queue manager's `@ipcc` directory, to the system hosting the WebSphere MQ Explorer. To do this you can use the File Transfer Application in binary mode.
3. Start a TCP/IP listener on a designated port.
4. Place both the CA and personal SSL certificates into the queue manager's SSL directory:
   - `/var/mqm/qmgrs/+QMNAME+/SSL` for UNIX systems
   - `C:\Program Files\WebSphere MQ\qmgrs\+QMNAME+\SSL` for Windows systems

   Where `+QMNAME+` is a token representing the name of the queue manager.

5. Create a key database file of type CMS named `key.kdb`, and stash the password in a file either by checking the option in the iKeyman GUI, or by using the -stash option with the gsk7cmd, runmqckm ,or gsk7capicmd commands.
6. Add the CA certificates to the key database created in the previous step.
7. Import the personal certificate for the queue manager into the key database.

For more detailed information on working with the Secure Sockets Layer on Windows systems, see the WebSphere MQ Security book.

On the system hosting the WebSphere MQ Explorer:

1. Create a key database file of type JKS named `key.jks`. Set a password for this key database file.

   The WebSphere MQ Explorer uses Java™ key store files (JKS) for SSL security, and so the key store file being created for configuring SSL for the WebSphere MQ Explorer must match this.
2. Add the CA certificates to the key database created in the previous step.
3. Import the personal certificate for the queue manager into the key database.
4. Start the WebSphere MQ Explorer either by using the start menu in Windows, or by running the **strmqcfg** command.
5. From the WebSphere MQ Explorer toolbar, click **Window -> Preferences**, then expand **WebSphere MQ Explorer** and click **SSL Client Certificate Stores**. Enter the name of, and password for, the JKS file created in step 1 in both the Trusted Certificate Store and the Personal Certificate Store, then click **OK**.
6. Close the **Preferences** window, and right-click **Queue Managers**. Click **Show/Hide Queue Managers**, and then click **Add** on the **Show/Hide Queue Managers** screen.
7. Type the name of the queue manager, and select the **Connect directly** option. Click next.
8. Select **Use client channel definition table** and specify the location of the channel table file that you transferred from the remote queue manager in step 2 on page 76 on the system hosting the remote queue manager.
9. Click **Finish**. You can now access the remote queue manager from the WebSphere MQ Explorer.

Connecting through another queue manager:

The WebSphere MQ Explorer allows you to connect to a queue manager through an intermediate queue manager, to which the WebSphere MQ Explorer is already connected. In this case, the WebSphere MQ Explorer puts PCF command messages to the intermediate queue manager, specifying the following:

- The *ObjectQMgrName* parameter in the object descriptor (MQOD) as the name of the target queue manager. For more information on queue name resolution, see the WebSphere MQ Application Programming Guide.
- The *UserIdentifier* parameter in the message descriptor (MQMD) as the local userId.

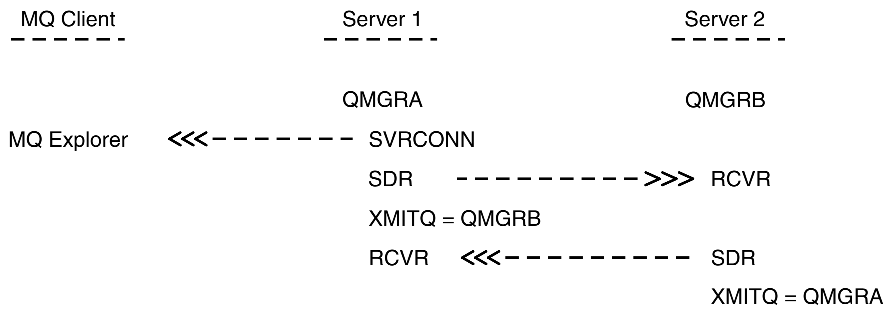
If the connection is then used to connect to the target queue manager via an intermediate queue manager, the userId is flowed in the *UserIdentifier* parameter of the message descriptor (MQMD) again. In order for the MCA listener on the target queue manager to accept this message, either the MCAUSER attribute must be set, or the userId must already exist with put authority.

The command server on the target queue manager puts messages to the transmission queue specifying the userId in the *UserIdentifier* parameter in the message descriptor (MQMD). For this put to succeed the userId must already exist on the target queue manager with put authority.

The following example shows you how to connect a queue manager, through an intermediate queue manager, to the WebSphere MQ Explorer.

Establish a remote administration connection to a queue manager. Verify that the:

- Queue manager on the server is active and has a server-connection channel (SVRCONN) defined.
- Listener is active.
- Command server is active.
- SYSTEM.MQ EXPLORER.REPLY.MODEL queue has been created and that you have sufficient authority.
- Queue manager listeners, command servers, and sender channels are started.



In this example:

- WebSphere MQ Explorer is connected to queue manager `QMGRA` (running on Server1) using a client connection.
- Queue manager `QMGRB` on Server2 can be now connected to WebSphere MQ Explorer through an intermediate queue manager (`QMGRA`)
- When connecting to `QMGRB` with WebSphere MQ Explorer, select `QMGRA` as the intermediate queue manager

In this situation, there is no direct connection to `QMGRB` from WebSphere MQ Explorer; the connection to `QMGRB` is through `QMGRA`.

Queue manager `QMGRB` on Server2 is connected to `QMGRA` on Server1 using sender-receiver channels. The channel between `QMGRA` and `QMGRB` must be set up in such a way that remote administration is possible; see “Preparing channels and transmission queues for remote administration” on page 60.

Data conversion

The WebSphere MQ Explorer works in CCSID 1208 (UTF-8). This enables the WebSphere MQ Explorer to display the data from remote queue managers correctly. Whether connecting to a queue manager directly, or via an intermediate queue manager, the WebSphere MQ Explorer requires all incoming messages to be converted to CCSID 1208 (UTF-8).

An error message is issued if you try to establish a connection between the WebSphere MQ Explorer and a queue manager with a CCSID that the WebSphere MQ Explorer does not recognize.

Supported conversions are described in the WebSphere MQ Application Programming Reference manual.

Using the WebSphere MQ Explorer

This section explains how to use the WebSphere MQ Explorer to do the following:
- Show or hide queue managers
- Use the WebSphere MQ Taskbar application (Windows only)
- Use the WebSphere MQ alert monitor application (Windows only)

Showing and hiding queue managers and clusters

The WebSphere MQ Explorer can display more than one queue manager at a time. The *Show/Hide Queue Manager* panel (selectable from the context menu for the Queue Managers tree node) allows you to choose whether you display information on another (remote) machine. Local queue managers are detected automatically.

To show a remote queue manager:
1. Right-click the **Queue Managers** tree node, then select *Show/Hide Queue Managers....*
2. Click **Add...**. The Show/Hide Queue Managers panel is displayed.
3. Fill in the name of the remote queue manager and the host name or IP address in the fields provided.

   The host name or IP address is used to establish a client connection to the remote queue manager using either its default server connection channel, SYSTEM.ADMIN.SVRCONN, or a user defined server connection channel.
4. Click **Finish**.

The Show/Hide Queue Managers panel also displays a list of all visible queue managers, and allows you to hide queue managers from the navigation view.

If the WebSphere MQ Explorer displays a queue manager that is a member of a cluster, the cluster is detected, and displayed automatically.

To export the list of remote queue managers from this panel:
1. Close the Show/Hide Queue Managers panel.
2. Right click the top **IBM WebSphere MQ** tree node in the Navigation pane of the WebSphere MQ Explorer, then select *Export MQ Explorer Settings....*
3. Select **Remote queue manager connection information**.
4. Select a file to store the exported settings in.
5. Finally, click **OK** to export the remote queue manager connection information to the specified file.

To import a list of remote queue managers:
1. Right click the top **IBM WebSphere MQ** tree node in the Navigation pane of the WebSphere MQ Explorer, then select *Import MQ Explorer Settings....*
2. Click **Browse**, and navigate to the path of the file that contains the remote queue manager connection information.

3. Click **Open**. If the file contains a list of remote queue managers, the **Remote queue manager connection information** box will be selected.
4. Finally, click **OK** to import the remote queue manager connection information into the WebSphere MQ Explorer.

Using the WebSphere MQ Taskbar application (Windows only)

On Windows, the WebSphere MQ icon is in the system tray on the server and is overlaid with a color-coded status symbol, which can have one of the following meanings:

Green Healthy; no alerts at present

Blue Indeterminate; WebSphere MQ is starting up or shutting down

Yellow
Alert; one or more services are failing or have already failed

When you click on the icon with your right mouse button, a context menu is displayed. From this menu, select the `WebSphere MQ Explorer` option to bring up the WebSphere MQ Explorer.

Using the WebSphere MQ alert monitor application (Windows only):

The WebSphere MQ alert monitor is an error detection tool that identifies and records problems with WebSphere MQ on a local machine. The alert monitor displays information about the current status of the local installation of a WebSphere MQ server It also monitors the Windows Advanced Configuration and Power Interface (ACPI) and ensures the ACPI settings are enforced.

From the WebSphere MQ alert monitor, you can:
- Access the WebSphere MQ Explorer directly
- View information relating to all outstanding alerts
- Shut down the WebSphere MQ service on the local machine
- Route alert messages over the network to a configurable user account, or to a Windows workstation or server

Starting the WebSphere MQ Explorer in standalone mode or Eclipse workbench mode

By default, the WebSphere MQ Explorer starts up in standalone mode using the Eclipse Rich Client Platform (RCP). The tools you need to configure WebSphere MQ will be visible, and other Eclipse tools will be hidden.

If you want to use the other perspectives available in Eclipse, which include the Eclipse Workbench toolbar and menu options, you can set WebSphere MQ to start up in an Eclipse Workbench. To do this, click **Window -> Preferences** and then select **WebSphere MQ Explorer** from the list. In the **Startup** section, select **in an Eclipse Workbench** and click **OK**. The change will take effect the next time you start WebSphere MQ Explorer.

Security on Windows

The WebSphere MQ Explorer uses *Component Object Model* (COM) technology to communicate between servers and between processes on a server.

The COM server application, *AMQMSRVN*, is shared between any client processes that need to use the WebSphere MQ COM Services.

Because AMQMSRVN must be shared between non-interactive and interactive logon sessions, you must launch it under a special user account. This special user account is called MUSR_MQADMIN. When you install WebSphere MQ and run the Prepare WebSphere MQ Wizard for the first time, it creates a local user account for AMQMSRVN called MUSR_MQADMIN with the required settings and permissions. The password for MUSR_MQADMIN is randomly generated when the account is created, and used to configure the logon environment for AMQMSRVN. The generated password does not expire.

This WebSphere MQ account will not be affected by any account policies that are set up on the system to require that account passwords are changed after a certain period of time.

The password is not known outside this *onetime* processing and is stored by the Windows operating system in a secure part of the Registry.

Using Active directory (Windows only)

In some network configurations, where user accounts are defined on domain controllers that are using Active Directory, the local user account MUSR_MQADMIN might not have the authority it requires to query the group membership of other domain user accounts. The Prepare WebSphere MQ Wizard identifies whether this is the case by carrying out tests and asking the user questions about the network configuration. If the local user account MUSR_MQADMIN does not have the required authority, the Prepare WebSphere MQ Wizard prompts the user for the account details of a domain user account with particular user rights. For the user rights that the domain user account requires see "User rights required for AMQMSRVN." Once the user has entered valid account details for the domain user account into the Prepare WebSphere MQ Wizard, it configures AMQMSRVN to run under this account instead of the local user account MUSR_MQADMIN. The account details are held in the secure part of the Registry and cannot be read by users.

When the service is running, AMQMSRVN is launched and remains running for as long as the service is running. A WebSphere MQ administrator who logs onto the server after AMQMSRVN is launched can use the WebSphere MQ Explorer to administer queue managers on the server. This connects the WebSphere MQ Explorer to the existing AMQMSRVN process. These two actions need different levels of permission before they can work:

- The launch process requires a launch permission.
- The WebSphere MQ administrator requires Access permission.

User rights required for AMQMSRVN:

The following table details the user rights required for the domain user account under which WebSphere MQ and specifically the AMQMSRVN DCOM object run.

Table 2. User rights required to launch AMQMSRVN

Logon as batch job	Enables WebSphere MQ Services COM server to run under this user account.
Logon as service	Enables users to set the WebSphere MQ service to logon using the configured account.

Table 2. User rights required to launch AMQMSRVN (continued)

Shut down the system	Allows the WebSphere MQ Service to restart the server if configured to do so when recovery of a service fails.
Debug programs	Enables WebSphere MQ to contact processes that are secured, such as ASP and IIS applications.
Increase quotas	Required for operating system **CreateProcessAsUser** call.
Act as part of the operating system	Required for operating system **LogonUser** call.
Bypass traverse checking	Required for operating system **LogonUser** call.
Replace a process level token	Required for operating system **LogonUser** call.

Your domain user account must have these Windows user rights set as effective user rights as listed in the Local Security Policy application. If they are not, set them using either the Local Security Policy application locally on the server, or by using the Domain Security Application domain wide.

Changing the user name associated with WebSphere MQ Services:

You might need to change the user name associated with WebSphere MQ Services from MUSR_MQADMIN to something else. (For example, you might need to do this if your queue manager is associated with DB2®, which does not accept user names of more than 8 characters.)

To change the user name :

1. Create a new user account (for example NEW_NAME)
2. Use the Prepare WebSphere MQ Wizard to enter the account details of the new user account.

   Windows Vista users with UAC enabled only: Use the following command line to set the new account:

   ```
   AMQMSRVN -user <domain\>NEW_NAME -password <password>
   ```

   Where `NEW_NAME` is the new user name you have chosen. This can be qualified by a domain name if required. WebSphere MQ allocates the correct security rights and group membership to the new user account.

   Ensure the application is run with Administrator privileges.

If for any reason you need to reset the user account back to the default MUSR_MQADMIN account, use the following command:

```
AMQMJPSE -r
```

Controlling access (Windows only)

When you install WebSphere MQ, default access permissions are set up for the AMQMSRVN process. These default access permissions grant access to the process to:

- mqm (local WebSphere MQ administrators group)
- Administrators (local administrators of this machine) (Windows only)

These permissions restrict access to the alert monitor task bar application and the **amqmdain** command to these users and groups only. Other users trying to access these functions are denied access. The WebSphere MQ Explorer uses **amqmdain** to start and end queue managers. If the WebSphere MQ Explorer is run by a user not authorized to run **amqmdain**, then an error is reported when the user attempts to start or stop a queue manager.

Before users run the WebSphere MQ Explorer, you must configure the access permissions of the objects involved. Use a tool called *DCOMCNFG.EXE*, shipped with Windows systems, to do this.

Using DCOMCNFG.EXE to change access permissions:

To start DCOMCNFG.EXE:

1. Click **Start**.
2. Click **Run**.
3. Type `dcomcnfg` in the open input field.
4. Click **OK**. The Component Services Window opens.
5. Expand **Component services**.
6. Expand **Computers**.
7. Expand **My Computer**.
8. Click the **DCOM Config** node.

A list of applications is displayed. From this list:

1. Find and highlight the **IBM MQSeries Services** entry.
2. Right-click **IBM MQSeries Services**, and then click **Properties**.

   This displays information about the location of the DCOM server (AMQMSRVN.EXE), together with its identity and security properties.
3. Select the **Security** page to view or modify the launch, access, or configuration permissions.
4. Stop and restart the IBM MQSeries service from the Windows Services control panel for your changes to take effect. (If your changes affect a user who is currently logged on, that user must log off and on again). Do the following:
   a. Access the panel by clicking **Start** → **Run** → **services.msc**. A list of services is displayed.
   b. Right-click **IBM MQSeries**, and select **Properties**. The IBM MQSeries Properties pages is displayed.
   c. Click **Stop**. The IBM MQSeries service stops.
   d. Click **Start**. The IBM MQSeries service restarts.

In addition to being able to add to the list of users that are allowed access to a service, you can deny access to specific users and groups. This means that you can grant access to a group of users (by specifying a group name) but deny access to individuals within that group.

Changing the password of the AMQMSRVN user account

If AMQMSRVN is running under the local user account MUSR_MQADMIN (or another local user account), you can change the password for the account as follows:

1. Stop the MQSeries service from the Computer Management panel.
2. Close any WebSphere MQ programs that are using the AMQMSRVN COM server (this includes the alert monitor, task bar, and so on).
3. Change the MUSR_MQADMIN password in the same way that you would change an individual's password.
4. Use DCOMCNFG.EXE to bring up the properties pages for the IBM MQSeries services.
5. Select the Identity Page.

6. Modify the password given for the MUSR_MQADMIN user account.

If AMQMSRVN is running under a domain user account, you can also change the password for the account as follows:

1. Change the password for the domain account on the domain controller. You might need to ask your domain administrator to do this for you.
2. Use the Prepare WebSphere MQ Wizard to enter the account details including the new password.

The user account that AMQMSRVN runs under executes any MQSC commands that are issued by user interface applications, or performed automatically on system startup, shutdown, or service recovery. This user account must therefore have WebSphere MQ administration rights. By default it is added to the local **mqm** group on the server. If this membership is removed, the IBM MQSeries service will not work.

If a security problem arises with the DCOM configuration or with the user account that AMQMSRVN runs under, error messages and descriptions appear in the system event log. One common error is for a user not to have access or launch rights to the server. This error appears in the system log as a DCOM error with the following message description:

```
Access denied attempting to launch a DCOM server.  The server is:
{55B99860-F95E-11d1-ABB6-0004ACF79B59}
```

Extending the WebSphere MQ Explorer

This information applies to WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform only).

WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) provide an administration interface called the WebSphere MQ Explorer to perform administration tasks as an alternative to using control or MQSC commands. The WebSphere MQ Explorer presents information in a style consistent with that of the Eclipse framework and the other plug-in applications that Eclipse supports.

This chapter explains how the features, and perspectives, available with the WebSphere MQ Explorer can be extended to give further administrative control over your WebSphere MQ system. Through extending the WebSphere MQ Explorer system administrators have the ability to customize the WebSphere MQ Explorer to improve the way they administer WebSphere MQ.

Who this chapter is for

This chapter is for system administrators and system programmers who intend to extend, and customize, the functionality of the WebSphere MQ Explorer.

What you need to know to understand this chapter

To use this chapter, you need the following:

- A good understanding of the Eclipse framework and of the utilities associated with it.
- Experience in writing Eclipse plug-ins.

Information on how to write Eclipse plug-ins is available in the *Platform Plug-in Developers Guide*, found in Eclipse help.

1. From the WebSphere MQ Explorer toolbar click, **Help** -> **Help Contents**.
2. Click **Platform Plug-in Developers Guide**.

- A good understanding of the features available with the WebSphere MQ Explorer.

Introduction

The WebSphere MQ Explorer is Eclipse based, and as such acquires all its functionality, and perspective information, through various plug-ins supplied with WebSphere MQ. To extend the WebSphere MQ Explorer you are required to write one, or more, Eclipse plug-ins. Through writing a plug-in you can extend the function of the WebSphere MQ Explorer in the following ways:

- Add further menu options to existing context menus and associate actions with them.
- Add tree nodes to the navigation view, and associated content pages.

When writing a plug-in, you will need to supply:

The plugin.xml file
: Use the plugin.xml file to specify *extension points*. Extension points provide the means by which plug-in developers can extend the functionality of the WebSphere MQ Explorer. There are many types extension point available within the WebSphere MQ Explorer and Eclipse. Each type of extension point is used to extend the Explorer in a different way. Most extension points are associated with a Java jar file. For more information on the extension points available, see "Utilizing extension points" on page 86.

Java jar file
: Use Java jar files contain the classes that provide the code needed to implement the added functionality specified by the extension points declared in the plugin.xml file. Every Java jar file is associated with at least one extension point.

WebSphere MQ supplies sample Eclipse plug-ins called *simple*, and *menu*. The simple plug-in utilizes all the extension points provided in the WebSphere MQ Explorer to extend the Explorer in a number of basic ways. The simple plug-in can be used as a basis for writing your own Eclipse plug-ins. For instructions of how to import the simple plug-in, see "Importing the sample Eclipse plug-ins."

Importing the sample Eclipse plug-ins

Instructions for importing the sample Eclipse plug-ins.

To import the sample Eclipse plug-ins, complete the following steps:

1. Open the WebSphere MQ Explorer in an Eclipse workbench.
2. Open the **Plug-in Development** perspective.
3. Click **File** → **Import** to open the Import wizard.

   In the Import wizard, complete the following steps:

   a. Click **Plug-in Development** → **Plug-ins and Fragments**.
   b. Select the **Projects with source folders** check box and click **Next**.
   c. Select one or more from:

      com.ibm.mq.explorer.sample.simple

com.ibm.mq.explorer.sample.menus

com.ibm.mq.explorer.jmsadmin.sample.menus

com.ibm.mq.explorer.tests.sample

d. Click Finish

You have now imported the sample Eclipse plug-ins.

Related concepts

"Starting the WebSphere MQ Explorer in standalone mode or Eclipse workbench mode" on page 80

Writing an Eclipse plug-in for the WebSphere MQ Explorer

This section details how to write an Eclipse plug-in for the WebSphere MQ Explorer. It is assumed that you have the prerequisite knowledge detailed in "What you need to know to understand this chapter" on page 84.

To write an Eclipse plug-in for the WebSphere MQ Explorer, you must utilize the extension points available to extend the functionality of the WebSphere MQ Explorer. The most common extension points are described, and accompanied by a number of code extracts from the simple plug-in to provide basic implementation examples. You must import the simple plug-in if you want access to the code that it contains. For instructions on how to import the simple plug-in, see "Importing the sample Eclipse plug-ins" on page 85.

The environment in which the WebSphere MQ Explorer is extended is an event driven interface. For example, when a Register extension point is extended with an instance of a user-written class that extends the IExplorerNotify interface, the user-written class will be called back when an event occurs. For example, when a queue manager is created. Many of these notifications include a MQExtObject as one of their arguments. An MQExtObject relates to the WebSphere MQ object that caused the event. A user-written class can call any of the MQExtObject public methods to find out about the object.

The IExplorerNotify interface, the associated MQExtObject, and other external definitions are documented in the WebSphere MQ Explorer JavaDoc. For information on how to access the WebSphere MQ Explorer JavaDoc, see "Accessing the WebSphere MQ Explorer Javadoc."

Accessing the WebSphere MQ Explorer Javadoc

External definitions relating to the WebSphere MQ Explorer are documented in Javadoc and can be displayed as HTML pages.

To access the WebSphere MQ Explorer Javadoc as HTML pages, complete the following steps:

1. Open the WebSphere MQ Explorer.
2. Click **Help** → **Help Contents**.
3. Expand **WebSphere MQ Explorer**.
4. Click **API Reference**.

The WebSphere MQ Explorer Javadoc is displayed in HTML.

Utilizing extension points

Instructions on how to use extension points.

This topic describes how to implement the extension points available in Eclipse plug-ins for the WebSphere MQ Explorer.

For further information on using extension points see the WebSphere MQ Explorer help, as follows:

1. Click **Help**->**Help Contents**.
2. Expand **Platform Plug-in Developers Guide**.
3. Click **Programmers Guide**.

For information on how to include an extension point, see **Plugging into the workbench**->**Basic workbench extension points** in the Programmers Guide.

Through utilizing the available extension points, you can extend the function of the WebSphere MQ Explorer in the following ways:

- Register extension points.
- Add further menu options to existing context menus and associate actions with them.
- Add tree nodes to the navigation view and associate content pages with them.
- Add property tabs to property dialogs and associate property pages with them.

Multiple extension points of the same type can be included in a single plug-in. The extension points that you use will be dependent on the way in which you intend to extend the functionality of the WebSphere MQ Explorer. However, every plug-in for the WebSphere MQ Explorer must use the *register* extension point. For details on the register extension point, see “Register.”

Register:

The *register* extension point is used for the following:

- To allow your plug-in to register itself with the WebSphere MQ Explorer. Every plug-in for the WebSphere MQ Explorer must include this extension point in plugin.xml. With out it, any function your plug-in adds to the WebSphere MQ Explorer will not be activated.
- To enable notify events. For information on notify events, see “Notify events” on page 88.

The following code extract is taken from the file, plugin.xml, from the simple plug-in and shows a basic implementation of the register extension point:

```
<extension
   id="com.ibm.mq.explorer.sample.simple"
   name="Simple Sample"
   point="com.ibm.mq.explorer.ui.registerplugin">
 <pluginDetails
   pluginId="com.ibm.mq.explorer.sample.simple"
   name="Simple"
   class="com.ibm.mq.explorer.sample.simple.SimpleNotify"
   enabledByDefault="true"
   description="a very simple sample plugin to Explorer"
   vendor="IBM">
 </pluginDetails>
</extension>
```

Enabling and disabling a plug-in:

All plug-ins that contain the register extension point can be enabled, or disabled, within the WebSphere MQ Explorer by doing the following:

1. From the WebSphere MQ Explorer toolbar click, **Window** -> **Preferences**.
2. Expand **IBM WebSphere MQ**.
3. Click **Enable plug-ins**.

   All registered plug-ins are displayed.
4. Select all plug-ins that should be enabled.
5. Click **OK**.

Notify events:

Within the WebSphere MQ Explorer, when a WebSphere MQ object is created, or manipulated, a java object relating to the WebSphere MQ object can be generated. These Java objects can be used to find the name, type, and other externalized attributes of a WebSphere MQ object.

For Java objects to be generated, the register extension point must specify a class. In the plugin.xml file from the simple plug-in, the class specified is as follows:

```
class="com.ibm.mq.explorer.sample.simple.SimpleNotify"
```

This class contains a number of object specific methods. When a WebSphere MQ object is created, or manipulated, the appropriate method from the notify class is called. This class can be used as a basis for writing your own class. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc. For information on how to access the WebSphere MQ Explorer JavaDoc, see "Accessing the WebSphere MQ Explorer Javadoc" on page 86.

Add tree node:

A *tree node* extension point is used to add a tree node to the navigation view and associate it with a content page.

The following code extract is taken from the file, plugin.xml, from the simple plug-in and shows a basic implementation of the tree node extension point:

```
<extension
   id="com.ibm.mq.explorer.samples.simpleTreeNode"
   name="Simple TreeNode"
   point="com.ibm.mq.explorer.ui.addtreenode">
 <treeNode
   pluginId="com.ibm.mq.explorer.sample.simple"
   name="com.ibm.mq.explorer.sample.simple"
   class="com.ibm.mq.explorer.sample.simple.SimpleTreeNodeFactory"
   treeNodeId="com.ibm.mq.explorer.sample.simple"
   sequence="888">
 </treeNode>
</extension>
```

As well as declaring the tree node extension point in plugin.xml, the following classes are needed:

- A class that contains a method that checks the id of any incoming tree node to determine whether to add sub nodes to it. This class must implement com.ibm.mq.explorer.ui.extensions.ITreeNodeFactory, and IExecutableExtension. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc. For information on how to access the WebSphere MQ Explorer JavaDoc, see "Accessing the WebSphere MQ Explorer Javadoc" on page 86.

  A working example of this class is available in the simple plug-in, called SimpleTreeNodeFactory.java

- A class that contains methods that return information about any new tree nodes, such as the name, id, and the associated content page class. This class must extend com.ibm.mq.ui.extensions.TreeNode. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc.

  A working example of this class is available in the simple plug-in, called SimpleTreeNode.java.

Add content page:

A *content page* extension point is used to add a content page to the content view. A content page can be associated with a tree node.

The following code extract is taken from the file, plugin.xml, from the simple plug-in and shows a basic implementation of the content page extension point:

```
<extension
   id="com.ibm.mq.explorer.sample.simpleContentPage"
   name="Simple ContentPage"
   point="com.ibm.mq.explorer.ui.addcontentpage">
 <contentPage
   pluginId="com.ibm.mq.explorer.sample.simple"
   name="com.ibm.mq.explorer.sample.simple"
   class="com.ibm.mq.explorer.sample.simple.SimpleContentPageFactory"
   contentPageId="com.ibm.mq.explorer.sample.simple">
 </contentPage>
</extension>
```

As well as declaring the content page extension point in plugin.xml, the following classes are needed:

- A class that contains methods that perform a number of functions such as return the content page id, create the content page, and set the object to draw the page. This class must extend com.ibm.mq.ui.extensions.ContentsPage. The class com.ibm.mq.explorer.ui.extensions.ContentTitleBar can be used to create a title for the content page consistent with the other content pages in the WebSphere MQ Explorer. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc. For information on how to access the WebSphere MQ Explorer JavaDoc, see “Accessing the WebSphere MQ Explorer Javadoc” on page 86.

  A working example of this class is available in the simple plug-in, called SimpleContentPage.java.
- A class that contains a method that returns an instance of the class extending ContentPage. This class must implement com.ibm.mq.explorer.ui.extensions.IContentPageFactory, and IExecutableExtension. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc.

  A working example of this class is available in the simple plug-in, called SimpleContentPageFactory.java

Add context menu item:

A *context menu* extension point is used to add context menu items to the WebSphere MQ Explorer.

The following code extract is taken from the file, plugin.xml, from the simple plug-in and shows a basic implementation of the context menu extension point:

```
<extension
   id="com.ibm.mq.explorer.sample.simple.object1"
   name="Object1"
   point="org.eclipse.ui.popupMenus">
 <objectContribution
    objectClass="com.ibm.mq.explorer.ui.extensions.MQExtObject"
    id="com.ibm.mq.explorer.sample.simple.obj1">
  <visibility>
   <and>
    <pluginState
      value="activated"
      id="com.ibm.mq.explorer.ui">
    </pluginState>
    <objectClass
      name="com.ibm.mq.explorer.ui.extensions.MQExtObject">
    </objectClass>
    <objectState
      name="PluginEnabled"
      value="com.ibm.mq.explorer.sample.simple">
    </objectState>
   </and>
  </visibility>
  <action
    label="Simple: Sample action on any MQExtObject"
    class="com.ibm.mq.explorer.sample.simple.MenuActions"
    menubarPath="additions"
    id="com.ibm.mq.explorer.sample.simple.obj.action1">
  </action>
 </objectContribution>
</extension>
```

Additional context menu items are added using the Eclipse extension point `org.eclipse.ui.popupMenus`. The `<visibility>` attribute in the above extract contains the elements that control the conditions under which the context menu item is displayed. These conditions include tests on the plug-in state, the type of object, and the state of the object. For example, a content menu item can be displayed for local queues only, or for remote queue managers only.

Adding a property tab to an Eclipse property dialog:

A *property tab* extension point is used to add a property tab to a property dialog and an associated property page.

The following code extract is taken from the file plugin.xml, from the simple plug-in, and shows a basic implementation of the property tab extension point:

```
<extension
   id="com.ibm.mq.explorer.samples.simplePropertyTab"
   name="Simple Property Tab"
   point="com.ibm.mq.explorer.ui.addpropertytab">
 <propertyTab
  class="com.ibm.mq.explorer.sample.simple.SimplePropertyTabFactory"
  objectId="com.ibm.mq.explorer.queuemanager"
  pluginId="com.ibm.mq.explorer.sample.simple"
  name="com.ibm.mq.explorer.sample.simple"
  propertyTabId="com.ibm.mq.explorer.sample.simple.propertyTab"
  propertyTabName="Simple Sample Property Tab"/>
</extension>
```

As well as declaring the property tab extension point in plugin.xml, the following classes are needed:

- A class that contains a method that creates and returns a property page to be displayed when a user clicks the property tab. This class must implement com.ibm.mq.explorer.ui.extensions.IPropertyTabFactory. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc. For information on how to access the WebSphere MQ Explorer JavaDoc, see "Accessing the WebSphere MQ Explorer Javadoc" on page 86.

A working example of this class, called SimplePropertyTabFactory.java, is available in the simple plug-in.

- A class used for creating the property page must extend com.ibm.mq.ui.extensions.PropertyPage. For the methods that this class must contain refer to the WebSphere MQ Explorer JavaDoc.

  A working example of this class, called SimplePropertyPage.java, is available in the simple plug-in.

Applying plug-ins to the WebSphere MQ Explorer

You can either run a plug-in with WebSphere MQ Explorer from the Eclipse workbench, or apply updates from a plug-in to WebSphere MQ Explorer permanently.

To run plug-ins with WebSphere MQ Explorer from the Eclipse workbench, complete the following steps:

1. Select the plug-in from the Package Explorer.
2. Click **Run** → **Run As** → **Eclipse Application**.

   A new Eclipse workbench opens.
3. In the new Eclipse workbench, open the WebSphere MQ Explorer perspective.
4. In the **Explorer preferences** section, select the ″Enable plug-ins″ page and enable the relevant sample plug-in or plug-ins.

To permanently apply updates to the WebSphere MQ Explorer provided by a plug-in, complete the following steps:

1. With a file browser, find the plug-in file that will provide the functionality extensions to the WebSphere MQ Explorer.
2. Copy the plug-in file, and paste it into `C:\Program Files\IBM\WebSphere MQ\eclipse\plugins`, (or equivalent on Linux (x86 platform)).
3. Restart the WebSphere MQ Explorer.

The updates provided by the plug-in are applied to the WebSphere MQ Explorer.

Chapter 4. Configuring WebSphere MQ

Configuring WebSphere MQ

This chapter tells you how to change the behavior of WebSphere MQ or an individual queue manager to suit your installation's needs.

You change WebSphere MQ configuration information by changing the values specified on a set of configuration attributes (or parameters) that govern WebSphere MQ.

How you change this configuration information, and where WebSphere MQ stores your changes, is platform-specific:

- WebSphere MQ for Windows uses the WebSphere MQ Explorer to make changes to attribute information within the **Windows Registry**. You can also use amqmdain to set some Registry values, as described in "amqmdain (WebSphere MQ services control)" on page 280.
- Users on all other platforms change attribute values by editing the **WebSphere MQ configuration files**. On WebSphere MQ for Linux (x86 platform) the WebSphere MQ configuration files can be edited using the WebSphere MQ Explorer.

This chapter describes:

- "Changing configuration information on Windows systems"
- "Changing configuration information on UNIX systems" on page 94

It then describes:

- The attributes you can use to modify WebSphere MQ configuration (for all queue managers) in "Attributes for changing WebSphere MQ configuration information" on page 99
- The attributes you can use to modify the configuration of an individual queue manager in "Changing queue manager configuration information" on page 106

Changing configuration information on Windows systems

All WebSphere MQ configuration information is stored in the Windows Registry. There is a simple, or close correlation between the contents of the Windows Registry and the WebSphere MQ configuration files.

You edit configuration information from the WebSphere MQ Explorer (or by using the **amqmdain** command). **Do not** try to edit the Registry system file directly as this might adversely affect the smooth running of both your WebSphere MQ system and your Windows operating system.

Viewing configuration information

You can view a description of the keys used by the Windows Registry from the WebSphere MQ Help System. You can access the WebSphere MQ Help System from:

- An icon in the Windows Start menu

- Help in the WebSphere MQ Explorer

Changing configuration information on UNIX systems

On UNIX platforms, you can change WebSphere MQ configuration attributes within:

- A WebSphere MQ configuration file (**mqs.ini**) to effect changes for WebSphere MQ on the node as a whole. There is one mqs.ini file for each node.
- A queue manager configuration file (**qm.ini**) to effect changes for specific queue managers. There is one qm.ini file for each queue manager on the node.

A configuration file (or ***stanza*** file) contains one or more stanzas, which are groups of lines in the .ini file that together have a common function or define part of a system, such as log functions, channel functions, and installable services.

Because the WebSphere MQ configuration file is used to locate the data associated with queue managers, a nonexistent or incorrect configuration file can cause some or all MQSC commands to fail. Also, applications cannot connect to a queue manager that is not defined in the WebSphere MQ configuration file.

Any changes you make to a configuration file usually do not take effect until the next time the queue manager is started.

On Linux (x86 platform) systems you can edit configuration information from the WebSphere MQ Explorer.

Editing configuration files

Before editing a configuration file, back it up so that you have a copy you can revert to if the need arises.

You can edit configuration files either:

- Automatically, using commands that change the configuration of queue managers on the node
- Manually, using a standard text editor

You can edit the default values in the WebSphere MQ configuration files after installation.

If you set an incorrect value on a configuration file attribute, the value is ignored and an operator message is issued to indicate the problem. (The effect is the same as missing out the attribute entirely.)

When you create a new queue manager:

- Back up the WebSphere MQ configuration file
- Back up the new queue manager configuration file

Comments can be included in configuration files by adding a “;” or a “#” character before the comment text. If you want to use a “;” or a “#” character without it representing a comment, you can prefix the character with a “\” character and it will be used as part of the configuration data.

When do you need to edit a configuration file?:

You might need to edit a configuration file if, for example:

- You lose a configuration file. (Recover from backup if you can.)
- You need to move one or more queue managers to a new directory.
- You need to change your default queue manager; this could happen if you accidentally delete the existing queue manager.
- You are advised to do so by your IBM Support Center.

Configuration file priorities:

The attribute values of a configuration file are set according to the following priorities:

- Parameters entered on the command line take precedence over values defined in the configuration files
- Values defined in the qm.ini files take precedence over values defined in the mqs.ini file

The WebSphere MQ configuration file, mqs.ini

The WebSphere MQ configuration file, mqs.ini, contains information relevant to all the queue managers on the node. It is created automatically during installation.

The mqs.ini file for WebSphere MQ for UNIX systems is in the `/var/mqm` directory. It contains:

- The names of the queue managers
- The name of the default queue manager
- The location of the files associated with each of them

The supplied `LogDefaults` stanza for a new WebSphere MQ Version 7.0 installation does not contain any explicit values for the attributes. The lack of an attribute means that the default for this value is used upon creation of a new queue manager

The values shown for the `LogDefaults` stanza in Figure 9 on page 96 are the default values. Note that a value of zero for the `LogBufferPages` attribute means 512.

If you require a non-default value, you must explicitly specify that value in the `LogDefaults` stanza.

```
#*******************************************************************#
#* Module Name: mqs.ini                                            *#
#* Type       : WebSphere MQ Machine-wide Configuration File       *#
#* Function   : Define WebSphere MQ resources for an entire machine *#
#*******************************************************************#
#* Notes      :                                                    *#
#* 1) This is the installation time default configuration          *#
#*                                                                 *#
#*******************************************************************#
AllQueueManagers:
#*******************************************************************#
#* The path to the qmgrs directory, below which queue manager data *#
#* is stored                                                       *#
#*******************************************************************#
DefaultPrefix=/var/mqm

LogDefaults:
   LogPrimaryFiles=3
   LogSecondaryFiles=2
   LogFilePages=4096
   LogType=CIRCULAR
   LogBufferPages=0
   LogDefaultPath=/var/mqm/log

QueueManager:
   Name=saturn.queue.manager
   Prefix=/var/mqm
   Directory=saturn!queue!manager

QueueManager:
   Name=pluto.queue.manager
   Prefix=/var/mqm
   Directory=pluto!queue!manager

DefaultQueueManager:
   Name=saturn.queue.manager

ApiExitTemplate:
   Name=OurPayrollQueueAuditor
   Sequence=2
   Function=EntryPoint
   Module=/usr/ABC/auditor
   Data=123

ApiExitCommon:
   Name=MQPoliceman
   Sequence=1
   Function=EntryPoint
   Module=/usr/MQPolice/tmqp
   Data=CheckEverything
```

Figure 9. Example of a WebSphere MQ configuration file for UNIX systems

Queue manager configuration files, qm.ini

A queue manager configuration file, qm.ini, contains information relevant to a specific queue manager. There is one queue manager configuration file for each queue manager. The qm.ini file is automatically created when the queue manager with which it is associated is created.

A qm.ini file is held in the root of the directory tree occupied by the queue manager. For example, the path and the name for a configuration file for a queue manager called QMNAME is:

```
/var/mqm/qmgrs/QMNAME/qm.ini
```

The queue manager name can be up to 48 characters in length. However, this does not guarantee that the name is valid or unique. Therefore, a directory name is generated based on the queue manager name. This process is known as *name transformation*. For a description, see "Understanding WebSphere MQ file names" on page 16.

Figure 10 on page 98 shows how groups of attributes might be arranged in a queue manager configuration file in WebSphere MQ for UNIX systems.

```
#* Module Name: qm.ini                                            *#
#* Type       : WebSphere MQ queue manager configuration file      *#
#  Function   : Define the configuration of a single queue manager *#
#*                                                                 *#
#******************************************************************#
#* Notes      :                                                    *#
#* 1) This file defines the configuration of the queue manager     *#
#*                                                                 *#
#******************************************************************#

ExitPath:
   ExitsDefaultPath=/var/mqm/exits
   ExitsDefaultPath64=/var/mqm/exits64

Service:
   Name=AuthorizationService
   EntryPoints=13

ServiceComponent:
   Service=AuthorizationService
   Name=MQSeries.UNIX.auth.service
   Module=/opt/mqm/bin/amqzfu 1
   ComponentDataSize=0

Log:
   LogPrimaryFiles=3
   LogSecondaryFiles=2
   LogFilePages=4096
   LogType=CIRCULAR
   LogBufferPages=0
   LogPath=/var/mqm/log/saturn!queue!manager/

XAResourceManager:
   Name=DB2 Resource Manager Bank
   SwitchFile=/usr/bin/db2swit
   XAOpenString=MQBankDB
   XACloseString=
   ThreadOfControl=THREAD

Channels: 2
   MaxChannels=20
   MaxActiveChannels=100
   MQIBindType=STANDARD

TCP:
   KeepAlive = Yes
   ClntSndBuffSize=32768
   ClntRcvBuffSize=32768
   Connect_Timeout=No timeout

QMErrorLog:
   ErrorLogSize=262144
   ExcludeMessage=7234
   SuppressMessage=9001,9002,9202
   SuppressInterval=30

ApiExitLocal:
   Name=ClientApplicationAPIchecker
   Sequence=3
   Function=EntryPoint
   Module=/usr/Dev/ClientAppChecker
   Data=9.20.176.20
```

Figure 10. Example queue manager configuration file for WebSphere MQ for UNIX systems

Notes® for Figure 10:

1. `/usr/mqm/bin/amqzfu` on AIX
2. For more information on the Channel stanza, see the WebSphere MQ Intercommunication manual.
3. The value of zero for `LogBufferPages` gives a value of 512.

Attributes for changing WebSphere MQ configuration information

The attributes described here modify the configuration of WebSphere MQ. On WebSphere MQ for Windows systems and on WebSphere MQ for Linux (x86 platform) systems, modify configuration information using the WebSphere MQ Explorer. On other systems, modify the information by editing the mqs.ini configuration file.

The following are detailed:
- "All queue managers"
- "Client exit path" on page 100
- "Default queue manager" on page 101
- "Exit properties" on page 101
- "Log defaults for WebSphere MQ" on page 101
- "Advanced Configuration and Power Interface (ACPI)" on page 104
- "API exits" on page 105
- "Queue managers" on page 105

All queue managers

Use the `General` and `Extended` WebSphere MQ properties page from the WebSphere MQ Explorer, or the `AllQueueManagers` stanza in the mqs.ini file to specify the following information about all queue managers.

DefaultPrefix=*directory_name*
This attribute specifies the path to the qmgrs directory, within which the queue manager data is kept.

If you change the default prefix for the queue manager, replicate the directory structure that was created at installation time (see Figure 37 on page 534).

In particular, you must create the qmgrs structure. Stop WebSphere MQ before changing the default prefix, and restart WebSphere MQ only after you have moved the structures to the new location and changed the default prefix.

Note: Do not delete the `/var/mqm/errors` directory on UNIX systems, or the `\errors` directory on Windows systems.

As an alternative to changing the default prefix, you can use the environment variable MQSPREFIX to override the `DefaultPrefix` for the **crtmqm** command.

Because of operating system restrictions, keep the supplied path sufficiently short so that the sum of the path length and any queue manager name is a maximum of 70 characters long.

ConvEBCDICNewline=NL_TO_LF|TABLE|ISO
EBCDIC code pages contain a new line (NL) character that is not supported by ASCII code pages (although some ISO variants of ASCII contain an equivalent).

Use the ConvEBCDICNewline attribute to specify how WebSphere MQ is to convert the EBCDIC NL character into ASCII format.

NL_TO_LF
Convert the EBCDIC NL character (X'15') to the ASCII line feed character, LF (X'0A'), for all EBCDIC to ASCII conversions.

NL_TO_LF is the default.

TABLE
Convert the EBCDIC NL character according to the conversion tables used on your platform for all EBCDIC to ASCII conversions.

The effect of this type of conversion might vary from platform to platform and from language to language; even on the same platform, the behavior might vary if you use different CCSIDs.

ISO
Convert:

- ISO CCSIDs using the TABLE method
- All other CCSIDs using the NL_TO_CF method

Possible ISO CCSIDs are shown in Table 3.

Table 3. List of possible ISO CCSIDs

CCSID	Code Set
819	ISO8859-1
912	ISO8859-2
915	ISO8859-5
1089	ISO8859-6
813	ISO8859-7
916	ISO8859-8
920	ISO8859-9
1051	roman8

If the ASCII CCSID is not an ISO subset, ConvEBCDICNewline defaults to NL_TO_LF.

For more information about data conversion, see the WebSphere MQ Application Programming Guide.

Client exit path

Use the `Exits` WebSphere MQ properties page from the WebSphere MQ Explorer, or the `ClientExitPath` stanza in the WebSphere MQ client configuration file file to specify the default path for location of channel exits on the client.

If both mqs.ini and WebSphere MQ client configuration file values are encountered, the WebSphere MQ client configuration file value is used; if there is no WebSphere MQ client configuration file value, the mqs.ini value is used if it is set.

ExitsDefaultPath=*defaultprefix*
The default prefix for the platform, for the location of 32-bit channel exits.

ExitsDefaultPath64=*defaultprefix*
The default prefix for the platform, for the location of 64-bit channel exits.

Default queue manager

Use the `General` WebSphere MQ properties page from the WebSphere MQ Explorer, or the `DefaultQueueManager` stanza in the mqs.ini file to specify the default queue manager.

Name=*default_queue_manager*
: The default queue manager processes any commands for which a queue manager name is not explicitly specified. The `DefaultQueueManager` attribute is automatically updated if you create a new default queue manager. If you inadvertently create a new default queue manager and then want to revert to the original, alter the `DefaultQueueManager` attribute manually.

Exit properties

Use the `Exits` WebSphere MQ properties page from the WebSphere MQ Explorer, or the `ExitProperties` stanza in the mqs.ini file to specify configuration options used by queue manager exit programs.

CLWLMode=SAFE|FAST
: The cluster workload exit, CLWL, allows you to specify which cluster queue in the cluster to open in response to an MQI call (**MQOPEN**, **MQPUT**, and so on). The CLWL exit runs either in FAST mode or SAFE mode depending on the value you specify on the CLWLMode attribute. If you omit the CLWLMode attribute, the cluster workload exit runs in SAFE mode.

SAFE
: Run the CLWL exit in a separate process from the queue manager. This is the default.

If a problem arises with the user-written CLWL exit when running in SAFE mode, the following happens:
- The CLWL server process (amqzlwa0) fails.
- The queue manager restarts the CLWL server process.
- The error is reported to you in the error log. If an MQI call is in progress, you receive notification in the form of a return code.

The integrity of the queue manager is preserved.

Note: Running the CLWL exit in a separate process can affect performance.

FAST
: Run the cluster exit inline in the queue manager process.

Specifying this option improves performance by avoiding the overheads associated with running in SAFE mode, but does so at the expense of queue manager integrity. You should only run the CLWL exit in FAST mode if you are convinced that there are **no** problems with your CLWL exit, and you are particularly concerned about performance.

If a problem arises when the CLWL exit is running in FAST mode, the queue manager will fail and you run the risk of the integrity of the queue manager being compromised.

Log defaults for WebSphere MQ

Use the `Default log settings` WebSphere MQ properties page from the WebSphere MQ Explorer, or the `LogDefaults` stanza in the mqs.ini file to specify information about log defaults for all queue managers. If the stanza doesn't exist then the MQ defaults will be used. The log attributes are used as default values when you create a queue manager, but can be overridden if you specify the log attributes on the **crtmqm** command. See "crtmqm (create queue manager)" on page 293 for details of this command.

Once a queue manager has been created, the log attributes for that queue manager are taken from the settings described in "Queue manager logs" on page 108.

The default prefix (specified in "All queue managers" on page 99) and log path specified for the particular queue manager (specified in "Queue manager logs" on page 108) allow the queue manager and its log to be on different physical drives. This is the recommended method, although by default they are on the same drive.

For information about calculating log sizes, see "Calculating the size of the log" on page 222.

Note: The limits given in the following parameter list are limits set by WebSphere MQ. Operating system limits might reduce the maximum possible log size.

LogPrimaryFiles=3|*2-254* **(Windows)|***2-510* **(UNIX systems)**
: The log files allocated when the queue manager is created.

  The minimum number of primary log files you can have is 2 and the maximum is 254 on Windows, or 510 on UNIX systems. The default is 3.

  The total number of primary and secondary log files must not exceed 255 on Windows, or 511 on UNIX systems, and must not be less than 3.

  The value is examined when the queue manager is created or started. You can change it after the queue manager has been created. However, a change in the value is not effective until the queue manager is restarted, and the effect might not be immediate.

LogSecondaryFiles=2|*1-253* **(Windows)|***1-509* **(UNIX systems)**
: The log files allocated when the primary files are exhausted.

  The minimum number of secondary log files is 1 and the maximum is 253 on Windows, or 509 on UNIX systems. The default number is 2.

  The total number of primary and secondary log files must not exceed 255 on Windows, or 511 on UNIX systems, and must not be less than 3.

  The value is examined when the queue manager is started. You can change this value, but changes do not become effective until the queue manager is restarted, and even then the effect might not be immediate.

LogFilePages=*number*
: The log data is held in a series of files called log files. The log file size is specified in units of 4 KB pages.

  The default number of log file pages is 4096, giving a log file size of 16 MB.

  On UNIX systems the minimum number of log file pages is 64, and on Windows the minimum number of log file pages is 32; in both cases the maximum number is 65 535.

  Note: The size of the log files specified during queue manager creation cannot be changed for a queue manager.

LogType=CIRCULAR|LINEAR
: The type of log to be used. The default is CIRCULAR.

CIRCULAR
Start restart recovery using the log to roll back transactions that were in progress when the system stopped.

See "Circular logging" on page 218 for a fuller explanation of circular logging.

LINEAR
For both restart recovery and media or forward recovery (creating lost or damaged data by replaying the contents of the log).

See "Linear logging" on page 219 for a fuller explanation of linear logging.

If you want to change the default, you can either edit the `LogType` attribute, or specify linear logging using the **crtmqm** command. You cannot change the logging method after a queue manager has been created.

LogBufferPages=0|*0-4096*
The amount of memory allocated to buffer records for writing, specifying the size of the buffers in units of 4 KB pages.

The minimum number of buffer pages is 18 and the maximum is 4096. Larger buffers lead to higher throughput, especially for larger messages.

If you specify 0 (the default), the queue manager selects the size. In WebSphere MQ Version 7.0 this is 512 (2048 KB).

If you specify a number between 1 and 17, the queue manager defaults to 18 (72 KB). If you specify a number between 18 and 4096, the queue manager uses the number specified to set the memory allocated.

The value is examined when the queue manager is created, and might be increased or decreased at either of these times. However, a change in the value is not effective until the queue manager is restarted.

LogDefaultPath=*directory_name*
The directory in which the log files for a queue manager reside. The directory resides on a local device to which the queue manager can write and, preferably, on a different drive from the message queues. Specifying a different drive gives added protection in case of system failure.

The default is:

- `<DefaultPrefix>\log` for WebSphere MQ for Windows where `<DefaultPrefix>` is the value specified on the `DefaultPrefix` attribute on the `All Queue Managers` WebSphere MQ properties page. This value is set at install time.
- `/var/mqm/log` for WebSphere MQ for UNIX systems

Alternatively, you can specify the name of a directory on the **crtmqm** command using the -ld flag. When a queue manager is created, a directory is also created under the queue manager directory, and this is used to hold the log files. The name of this directory is based on the queue manager name. This ensures that the log file path is unique, and also that it conforms to any limitations on directory name lengths.

If you do not specify -ld on the **crtmqm** command, the value of the `LogDefaultPath` attribute in the mqs.ini file is used.

The queue manager name is appended to the directory name to ensure that multiple queue managers use different log directories.

When the queue manager is created, a `LogPath` value is created in the log attributes in the configuration information, giving the complete directory name for the queue manager's log. This value is used to locate the log when the queue manager is started or deleted.

LogWriteIntegrity=SingleWrite|DoubleWrite|TripleWrite
The method the logger uses to reliably write log records.

SingleWrite
Some hardware guarantees that, if a write operation writes a page and fails for any reason, a subsequent read of the same page into a buffer results in each byte in the buffer being either:

- The same as before the write, or
- The byte that should have been written in the write operation

On this type of hardware (for example, ssa write cache enabled), it is safe for the logger to write log records in a single write as the hardware assures full write integrity. This method provides the highest level of performance.

DoubleWrite
The DoubleWrite method was the default method used in WebSphere MQ V5.2 and is available for back-compatibility purposes only.

TripleWrite
This is the default method. Where hardware that assures write integrity is not available, write log records using the TripleWrite method because it provides full write integrity.

Advanced Configuration and Power Interface (ACPI)

Windows supports the Advanced Configuration and Power Interface (ACPI) standard. This enables Windows users with ACPI enabled hardware to stop and restart channels when the system enters and resumes from suspend mode. Use the `ACPI` WebSphere MQ properties page from the WebSphere MQ Explorer, to specify how WebSphere MQ is to behave when the system receives a suspend request.

Note that the settings specified in the `ACPI` WebSphere MQ properties page are applied only when the Alert Monitor is running. The Alert Monitor icon is present on the task bar if the Alert Monitor is running.

DoDialog=Y | N
Displays the dialog at the time of a suspend request.

DenySuspend=Y | N
Denies the suspend request. This is used if DoDialog=N, or if DoDialog=Y and a dialog cannot be displayed, for example, because your laptop lid is closed.

CheckChannelsRunning=Y | N
Checks whether any channels are running. The outcome can determine the outcome of the other settings.

The following table outlines the effect of each combination of these parameters:

DoDialog	DenySuspend	CheckChannels Running	Action
N	N	N	Accept the suspend request.
N	N	Y	Accept the suspend request.
N	Y	N	Deny the suspend request.

N	Y	Y	If any channels are running deny the suspend request; if not accept the request.
Y	N	N	Display the dialog (see note below; accept the suspend request). This is the default.
Y	N	Y	If no channels are running accept the suspend request; if they are display the dialog (see note below; accept the request).
Y	Y	N	Display the dialog (see note below; deny the suspend request).
Y	Y	Y	If no channels are running accept the suspend request; if they are display the dialog (see note below; deny the request).

Note: In cases where the action is to display the dialog, if the dialog cannot be displayed (for example because your laptop lid is closed), the DenySuspend option is used to determine whether the suspend request is accepted or denied.

API exits

Use the `Exits` WebSphere MQ properties page from the WebSphere MQ Explorer, or the `ApiExitTemplate` and `ApiExitCommon` stanza in the mqs.ini file to identify API exit routines for all queue managers. On Windows systems, you can also use the **amqmdain** command to change the Registry entries for API exits. (To identify API exit routines for individual queue managers, you use the `ApiExitLocal` stanza, as described in "API exits" on page 118.)

For a complete description of the attributes for these stanzas, see "Configuring API exits" on page 481.

Queue managers

On UNIX systems, there is one `QueueManager` stanza for every queue manager. These attributes specify the queue manager name, and the name of the directory containing the files associated with that queue manager. The name of the directory is based on the queue manager name, but is transformed if the queue manager name is not a valid file name. (See "Understanding WebSphere MQ file names" on page 16 for more information about name transformation.)

On Windows systems, this information is held in the Registry. You cannot use the WebSphere MQ Explorer to change it directly.

Name=*queue_manager_name*
: The name of the queue manager.

Prefix=*prefix*
: Where the queue manager files are stored. By default, this is the same as the value specified on the DefaultPrefix attribute of the All Queue Managers information.

Directory=*name*
: The name of the subdirectory under the `<prefix>\QMGRS` directory where the

queue manager files are stored. This name is based on the queue manager name, but can be transformed if there is a duplicate name or if the queue manager name is not a valid file name.

Changing queue manager configuration information

The attributes described here modify the configuration of an individual queue manager. They override any settings for WebSphere MQ. On WebSphere MQ for Windows systems and on WebSphere MQ for Linux (x86 platform) systems, modify configuration information using the WebSphere MQ Explorer. On other systems, modify the information by editing the qm.ini configuration file.

The following are detailed:
- "Installable services"
- "Service components" on page 108
- "Queue manager logs" on page 108
- "Restricted mode" on page 111
- "XA resource managers" on page 111
- "Attributes of channels" on page 112
- "LU62, NETBIOS, TCP, and SPX" on page 114
- "Exit path" on page 117
- "API exits" on page 118
- "Queue manager error logs" on page 118
- "Queue manager default bind type" on page 119

Installable services

There are significant implications to changing installable services and their components. For this reason, the installable services are read-only in the WebSphere MQ Explorer. To change installable services in on Windows systems, use **regedit** or on UNIX systems use the `Service` stanza in the qm.ini file.

For each component within a service, you must also specify the name and path of the module containing the code for that component. On UNIX systems, use the `ServiceComponent` stanza for this.

Name=AuthorizationService|NameService
The name of the required service.

AuthorizationService
For WebSphere MQ, the Authorization Service component is known as the Object Authority Manager, or OAM.

The `AuthorizationService` stanza and its associated `ServiceComponent` stanza are added automatically when the queue manager is created. Add other `ServiceComponent` stanzas manually.

NameService
No name service is provided by default. If you require a name service, you must add the `NameService` stanza manually.

EntryPoints=*number-of-entries*
The number of entry points defined for the service. This includes the initialization and termination entry points.

SecurityPolicy=Default|NTSIDsRequired (WebSphere MQ for Windows only)
The SecurityPolicy attribute applies only if the service specified is the default authorization service, that is, the OAM. The SecurityPolicy attribute allows you to specify the security policy for each queue manager. The possible values are:

Default
Use the default security policy to take effect. If a Windows security identifier (NT SID) is not passed to the OAM for a particular user ID, an attempt is made to obtain the appropriate SID by searching the relevant security databases.

NTSIDsRequired
Pass an NT SID to the OAM when performing security checks.

See “Windows security identifiers (SIDs)” on page 126 for more information.

SharedBindingsUserId=*user-type*
The SharedBindingsUserId attribute applies only if the service specified is the default authorization service, that is, the OAM. The SharedBindingsUserId attribute is used with relation to shared bindings only. This value allows you to specify whether the *UserIdentifier* field in the *IdentityContext* structure, from the MQZ_AUTHENTICATE_USER function, is the effective user Id or the real user Id. For information on the MQZ_AUTHENTICATE_USER function, see “MQZ_AUTHENTICATE_USER – Authenticate user” on page 407. The possible values are:

Default
The value of the *UserIdentifier* field is set as the real user Id.

Real
The value of the *UserIdentifier* field is set as the real user Id.

Effective
The value of the *UserIdentifier* field is set as the effective user Id.

FastpathBindingsUserId=*user-type*
The FastpathBindingsUserId attribute applies only if the service specified is the default authorization service, that is, the OAM. The FastpathBindingsUserId attribute is used with relation to fastpath bindings only. This value allows you to specify whether the *UserIdentifier* field in the *IdentityContext* structure, from the MQZ_AUTHENTICATE_USER function, is the effective user Id or the real user Id. For information on the MQZ_AUTHENTICATE_USER function, see “MQZ_AUTHENTICATE_USER – Authenticate user” on page 407. The possible values are:

Default
The value of the *UserIdentifier* field is set as the real user Id.

Real
The value of the *UserIdentifier* field is set as the real user Id.

Effective
The value of the *UserIdentifier* field is set as the effective user Id.

IsolatedBindingsUserId =*user-type*
The IsolatedBindingsUserId attribute applies only if the service specified is the default authorization service, that is, the OAM. The IsolatedBindingsUserId attribute is used with relation to isolated bindings only. This value allows you to specify whether the *UserIdentifier* field in the *IdentityContext* structure, from the MQZ_AUTHENTICATE_USER function, is the effective user Id or the real

user Id. For information on the MQZ_AUTHENTICATE_USER function, see "MQZ_AUTHENTICATE_USER – Authenticate user" on page 407. The possible values are:

Default
The value of the *UserIdentifier* field is set as the effective user Id.

Real
The value of the *UserIdentifier* field is set as the real user Id.

Effective
The value of the *UserIdentifier* field is set as the effective user Id.

For more information about installable services and components, see "Installable services and components" on page 391.

For more information about security services in general, see "WebSphere MQ security" on page 122.

Service components:

You need to specify service component information when you add a new installable service. On Windows systems use **regedit**, and on UNIX systems use the `ServiceComponent` stanza in the qm.ini file.

The authorization service stanza is present by default, and the associated component, the OAM, is active.

Service=*service_name*
The name of the required service. This must match the value specified on the `Name` attribute of the Service configuration information.

Name=*component_name*
The descriptive name of the service component. This must be unique and contain only characters that are valid for the names of WebSphere MQ objects (for example, queue names). This name occurs in operator messages generated by the service. We recommend that this name begins with a company trademark or similar distinguishing string.

Module=*module_name*
The name of the module to contain the code for this component. This must be a full path name.

ComponentDataSize=*size*
The size, in bytes, of the component data area passed to the component on each call. Specify zero if no component data is required.

For more information about installable services and components, see "Installable services and components" on page 391.

Queue manager logs

Use the `Log` queue manager properties page from the WebSphere MQ Explorer, or the `Log` stanza in the qm.ini file, to specify information about logging on this queue manager.

By default, these settings are inherited from the settings specified for the default log settings for the queue manager (described in "Log defaults for WebSphere MQ" on page 101). Change these settings only if you want to configure this queue manager in a different way.

For information about calculating log sizes, see "Calculating the size of the log" on page 222.

Note: The limits given in the following parameter list are set by WebSphere MQ. Operating system limits might reduce the maximum possible log size.

LogPrimaryFiles=3|*2-254* (Windows)|*2-510* (UNIX systems)
The log files allocated when the queue manager is created.

The minimum number of primary log files you can have is 2 and the maximum is 254 on Windows, or 510 on UNIX systems. The default is 3.

The total number of primary and secondary log files must not exceed 255 on Windows, or 511 on UNIX systems, and must not be less than 3.

The value is examined when the queue manager is created or started. You can change it after the queue manager has been created. However, a change in the value is not effective until the queue manager is restarted, and the effect might not be immediate.

LogSecondaryFiles=2|*1-253* (Windows)|*1-509* (UNIX systems)
The log files allocated when the primary files are exhausted.

The minimum number of secondary log files is 1 and the maximum is 253 on Windows, or 509 on UNIX systems. The default number is 2.

The total number of primary and secondary log files must not exceed 255 on Windows, or 511 on UNIX systems, and must not be less than 3.

The value is examined when the queue manager is started. You can change this value, but changes do not become effective until the queue manager is restarted, and even then the effect might not be immediate.

LogFilePages=*number*
The log data is held in a series of files called log files. The log file size is specified in units of 4 KB pages.

The default number of log file pages is 4096, giving a log file size of 16 MB.

On UNIX systems the minimum number of log file pages is 64, and on Windows the minimum number of log file pages is 32; in both cases the maximum number is 65 535.

Note: The size of the log files specified during queue manager creation cannot be changed for a queue manager.

LogType=CIRCULAR|LINEAR
The type of logging to be used by the queue manager. You cannot change the type of logging to be used once the queue manager has been created. Refer to the description of the LogType attribute in "Log defaults for WebSphere MQ" on page 101 for information about creating a queue manager with the type of logging you require.

CIRCULAR
Start restart recovery using the log to roll back transactions that were in progress when the system stopped.

See "Circular logging" on page 218 for a fuller explanation of circular logging.

LINEAR
For both restart recovery and media or forward recovery (creating lost or damaged data by replaying the contents of the log).

See “Linear logging” on page 219 for a fuller explanation of linear logging.

LogBufferPages=0|*0-4096*
The amount of memory allocated to buffer records for writing, specifying the size of the buffers in units of 4 KB pages.

The minimum number of buffer pages is 18 and the maximum is 4096. Larger buffers lead to higher throughput, especially for larger messages.

If you specify 0 (the default), the queue manager selects the size. In WebSphere MQ Version 7.0 this is 512 (2048 KB).

If you specify a number between 1 and 17, the queue manager defaults to 18 (72 KB). If you specify a number between 18 and 4096, the queue manager uses the number specified to set the memory allocated.

The value is examined when the queue manager is created or started, and might be increased or decreased at either of these times. However, a change in the value is not effective until the queue manager is restarted.

LogPath=*directory_name*
The directory in which the log files for a queue manager reside. This must exist on a local device to which the queue manager can write and, preferably, on a different drive from the message queues. Specifying a different drive gives added protection in case of system failure.

The default is:

- `C:\Program Files\IBM\WebSphere MQ\log` in WebSphere MQ for Windows.
- `/var/mqm/log` in WebSphere MQ for UNIX systems.

You can specify the name of a directory on the **crtmqm** command using the -ld flag. When a queue manager is created, a directory is also created under the queue manager directory, and this is used to hold the log files. The name of this directory is based on the queue manager name. This ensures that the log file path is unique, and also that it conforms to any limitations on directory name lengths.

If you do not specify -ld on the **crtmqm** command, the value of the `LogDefaultPath` attribute is used.

In WebSphere MQ for UNIX systems, user ID mqm and group mqm must have full authorities to the log files. If you change the locations of these files, you must give these authorities yourself. This is not required if the log files are in the default locations supplied with the product.

LogWriteIntegrity=SingleWrite|DoubleWrite|TripleWrite
The method the logger uses to reliably write log records.

SingleWrite
Some hardware guarantees that, if a write operation writes a page and fails for any reason, a subsequent read of the same page into a buffer results in each byte in the buffer being either:

- The same as before the write, or
- The byte that should have been written in the write operation

On this type of hardware (for example, ssa write cache enabled), it is safe for the logger to write log records in a single write as the hardware assures full write integrity. This method provides the highest level of performance.

DoubleWrite
The DoubleWrite method was the default method used in WebSphere MQ V5.2 and is available for back-compatibility purposes only.

TripleWrite
This is the default method. Where hardware that assures write integrity is not available, write log records using the TripleWrite method because it provides full write integrity.

Restricted mode

This option applies to UNIX systems only. The `RestrictedMode` stanza is set by the -g option on the **crtmqm** command. Do **not** change this stanza after the queue manager has been created. If you do not use the -g option, the stanza is not created in the qm.ini file.

ApplicationGroup
The name of the group with members that are allowed to:
- Run MQI applications
- Update all IPCC resources
- Change the contents of some queue manager directories

XA resource managers

Use the `XA resource manager` queue manager properties page from the WebSphere MQ Explorer, or the `XAResourceManager` stanza in the qm.ini file, to specify the following information about the resource managers involved in global units of work coordinated by the queue manager.

Add XA resource manager configuration information manually for each instance of a resource manager participating in global units of work; no default values are supplied.

See "Database coordination" on page 160 for more information about resource manager attributes.

Name=*name* **(mandatory)**
This attribute identifies the resource manager instance.

The `Name` value can be up to 31 characters in length. You can use the name of the resource manager as defined in its XA-switch structure. However, if you are using more than one instance of the same resource manager, you must construct a unique name for each instance. You can ensure uniqueness by including the name of the database in the `Name` string, for example.

WebSphere MQ uses the `Name` value in messages and in output from the **dspmqtrn** command.

Do not change the name of a resource manager instance, or delete its entry from the configuration information, once the associated queue manager has started and the resource manager name is in effect.

SwitchFile=*name* **(mandatory)**
The fully-qualified name of the load file containing the resource manager's XA switch structure.

If you are using a 64-bit queue manager with 32-bit applications, the `name` value should contain only the base name of the load file containing the resource manager's XA switch structure.

The 32-bit file will be loaded into the application from the path specified by **ExitsDefaultPath**.

The 64-bit file will be loaded into the queue manager from the path specified by **ExitsDefaultPath64**.

XAOpenString=*string* **(optional)**
The string of data to be passed to the resource manager's xa_open entry point. The contents of the string depend on the resource manager itself. For example, the string could identify the database that this instance of the resource manager is to access. For more information about defining this attribute, see:

- "Adding resource manager configuration information for DB2" on page 168
- "Adding resource manager configuration information for Oracle" on page 171
- "Adding resource manager configuration information for Sybase" on page 175
- "Adding resource manager configuration information for Informix" on page 173

and consult your resource manager documentation for the appropriate string.

XACloseString=*string* **(optional)**
The string of data to be passed to the resource manager's xa_close entry point. The contents of the string depend on the resource manager itself. For more information about defining this attribute, see:

- "Adding resource manager configuration information for DB2" on page 168
- "Adding resource manager configuration information for Oracle" on page 171
- "Adding resource manager configuration information for Sybase" on page 175
- "Adding resource manager configuration information for Informix" on page 173

and consult your database documentation for the appropriate string.

ThreadOfControl=THREAD|PROCESS
This attribute is mandatory for WebSphere MQ for Windows. The queue manager uses this value for serialization when it needs to call the resource manager from one of its own multithreaded processes.

THREAD
The resource manager is fully *thread aware*. In a multithreaded WebSphere MQ process, XA function calls can be made to the external resource manager from multiple threads at the same time.

PROCESS
The resource manager is not *thread safe*. In a multithreaded WebSphere MQ process, only one XA function call at a time can be made to the resource manager.

The `ThreadOfControl` entry does not apply to XA function calls issued by the queue manager in a multithreaded application process. In general, an application that has concurrent units of work on different threads requires this mode of operation to be supported by each of the resource managers.

Attributes of channels

These attributes determine the configuration of a channel.

Use the `Channels` queue manager properties page from the WebSphere MQ Explorer, or the `CHANNELS` stanza in the qm.ini file, to specify information about channels.

MaxChannels=100|*number*
The maximum number of channels allowed, in the range 1 - 9999. The default is 100.

This parameter applies to z/OS only.

MaxActiveChannels=*MaxChannels_value*
The maximum number of channels allowed to be active at any time. The default is the value specified for the `MaxChannels` attribute.

This parameter applies to z/OS only.

MaxInitiators=3|*number*
The maximum number of initiators. The default and maximum value is 3. Any value greater than 3 will be taken as 3.

MQIBindType=FASTPATH|SHARED
The binding for applications:

FASTPATH
Channels connect using **MQCONNX** FASTPATH; there is no agent process.

SHARED
Channels connect using SHARED.

PipeLineLength=1|*number*
The maximum number of concurrent threads a channel will use. The default is 1. Any value greater than 1 is treated as 2.

When you use pipelining, configure the queue managers at both ends of the channel to have a *PipeLineLength* greater than 1.

Note: Pipelining is only effective for TCP/IP channels.

AdoptNewMCA=NO|SVR|SDR|RCVR|CLUSRCVR|ALL|FASTPATH
If WebSphere MQ receives a request to start a channel, but finds that an instance of the channel is already running, in some cases the existing channel instance must be stopped before the new one can start. The `AdoptNewMCA` attribute allows you to control which types of channels can be ended in this way.

If you specify the `AdoptNewMCA` attribute for a given channel type, but the new channel fails to start because a matching channel instance is already running:
1. The new channel tries to stop the previous one by requesting it to end.
2. If the previous channel server does not respond to this request by the time the AdoptNewMCATimeout wait interval expires, the thread or process for the previous channel server is ended.
3. If the previous channel server has not ended after step 2, and after the AdoptNewMCATimeout wait interval expires for a second time, WebSphere MQ ends the channel with a `CHANNEL IN USE` error.

The AdoptNewMCA functionality applies to server, sender, receiver and cluster-receiver channels. In the case of a sender or server channel, only one instance of a channel with a particular name can be running in the receiving queue manager. In the case of a receiver or cluster-receiver channel, multiple instances of a channel with a particular name might be running in the receiving queue manager, but only one instance can run at any one time from a particular remote queue manager.

Note: AdoptNewMCA is not supported on requester or server-connection channels.

Specify one or more values, separated by commas or blanks, from the following list:

NO
The `AdoptNewMCA` feature is not required. This is the default.

SVR
Adopt server channels.

SDR
Adopt sender channels.

RCVR
Adopt receiver channels.

CLUSRCVR
Adopt cluster receiver channels.

ALL
Adopt all channel types except FASTPATH channels.

FASTPATH
Adopt the channel if it is a FASTPATH channel. This happens only if the appropriate channel type is also specified, for example: `AdoptNewMCA=RCVR,SVR,FASTPATH`.

Attention!: The AdoptNewMCA attribute might behave in an unpredictable fashion with FASTPATH channels. Exercise great caution when enabling the AdoptNewMCA attribute for FASTPATH channels.

AdoptNewMCATimeout=60|1 – 3600
The amount of time, in seconds, that the new channel instance waits for the old channel instance to end. Specify a value in the range 1 – 3600. The default value is 60.

AdoptNewMCACheck=QM|ADDRESS|NAME|ALL
The type of checking required when enabling the `AdoptNewMCA` attribute. If possible, perform full checking to protect your channels from being shut down, inadvertently or maliciously. At the very least, check that the channel names match.

Specify one or more of the following values, separated by commas or blanks:

QM
Check that the queue manager names match.

ADDRESS
Check the communications address. For example, the TCP/IP address.

NAME
Check that the channel names match.

ALL
Check for matching queue manager names, the communications address, and for matching channel names.

The default is `AdoptNewMCACheck=NAME,ADDRESS,QM`.

LU62, NETBIOS, TCP, and SPX

Use the following queue manager properties pages, or stanzas in the qm.ini file, to specify network protocol configuration parameters. They override the default attributes for channels.

LU62 (WebSphere MQ for Windows only)
Use the `LU6.2` queue manager properties page from the WebSphere MQ Explorer, or the `LU62` stanza in the qm.ini file, to specify SNA LU 6.2 protocol configuration parameters.

TPName
The TP name to start on the remote site.

Library1=*DLLName 1*
The name of the APPC DLL.

The default value is WCPIC32.

Library2=*DLLName2*
The same as Library1, used if the code is stored in two separate libraries.

The default value is WCPIC32.

NETBIOS (WebSphere MQ for Windows only)
Use the `Netbios` queue manager properties page from the WebSphere MQ Explorer, or the `NETBIOS` stanza in the qm.ini file, to specify NetBIOS protocol configuration parameters.

LocalName=*name*
The name by which this machine is known on the LAN.

AdapterNum=0|*adapter_number*
The number of the LAN adapter. The default is adapter 0.

NumSess=1|*number_of_sessions*
The number of sessions to allocate. The default is 1.

NumCmds=1|*number_of_commands*
The number of commands to allocate. The default is 1.

NumNames=1|*number_of_names*
The number of names to allocate. The default is 1.

Library1=*DLLName1*
The name of the NetBIOS DLL.

The default value is NETAPI32.

TCP
Use the `TCP` queue manager properties page from the WebSphere MQ Explorer, or the `TCP` stanza in the qm.ini file, to specify Transmission Control Protocol / Internet Protocol (TCP/IP) configuration parameters.

Port=1414|*port_number*
The default port number, in decimal notation, for TCP/IP sessions. The *well known* port number for WebSphere MQ is 1414.

Library1=*DLLName1* **(WebSphere MQ for Windows only)**
The name of the TCP/IP sockets DLL.

The default is WSOCK32.

KeepAlive=YES|NO
Switch the KeepAlive function on or off. KeepAlive=YES causes TCP/IP to check periodically that the other end of the connection is still available. If it is not, the channel is closed.

ListenerBacklog=number
Override the default number of outstanding requests for the TCP/IP listener.

When receiving on TCP/IP, a maximum number of outstanding connection requests is set. This can be considered to be a *backlog* of requests waiting on the TCP/IP port for the listener to accept the request. The default listener backlog values are shown in Table 4.

Table 4. Default outstanding connection requests (TCP)

Platform	Default ListenerBacklog value
Windows Server	100
Windows Workstation	5
Linux	100
Solaris	100
HP-UX	20
AIX V4.2 or later	100
AIX V4.1 or earlier	10

Note: Some operating systems support a larger value than the default shown. Use this to avoid reaching the connection limit.

Conversely, some operating systems might limit the size of the TCP backlog, so the effective TCP backlog could be smaller than requested here.

If the backlog reaches the values shown in Table 4, the TCP/IP connection is rejected and the channel cannot start. For message channels, this results in the channel going into a RETRY state and retrying the connection at a later time. For client connections, the client receives an MQRC_Q_MGR_NOT_AVAILABLE reason code from **MQCONN** and retries the connection at a later time.

ClntSndBuffSize=number|32768
The size in bytes of the TCP/IP send buffer for each channel instance.

ClntRcvBuffSize=number|32768
The size in bytes of the TCP/IP receive buffer for each channel instance.

Connect_Timeout=number|No timeout
The number of seconds before an attempt to connect the socket times out.

SPX (WebSphere MQ for Windows only)
Use the SPX queue manager properties page from the WebSphere MQ Explorer, or the SPX stanza in the qm.ini file, to specify SPX protocol configuration parameters.

Socket=5E86|*socket_number*
The SPX socket number in hexadecimal notation. The default is X'5E86'.

BoardNum=0|*adapter_number*
The LAN adapter number. The default is adapter 0.

KeepAlive=YES|NO
Switch the KeepAlive function on or off.

KeepAlive=YES causes SPX to check periodically that the other end of the connection is still available. If it is not, the channel is closed.

Library1=*DLLName1*
The name of the SPX DLL.

The default is WSOCK32.DLL.

Library2=*DLLName2*
The same as LibraryName1, used if the code is stored in two separate libraries.

The default is WSOCK32.DLL.

ListenerBacklog=number
Override the default number of outstanding requests for the SPX listener.

When receiving on SPX, a maximum number of outstanding connection requests is set. This can be considered to be a *backlog* of requests waiting on the SPX socket for the listener to accept the request. The default listener backlog values are shown in Table 5.

Table 5. Default outstanding connection requests (SPX)

Platform	**Default ListenerBacklog value**
Windows Server	100
Windows Workstation	5

Note: Some operating systems support a larger value than the default shown. Use this to avoid reaching the connection limit.

Conversely, some operating systems might limit the size of the SPX backlog, so the effective SPX backlog could be smaller than requested here.

If the backlog reaches the values shown in Table 5, the SPX connection is rejected and the channel cannot start. For message channels, this results in the channel going into a RETRY state and retrying the connection at a later time. For client connections, the client receives an MQRC_Q_MGR_NOT_AVAILABLE reason code from **MQCONN** and should retry the connection at a later time.

Exit path

Use the `Exits` queue manager properties page from the WebSphere MQ Explorer, or the `ExitPath` stanza in the qm.ini file to specify the path for user exit programs.

ExitsDefaultPath=*string*
The ExitsDefaultPath attribute specifies the location of:
- 32-bit channel exits for clients
- 32-bit channel exits and data conversion exits for servers
- Unqualified XA switch load files

ExitsDefaultPath64=*string*
The ExitsDefaultPath64 attribute specifies the location of:
- 64-bit channel exits for clients
- 64-bit channel exits and data conversion exits for servers
- Unqualified XA switch load files

The exit path for clients is held in the WebSphere MQ clients configuration information, as described in “Client configuration files, WebSphere MQ client configuration file” on page 119.

If you do not have a clients configuration file, and are still using the mqs.ini file, the exit path information is described in “Client exit path” on page 100.

API exits:

Use the `Exits` queue manager properties page from the WebSphere MQ Explorer, or the `ApiExitLocal` stanza in the qm.ini file to identify API exit routines for a queue manager. On Windows systems, you can also use the amqmdain command to change the Registry entries for API exits. (To identify API exit routines for all queue managers, you use the `ApiExitCommon` and `ApiExitTemplate` stanzas, as described in "API exits" on page 105.)

For a complete description of the attributes for these stanzas, see "Configuring API exits" on page 481.

Queue manager error logs

Use the `Extended` queue manager properties page from the WebSphere MQ Explorer, or the `QMErrorLog` stanza in the qm.ini file to tailor the operation and contents of queue manager error logs.

ErrorLogSize=*maxsize*
: Specifies the size of the queue manager error log at which it is copied to the backup. *maxsize* must be between 32768 and 2147483648 bytes. If **ErrorLogSize** is not specified, the default value of 262144 bytes (256KB) is used.

ExcludeMessage=*msgIds*
: Specifies messages that are not to be written to the queue manager error log. *msqIds* contain a comma separated list of message id's from the following:

  7163 - Job started message (i5/OS only)
  7234 - Number of messages loaded
  9001 - Channel program ended normally
  9002 - Channel program started
  9202 - Remote host not available
  9208 - Error on receive from host
  9209 - Connection closed
  9228 - Cannot start channel responder
  9508 - Cannot connect to queue manager
  9524 - Remote queue manager unavailable
  9528 - User requested closure of channel
  9558 - Remote Channel is not available
  9999 - Channel program ended abnormally

SuppressMessage=*msgIds*
: Specifies messages that will be written to the queue manager error log once only in a specified time interval. The time interval is specified by **SuppressInterval**. *msqIds* contain a comma separated list of message id's from the following:

  7163 - Job started message (i5/OS only)
  7234 - Number of messages loaded
  9001 - Channel program ended normally
  9002 - Channel program started
  9202 - Remote host not available
  9208 - Error on receive from host

9209 - Connection closed

9228 - Cannot start channel responder

9508 - Cannot connect to queue manager

9524 - Remote queue manager unavailable

9528 - User requested closure of channel

9558 - Remote Channel is not available

9999 - Channel program ended abnormally

If the same message id is specified in both **SuppressMessage** and **ExcludeMessage**, the message is excluded.

SuppressInterval=*length*
: Specifies the time interval, in seconds, in which messages specified in **SuppressMessage** will be written to the queue manager error log once only. *length* must be between 1 and 86400 seconds. If **SuppressInterval** is not specified, the default value of 30 seconds is used.

Queue manager default bind type

Use the `Extended` queue manager properties page from the WebSphere MQ Explorer, or the `Connection` stanza in the qm.ini file to specify the default bind type.

DefaultBindType=SHARED|ISOLATED
: If DefaultBindType is set to ISOLATED, applications and the queue manager run in separate processes, and no resources are shared between them.

  If DefaultBindType is set to SHARED, applications and the queue manager run in separate processes, however some resources are shared between them.

  The default is SHARED.

Client configuration files, WebSphere MQ client configuration file

On all platforms, the WebSphere MQ client configuration file file is used to specify the client configuration options.

A WebSphere MQ client application uses the following search path to locate the WebSphere MQ client configuration file:

1. The location specified by the environment variable MQCLNTCF.

   The format of this environment variable is a full URL. This means the file name might not necessarily be `WebSphere MQ client configuration file` and facilitates placing the file on a network attached file-system

   Note the following:

   - C and XMS clients support only the `file:` protocol; the `file:` protocol is assumed if the URL string does not begin with `protocol:`
   - To allow for Java 1.4.2 JREs, that do not support reading environment variables, the MQCLNTCF environment variable can be overridden with a MQCLNTCF Java System Property.
2. A file called `WebSphere MQ client configuration file` in the present working directory of the application.
3. A file called `WebSphere MQ client configuration file` in the WebSphere MQ data directory.

Note the following:

- The WebSphere MQ data directory does not exist on certain platforms, for example, System i™ and System z™, or in cases where the client has been supplied with another product.
- On platforms with a UNIX-like file system, the directory is `/var/mqm`
- On Windows platforms you configure a new environment variable, MQ_FILE_PATH, during installation, to point at the installation base location.
- To allow for Java 1.4.2 JREs the you can manually override the MQ_FILE_PATH environment variable with a MQ_FILE_PATH Java System Property.

4. A file called `WebSphere MQ client configuration file` in a standard directory appropriate to the platform, and accessible to users:
   - For all Java clients this is the value of the `user.home` Java System Property
   - For C clients on UNIX platforms this is the value of the HOME environment variable
   - For C clients on Windows this is the concatenated values of the HOMEDRIVE and HOMEPATH environment variables

Figure 11 on page 121 shows how groups of attributes might be arranged in a client configuration file.

```
#* Module Name: mqclient.ini                                      *#
#* Type       : WebSphere MQ client configuration file            *#
#  Function   : Define the configuration of a client              *#
#*                                                                *#
#******************************************************************#
#* Notes      :                                                   *#
#* 1) This file defines the configuration of a client             *#
#*                                                                *#
#******************************************************************#

ClientExitPath:
   ExitsDefaultPath=/var/mqm/exits
   ExitsDefaultPath64=/var/mqm/exits64

TCP:
   Library1=DLLName1
   KeepAlive = Yes
   ClntSndBuffSize=32768
   ClntRcvBuffSize=32768
   Connect_Timeout=0

MessageBuffer:
   MaximumSize=-1
   Updatepercentage=-1
   PurgeTime=0

LU62:
   TPName
   Library1=DLLName1
   Library2=DLLName2

NETBIOS:
   LocalName=name
   AdapterNum=0
   NumSess=1
   NumCmds=1
   NumNames=1
   Library1=DLLName1

SPX:
   Socket=5E86
   BoardNum=0
   KeepAlive=YES
   Library1=DLLName1
   Library2=DLLName2
```

Figure 11. Example client configuration file

Notes for Figure 11:

1. The `TCP`, `ClientExitPath`, and `MessageBuffer` stanza values apply to the C client, the Java clients, and the fully-managed .NET client, with the exception of the `Connect_Timeout` value, which applies only to the C, Java, and JMS clients.

   The client default for `Connect_Timeout` is zero, unless the channel has been configured with a non-zero client channel weighting, in which case the `Connect_Timeout` default is 5.
2. The `ClientExitPath` values must not end with the '/' (forward slash) character.
3. The LU62, NETBIOS, and SPX stanzas apply only to:
   - The C client
   - WebSphere MQ for Windows

   For more information about these stanzas, see "LU62, NETBIOS, TCP, and SPX" on page 114.

WebSphere MQ security

WebSphere MQ queue managers transfer information that is potentially valuable, so you need to use an authority system to ensure that unauthorized users cannot access your queue managers. Consider the following types of security controls:

Who can administer WebSphere MQ
You can define the set of users who can issue commands to administer WebSphere MQ.

Who can use WebSphere MQ objects
You can define which users (usually applications) can use MQI calls and PCF commands to do the following:

- Who can connect to a queue manager.
- Who can access objects (queues, process definitions, namelists, channels, client connection channels, listeners, services, and authentication information objects), and what type of access they have to those objects.
- Who can access WebSphere MQ messages.
- Who can access the context information associated with a message.

Channel security
You need to ensure that channels used to send messages to remote systems can access the required resources.

You can use standard operating facilities to grant access to program libraries, MQI link libraries, and commands. However, the directory containing queues and other queue manager data is private to WebSphere MQ; do not use standard operating system commands to grant or revoke authorizations to MQI resources.

Authority to administer WebSphere MQ

WebSphere MQ administrators have authority to use all WebSphere MQ commands (including the commands to grant WebSphere MQ authorities for other users)

To be a WebSphere MQ administrator, you must be a member of a special group called the *mqm* group (or a member of the Administrators group on Windows systems; see below). The mqm group is created automatically when WebSphere MQ is installed; add further users to the group to allow them to perform administration (including the root user on UNIX systems). All members of this group have access to all resources. This access can be revoked only by removing a user from the mqm group.

On UNIX platforms, a special user ID of mqm is also created, for use by the product only. It must never be available to non-privileged users. All WebSphere MQ objects are owned by user ID mqm.

On Windows systems, members of the Administrators group can also administer any queue manager. You can also create a domain mqm group on the domain controller that contains all privileged user IDs active within the domain, and add it to the local mqm group. Some commands, for example **crtmqm**, manipulate authorities on WebSphere MQ objects and so need authority to work with these objects (as described below). Members of the mqm group have authority to work with all objects, but there might be circumstances on Windows systems when authority is denied if you have a local user and a domain-authenticated user with the same name. This is described in “Principals and groups” on page 125.

Windows Vista introduces a User Account Control (UAC) feature, which restricts the actions users can perform on certain operating system facilities, even if they are members of the Administrators group. See User Account Control (UAC) on Windows Vista for more information. If your userid is in the Administrators group but not the mqm group you must use an elevated command prompt to issue MQ admin commands such as crtmqm, otherwise the error ″AMQ7077: You are not authorized to perform the requested operation″ is generated. To open an elevated command prompt, right-click the start menu item, or icon, for the command prompt, and select ″Run as administrator″.

You do not need to be a member of the mqm group to do the following:
- Issue commands from an application program that issues PCF commands, or MQSC commands within an Escape PCF command, unless the commands manipulate channel initiators. (These commands are described in “Protecting channel initiator definitions” on page 141).
- Issue MQI calls from an application program (unless you want to use the fastpath bindings on the **MQCONNX** call).
- Use the **crtmqcvx** command to create a fragment of code that performs data conversion on data type structures.
- Use the **dspmq** command to display queue managers.
- Use the **dspmqtrc** command to display WebSphere MQ formatted trace output.

Managing the mqm group

Security administrators add users who need to administer WebSphere MQ to the mqm group. This includes the root user on UNIX systems. They might also need to remove users who no longer need this authority. These tasks are described in “Creating and managing groups” on page 129.

If your domain controller runs on Windows 2000 or Windows 2003, your domain administrator might have to set up a special account for WebSphere MQ to use. This is described in the WebSphere MQ for Windows Quick Beginnings.

Authority to work with WebSphere MQ objects

Queue managers, queues, process definitions, namelists, channels, client connection channels, listeners, services and authentication information objects are all accessed from applications that use MQI calls or PCF commands. These resources are all protected by WebSphere MQ, and applications need to be given permission to access them. The entity making the request might be a user, an application program that issues an MQI call, or an administration program that issues a PCF command. The identifier of the requester is referred to as the *principal*.

Different groups of principals can be granted different types of access authority to the same object. For example, for a specific queue, one group might be allowed to perform both put and get operations; another group might be allowed only to browse the queue (**MQGET** with browse option). Similarly, some groups might have put and get authority to a queue, but not be allowed to alter attributes of the queue or delete it.

Some operations are particularly sensitive and should be limited to privileged users. For example:

- Accessing some special queues, such as transmission queues or the command queue SYSTEM.ADMIN.COMMAND.QUEUE
- Running programs that use full MQI context options
- Creating and deleting application queues

Full access permission to an object is automatically given to the user ID that created the object and to all members of the mqm group (and to the members of the local Administrators group on Windows systems).

When security checks are made

The security checks made for a typical application are as follows:

Connecting to the queue manager (MQCONN or MQCONNX calls)
This is the first time that the application is associated with a particular queue manager. The queue manager interrogates the operating environment to discover the user ID associated with the application. WebSphere MQ then verifies that the user ID is authorized to connect to the queue manager and retains the user ID for future checks.

Users do not have to sign on to WebSphere MQ; WebSphere MQ assumes that users have signed on to the underlying operating system and have been authenticated by that.

Opening the object (MQOPEN or MQPUT1 calls)
WebSphere MQ objects are accessed by opening the object and issuing commands against it. All resource checks are performed when the object is opened, rather than when it is actually accessed. This means that the **MQOPEN** request must specify the type of access required (for example, whether the user wants only to browse the object or perform an update like putting messages onto a queue).

WebSphere MQ checks the resource that is named in the **MQOPEN** request. For an alias or remote queue object, the authorization used is that of the object itself, not the queue to which the alias or remote queue resolves. This means that the user does not need permission to access it. Limit the authority to create queues to privileged users. If you do not, users might bypass the normal access control simply by creating an alias. If a remote queue is referred to explicitly with both the queue and queue manager names, the transmission queue associated with the remote queue manager is checked.

The authority to a dynamic queue is based on that of the model queue from which it is derived, but is not necessarily the same. This is described in Note 1 on page 145.

The user ID used by the queue manager for access checks is the user ID obtained from the operating environment of the application connected to the queue manager. A suitably authorized application can issue an **MQOPEN** call specifying an alternative user ID; access control checks are then made on the alternative user ID. This does not change the user ID associated with the application, only that used for access control checks.

Putting and getting messages (MQPUT or MQGET calls)
No access control checks are performed.

Closing the object (MQCLOSE)
No access control checks are performed, unless the **MQCLOSE** will result in a dynamic queue being deleted. In this case, there is a check that the user ID is authorized to delete the queue.

How access control is implemented by WebSphere MQ

WebSphere MQ uses the security services provided by the underlying operating system. An access control interface called the Authorization Service Interface is part of WebSphere MQ. WebSphere MQ supplies an implementation of an access control manager (conforming to the Authorization Service Interface) known as the *Object Authority Manager (OAM)*. This is automatically installed and enabled for each queue manager you create, unless you specify otherwise (as described in “Preventing security access checks” on page 139). The OAM can be replaced by any user or vendor written component that conforms to the Authorization Service Interface.

The OAM exploits the security features of the underlying operating system, using operating system user and group IDs. Users can access WebSphere MQ objects only if they have the correct authority. “Using the OAM to control access to objects” on page 134 describes how to grant and revoke this authority.

The OAM maintains an access control list (ACL) for each resource that it controls. Authorization data is stored on a local queue called SYSTEM.AUTH.DATA.QUEUE. Access to this queue is restricted to users in the mqm group, and additionally on Windows, to users in the Administrators group, and users logged in with the SYSTEM ID. User access to the queue cannot be changed.

WebSphere MQ supplies commands to create, and maintain access control lists. For more information on these commands, see “Using the OAM to control access to objects” on page 134.

WebSphere MQ passes the OAM a request containing a principal, a resource name, and an access type. The OAM grants or rejects access based on the ACL that it maintains. WebSphere MQ follows the decision of the OAM; if the OAM cannot make a decision, WebSphere MQ does not allow access.

Identifying the user ID

The OAM needs to be able to identify who is requesting access to a particular resource. WebSphere MQ uses the term *principal* to refer to this identifier. The principal is established when the application first connects to the queue manager; it is determined by the queue manager from the user ID associated with the connecting application. (If the application is running in a transaction monitor environment, the connection is through the X/Open XA interface, which does not provide a mechanism for passing user IDs, so WebSphere MQ assumes a default user name.)

On UNIX systems, the authorization routines checks either the real (logged-in) user ID, or the effective user ID associated with the application. The user ID checked can be dependent on the bind type, for details see “Installable services” on page 106.

WebSphere MQ propagates the user ID received from the system in the message header (MQMD structure) of each message as identification of the user. This identifier is part of the message context information and is described in “Context authority” on page 127. Applications cannot alter this information unless they have been authorized to change context information.

Principals and groups:

Principals can belong to groups. You can grant access to a particular resource to groups rather than to individuals, to reduce the amount of administration required. For example, you might define a group consisting of users who want to run a particular application. Other users can be given access to all the resources they require simply by adding their user ID to the appropriate group. This is described in "Creating and managing groups" on page 129.

A principal can belong to more than one group (its group set) and has the aggregate of all the authorities granted to each group in its group set. These authorities are cached, so any changes you make to the principal's group membership are not recognized until the queue manager is restarted, unless you issue the MQSC command REFRESH SECURITY (or the PCF equivalent).

UNIX systems

All ACLs are based on groups. When a user is granted access to a particular resource, the user ID's primary group is included in the ACL, not the individual user ID, and authority is granted to all members of that group. Because of this, be aware that you could inadvertently change the authority of a principal by changing the authority of another principal in the same group.

Note: To add a user to an ACL or any group, WebSphere MQ on UNIX systems requires the user ID to have a maximum length of eight characters.

All users are nominally assigned to the default user group *nobody* and by default, no authorizations are given to this group. You can change the authorization in the *nobody* group to grant access to WebSphere MQ resources to users without specific authorizations.

Windows systems

ACLs are based on both user IDs and groups. Checks are the same as for UNIX systems except that individual user IDs can appear in the ACL as well. You can have different users on different domains with the same user ID; WebSphere MQ allows user IDs to be qualified by a domain name so that these users can be given different levels of access. Group names always refer to local groups, so you don't need to qualify them with a domain name.

User IDs can contain up to 20 characters, domain names up to 15 characters, and group names up to 64 characters.

The OAM first checks the local security database, then the database of the primary domain, and finally the database of any trusted domains. The first user ID encountered is used by the OAM for checking. Each of these user IDs might have different group memberships on a particular computer.

Some control commands (for example, **crtmqm**) change authorities on WebSphere MQ objects using the Object Authority Manager (OAM). Because the OAM searches the security databases in the order given above to determine the authority rights for a given user ID, the authority determined by the OAM might override the fact that a user ID is a member of the local mqm group. For example, if you issue **crtmqm** from a user ID authenticated by a domain controller that has membership of the local mqm group through a global group, the command fails if the system has a local user of the same name who is not in the local mqm group.

Windows security identifiers (SIDs):

On Windows systems, the security identifier (SID) is used to supplement the user ID. The SID contains information that identifies the full user account details on the Windows security account manager (SAM) database where the user is defined. When a message is created on WebSphere MQ for Windows, WebSphere MQ stores the SID in the message descriptor. When WebSphere MQ for Windows performs authorization checks, it uses the SID to query the full information from the SAM database. (The SAM database in which the user is defined must be accessible for this query to succeed.)

By default, if a Windows SID is not supplied with an authorization request, WebSphere MQ identifies the user based on the user name alone. It does this by searching the security databases in the following order:

1. The local security database
2. The security database of the primary domain
3. The security database of trusted domains

If the user name is not unique, incorrect WebSphere MQ authority might be granted. To prevent this problem, include an SID in each authorization request; the SID is used by WebSphere MQ to establish user credentials.

To specify that all authorization requests must include an SID, use **regedit**. Set the SecurityPolicy to NTSIDsRequired.

Alternate-user authority

You can specify that a user ID can use the authority of another user when accessing a WebSphere MQ object. This is called *alternate-user authority*, and you can use it on any WebSphere MQ object.

Alternate-user authority is essential where a server receives requests from a program and wants to ensure that the program has the required authority for the request. The server might have the required authority, but it needs to know whether the program has the authority for the actions it has requested.

For example, assume that a server program running under user ID PAYSERV retrieves a request message from a queue that was put on the queue by user ID USER1. When the server program gets the request message, it processes the request and puts the reply back into the reply-to queue specified with the request message. Instead of using its own user ID (PAYSERV) to authorize opening the reply-to queue, the server can specify a different user ID, in this case, USER1. In this example, you can use alternate-user authority to control whether PAYSERV is allowed to specify USER1 as an alternate-user ID when it opens the reply-to queue.

The alternate-user ID is specified on the `AlternateUserId` field of the object descriptor.

Context authority

Context is information that applies to a particular message and is contained in the message descriptor, MQMD, which is part of the message. The context information comes in two sections:

Identity section
: Who the message came from. It consists of the `UserIdentifier`, `AccountingToken`, and `ApplIdentityData` fields.

Origin section
: Where the message came from, and when it was put onto the queue. It consists of the `PutApplType`, `PutApplName`, `PutDate`, `PutTime`, and `ApplOriginData` fields.

Applications can specify the context data when either an **MQOPEN** or **MQPUT** call is made. This data might be generated by the application, passed on from another message, or generated by the queue manager by default. For example, context data can be used by server programs to check the identity of the requester, testing whether the message came from an application running under an authorized user ID.

A server program can use the `UserIdentifier` to determine the user ID of an alternate user. You use context authorization to control whether the user can specify any of the context options on any **MQOPEN** or **MQPUT1** call.

See the WebSphere MQ Application Programming Guide for information about the context options, and the WebSphere MQ Application Programming Reference for descriptions of the message descriptor fields relating to context.

Connecting to WebSphere MQ using Terminal Services

If you are connecting using Terminal Services to a machine running one of:

- Windows XP with service pack 2 or later. (Service pack 2 for Windows XP is a pre-requisite for WebSphere MQ)
- Windows 2003
- Windows Vista

and you have problems creating or starting a queue manager this might be because of the introduction of a new user right, “Create global objects”, in these operating systems.

The “Create global objects” user right limits the users authorized to create objects in the global namespace. In order for an application to create a global object, it must either be running in the global namespace, or the user under which the application is running must have the “Create global objects” user right applied to it.

The various methods of administering WebSphere MQ should work when you use terminal services; if they do not, try setting the “Create global objects” user right:

1. Open the Administrative Tools panel:

   Windows 2003 and Windows XP
   : Access this panel using **Control Panel** → **Administrative Tools**.

   Windows Vista
   : Access this panel using **Control Panel** → **System and Maintenance** → **Administrative Tools**.
2. Double-click **Local Security Policy**.
3. Expand **Local Policies**.
4. Click **User Rights Assignment**.
5. Add the new user or group to the “Create global objects” policy.

Administrators have the “Create global objects” user right applied by default, so if you are an administrator you will be able to create and start queue managers when connected via Terminal Services without altering your user rights.

Configuring additional authority for Windows applications connecting to WebSphere MQ

You might experience problems if you have Windows applications, for example ASP pages, connecting to WebSphere MQ that are configured to run at a security level higher than usual.

WebSphere MQ requires SYNCHRONIZE access to application processes in order to coordinate certain actions. APAR IC35116 changed WebSphere MQ so that the appropriate privileges are specified. However, the account under which WebSphere MQ processes run might need additional authorization before the requested access can be granted. Directions for configuring additional authority are given below.

To configure additional authority to the user ID under which WebSphere MQ processes are running:

- Bring up the Local Security Policy tool, click on Security Settings ->Local Policies->User Right Assignments, click on ″Debug Programs″.
- Double click ″Debug Programs″, then Add your WebSphere MQ user ID to the list

If the system is in a Windows domain and the effective policy setting is still not set, even though the local policy setting is set, the user ID must be authorized in the same way at domain level, using the Domain Security Policy tool.

Creating and managing groups

This section tells you how to create groups and add users to them. It also describes how to remove a user from a group. Any changes you make to a principal’s group membership are not recognized until the queue manager is restarted, unless you issue the MQSC command REFRESH SECURITY (or the PCF equivalent).

Windows

The following instructions lead you through the process of administering groups on a workstation or member server machine. For domain controllers, users and groups are administered through Active Directory. For more details on using Active Directory refer to the appropriate operating system instructions.

Use the Computer Management panel to work with user and groups.

Windows 2003 and Windows XP
Access this panel using **Control Panel** → **Administrative Tools** → **Computer Management**.

Windows Vista
Access this panel using **Control Panel** → **System and Maintenance** → **Administrative Tools** → **Computer Management**.

Creating a group:

1. Open the control panel.
2. Double-click **Administrative Tools**. The Administrative Tools panel opens.
3. Double-click **Computer Management**. The Computer Management panel opens.

4. Expand **Local Users and Groups**.
5. Right-click **Groups**, and select **New Group...**. The New Group panel is displayed.
6. Type an appropriate name in the Group name field, then click **Create**.
7. Click **Close**.

You have now created a group.

Adding a user to a group:

1. From the Computer Management panel, expand **Local Users and Groups**.
2. Select **Users**.
3. Double-click the user that you want to add to a group. The user properties panel is displayed.
4. Select the **Member Of** tab.
5. Select the group that you want to add the user to. If the group you want is not visible:
   a. Click **Add...**. The Select Groups panel is displayed.
   b. Click **Locations...**. The Locations panel is displayed.
   c. Select the location of the group you want to add the user to from the list and click **OK**.
   d. Type the group name in the field provided.

      Alternatively, click **Advanced...** and then **Find Now** to list the groups available in the currently selected location. From here, select the group you want to add the user to and click **OK**.
   e. Click **OK**. The user properties panel is displayed, showing the group you added.
   f. Select the group.
6. Click **OK**. The Computer Management panel is displayed.

You have now added a user to a group.

Displaying who is in a group:

1. From the Computer Management panel, expand **Local Users and Groups**.
2. Select **Groups**.
3. Double-click a group. The group properties panel is displayed.

The group members are displayed.

Removing a user from a group:

1. From the Computer Management panel, expand **Local Users and Groups**.
2. Select **Users**.
3. Double-click the user that you want to add to a group. The user properties panel is displayed.
4. Select the **Member Of** tab.
5. Select the group that you want to remove the user from, then click **Remove**.
6. Click **OK**. The Computer Management panel is displayed.

You have now removed a user from a group.

HP-UX

On HP-UX, providing you are not using NIS or NIS+, use the System Administration Manager (SAM) to work with groups.

Creating a group:

1. From the System Administration Manager (SAM), double click Accounts for Users and Groups.
2. Double click Groups.
3. Select Add from the Actions pull down to display the Add a New Group panel.
4. Enter the name of the group and select the users that you want to add to the group.
5. Click Apply to create the group.

You have now created a group.

Adding a user to a group:

1. From the System Administration Manager (SAM), double click Accounts for Users and Groups.
2. Double click Groups.
3. Highlight the name of the group and select Modify from the Actions pull down to display the Modify an Existing Group panel.
4. Select a user that you want to add to the group and click Add.
5. If you want to add other users to the group, repeat step 4 for each user.
6. When you have finished adding names to the list, click OK.

You have now added a user to a group.

Displaying who is in a group:

1. From the System Administration Manager (SAM), double click Accounts for Users and Groups.
2. Double click Groups.
3. Highlight the name of the group and select Modify from the Actions pull down to display the Modify an Existing Group panel, showing a list of the users in the group.

The group members are displayed.

Removing a user from a group:

1. From the System Administration Manager (SAM), double click Accounts for Users and Groups.
2. Double click Groups.
3. Highlight the name of the group and select Modify from the Actions pull down to display the Modify an Existing Group panel.
4. Select a user that you want to remove from the group and click Remove.
5. If you want to remove other users from the group, repeat step 4 for each user.
6. When you have finished removing names from the list, click OK.

You have now removed a user from a group

AIX

On AIX, providing you are not using NIS or NIS+, use SMITTY to work with groups.

You have now added a user to a group.

Creating a group:

1. From SMITTY, select Security and Users and press Enter.
2. Select Groups and press Enter.
3. Select Add a Group and press Enter.
4. Enter the name of the group and the names of any users that you want to add to the group, separated by commas.
5. Press Enter to create the group.

You have now created a group.

Adding a user to a group:

1. From SMITTY, select Security and Users and press Enter.
2. Select Groups and press Enter.
3. Select Change / Show Characteristics of Groups and press Enter.
4. Enter the name of the group to show a list of the members of the group.
5. Add the names of the users that you want to add to the group, separated by commas.
6. Press Enter to add the names to the group.

Displaying who is in a group:

1. From SMITTY, select Security and Users and press Enter.
2. Select Groups and press Enter.
3. Select Change / Show Characteristics of Groups and press Enter.
4. Enter the name of the group to show a list of the members of the group.

The group members are displayed.

Removing a user from a group:

1. From SMITTY, select Security and Users and press Enter.
2. Select Groups and press Enter.
3. Select Change / Show Characteristics of Groups and press Enter.
4. Enter the name of the group to show a list of the members of the group.
5. Delete the names of the users that you want to remove from the group.
6. Press Enter to remove the names from the group.

You have now removed a user from a group.

Solaris

On Solaris, providing you are not using NIS or NIS+, use the `/etc/group` file to work with groups.

Creating a group:

The file `/etc/group` file will hold group information.

To create a new group, type the following command:

```
groupadd group-name
```

Where *group-name* is the name of the group.

Adding a user to a group:

To add a member to a supplementary group, execute the `usermod` command and list the supplementary groups that the user is currently a member of, and the supplementary groups that the user is to become a member of. For example, if the user is a member of the group `groupa`, and is to become a member of `groupb` also, the following command is used:

```
usermod -G groupa,groupb user-name
```

Where *`user-name`* is the user name.

Displaying who is in a group:

To display who is a member of a group, look at the entry for that group in the `/etc/group` file.

Removing a user from a group:

To remove a member from a supplementary group, execute the `usermod` command listing the supplementary groups that you want the user to remain a member of. For example, if the user's primary group is `users` and the user is also a member of the groups `mqm`, `groupa` and `groupb`, to remove the user from the `mqm` group, the following command is used:

```
usermod -G groupa,groupb user-name
```

Where *`user-name`* is the user name.

Linux

On Linux, providing you are not using NIS or NIS+, use the `/etc/group` file to work with groups.

Creating a group:

The file `/etc/group` file will hold group information.

To create a new group, type the following command:

```
groupadd -g group-ID group-name
```

Where *group-ID* is the numeric identifier of the group, and *group-name* is the name of the group.

Adding a user to a group:

To add a member to a supplementary group, execute the `usermod` command and list the supplementary groups that the user is currently a member of, and the supplementary groups that the user is to become a member of. For example, if the user is a member of the group `groupa`, and is to become a member of `groupb` also, the following command is used:

```
usermod -G groupa,groupb user-name
```

Where `user-name` is the user name.

Displaying who is in a group:

To display who is a member of a group, type the following command:

```
getent group group-name
```

Where *group-name* is the name of the group.

Removing a user from a group:

To remove a member from a supplementary group, execute the `usermod` command listing the supplementary groups that you want the user to remain a member of. For example, if the user's primary group is `users` and the user is also a member of the groups `mqm`, `groupa` and `groupb`, to remove the user from the `mqm` group, the following command is used:

```
usermod -G groupa,groupb user-name
```

Where `user-name` is the user name.

Using the OAM to control access to objects

The OAM provides a command interface for granting and revoking authority to WebSphere MQ objects. You must be suitably authorized to use these commands, as described in "Authority to administer WebSphere MQ" on page 122. User IDs that are authorized to administer WebSphere MQ have *super user* authority to the queue manager, which means that you do not have to grant them further permission to issue any MQI requests or commands.

Giving access to a WebSphere MQ object

Use the **setmqaut** control command, or the **MQCMD_SET_AUTH_REC** PCF command to give users, and groups of users, access to WebSphere MQ objects. For a full definition of the **setmqaut** control command and its syntax, see "setmqaut (grant or revoke authority)" on page 357, and for a full definition of the **MQCMD_SET_AUTH_REC** PCF command and its syntax, see the WebSphere MQ Programmable Command Formats and Administration Interface book.

The queue manager must be running to use this command. When you have changed access for a principal, the changes are reflected immediately by the OAM.

To give users access to an object, you need to specify:

- The name of the queue manager that owns the objects you are working with; if you do not specify the name of a queue manager, the default queue manager is assumed.
- The name and type of the object (to identify the object uniquely). You specify the name as a *profile*; this is either the explicit name of the object, or a generic name, including wildcard characters. For a detailed description of generic profiles, and the use of wildcard characters within them, see "Using OAM generic profiles" on page 135.
- One or more principals and group names to which the authority applies.

  If a user ID contains spaces, enclose it in single quotes when you use this command. On Windows systems, you can qualify a user ID with a domain name. If the actual user ID contains an @ symbol, replace this with @@ to show that it is part of the user ID, not the delimiter between the user ID and the domain name.

- A list of authorizations. Each item in the list specifies a type of access that is to be granted to that object (or revoked from it). Each authorization in the list is specified as a keyword, prefixed with a plus sign (+) or a minus sign (-). Use a plus sign to add the specified authorization, and a minus sign to remove the authorization. There must be no spaces between the + or - sign and the keyword.

  You can specify any number of authorizations in a single command. For example, the list of authorizations to permit a user or group to put messages on a queue and to browse them, but to revoke access to get messages is:

  ```
  +browse -get +put
  ```

Examples of using the command:

The following examples show how to use the **setmqaut** command to grant and revoke permission to use an object:

```
setmqaut -m saturn.queue.manager -t queue -n RED.LOCAL.QUEUE
        -g groupa +browse -get +put
```

In this example:

- `saturn.queue.manager` is the queue manager name
- `queue` is the object type
- `RED.LOCAL.QUEUE` is the object name
- `groupa` is the identifier of the group whose authorizations are to change
- `+browse -get +put` is the authorization list for the specified queue
  - `+browse` adds authorization to browse messages on the queue (to issue **MQGET** with the browse option)
  - `-get` removes authorization to get (**MQGET**) messages from the queue
  - `+put` adds authorization to put (**MQPUT**) messages on the queue

The following command revokes put authority on the queue MyQueue from principal fvuser and from groups groupa and groupb. On UNIX systems, this command also revokes put authority for all principals in the same primary group as fvuser.

```
setmqaut -m saturn.queue.manager -t queue -n MyQueue -p fvuser
        -g groupa -g groupb -put
```

Using the command with a different authorization service:

If you are using your own authorization service instead of the OAM, you can specify the name of this service on the **setmqaut** command to direct the command to this service. You must specify this parameter if you have multiple installable components running at the same time; if you do not, the update is made to the first installable component for the authorization service. By default, this is the supplied OAM.

Using OAM generic profiles

OAM generic profiles enable you to set the authority a user has to many objects at once, rather than having to issue separate **setmqaut** commands against each individual object when it is created. Using generic profiles in the **setmqaut** command enables you to set a generic authority for all objects that fit that profile.

The rest of this section describes the use of generic profiles in more detail:
- "Using wildcard characters"
- "Profile priorities"
- "Dumping profile settings" on page 137

Using wildcard characters:

What makes a profile generic is the use of special characters (wildcard characters) in the profile name. For example, the ? wildcard character matches any single character in a name. So, if you specify `ABC.?EF`, the authorization you give to that profile applies to any objects with the names `ABC.DEF`, `ABC.CEF`, `ABC.BEF`, and so on.

The wildcard characters available are:

? Use the question mark (?) instead of any single character. For example, `AB.?D` would apply to the objects `AB.CD`, `AB.ED`, and `AB.FD`.

* Use the asterisk (*) as:

- A *qualifier* in a profile name to match any one qualifier in an object name. A qualifier is the part of an object name delimited by a period. For example, in `ABC.DEF.GHI`, the qualifiers are `ABC`, `DEF`, and `GHI`.

  For example, `ABC.*.JKL` would apply to the objects `ABC.DEF.JKL`, and `ABC.GHI.JKL`. (Note that it would **not** apply to `ABC.JKL`; * used in this context always indicates one qualifier.)
- A character within a qualifier in a profile name to match zero or more characters within the qualifier in an object name.

  For example, `ABC.DE*.JKL` would apply to the objects `ABC.DE.JKL`, `ABC.DEF.JKL`, and `ABC.DEGH.JKL`.

** Use the double asterisk (**) **once** in a profile name as:

- The entire profile name to match all object names. For example if you use `-t prcs` to identify processes, then use ** as the profile name, you change the authorizations for all processes.
- As either the beginning, middle, or ending qualifier in a profile name to match zero or more qualifiers in an object name. For example, `**.ABC` identifies all objects with the final qualifier ABC.

Note: When using wildcard characters on UNIX systems, you **must** enclose the profile name in quotes.

Profile priorities:

An important point to understand when using generic profiles is the priority that profiles are given when deciding what authorities to apply to an object being created. For example, suppose that you have issued the commands:

```
setmqaut -n AB.* -t q +put -p fred
setmqaut -n AB.C* -t q +get -p fred
```

The first gives put authority to all queues for the principal fred with names that match the profile AB.*; the second gives get authority to the same types of queue that match the profile AB.C*.

Suppose that you now create a queue called AB.CD. According to the rules for wildcard matching, either setmqaut could apply to that queue. So, does it have put or get authority?

To find the answer, you apply the rule that, whenever multiple profiles can apply to an object, **only the most specific applies**. The way that you apply this rule is by comparing the profile names from left to right. Wherever they differ, a non-generic character is more specific then a generic character. So, in the example above, the queue AB.CD has **get** authority (AB.C* is more specific than AB.*).

When you are comparing generic characters, the order of *specificity* is:
1. ?
2. *
3. **

Dumping profile settings:

The **dmpmqaut** control command and the **MQCMD_INQUIRE_AUTH_RECS** PCF command, enable you to dump the current authorizations associated with a specified profile. For a full definition of the **dmpmqaut** control command and its syntax, see "dmpmqaut (dump authority)" on page 300, and for a full definition of the **MQCMD_INQUIRE_AUTH_RECS** PCF command and its syntax, see the WebSphere MQ Programmable Command Formats and Administration Interface book.

The following examples show the use of the **dmpmqaut** control command to dump authority records for generic profiles:
1. This example dumps all authority records with a profile that matches queue a.b.c for principal user1.
   ```
   dmpmqaut -m qm1 -n a.b.c -t q -p user1
   ```
   The resulting dump would look something like this:
   ```
   profile:     a.b.*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse, put, inq
   ```
   Note: UNIX users cannot use the `-p` option; they must use `-g groupname` instead.
2. This example dumps all authority records with a profile that matches queue a.b.c.
   ```
   dmpmqaut -m qmgr1 -n a.b.c -t q
   ```
   The resulting dump would look something like this:
   ```
   profile:     a.b.c
   object type: queue
   entity:      Administrator
   type:        principal
   authority:   all
   - - - - - - - - - - - - - - - - -
   profile:     a.b.*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse, put, inq
   - - - - - - - - - - - - - - - - -
   profile:     a.**
   object type: queue
   entity:      group1
   type:        group
   authority:   get
   ```

3. This example dumps all authority records for profile a.b.*, of type queue.

   ```
   dmpmqaut -m qmgr1 -n a.b.* -t q
   ```

   The resulting dump would look something like this:

   ```
   profile:     a.b.*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse, put, inq
   ```
4. This example dumps all authority records for queue manager qmX.

   ```
   dmpmqaut -m qmX
   ```

   The resulting dump would look something like this:

   ```
   profile:     q1
   object type: queue
   entity:      Administrator
   type:        principal
   authority:   all
   - - - - - - - - - - - - - - - - -
   profile:     q*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse
   - - - - - - - - - - - - - - - - -
   profile:     name.*
   object type: namelist
   entity:      user2
   type:        principal
   authority:   get
   - - - - - - - - - - - - - - - - -
   profile:     pr1
   object type: process
   entity:      group1
   type:        group
   authority:   get
   ```
5. This example dumps all profile names and object types for queue manager qmX.

   ```
   dmpmqaut -m qmX -l
   ```

   The resulting dump would look something like this:

   ```
   profile: q1, type: queue
   profile: q*, type: queue
   profile: name.*, type: namelist
   profile: pr1, type: process
   ```

Note: For WebSphere MQ for Windows only, all principals displayed include domain information, for example:

```
profile:     a.b.*
object type: queue
entity:      user1@domain1
type:        principal
authority:   get, browse, put, inq
```

For detailed information on the command, see “dmpmqaut (dump authority)” on page 300.

Displaying access settings

Use the **dspmqaut** control command, or the **MQCMD_INQUIRE_ENTITY_AUTH** PCF command to view the authorizations that a specific principal or group has for a particular object. The queue manager must be running to use this command. When you change access for a principal, the changes are reflected immediately by the OAM. Authorization can be displayed for only one group or principal at a time. For a full definition of the **dmpmqaut** control command and its syntax, see "dspmqaut (display authority)" on page 306, and for a full definition of the **MQCMD_INQUIRE_ENTITY_AUTH** PCF command and its syntax, see the WebSphere MQ Programmable Command Formats and Administration Interface book.

The following example shows the use of the **dspmqaut** control command to display the authorizations that the group `GpAdmin` has to a process definition named `Annuities` that is on queue manager `QueueMan1`.

```
dspmqaut -m QueueMan1 -t process -n Annuities -g GpAdmin
```

Changing and revoking access to a WebSphere MQ object

To change the level of access that a user or group has to an object, use the **setmqaut** command. To revoke the access of a particular user that is a member of a group that has authorization, remove the user from the group.

The process of removing the user from a group is described in "Creating and managing groups" on page 129.

The user ID that creates a WebSphere MQ object is granted full control authorities to that object. If you remove this user ID from the local mqm group (or the Administrators group on Windows systems) these authorities are not revoked. Use the **setmqaut** control command or the **MQCMD_DELETE_AUTH_REC** PCF command to revoke access to an object for the user ID that created it, after removing it from the mqm or Administrators group. For a full definition of the **setmqaut** control command and its syntax, see WebSphere MQ System Administration Guide, and for a full definition of the **MQCMD_INQUIRE_ENTITY_AUTH** PCF command and its syntax, see WebSphere MQ Programmable Command Formats and Administration Interface.

On Windows, delete the OAM entries corresponding to a particular Windows user account before deleting the user profile. It is impossible to remove the OAM entries after removing the user account.

Preventing security access checks

If you decide that you do not want to perform security checks (for example, in a test environment), you can disable the OAM in one of two ways:

- Set the operating system environment variable MQSNOAUT as follows, before you create a queue manager (if you do this, you cannot add an OAM later):

  On Windows systems:

  ```
  SET MQSNOAUT=yes
  ```

  On UNIX systems:

  ```
  export MQSNOAUT=yes
  ```

- Use the WebSphere MQ Explorer or edit the queue manager configuration file to remove the service. (if you do this, you cannot add an OAM later)

If you use setmqaut, or dspmqaut, while the OAM is disabled, the following will occur:

- The OAM will not validate the specified principal, or group, meaning the command will accept invalid values.
- The OAM will not perform security checks and will indicate that all principals, and groups, are authorized to perform all applicable object operations.

When an OAM is removed, it cannot be put back on an existing queue manager. This is because the OAM needs to be in place at object creation time. To use the WebSphere MQ OAM again after it has been removed, the queue manager needs to be rebuilt.

Channel security

Message channel agents (MCAs) are WebSphere MQ applications and need access to various WebSphere MQ resources.

- The user ID associated with a sending channel needs access to the queue manager, the transmission queue, the dead-letter queue, and any resources required by channel exits.
- The user ID associated with the receiving channel needs to open the target queues to put messages onto them. This involves the MQI, so access control checks might need to be made. You can specify whether these checks are made against the user ID associated with the MCA (as described below), or the user ID associated with the message (from the MQMD context field).

  The PUTAUT parameter of the channel definition specifies which user ID is used for these checks.

  - If you use the user ID of the MCA, this user ID will already be defined on the local system.
  - If you use the user ID associated with the message, it is likely that this is a user ID from a remote system. This remote system user ID must be recognized by the target system and have the authority to connect to the queue manager, make inquiries, set attributes, and set context options (`+connect`, `+inq`, `+set`, and `+setall`). It must also have authority to put messages and set context information (`+put` and `+setall`) for the destination and dead-letter queues.

The user ID associated with the MCA depends on the type of MCA.

Caller MCA
These are MCAs that initiate a channel. They can be started as individual processes, as threads of the channel initiator, or as threads of a process pool. The user ID used is that associated with the parent process (the channel initiator), or the process causing the MCA to be started.

Responder MCA
These are MCAs that are started as a result of a request by a caller MCA. They can be started as individual processes, as threads of the listener, or as threads of a process pool. The user ID can be any one of the following (in this order of preference):

1. On APPC, the caller MCA can indicate the user ID to be used for the responder MCA. This is called the network user ID and applies only to channels started as individual processes. This is set using the USERID parameter of the channel definition.

2. If the USERID parameter is not used, the channel definition of the responder MCA can specify the user ID that the MCA is to use. This is set using the MCAUSER parameter of the channel definition.
3. If the user ID has not been set by either of the methods above, the user ID of the process that starts the MCA or the user ID of the parent process (the listener) is used.

Protecting channel initiator definitions

WebSphere MQ channel initiators are not WebSphere MQ objects; access to them is not controlled by the OAM. WebSphere MQ does not allow users or applications to manipulate these objects, unless their user ID is a member of the mqm group. If you have an application that issues the PCF command **StartChannelInitiator**, the user ID specified in the message descriptor of the PCF message must be a member of the mqm group on the target queue manager.

A user ID must also be a member of the mqm group on the target machine to issue the equivalent MQSC commands through the Escape PCF command or using **runmqsc** in indirect mode.

Transmission queues

Queue managers automatically put remote messages on a transmission queue; no special authority is required for this. However, putting a message directly on a transmission queue requires special authorization; see Table 8 on page 145.

Channel exits

You can use channel exits for added security. A security exit forms a secure connection between two security exit programs, where one program is for the sending message channel agent (MCA), and one is for the receiving MCA.

See WebSphere MQ Application Programming Guide and WebSphere MQ Intercommunication for more information about channel exits.

Protecting channels with SSL

The Secure Sockets Layer (SSL) protocol provides out of the box channel security, with protection against eavesdropping, tampering, and impersonation. WebSphere MQ support for SSL enables you to specify, on the channel definition, that a particular channel uses SSL security. You can also specify details of the kind of security you want, such as the encryption algorithm you want to use.

SSL support in WebSphere MQ uses the queue manager authentication information object and various MQSC commands and queue manager and channel parameters that define the SSL support required in detail.

The following MQSC commands support SSL:

ALTER AUTHINFO
Modifies the attributes of an authentication information object.

DEFINE AUTHINFO
Creates a new authentication information object.

DELETE AUTHINFO
Deletes an authentication information object.

DISPLAY AUTHINFO
: Displays the attributes for a specific authentication information object.

The following queue manager parameters support SSL:

SSLCRLNL
: Allows access to a certificate revocation list. The SSLCRLNL attribute specifies a namelist. The namelist contains zero or more authentication information objects. Each authentication information object gives access to an LDAP server.

SSLCRYP
: On Windows and UNIX systems, sets the SSLCryptoHardware queue manager attribute. This attribute is the name of the parameter string that you can use to configure the cryptographic hardware you have on your system.

SSLEV
: Determines whether an SSL event message will be reported if a channel using SSL fails to establish an SSL connection.

SSLFIPS
: Specifies whether only FIPS-certified algorithms are to be used if cryptography is carried out in WebSphere MQ. If cryptographic hardware is configured, the cryptographic modules used are those provided by the hardware product, and these may, or may not, be FIPS-certified to a particular level. This depends on the hardware product in use.

SSLKEYR
: On Windows and UNIX systems, associates a key repository with a queue manager. The key database is held in a *GSKit* key database. (The IBM Global Security Kit (GSKit) enables you to use SSL security on Windows and UNIX systems systems.)

SSLRKEYC
: The number of unencrypted bytes sent and received within an SSL conversation before the secret key is renegotiated. The number of bytes includes control information sent by the MCA.

The following channel parameters support SSL:

SSLCAUTH
: Defines whether WebSphere MQ requires and validates a certificate from the SSL client.

SSLCIPH
: Specifies the encryption strength and function (CipherSpec), for example NULL_MD5 or RC4_MD5_US. The CipherSpec must match at both ends of channel.

SSLPEER
: Specifies the distinguished name (unique identifier) of allowed partners.

This book describes the **setmqaut**, **dspmqaut**, **dmpmqaut**, **rcrmqobj**, **rcdmqimg**, and **dspmqfls** commands to support the authentication information object. It also describes the **amqtcert** command for migrating certificates on Windows systems, the IKEYCMD command for managing certificates on UNIX systems, and the GSKCapiCmd tool for managing certificates on UNIX and Windows systems. See the following sections:

- "setmqaut (grant or revoke authority)" on page 357

- “dspmqaut (display authority)” on page 306
- “dmpmqaut (dump authority)” on page 300
- “rcrmqobj (recreate object)” on page 343
- “rcdmqimg (record media image)” on page 341
- “dspmqfls (display files)” on page 311
- “amqtcert (transfer certificates)” on page 286
- “Managing keys and certificates” on page 377

For an overview of channel security using SSL, see *WebSphere MQ Security*.

For details of MQSC commands associated with SSL, see the *WebSphere MQ Script (MQSC) Command Reference*.

For details of PCF commands associated with SSL, see *WebSphere MQ Programmable Command Formats and Administration Interface*.

How authorizations work

The authorization specification tables starting in topic Table 6 on page 144 define precisely how the authorizations work and the restrictions that apply. The tables apply to these situations:
- Applications that issue MQI calls
- Administration programs that issue MQSC commands as escape PCFs
- Administration programs that issue PCF commands

In this section, the information is presented as a set of tables that specify the following:

Action to be performed
MQI option, MQSC command, or PCF command.

Access control object
Queue, process, queue manager, namelist, authentication information, channel, client connection channel, listener, or service.

Authorization required
Expressed as an MQZAO_ constant.

In the tables, the constants prefixed by MQZAO_ correspond to the keywords in the authorization list for the **setmqaut** command for the particular entity. For example, MQZAO_BROWSE corresponds to the keyword `+browse`, MQZAO_SET_ALL_CONTEXT corresponds to the keyword `+setall`, and so on. These constants are defined in the header file cmqzc.h, supplied with the product.

Authorizations for MQI calls

An application is allowed to issue specific MQI calls and options only if the user identifier under which it is running (or whose authorizations it is able to assume) has been granted the relevant authorization.

Four MQI calls might require authorization checks: **MQCONN**, **MQOPEN**, **MQPUT1**, and **MQCLOSE**.

For **MQOPEN** and **MQPUT1**, the authority check is made on the name of the object being opened, and not on the name, or names, resulting after a name has been resolved. For example, an application might be granted authority to open an alias queue without having authority to open the base queue to which the alias resolves. The rule is that the check is carried out on the first definition encountered during the process of resolving a name that is not a queue manager alias, unless the queue manager alias definition is opened directly; that is, its name is displayed in the `ObjectName` field of the object descriptor. Authority is always needed for the object being opened. In some cases additional queue-independent authority, obtained through an authorization for the queue manager object, is required.

Table 6, Table 7, Table 8 on page 145, and Table 9 on page 145 summarize the authorizations needed for each call. In the tables *Not applicable* means that authorization checking is not relevant to this operation; *No check* means that no authorization checking is performed.

Note: You will find no mention of namelists, channels, client connection channels, listeners, services, or authentication information objects in these tables. This is because none of the authorizations apply to these objects, except for MQOO_INQUIRE, for which the same authorizations apply as for the other objects.

The special authorization MQZAO_ALL_MQI includes all the authorizations in the tables that are relevant to the object type, except MQZAO_DELETE and MQZAO_DISPLAY, which are classed as administration authorizations.

Table 6. Security authorization needed for MQCONN calls

Authorization required for:	Queue object (1 on page 145)	Process object	Queue manager object
MQCONN	Not applicable	Not applicable	MQZAO_CONNECT

Table 7. Security authorization needed for MQOPEN calls

Authorization required for:	Queue object (1 on page 145)	Process object	Queue manager object
MQOO_INQUIRE	MQZAO_INQUIRE	MQZAO_INQUIRE	MQZAO_INQUIRE
MQOO_BROWSE	MQZAO_BROWSE	Not applicable	No check
MQOO_INPUT_*	MQZAO_INPUT	Not applicable	No check
MQOO_SAVE_ ALL_CONTEXT **(2 on page 146)**	MQZAO_INPUT	Not applicable	Not applicable
MQOO_OUTPUT (Normal queue) **(3 on page 146)**	MQZAO_OUTPUT	Not applicable	Not applicable
MQOO_PASS_ IDENTITY_CONTEXT **(4 on page 146)**	MQZAO_PASS_ IDENTITY_CONTEXT	Not applicable	No check
MQOO_PASS_ALL_ CONTEXT **(4 on page 146, 5 on page 146)**	MQZAO_PASS _ALL_CONTEXT	Not applicable	No check
MQOO_SET_ IDENTITY_CONTEXT **(4 on page 146, 5 on page 146)**	MQZAO_SET_ IDENTITY_CONTEXT	Not applicable	MQZAO_SET_ IDENTITY_CONTEXT **(6 on page 146)**

MQOO_SET_ ALL_CONTEXT **(4 on page 146, 7 on page 146)**	MQZAO_SET_ ALL_CONTEXT	Not applicable	MQZAO_SET_ ALL_CONTEXT **(6 on page 146)**
MQOO_OUTPUT (Transmission queue) **(8 on page 146)**	MQZAO_SET_ ALL_CONTEXT	Not applicable	MQZAO_SET_ ALL_CONTEXT **(6 on page 146)**
MQOO_SET	MQZAO_SET	Not applicable	No check
MQOO_ALTERNATE_ USER_AUTHORITY	**(9 on page 146)**	**(9 on page 146)**	MQZAO_ALTERNATE_ USER_AUTHORITY **(9 on page 146, 10 on page 146)**

Table 8. Security authorization needed for MQPUT1 calls

Authorization required for:	Queue object (1)	Process object	Queue manager object
MQPMO_PASS_ IDENTITY_CONTEXT	MQZAO_PASS_ IDENTITY_CONTEXT **(11 on page 146)**	Not applicable	No check
MQPMO_PASS_ALL _CONTEXT	MQZAO_PASS_ ALL_CONTEXT **(11 on page 146)**	Not applicable	No check
MQPMO_SET_ IDENTITY_CONTEXT	MQZAO_SET_ IDENTITY_CONTEXT **(11 on page 146)**	Not applicable	MQZAO_SET_ IDENTITY_CONTEXT **(6 on page 146)**
MQPMO_SET_ ALL_CONTEXT	MQZAO_SET_ ALL_CONTEXT **(11 on page 146)**	Not applicable	MQZAO_SET_ ALL_CONTEXT **(6 on page 146)**
(Transmission queue) **(8 on page 146)**	MQZAO_SET_ ALL_CONTEXT	Not applicable	MQZAO_SET_ ALL_CONTEXT **(6 on page 146)**
MQPMO_ALTERNATE_ USER_AUTHORITY	**(12 on page 146)**	Not applicable	MQZAO_ALTERNATE_ USER_AUTHORITY **(10 on page 146)**

Table 9. Security authorization needed for MQCLOSE calls

Authorization required for:	Queue object (1)	Process object	Queue manager object
MQCO_DELETE	MQZAO_DELETE **(13 on page 146)**	Not applicable	Not applicable
MQCO_DELETE _PURGE	MQZAO_DELETE **(13 on page 146)**	Not applicable	Not applicable

Notes for the tables:

1. If opening a model queue:
   - MQZAO_DISPLAY authority is needed for the model queue, in addition to the authority to open the model queue for the type of access for which you are opening.
   - MQZAO_CREATE authority is not needed to create the dynamic queue.
   - The user identifier used to open the model queue is automatically granted all the queue-specific authorities (equivalent to MQZAO_ALL) for the dynamic queue created.

2. MQOO_INPUT_* must also be specified. This is valid for a local, model, or alias queue.
3. This check is performed for all output cases, except transmission queues (see note 8).
4. MQOO_OUTPUT must also be specified.
5. MQOO_PASS_IDENTITY_CONTEXT is also implied by this option.
6. This authority is required for both the queue manager object and the particular queue.
7. MQOO_PASS_IDENTITY_CONTEXT, MQOO_PASS_ALL_CONTEXT, and MQOO_SET_IDENTITY_CONTEXT are also implied by this option.
8. This check is performed for a local or model queue that has a *Usage* queue attribute of MQUS_TRANSMISSION, and is being opened directly for output. It does not apply if a remote queue is being opened (either by specifying the names of the remote queue manager and remote queue, or by specifying the name of a local definition of the remote queue).
9. At least one of MQOO_INQUIRE (for any object type), or MQOO_BROWSE, MQOO_INPUT_*, MQOO_OUTPUT, or MQOO_SET (for queues) must also be specified. The check carried out is as for the other options specified, using the supplied alternate-user identifier for the specific-named object authority, and the current application authority for the MQZAO_ALTERNATE_USER_IDENTIFIER check.
10. This authorization allows any *AlternateUserId* to be specified.
11. An MQZAO_OUTPUT check is also carried out if the queue does not have a *Usage* queue attribute of MQUS_TRANSMISSION.
12. The check carried out is as for the other options specified, using the supplied alternate-user identifier for the specific-named queue authority, and the current application authority for the MQZAO_ALTERNATE_USER_IDENTIFIER check.
13. The check is carried out only if both of the following are true:
    - A permanent dynamic queue is being closed and deleted.
    - The queue was not created by the **MQOPEN** call that returned the object handle being used.

    Otherwise, there is no check.

Authorizations for MQSC commands in escape PCFs

This section summarizes the authorizations needed for each MQSC command contained in Escape PCF.

Not applicable means that authorization checking is not relevant to this operation.

The user ID under which the program that submits the command is running must also have the following authorities:
- MQZAO_CONNECT authority to the queue manager
- DISPLAY authority on the queue manager in order to perform PCF commands
- Authority to issue the MQSC command within the text of the Escape PCF command

ALTER *object*

Object	Authorization required
Queue	MQZAO_CHANGE

Topic	MQZAO_CHANGE
Process	MQZAO_CHANGE
Queue manager	MQZAO_CHANGE
Namelist	MQZAO_CHANGE
Authentication information	MQZAO_CHANGE
Channel	MQZAO_CHANGE
Client connection channel	MQZAO_CHANGE
Listener	MQZAO_CHANGE
Service	MQZAO_CHANGE

CLEAR *object*

Object	**Authorization required**
Queue	MQZAO_CLEAR
Topic	MQZOA_CLEAR
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	Not applicable
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

DEFINE *object* **NOREPLACE (1 on page 150)**

Object	**Authorization required**
Queue	MQZAO_CREATE **(2 on page 150)**
Topic	MQZAO_CREATE **(2 on page 150)**
Process	MQZAO_CREATE **(2 on page 150)**
Queue manager	Not applicable
Namelist	MQZAO_CREATE **(2 on page 150)**
Authentication information	MQZAO_CREATE **(2 on page 150)**
Channel	MQZAO_CREATE **(2 on page 150)**
Client connection channel	MQZAO_CREATE **(2 on page 150)**
Listener	MQZAO_CREATE **(2 on page 150)**
Service	MQZAO_CREATE **(2 on page 150)**

DEFINE *object* **REPLACE (1 on page 150, 3 on page 150)**

Object	**Authorization required**
Queue	MQZAO_CHANGE
Topic	MQZAO_CHANGE
Process	MQZAO_CHANGE

Queue manager	Not applicable
Namelist	MQZAO_CHANGE
Authentication information	MQZAO_CHANGE
Channel	MQZAO_CHANGE
Client connection channel	MQZAO_CHANGE
Listener	MQZAO_CHANGE
Service	MQZAO_CHANGE

DELETE *object*

Object	**Authorization required**
Queue	MQZAO_DELETE
Topic	MQZAO_DELETE
Process	MQZAO_DELETE
Queue manager	Not applicable
Namelist	MQZAO_DELETE
Authentication information	MQZAO_DELETE
Channel	MQZAO_DELETE
Client connection channel	MQZAO_DELETE
Listener	MQZAO_DELETE
Service	MQZAO_DELETE

DISPLAY *object*

Object	**Authorization required**
Queue	MQZAO_DISPLAY
Topic	MQZAO_DISPLAY
Process	MQZAO_DISPLAY
Queue manager	MQZAO_DISPLAY
Namelist	MQZAO_DISPLAY
Authentication information	MQZAO_DISPLAY
Channel	MQZAO_DISPLAY
Client connection channel	MQZAO_DISPLAY
Listener	MQZAO_DISPLAY
Service	MQZAO_DISPLAY

PING CHANNEL

Object	**Authorization required**
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable

Authentication information	Not applicable
Channel	MQZAO_CONTROL
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

RESET CHANNEL

Object	**Authorization required**
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL_EXTENDED
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

RESOLVE CHANNEL

Object	**Authorization required**
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL_EXTENDED
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

START CHANNEL/LISTENER/SERVICE

Object	**Authorization required**
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL

Client connection channel	Not applicable
Listener	MQZAO_CONTROL
Service	MQZAO_CONTROL

STOP CHANNEL/LISTENER/SERVICE

Object	**Authorization required**
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL
Client connection channel	Not applicable
Listener	MQZAO_CONTROL
Service	MQZAO_CONTROL

Note:

1. For DEFINE commands, MQZAO_DISPLAY authority is also needed for the LIKE object if one is specified, or on the appropriate SYSTEM.DEFAULT.xxx object if LIKE is omitted.
2. The MQZAO_CREATE authority is not specific to a particular object or object type. Create authority is granted for all objects for a specified queue manager, by specifying an object type of QMGR on the **setmqaut** command.
3. This applies if the object to be replaced already exists. If it does not, the check is as for DEFINE *object* NOREPLACE.

Authorizations for PCF commands

This section summarizes the authorizations needed for each PCF command.

No check means that no authorization checking is carried out; *Not applicable* means that authorization checking is not relevant to this operation.

The user ID under which the program that submits the command is running must also have the following authorities:

- MQZAO_CONNECT authority to the queue manager
- DISPLAY authority on the queue manager in order to perform PCF commands

The special authorization MQZAO_ALL_ADMIN includes all the authorizations in the following list that are relevant to the object type, except MQZAO_CREATE, which is not specific to a particular object or object type.

Change *object*

Object	**Authorization required**
Queue	MQZAO_CHANGE
Topic	MQZAO_CHANGE

Process	MQZAO_CHANGE
Queue manager	MQZAO_CHANGE
Namelist	MQZAO_CHANGE
Authentication information	MQZAO_CHANGE
Channel	MQZAO_CHANGE
Client connection channel	MQZAO_CHANGE
Listener	MQZAO_CHANGE
Service	MQZAO_CHANGE

Clear *object*

Object	**Authorization required**
Queue	MQZAO_CLEAR
	MQZAO_CLEAR
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	Not applicable
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

Copy *object* **(without replace) (1)**

Object	**Authorization required**
Queue	MQZAO_CREATE **(2)**
Topic	MQZAO_CREATE **(2)**
Process	MQZAO_CREATE **(2)**
Queue manager	Not applicable
NamelistMQZAO_CREATE	MQZAO_CREATE **(2)**
Authentication information	MQZAO_CREATE **(2)**
Channel	MQZAO_CREATE **(2)**
Client connection channel	MQZAO_CREATE **(2)**
Listener	MQZAO_CREATE **(2)**
Service	MQZAO_CREATE **(2)**

Copy *object* **(with replace) (1, 4)**

Object	**Authorization required**
Queue	MQZAO_CHANGE
Topic	MQZAO_CHANGE
Process	MQZAO_CHANGE
Queue manager	Not applicable

Namelist	MQZAO_CHANGE
Authentication information	MQZAO_CHANGE
Channel	MQZAO_CHANGE
Client connection channel	MQZAO_CHANGE
Listener	MQZAO_CHANGE
Service	MQZAO_CHANGE

Create *object* (without replace) (3)

Object	**Authorization required**
Queue	MQZAO_CREATE **(2)**
Topic	MQZAO_CREATE **(2)**
Process	MQZAO_CREATE **(2)**
Queue manager	Not applicable
Namelist	MQZAO_CREATE **(2)**
Authentication information	MQZAO_CREATE **(2)**
Channel	MQZAO_CREATE **(2)**
Client connection channel	MQZAO_CREATE **(2)**
Listener	MQZAO_CREATE **(2)**
Service	MQZAO_CREATE **(2)**

Create *object* (with replace) (3, 4)

Object	**Authorization required**
Queue	MQZAO_CHANGE
Topic	MQZAO_CHANGE
Process	MQZAO_CHANGE
Queue manager	Not applicable
Namelist	MQZAO_CHANGE
Authentication information	MQZAO_CHANGE
Channel	MQZAO_CHANGE
Client connection channel	MQZAO_CHANGE
Listener	MQZAO_CHANGE
Service	MQZAO_CHANGE

Delete *object*

Object	**Authorization required**
Queue	MQZAO_DELETE
Topic	MQZAO_DELETE
Process	MQZAO_DELETE
Queue manager	MQZAO_DELETE
Namelist	MQZAO_DELETE
Authentication information	MQZAO_DELETE

Channel	MQZAO_DELETE
Client connection channel	MQZAO_DELETE
Listener	MQZAO_DELETE
Service	MQZAO_DELETE

Inquire *object*

Object	**Authorization required**
Queue	MQZAO_DISPLAY
Topic	MQZAO_DISPLAY
Process	MQZAO_DISPLAY
Queue manager	MQZAO_DISPLAY
Namelist	MQZAO_DISPLAY
Authentication information	MQZAO_DISPLAY
Channel	MQZAO_DISPLAY
Client connection channel	MQZAO_DISPLAY
Listener	MQZAO_DISPLAY
Service	MQZAO_DISPLAY

Inquire *object* names

Object	**Authorization required**
Queue	No check
Topic	No check
Process	No check
Queue manager	No check
Namelist	No check
Authentication information	No check
Channel	No check
Client connection channel	No check
Listener	No check
Service	No check

Ping Channel

Object	**Authorization required**
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL
Client connection channel	Not applicable

Listener	Not applicable
Service	Not applicable

Reset Channel

Object	Authorization required
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL_EXTENDED
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

Reset Queue Statistics

Object	Authorization required
Queue	MQZAO_DISPLAY and MQZAO_CHANGE
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	Not applicable
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

Resolve Channel

Object	Authorization required
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL_EXTENDED
Client connection channel	Not applicable
Listener	Not applicable
Service	Not applicable

Start Channel/Listener/Service

Object	Authorization required
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL
Client connection channel	Not applicable
Listener	MQZAO_CONTROL
Service	MQZAO_CONTROL

Stop Channel/Listener/Service

Object	Authorization required
Queue	Not applicable
Topic	Not applicable
Process	Not applicable
Queue manager	Not applicable
Namelist	Not applicable
Authentication information	Not applicable
Channel	MQZAO_CONTROL
Client connection channel	Not applicable
Listener	MQZAO_CONTROL
Service	MQZAO_CONTROL

Note:

1. For Copy commands, MQZAO_DISPLAY authority is also needed for the From object.
2. The MQZAO_CREATE authority is not specific to a particular object or object type. Create authority is granted for all objects for a specified queue manager, by specifying an object type of QMGR on the **setmqaut** command.
3. For Create commands, MQZAO_DISPLAY authority is also needed for the appropriate SYSTEM.DEFAULT.* object.
4. This applies if the object to be replaced already exists. If it does not, the check is as for Copy or Create without replace.

Guidelines for Windows

This information applies only when you are running WebSphere MQ in a Windows environment.

WebSphere MQ for Windows runs on Windows 2003, Windows Vista, and Windows XP, but the operation of WebSphere MQ security can be affected by differences between the platforms.

WebSphere MQ security relies on calls to the operating system API for information about user authorizations and group memberships. Some functions do not behave identically on the Windows systems. This section includes descriptions of how those differences might affect WebSphere MQ security when you are running WebSphere MQ in a Windows environment.

When you get a ’group not found’ error

This problem can arise because WebSphere MQ loses access to the local mqm group when Windows servers are promoted to, or demoted from, domain controllers. The symptom is an error indicating the lack of a local mqm group, for example:

```
>crtmqm qm0
AMQ8066:Local mqm group not found.
```

Altering the state of a machine between server and domain controller can affect the operation of WebSphere MQ, because WebSphere MQ uses a locally-defined mqm group. When a server is promoted to be a domain controller, the scope changes from local to domain local. When the machine is demoted to server, all domain local groups are removed. This means that changing a machine from server to domain controller and back to server loses access to a local mqm group.

To remedy this problem, recreate the local mqm group using the standard Windows management tools. Because all group membership information is lost, you must reinstate privileged WebSphere MQ users in the newly-created local mqm group. If the machine is a domain member, you must also add the domain mqm group to the local mqm group to grant privileged domain WebSphere MQ user IDs the required level of authority.

When you have problems with WebSphere MQ and domain controllers

Certain problems can arise with security settings when Windows servers are promoted to domain controllers.

While promoting Windows 2000 or Windows 2003 servers to domain controllers, you are presented with the option of selecting a default or non-default security setting relating to user and group permissions. This option controls whether arbitrary users are able to retrieve group memberships from the active directory. Because WebSphere MQ relies on group membership information to implement its security policy, it is important that the user ID that is performing WebSphere MQ operations can determine the group memberships of other users.

On Windows 2000, when a domain is created using the default security option, the default user ID created by WebSphere MQ during the installation process (MUSR_MQADMIN) can obtain group memberships for other users as required. The product then installs normally, creating default objects, and the queue manager can determine the access authority of local and domain users if required.

On Windows 2000, when a domain is created using the non-default security option, or on Windows 2003 when a domain is created using the default security option, the user ID created by WebSphere MQ during the installation (MUSR_MQADMIN) cannot always determine the required group memberships. In this case, you need to know:

- How Windows 2000 with non-default, or Windows 2003 with default, security permissions behaves
- How to allow domain mqm group members to read group membership

- How to configure WebSphere MQ Services to run under a domain user

Windows 2000 domain with non-default, or Windows 2003 domain with default, security permissions:

If a **local** user installs WebSphere MQ, the Prepare WebSphere MQ Wizard detects that the local user (MUSR_MQADMIN) created for the WebSphere MQ services (AMQMSRVN) can retrieve the group membership information of the installing user. The Prepare WebSphere MQ Wizard asks the user questions about the network configuration to determine whether there are other user accounts defined on domain controllers running on Windows 2000 or later. If so, the WebSphere MQ services need to run under a domain user account with particular settings and authorities. The Prepare WebSphere MQ Wizard prompts the user for the account details of this user. Its online help provides details of the domain user account required that can be sent to the domain administrator.

If a **domain** user installs WebSphere MQ, the Prepare WebSphere MQ Wizard detects that the local user (MUSR_MQADMIN) created for the WebSphere MQ services (AMQMSRVN) cannot retrieve the group membership information of the installing user. In this case, the Prepare WebSphere MQ Wizard always prompts the user for the account details of the domain user account for the WebSphere MQ services to use.

When WebSphere MQ services needs to use a domain user account, WebSphere MQ cannot operate correctly until this has been configured using the Prepare WebSphere MQ Wizard. This configuration includes creating default objects such as the Default Configuration. The Prepare WebSphere MQ Wizard does not allow the user to continue with other tasks, such as creating the Default Configuration, until the WebSphere MQ services have been configured with a suitable account.

If a Windows 2000 domain has been configured with non-default security permissions, the usual solution to enable WebSphere MQ to work correctly is to configure it with a suitable domain user account, as described above.

See the WebSphere MQ for Windows Quick Beginnings for more information.

Configuring WebSphere MQ Services to run under a domain user:

Use the Prepare WebSphere MQ Wizard to enter the account details of the domain user account. Alternatively, use the following command line to set the domain user account:

```
AMQMSRVN -user [domain]\[userid] -password [password]
```

In either case, WebSphere MQ allocates the correct security rights and group membership to the new user account.

Applying security template files

Windows supports text-based security template files that you can use to apply uniform security settings to one or more computers with the Security Configuration and Analysis MMC snap-in. In particular, Windows supplies several templates that include a range of security settings with the aim of providing specific levels of security. These include compatible, basic, secure, and highly-secure.

Be aware that applying one of these templates might affect the security settings applied to WebSphere MQ files and directories. If you want to use the highly-secure template, configure your machine before you install WebSphere MQ. If you apply the highly-secure template to a machine on which WebSphere MQ is already installed, all the permissions you have specifically set on the WebSphere MQ files and directories are removed. This means that you lose Administrator and mqm group access and, when applicable, Everyone group access from the error directories.

Nested groups

There are restrictions on the use of nested groups. These result partly from the domain functional level and partly from WebSphere MQ restrictions.

Active Directory can support different group types within a Domain context depending on the Domain functional level. By default, Windows 2003 domains are in the *Windows 2000 mixed* functional level. (Windows server 2003 , Windows XP and Windows Vista all follow the Windows 2003 domain model.) The domain functional level determines the supported group types and level of nesting allowed when configuring user IDs in a domain environment. Refer to Active Directory documentation for details on the Group Scope and inclusion criteria.

In addition to Active Directory requirements, further restrictions are imposed on IDs used by WebSphere MQ. The network APIs used by WebSphere MQ do not support all the configurations that are supported by the domain functional level. As a result, WebSphere MQ is not able to query the group memberships of any Domain IDs present in a Domain Local group which is then nested in a local group. Furthermore, multiple nesting of global and universal groups is not supported. However, immediately nested global or universal groups are supported.

Transactional support

This chapter introduces transactional support. The work required to enable your applications to use WebSphere MQ in conjunction with a database product spans the areas of application programming and system administration. Use the information here together with Chapter 13, "Committing and backing out units of work" of the WebSphere MQ Application Programming Guide.

We start by introducing the units of work that form transactions, then describe the ways in which you enable WebSphere MQ to coordinate transactions with databases.

Introducing units of work

This section introduces the general concepts of commit, backout, syncpoint, and unit of work. If you are familiar with these transaction processing terms, you can skip to “Scenario 1: Queue manager performs the coordination” on page 160, where we start to deal in more detail with their use with WebSphere MQ.

When a program puts messages on queues within a unit of work, those messages are made visible to other programs only when the program *commits* the unit of work. To commit a unit of work, all updates must be successful to preserve data integrity.

If the program detects an error and decides not to make the put operation permanent, it can *back out* the unit of work. When a program performs a backout, WebSphere MQ restores the queues by removing the messages that were put on the queues by that unit of work.

Similarly, when a program gets messages from one or more queues within a unit of work, those messages remain on the queues until the program commits the unit of work, but the messages are not available to be retrieved by other programs. The messages are permanently deleted from the queues when the program commits the unit of work. If the program backs out the unit of work, WebSphere MQ restores the queues by making the messages available to be retrieved by other programs.

The decision to commit or back out the changes is taken, in the simplest case, at the end of a task. However, it can be more useful for an application to synchronize data changes at other logical points within a task. These logical points are called syncpoints (or synchronization points) and the period of processing a set of updates between two syncpoints is called a *unit of work*. Several MQGET calls and MQPUT calls can be part of a single unit of work.

With WebSphere MQ, we need to distinguish between *local* and *global* units of work:

Local units of work

Are those in which the only actions are puts to, and gets from, WebSphere MQ queues, and the coordination of each unit of work is provided within the queue manager using a *single-phase commit* process.

Use local units of work when the only resources to be updated are the queues managed by a single WebSphere MQ queue manager. Updates are committed using the MQCMIT verb or backed out using MQBACK.

There are no system administration tasks, other than log management, involved in using local units of work. In your applications, where you use the MQPUT and MQGET calls with MQCMIT and MQBACK, try using the MQPMO_SYNCPOINT and MQGMO_SYNCPOINT options. (For information on log management, see "Managing log files" on page 225.)

Global units of work

Are those in which other resources, such as tables in a relational database, are also updated. When more than one *resource manager* is involved, there is a need for *transaction manager* software that uses a *two-phase commit* process to coordinate the global unit of work.

Use global units of work when you also need to include updates to relational database manager software, such as DB2, Oracle, Sybase, and Informix®.

We define two scenarios for global units of work:

1. In the first, the queue manager itself acts as the transaction manager. In this scenario, MQI verbs control the global units of work; they are started in applications using the MQBEGIN verb and then committed using MQCMIT or backed out using MQBACK.
2. In the second, the transaction manager role is performed by other software, such as TXSeries, Encina®, or Tuxedo. In this scenario, an API provided by the transaction manager software is used to control the unit of work (for example, EXEC CICS SYNCPOINT for TXSeries).

The following sections describe all the steps necessary to use global units of work, organized by the two scenarios:
- "Scenario 1: Queue manager performs the coordination" below
- "Scenario 2: Other software provides the coordination" on page 184

Scenario 1: Queue manager performs the coordination

This section describes this scenario, including:
- "Database coordination"
- "DB2 configuration" on page 167
- "Oracle configuration" on page 170
- "Informix configuration" on page 172
- "Sybase configuration" on page 174
- "Multiple database configurations" on page 176
- "Security considerations" on page 177
- "Administration tasks" on page 177

Database coordination

When the queue manager coordinates global units of work itself, it becomes possible to integrate database updates within the units of work. That is, a mixed MQI and SQL application can be written, and the MQCMIT and MQBACK verbs can be used to commit or roll back the changes to the queues and databases together.

The queue manager achieves this using the two-phase commit protocol described in *X/Open Distributed Transaction Processing: The XA Specification*. When a unit of work is to be committed, the queue manager first asks each participating database manager whether it is prepared to commit its updates. Only if all the participants, including the queue manager itself, are prepared to commit, are all the queue and database updates committed. If any participant cannot prepare its updates, the unit of work is backed out instead.

In general, a global unit of work is implemented in an application by the following method (in pseudocode):

```
MQBEGIN
MQGET (include the flag MQGMO_SYNCPOINT in the message options)
MQPUT (include the flag MQPMO_SYNCPOINT in the message options)
SQL INSERT
MQCMIT
```

The purpose of MQBEGIN is to denote the beginning of a global unit of work. The purpose of MQCMIT is to denote the end of the global unit of work, and to complete it with all participating resource managers, using the two-phase commit protocol.

When the unit of work (also known as a *transaction*) is completed successfully using MQCMIT, all actions taken within that unit of work are made permanent or irreversible. If, for any reason, the unit of work fails, all actions are instead backed out. It is not acceptable for one action comprising a unit of work to be made permanent while another is forgotten. This is the principle of a unit of work: either all actions within the unit of work are made permanent or none of them are.

Note:

1. The application programmer can force a unit of work to be backed out by calling MQBACK. The unit of work is also backed out by the queue manager if the application or database *crashes* before MQCMIT is called.
2. If an application calls MQDISC without calling MQCMIT, the queue manager behaves as if MQCMIT had been called, and commits the unit of work.

In between MQBEGIN and MQCMIT, the queue manager does not make any calls to the database to update its resources. That is, the only way a database's tables are changed is by your code (for example, the SQL INSERT in the pseudocode above).

Full recovery support is provided if the queue manager loses contact with any of the database managers during the commit protocol. If a database manager becomes unavailable while it is in doubt, that is, it has successfully prepared to commit, but has yet to receive a commit or backout decision, the queue manager remembers the outcome of the unit of work until that outcome has been successfully delivered to the database. Similarly, if the queue manager terminates with incomplete commit operations outstanding, these are remembered over queue manager restart. If an application terminates unexpectedly, the integrity of the unit of work is not compromised, but the outcome depends on where in the process the application terminated, as described inTable 11.

What happens when the database or application program crashes is summarized in the tables below:

Table 10. What happens when a database server crashes

Before the application call to MQCMIT.	The unit of work is backed out.
During the application call to MQCMIT, **before** all databases have indicated that they have successfully prepared.	The unit of work is backed out with a reason code of MQRC_BACKED_OUT.
During the application call to MQCMIT, **after** all databases have indicated that they have successfully prepared, but before all have indicated that they have successfully committed.	The unit of work is held in recoverable state by the queue manager, with a reason code of MQRC_OUTCOME_PENDING.
During the application call to MQCMIT, **after** all databases have indicated that they have successfully committed.	The unit of work is committed with a reason code of MQRC_NONE.
After the application call to MQCMIT.	The unit of work is committed with a reason code of MQRC_NONE.

Table 11. What happens when an application program crashes

Before the application call to MQCMIT.	The unit of work is backed out.
During the application call to MQCMIT, **before** the queue manager has received the application's MQCMIT request.	The unit of work is backed out.
During the application call to MQCMIT, **after** the queue manager has received the application's MQCMIT request.	The queue manager tries to commit using two-phase commit (subject to the database products successfully executing and committing their parts of the unit of work).

In the case where the reason code on return from MQCMIT is MQRC_OUTCOME_PENDING, the unit of work is remembered by the queue manager until it has been able to reestablish contact with the database server, and tell it to commit its part of the unit of work. Refer to “Administration tasks” on page 177 for information on how and when recovery is done.

The queue manager communicates with database managers using the XA interface as described in *X/Open Distributed Transaction Processing: The XA Specification*. Examples of these function calls are xa_open, xa_start, xa_end, xa_prepare, and xa_commit. We use the terms *transaction manager* and *resource manager* in the same sense as they are used in the XA specification.

Restrictions:

The following restrictions apply to the database coordination support:

- The ability to coordinate database updates within WebSphere MQ units of work is **not** supported in an MQI client application. The use of MQBEGIN in a client application fails, as described in the WebSphere MQ Application Programming Reference. A program that calls MQBEGIN must run as a *server* application on the same machine as the queue manager.

  Note: A *server* application is a program that has been linked with the necessary WebSphere MQ server libraries; a *client* application is a program that has been linked with the necessary WebSphere MQ client libraries. See WebSphere MQ Clients and the WebSphere MQ Application Programming Guide for details on compiling and linking your programs.
- The database server can reside on a different machine from the queue manager server, as long as the database client is installed on the same machine as the queue manager, and it supports this function. Consult the database product’s documentation to determine whether their client software can be used for two-phase commit systems.
- Although the queue manager behaves as a resource manager (for the purposes of being involved in Scenario 2 global units of work), it is not possible to make one queue manager coordinate another queue manager within its Scenario 1 global units of work.

Switch load files:

The switch load file is a shared library (a DLL on Windows systems) that is loaded by the code in your WebSphere MQ application and the queue manager. Its purpose is to simplify the loading of the database’s client shared library, and to return the pointers to the XA functions.

The details of the switch load file must be specified before the queue manager is started. The details are placed in the qm.ini file (UNIX systems), or the Registry (Windows systems).

- On Windows or Linux (x86 platform) systems use the WebSphere MQ Explorer. On Windows systems the Registry is updated. On Linux (x86 platform) systems the file, qm.ini, is updated.
- On all other systems edit the file, qm.ini, directly.

The C source for the switch load file is supplied with the WebSphere MQ installation if it supports Scenario 1 global units of work. The source contains a function called MQStart. When the switch load file is loaded, the queue manager calls this function, which returns the address of a structure called an *XA switch*.

The XA switch structure exists in the database client shared library, and contains a number of function pointers, as described in Table 12:

Table 12. XA switch function pointers

Function pointer name	XA function	Purpose
xa_open_entry	xa_open	Connect to database
xa_close_entry	xa_close	Disconnect from database
xa_start_entry	xa_start	Start a branch of a global unit of work
xa_end_entry	xa_end	Suspend a branch of a global unit of work
xa_rollback_entry	xa_rollback	Roll back a branch of a global unit of work
xa_prepare_entry	xa_prepare	Prepare to commit a branch of a global unit of work
xa_commit_entry	xa_commit	Commit a branch of a global unit of work
xa_recover_entry	xa_recover	Discover from the database whether it has an in-doubt unit of work
xa_forget_entry	xa_forget	Allow a database to forget a branch of a global unit of work
xa_complete_entry	xa_complete	Complete a branch of a global unit of work

During the first MQBEGIN call in your application, the WebSphere MQ code that executes as part of MQBEGIN loads the switch load file, and calls the xa_open function in the database shared library. Similarly, during queue manager startup, and on other subsequent occasions, some queue manager processes load the switch load file and call xa_open.

You can reduce the number of xa_* calls by using *dynamic registration*. For a complete description of this optimization technique, see “XA dynamic registration” on page 182.

Configuring your system for database coordination:

There are several tasks that you must perform before a database manager can participate in global units of works coordinated by the queue manager. These are described here as follows:

- “Installing and configuring the database product”
- “Creating switch load files” on page 164
- “Adding configuration information to the queue manager” on page 165
- “Writing and modifying your applications” on page 166
- “Testing the system” on page 167

Installing and configuring the database product:

The steps involved in installing and configuring your database product are, of course, described in that product’s own documentation. Installation issues are well beyond the scope of this chapter, but we can list general configuration issues, as they relate to the interoperation between WebSphere MQ and the database.

Database connections:

An application that establishes a standard connection to the queue manager is associated with a thread in a separate local queue manager agent process. (A connection that is not a *fastpath* connection is a *standard* connection in this context. For more information, see "Connecting to a queue manager using the MQCONNX call" in the WebSphere MQ Application Programming Guide.)

When the application issues **MQBEGIN**, both it and the agent process call the xa_open function in the database client library. In response to this, the database client library code *connects* to the database that is to be involved in the unit of work *from both the application and queue manager processes*. These database connections are maintained as long as the application remains connected to the queue manager.

This is an important consideration if the database supports only a limited number of users or connections, because two connections are being made to the database to support the one application program.

Client/server configuration:

The database client library that is loaded into the WebSphere MQ queue manager and application processes **must** be able to send to and receive from its server. Ensure that:

- The database's client/server configuration files have the correct details
- The relevant environment variables are set in the environment of the queue manager **and** the application processes

Creating switch load files:

WebSphere MQ comes with a sample makefile, used to build switch load files for the supported database managers. This makefile, together with all the associated C source files required to build the switch load files, is installed in the following directories:

- For WebSphere MQ for Windows, in the `C:\Program Files\IBM\WebSphere MQ\tools\c\samples\xatm\` directory
- For WebSphere MQ for UNIX systems, in the `/opt/mqm/samp/xatm/` directory (`/usr/mqm/samp/xatm` on AIX)

The sample source modules used to build the switch load files are:

- For DB2, db2swit.c
- For Oracle, oraswit.c
- For Informix, infswit.c
- For Sybase, sybswit.c

When you generate switch load files it is recommended that 32-bit switch load files are installed in `/var/mqm/exits` and 64-bit switch load files are installed in `/var/mqm/exits64`.

If you have 32-bit queue managers then the sample make file, xaswit.mak, will install a 32-bit switch load file in `/var/mqm/exits`.

If you have 64-bit queue managers then the sample make file, xaswit.mak, will install a 32-bit switch load file in `/var/mqm/exits`, and a 64-bit switch load file in `/var/mqm/exits64`.

Adding configuration information to the queue manager:

When you have created a switch load file for your database manager, and placed it in a safe location, you must specify that location to your queue manager.

- On Windows and Linux (x86 platform) systems use the WebSphere MQ Explorer. Specify the details of the switch load file in the queue manager properties panel, under XA resource manager.
- On all other systems specify the details of the switch load file in the XAResourceManager stanza in the queue manager's qm.ini file.

Add an XAResourceManager stanza for the database that your queue manager is going to coordinate. The most common case is for there to be only one database, and therefore only one XAResourceManager stanza. More complicated configurations involving multiple databases, are discussed in "Multiple database configurations" on page 176. The attributes of the XAResourceManager stanza are as follows:

Name=name
User-chosen string that identifies the resource manager. In effect, it gives a name to the XAResourceManager stanza. The name is mandatory and can be up to 31 characters in length.

The name you choose must be unique; there must be only one XAResourceManager stanza with this name in this qm.ini file. The name should also be meaningful, because the queue manager uses it to refer to this resource manager both in queue manager error log messages and in output when the **dspmqtrn** command is used. (See "Displaying outstanding units of work with the dspmqtrn command" on page 178 for more information.)

Once you have chosen a name, and have started the queue manager, do not change the Name attribute. This is discussed in more detail in "Changing configuration information" on page 181.

SwitchFile=name
This is the name of the XA switch load file you built earlier. This is a mandatory attribute. The code in the queue manager and WebSphere MQ application processes tries to load the switch load file on two occasions:

1. At queue manager startup
2. When you make the first call to MQBEGIN in your WebSphere MQ application process

The security and permissions attributes of your switch load file must allow these processes to perform this action.

XAOpenString=string
This is a string of data that WebSphere MQ code passes in its calls to the database manager's xa_open function. This is an optional attribute; if it is omitted a zero-length string is assumed.

The code in the queue manager and WebSphere MQ application processes call the xa_open function on two occasions:

1. At queue manager startup
2. When you make the first call to MQBEGIN in your WebSphere MQ application process

The format for this string is particular to each database product, and will be described in the documentation for that product. In general, the xa_open string contains authentication information (user name and password) to allow a connection to the database in both the queue manager and the application processes.

XACloseString=string
This is a string of data that WebSphere MQ code passes in its calls to the database manager's xa_close function. This is an optional attribute; if it is omitted a zero-length string is assumed.

The code in the queue manager and WebSphere MQ application processes call the xa_close function on two occasions:

1. At queue manager startup
2. When you make a call to MQDISC in your WebSphere MQ application process, having earlier made a call to MQBEGIN

The format for this string is particular to each database product, and will be described in the documentation for that product. In general, the string is empty, and it is common to omit the XACloseString attribute from the XAResourceManager stanza.

ThreadOfControl=THREAD | PROCESS
The ThreadOfControl value can be THREAD or PROCESS. The queue manager uses it for serialization purposes. This is an optional attribute; if it is omitted, the value PROCESS is assumed.

If the database client code allows threads to call the XA functions without serialization, the value for ThreadOfControl can be THREAD. The queue manager assumes that it can call the XA functions in the database client shared library from multiple threads at the same time, if necessary.

If the database client code does not allow threads to call its XA functions in this way, the value for ThreadOfControl must be PROCESS. In this case, the queue manager serializes all calls to the database client shared library so that only one call at a time is made from within a particular process. You probably also need to ensure that your application performs similar serialization if it runs with multiple threads.

Note that this issue, of the database product's ability to cope with multi-threaded processes in this way, is an issue for that product's vendor. Consult the database product's documentation for details on whether you can set the ThreadOfControl attribute to THREAD or PROCESS. We recommend that, if you can, you set ThreadOfControl to THREAD. If in doubt, the *safer* option is to set it to PROCESS, although you will lose the potential performance benefits of using THREAD.

Writing and modifying your applications:

The sample application programs for Scenario 1 global units of work that are supplied with a WebSphere MQ installation are described in the WebSphere MQ Application Programming Guide.

In general, a global unit of work is implemented in an application by the following method (in pseudocode):

```
MQBEGIN
MQGET
MQPUT
SQL INSERT
```

MQCMIT

The purpose of MQBEGIN is to denote the beginning of a global unit of work. The purpose of MQCMIT is to denote the end of the global unit of work, and to complete it with all participating resource managers, using the two-phase commit protocol.

In between MQBEGIN and MQCMIT, the queue manager does not make any calls to the database to update its resources. That is, the only way a database's tables are changed is by your code (for example, the SQL INSERT in the pseudocode above).

The role of the queue manager, as far as the database is concerned, is to tell it when a global unit of work has started, when it has ended, and whether the global unit of work should be committed or rolled-back.

As far as your application is concerned, the queue manager performs two roles: a resource manager (where the resources are messages on queues) and the transaction manager for the global unit of work.

We recommend that you start with the supplied sample programs, and work through the various WebSphere MQ and database API calls that are being made in those programs. The API calls concerned are fully documented in the WebSphere MQ Application Programming Guide, the WebSphere MQ Application Programming Reference, and (in the case of the database's own API) the database's own documentation.

Testing the system:

You only know whether your application and system are correctly configured by running them during testing. You can test the system's configuration (the successful communication between queue manager and database) by building and running one of the supplied sample programs.

DB2 configuration

The supported levels of DB2 are defined at: http://www-1.ibm.com/support/docview.wss?rs=171&uid=swg27006467

Note: 32-bit instances of DB2 are not supported on platforms where the queue manager is 64-bit.

Do the following:
1. Check the environment variable settings.
2. Create the DB2 switch load file.
3. Add resource manager configuration information.
4. Change DB2 configuration parameters if necessary.

Read this information in conjunction with the general information provided in "Configuring your system for database coordination" on page 163.

Warning: If you run `db2profile` on UNIX platforms, the environment variable LIBPATH and LD_LIBRARY_PATH are set. It is advisable to `unset` these environment variables, see appropriate *Quick Beginnings* Guide.

Checking the DB2 environment variable settings:

Ensure that your DB2 environment variables are set for queue manager processes ***as well as in*** your application processes. In particular, you must always set the DB2INSTANCE environment variable ***before*** you start the queue manager. The DB2INSTANCE environment variable identifies the DB2 instance containing the DB2 databases that are being updated. For example:

- On UNIX systems, use:
  ```
  export DB2INSTANCE=db2inst1
  ```
- On Windows systems, use:
  ```
  set DB2INSTANCE=DB2
  ```

Creating the DB2 switch load file:

The easiest way to create the DB2 switch load file is to use the sample file xaswit.mak, which WebSphere MQ provides to build the switch load files for a variety of database products.

On Windows systems, you can find xaswit.mak in the directory `C:\Program Files\IBM\WebSphere MQ\tools\c\samples\xatm`. To create the DB2 switch load file with Microsoft Visual C++, use:

```
nmake /f xaswit.mak db2swit.dll
```

The generated switch file is placed in `c:\Program Files\IBM\WebSphere MQ\exits`.

On AIX, you can find xaswit.mak in the directory `/usr/mqm/samp/xatm`; on other UNIX systems, you can find it in the directory `/opt/mqm/samp/xatm`.

Edit xaswit.mak to *uncomment* the lines appropriate to the version of DB2 you are using. Then execute the makefile using the command:

```
make -f xaswit.mak db2swit
```

The generated 32-bit switch load file is placed in `/var/mqm/exits`.

The generated 64-bit switch load file is placed in `/var/mqm/exits64`.

Adding resource manager configuration information for DB2:

The next step is to modify the configuration information for the queue manager, as described in “Adding configuration information to the queue manager” on page 165, to declare DB2 as a participant in global units of work.

- On Windows and Linux (x86 platform) systems use the WebSphere MQ Explorer. Specify the details of the switch load file in the queue manager properties panel, under XA resource manager.
- On all other systems specify the details of the switch load file in the XAResourceManager stanza in the queue manager’s qm.ini file.

Figure 12 on page 169 is a UNIX sample, showing an XAResourceManager entry where the database to be coordinated is called `mydbname`, this name being specified in the `XAOpenString`:

```
XAResourceManager:
  Name=mydb2
  SwitchFile=db2swit
  XAOpenString=mydbname,myuser,mypasswd,toc=t
  ThreadOfControl=THREAD
```

Figure 12. Sample XAResourceManager entry for DB2 on UNIX platforms

Note:

1. `ThreadOfControl=THREAD` cannot be used with DB2 versions prior to version 8. It is recommended that you always set `ThreadOfControl` and the XAOpenString parameter `toc` to one of the following combinations:
   - `ThreadOfControl=THREAD` and `toc=t`
   - `ThreadOfControl=PROCESS` and `toc=p`

   If you are using the jdbcdb2 XA switch load file to enable JDBC/JTA coordination, you must use `ThreadOfControl=PROCESS` and `toc=p`.

Changing DB2 configuration parameters:

For each DB2 database that the queue manager is coordinating, you need to:

Set database privileges

The queue manager processes run with effective user and group mqm on UNIX systems. On Windows systems, they run as the user that started the queue manager. This can be one of:

1. The user who issued the **strmqm** command, or
2. The user under which the IBM MQSeries Service COM server runs

By default, this user is called MUSR_MQADMIN.

If you have not specified a user name and password on the xa_open string, **the user under which the queue manager is running** is used by DB2 to authenticate the xa_open call. If this user (for example, user mqm on UNIX systems) does not have minimal privileges in the database, the database refuses to authenticate the xa_open call.

The same considerations apply to your application process. If you have not specified a user name and password on the xa_open string, the user under which your application is running is used by DB2 to authenticate the xa_open call that is made during the first MQBEGIN. Again, this user must have minimal privileges in the database for this to work.

For example, give the mqm user connect authority in the mydbname database by issuing the following DB2 commands:

```
db2 connect to mydbname
db2 grant connect on database to user mqm
```

See “Security considerations” on page 177 for more information about security.

Change the tp_mon_name parameter

For DB2 for Windows systems only, change the TP_MON_NAME configuration parameter to name the DLL that DB2 uses to call the queue manager for dynamic registration.

Use the command `db2 update dbm cfg using TP_MON_NAME mqmax` to name MQMAX.DLL as the library that DB2 uses to call the queue manager. This must be present in a directory within PATH.

Reset the maxappls parameter

You might need to review your setting for the *maxappls* parameter, which limits the maximum number of applications that can be connected to a database. Refer to "Database connections" on page 164.

Oracle configuration

Do the following:

1. Check environment variable settings.
2. Create the Oracle switch load file.
3. Add resource manager configuration information.
4. Change the Oracle configuration parameters, if necessary.

A current list of levels of Oracle supported by WebSphere MQ is provided at: http://www.ibm.com/support/docview.wss?rs=171&uid=swg27006467

Checking the Oracle environment variable settings:

Ensure that your Oracle environment variables are set for queue manager processes ***as well as in*** your application processes. In particular, always set the following environment variables **before** starting the queue manager:

ORACLE_HOME

The Oracle home directory. For example, on UNIX systems, use:

```
export ORACLE_HOME=/opt/oracle/product/8.1.6
```

On Windows systems, use:

```
set ORACLE_HOME=c:\oracle\ora81
```

ORACLE_SID

The Oracle SID being used. If you are using Net8 for client/server connectivity, you might not need to set this environment variable. Consult your Oracle documentation.

An example of setting this, on UNIX systems, is:

```
export ORACLE_SID=sid1
```

The equivalent on Windows systems is:

```
set ORACLE_SID=sid1
```

Creating the Oracle switch load file:

The easiest way to create the Oracle switch load file is to use the sample file xaswit.mak, which WebSphere MQ provides to build the switch load files for a variety of database products.

On Windows systems, you can find xaswit.mak in the directory `C:\Program Files\IBM\WebSphere MQ\tools\c\samples\xatm`. To create the Oracle switch load file with Microsoft Visual C++, use:

```
nmake /f xaswit.mak oraswit.dll
```

The generated switch file is placed in `c:\Program Files\IBM\WebSphere MQ\exits`.

On AIX, you can find xaswit.mak in the directory `/usr/mqm/samp/xatm`; on other UNIX systems, you can find it in the directory `/opt/mqm/samp/xatm`.

Edit xaswit.mak to *uncomment* the lines appropriate to the version of Oracle you are using. Then execute the makefile using the command:

```
make -f xaswit.mak oraswit
```

The generated 32-bit switch load file is placed in `/var/mqm/exits`.

The generated 64-bit switch load file is placed in `/var/mqm/exits64`.

Adding resource manager configuration information for Oracle:

The next step is to modify the configuration information for the queue manager, as described in "Adding configuration information to the queue manager" on page 165, to declare Oracle as a participant in global units of work.

- On Windows and Linux (x86 platform) systems use the WebSphere MQ Explorer. Specify the details of the switch load file in the queue manager properties panel, under XA resource manager.
- On all other systems specify the details of the switch load file in the XAResourceManager stanza in the queue manager's qm.ini file.

Figure 13 is a UNIX sample showing an XAResourceManager entry. It is recommend that you add a `LogDir` to the XA open string so that all error and tracing information is logged to the same place.

```
XAResourceManager:
  Name=myoracle
  SwitchFile=oraswit
  XAOpenString=Oracle_XA+Acc=P/myuser/mypasswd+SesTm=35+LogDir=/tmp+threads=true
  ThreadOfControl=THREAD
```

Figure 13. Sample XAResourceManager entry for Oracle on UNIX platforms

Note:

1. In Figure 13, the xa_open string has been used with four parameters. Additional parameters can be included as described in Oracle's documentation.
2. When using Oracle with WebSphere MQ V5.3 for AIX, you must add the `+SqlNet` clause to the xa_open string. WebSphere MQ V5.3 for AIX, uses AIX extended shared memory facilities and the `+SqlNet` client/server connectivity solution must be used to enable Oracle's client library to reach the Oracle server. Additional text must be added to the Oracle `listener` and `tnsnames` files, see Oracle's XA and Net9 documentation for details.
3. When using the WebSphere MQ parameter `ThreadOfControl=THREAD` you must use the Oracle parameter `+threads=true` in the XAResourceManager stanza.

See the *Oracle8 Server Application Developer's Guide* for more information on the xa_open string.

Changing Oracle configuration parameters:

For each Oracle database that the queue manager is coordinating, you need to:

Review your maximum sessions

You might need to review your LICENSE_MAX_SESSIONS and PROCESSES settings to take into account the additional connections required by processes belonging to the queue manager. Refer to "Database connections" on page 164 for more details.

Set database privileges

The Oracle user name specified in the xa_open string must have privileges to access the DBA_PENDING_TRANSACTIONS view, as described in the Oracle documentation.

The necessary privilege can be given using the following example command:

```
grant select on DBA_PENDING_TRANSACTIONS to myuser;
```

Informix configuration

Do the following:

1. Ensure that you have installed the appropriate Informix client SDK:
   - 32-bit queue managers and applications require a 32-bit Informix client SDK.
   - 64-bit queue managers and applications require a 64-bit Informix client SDK.
2. Ensure Informix databases are created correctly.
3. Check environment variable settings.
4. Build the Informix switch load file.
5. Add resource manager configuration information.

A current list of levels of Informix supported by WebSphere MQ is provided at: http://www.ibm.com/support/docview.wss?rs=171&uid=swg27006467

Ensuring Informix databases are created correctly:

Every Informix database that is to be coordinated by a WebSphere MQ queue manager must be created specifying the `log` parameter. For example:

```
create database mydbname with log;
```

WebSphere MQ queue managers are unable to coordinate Informix databases that do not have the `log` parameter specified on creation. If a queue manager attempts to coordinate an Informix database that does not have the `log` parameter specified on creation, the xa_open call to Informix will fail, and a number of FFST errors will be generated.

Checking the Informix environment variable settings:

Ensure that your Informix environment variables are set for queue manager processes ***as well as in*** your application processes. In particular, always set the following environment variables **before** starting the queue manager:

INFORMIXDIR

The directory of the Informix product installation.

- For 32-bit UNIX applications, use the following command:
  ```
  export INFORMIXDIR=/opt/informix/32-bit
  ```
- For 64-bit UNIX applications, use the following command:
  ```
  export INFORMIXDIR=/opt/informix/64-bit
  ```
- For Windows applications, use the following command:
  ```
  set INFORMIXDIR=c:\informix
  ```

For systems that have 64-bit queue managers that must support both 32-bit and 64-bit applications, you need both the Informix 32-bit and 64-bit client SDKs installed. The sample make file `xaswit.mak`, used for creating a switch load file also sets both product installation directories.

INFORMIXSERVER

The name of the Informix server. For example, on UNIX systems, use:

```
export INFORMIXSERVER=hostname_1
```

On Windows systems, use:

```
set INFORMIXSERVER=hostname_1
```

ONCONFIG

The name of the Informix server configuration file. For example, on UNIX systems, use:

```
export ONCONFIG=onconfig.hostname_1
```

On Windows systems, use:

```
set ONCONFIG=onconfig.hostname_1
```

Creating the Informix switch load file:

The easiest way to create the Informix switch load file is to use the sample file xaswit.mak, which WebSphere MQ provides to build the switch load files for a variety of database products.

On Windows systems, you can find xaswit.mak in the directory `C:\Program Files\IBM\WebSphere MQ\tools\c\samples\xatm`. To create the Informix switch load file with Microsoft Visual C++, use:

```
nmake /f xaswit.mak infswit.dll
```

The generated switch file is placed in `c:\Program Files\IBM\WebSphere MQ\exits`.

On AIX, you can find xaswit.mak in the directory `/usr/mqm/samp/xatm`; on other UNIX systems, you can find it in the directory `/opt/mqm/samp/xatm`.

Edit xaswit.mak to *uncomment* the lines appropriate to the version of Informix you are using. Then execute the makefile using the command:

```
make -f xaswit.mak infswit
```

The generated 32-bit switch load file is placed in `/var/mqm/exits`.

The generated 64-bit switch load file is placed in `/var/mqm/exits64`.

Adding resource manager configuration information for Informix:

The next step is to modify the configuration information for the queue manager, as described in “Adding configuration information to the queue manager” on page 165, to declare Informix as a participant in global units of work.

- On Windows and Linux (x86 platform) systems use the WebSphere MQ Explorer. Specify the details of the switch load file in the queue manager properties panel, under XA resource manager.
- On all other systems specify the details of the switch load file in the XAResourceManager stanza in the queue manager’s qm.ini file.

Figure 14 on page 174 is a UNIX sample, showing an XAResourceManager entry where the database to be coordinated is called `mydbname`, this name being specified in the `XAOpenString`:

```
XAResourceManager:
  Name=myinformix
  SwitchFile=infswit
  XAOpenString=mydbname
  ThreadOfControl=PROCESS
```

Figure 14. Sample XAResourceManager entry for Informix on UNIX platforms

Note: In Figure 14, ThreadOfControl is specified as PROCESS. This value is required for the queue manager to use the Informix XA switch-load file. However, also note that the supported levels of Informix do not allow multi-threaded XA applications.

Sybase configuration

Do the following:

1. Ensure you have installed the Sybase XA libraries, for example by installing the XA DTM option.
2. Check environment variable settings.
3. Enable Sybase XA support.
4. Create the Sybase switch load file.
5. Add resource manager configuration information.

A current list of levels of Sybase supported by WebSphere MQ is provided at: http://www.ibm.com/support/docview.wss?rs=171&uid=swg27006467

Checking the Sybase environment variable settings:

Ensure that your Sybase environment variables are set for queue manager processes ***as well as in*** your application processes. In particular, always set the following environment variables **before** starting the queue manager:

SYBASE
The location of the Sybase product installation. For example, on UNIX systems, use:

```
export SYBASE=/sybase
```

On Windows systems, use:

```
set SYBASE=c:\sybase
```

SYBASE_OCS
The directory under SYBASE where you have installed the Sybase client files. For example, on UNIX systems, use:

```
export SYBASE_OCS=OCS-12_0
```

On Windows systems, use:

```
set SYBASE_OCS=OCS-12_0
```

Enabling Sybase XA support:

Within the Sybase XA configuration file (`$SYBASE/$SYBASE_OCS/xa_config`), define a Logical Resource Manager (LRM) for each connection to the Sybase server that is being updated.

An example of the contents of `$SYBASE/$SYBASE_OCS/xa_config` is shown in Figure 15.

```
# The first line must always be a comment

[xa]

  LRM=lrmname
  server=servername
```

Figure 15. Example contents of $SYBASE/$SYBASE_OCS/xa_config

Creating the Sybase switch load file:

The easiest way to create the Sybase switch load file is to use the sample files supplied with WebSphere MQ.

On Windows systems, you can find xaswit.mak in the directory `C:\Program Files\IBM\WebSphere MQ\tools\c\samples\xatm`. To create the Sybase switch load file with Microsoft Visual C++, use:

```
nmake /f xaswit.mak sybswit.dll
```

The generated switch file is placed in `c:\Program Files\IBM\WebSphere MQ\exits`.

On AIX, you can find xaswit.mak in the directory `/usr/mqm/samp/xatm`; on other UNIX systems, you can find it in the directory `/opt/mqm/samp/xatm`.

Edit xaswit.mak to *uncomment* the lines appropriate to the version of Sybase you are using. Then execute the makefile using the command:

```
make -f xaswit.mak sybswit
```

The generated 32-bit switch load file is placed in `/var/mqm/exits`.

The generated 64-bit switch load file is placed in `/var/mqm/exits64`.

Adding resource manager configuration information for Sybase:

The next step is to modify the configuration information for the queue manager, as described in “Adding configuration information to the queue manager” on page 165, to declare Sybase as a participant in global units of work.

- On Windows and Linux (x86 platform) systems use the WebSphere MQ Explorer. Specify the details of the switch load file in the queue manager properties panel, under XA resource manager.
- On all other systems specify the details of the switch load file in the XAResourceManager stanza in the queue manager’s qm.ini file.

Figure 16 on page 176 shows a UNIX sample, which uses the database associated with the *lrmname* LRM definition in the Sybase XA configuration file, `$SYBASE/$SYBASE_OCS/xa_config`. Include a log file name if you want XA function calls to be logged:

```
XAResourceManager:
  Name=mysybase
  SwitchFile=sybswit
  XAOpenString=-Uuser -Ppassword -Nlrmname -L/tmp/sybase.log -Txa
  ThreadOfControl=THREAD
```

Figure 16. Sample XAResourceManager entry for Sybase on UNIX platforms

Using multi-threaded programs with Sybase:

If you are using multi-threaded programs with WebSphere MQ global units of work incorporating updates to Sybase, you ***must*** use the value THREAD for the ThreadOfControl parameter as shown in Figure 16.

Also ensure that you link your program (and the switch load file) with the threadsafe Sybase libraries (the _r versions).

Multiple database configurations

If you want to configure the queue manager so that updates to multiple databases can be included within global units of work, add an XAResourceManager stanza for each database.

If the databases are all managed by the same database manager, each stanza defines a separate database. Each stanza specifies the same *SwitchFile*, but the contents of the *XAOpenString* are different because it specifies the name of the database being updated. For example, the stanzas shown in Figure 17 configure the queue manager with the DB2 databases *MQBankDB* and *MQFeeDB* on UNIX systems.

```
XAResourceManager:
  Name=DB2 MQBankDB
  SwitchFile=db2swit
  XAOpenString=MQBankDB

XAResourceManager:
  Name=DB2 MQFeeDB
  SwitchFile=db2swit
  XAOpenString=MQFeeDB
```

Figure 17. Sample XAResourceManager entries for multiple DB2 databases

If the databases to be updated are managed by different database managers, add an XAResourceManager stanza for each. In this case, each stanza specifies a different *SwitchFile*. For example, if *MQFeeDB* is managed by Oracle instead of DB2, use the following stanzas on UNIX systems:

```
XAResourceManager:
  Name=DB2 MQBankDB
  SwitchFile=db2swit
  XAOpenString=MQBankDB

XAResourceManager:
  Name=Oracle MQFeeDB
  SwitchFile=oraswit
  XAOpenString=Oracle_XA+Acc=P/myuser/mypassword+SesTm=35+LogDir=/tmp/ora.log+DB=MQFeeDB
```

Figure 18. Sample XAResourceManager entries for a DB2 and Oracle database

In principle, there is no limit to the number of database instances that can be configured with a single queue manager.

Note: For information on support for including Informix databases in multiple database updates within global units of work, check the product readme file.

Security considerations

The following information is provided for guidance only. In all cases, refer to the documentation provided with the database manager to determine the security implications of running your database under the XA model.

An application process denotes the start of a global unit of work using the **MQBEGIN** verb. The first **MQBEGIN** call that an application issues connects to all participating databases by calling their client library code at the xa_open entry point. All the database managers provide a mechanism for supplying a user ID and password in their XAOpenString. This is the only time that authentication information flows.

Note that, on UNIX platforms, fastpath applications must run with an effective user ID of mqm while making MQI calls.

Administration tasks

In normal operations, only a minimal amount of administration is necessary after you have completed the configuration steps. The administration job is made easier because the queue manager tolerates database managers not being available. In particular this means that:

- The queue manager can start at any time without first starting each of the database managers.
- The queue manager does not need to stop and restart if one of the database managers becomes unavailable.

This allows you to start and stop the queue manager independently from the database server.

Whenever contact is lost between the queue manager and a database, they need to resynchronize when both become available again. Resynchronization is the process by which any in-doubt units of work involving that database are completed. In general, this occurs automatically without the need for user intervention. The queue manager asks the database for a list of units of work that are in doubt. It then instructs the database to either commit or roll back each of these in-doubt units of work.

When a queue manager starts, it resynchronizes with each database. When an individual database becomes unavailable, only that database needs to be resynchronized the next time that the queue manager notices it is available again.

The queue manager regains contact with a previously unavailable database automatically as new global units of work are started with MQBEGIN. It does this by calling the xa_open function in the database client library. If this xa_open call fails, MQBEGIN returns with a completion code of MQCC_WARNING and a reason code of MQRC_PARTICIPANT_NOT_AVAILABLE. You can retry the MQBEGIN call later.

Do not continue to attempt a global unit of work that involves updates to a database that has indicated failure during MQBEGIN. There will not be a connection to that database through which updates can be made. Your only options are to end the program, or to retry MQBEGIN periodically in the hope that the database might become available again.

Alternatively, you can use the **rsvmqtrn** command to resolve explicitly all in-doubt units of work.

In-doubt units of work:

A database might be left with in-doubt units of work if contact with the queue manager is lost after the database manager has been instructed to prepare. Until the database server receives the outcome from the queue manager (commit or roll back), it needs to retain the database locks associated with the updates.

Because these locks prevent other applications from updating or reading database records, resynchronization needs to take place as soon as possible.

If, for some reason, you cannot wait for the queue manager to resynchronize with the database automatically, you can use facilities provided by the database manager to commit or roll back the database updates manually. In the *X/Open Distributed Transaction Processing: The XA Specification*, this is called making a *heuristic* decision. Use it only as a last resort because of the possibility of compromising data integrity; you might, for example, mistakenly roll back the database updates when all other participants have committed their updates.

It is far better to restart the queue manager, or use the **rsvmqtrn** command when the database has been restarted, to initiate automatic resynchronization.

Displaying outstanding units of work with the dspmqtrn command:

While a database manager is unavailable, you can use the **dspmqtrn** command to check the state of outstanding global units of work involving that database.

The **dspmqtrn** command displays only those units of work in which one or more participants are in doubt, awaiting the decision from the queue manager to commit or roll back the prepared updates.

For each of these global units of work, the state of each participant is displayed in the output from **dspmqtrn**. If the unit of work did not update the resources of a particular resource manager, it is not displayed.

With respect to an in-doubt unit of work, a resource manager is said to have done one of the following things:

Prepared
The resource manager is prepared to commit its updates.

Committed
The resource manager has committed its updates.

Rolled-back
The resource manager has rolled back its updates.

Participated
The resource manager is a participant, but has not prepared, committed, or rolled back its updates.

When the queue manager is restarted, it asks each database having an XAResourceManager stanza for a list of its in-doubt global units of work. If the database has not been restarted, or is otherwise unavailable, the queue manager cannot yet deliver to the database the final outcomes for those units of work. The outcome of the in-doubt units of work is delivered to the database at the first opportunity when the database is again available.

In this case, the database manager is reported as being in *prepared* state until such time as resynchronization has occurred.

Whenever the **dspmqtrn** command displays an in-doubt unit of work, it first lists all the possible resource managers that could be participating. These are allocated a unique identifier, *RMId*, which is used instead of the *Name* of the resource managers when reporting their state with respect to an in-doubt unit of work.

Figure 19 shows the result of issuing the following command:

```
dspmqtrn -m MY_QMGR
```

```
AMQ7107: Resource manager 0 is MQSeries.
AMQ7107: Resource manager 1 is DB2 MQBankDB.
AMQ7107: Resource manager 2 is DB2 MQFeeDB.

AMQ7056: Transaction number 0,1.
    XID: formatID 5067085, gtrid_length 12, bqual_length 4
         gtrid [3291A5060000201374657374]
         bqual [00000001]
AMQ7105: Resource manager 0 has committed.
AMQ7104: Resource manager 1 has prepared.
AMQ7104: Resource manager 2 has prepared.
```

Figure 19. Sample dspmqtrn output

The output in Figure 19 shows that there are three resource managers associated with the queue manager. The first is resource manager `0`, which is the queue manager itself. The other two resource manager instances are the `MQBankDB` and `MQFeeDB` DB2 databases.

The example shows only a single in-doubt unit of work. A message is issued for all three resource managers, which means that updates were made to the queue manager and both DB2 databases within the unit of work.

The updates made to the queue manager, resource manager **0**, have been *committed*. The updates to the DB2 databases are in *prepared* state, which means that DB2 must have become unavailable before it was called to commit the updates to the *MQBankDB* and *MQFeeDB* databases.

The in-doubt unit of work has an external identifier called an XID (*transaction id*). This is a piece of data given to DB2 by the queue manager to identify its portion of the global unit of work.

Resolving outstanding units of work with the rsvmqtrn command:

The output shown in Figure 19 on page 179 shows a single in-doubt unit of work in which the commit decision has yet to be delivered to both DB2 databases.

To complete this unit of work, the queue manager and DB2 need to resynchronize when DB2 next becomes available. The queue manager uses the start of new units of work as an opportunity to regain contact with DB2. Alternatively, you can instruct the queue manager to resynchronize explicitly using the **rsvmqtrn** command.

Do this soon after DB2 has been restarted, so that any database locks associated with the in-doubt unit of work are released as quickly as possible. Use the -a option, which tells the queue manager to resolve all in-doubt units of work. In the following example, DB2 has restarted, so the queue manager can resolve the in-doubt unit of work:

```
> rsvmqtrn -m MY_QMGR -a
Any in-doubt transactions have been resolved.
```

Mixed outcomes and errors:

Although the queue manager uses a two-phase commit protocol, this does not completely remove the possibility of some units of work completing with mixed outcomes. This is where some participants commit their updates and some back out their updates.

Units of work that complete with a mixed outcome have serious implications because shared resources that should have been updated as a single unit of work are no longer in a consistent state.

Mixed outcomes are mainly caused when heuristic decisions are made about units of work instead of allowing the queue manager to resolve in-doubt units of work itself. Such decisions are outside the queue manager’s control.

Whenever the queue manager detects a mixed outcome, it produces FFST information and documents the failure in its error logs, with one of two messages:

- If a database manager rolls back instead of committing:

  ```
  AMQ7606 A transaction has been committed but one or more resource
          managers have rolled back.
  ```

- If a database manager commits instead of rolling back:

  ```
  AMQ7607 A transaction has been rolled back but one or more resource
          managers have committed.
  ```

Further messages identify the databases that are heuristically damaged. It is then your responsibility to locally restore consistency to the affected databases. This is a complicated procedure in which you need first to isolate the update that has been wrongly committed or rolled back, then to undo or redo the database change manually.

Changing configuration information:

After the queue manager has successfully started to coordinate global units of work, do not change any of the resource manager configuration information.

If you need to change the configuration information you can do so at any time, but the changes do not take effect until after the queue manager has been restarted.

If you remove the resource manager configuration information for a database, you are effectively removing the ability for the queue manager to contact that database manager.

Never change the *Name* attribute in any of your resource manager configuration information. This attribute uniquely identifies that database manager instance to the queue manager. If you change this unique identifier, the queue manager assumes that the database has been removed and a completely new instance has been added. The queue manager still associates outstanding units of work with the old *Name*, possibly leaving the database in an in-doubt state.

Removing database manager instances:

If you need to remove a database from your configuration permanently, ensure that the database is not in doubt before you restart the queue manager. Database products provide commands for listing in-doubt transactions. If there are any in-doubt transactions, first allow the queue manager to resynchronize with the database. Do this by starting the queue manager. You can verify that resynchronization has taken place by using the **rsvmqtrn** command or the database's own command for viewing in-doubt units of work. Once you are satisfied that resynchronization has taken place, end the queue manager and remove the database's configuration information.

If you fail to observe this procedure the queue manager still remembers all in-doubt units of work involving that database. A warning message, AMQ7623, is issued every time the queue manager is restarted. If you are never going to configure this database with the queue manager again, use the -r option of the **rsvmqtrn** command to instruct the queue manager to forget about the database's participation in its in-doubt transactions. The queue manager forgets about such transactions only when in-doubt transactions have been completed with all participants.

There are times when you might need to remove some resource manager configuration information temporarily. On UNIX systems this is best achieved by commenting out the stanza so that it can be easily reinstated at a later time. You might decide to do this if there are errors every time the queue manager contacts a particular database or database manager. Temporarily removing the resource manager configuration information concerned allows the queue manager to start global units of work involving all the other participants. Here is an example of a commented-out `XAResourceManager` stanza follows:

```
# This database has been temporarily removed
#XAResourceManager:
#  Name=mydb2
#  SwitchFile=db2swit
#  XAOpenString=mydbname,myuser,mypassword,toc=t
#  ThreadOfControl=THREAD
```

Figure 20. Commented- out XAResourceManager stanza on UNIX systems

On Windows systems, use the WebSphere MQExplorer to delete the information about the database manager instance. Take great care to type in the correct name in the *Name* field when reinstating it. If you mistype the name, you may face in-doubt problems, as described in “Changing configuration information” on page 181.

XA dynamic registration

The XA specification provides a way of reducing the number of `xa_*` calls that a transaction manager makes to a resource manager. This optimization is known as *dynamic registration*. Dynamic registration is supported by DB2. Other databases might support it; consult the documentation for your database product for details.

Why is the dynamic registration optimization useful? In your application, some global units of work might contain updates to database tables; others might not contain such updates. When no persistent update has been made to a database’s tables, there is no need to include that database in the commit protocol that occurs during MQCMIT.

Whether or not your database supports dynamic registration, your application calls `xa_open` during the first MQBEGIN call on a WebSphere MQ connection. It also calls `xa_close` on the subsequent MQDISC call. The pattern of subsequent XA calls depends on whether the database supports dynamic registration:

If your database does not support dynamic registration...
Every global unit of work involves several XA function calls made by WebSphere MQ code into the database client library, regardless of whether you made a persistent update to the tables of that database within your unit of work. These include:

- `xa_start` and `xa_end` from the application process. These are used to declare the beginning and end of a global unit of work.
- `xa_prepare`, `xa_commit`, and `xa_rollback` from the queue manager agent process, amqzlaa0. These are used to deliver the outcome of the global unit of work: the commit or rollback decision.

In addition, the queue manager agent process also calls `xa_open` during the first MQBEGIN.

If your database supports dynamic registration...
The WebSphere MQ code makes only those XA function calls that are necessary. For a global unit of work that has **not** involved persistent updates to database resources, there are **no** XA calls to the database. For a global unit of work that **has** involved such persistent updates, the calls are to:

- `xa_end` from the application process to declare the end of the global unit of work.
- `xa_prepare`, `xa_commit`, and `xa_rollback` from the queue manager agent process, amqzlaa0. These are used to deliver the outcome of the global unit of work: the commit or rollback decision.

For dynamic registration to work, it is vital that the database has a way of telling WebSphere MQ when it has performed a persistent update that it wants to be included in the current global unit of work. WebSphere MQ provides the `ax_reg` function for this purpose.

The database's client code that runs in your application process finds the `ax_reg` function and calls it, to *dynamically register* the fact it has done persistent work within the current global unit of work. In response to this `ax_reg` call, WebSphere MQ records that the database has participated. If this is the first `ax_reg` call on this WebSphere MQ connection, the queue manager agent process calls `xa_open`.

The database client code make this `ax_reg` call when it is running in your process, for example, during an SQL UPDATE call or whatever call in the database's client API is responsible

Error conditions:

There is an opportunity here for a confusing failure in the queue manager. Here is a common example. If you forget to set your database environment variables properly before starting your queue manager, the queue manager's calls to `xa_open` fail. No global units of work can be used.

To avoid this, ensure that you have set the relevant environment variables before starting the queue manager. Review your database product's documentation, and the advice given in "Checking the DB2 environment variable settings" on page 167, "Checking the Oracle environment variable settings" on page 170, and "Checking the Sybase environment variable settings" on page 174.

With all database products, the queue manager calls `xa_open` once at queue manager startup, as part of the recovery session (as explained in "Administration tasks" on page 177). This `xa_open` call fails if you set your database environment variables incorrectly, but it does not cause the queue manager to fail to start. This is because the same `xa_open` error code is used by the database client library to indicate that the database server is unavailable. We do not treat this as a serious error, as the queue manager must be able to start to continue processing data outside global units of work involving that database.

Subsequent calls to `xa_open` are made from the queue manager during the first MQBEGIN on a WebSphere MQ connection (if dynamic registration is not being used) or during a call by the database client code to the WebSphere MQ-provided `ax_reg` function (if dynamic registration is being used).

The **timing** of any error conditions (or, occasionally, FFST reports) depends on whether you are using dynamic registration:
- If you are using dynamic registration, your MQBEGIN call could succeed, but your SQL UPDATE (or similar) database call will fail.
- If you are not using dynamic registration, your MQBEGIN call will fail.

Ensure that your environment variables are set correctly in your application and queue manager processes.

Summarizing XA calls:

Table 13 lists the calls that are made to the XA functions in a database client library as a result of the various MQI calls that control global units of work. This is not a complete description of the protocol described in the XA specification; we have provided it as a brief overview.

Note that `xa_start` and `xa_end` calls are always called by WebSphere MQ code in the application process, whereas `xa_prepare`, `xa_commit`, and `xa_rollback` are always called from the queue manager agent process, amqzlaa0.

The `xa_open` and `xa_close` calls shown in this table are all made from the application process. The queue manager agent process calls `xa_open` in the circumstances described in "Error conditions" on page 183.

Table 13. Summary of XA function calls

MQI call	**XA calls made with dynamic registration**	**XA calls made without dynamic registration**
First MQBEGIN	`xa_open`	`xa_open` `xa_start`
Subsequent MQBEGIN	No XA calls	`xa_start`

MQCMIT (**without** `ax_reg` being called during the current global unit of work)	No XA calls	`xa_end`
		`xa_prepare`
		`xa_commit`
		`xa_rollback`

MQCMIT (**with** `ax_reg` being called during the current global unit of work)	`xa_end`
	`xa_prepare`
	`xa_commit`
	`xa_rollback`
		Not applicable. No calls are made to ax_reg in non-dynamic mode.

MQBACK (**without** `ax_reg` being called during the current global unit of work)	No XA calls	`xa_end` `xa_rollback`
MQBACK (**with** `ax_reg` being called during the current global unit of work)	`xa_end` `xa_rollback`	Not applicable. No calls are made to ax_reg in non-dynamic mode.
MQDISC, where MQCMIT or MQBACK was called first. If they were not, MQCMIT processing is first done during MQDISC.	`xa_close`	`xa_close`
Notes: 1. For MQCMIT, `xa_commit` is called if `xa_prepare` is successful. Otherwise, `xa_rollback` is called.		

Scenario 2: Other software provides the coordination

In scenario 2, an external transaction manager coordinates global units of work, starting and committing them under control of the transaction manager's API. The MQBEGIN, MQCMIT, and MQBACK verbs are unavailable.

This section describes this scenario, including:

- "External syncpoint coordination" on page 185
- "Using CICS" on page 187
- "Using the Microsoft Transaction Server (COM+)" on page 191

External syncpoint coordination

A global unit of work can also be coordinated by an external X/Open XA-compliant transaction manager. Here the WebSphere MQ queue manager participates in, but does not coordinate, the unit of work.

The flow of control in a global unit of work coordinated by an external transaction manager is as follows:

1. An application tells the external syncpoint coordinator (for example, TXSeries) that it wants to start a transaction.
2. The syncpoint coordinator tells known resource managers, such as WebSphere MQ, about the current transaction.
3. The application issues calls to resource managers associated with the current transaction. For example, the application could issue **MQGET** calls to WebSphere MQ.
4. The application issues a commit or backout request to the external syncpoint coordinator.
5. The syncpoint coordinator completes the transaction by issuing the appropriate calls to each resource manager, typically using two-phase commit protocols.

The supported levels of external syncpoint coordinators that can provide a two-phase commit process for transactions in which WebSphere MQ participates are defined at: http://www.ibm.com/support/docview.wss?rs=171 &uid=swg27006467

See the WebSphere MQ Application Programming Guide for information about writing and building transactions to be coordinated by an external syncpoint coordinator.

The rest of this chapter describes how to enable external units of work.

The WebSphere MQ XA switch structure:

Each resource manager participating in an externally coordinated unit of work must provide an XA switch structure. This structure defines both the capabilities of the resource manager and the functions that are to be called by the syncpoint coordinator.

WebSphere MQ provides two versions of this structure:

- `MQRMIXASwitch` for static XA resource management
- `MQRMIXASwitchDynamic` for dynamic XA resource management

Consult your transaction manager documentation to determine whether to use the static or dynamic resource management interface. Wherever a transaction manager supports it, we recommend that you use dynamic XA resource management.

Some 64-bit transaction managers treat the *long* type in the XA specification as 64-bit, and some treat it as 32-bit. WebSphere MQ supports both models:

- If your transaction manager is 32-bit, or your transaction manager is 64-bit but treats the *long* type as 32-bit, use the switch load file listed in Table 14 on page 186.
- If your transaction manager is 64-bit and treats the *long* type as 64-bit, use the switch load file listed in Table 15 on page 186.

A list of known 64-bit transaction managers that treat the *long* type as 64-bit is provided in Table 16. Consult your transaction manager documentation if you are unsure which model your transaction manager uses.

Table 14. XA switch load file names

Platform	Switch load file name (server)	Switch load file name (extended transactional client)
Windows	*mqmxa.dll*	*mqcxa.dll*
AIX (nonthreaded)	*libmqmxa.a*	*libmqcxa.a*
AIX (threaded)	*libmqmxa_r.a*	*libmqcxa_r.a*
HP-UX (nonthreaded)	*libmqmxa.so*	*libmqcxa.so*
HP-UX (threaded)	*libmqmxa_r.so*	*libmqcxa_r.so*
Linux (nonthreaded)	*libmqmxa.so*	*libmqcxa.so*
Linux (threaded)	*libmqmxa_r.so*	*libmqcxa_r.so*
Solaris	*libmqmxa.so*	*libmqcxa.so*

Table 15. Alternative 64-bit XA switch load file names

Platform	Switch load file name (server)	Switch load file name (extended transactional client)
AIX (nonthreaded)	*libmqmxa64.a*	*libmqcxa64.a*
AIX (threaded)	*libmqmxa64_r.a*	*libmqcxa64_r.a*
HP-UX (nonthreaded)	*libmqmxa64.so*	*libmqcxa64.so*
HP-UX (threaded)	*libmqmxa64_r.so*	*libmqcxa64_r.so*
Linux (nonthreaded)	*libmqmxa64.so*	*libmqcxa64.so*
Linux (threaded)	*libmqmxa64_r.so*	*libmqcxa64_r.so*
Solaris	*libmqmxa64.so*	*libmqcxa64.so*

Table 16. 64-bit transaction managers that require the alternate 64-bit switch load file

Transaction Manager
Tuxedo

Some external syncpoint coordinators (not CICS) require that each resource manager participating in a unit of work supplies its name in the name field of the XA switch structure. The WebSphere MQ resource manager name is MQSeries_XA_RMI.

The syncpoint coordinator defines how the WebSphere MQ XA switch structure links to it. Information about linking the WebSphere MQ XA switch structure with CICS is provided in "Using CICS" on page 187. For information about linking the WebSphere MQ XA switch structure with other XA-compliant syncpoint coordinators, consult the documentation supplied with those products.

The following considerations apply to using WebSphere MQ with all XA-compliant syncpoint coordinators:

- The xa_info structure passed on any xa_open call by the syncpoint coordinator includes the name of a WebSphere MQ queue manager. The name takes the same form as the queue-manager name passed to the **MQCONN** call. If the name passed on the xa_open call is blank, the default queue manager is used.

Alternatively, the xa_info structure can contain values for the *TPM* and *AXLIB* parameters. The *TPM* parameter specifies the transaction manager being used. The valid values are CICS, TUXEDO and ENCINA. The *AXLIB* parameter specifies the name of the library that contains the transaction manager's ax_reg and ax_unreg functions. For more information on these parameters, see the section about configuring extended transactional clients in WebSphere MQ Clients. If the xa_info structure contains either of these parameters, the queue manager name is specified in the *QMNAME* parameter, unless the default queue manager is being used.

- Only one queue manager at a time can participate in a transaction coordinated by an instance of an external syncpoint coordinator. The syncpoint coordinator is effectively connected to the queue manager, and is subject to the rule that only one connection at a time is supported.
- All applications that include calls to an external syncpoint coordinator can connect only to the queue manager that is participating in the transaction managed by the external coordinator (because they are already effectively connected to that queue manager). However, such applications must issue an **MQCONN** call to obtain a connection handle, and an **MQDISC** call before they exit.
- A queue manager with resource updates coordinated by an external syncpoint coordinator must start before the external syncpoint coordinator. Similarly, the syncpoint coordinator must end before the queue manager.
- If your external syncpoint coordinator terminates abnormally, stop and restart your queue manager ***before*** restarting the syncpoint coordinator to ensure that any messaging operations uncommitted at the time of the failure are properly resolved.

Using CICS

CICS is one of the elements of TXSeries. The versions of TXSeries that are XA-compliant (and use a two-phase commit process) are defined at: http://www.ibm.com/support/docview.wss?rs=171&uid=swg27006467

The CICS two-phase commit process:

WebSphere MQ also supports other transaction managers. See http://www.ibm.com/support/docview.wss?rs=171&uid=swg27006467 for the current lists of supported software.

Requirements of the two-phase commit process:

When you use the CICS two-phase commit process with WebSphere MQ, note the following requirements:

- WebSphere MQ and CICS must reside on the same physical machine.
- WebSphere MQ does not support CICS on a WebSphere MQ client.
- You must start the queue manager, with its name specified in the XAD resource definition stanza, ***before*** you attempt to start CICS. Failure to do this will prevent you from starting CICS if you have added an XAD resource definition stanza for WebSphere MQ to the CICS region.
- Only one WebSphere MQ queue manager can be accessed at a time from a single CICS region.

- A CICS transaction must issue an **MQCONN** request before it can access WebSphere MQ resources. The **MQCONN** call must specify the name of the WebSphere MQ queue manager specified on the XAOpen entry of the XAD resource definition stanza for the CICS region. If this entry is blank, the **MQCONN** request must specify the default queue manager.
- A CICS transaction that accesses WebSphere MQ resources must issue an **MQDISC** call from the transaction before returning to CICS. Failure to do this might mean that the CICS application server is still connected, leaving queues open. Additionally, if you do not install a task termination exit (see "Sample task termination exit" on page 191), the CICS application server might later end abnormally, perhaps during a subsequent transaction.
- You must ensure that the CICS user ID (cics) is a member of the mqm group, so that the CICS code has the authority to call WebSphere MQ.

  For transactions running in a CICS environment, the queue manager adapts its methods of authorization and determining context as follows:
  - The queue manager queries the user ID under which CICS runs the transaction. This is the user ID checked by the Object Authority Manager, and is used for context information.
  - In the message context, the application type is MQAT_CICS.
  - The application name in the context is copied from the CICS transaction name.

General XA support:

General XA is not supported on i5/OS.

An XA switch load module is provided to enable you to link CICS with WebSphere MQ on UNIX systems. Additionally, sample source code files are provided to enable you to develop the XA switches for other transaction messages. The names of the switch load modules provided are:

Table 17. Essential code for CICS applications: XA initialization routine

C (source)	C (exec) - add one of the following to your XAD.Stanza
amqzscix.c	amqzsc - TXSeries for AIX, Version 5.1, amqzsc - TXSeries for HP-UX, Version 5.1 amqzsc - TXSeries for Sun Solaris, Version 5.1
amqzscin.c	mqmc4swi - TXSeries for Windows, Version 5.1

Building libraries for use with CICS:

Pre-built switch load files are supplied with WebSphere MQ. These are shared libraries (DLLs on Windows) for use with CICS programs in which you require 2-phase commit using the XA protocol. The names of these pre-built libraries are in the table Essential code for CICS applications: XA initialization routine. Sample source code is also supplied in the following directories:

Platform	Directory	Source file
AIX	/usr/mqm/samp/	amqzscix.c
Other UNIX platforms	/opt/mqm/samp/	amqzscix.c

Platform	Directory	Source file
Windows	c:\Program Files\IBM\Websphere MQ\Tools\c\Samples	amqzscin.c

To build the switch load file from the sample source, follow the appropriate instructions for your platform:

AIX
Issue the following command:

```
xlC_r4 /usr/mqm/samp/amqzscix.c -I/usr/lpp/encina/include   -e amqzscix -o amqzsc
    /usr/lpp/cics/lib/regxa_swxa.o   -L/usr/lpp/cics/lib -L/usr/lpp/encina/lib
    -lmqmcics_r -lmqmxa_r   -lmqm_r -lcicsrt -lEncina -lEncServer -ldce
```

Solaris
Issue the following command:

```
/opt/SUNWspro/bin/cc -s -l/opt/encina/include amqzscix.c -G -o amqzscix  -e
    CICS_XA_Init -L/opt/encina/lib -L/opt/dcelocal/lib /opt/cics/lib/reqxa_swxa.o
    -lmqmcics -lmqmxa -lmqm -lmqmcs_d -lmqmzse -lcicsrt -lEncina -lEncSfs -ldce
```

HP-UX
Issue the following command:

```
cc -c -s -I/opt/encina/include /opt/mqm/samp/amqzscix.c -Aa +z -o  amqzscix.o ld -b
    -o amqzscix amqzscix.o /opt/cics/lib/regxa_swxa.o +e CICS_XA_Init \
    -L/opt/encina/lib -L/opt/cics/lib -lmqmxa_r -lmqm_r -ldbm -lc -lm
```

Windows
Follow these steps:

1. Use the cl command to build amqzscin.obj by compiling using at least the following:
   ```
   cl.exe -c -IEncinaPath\include -IWebSphereMQPath\include -Gz -LD amqzscin.c
   ```
2. Create a module definition file named mqmc1415.def containing the following lines:
   ```
   LIBRARY MQMC4SWI
   EXPORTS
   CICS_XA_Init
   ```
3. Use the lib command to build an export file and an import library using at least the following:
   ```
   lib -def:mqmc4swi.def -out:mqmc4swi.lib
   ```
   If the lib command is successful then an mqmc4swi.exp will also have been built.
4. Use the link command to build mqmc4swi.dll by linking using at least the following:
   ```
   link.exe -dll -nod -out:mqmc4swi.dll
       amqzscin.obj CicsPath\lib\regxa_swxa.obj
       mqmc4swi.exp mqmcics4.lib
      CicsPath\lib\libcicsrt.lib
      DcePath\lib\libdce.lib DcePath\lib\pthreads.lib
      EncinaPath\lib\libEncina.lib
      EncinaPath\lib\libEncServer.lib
      msvcrt.lib kernel32.lib
   ```

WebSphere MQ XA support and Tuxedo:

WebSphere MQ on Windows and UNIX systems can block Tuxedo-coordinated XA applications indefinitely in xa_start. This can occur only when two or more processes coordinated by Tuxedo in a single global transaction attempt to access

WebSphere MQ using the same transaction branch ID (XID). If Tuxedo gives each process in the global transaction a different XID to use with WebSphere MQ, this cannot occur.

To avoid the problem, configure each application in Tuxedo that accesses WebSphere MQ under a single global transaction ID (gtrid), within its own Tuxedo server group. Processes in the same server group use the same XID when accessing resource managers on behalf of a single gtrid, and are therefore vulnerable to blocking in xa_start in WebSphere MQ. Processes in different server groups use separate XIDs when accessing resource managers and so do not have to serialize their transaction work in WebSphere MQ.

Enabling the CICS two-phase commit process:

To enable CICS to use a two-phase commit process to coordinate transactions that include MQI calls, add a CICS XAD resource definition stanza entry to the CICS region.

Here is an example of adding an XAD stanza entry for WebSphere MQ for Windows, where `<Drive>` is the drive where WebSphere MQ is installed (for example, D:).

```
cicsadd –cxad –r<cics_region> \
     ResourceDescription="MQM XA Product Description" \
     SwitchLoadFile="<Drive>:\Program Files\IBM\WebSphere MQ\bin\mqmc4swi.dll" \
     XAOpen=<queue_manager_name>
```

For extended transactional clients, use the switch load file mqcc4swi.dll.

Here is an example of adding an XAD stanza entry for WebSphere MQ for UNIX systems:

```
cicsadd –cxad –r<cics_region> \
      ResourceDescription="MQM XA Product Description" \
      SwitchLoadFile="/opt/mqm/lib/amqzsc" \
      XAOpen=<queue_manager_name>
```

For extended transactional clients, use the switch load file amqczsc.

For information about using the **cicsadd** command, see the *CICS Administration Reference*, or *CICS Administration Guide* for your platform.

Calls to WebSphere MQ can be included in a CICS transaction, and the WebSphere MQ resources will be committed or rolled back as directed by CICS. This support is not available to client applications.

You ***must*** issue an **MQCONN** from your CICS transaction in order to access WebSphere MQ resources, followed by a corresponding **MQDISC** on exit.

Enabling CICS user exits:

Before using a CICS user exit, read the *CICS Administration Guide* for your platform.

A CICS user exit *point* (normally referred to as a *user exit*) is a place in a CICS module at which CICS can transfer control to a program that you have written (a user exit *program*), and at which CICS can resume control when your exit program has finished its work.

Sample task termination exit:

WebSphere MQ supplies sample source code for a CICS task termination exit in the following directories:

Table 18. CICS task termination exits

Platform	Directory	Source file
AIX	/opt/mqm/samp	amqzscgx.c
Other UNIX systems	/usr/mqm/samp	amqzscgx.c
Windows	c:\Program Files\IBM\Websphere MQ\Tools\c\Samples	amqzscgn.c

The build instructions for the sample task termination exit are contained in the comments near the top of each source file.

This exit is invoked by CICS at normal and abnormal task termination (after any syncpoint has been taken). No recoverable work is permitted in the exit program.

These functions are only used in a WebSphere MQ and CICS context in which the CICS version supports the XA interface. CICS refers to these libraries as ″programs″ or ″user exits″.

CICS has a number of user exits and amqzscgx, if used, is defined and enabled on CICS as the ″Task termination user exit (UE014015)″, that is, exit number 15.

When the task termination exit is called by CICS, CICS has already informed WebSphere MQ of the task's termination state and WebSphere MQ has taken the appropriate action (commit or rollback). All the exit does is to issue an MQDISC to clean up.

One purpose of installing and configuring your CICS system to use a task termination exit is to protect your system against some of the consequences of faulty application code. For example, if your CICS transaction ends abnormally without first calling MQDISC, and has no task termination exit installed, then you might see (within around 10 seconds) a subsequent catastrophic failure of the CICS region. This is because WebSphere MQ's health thread, that runs in the cicsas process, will not have been posted and given time to clean up and return. The symptoms might be that the cicsas process ends immediately, having written FFST reports to /var/mqm/errors or the equivalent location on Windows.

Using the Microsoft Transaction Server (COM+)

COM+ (Microsoft Transaction Server) is designed to help users run business logic applications in a typical middle tier server. COM+ divides work up into *activities*, which are typically short independent chunks of business logic, such as *transfer funds from account A to account B*. COM+ relies heavily on object orientation and in particular on COM; loosely a COM+ activity is represented by a COM (business) object.

COM+ is an integrated part of the operating system. To use COM+ on Windows 2000 and Windows XP, you need Hotfix Q313582 (also known as COM+ Rollup Package 19.1).

COM+ provides three services to the business object administrator, removing much of the worry from the business object programmer:
- Transaction management
- Security
- Resource pooling

You usually use COM+ with front end code that is a COM client to the objects held within COM+, and back end services such as a database, with WebSphere MQ bridging between the COM+ business object and the back end.

The front end code can be a standalone program, or an Active Server Page (ASP) hosted by the Microsoft Internet Information Server (IIS). The front end code can reside on the same computer as COM+ and its business objects, with connection through COM. Alternatively, the front end code can reside on a different computer, with connection through DCOM. You can use different clients to access the same COM+ business object in different situations.

The back end code can reside on the same computer as COM+ and its business objects, or on a different computer with connection through any of the WebSphere MQ supported protocols.

For detailed information on using COM+, including how to configure it, and how to develop your applications and object code, read the *WebSphere MQ COM+ Component Services Support* part of the WebSphere MQ Help Center.

The WebSphere MQ dead-letter queue handler

A *dead-letter queue* (DLQ), sometimes referred to as an *undelivered-message queue*, is a holding queue for messages that cannot be delivered to their destination queues. Every queue manager in a network should have an associated DLQ.

Messages can be put on the DLQ by queue managers, message channel agents (MCAs), and applications. All messages on the DLQ must be prefixed with a *dead-letter header* structure, MQDLH.

Messages put on the DLQ by a queue manager or a message channel agent always have an MQDLH; applications putting messages on the DLQ must supply an MQDLH. The *Reason* field of the MQDLH structure contains a reason code that identifies why the message is on the DLQ.

All WebSphere MQ environments need a routine to process messages on the DLQ regularly. WebSphere MQ supplies a default routine, called the *dead-letter queue handler* (the DLQ handler), which you invoke using the **runmqdlq** command.

Instructions for processing messages on the DLQ are supplied to the DLQ handler by means of a user-written *rules table*. That is, the DLQ handler matches messages on the DLQ against entries in the rules table; when a DLQ message matches an entry in the rules table, the DLQ handler performs the action associated with that entry.

This chapter contains the following sections:
- "Invoking the DLQ handler" on page 193
- "The DLQ handler rules table" on page 194
- "How the rules table is processed" on page 199
- "An example DLQ handler rules table" on page 201

Invoking the DLQ handler

Invoke the DLQ handler using the **runmqdlq** command. You can name the DLQ you want to process and the queue manager you want to use in two ways:

- As parameters to **runmqdlq** from the command prompt. For example:
  ```
  runmqdlq ABC1.DEAD.LETTER.QUEUE ABC1.QUEUE.MANAGER <qrule.rul
  ```
- In the rules table. For example:
  ```
  INPUTQ(ABC1.DEAD.LETTER.QUEUE) INPUTQM(ABC1.QUEUE.MANAGER)
  ```

The above examples apply to the DLQ called ABC1.DEAD.LETTER.QUEUE, owned by the queue manager ABC1.QUEUE.MANAGER.

If you do not specify the DLQ or the queue manager as shown above, the default queue manager for the installation is used along with the DLQ belonging to that queue manager.

The **runmqdlq** command takes its input from `stdin`; you associate the rules table with **runmqdlq** by redirecting `stdin` from the rules table.

To run the DLQ handler you must be authorized to access both the DLQ itself and any message queues to which messages on the DLQ are forwarded. For the DLQ handler to put messages on queues with the authority of the user ID in the message context, you must also be authorized to assume the identity of other users.

For more information about the **runmqdlq** command, see "runmqdlq (run dead-letter queue handler)" on page 347.

The sample DLQ handler, amqsdlq

In addition to the DLQ handler invoked using the **runmqdlq** command, WebSphere MQprovides the source of a sample DLQ handler, amqsdlq, whose function is similar to that provided by **runmqdlq**. You can customize amqsdlq to provide a DLQ handler that meets your requirements. For example, you might decide that you want a DLQ handler that can process messages without dead-letter headers. (Both the default DLQ handler and the sample, amqsdlq, process only those messages on the DLQ that begin with a dead-letter header, MQDLH. Messages that do not begin with an MQDLH are identified as being in error, and remain on the DLQ indefinitely.)

In WebSphere MQ for Windows, the source of amqsdlq is supplied in the directory:

```
c:\Program Files\IBM\WebSphere MQ\tools\c\samples\dlq
```

and the compiled version is supplied in the directory:

```
c:\Program Files\IBM\WebSphere MQ\tools\c\samples\bin
```

In WebSphere MQ for UNIX systems, the source of amqsdlq is supplied in the directory:

`/opt/mqm/samp/dlq` (`/usr/mqm/samp/dlq` on AIX)

and the compiled version is supplied in the directory:

`/opt/mqm/samp/bin` (`/usr/mqm/samp/bin` on AIX)

The DLQ handler rules table

The DLQ handler rules table defines how the DLQ handler is to process messages that arrive on the DLQ. There are two types of entry in a rules table:

- The first entry in the table, which is optional, contains *control data*.
- All other entries in the table are *rules* for the DLQ handler to follow. Each rule consists of a *pattern* (a set of message characteristics) that a message is matched against, and an *action* to be taken when a message on the DLQ matches the specified pattern. There must be at least one rule in a rules table.

Each entry in the rules table comprises one or more keywords.

Control data

This section describes the keywords that you can include in a control-data entry in a DLQ handler rules table. Note the following:

- The default value for a keyword, if any, is underlined.
- The vertical line (|) separates alternatives, only one of which can be specified.
- All keywords are optional.

INPUTQ (*QueueName***|'_')**
The name of the DLQ you want to process:

1. Any INPUTQ value you supply as a parameter to the **runmqdlq** command overrides any INPUTQ value in the rules table.
2. If you do not specify an INPUTQ value as a parameter to the **runmqdlq** command, but you **do** specify a value in the rules table, the INPUTQ value in the rules table is used.
3. If no DLQ is specified or you specify INPUTQ(' ') in the rules table, the name of the DLQ belonging to the queue manager whose name is supplied as a parameter to the **runmqdlq** command is used.
4. If you do not specify an INPUTQ value as a parameter to the **runmqdlq** command or as a value in the rules table, the DLQ belonging to the queue manager named on the INPUTQM keyword in the rules table is used.

INPUTQM (*QueueManagerName***|'_')**
The name of the queue manager that owns the DLQ named on the INPUTQ keyword:

1. Any INPUTQM value you supply as a parameter to the **runmqdlq** command overrides any INPUTQM value in the rules table.
2. If you do not specify an INPUTQM value as a parameter to the **runmqdlq** command, the INPUTQM value in the rules table is used.
3. If no queue manager is specified or you specify INPUTQM(' ') in the rules table, the default queue manager for the installation is used.

RETRYINT (*Interval***|60)**
The interval, in seconds, at which the DLQ handler should reprocess messages on the DLQ that could not be processed at the first attempt, and for which repeated attempts have been requested. By default, the retry interval is 60 seconds.

WAIT (YES|NO|*nnn***)**
Whether the DLQ handler should wait for further messages to arrive on the DLQ when it detects that there are no further messages that it can process.

YES The DLQ handler waits indefinitely.

NO The DLQ handler ends when it detects that the DLQ is either empty or contains no messages that it can process.

nnn The DLQ handler waits for *nnn* seconds for new work to arrive before ending, after it detects that the queue is either empty or contains no messages that it can process.

Specify WAIT (YES) for busy DLQs, and WAIT (NO) or WAIT (*nnn*) for DLQs that have a low level of activity. If the DLQ handler is allowed to terminate, invoke it again using triggering. For more information about triggering, see the WebSphere MQ Application Programming Guide.

An alternative to including control data in the rules table is to supply the names of the DLQ and its queue manager as input parameters to the **runmqdlq** command. If you specify a value both in the rules table and as input to the **runmqdlq** command, the value specified on the **runmqdlq** command takes precedence.

If you include a control-data entry in the rules table, it must be the **first** entry in the table.

Rules (patterns and actions)

Here is an example rule from a DLQ handler rules table:

```
PERSIST(MQPER_PERSISTENT) REASON (MQRC_PUT_INHIBITED) +
 ACTION (RETRY) RETRY (3)
```

This rule instructs the DLQ handler to make three attempts to deliver to its destination queue any persistent message that was put on the DLQ because **MQPUT** and **MQPUT1** were inhibited.

All keywords that you can use on a rule are described in the rest of this section. Note the following:

- The default value for a keyword, if any, is underlined. For most keywords, the default value is * (asterisk), which matches any value.
- The vertical line (|) separates alternatives, only one of which can be specified.
- All keywords except ACTION are optional.

This section begins with a description of the pattern-matching keywords (those against which messages on the DLQ are matched), and then describes the action keywords (those that determine how the DLQ handler is to process a matching message).

The pattern-matching keywords:

The pattern-matching keywords, which you use to specify values against which messages on the DLQ are matched, are described below. All pattern-matching keywords are optional.

APPLIDAT (*ApplIdentityData***|<u>*</u>)**
The *ApplIdentityData* value specified in the message descriptor, MQMD, of the message on the DLQ.

APPLNAME (*PutApplName***|<u>*</u>)**
The name of the application that issued the **MQPUT** or **MQPUT1** call, as specified in the *PutApplName* field of the message descriptor MQMD of the message on the DLQ.

APPLTYPE (*PutApplType***|*)**
The *PutApplType* value, specified in the message descriptor MQMD, of the message on the DLQ.

DESTQ (*QueueName***|*)**
The name of the message queue for which the message is destined.

DESTQM (*QueueManagerName***|*)**
The name of the queue manager of the message queue for which the message is destined.

FEEDBACK (*Feedback***|*)**
When the *MsgType* value is MQFB_REPORT, *Feedback* describes the nature of the report.

You can use symbolic names. For example, you can use the symbolic name MQFB_COA to identify those messages on the DLQ that need confirmation of their arrival on their destination queues.

FORMAT (*Format***|*)**
The name that the sender of the message uses to describe the format of the message data.

MSGTYPE (*MsgType***|*)**
The message type of the message on the DLQ.

You can use symbolic names. For example, you can use the symbolic name MQMT_REQUEST to identify those messages on the DLQ that need replies.

PERSIST (*Persistence***|*)**
The persistence value of the message. (The persistence of a message determines whether it survives restarts of the queue manager.)

You can use symbolic names. For example, you can use the symbolic name MQPER_PERSISTENT to identify messages on the DLQ that are persistent.

REASON (*ReasonCode***|*)**
The reason code that describes why the message was put to the DLQ.

You can use symbolic names. For example, you can use the symbolic name MQRC_Q_FULL to identify those messages placed on the DLQ because their destination queues were full.

REPLYQ (*QueueName***|*)**
The name of the reply-to queue specified in the message descriptor, MQMD, of the message on the DLQ.

REPLYQM (*QueueManagerName***|*)**
The name of the queue manager of the reply-to queue, as specified in the message descriptor, MQMD, of the message on the DLQ.

USERID (*UserIdentifier***|*)**
The user ID of the user who originated the message on the DLQ, as specified in the message descriptor, MQMD.

The action keywords:

The action keywords, used to describe how a matching message is to be processed, are described below.

ACTION (DISCARD|IGNORE|RETRY|FWD)
The action to be taken for any message on the DLQ that matches the pattern defined in this rule.

DISCARD
Delete the message from the DLQ.

IGNORE
Leave the message on the DLQ.

RETRY
If the first attempt to put the message on its destination queue fails, try again. The RETRY keyword sets the number of tries made to implement an action. The RETRYINT keyword of the control data controls the interval between attempts.

FWD Forward the message to the queue named on the FWDQ keyword.

You must specify the ACTION keyword.

FWDQ (*QueueName***|&DESTQ|&REPLYQ)**
The name of the message queue to which to forward the message when ACTION (FWD) is requested.

QueueName
The name of a message queue. FWDQ(' ') is not valid.

&DESTQ
Take the queue name from the *DestQName* field in the MQDLH structure.

&REPLYQ
Take the queue name from the *ReplyToQ* field in the message descriptor, MQMD.

To avoid error messages when a rule specifying FWDQ (&REPLYQ) matches a message with a blank *ReplyToQ* field, specify REPLYQ (?*) in the message pattern.

FWDQM (*QueueManagerName***|&DESTQM|&REPLYQM|'** __**'**__**)**
The queue manager of the queue to which to forward a message.

QueueManagerName
The name of the queue manager of the queue to which to forward a message when ACTION (FWD) is requested.

&DESTQM
Take the queue manager name from the *DestQMgrName* field in the MQDLH structure.

&REPLYQM
Take the queue manager name from the *ReplyToQMgr* field in the message descriptor, MQMD.

' ' FWDQM(' '), which is the default value, identifies the local queue manager.

HEADER (__**YES**__**|NO)**
Whether the MQDLH should remain on a message for which ACTION (FWD) is requested. By default, the MQDLH remains on the message. The HEADER keyword is not valid for actions other than FWD.

PUTAUT (__**DEF**__**|CTX)**
The authority with which messages should be put by the DLQ handler:

DEF Put messages with the authority of the DLQ handler itself.

CTX Put the messages with the authority of the user ID in the message context. If you specify PUTAUT (CTX), you must be authorized to assume the identity of other users.

RETRY (*RetryCount***|1)**
The number of times, in the range 1–999 999 999, to try an action (at the interval specified on the RETRYINT keyword of the control data). The count of attempts made by the DLQ handler to implement any particular rule is specific to the current instance of the DLQ handler; the count does not persist across restarts. If the DLQ handler is restarted, the count of attempts made to apply a rule is reset to zero.

Rules table conventions

The rules table must adhere to the following conventions regarding its syntax, structure, and contents:

- A rules table must contain at least one rule.
- Keywords can occur in any order.
- A keyword can be included only once in any rule.
- Keywords are not case-sensitive.
- A keyword and its parameter value must be separated from other keywords by at least one blank or comma.
- There can be any number of blanks at the beginning or end of a rule, and between keywords, punctuation, and values.
- Each rule must begin on a new line.
- For reasons of portability, the significant length of a line must not be greater than 72 characters.
- Use the plus sign (+) as the last nonblank character on a line to indicate that the rule continues from the first nonblank character in the next line. Use the minus sign (-) as the last nonblank character on a line to indicate that the rule continues from the start of the next line. Continuation characters can occur within keywords and parameters.

  For example:

  ```
  APPLNAME('ABC+
    D')
  ```

  results in ’ABCD’, and

  ```
  APPLNAME('ABC-
    D')
  ```

  results in ’ABC D’.
- Comment lines, which begin with an asterisk (*), can occur anywhere in the rules table.
- Blank lines are ignored.
- Each entry in the DLQ handler rules table comprises one or more keywords and their associated parameters. The parameters must follow these syntax rules:
  – Each parameter value must include at least one significant character. The delimiting quotation marks in quoted values are not considered significant. For example, these parameters are valid:

`FORMAT('ABC')`	3 significant characters
`FORMAT(ABC)`	3 significant characters
`FORMAT('A')`	1 significant character
`FORMAT(A)`	1 significant character
`FORMAT(' ')`	1 significant character

These parameters are invalid because they contain no significant characters:

```
FORMAT('')
FORMAT( )
FORMAT()
FORMAT
```

- Wildcard characters are supported. You can use the question mark (?) instead of any single character, except a trailing blank; you can use the asterisk (*) instead of zero or more adjacent characters. The asterisk (*) and the question mark (?) are ***always*** interpreted as wildcard characters in parameter values.
- Wildcard characters cannot be included in the parameters of these keywords: ACTION, HEADER, RETRY, FWDQ, FWDQM, and PUTAUT.
- Trailing blanks in parameter values, and in the corresponding fields in the message on the DLQ, are not significant when performing wildcard matches. However, leading and embedded blanks within strings in quotation marks are significant to wildcard matches.
- Numeric parameters cannot include the question mark (?) wildcard character. You can use the asterisk (*) instead of an entire numeric parameter, but not as part of a numeric parameter. For example, these are valid numeric parameters:

`MSGTYPE(2)`	Only reply messages are eligible
`MSGTYPE(*)`	Any message type is eligible
`MSGTYPE('*')`	Any message type is eligible

  However, `MSGTYPE('2*')` is not valid, because it includes an asterisk (*) as part of a numeric parameter.
- Numeric parameters must be in the range 0–999 999 999. If the parameter value is in this range, it is accepted, even if it is not currently valid in the field to which the keyword relates. You can use symbolic names for numeric parameters.
- If a string value is shorter than the field in the MQDLH or MQMD to which the keyword relates, the value is padded with blanks to the length of the field. If the value, excluding asterisks, is longer than the field, an error is diagnosed. For example, these are all valid string values for an 8 character field:

`'ABCDEFGH'`	8 characters
`'A*C*E*G*I'`	5 characters excluding asterisks
`'*A*C*E*G*I*K*M*O*'`	8 characters excluding asterisks

- Enclose strings that contain blanks, lowercase characters, or special characters other than period (.), forward slash (/), underscore (_), and percent sign (%) in single quotation marks. Lowercase characters not enclosed in quotation marks are folded to uppercase. If the string includes a quotation, use two single quotation marks to denote both the beginning and the end of the quotation. When the length of the string is calculated, each occurrence of double quotation marks is counted as a single character.

How the rules table is processed

The DLQ handler searches the rules table for a rule whose pattern matches a message on the DLQ. The search begins with the first rule in the table, and continues sequentially through the table. When the DLQ handler finds a rule with a matching pattern, it takes the action from that rule. The DLQ handler increments the retry count for a rule by 1 whenever it applies that rule. If the first try fails, the DLQ handler tries again until the number of tries matches the number specified on the RETRY keyword. If all attempts fail, the DLQ handler searches for the next matching rule in the table.

This process is repeated for subsequent matching rules until an action is successful. When each matching rule has been attempted the number of times specified on its RETRY keyword, and all attempts have failed, ACTION (IGNORE) is assumed. ACTION (IGNORE) is also assumed if no matching rule is found.

Note:

1. Matching rule patterns are sought only for messages on the DLQ that begin with an MQDLH. Messages that do not begin with an MQDLH are reported periodically as being in error, and remain on the DLQ indefinitely.
2. All pattern keywords can be allowed to default, such that a rule can consist of an action only. Note, however, that action-only rules are applied to all messages on the queue that have MQDLHs and that have not already been processed in accordance with other rules in the table.
3. The rules table is validated when the DLQ handler starts, and errors are flagged at that time. (Error messages issued by the DLQ handler are described in WebSphere MQ Messages.) You can make changes to the rules table at any time, but those changes do not come into effect until the DLQ handler restarts.
4. The DLQ handler does not alter the content of messages, the MQDLH, or the message descriptor. The DLQ handler always puts messages to other queues with the message option MQPMO_PASS_ALL_CONTEXT.
5. Consecutive syntax errors in the rules table might not be recognized because the rules table is designed to eliminate the generation of repetitive errors during validation.
6. The DLQ handler opens the DLQ with the MQOO_INPUT_AS_Q_DEF option.
7. Multiple instances of the DLQ handler can run concurrently against the same queue, using the same rules table. However, it is more usual for there to be a one-to-one relationship between a DLQ and a DLQ handler.

Ensuring that all DLQ messages are processed

The DLQ handler keeps a record of all messages on the DLQ that have been seen but not removed. If you use the DLQ handler as a filter to extract a small subset of the messages from the DLQ, the DLQ handler still has to keep a record of those messages on the DLQ that it did not process. Also, the DLQ handler cannot guarantee that new messages arriving on the DLQ are seen, even if the DLQ is defined as first-in-first-out (FIFO). If the queue is not empty, the DLQ is periodically re-scanned to check all messages.

For these reasons, try to ensure that the DLQ contains as few messages as possible; if messages that cannot be discarded or forwarded to other queues (for whatever reason) are allowed to accumulate on the queue, the workload of the DLQ handler increases and the DLQ itself can fill up.

You can take specific measures to enable the DLQ handler to empty the DLQ. For example, try not to use ACTION (IGNORE), which simply leaves messages on the DLQ. (Remember that ACTION (IGNORE) is assumed for messages that are not explicitly addressed by other rules in the table.) Instead, for those messages that you would otherwise ignore, use an action that moves the messages to another queue. For example:

```
ACTION (FWD) FWDQ (IGNORED.DEAD.QUEUE) HEADER (YES)
```

Similarly, make the final rule in the table a catchall to process messages that have not been addressed by earlier rules in the table. For example, the final rule in the table could be something like this:

```
ACTION (FWD) FWDQ (REALLY.DEAD.QUEUE) HEADER (YES)
```

This forwards messages that fall through to the final rule in the table to the queue `REALLY.DEAD.QUEUE`, where they can be processed manually. If you do not have such a rule, messages are likely to remain on the DLQ indefinitely.

An example DLQ handler rules table

The following example rules table contains a single control-data entry and several rules:

```
*************************************************************************
*       An example rules table for the runmqdlq command                *
*************************************************************************
* Control data entry
* ------------------
* If no queue manager name is supplied as an explicit parameter to
* runmqdlq, use the default queue manager for the machine.
* If no queue name is supplied as an explicit parameter to runmqdlq,
* use the DLQ defined for the local queue manager.
*
inputqm(' ')  inputq(' ')

* Rules
* -----
* We include rules with ACTION (RETRY) first to try to
* deliver the message to the intended destination.
* If a message is placed on the DLQ because its destination
* queue is full, attempt to forward the message to its
* destination queue. Make 5 attempts at approximately
* 60-second intervals (the default value for RETRYINT).

REASON(MQRC_Q_FULL) ACTION(RETRY) RETRY(5)

* If a message is placed on the DLQ because of a put inhibited
* condition, attempt to forward the message to its
* destination queue. Make 5 attempts at approximately
* 60-second intervals (the default value for RETRYINT).

REASON(MQRC_PUT_INHIBITED) ACTION(RETRY) RETRY(5)

* The AAAA corporation are always sending messages with incorrect
* addresses. When we find a request from the AAAA corporation,
* we return it to the DLQ (DEADQ) of the reply-to queue manager
* (&REPLYQM).
* The AAAA DLQ handler attempts to redirect the message.

MSGTYPE(MQMT_REQUEST) REPLYQM(AAAA.*) +
  ACTION(FWD) FWDQ(DEADQ) FWDQM(&REPLYQM)

* The BBBB corporation never do things by half measures. If
* the queue manager BBBB.1 is unavailable, try to
* send the message to BBBB.2

DESTQM(bbbb.1) +
  action(fwd) fwdq(&DESTQ) fwdqm(bbbb.2) header(no)

* The CCCC corporation considers itself very security
* conscious, and believes that none of its messages
* will ever end up on one of our DLQs.
* Whenever we see a message from a CCCC queue manager on our
* DLQ, we send it to a special destination in the CCCC organization
* where the problem is investigated.

REPLYQM(CCCC.*) +
  ACTION(FWD) FWDQ(ALARM) FWDQM(CCCC.SYSTEM)

* Messages that are not persistent run the risk of being
* lost when a queue manager terminates. If an application
* is sending nonpersistent messages, it should be able
* to cope with the message being lost, so we can afford to
* discard the message.   PERSIST(MQPER_NOT_PERSISTENT) ACTION(DISCARD)
* For performance and efficiency reasons, we like to keep
* the number of messages on the DLQ small.
* If we receive a message that has not been processed by
* an earlier rule in the table, we assume that it
* requires manual intervention to resolve the problem.
* Some problems are best solved at the node where the
* problem was detected, and others are best solved where
* the message originated. We don't have the message origin,
* but we can use the REPLYQM to identify a node that has
* some interest in this message.
* Attempt to put the message onto a manual intervention
* queue at the appropriate node. If this fails,
* put the message on the manual intervention queue at
* this node.

REPLYQM('?*') +
  ACTION(FWD) FWDQ(DEADQ.MANUAL.INTERVENTION) FWDQM(&REPLYQM)

ACTION(FWD) FWDQ(DEADQ.MANUAL.INTERVENTION)
```

Supporting the Microsoft Cluster Service (MSCS)

This information applies to WebSphere MQ for Windows only.

The Microsoft Cluster Service (MSCS) enables you to connect servers into a *cluster*, giving higher availability of data and applications, and making it easier to manage the system. MSCS can automatically detect and recover from server or application failures.

MSCS supports *failover* of *virtual servers*, which correspond to applications, Web sites, print queues, or file shares (including their disk spindles, files, IP addresses, and so on).

Failover is the process by which MSCS detects a failure in an application on one computer in the cluster, and shuts down the disrupted application in an orderly manner, transfers its state data to the other computer, and re-initiates the application there.

This chapter introduces MSCS clusters and describes setting up MSCS support in the following sections:
- "Introducing MSCS clusters" on page 203
- "Setting up WebSphere MQ for MSCS clustering" on page 204

Then tells you how to configure WebSphere MQ for MSCS clustering, in the following sections:

- “Creating a queue manager for use with MSCS” on page 207
- “Moving a queue manager to MSCS storage” on page 207
- “Putting a queue manager under MSCS control” on page 209
- “Removing a queue manager from MSCS control” on page 211

And then gives some useful hints on using MSCS with WebSphere MQ, and details the WebSphere MQ MSCS support utility programs, in the following sections:

- “Hints and tips on using MSCS” on page 212
- “WebSphere MQ MSCS support utility programs” on page 216

Introducing MSCS clusters

Before we start to look at MSCS clusters, we need to distinguish between them and WebSphere MQ clusters:

WebSphere MQ clusters
are groups or two or more queue managers on one or more computers, providing automatic interconnection, and allowing queues to be shared amongst them for load balancing and redundancy.

MSCS clusters
are groups of two or more computers, connected together and configured in such a way that, if one fails, MSCS performs a *failover*, transferring the state data of applications from the failing computer to another computer in the cluster and reinitiating their operation there.

In the rest of this book, *clusters* means WebSphere MQ clusters. In this chapter, *clusters* **always** means MSCS clusters.

Let us start by looking at a two-machine cluster. A two-machine cluster comprises two computers (for example, A and B) that are jointly connected to a network for client access using a *virtual IP address*. They might also be connected to each other by one or more private networks. A and B share at least one disk for the server applications on each to use. There is also another shared disk, which must be a redundant array of independent disks (*RAID*) Level 1, for the exclusive use of MSCS; this is known as the *quorum* disk. MSCS monitors both computers to check that the hardware and software are running correctly.

In a simple setup such as this, both computers have all the applications installed on them, but only computer A runs with live applications; computer B is just running and waiting. If computer A encounters any one of a range of problems, MSCS shuts down the disrupted application in an orderly manner, transfers its state data to the other computer, and re-initiates the application there. This is known as a *failover*. Applications can be made *cluster-aware* so that they interact fully with MSCS and failover gracefully.

A typical setup for a two-computer cluster is as shown in Figure 21 on page 204.

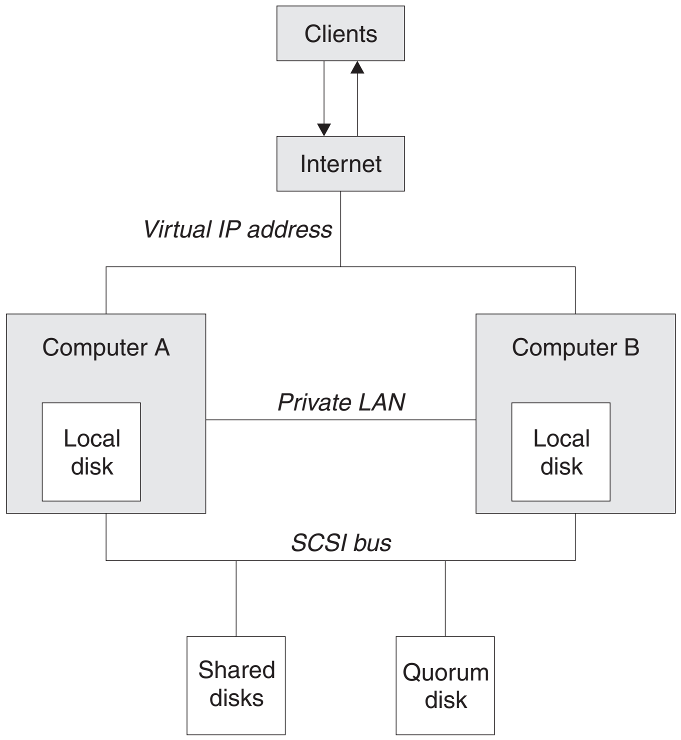


Figure 21. Two-computer MSCS cluster

Each computer can access the shared disk, but only one at a time, under the control of MSCS. In the event of a failover, MSCS switches the access to the other computer. The shared disk itself is usually a RAID, but need not be.

Each computer is connected to the external network for client access, and each has an IP address. However an external client, communicating with this cluster, sees only one *virtual IP address*, and MSCS routes the IP traffic within the cluster appropriately.

MSCS also performs its own communications between the two computers, either over one or more private connections or over the public network, in order to monitor their states using the heartbeat, synchronize their databases, and so on.

Setting up WebSphere MQ for MSCS clustering

You configure WebSphere MQ for clustering by making the queue manager the unit of failover to MSCS. You define a queue manager as a resource to MSCS, which can then monitor it, and transfer it to another computer in the cluster if there is a problem.

To set your system up for this, you start by installing WebSphere MQ on each computer in the cluster. WebSphere MQ for Windows Quick Beginnings tells you how to do this.

The queue managers themselves need to exist only on the computer on which you create them. In the event of a failover, the MSCS initiates the queue managers on the other computer. The queue managers, however, must have their log and data files on a cluster shared disk, and not on a local drive. If you have a queue manager already installed on a local drive, you can migrate it using a tool provided with WebSphere MQ; see "Moving a queue manager to MSCS storage" on page 207 on page 207. If you want to create new queue managers for use with MSCS, see "Creating a queue manager for use with MSCS" on page 207.

After installation and migration, use the MSCS Cluster Administrator to make MSCS aware of your queue managers; see "Putting a queue manager under MSCS control" on page 209.

If you decide to remove a queue manager from MSCS control, use the procedure described in "Removing a queue manager from MSCS control" on page 211.

Setup symmetry

When an application switches from one node to the other it must behave in the same way, regardless of node. The best way of ensuring this is to make the environments identical. If you can, set up a cluster with identical hardware, operating system software, product software, and configuration on each computer. In particular, ensure that all the required software installed on the two computers is identical in terms of version, maintenance level, SupportPacs, paths and exits (as described WebSphere MQ for Windows Quick Beginnings), and that there is a common namespace (security environment) as described in "MSCS security."

MSCS security

Start by making sure you have identical software installations on each computer in the cluster, as described in WebSphere MQ for Windows Quick Beginnings.

For successful MSCS security, follow these guidelines:
- Create a common namespace (security environment) across the cluster.
- Make the nodes of the MSCS cluster members of a domain, within which the user account that is the *cluster owner* is a domain account.
- Make the other user accounts on the cluster also domain accounts, so that they are available on both nodes. This is automatically the case if you already have a domain, and the accounts relevant to WebSphere MQ are domain accounts. If you do not currently have a domain, consider setting up a *mini-domain* to cater for the cluster nodes and relevant accounts. Your aim is to make your cluster of two computers look like a single computing resource.

  Remember that an account that is local to one computer does not exist on the other one. Even if you create an account with the same name on the other computer, its security identifier (SID) is different, so, when your application is moved to the other node, the permissions do not exist on that node.

During a failover or move, WebSphere MQ MSCS support ensures that all files that contain queue manager objects have equivalent permissions on the destination node. Explicitly, the code checks that the Administrators and mqm groups, and the SYSTEM account, have full control, and that if `Everyone` had read access on the old node, that permission is added on the destination node.

You can use a domain account to run your WebSphere MQ Service. Make sure that it exists in the local mqm group on each computer in the cluster.

Using multiple queue managers with MSCS

If you are running more than one queue manager on a computer, you can choose one of the following setups:

- All the queue managers in a single group. In this configuration, if a problem occurs with any queue manager, all the queue managers in the group failover to the other computer as a group.
- A single queue manager in each group. In this configuration, if a problem occurs with the queue manager, it alone fails over to the other computer without affecting the other queue managers.
- A mixture of the first two setups.

Cluster modes

There are two modes in which you might run a cluster system with WebSphere MQ:
- Active/Passive
- Active/Active

Note: If you are using MSCS together with the Microsoft Transaction Server (COM+), you cannot use Active/Active mode.

Active/Passive mode:

In Active/Passive mode, computer A has the running application on it, and computer B is backup, only being used when MSCS detects a problem.

You can use this mode with only one shared disk, but, if any application causes a failover, **all** the applications must be transferred as a group (because only one computer can access the shared disk at a time).

You can configure MSCS with A as the *preferred* computer. Then, when computer A has been repaired or replaced and is working properly again, MSCS detects this and automatically switches the application back to computer A.

If you run more than one queue manager, consider having a separate shared disk for each. Then put each queue manager in a separate group in MSCS. In this way, any queue manager can failover to the other computer without affecting the other queue managers.

Active/Active mode:

In Active/Active mode, computers A and B both have running applications, and the groups on each computer are set to use the other computer as backup. If a failure is detected on computer A, MSCS transfers the state data to computer B, and reinitiates the application there. computer B then runs its own application and A's.

For this setup you need at least two shared disks. You can configure MSCS with A as the preferred computer for A's applications, and B as the preferred computer for B's applications. After failover and repair, each application automatically ends up back on its own computer.

For WebSphere MQ this means that you could, for example, run two queue managers, one on each of A and B, with each exploiting the full power of its own computer. After a failure on computer A, both queue managers would run on computer B. This would mean sharing the power of the one computer, with a reduced ability to process large quantities of data at speed. However, your critical applications would still be available while you find and repair the fault on A.

Creating a queue manager for use with MSCS

This procedure ensures that a new queue manager is created in such a way that it is suitable for preparing and placing under MSCS control.

You start by creating the queue manager with all its resources on a local drive, and then migrate the log files and data files to a shared disk. (You can reverse this operation.) Do **not** attempt to create a queue manager with its resources on a shared drive.

You can create a queue manager for use with MSCS in two ways, either from a command prompt, or in the WebSphere MQ Explorer. The advantage of doing using a command prompt is that the queue manager is created *stopped* and set to *manual startup*, which is ready for MSCS. (The WebSphere MQ Explorer automatically starts a new queue manager and sets it to automatic startup after creation. You have to change this.)

Creating a queue manager from a command prompt

1. Ensure that you have the environment variable `MQSPREFIX` set to refer to a local drive, for example `C:\WebSphere MQ`. If you change this, reboot the machine so that the System account picks up the change. If you do not set the variable, the queue manager is created in the WebSphere MQ default directory for queue managers.
2. Create the queue manager using the **crtmqm** command. For example, to create a queue manager called `mscs_test` in the default directory, use:
   ```
   crtmqm mscs_test
   ```
3. Proceed to "Moving a queue manager to MSCS storage."

Creating a queue manager using the WebSphere MQ Explorer

1. Start the WebSphere MQ Explorer from the Start menu.
2. In the Navigator View, expand the tree nodes to find the **Queue Managers** tree node.
3. Right-click the **Queue Managers** tree node, and select **New**->**Queue Manager**. The Create Queue Manager panel is displayed.
4. Complete the dialog (Step 1), then click **Next>**.
5. Complete the dialog (Step 2), then click **Next>**.
6. Complete the dialog (Step 3), ensuring that **Start Queue Manager** and **Create Server Connection Channel** are not selected, then click **Next>**.
7. Complete the dialog (Step 4), then click **Finish**.
8. Proceed to "Moving a queue manager to MSCS storage."

Moving a queue manager to MSCS storage

This procedure configures an existing queue manager to make it suitable for putting under MSCS control. To achieve this, you move the log files and data files to shared disks to make them available to the other computer in the event of a failure. For example, the existing queue manager might have paths such as `C:\WebSphere MQ\log\<QMname>` and `C:\WebSphere MQ\qmgrs\<QMname>`. Do ***not*** try to move the files by hand; use the utility program supplied as part of WebSphere MQ MSCS Support as described below.

If the queue manager being moved uses SSL connections and the SSL key repository is in the queue manager data directory on the local machine, then the key repository will be moved with the rest of the queue manager to the shared disk. By default, the queue manager attribute that specifies the SSL key repository location, SSLKEYR, is set to `<mqmtop>\qmgrs\QMGRNAME\ssl\key`, which is under the queue manager data directory. The `hamvmqm` command does not modify this queue manager attribute. In this situation you must modify the queue manager attribute, SSLKEYR, using the WebSphere MQ Explorer or the MQSC command `ALTER QMGR`, to point to the new SSL key repository file.

The procedure is:

1. Shut down the queue manager, and check that there are no errors.
2. If the queue manager's log files or queue files are already stored on a shared disk, skip the rest of this procedure and proceed directly to "Putting a queue manager under MSCS control" on page 209.
3. Make a full media backup of the queue files and log files and store the backup in a safe place (see "Queue manager log files" on page 214 for why this is important).
4. If you already have a suitable shared disk resource proceed to step 6. Otherwise, using the MSCS Cluster Administrator to create a resource of type *shared disk* with sufficient capacity to store the queue manager log files and data (queue) files.
5. Test the shared disk by using the MSCS Cluster Administrator to move it from one cluster node to the other and back again.
6. Make sure that the shared disk is online on the cluster node where the queue manager log and data files are stored locally.
7. Run the utility program to move the queue manager as follows:
   ```
   hamvmqm /m qmname /dd "e:\WebSphere MQ" /ld e:\WebSphere MQ\log"
   ```
   substituting your queue manager name for *qmname*, your shared disk drive letter for *e*, and your chosen directory for *WebSphere MQ*. The directories are created if they do not already exist.
8. Test the queue manager to ensure that it works, using the WebSphere MQ Explorer. For example:
   a. Right-click the queue manager tree node, then select **Start**. The queue manager starts.
   b. Right-click the **Queues** tree node, then select **New**->**Local Queue...**, and give the queue a name.
   c. Click **Finish**.
   d. Right-click the queue, then select **Put Test Message...**. The Put Test Message panel is displayed.
   e. Type some message text, then click **Put Test Message**, and close the panel.
   f. Right-click the queue, then select **Browse Messages...**. The Message Browser panel is displayed.
   g. Ensure your message is on the queue, then click **Close** . The Message Browser panel closes.
   h. Right-click the queue, then select **Clear Messages...**. The messages on the queue are cleared.
   i. Right-click the queue, then select **Delete...**. A confirmation panel is displayed, click **OK**. The queue is deleted.
   j. Right-click the queue manager tree node, then select **Stop...**. The End Queue Manager panel is displayed.
   k. Click **OK**. The queue manager stops.

9. As WebSphere MQ Administrator ensure that the startup attribute of the queue manager is set to manual. In the WebSphere MQ Explorer, set the Startup field to `manual` in the queue manager properties panel.
10. Proceed to "Putting a queue manager under MSCS control."

Putting a queue manager under MSCS control

Before you put a queue manager under MSCS control:

1. Ensure that WebSphere MQ and its MSCS Support is installed on both machines in the cluster and that the software on each computer is identical, as described in "Setting up WebSphere MQ for MSCS clustering" on page 204.
2. Use the **haregtyp** utility program to register WebSphere MQ as an MSCS resource type on all of the cluster nodes. See "WebSphere MQ MSCS support utility programs" on page 216 for additional information.
3. If you have not yet created the queue manager, see "Creating a queue manager for use with MSCS" on page 207.
4. If you have created the queue manager, or it already exists, ensure that you have carried out the procedure in "Moving a queue manager to MSCS storage" on page 207.
5. Stop the queue manager, if it is running, using either a command prompt or the WebSphere MQ Explorer.
6. Test MSCS operation of the shared drives before going on to the procedure below.

To place a queue manager under MSCS control:

1. Log in to the cluster node computer hosting the queue manager, or log in to a remote workstation as a user with cluster administration permissions, and connect to the cluster node hosting the queue manager.
2. Start the MSCS Cluster Administrator.
3. Open a connection to the cluster.
4. Create an MSCS group to be used to contain the resources for the queue manager. Name the group in such a way that it is obvious which queue manager it relates to. Each group can contain multiple queue managers, as described in "Using multiple queue managers with MSCS" on page 205.

   Use the group for all the remaining steps.
5. Create a resource instance for each of the SCSI logical drives that the queue manager uses.

   You can use one drive to store both the logs and queue files, or you can split them up across drives. In either case, if each queue manager has its own shared disk, ensure that all drives used by this queue manager are exclusive to this queue manager, that is, that nothing else relies on the drives. Also ensure that you create a resource instance for every drive that the queue manager uses.

   The resource type for a drive depends on the SCSI support you are using; refer to your SCSI adapter instructions. There might already be groups and resources for each of the shared drives. If so, you do not need to create the resource instance for each drive. Just move it from its current group to the one created for the queue manager.

   For each drive resource, set possible owners to both nodes. Set dependent resources to none.
6. Create a resource instance for the IP address.

Create an IP address resource (resource type *IP Address*). This address should be an unused IP address to be used by clients and other queue managers to connect to the *virtual* queue manager. This IP address is not the normal (static) address of either node; it is an additional address that *floats* between them. Although MSCS handles the routing of this address, it does **not** verify that the address can be reached.

7. Create a resource instance for the queue manager.

   Create a resource of type *IBM WebSphere MQ MSCS*. If the *IBM WebSphere MQ MSCS* resource type is not listed then run the `haregtyp.exe` command described in "WebSphere MQ MSCS support utility programs" on page 216 to register it. When you refresh the Cluster Administrator application, the *IBM WebSphere MQ MSCS* resource type will be listed.

   The wizard prompts you for various items, including the following:

   - `Name`; choose a name that makes it easy to identify which queue manager it is for.
   - `Add to group`; use the group that you created
   - `Run in a separate Resource Monitor`; for better isolation
   - `Possible owners`; set both nodes
   - `Dependencies`; add the drive and IP address for this queue manager.

     Warning: Failure to add these dependencies means that WebSphere MQ attempts to write the queue manager status to the wrong cluster disk during failovers. Because many processes might be attempting to write to this disk simultaneously, some WebSphere MQ processes could be blocked from running.
   - `Parameters`; as follows:
     – `QueueManagerName` (required); the name of the queue manager that this resource is to control. This queue manager must exist on the local computer.
     – `PostOnlineCommand` (optional); you can specify a program to run whenever the queue manager resource changes its state from offline to online. For more details see "PostOnlineCommand and PreOfflineCommand" on page 215.
     – `PreOfflineCommand` (optional); you can specify a program to run whenever the queue manager resource changes its state from online to offline. For more details see "PostOnlineCommand and PreOfflineCommand" on page 215.
8. Optionally, set a preferred node (but note the comments in "Using preferred nodes" on page 215).
9. The *Failover Policy* (as defined in the properties for the group) is set by default to sensible values, but you can tune the thresholds and periods that control *Resource Failover* and *Group Failover* to match the loads placed on the queue manager.
10. Test the queue manager by bringing it online in the MSCS Cluster Administrator and subjecting it to a test workload. If you are experimenting with a test queue manager, use the WebSphere MQ Explorer. For example:
    a. Right-click the **Queues** tree node, then select **New**->**Local Queue...**, and give the queue a name.
    b. Click **Finish**. The queue is created, and displayed in the content view.
    c. Right-click the queue, then select **Put Test Message...**. The Put Test Message panel is displayed.

d. Type some message text, then click **Put Test Message**, and close the panel.
e. Right-click the queue, then select **Browse Messages...**. The Message Browser panel is displayed.
f. Ensure your message is on the queue, then click **Close** . The Message Browser panel closes.
g. Right-click the queue, then select **Clear Messages...**. The messages on the queue are cleared.
h. Right-click the queue, then select **Delete...**. A confirmation panel is displayed, click **OK**. The queue is deleted.

11. Test that the queue manager can be taken offline and back online using the MSCS Cluster Administrator.
12. Simulate a failover.

    In the MSCS Cluster Administrator, right-click the group containing the queue manager and select `Move Group`. This can take some minutes to do. (If at other times you just want to move a queue manager to another node quickly, follow the procedure in "Moving a queue manager to MSCS storage" on page 207.) You can also right-click and select `Initiate Failure`; the action (local restart or failover) depends on the current state and the configuration settings.

Removing a queue manager from MSCS control

You can remove queue managers from MSCS control, and return them to manual administration. You do not need to do this for maintenance operations. You can do that by taking a queue manager offline temporarily, using the MSCS Cluster Administrator. Removing a queue manager from MSCS control is a more permanent change; only do it if you decide that you no longer want MSCS to have any further control of the queue manager.

If the queue manager being removed uses SSL connections you must modify the queue manager attribute, SSLKEYR, using the WebSphere MQ Explorer or the MQSC command `ALTER QMGR`, to point to the SSL key repository file on the local directory.

The procedure is:

1. Take the queue manager resource offline using the MSCS Cluster Administrator. To do this, see "Taking a queue manager offline from MSCS."
2. Destroy the resource instance. This does not destroy the queue manager.
3. Optionally, migrate the queue manager files back from shared drives to local drives. To do this, see "Returning a queue manager from MSCS storage" on page 212.
4. Test the queue manager.

Taking a queue manager offline from MSCS

The procedure is:

1. Start the MSCS Cluster Administrator.
2. Open a connection to the cluster.
3. Select `Groups`, and open the group containing the queue manager to be moved.
4. Select the queue manager resource.
5. Right-click it and select `Offline`.
6. Wait for completion.

Returning a queue manager from MSCS storage

This procedure configures the queue manager to be back on its computer's local drive, that is, it becomes a *normal* WebSphere MQ queue manager. To achieve this, you move the log files and data files from the shared disks. For example, the existing queue manager might have paths such as `E:\WebSphere MQ\log\<QMname>` and `E:\WebSphere MQ\qmgrs\<QMname>`. Do not try to move the files by hand; use the **hamvmqm** utility program supplied as part of WebSphere MQ MSCS Support as described below:

1. Shut down the queue manager, and check that there are no errors.
2. Make a full media backup of the queue files and log files and store the backup in a safe place (see "Queue manager log files" on page 214 for why this is important).
3. Decide which local drive to use and ensure that it has sufficient capacity to store the queue manager log files and data (queue) files.
4. Make sure that the shared disk on which the files currently reside is online on the cluster node to which to move the queue manager log and data files.
5. Run the utility program to move the queue manager as follows:

   ```
   hamvmqm /m qmname /dd "c:\WebSphere MQ" /ld "c:\WebSphere MQ\log"
   ```

   substituting your queue manager name for *qmname*, your local disk drive letter for *c*, and your chosen directory for *WebSphere MQ* (the directories are created if they do not already exist).
6. Test the queue manager to ensure that it works (as described in "Moving a queue manager to MSCS storage" on page 207).

Hints and tips on using MSCS

This section contains some general information to help you use WebSphere MQ support for MSCS effectively.

How long does it take to fail a queue manager over from one machine to the other? This depends heavily on the amount of workload on the queue manager and on the mix of traffic, that is, how much of it is persistent, within syncpoint, how much committed before the failure, and so on. In our test we have seen failover and failback times of about a minute. This was on a very lightly loaded queue manager and actual times will vary considerably depending on load.

Verifying that MSCS is working

The task descriptions starting with "Creating a queue manager for use with MSCS" on page 207 assume that you have a running MSCS cluster within which you can create, migrate, and destroy resources. If you want to make sure that you have such a cluster:

1. Using the MSCS Cluster Administrator, create a group.
2. Within that group, create an instance of a generic application resource, specifying the system clock (pathname `C:\winnt\system32\clock.exe` and working directory of `C:\`).
3. Make sure that you can bring the resource online, that you can move the group that contains it to the other node, and that you can take the resource offline.

Manual startup

For a queue manager managed by MSCS, you ***must*** set the startup attribute to manual. This ensures that the WebSphere MQ MSCS support can restart the IBM MQSeries Service without immediately starting the queue manager.

The WebSphere MQ MSCS support needs to be able to restart the service so that it can perform monitoring and control, but must itself remain in control of which queue managers are running, and on which machines. See"Moving a queue manager to MSCS storage" on page 207 for more information.

MSCS and queue managers

This section describes some things to consider about your queue managers when using MSCS, as follows:
- "Creating a matching queue manager on the other node"
- "Default queue managers"
- "Deleting a queue manager"
- "Support for existing queue managers"
- "Telling MSCS which queue managers to manage" on page 214
- "Queue manager log files" on page 214
- "Multiple queue managers" on page 214

Creating a matching queue manager on the other node:

For clustering to work with WebSphere MQ, you need an identical queue manager on node B for each one on node A. However, you do not need to explicitly create the second one. You can create or prepare a queue manager on one node, move it to the other node as described in "Moving a queue manager to MSCS storage" on page 207, and it is fully duplicated on that node.

Default queue managers:

Do not use a default queue manager under MSCS control. A queue manager does not have a property that makes it the default; WebSphere MQ keeps its own separate record. If you move a queue manager set to be the default to the other computer on failover, it does not become the default there. Make all your applications refer to specific queue managers by name.

Deleting a queue manager:

Once a queue manager has moved node, its details exist in the registry on both computers. When you want to delete it, do so as normal on one computer, and then run the utility described in "WebSphere MQ MSCS support utility programs" on page 216 to clean up the registry on the other computer.

Support for existing queue managers:

You can put an existing queue manager under MSCS control, provided that you can put your queue manager log files and queue files on a disk that is on the shared SCSI bus between the two machines (see Figure 21 on page 204). You need to take the queue manager offline briefly while the MSCS Resource is created.

If you want to create a new queue manager, create it independently of MSCS, test it, then put it under MSCS control. See:

- “Creating a queue manager for use with MSCS” on page 207
- “Moving a queue manager to MSCS storage” on page 207
- “Putting a queue manager under MSCS control” on page 209

Telling MSCS which queue managers to manage:

You choose which queue managers are placed under MSCS control by using the MSCS Cluster Administrator to create a resource instance for each such queue manager. This process presents you with a list of resources from which to select the queue manager that you want that instance to manage.

Queue manager log files:

When you move a queue manager to MSCS storage, you move its log and data files to a shared disk (for an example see “Moving a queue manager to MSCS storage” on page 207).

It is advisable before you move, to shut the queue manager cleanly and take a full backup of the data files and log files.

Multiple queue managers:

WebSphere MQ MSCS support allows you to run multiple queue managers on each machine and to place individual queue managers under MSCS control.

Always use MSCS to manage clusters

Do not try to perform start and stop operations directly on any clustered queue manager using either the WebSphere MQ Explorer. Instead, use the MSCS Cluster Administrator to request that MSCS brings the queue manager online or takes it offline. This is partly to prevent possible confusion caused by MSCS reporting that the queue manager is offline, when in fact you have started it outside the control of MSCS. More seriously, stopping a queue manager without using MSCS is detected by MSCS as a failure, initiating failover to the other node.

Working in Active/Active mode

Both computers in the MSCS cluster can run queue managers in Active/Active mode. You do not need to have a completely idle machine acting as standby (but you can, if you want, in Active/Passive Mode). If you plan to use both machines to run workload, provide each with sufficient capacity (processor, memory, secondary storage) to run the entire cluster workload at a satisfactory level of performance.

Note: If you are using MSCS together with Microsoft Transaction Server (COM+), you **cannot** use Active/Active mode. This is because, to use WebSphere MQ with MSCS and COM+:

- Application components that use WebSphere MQ’s COM+ support must run on the same computer as the Distributed Transaction Coordinator (DTC), a part of COM+.
- The queue manager must also run on the same computer.
- The DTC must be configured as an MSCS resource, and can therefore run on only one of the computers in the cluster at any time.

PostOnlineCommand and PreOfflineCommand

Specify these commands in the Parameters to a resource of type `IBM WebSphere MQ MSCS`. You can use them to integrate WebSphere MQ MSCS support with other systems or procedures. For example, you could specify the name of a program that sends a mail message, activates a pager, or generates some other form of alert to be captured by another monitoring system.

PostOnlineCommand is invoked when the resource changes from offline to online; PreOfflineCommand is invoked for a change from online to offline. When invoked these commands are run, by default, from `\Windows\system32`. Both commands run under the user account used to run the MSCS Cluster Service; and are invoked asynchronously; WebSphere MQ MSCS support does not wait for them to complete before continuing. This eliminates any risk that they might block or delay further cluster operations.

You can also use these commands to issue WebSphere MQ commands, for example to restart Requester channels However, the commands are run at the point in time when the queue manager's state changes so they are not intended to perform long-running functions and must not make assumptions about the current state of the queue manager; it is quite possible that, immediately after the queue manager was brought online, an administrator issued an offline command.

If you want to run programs that depend on the state of the queue manager, consider creating instances of the `MSCS Generic Application` resource type, placing them in the same MSCS group as the queue manager resource, and making them dependent on the queue manager resource.

Using preferred nodes

It can be useful when using Active/Active mode to configure a *preferred node* for each queue manager. However, in general it is better not to set a preferred node but to rely on a manual failback. Unlike some other relatively stateless resources, a queue manager can take a while to fail over (or back) from one node to the other. To avoid unnecessary outages, test the recovered node before failing a queue manager back to it. This precludes use of the `immediate` failback setting. You can configure failback to occur between certain times of day.

Probably the safest route is to move the queue manager back manually to the desired node, when you are certain that the node is fully recovered. This precludes use of the `preferred node` option.

Performance benchmarking

If COM+ errors occur in the Application Event log

When you install WebSphere MQ on a newly-installed MSCS cluster, you might find an error with Source COM+ and Event ID 4691 reported in the Application Event log.

This means that you are trying to run WebSphere MQ on a Microsoft Cluster Server (MSCS) environment when the Microsoft Distributed Transaction Coordinator (MSDTC) has not been configured to run in such an environment. For information on configuring MSDTC in a clustered environment, refer to Microsoft documentation.

WebSphere MQ MSCS support utility programs

WebSphere MQ support for MSCS includes the following utility programs that you can run at a command prompt:

Register/unregister the resource type
`haregtyp.exe`

After you *unregister* the WebSphere MQ MSCS resource type you can no longer create any resources of that type. MSCS does not let you unregister a resource type if you still have instances of that type within the cluster:

1. Using the MSCS Cluster Administrator, stop any queue managers that are running under MSCS control, by taking them offline as described in "Taking a queue manager offline from MSCS" on page 211.
2. Using the MSCS Cluster Administrator, delete the resource instances.
3. At a command prompt, unregister the resource type by entering the following command:
   ```
   haregtyp /u
   ```

If you want to *register* the type (or re-register it at a later time), enter the following command at a command prompt:

```
haregtyp /r
```

After successfully registering the MSCS libraries, you must reboot the system if you have not done so since installing WebSphere MQ.

Move a queue manager to MSCS storage
`hamvmqm.exe`

See "Moving a queue manager to MSCS storage" on page 207.

Delete a queue manager from a node
`hadltmqm.exe`

Consider the case where you have had a queue manager in your cluster, it has been moved from one node to another, and now you want to destroy it. Use the WebSphere MQ Explorer to delete it on the node where it currently is. The registry entries for it still exist on the other computer. To delete these, enter the following command at a prompt on that computer:

```
hadltmqm /m qmname
```

where `qmname` is the name of the queue manager to remove.

Check and save setup details
`amqmsysn.exe`

This utility presents a dialog showing full details of your WebSphere MQ MSCS Support setup, such as might be requested if you call IBM support. There is an option to save the details to a file.

Chapter 5. Recovery and problem determination

Recovery and restart

A messaging system ensures that messages entered into the system are delivered to their destination. This means that it must provide a method of tracking the messages in the system, and of recovering messages if the system fails for any reason.

WebSphere MQ ensures that messages are not lost by maintaining recovery logs of the activities of the queue managers that handle the receipt, transmission, and delivery of messages. It uses these logs for three types of recovery:

1. *Restart recovery*, when you stop WebSphere MQ in a planned way.
2. *Crash recovery*, when a failure stops WebSphere MQ.
3. *Media recovery*, to restore damaged objects.

In all cases, the recovery restores the queue manager to the state it was in when the queue manager stopped, except that any in-flight transactions are rolled back, removing from the queues any updates that were in-flight at the time the queue manager stopped. Recovery restores all persistent messages; nonpersistent messages can be lost during the process.

The rest of this chapter introduces the concepts of recovery and restart in more detail, and tells you how to recover if problems occur. It covers the following topics:

- "Making sure that messages are not lost (logging)"
- "Using checkpointing to ensure complete recovery" on page 220
- "Calculating the size of the log" on page 222
- "Managing logs" on page 223
- "Using the log for recovery" on page 227
- "Protecting WebSphere MQ log files" on page 229
- "Backing up and restoring WebSphere MQ" on page 230
- "Recovery scenarios" on page 234
- "Dumping the contents of the log using the dmpmqlog command" on page 236

Making sure that messages are not lost (logging)

WebSphere MQ records all significant changes to the data controlled by the queue manager in a recovery log.

This includes creating and deleting objects, persistent message updates, transaction states, changes to object attributes, and channel activities. The log contains the information you need to recover all updates to message queues by:

- Keeping records of queue manager changes
- Keeping records of queue updates for use by the restart process
- Enabling you to restore data after a hardware or software failure

What logs look like

A WebSphere MQ log consists of two components:

1. One or more files of log data.
2. A log control file

A file of log data is also known as a log extent.

There are a number of log files that contain the data being recorded. You can define the number and size (as explained in “Configuring WebSphere MQ” on page 93), or take the system default of three files.

In WebSphere MQ for Windows, each of the three files defaults to 1 MB. In WebSphere MQ for UNIX systems, each of the three files defaults to 4 MB.

When you create a queue manager, the number of log files you define is the number of *primary* log files allocated. If you do not specify a number, the default value is used.

In WebSphere MQ for Windows, if you have not changed the log path, log files are created under the directory:

```
C:\Program Files\IBM\WebSphere MQ\log\<QMgrName>
```

In WebSphere MQ for UNIX systems, if you have not changed the log path, log files are created under the directory:

```
/var/mqm/log/<QMgrName>
```

WebSphere MQ starts with these primary log files, but if the primary log space is not sufficient, it allocates *secondary* log files. It does this dynamically and removes them when the demand for log space reduces. By default, up to two secondary log files can be allocated. You can change this default allocation, as described in “Configuring WebSphere MQ” on page 93.

The log control file:

The log control file contains the information needed to control the use of log files, such as their size and location, the name of the next available file, and so on.

Note: Ensure that the logs created when you start a queue manager are large enough to accommodate the size and volume of messages that your applications will handle. You will probably need to change the default log numbers and sizes to meet your requirements. For more information, see “Calculating the size of the log” on page 222.

Types of logging

In WebSphere MQ, the number of files that are required for logging depends on the file size, the number of messages you have received, and the length of the messages. There are two ways of maintaining records of queue manager activities: circular logging and linear logging.

Circular logging:

Use circular logging if all you want is restart recovery, using the log to roll back transactions that were in progress when the system stopped.

Circular logging keeps all restart data in a ring of log files. Logging fills the first file in the ring, then moves on to the next, and so on, until all the files are full. It then goes back to the first file in the ring and starts again. This continues as long as the product is in use, and has the advantage that you never run out of log files.

WebSphere MQ keeps the log entries required to restart the queue manager without loss of data until they are no longer required to ensure queue manager data recovery. The mechanism for releasing log files for reuse is described in "Using checkpointing to ensure complete recovery" on page 220.

Linear logging:

Use linear logging if you want both restart recovery and media recovery (recreating lost or damaged data by replaying the contents of the log).

Linear logging keeps the log data in a continuous sequence of files. Space is not reused, so you can always retrieve any record logged in any log extent that has not been deleted

As disk space is finite, you might have to think about some form of archiving. It is an administrative task to manage your disk space for the log, reusing or extending the existing space as necessary.

The number of log files used with linear logging can be very large, depending on your message flow and the age of your queue manager. However, there are a number of files that are said to be *active*. Active files contain the log entries required to restart the queue manager. Collectively, active log files are known as the *active log*. The number of active log files is usually less than the number of primary log files as defined in the configuration files. (See "Calculating the size of the log" on page 222 for information about defining the number.)

The key event that controls whether a log file is termed active or not is a *checkpoint*. A WebSphere MQ checkpoint is a point of consistency between the recovery log and object files. A checkpoint determines the set of log files needed to perform restart recovery. Log files that are not active are not required for restart recovery, and are termed inactive. In some cases inactive log files are required for media recovery. (See "Using checkpointing to ensure complete recovery" on page 220 for further information about checkpointing.)

Inactive log files can be archived as they are not required for restart recovery. Inactive log files that are not required for media recovery can be considered as superfluous log files. You can delete superfluous log files if they are no longer of interest to your operation. Refer to "Managing logs" on page 223 for further information about the disposition of log files.

If a new checkpoint is recorded in the second, or later, primary log file, the first file can become inactive and a new primary file is formatted and added to the end of the primary pool, restoring the number of primary files available for logging. In this way the primary log file pool can be seen to be a current set of files in an ever-extending list of log files. Again, it is an administrative task to manage the inactive files according to the requirements of your operation.

Although secondary log files are defined for linear logging, they are not used in normal operation. If a situation arises when, probably due to long-lived transactions, it is not possible to free a file from the active pool because it might still be required for a restart, secondary files are formatted and added to the active log file pool.

If the number of secondary files available is used up, requests for most further operations requiring log activity will be refused with an MQRC_RESOURCE_PROBLEM return code being returned to the application.

Both types of logging can cope with unexpected loss of power, assuming that there is no hardware failure.

Using checkpointing to ensure complete recovery

Persistent updates to message queues happen in two stages. First, the records representing the update are written to the log, then the queue file is updated. The log files can thus become more up-to-date than the queue files. To ensure that restart processing begins from a consistent point, WebSphere MQ uses checkpoints. A checkpoint is a point in time when the record described in the log is the same as the record in the queue. The checkpoint itself consists of the series of log records needed to restart the queue manager; for example, the state of all transactions (units of work) active at the time of the checkpoint.

WebSphere MQ generates checkpoints automatically. They are taken when the queue manager starts, at shutdown, when logging space is running low, and after every 10 000 operations logged.

As the queues handle further messages, the checkpoint record becomes inconsistent with the current state of the queues.

When WebSphere MQ restarts, it finds the latest checkpoint record in the log. This information is held in the checkpoint file that is updated at the end of every checkpoint. The checkpoint record represents the most recent point of consistency between the log and the data. All the operations that have taken place since the checkpoint are replayed forward. This is known as the replay phase. The replay phase brings the queues back to the logical state they were in before the system failure or shutdown. During the replay phase a list is created of the transactions that were in-flight when the system failure or shutdown occurred. Messages AMQ7229 and AMQ7230 are issued to indicate the progression of the replay phase.

In order to know which operations to back out or commit, WebSphere MQ accesses each active log record associated with an in-flight transaction. This is known as the recovery phase. Messages AMQ72321, AMQ7232 and AMQ7234 are issued to indicate the progression of the recovery phase.

Once all the necessary log records have been accessed during the recovery phase, each active transaction is in turn resolved and each operation associated with the transaction will be either backed out or committed. This is known as the resolution phase. Message AMQ7233 is issued to indicate the progression of the resolution phase.

WebSphere MQ maintains internal pointers to the head and tail of the log. It moves the head pointer to the most recent checkpoint consistent with recovering message data.

Checkpoints are used to make recovery more efficient, and to control the reuse of primary and secondary log files.

In Figure 22, all records before the latest checkpoint, Checkpoint 2, are no longer needed by WebSphere MQ. The queues can be recovered from the checkpoint information and any later log entries. For circular logging, any freed files prior to the checkpoint can be reused. For a linear log, the freed log files no longer need to be accessed for normal operation and become inactive. In the example, the queue head pointer is moved to point at the latest checkpoint, Checkpoint 2, which then becomes the new queue head, Head 2. Log File 1 can now be reused.

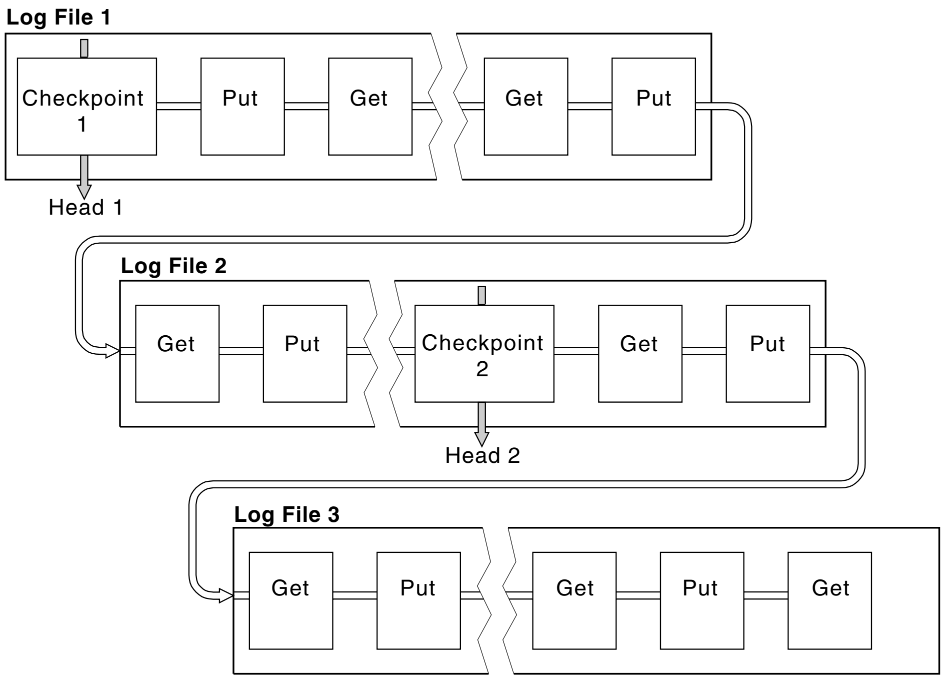


Figure 22. Checkpointing. For simplicity, only the ends of the log files are shown.

Figure 23 on page 222 shows how a long-running transaction affects reuse of log files. In the example, a long-running transaction has made an entry to the log, shown as LR 1, after the first checkpoint shown. The transaction does not complete (at point LR 2) until after the third checkpoint. All the log information from LR 1 onwards is retained to allow recovery of that transaction, if necessary, until it has completed.

After the long-running transaction has completed, at LR 2, the head of the log is moved to Checkpoint 3, the latest logged checkpoint. The files containing log records before Checkpoint 3, Head 2, are no longer needed. If you are using circular logging, the space can be reused.

If the primary log files are completely full before the long-running transaction completes, secondary log files are used to avoid the logs getting full.

When the log head is moved and you are using circular logging, the primary log files might become eligible for reuse and the logger, after filling the current file, reuses the first primary file available to it. If you are using linear logging, the log head is still moved down the active pool and the first file becomes inactive. A new primary file is formatted and added to the bottom of the pool in readiness for future logging activities.

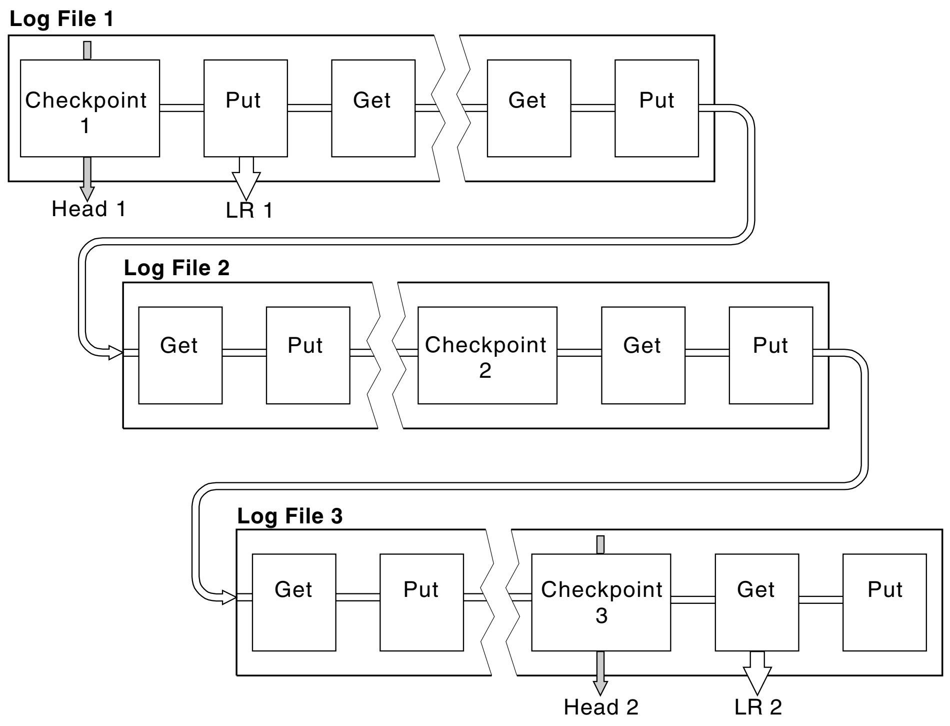


Figure 23. Checkpointing with a long-running transaction. For simplicity, only the ends of the log files are shown.

Checkpointing with long-running transactions

Calculating the size of the log

After deciding whether the queue manager should use circular or linear logging, you need to estimate the size of the log that the queue manager needs. The size of the log is determined by the following log configuration parameters:

LogFilePages
The size of each primary and secondary log file in units of 4K pages

LogPrimaryFiles
The number of preallocated primary log files

LogSecondaryFiles
The number of secondary log files that can be created for use when the primary log files are full

Table 19 on page 223 shows the amount of data the queue manager logs for various operations. Most queue manager operations need a minimal amount of log space. However, when a persistent message is put to a queue, **all** the message data must be written to the log to make it possible to recover the message. The size of the log depends, typically, on the number and size of the persistent messages the queue manager needs to handle.

Table 19. Log overhead sizes (all values are approximate)

Operation	Size
Put persistent message	750 bytes + message length If the message is large, it is divided into segments of 15700 bytes, each with a 300-byte overhead.
Get message	260 bytes
Syncpoint, commit	750 bytes
Syncpoint, rollback	1000 bytes + 12 bytes for each get or put to be rolled back
Create object	1500 bytes
Delete object	300 bytes
Alter attributes	1024 bytes
Record media image	800 bytes + image The image is divided into segments of 260 000 bytes, each having a 300-byte overhead.
Checkpoint	750 bytes + 200 bytes for each active unit of work Additional data might be logged for any uncommitted puts or gets that have been buffered for performance reasons.

Note:

1. You can change the number of primary and secondary log files each time the queue manager starts.
2. You cannot change the log file size; you must determine it **before** creating the queue manager.
3. The number of primary log files and the log file size determine the amount of log space that is preallocated when the queue manager is created.
4. The total number of primary and secondary log files cannot exceed 511 on UNIX systems, or 255 on Windows, which in the presence of long-running transactions, limits the maximum amount of log space available to the queue manager for restart recovery. The amount of log space the queue manager might need for media recovery does not share this limit.
5. When *circular* logging is being used, the queue manager reuses primary log space. This means that the queue manager's log can be smaller than the amount of data you have estimated that the queue manager needs to log. The queue manager will, up to a limit, allocate a secondary log file when a log file becomes full, and the next primary log file in the sequence is not available.
6. Primary log files are made available for reuse during a checkpoint. The queue manager takes both the primary and secondary log space into consideration before taking a checkpoint because the amount of log space is running low.

   If you do not define more primary log files than secondary log files, the queue manager might allocate secondary log files before a checkpoint is taken. This makes the primary log files available for reuse.

Managing logs

Over time, some of the log records written become unnecessary for restarting the queue manager. If you are using circular logging, the queue manager reclaims freed space in the log files. This activity is transparent to the user and you do not usually see the amount of disk space used reduce because the space allocated is quickly reused.

Of the log records, only those written since the start of the last complete checkpoint, and those written by any active transactions, are needed to restart the queue manager. Thus, the log might fill if a checkpoint has not been taken for a long time, or if a long-running transaction wrote a log record a long time ago. The queue manager tries to take checkpoints often enough to avoid the first problem.

When a long-running transaction fills the log, attempts to write log records fail and some MQI calls return MQRC_RESOURCE_PROBLEM. (Space is reserved to commit or roll back all in-flight transactions, so **MQCMIT** or **MQBACK** should not fail.)

The queue manager rolls back transactions that consume too much log space. An application whose transaction is rolled back in this way cannot perform subsequent **MQPUT** or **MQGET** operations specifying syncpoint under the same transaction. An attempt to put or get a message under syncpoint in this state returns MQRC_BACKED_OUT. The application can then issue **MQCMIT**, which returns MQRC_BACKED_OUT, or **MQBACK** and start a new transaction. When the transaction consuming too much log space has been rolled back, its log space is released and the queue manager continues to operate normally.

If the log fills, message AMQ7463 is issued. In addition, if the log fills because a long-running transaction has prevented the space being released, message AMQ7465 is issued.

Finally, if records are being written to the log faster than the asynchronous housekeeping processes can handle them, message AMQ7466 is issued. If you see this message, increase the number of log files or reduce the amount of data being processed by the queue manager.

What happens when a disk gets full

The queue manager logging component can cope with a full disk, and with full log files. If the disk containing the log fills, the queue manager issues message AMQ6708 and an error record is taken.

The log files are created at their maximum size, rather than being extended as log records are written to them. This means that WebSphere MQ can run out of disk space only when it is creating a new file; it cannot run out of space when it is writing a record to the log. WebSphere MQ always knows how much space is available in the existing log files, and manages the space within the files accordingly.

If you fill the drive containing the log files, you might be able to free some disk space. If you are using a linear log, there might be some inactive log files in the log directory, and you can copy these files to another drive or device. If you still run out of space, check that the configuration of the log in the queue manager configuration file is correct. You might be able to reduce the number of primary or secondary log files so that the log does not outgrow the available space. You cannot alter the size of the log files for an existing queue manager. The queue manager assumes that all log files are the same size.

Managing log files

Allocate sufficient space for your log files. For linear logging, you can delete old log files when they are no longer required.

If you are using circular logging, ensure that there is sufficient space to hold the log files when you configure your system (see “Log defaults for WebSphere MQ” on page 101 and “Queue manager logs” on page 108). The amount of disk space used by the log does not increase beyond the configured size, including space for secondary files to be created when required.

If you are using a linear log, the log files are added continually as data is logged, and the amount of disk space used increases with time. If the rate of data being logged is high, disk space is consumed rapidly by new log files.

Over time, the older log files for a linear log are no longer needed to restart the queue manager or to perform media recovery of any damaged objects. The following are methods for determining which log files are still required:

Logger event messages
: When enabled, logger event messages are generated when queue managers starts writing log records to a new log file. The contents of logger event messages specify the log files that are still required for queue manager restart, and media recovery. For more information on logger event messages, see Monitoring WebSphere MQ

Queue manager status
: Executing the MQSC command, DISPLAY QMSTATUS, or the PCF command, Inquire Queue Manager Status, returns queue manager information, including details of the required log files. For more information on MQSC commands, see the WebSphere MQ Script (MQSC) Command Reference manual, and for information on PCF commands, see the WebSphere MQ Programmable Command Formats and Administration Interface manual.

Queue manager messages
: Periodically, the queue manager issues a pair of messages to indicate which of the log files are needed:
  - Message AMQ7467 gives the name of the oldest log file needed to restart the queue manager. This log file and all newer log files must be available during queue manager restart.
  - Message AMQ7468 gives the name of the oldest log file needed for media recovery.

Only log files required for queue manager restart, active log files, need to be online. Inactive log files can be copied to an archive medium such as tape for disaster recovery, and removed from the log directory. Inactive log files that are not required for media recovery can be considered as superfluous log files. You can delete superfluous log files if they are no longer of interest to your operation.

To determine ″older″ and ″newer″ log files, use the log file number rather than the modification times applied by the file system.

If any log file that is needed cannot be found, operator message AMQ6767 is issued. Make the log file, and all subsequent log files, available to the queue manager and retry the operation.

Note: When performing media recovery, all the required log files must be available in the log file directory at the same time. Make sure that you take regular media images of any objects you might wish to recover to avoid running out of disk space to hold all the required log files.

Messages AMQ7467 and AMQ7468 can also be issued at the time of running the **rcdmqimg** command. For more information about this command, see “rcdmqimg (record media image)” on page 341.

Determining superfluous log files:

When managing linear log files, it is important to be sure which files can be deleted or archived. This information will assist you in making this decision.

Do not use the file system’s modification times to determine ″older″ log files. Use only the log file number. The queue manager’s use of log files follows complex rules, including pre-allocation and formatting of log files before they are needed. You might see log files with modification times that would be misleading if you try to use these times to determine relative age.

To determine the oldest log file needed to restart the queue manager, issue the command `DISPLAY QMSTATUS RECLOG`.

To determine the oldest log file needed to perform media recovery, issue the command `DISPLAY QMSTATUS MEDIALOG`.

In general a lower log file number implies an older log. Unless you have a very high log file turnover, of the order of 3000 log files per day for 10 years, then you do not need to cater for the number wrapping at 9 999 999. In this case, you can archive any log file with a number less than the RECLOG value, and you can delete any log file with a number less than both the RECLOG and MEDIALOG values.

If however you have a very high turnover of log files, or otherwise want to be confident of coping with the general case, then the following algorithm can typically be used:

```
Let S == restart log file number ( from DISPLAY QMSTATUS RECLOG).
Let M == media recovery log file number (from DISPLAY QMSTATUS MEDIALOG).
Let L == a given log file number whose eligibility for deletion or archiving needs to be deter

function minlog (a, b) {
    if (abs (a - b) < 5000000)
        return min (a, b);  # Not wrapped.
    else
        return max (a, b);  # Wrapped. }

A log file L can be deleted if (L != S && L != M && minlog (L,  minlog (S, M)) == L).
A log file L can be archived if (L != S && minlog (L, S) == L).
```

Log file location:

When choosing a location for your log files, remember that operation is severely impacted if WebSphere MQ fails to format a new log because of lack of disk space.

If you are using a circular log, ensure that there is sufficient space on the drive for at least the configured primary log files. Also leave space for at least one secondary log file, which is needed if the log has to grow.

If you are using a linear log, allow considerably more space; the space consumed by the log increases continuously as data is logged.

Ideally, place the log files on a separate disk drive from the queue manager data. This has benefits in terms of performance. It might also be possible to place the log files on multiple disk drives in a mirrored arrangement. This protects against failure of the drive containing the log. Without mirroring, you could be forced to go back to the last backup of your WebSphere MQ system.

Using the log for recovery

There are several ways that your data can be damaged. WebSphere MQ helps you to recover from:

- A damaged data object
- A power loss in the system
- A communications failure

This section looks at how the logs are used to recover from these problems.

Recovering from power loss or communications failures

WebSphere MQ can recover from both communications failures and loss of power. In addition, it can sometimes recover from other types of problem, such as inadvertent deletion of a file.

In the case of a communications failure, messages remain on queues until they are removed by a receiving application. If the message is being transmitted, it remains on the transmission queue until it can be successfully transmitted. To recover from a communications failure, you can usually restart the channels using the link that failed.

If you lose power, when the queue manager is restarted WebSphere MQ restores the queues to their committed state at the time of the failure. This ensures that no persistent messages are lost. Nonpersistent messages are discarded; they do not survive when WebSphere MQ stops abruptly.

Recovering damaged objects

There are ways in which a WebSphere MQ object can become unusable, for example because of inadvertent damage. You then have to recover either your complete system or some part of it. The action required depends on when the damage is detected, whether the log method selected supports media recovery, and which objects are damaged.

Media recovery:

Media recovery re-creates objects from information recorded in a linear log. For example, if an object file is inadvertently deleted, or becomes unusable for some other reason, media recovery can re-create it. The information in the log required for media recovery of an object is called a *media image*. Media images can be recorded manually, using the **rcdmqimg** command, or automatically in some circumstances.

A media image is a sequence of log records containing an image of an object from which the object itself can be re-created.

The first log record required to re-create an object is known as its *media recovery record*; it is the start of the latest media image for the object. The media recovery record of each object is one of the pieces of information recorded during a checkpoint.

When an object is re-created from its media image, it is also necessary to replay any log records describing updates performed on the object since the last image was taken.

Consider, for example, a local queue that has an image of the queue object taken before a persistent message is put onto the queue. In order to re-create the latest image of the object, it is necessary to replay the log entries recording the putting of the message to the queue, as well as replaying the image itself.

When an object is created, the log records written contain enough information to completely re-create the object. These records make up the object's first media image. Subsequently, at each shutdown, the queue manager records media images automatically as follows:

- Images of all process objects and queues that are not local
- Images of empty local queues

Media images can also be recorded manually using the **rcdmqimg** command, described in "rcdmqimg (record media image)" on page 341. This command writes a media image of the WebSphere MQ object. Once this has been done, only the logs that hold the media image, and all the logs created after this time, are needed to re-create damaged objects. The benefit of doing this depends on such factors as the amount of free storage available, and the speed at which log files are created.

Recovering from media images:

WebSphere MQ automatically recovers some objects from their media image if it finds that they are corrupt or damaged. In particular, this applies to objects found to be damaged during the normal queue manager startup. If any transaction was incomplete when the queue manager last shutdown, any queue affected is also recovered automatically in order to complete the startup operation.

You must recover other objects manually, using the **rcrmqobj** command, which replays the records in the log to re-create the WebSphere MQ object. The object is re-created from its latest image found in the log, together with all applicable log events between the time the image was saved and the time the re-create command was issued. If a WebSphere MQ object becomes damaged, the only valid actions that can be performed are either to delete it or to re-create it by this method. Nonpersistent messages **cannot** be recovered in this way.

See "rcrmqobj (recreate object)" on page 343 for further details of the **rcrmqobj** command.

The log file containing the media recovery record, and all subsequent log files, must be available in the log file directory when attempting media recovery of an object. If a required file cannot be found, operator message AMQ6767 is issued and the media recovery operation fails. If you do not take regular media images of the objects that you want to re-create, you might have insufficient disk space to hold all the log files required to re-create an object.

Recovering damaged objects during start up:

If the queue manager discovers a damaged object during startup, the action it takes depends on the type of object and whether the queue manager is configured to support media recovery.

If the queue manager object is damaged, the queue manager cannot start unless it can recover the object. If the queue manager is configured with a linear log, and thus supports media recovery, WebSphere MQ automatically tries to re-create the queue manager object from its media images. If the log method selected does not support media recovery, you can either restore a backup of the queue manager or delete the queue manager.

If any transactions were active when the queue manager stopped, the local queues containing the persistent, uncommitted messages put or got inside these transactions are also needed to start the queue manager successfully. If any of these local queues is found to be damaged, and the queue manager supports media recovery, it automatically tries to re-create them from their media images. If any of the queues cannot be recovered, WebSphere MQ cannot start.

If any damaged local queues containing uncommitted messages are discovered during startup processing on a queue manager that does not support media recovery, the queues are marked as damaged objects and the uncommitted messages on them are ignored. This is because it is not possible to perform media recovery of damaged objects on such a queue manager and the only action left is to delete them. Message AMQ7472 is issued to report any damage.

Recovering damaged objects at other times:

Media recovery of objects is automatic only during startup. At other times, when object damage is detected, operator message AMQ7472 is issued and most operations using the object fail. If the queue manager object is damaged at any time after the queue manager has started, the queue manager performs a preemptive shutdown. When an object has been damaged you can delete it or, if the queue manager is using a linear log, attempt to recover it from its media image using the **rcrmqobj** command (see "rcrmqobj (recreate object)" on page 343 for further details).

Protecting WebSphere MQ log files

Do not remove the active log files manually when a WebSphere MQ queue manager is running. If a user inadvertently deletes the log files that a queue manager needs to restart, WebSphere MQ **does not** issue any errors and continues to process data *including persistent messages*. The queue manager shuts down normally, but can fail to restart. Recovery of messages then becomes impossible.

Users with the authority to remove logs that are being used by an active queue manager also have authority to delete other important queue manager resources (such as queue files, the object catalog, and WebSphere MQ executables). They can therefore damage, perhaps through inexperience, a running or dormant queue manager in a way against which WebSphere MQ cannot protect itself.

Exercise caution when conferring super user or mqm authority.

Backing up and restoring WebSphere MQ

Periodically, you can take measures to protect queue managers against possible corruption caused by hardware failures. There are two ways of protecting a queue manager:

Backup the queue manager data

In the event of hardware failure, a queue manager can be forced to stop. If any queue manager log data is lost due to the hardware failure, the queue manager might be unable to restart. Through backing up queue manager data you may be able to recover some, or all, of the lost queue manager data.

In general, the more frequently you backup queue manager data, the less data you will lose in the event of hardware failure resulting in loss of integrity in the recovery log.

To backup queue manager data, the queue manager must not be running.

For instructions of how to backup queue manager data, and how to restore queue manager data, see:

- "Backing up queue manager data."
- "Restoring queue manager data" on page 231.

Using a backup queue manager

In the event of severe hardware failure, a queue manager can be unrecoverable. In this situation, if the unrecoverable queue manager has a dedicated backup queue manager, the backup queue manager can be activated in place of the unrecoverable queue manager. If it was updated regularly, the backup queue manager log can contain log data up to, and including, the last complete log extent from the unrecoverable queue manager.

A backup queue manager can be updated while the existing queue manager is still running.

For instructions of how to create a backup queue manager, and how to activate a backup queue manager, see:

- "Creating a backup queue manager" on page 232.
- "Starting a backup queue manager" on page 233.

Backing up queue manager data

To take a backup copy of a queue manager's data:

1. Ensure that the queue manager is not running. If you try to take a backup of a running queue manager, the backup might not be consistent because of updates in progress when the files were copied.

   If possible, stop your queue manager in an orderly way. Try executing **endmqm -w** (a wait shutdown); only if that fails, use **endmqm -i** (an immediate shutdown).
2. Find the directories under which the queue manager places its data and its log files, using the information in the configuration files. For more information about this, see "Configuring WebSphere MQ" on page 93.

   Note: You might have some difficulty in understanding the names that appear in the directory. The names are transformed to ensure that they are compatible

with the platform on which you are using WebSphere MQ. For more information about name transformations, see “Understanding WebSphere MQ file names” on page 16.
3. Take copies of all the queue manager’s data and log file directories, including all subdirectories.

   Make sure that you do not miss any files, especially the log control file, as described in *WebSphere MQ System Administration Guide*,and the configuration files (or equivalent Registry entries on Windows) as described in *WebSphere MQ Intercommunication*. Some of the directories might be empty, but you need them all to restore the backup at a later date, so save them too.
4. Preserve the ownerships of the files. For WebSphere MQ for UNIX systems, you can do this with the **tar** command. (If you have queues larger than 2 GB, you cannot use **tar**; for more information, see “Enabling large queues” on page 43.)

Restoring queue manager data

To restore a backup of a queue manager’s data:
1. Ensure that the queue manager is not running.
2. Find the directories under which the queue manager places its data and its log files, using the information in the configuration files
3. Clear out the directories into which you are going to place the backed-up data.
4. Copy the backed-up queue manager data and log files into the correct places.
5. Update the configuration information files (or equivalent Registry entries on Windows).

Check the resulting directory structure to ensure that you have all the required directories.

See Chapter 9, “Directory structure (Windows systems),” on page 531 and Chapter 10, “Directory structure (UNIX systems),” on page 533 for more information about WebSphere MQ directories and subdirectories.

Make sure that you have a log control file as well as the log files. Also check that the WebSphere MQ and queue manager configuration files are consistent so that WebSphere MQ can look in the correct places for the restored data.

If the data was backed up and restored correctly, the queue manager will now start.

For circular logging, backup the queue manager data and log file directories at the same time as this should allow a consistent set of queue manager data and logs to be restored.

For linear logging, we recommend that you backup the queue manager data and log file directories at the same time. However, it is possible to restore only the queue manager data files if a corresponding complete sequence of log files is available.

Using a backup queue manager

An existing queue manager can have a dedicated backup queue manager. A backup queue manager is an inactive copy of the existing queue manager. If the existing queue manager becomes unrecoverable due to severe hardware failure, the backup queue manager can be brought online to replace the unrecoverable queue manager.

The existing queue manager log files must regularly be copied to the backup queue manager to ensure that the backup queue manager remains an effective method for disaster recovery. The existing queue manager does not need to be stopped for log files to be copied, however you should only copy a log file if the queue manager has finished writing to it. Because the existing queue manager log is continually updated, there is always a slight discrepancy between the existing queue manager log and the log data copied to the backup queue manager log. Regular updates to the backup queue manager minimizes the discrepancy between the two logs.

If a backup queue manager is required to be brought online it must be activated, and then started. The requirement to activate a backup queue manager before it is started is a preventative measure to protect against a backup queue manager being started accidentally. Once a backup queue manager is activated it can no longer be updated.

For information on how to create, update, and start a backup queue manager, see the following:
- "Creating a backup queue manager"
- "Updating a backup queue manager"
- "Starting a backup queue manager" on page 233

Creating a backup queue manager

You can only use a backup queue manager when using linear logging.

To create a backup queue manager for an existing queue manager, do the following:
1. Create a backup queue manager for the existing queue manager using the control command `crtmqm`. The backup queue manager requires the following:
   - To have the same attributes as the existing queue manager, for example the queue manager name, the logging type, and the log file size.
   - To be on the same platform as the existing queue manager.
   - To be at an equal, or higher, code level than the existing queue manager.
2. Take copies of all the existing queue manager's data and log file directories, including all subdirectories, as described in "Backing up queue manager data" on page 230.
3. Overwrite the backup queue manager's data and log file directories, including all subdirectories, with the copies taken from the existing queue manager.
4. Execute the following control command on the backup queue manager:

   strmqm -r *BackupQMName*

   This flags the queue manager as a backup queue manager within WebSphere MQ, and replays all the copied log extents to bring the backup queue manager in step with the existing queue manager.

Updating a backup queue manager

To ensure that a backup queue manager remains an effective method for disaster recovery it must be updated regularly. Regular updating lessens the discrepancy between the backup queue manager log, and the current queue manager log. There is no need to stop the queue manager to be backed up.

To update a backup queue manager, do the following:

1. Issue the following Script (MQSC) command on the queue manager to be backed up:
   ```
   RESET QMGR TYPE(ADVANCELOG)
   ```
   This stops any writing to the current log, and then advances the queue manager logging to the next log extent. This ensures you backup all information logged up to the current time.
2. Obtain the (new) current active log extent number by issuing the following Script (MQSC) command on the queue manager to be backed up:
   ```
   DIS QMSTATUS CURRLOG
   ```
3. Copy the updated log extent files from the current queue manager log directory to the backup queue manager log directory - copy all the log extents since the last update, and up to (but not including) the current extent noted in step 2. Copy only log extent files, the ones beginning with ″S...″.
4. Issue the following control command on the backup queue manager:
   ```
   strmqm -r BackupQMName
   ```
   This replays all the copied log extents and brings the backup queue manager into step with the queue manager. When the replay finishes you receive a message that identifies all the log extents required for restart recovery, and all the log extents required for media recovery.

   Warning: If you copy a **non-contiguous** set of logs to the backup queue manager log directory, only the logs up to the point where the first missing log is found will be replayed.

Starting a backup queue manager

To substitute an unrecoverable queue manager with it's backup queue manager, do the following:

1. Execute the following control command to activate the backup queue manager:
   ```
   strmqm -a BackupQMName
   ```
   The backup queue manager is activated. Now active, the backup queue manager can no longer be updated.
2. Execute the following control command to start the backup queue manager:
   ```
   strmqm BackupQMName
   ```
   WebSphere MQ regards this as restart recovery, and utilizes the log from the backup queue manager. During the last update to the backup queue manager replay will have occurred, therefore only the active transactions from the last recorded checkpoint are rolled back.

   When an unrecoverable queue manager is substituted for a backup queue manager some of the queue manager data from the unrecoverable queue manager can be lost. The amount of lost data is dependent on how recently the backup queue manager was last updated. The more recently the last update, the less queue manager data loss.
3. Restart all channels.

Check the resulting directory structure to ensure that you have all the required directories.

See Chapter 9, "Directory structure (Windows systems)," on page 531 and Chapter 10, "Directory structure (UNIX systems)," on page 533 for more information about WebSphere MQ directories and subdirectories.

Make sure that you have a log control file as well as the log files. Also check that the WebSphere MQ and queue manager configuration files are consistent so that WebSphere MQ can look in the correct places for the restored data.

If the data was backed up and restored correctly, the queue manager will now start.

Note: Even though the queue manager data and log files are held in different directories, back up and restore the directories at the same time. If the queue manager data and log files have different ages, the queue manager is not in a valid state and will probably not start. If it does start, your data is likely to be corrupt.

Recovery scenarios

This section looks at a number of possible problems and indicates how to recover from them.

Disk drive failures

You might have problems with a disk drive containing either the queue manager data, the log, or both. Problems can include data loss or corruption. The three cases differ only in the part of the data that survives, if any.

In ***all*** cases first check the directory structure for any damage and, if necessary, repair such damage. If you lose queue manager data, the queue manager directory structure might have been damaged. If so, re-create the directory tree manually before you restart the queue manager.

If damage has occurred to the queue manager data files, but not to the queue manager log files, then the queue manager will normally be able to restart. If any damage has occurred to the queue manager log files, then it is likely that the queue manager will not be able to restart.

Having checked for structural damage, there are a number of things you can do, depending on the type of logging that you use.

- **Where there is major damage to the directory structure or any damage to the log**, remove all the old files back to the `QMgrName` level, including the configuration files, the log, and the queue manager directory, restore the last backup, and restart the queue manager.
- **For linear logging with media recovery**, ensure that the directory structure is intact and restart the queue manager. If the queue manager restarts, check, using MQSC commands such as DISPLAY QUEUE, whether any other objects have been damaged. Recover those you find, using the **rcrmqobj** command. For example:

  ```
  rcrmqobj -m QMgrName -t all *
  ```

where QMgrName is the queue manager being recovered. -t all * indicates that all damaged objects of any type are to be recovered. If only one or two objects have been reported as damaged, you can specify those objects by name and type here.

- **For linear logging with media recovery and with an undamaged log**, you might be able to restore a backup of the queue manager data leaving the existing log files and log control file unchanged. Starting the queue manager applies the changes from the log to bring the queue manager back to its state when the failure occurred.

  This method relies on two things:

  1. You must restore the checkpoint file as part of the queue manager data. This file contains the information determining how much of the data in the log must be applied to give a consistent queue manager.
  2. You must have the oldest log file required to start the queue manager at the time of the backup, and all subsequent log files, available in the log file directory.

  If this is not possible, restore a backup of both the queue manager data and the log, both of which were taken at the same time. This causes message integrity to be lost.

- **For circular logging**, if the queue manager log files are damaged, restore the queue manager from the latest backup that you have. Once you have restored the backup, restart the queue manager and check as above for damaged objects. However, because you do not have media recovery, you must find other ways of re-creating the damaged objects.

  If the queue manager log files are not damaged, the queue manager will normally be able to restart. Following the restart you must identify all damaged objects, then delete and redefine them.

Damaged queue manager object

If the queue manager object has been reported as damaged during normal operation, the queue manager performs a preemptive shutdown. There are two ways of recovering in these circumstances, depending on the type of logging you use:

- **For linear logging**, manually delete the file containing the damaged object and restart the queue manager. (You can use the **dspmqfls** command to determine the real, file-system name of the damaged object.) Media recovery of the damaged object is automatic.
- **For circular logging**, restore the last backup of the queue manager data and log, and restart the queue manager.

Damaged single object

If a single object is reported as damaged during normal operation:

- **For linear logging**, re-create the object from its media image.
- **For circular logging**, we do not support re-creating a single object.

Automatic media recovery failure

If a local queue required for queue manager startup with a linear log is damaged, and the automatic media recovery fails, restore the last backup of the queue manager data and log and restart the queue manager.

Dumping the contents of the log using the dmpmqlog command

Use the **dmpmqlog** command to dump the contents of the queue manager log. By default all active log records are dumped, that is, the command starts dumping from the head of the log (usually the start of the last completed checkpoint).

The log can usually be dumped only when the queue manager is not running. Because the queue manager takes a checkpoint during shutdown, the active portion of the log usually contains a small number of log records. However, you can use the **dmpmqlog** command to dump more log records using one of the following options to change the start position of the dump:

- Start dumping from the *base* of the log. The base of the log is the first log record in the log file that contains the head of the log. The amount of additional data dumped in this case depends on where the head of the log is positioned in the log file. If it is near the start of the log file, only a small amount of additional data is dumped. If the head is near the end of the log file, significantly more data is dumped.
- Specify the start position of the dump as an individual log record. Each log record is identified by a unique *log sequence number (LSN)*. In the case of circular logging, this starting log record cannot be before the base of the log; this restriction does not apply to linear logs. You might need to reinstate inactive log files before running the command. You must specify a valid LSN, taken from previous **dmpmqlog** output, as the start position.

  For example, with linear logging you can specify the `nextlsn` from your last **dmpmqlog** output. The `nextlsn` appears in `Log File Header` and indicates the LSN of the next log record to be written. Use this as a start position to format all log records written since the last time the log was dumped.
- **For linear logs only**, you can instruct **dmpmqlog** to start formatting log records from any given log file extent. In this case, **dmpmqlog** expects to find this log file, and each successive one, in the same directory as the active log files. This option does not apply to circular logs, where **dmpmqlog** cannot access log records prior to the base of the log.

The output from the **dmpmqlog** command is the `Log File Header` and a series of formatted log records. The queue manager uses several log records to record changes to its data.

Some of the information that is formatted is only of use internally. The following list includes the most useful log records:

Log File Header

Each log has a single log file header, which is always the first thing formatted by the **dmpmqlog** command. It contains the following fields:

logactive	The number of primary log extents.
loginactive	The number of secondary log extents.
logsize	The number of 4 KB pages per extent.
baselsn	The first LSN in the log extent containing the head of the log.
nextlsn	The LSN of the next log record to be written.
headlsn	The LSN of the log record at the head of the log.
tailsn	The LSN identifying the tail position of the log.

hflag1	Whether the log is CIRCULAR or LOG RETAIN (linear).
HeadExtentID	The log extent containing the head of the log.

Log Record Header

Each log record within the log has a fixed header containing the following information:

LSN	The log sequence number.
LogRecdType	The type of the log record.
XTranid	The transaction identifier associated with this log record (if any). A `TranType` of MQI indicates a WebSphere MQ-only transaction. A `TranType` of XA is involved with other resource managers. Updates involved within the same unit of work have the same `XTranid`.
QueueName	The queue associated with this log record (if any).
Qid	The unique internal identifier for the queue.
PrevLSN	The LSN of the previous log record within the same transaction (if any).

Start Queue Manager

This logs that the queue manager has started.

StartDate	The date that the queue manager started.
StartTime	The time that the queue manager started.

Stop Queue Manager

This logs that the queue manager has stopped.

StopDate	The date that the queue manager stopped.
StopTime	The time that the queue manager stopped.
ForceFlag	The type of shutdown used.

Start Checkpoint

This denotes the start of a queue manager checkpoint.

End Checkpoint

This denotes the end of a queue manager checkpoint.

ChkPtLSN	The LSN of the log record that started this checkpoint.

Put Message

This logs a persistent message put to a queue. If the message was put under syncpoint, the log record header contains a non-null `XTranid`. The remainder of the record contains:

SpcIndex	An identifier for the message on the queue. It can be used to match the corresponding **MQGET** that was used to get this message from the queue. In this case a subsequent `Get Message` log record can be found containing the same `QueueName` and `SpcIndex`. At this point the `SpcIndex` identifier can be reused for a subsequent put message to that queue.

Data	Contained in the hex dump for this log record is various internal data followed by the Message Descriptor (eyecatcher MD) and the message data itself.

Put Part
Persistent messages that are too large for a single log record are logged as a single `Put Message` record followed by multiple `Put Part` log records.

Data	Continues the message data where the previous log record left off.

Get Message
Only gets of persistent messages are logged. If the message was got under syncpoint, the log record header contains a non-null `XTranid`. The remainder of the record contains:

SpcIndex	Identifies the message that was retrieved from the queue. The most recent `Put Message` log record containing the same `QueueName` and `SpcIndex` identifies the message that was retrieved.
QPriority	The priority of the message retrieved from the queue.

Start Transaction
Indicates the start of a new transaction. A TranType of MQI indicates a WebSphere MQ-only transaction. A TranType of XA indicates one that involves other resource managers. All updates made by this transaction will have the same `XTranid`.

Prepare Transaction
Indicates that the queue manager is prepared to commit the updates associated with the specified `XTranid`. This log record is written as part of a two-phase commit involving other resource managers.

Commit Transaction
Indicates that the queue manager has committed all updates made by a transaction.

Rollback Transaction
This denotes the queue manager's intention to roll back a transaction.

End Transaction
This denotes the end of a rolled-back transaction.

Transaction Table
This record is written during syncpoint. It records the state of each transaction that has made persistent updates. For each transaction the following information is recorded:

XTranid	The transaction identifier.
FirstLSN	The LSN of the first log record associated with the transaction.
LastLSN	The LSN of the last log record associated with the transaction.

Transaction Participants
This log record is written by the XA Transaction Manager component of the queue manager. It records the external resource managers that are participating in transactions. For each participant the following is recorded:

RMName	The name of the resource manager.
RMID	The resource manager identifier. This is also logged in subsequent `Transaction Prepared` log records that record global transactions in which the resource manager is participating.
SwitchFile	The switch load file for this resource manager.
XAOpenString	The XA open string for this resource manager.
XACloseString	The XA close string for this resource manager.

Transaction Prepared
This log record is written by the XA Transaction Manager component of the queue manager. It indicates that the specified global transaction has been successfully prepared. Each of the participating resource managers will be instructed to commit. The `RMID` of each prepared resource manager is recorded in the log record. If the queue manager itself is participating in the transaction a `Participant Entry` with an `RMID` of zero will be present.

Transaction Forget
This log record is written by the XA Transaction Manager component of the queue manager. It follows the `Transaction Prepared` log record when the commit decision has been delivered to each participant.

Purge Queue
This logs the fact that all messages on a queue have been purged, for example, using the MQSC command CLEAR QUEUE.

Queue Attributes
This logs the initialization or change of the attributes of a queue.

Create Object
This logs the creation of a WebSphere MQ object.

ObjName	The name of the object that was created.
UserId	The user ID performing the creation.

Delete Object
This logs the deletion of a WebSphere MQ object.

ObjName	The name of the object that was deleted.

Problem determination

This chapter suggests reasons for some of the problems you might experience using WebSphere MQ. You usually start with a symptom, or set of symptoms, and trace them back to their cause.

Problem determination is not problem solving. However, the process of problem determination often enables you to solve a problem. For example, if you find that the cause of the problem is an error in an application program, you can solve the problem by correcting the error.

Not all problems can be solved immediately, for example, performance problems caused by the limitations of your hardware. Also, if you think that the cause of the problem is in the WebSphere MQ code, contact your IBM Support Center. This chapter contains these sections:

Preliminary checks

Before you start problem determination in detail, it is worth considering the facts to see if there is an obvious cause of the problem, or a likely area in which to start your investigation. This approach to debugging can often save a lot of work by highlighting a simple error, or by narrowing down the range of possibilities.

The cause of your problem could be in:
- WebSphere MQ
- The network
- The application

The sections that follow raise some fundamental questions that you need to consider. As you work through the questions, make a note of anything that might be relevant to the problem. Even if your observations do not suggest a cause immediately, they could be useful later if you have to carry out a systematic problem determination exercise.

Has WebSphere MQ run successfully before?

If WebSphere MQ has not run successfully before, it is likely that you have not yet set it up correctly. See one of the following publications to check that you have installed the product correctly, and run the verification procedure:
- WebSphere MQ for AIX Quick Beginnings
- WebSphere MQ for HP-UX Quick Beginnings
- WebSphere MQ for Linux Quick Beginnings
- WebSphere MQ for Solaris Quick Beginnings
- WebSphere MQ for Windows Quick Beginnings

Also look at WebSphere MQ Intercommunication for information about post-installation configuration of WebSphere MQ.

Are there any error messages?

WebSphere MQ uses error logs to capture messages concerning its own operation, any queue managers that you start, and error data coming from the channels that are in use. Check the error logs to see if any messages have been recorded that are associated with your problem.

See “Error logs” on page 251 for information about the locations and contents of the error logs.

Does the Windows Application Event Log show any WebSphere MQ errors? (Windows only)

WebSphere MQ also logs errors in the Windows Application Event Log. Some information about the cause of the error might be found here. To find the log, from the Computer Management panel, expand **Event Viewer** and select **Application**.

Are there any return codes explaining the problem?

If your application gets a return code indicating that a Message Queue Interface (MQI) call has failed, refer to the WebSphere MQ Application Programming Reference manual for a description of that return code.

Can you reproduce the problem?

If you can reproduce the problem, consider the conditions under which it is reproduced:

- Is it caused by a command or an equivalent administration request?

  Does the operation work if it is entered by another method? If the command works if it is entered on the command line, but not otherwise, check that the command server has not stopped, and that the queue definition of the SYSTEM.ADMIN.COMMAND.QUEUE has not been changed.
- Is it caused by a program? Does it fail on all WebSphere MQ systems and all queue managers, or only on some?
- Can you identify any application that always seems to be running in the system when the problem occurs? If so, examine the application to see if it is in error.

Have any changes been made since the last successful run?

When you are considering changes that might recently have been made, think about the WebSphere MQ system, and also about the other programs it interfaces with, the hardware, and any new applications. Consider also the possibility that a new application that you are not aware of might have been run on the system.

- Have you changed, added, or deleted any queue definitions?
- Have you changed or added any channel definitions? Changes might have been made to either WebSphere MQ channel definitions or any underlying communications definitions required by your application.
- Do your applications deal with return codes that they might get as a result of any changes you have made?
- Have you changed any component of the operating system that could affect the operation of WebSphere MQ? For example, have you modified the Windows Registry.

Has the application run successfully before?

If the problem appears to involve one particular application, consider whether the application has run successfully before.

Before you answer **Yes** to this question, consider the following:

- Have any changes been made to the application since it last ran successfully?

  If so, it is likely that the error lies somewhere in the new or modified part of the application. Take a look at the changes and see if you can find an obvious reason for the problem. Is it possible to retry using a back level of the application?

- Have all the functions of the application been fully exercised before?

  Could it be that the problem occurred when part of the application that had never been invoked before was used for the first time? If so, it is likely that the error lies in that part of the application. Try to find out what the application was doing when it failed, and check the source code in that part of the program for errors.

  If a program has been run successfully on many previous occasions, check the current queue status and the files that were being processed when the error occurred. It is possible that they contain some unusual data value that invokes a rarely-used path in the program.
- Does the application check all return codes?

  Has your WebSphere MQ system been changed, perhaps in a minor way, such that your application does not check the return codes it receives as a result of the change. For example, does your application assume that the queues it accesses can be shared? If a queue has been redefined as exclusive, can your application deal with return codes indicating that it can no longer access that queue?
- Does the application run on other WebSphere MQ systems?

  Could it be that there is something different about the way that this WebSphere MQ system is set up that is causing the problem? For example, have the queues been defined with the same message length or priority?

If the application has not run successfully before:

If your application has not yet run successfully, examine it carefully to see if you can find any errors.

Before you look at the code, and depending upon which programming language the code is written in, examine the output from the translator, or the compiler and linkage editor, to see if any errors have been reported.

If your application fails to translate, compile, or link-edit into the load library, it will also fail to run if you attempt to invoke it. See the WebSphere MQ Application Programming Guide for information about building your application.

If the documentation shows that each of these steps was accomplished without error, consider the coding logic of the application. Do the symptoms of the problem indicate the function that is failing and, therefore, the piece of code in error? See "Common programming errors" for some examples of common errors that cause problems with WebSphere MQ applications.

Common programming errors:

The errors in the following list illustrate the most common causes of problems encountered while running WebSphere MQ programs. Consider the possibility that the problem with your WebSphere MQ system could be caused by one or more of these errors:
- Assuming that queues can be shared, when they are in fact exclusive.
- Passing incorrect parameters in an MQI call.
- Passing insufficient parameters in an MQI call. This might mean that WebSphere MQ cannot set up completion and reason codes for your application to process.
- Failing to check return codes from MQI requests.
- Passing variables with incorrect lengths specified.

- Passing parameters in the wrong order.
- Failing to initialize *MsgId* and *CorrelId* correctly.
- Failing to initialize *Encoding* and *CodedCharSetId* following MQRC_TRUNCATED_MSG_ACCEPTED.

Problems with commands

Be careful when including special characters, for example, back slash (\) and double quote (") characters, in descriptive text for some commands. If you use either of these characters in descriptive text, precede them with a \, that is, enter \\ or \" if you want \ or " in your text.

Does the problem affect specific parts of the network?

You might be able to identify specific parts of the network that are affected by the problem (remote queues, for example). If the link to a remote message queue manager is not working, the messages cannot flow to a remote queue.

Check that the connection between the two systems is available, and that the intercommunication component of WebSphere MQ has started.

Check that messages are reaching the transmission queue, and check the local queue definition of the transmission queue and any remote queues.

Have you made any network-related changes, or changed any WebSphere MQ definitions, that might account for the problem?

Does the problem occur at specific times of the day?

If the problem occurs at specific times of day, it could be that it depends on system loading. Typically, peak system loading is at mid-morning and mid-afternoon, so these are the times when load-dependent problems are most likely to occur. (If your WebSphere MQ network extends across more than one time zone, peak system loading might seem to occur at some other time of day.)

Is the problem intermittent?

An intermittent problem could be caused by the way that processes can run independently of each other. For example, a program might issue an MQGET call without specifying a wait option before an earlier process has completed. An intermittent problem might also be seen if your application tries to get a message from a queue while the call that put the message is in-doubt (that is, before it has been committed or backed out).

Have you applied any service updates?

If you have applied a service update to WebSphere MQ, check that the update action completed successfully and that no error message was produced.

- Did the update have any special instructions?
- Was any test run to verify that the update was applied correctly and completely?
- Does the problem still exist if WebSphere MQ is restored to the previous service level?
- If the installation was successful, check with the IBM Support Center for any maintenance package errors.

- If a maintenance package has been applied to any other program, consider the effect it might have on the way WebSphere MQ interfaces with it.

Looking at problems in more detail

Perhaps the preliminary checks have enabled you to find the cause of the problem. If so, you should now be able to resolve it, possibly with the help of other books in the WebSphere MQ library and in the libraries of other licensed programs.

If you have not yet found the cause, start to look at the problem in greater detail. The purpose of this section is to help you identify the cause of your problem if the preliminary checks have not enabled you to find it. When you have established that no changes have been made to your system, and that there are no problems with your application programs, choose the option that best describes the symptoms of your problem.

- "Have you obtained incorrect output?"
- "Have you failed to receive a response from a PCF command?" on page 247
- "Are some of your queues failing?" on page 248
- "Are you receiving an error code when creating or starting a queue manager? (Windows only)" on page 248
- "Does the problem affect only remote queues?" on page 248
- "Is your application or system running slowly?" on page 249

If none of these symptoms describe your problem, consider whether it might have been caused by another component of your system.

Have you obtained incorrect output?

In this book, *incorrect output* refers to your application:

- Not receiving a message that it was expecting.
- Receiving a message containing unexpected or corrupted information.
- Receiving a message that it was not expecting, for example, one that was destined for a different application.

Messages that do not appear on the queue:

If messages do not appear when you are expecting them, check for the following:

- Has the message been put on the queue successfully?
  - Has the queue been defined correctly? For example, is MAXMSGL sufficiently large?
  - Is the queue enabled for putting?
  - Is the queue already full?
  - Has another application got exclusive access to the queue?
- Are you able to get any messages from the queue?
  - Do you need to take a syncpoint?

    If messages are being put or retrieved within syncpoint, they are not available to other tasks until the unit of recovery has been committed.
  - Is your wait interval long enough?

    You can set the wait interval as an option for the MQGET call. Ensure that you are waiting long enough for a response.

  - Are you waiting for a specific message that is identified by a message or correlation identifier (*MsgId* or *CorrelId*)?

    Check that you are waiting for a message with the correct *MsgId* or *CorrelId*. A successful MQGET call sets both these values to that of the message retrieved, so you might need to reset these values in order to get another message successfully.

    Also, check whether you can get other messages from the queue.
  - Can other applications get messages from the queue?
  - Was the message you are expecting defined as persistent?

    If not, and WebSphere MQ has been restarted, the message has been lost.
  - Has another application got exclusive access to the queue?

If you cannot find anything wrong with the queue, and WebSphere MQ is running, check the process that you expected to put the message onto the queue for the following:

- Did the application start?

  If it should have been triggered, check that the correct trigger options were specified.
- Did the application stop?
- Is a trigger monitor running?
- Was the trigger process defined correctly?
- Did the application complete correctly?

  Look for evidence of an abnormal end in the job log.
- Did the application commit its changes, or were they backed out?

If multiple transactions are serving the queue, they can conflict with one another. For example, suppose one transaction issues an MQGET call with a buffer length of zero to find out the length of the message, and then issues a specific MQGET call specifying the *MsgId* of that message. However, in the meantime, another transaction issues a successful MQGET call for that message, so the first application receives a reason code of MQRC_NO_MSG_AVAILABLE. Applications that are expected to run in a multiple server environment must be designed to cope with this situation.

Consider that the message could have been received, but that your application failed to process it in some way. For example, did an error in the expected format of the message cause your program to reject it? If this is the case, refer to "Messages that contain unexpected or corrupted information."

Messages that contain unexpected or corrupted information:

If the information contained in the message is not what your application was expecting, or has been corrupted in some way, consider the following:

- Has your application, or the application that put the message onto the queue, changed?

  Ensure that all changes are simultaneously reflected on all systems that need to be aware of the change.

  For example, the format of the message data might have been changed, in which case, both applications must be recompiled to pick up the changes. If one application has not been recompiled, the data will appear corrupt to the other.
- Is an application sending messages to the wrong queue?

Check that the messages your application is receiving are not really intended for an application servicing a different queue. If necessary, change your security definitions to prevent unauthorized applications from putting messages on to the wrong queues.

If your application uses an alias queue, check that the alias points to the correct queue.

- Has the trigger information been specified correctly for this queue?

  Check that your application should have started; or should a different application have started?

If these checks do not enable you to solve the problem, check your application logic, both for the program sending the message, and for the program receiving it.

Problems with incorrect output when using distributed queues:

If your application uses distributed queues, consider the following points:

- Has WebSphere MQ been correctly installed on both the sending and receiving systems, and correctly configured for distributed queuing?
- Are the links available between the two systems?

  Check that both systems are available, and connected to WebSphere MQ. Check that the connection between the two systems is active.

  You can use the MQSC command PING against either the queue manager (PING QMGR) or the channel (PING CHANNEL) to verify that the link is operable.
- Is triggering set on in the sending system?
- Is the message for which you are waiting a reply message from a remote system?

  Check that triggering is activated in the remote system.
- Is the queue already full?

  If so, check if the message has been put onto the dead-letter queue.

  The dead-letter queue header contains a reason or feedback code explaining why the message could not be put onto the target queue. See the WebSphere MQ Application Programming Reference for information about the dead-letter queue header structure.
- Is there a mismatch between the sending and receiving queue managers?

  For example, the message length could be longer than the receiving queue manager can handle.
- Are the channel definitions of the sending and receiving channels compatible?

  For example, a mismatch in sequence number wrap can stop the distributed queuing component. See WebSphere MQ Intercommunication for more information about distributed queuing.
- Is data conversion involved? If the data formats between the sending and receiving applications differ, data conversion is necessary. Automatic conversion occurs when the MQGET call is issued if the format is recognized as one of the built-in formats.

  If the data format is not recognized for conversion, the data conversion exit is taken to allow you to perform the translation with your own routines.

  Refer to the WebSphere MQ Application Programming Guide for further details of data conversion.

Have you failed to receive a response from a PCF command?

If you have issued a command but have not received a response, consider the following:

- Is the command server running?

  Work with the **dspmqcsv** command to check the status of the command server.
  - If the response to this command indicates that the command server is not running, use the **strmqcsv** command to start it.
  - If the response to the command indicates that the SYSTEM.ADMIN.COMMAND.QUEUE is not enabled for MQGET requests, enable the queue for MQGET requests.
- Has a reply been sent to the dead-letter queue?

  The dead-letter queue header structure contains a reason or feedback code describing the problem. See the WebSphere MQ Application Programming Reference for information about the dead-letter queue header structure (MQDLH).

  If the dead-letter queue contains messages, you can use the provided browse sample application (amqsbcg) to browse the messages using the MQGET call. The sample application steps through all the messages on a named queue for a named queue manager, displaying both the message descriptor and the message context fields for all the messages on the named queue.
- Has a message been sent to the error log?

  See "Error logs" on page 251 for further information.
- Are the queues enabled for put and get operations?
- Is the `WaitInterval` long enough?

  If your MQGET call has timed out, a completion code of MQCC_FAILED and a reason code of MQRC_NO_MSG_AVAILABLE are returned. (See the WebSphere MQ Application Programming Reference for information about the `WaitInterval` field, and completion and reason codes from MQGET.)
- If you are using your own application program to put commands onto the SYSTEM.ADMIN.COMMAND.QUEUE, do you need to take a syncpoint?

  Unless you have specifically excluded your request message from syncpoint, you need to take a syncpoint before receiving reply messages.
- Are the MAXDEPTH and MAXMSGL attributes of your queues set sufficiently high?
- Are you using the `CorrelId` and `MsgId` fields correctly?

  Set the values of `MsgId` and `CorrelId` in your application to ensure that you receive all messages from the queue.

Try stopping the command server and then restarting it, responding to any error messages that are produced.

If the system still does not respond, the problem could be with either a queue manager or the whole of the WebSphere MQ system. First, try stopping individual queue managers to isolate a failing queue manager. If this does not reveal the problem, try stopping and restarting WebSphere MQ, responding to any messages that are produced in the error log.

If the problem still occurs after restart, contact your IBM Support Center for help.

Are some of your queues failing?

If you suspect that the problem occurs with only a subset of queues, check the local queues that you think are having problems:

1. Display the information about each queue. You can use the MQSC command DISPLAY QUEUE to display the information.
2. Use the data displayed to do the following checks:
   - If CURDEPTH is at MAXDEPTH, the queue is not being processed. Check that all applications are running normally.
   - If CURDEPTH is not at MAXDEPTH, check the following queue attributes to ensure that they are correct:
     - If triggering is being used:
       - Is the trigger monitor running?
       - Is the trigger depth too great? That is, does it generate a trigger event often enough?
       - Is the process name correct?
       - Is the process available and operational?
     - Can the queue be shared? If not, another application could already have it open for input.
     - Is the queue enabled appropriately for GET and PUT?
   - If there are no application processes getting messages from the queue, determine why this is so. It could be because the applications need to be started, a connection has been disrupted, or the MQOPEN call has failed for some reason.

     Check the queue attributes IPPROCS and OPPROCS. These attributes indicate whether the queue has been opened for input and output. If a value is zero, it indicates that no operations of that type can occur. The values might have changed; the queue might have been open but is now closed.

     You need to check the status at the time you expect to put or get a message.

If you are unable to solve the problem, contact your IBM Support Center for help.

Are you receiving an error code when creating or starting a queue manager? (Windows only)

If the WebSphere MQ Explorer, or the **amqmdain** command, fails to create or start a queue manager, indicating an authority problem, it might be because the user under which the “IBM MQSeries Services” process (**AMQMSRVN**) is running has insufficient rights.

Ensure that the user with which the **AMQMSRVN** service is configured has the rights described in “User rights required for AMQMSRVN” on page 81. By default this service is configured to run as the **MUSR_MQADMIN** user.

Does the problem affect only remote queues?

If the problem affects only remote queues:

- Check that required channels have started, can be triggered, and any required initiators are running.
- Check that the programs that should be putting messages to the remote queues have not reported problems.

- If you use triggering to start the distributed queuing process, check that the transmission queue has triggering set on. Also, check that the trigger monitor is running.
- Check the error logs for messages indicating channel errors or problems.
- If necessary, start the channel manually. See WebSphere MQ Intercommunication for information about starting channels.

Is your application or system running slowly?

If your application is running slowly, it might be in a loop or waiting for a resource that is not available.

This might also indicate a performance problem. Perhaps your system is operating near the limits of its capacity. This type of problem is probably worst at peak system load times, typically at mid-morning and mid-afternoon. (If your network extends across more than one time zone, peak system load might seem to occur at some other time.)

A performance problem might be caused by a limitation of your hardware.

If you find that performance degradation is not dependent on system loading, but happens sometimes when the system is lightly loaded, a poorly-designed application program is probably to blame. This could appear to be a problem that only occurs when certain queues are accessed.

The following symptoms might indicate that WebSphere MQ is running slowly:
- Your system is slow to respond to MQSC commands.
- Repeated displays of the queue depth indicate that the queue is being processed slowly for an application with which you would expect a large amount of queue activity.

If the performance of your system is still degraded after reviewing the above possible causes, the problem might lie with WebSphere MQ itself. If you suspect this, contact your IBM Support Center for help.

Tuning performance for nonpersistent messages on AIX:

If you are using AIX, consider setting your tuning parameter to exploit full performance for nonpersistent messages. To set the tuning parameter so that it takes effect immediately, issue the following command as a root user:

```
/usr/sbin/ioo -o j2_nPagesPerWriteBehindCluster=0
```

To set the tuning parameter so that it takes effect immediately and persists over reboots, issue the following command as a root user:

```
/usr/sbin/ioo -p -o j2_nPagesPerWriteBehindCluster=0
```

Normally, nonpersistent messages are kept only in memory, but there are circumstances where AIX can schedule nonpersistent messages to be written to disk. Messages scheduled to be written to disk are unavailable for MQGET until the disk write completes. The suggested tuning command varies this threshold; instead of scheduling messages to be written to disk when 16 kilobytes of data are queued, the write-to-disk occurs only when real storage on the machine becomes close to full. This is a global alteration and may effect other software components.

On AIX, when using multithreaded applications and especially when running on machines with multiple CPUs, we strongly recommend setting AIXTHREADSCOPE=S in the environment before starting the application, for better performance and more solid scheduling. For example:

```
export AIXTHREADSCOPE=S
```

Setting AIXTHREAD_SCOPE=S means that user threads created with default attributes will be placed into system-wide contention scope. If a user thread is created with system-wide contention scope, it is bound to a kernel thread and it is scheduled by the kernel. The underlying kernel thread is not shared with any other user thread.

Application design considerations

There are a number of ways in which poor program design can affect performance. These can be difficult to detect because the program can appear to perform well itself, but affect the performance of other tasks. Several problems specific to programs making WebSphere MQ calls are discussed in the following sections.

For more information about application design, see the WebSphere MQ Application Programming Guide.

Effect of message length

The amount of data in a message can affect the performance of the application that processes the message. To achieve the best performance from your application, send only the essential data in a message. For example, in a request to debit a bank account, the only information that might need to be passed from the client to the server application is the account number and the amount of the debit.

Effect of message persistence

Persistent messages are usually logged. Logging messages reduces the performance of your application, so use persistent messages for essential data only. If the data in a message can be discarded if the queue manager stops or fails, use a nonpersistent message.

Searching for a particular message

The MQGET call usually retrieves the first message from a queue. If you use the message and correlation identifiers (*MsgId* and *CorrelId*) in the message descriptor to specify a particular message, the queue manager has to search the queue until it finds that message. Using the MQGET call in this way affects the performance of your application.

Queues that contain messages of different lengths

If your application cannot use messages of a fixed length, grow and shrink the buffers dynamically to suit the typical message size. If the application issues an MQGET call that fails because the buffer is too small, the size of the message data is returned. Add code to your application so that the buffer is resized accordingly and the MQGET call is re-issued.

Note: if you do not set the *MaxMsgLength* attribute explicitly, it defaults to 4 MB, which might be very inefficient if this is used to influence the application buffer size.

Frequency of syncpoints

Programs that issue very large numbers of MQPUT or MQGET calls within syncpoint, without committing them, can cause performance problems. Affected queues can fill up with messages that are currently inaccessible, while other tasks might be waiting to get these messages. This has implications in terms of storage, and in terms of threads tied up with tasks that are attempting to get messages.

Use of the MQPUT1 call

Use the MQPUT1 call only if you have a single message to put on a queue. If you want to put more than one message, use the MQOPEN call, followed by a series of MQPUT calls and a single MQCLOSE call.

Number of threads in use

For WebSphere MQ for Windows, an application might require a large number of threads. Each queue manager process is allocated a maximum allowable number of application threads.

Applications might use too many threads. Consider whether the application takes into account this possibility and that it takes actions either to stop or to report this type of occurrence.

Error logs

WebSphere MQ uses a number of error logs to capture messages concerning its own operation of WebSphere MQ, any queue managers that you start, and error data coming from the channels that are in use.

The location of the error logs depends on whether the queue manager name is known and whether the error is associated with a client.

- If the queue manager name is known, the location of the error log is shown in Table 20.

Table 20. Queue manager error log directory

Platform	**Directory**
UNIX systems	`/var/mqm/qmgrs/`*`qmname`*`/errors`
Windows systems	`c:\Program Files\IBM\WebSphere MQ\qmgrs\`*`qmname`*`\errors`

- If the queue manager name is not known, the location of the error log is shown in Table 21.

Table 21. System error log directory

Platform	**Directory**
UNIX systems	`/var/mqm/errors`
Windows systems	`c:\Program Files\IBM\WebSphere MQ\errors`

- If an error has occurred with a client application, the location of the error log on the client is shown in Table 22 on page 252.

Table 22. Client error log directory

Platform	Directory
UNIX systems	`/var/mqm/errors`
Windows systems	`c:\Program Files\IBM\WebSphere MQ Client\errors`

In WebSphere MQ for Windows, an indication of the error is also added to the Application Log, which can be examined with the Event Viewer application provided with Windows systems.

Error log files

At installation time an `errors` subdirectory is created in the `/var/mqm` file path under UNIX systems, and in the `\IBM\WebSphere MQ\` file path under Windows systems. The `errors` subdirectory can contain up to three error log files named:

- AMQERR01.LOG
- AMQERR02.LOG
- AMQERR03.LOG

After you have created a queue manager, it creates three error log files when it needs them. These files have the same names as those in the system error log directory, that is AMQERR01, AMQERR02, and AMQERR03, and each has a default capacity of 256 KB. The capacity can be altered in the `Extended` queue manager properties page from the WebSphere MQ Explorer, or in the `QMErrorLog` stanza in the qm.ini file. These files are placed in the `errors` subdirectory in the `/var/mqm/qmgrs/`*`qmname`* file path under UNIX systems, or in the `\IBM\WebSphere MQ\qmgrs\`*`qmname`*`\errors` file path under Windows systems.

As error messages are generated, they are placed in AMQERR01. When AMQERR01 gets bigger than 256 KB it is copied to AMQERR02. Before the copy, AMQERR02 is copied to AMQERR03.LOG. The previous contents, if any, of AMQERR03 are discarded.

The latest error messages are thus always placed in AMQERR01, the other files being used to maintain a history of error messages.

All messages relating to channels are also placed in the appropriate queue manager's errors files, unless the queue manager is unavailable, or its name is unknown, in which case channel-related messages are placed in the system error log directory.

To examine the contents of any error log file, use your usual system editor.

Early errors:

There are a number of special cases where these error logs have not yet been established and an error occurs. WebSphere MQ attempts to record any such errors in an error log. The location of the log depends on how much of a queue manager has been established.

If, because of a corrupt configuration file for example, no location information can be determined, errors are logged to an errors directory that is created at installation time on the root directory (`/var/mqm` or `C:\Program Files\IBM\WebSphere MQ`).

If WebSphere MQ can read its configuration information, and can access the value for the Default Prefix, errors are logged in the errors subdirectory of the directory identified by the Default Prefix attribute. For example, if the default prefix is `C:\Program Files\IBM\WebSphere MQ`, errors are logged in `C:\Program Files\IBM\WebSphere MQ\errors`.

For further information about configuration files, see "Configuring WebSphere MQ" on page 93.

Note: Errors in the Windows Registry are notified by messages when a queue manager is started.

An example of an error log:

Figure 24 shows an extract from a WebSphere MQ error log:

```
17/11/2004  10:32:29 - Process(2132.1) User(USER_1) Program(runmqchi.exe)
AMQ9542: Queue manager is ending.

EXPLANATION:
The program will end because the queue manager is quiescing.
ACTION:
None.
----- amqrimna.c : 931 -------------------------------------------------------
```

Figure 24. Sample WebSphere MQ error log

Error log access restrictions under UNIX systems

Certain error log directories and error logs have access restrictions under UNIX systems. To gain the following access permissions, a user or application must be a member of the mqm group:

- Read and write access to all queue manager error log directories.
- Read and write access to all queue manager error logs.
- Write access to the system error logs.

If an unauthorized user or application attempts to write a message to a queue manager error log directory, the message is redirected to the system error log directory.

Ignoring error codes under UNIX systems

On UNIX systems, if you do not want certain error messages to be written to a queue manager error log, you can specify the error codes that are to be ignored using the QMErrorLog stanza. For more information, see "Queue manager error logs" on page 118.

Ignoring error codes under Windows systems

On Windows systems, if an error message has a severity of ERROR, the message is written to both the WebSphere MQ error log and the Windows Application Event Log.

If you do not want certain error messages to be written to the Windows Application Event Log, you can specify the error codes that are to be ignored in the Windows registry. Use the registry key:

```
HKEY_LOCAL_MACHINE\Software\IBM\MQSeries\CurrentVersion\IgnoredErrorCodes
```

The value that you set it to is an array of strings delimited by the NULL character, with each string value relating to the error code that you want ignored from the error log. The complete list is terminated with a NULL character, which is of type REG_MULTI_SZ.

For example, if you want WebSphere MQ to exclude error codes AMQ3045, AMQ6055, and AMQ8079 from the Windows Application Event Log, set the value to:

```
AMQ3045\0AMQ6055\0AMQ8079\0\0
```

The list of messages you want to exclude is defined for all queue managers on the machine. Any changes you make to the configuration will not take effect until each queue manager is restarted.

Operator messages

Operator messages identify normal errors, typically caused directly by users doing things like using parameters that are not valid on a command. Operator messages are national-language enabled, with message catalogs installed in standard locations.

These messages are written to the associated window, if any. In addition, some operator messages are written to the AMQERR01.LOG file in the queue manager directory, and others to the equivalent file in the system error log directory.

Dead-letter queues

Messages that cannot be delivered for some reason are placed on the dead-letter queue. You can check whether the queue contains any messages by issuing the MQSC command DISPLAY QUEUE. If the queue contains messages, use the provided browse sample application (amqsbcg) to browse messages on the queue using the **MQGET** call. The sample application steps through all the messages on a named queue for a named queue manager, displaying both the message descriptor and the message context fields for each message. See “Browsing queues” on page 41 for more information about running this sample and about the kind of output it produces.

You must decide how to dispose of any messages found on the dead-letter queue, depending on the reasons for the messages being put on the queue.

Problems might occur if you do not associate a dead-letter queue with each queue manager. For more information about dead-letter queues, see “The WebSphere MQ dead-letter queue handler” on page 192.

Configuration files and problem determination

Configuration file errors typically prevent queue managers from being found, and result in *queue manager unavailable* errors. Ensure that the configuration files exist, and that the WebSphere MQ configuration file references the correct queue manager and log directories.

Errors in the Windows Registry are notified by messages when a queue manager is started.

Tracing

This section describes how to produce a trace for WebSphere MQ.

Tracing WebSphere MQ for Windows

You enable or modify tracing using the **strmqtrc** control command, described in “strmqtrc (Start trace)” on page 370. To stop tracing, you use the **endmqtrc** control command, described in “endmqtrc (end trace)” on page 328.

In WebSphere MQ for Windows systems, you can also start and stop tracing using the WebSphere MQ Explorer, as follows:

1. Start the WebSphere MQ Explorer from the Start menu.
2. In the Navigator View, right-click the **WebSphere MQ** tree node, and select **Trace...**. The Trace Dialog is displayed.
3. Click **Start** or **Stop** as appropriate.

Selective component tracing on WebSphere MQ for Windows:

Use the -t and -x options to control the amount of trace detail to record. By default, **all** trace points are enabled. The -x option enables you to specify the points that you do **not** want to trace. So if, for example, you want to trace only data flowing over communications networks, use:

```
strmqtrc -x all -t comms
```

For a full description of the trace command, see “strmqtrc (Start trace)” on page 370.

Selective process tracing on WebSphere MQ for Windows:

This introduces the concept of selective process tracing on Websphere MQ for Windows.

Use the -p option of the strmqtrc command control to restrict trace generation to specified named processes. For example, to trace all threads that result from any executing process called amqxxx.exe, use the following command:

```
strmqtrc -p amqxxx.exe
```

For a full description of the trace command, see “strmqtrc (Start trace)” on page 370.

Trace files:

This introduces trace files for Windows systems; their file paths and their file names.

By default, the trace files are placed in the directory`\<mqmwork>\trace`, where `<mqmwork>` is the directory selected, when WebSphere MQ is installed, to hold WebSphere MQ data files. If you want to, you can specify a different directory path when you start a trace.

You can issue the command strmqtrc -s to find the current directory path for the trace files.

Trace files are named `AMQ`*`ppppp.qq`*`.TRC`, where:

ppppp	Is the ID of the process reporting the error.
qq	Starts at 0. If the full filename already exists, this value is incremented by one until a unique trace filename is found. A trace filename can already exist if a process is reused.

Note:

1. The process identifier can contain fewer, or more, digits than shown in the example.
2. There is one trace file for each process running as part of the entity being traced.

An example of WebSphere MQ for Windows trace data:

Figure 25 shows an extract from a WebSphere MQ for Windows trace:

```
Counter  TimeStamp          PID.TID   Data
============================================================

00000D12 15:13:09.961154  10064.1      !! - Thread stack
00000D13 15:13:09.961173  10064.1      !! - -> InitProcessInitialisation
00000D14 15:13:09.961206  10064.1     --{  InitProcessInitialisation
00000D15 15:13:09.961899  10064.1     ---{  xcsReleaseThreadMutexSem
00000D16 15:13:09.961927  10064.1     ---}  xcsReleaseThreadMutexSem (rc=OK)
00000D17 15:13:09.961942  10064.1     ---{  xcsGetEnvironmentInteger
00000D18 15:13:09.962017  10064.1     ----{  xcsGetEnvironmentString
00000D19 15:13:09.962045  10064.1     xcsGetEnvironmentString[AMQ_AFFINITY_MASK]#
                                            = NULL
00000D1A 15:13:09.962051  10064.1     ----}! xcsGetEnvironmentString
                                            (rc=xecE_E_ENV_VAR_NOT_FOUND)
00000D1B 15:13:09.962083  10064.1     ---}! xcsGetEnvironmentInteger
                                            (rc=xecE_E_ENV_VAR_NOT_FOUND)
00000D1C 15:13:09.962092  10064.1     --}  InitProcessInitialisation (rc=OK)
00000D1D 15:13:09.962097  10064.1     --{  xcsCreateThreadMutexSem
00000D1E 15:13:09.962106  10064.1     ---{  xcsCloseHandle
00000D1F 15:13:09.962113  10064.1      Handle (0x48), Handle Type (9)
00000D20 15:13:09.962121  10064.1      OK
00000D21 15:13:09.962125  10064.1     ---}! xcsCloseHandle (rc=Unknown(1))
00000D22 15:13:09.963830  10064.1     --}  xcsCreateThreadMutexSem (rc=OK)
00000D23 15:13:09.963908  10064.1     --{  xcsProgramInit
00000D24 15:13:09.963914  10064.1     ---{  xcsProgramInit
00000D25 15:13:09.964557  10064.1      Adjusted Privilege NewPrivileges.Attribute
                                            = 2 OldPrivileges.Attribute = 1245120
```

Figure 25. Sample WebSphere MQ for Windows trace

Tracing WebSphere MQ for UNIX systems

This is a brief introduction to the trace control commands you can use in Websphere MQ for UNIX.

In WebSphere MQ for UNIX systems you enable or modify tracing using the **strmqtrc** control command, which is described in “strmqtrc (Start trace)” on page 370. To stop tracing, you use the **endmqtrc** control command, which is described in “endmqtrc (end trace)” on page 328. On WebSphere MQ for Linux (x86 platform) systems you can alternatively use the WebSphere MQ Explorer to start and stop tracing, however, the function provided allows you to trace only everything, equivalent to using the commands `strmqtrc -e` and `endmqtrc -e`.

Trace output is unformatted; use the dspmqtrc control command to format trace output before viewing. For example, to format all trace files in the current directory use the following command:

```
dspmqtrc *.TRC
```

For more information on the control command **dspmqtrc**, see “dspmqtrc (display formatted trace output)” on page 320.

Selective component tracing on WebSphere MQ for UNIX systems:

Use the -t and -x options to control the amount of trace detail to record. By default, **all** trace points are enabled. The -x option enables you to specify the points you do **not** want to trace. So if, for example, you want to trace, for queue manager QM1, only output data associated with using Secure Sockets Layer (SSL) channel security, use:

```
strmqtrc -m QM1 -t ssl
```

For a full description of the trace command, see “strmqtrc (Start trace)” on page 370.

Selective process tracing on WebSphere MQ for UNIX:

This introduces the concept of selective process tracing on Websphere MQ for UNIX.

Use the -p option of the strmqtrc command control to restrict trace generation to specified named processes. For example, to trace all threads that result from any executing process called amqxxx.exe, use the following command:

```
strmqtrc -p amqxxx.exe
```

For a full description of the trace command, see “strmqtrc (Start trace)” on page 370.

Example trace data for WebSphere MQ for UNIX systems:

Figure 26 on page 258 shows an extract from a WebSphere MQ for HP-UX trace:

```
Timestamp        Process.Thread  Trace Data
============================================
 15:19:01.830759    18153.1         Version : 7.0.0.0    Level : p000-L050228
 15:19:01.831571    18153.1         Date : 03/04/05  Time : 15:19:01
 15:19:01.831598    18153.1         PID : 18153 Process : strmqm_nd
 15:19:01.831607    18153.1         QueueManager : QM1
 15:19:01.831615    18153.1         --------------------------------
 15:19:01.831623    18153.1         Trace Control Memory:
 15:19:01.831632    18153.1         StrucId:
 15:19:01.831640    18153.1         EarlyTraceOptions:        0
 15:19:01.831649    18153.1         EarlyTraceMaxFileSize: 0
 15:19:01.831657    18153.1         ActiveEntries:     0
 15:19:01.831665    18153.1         Options MaxFileSize FileCount SubPoolName
 15:19:01.831674    18153.1          1f4ffff            0    0         elk
 15:19:01.831683    18153.1                0            0    0
 15:19:01.831691    18153.1                0            0    0
 15:19:01.831700    18153.1                0            0    0
 15:19:01.831709    18153.1                0            0    0
 15:19:01.831717    18153.1                0            0    0
 15:19:01.831726    18153.1                0            0    0
 15:19:01.831778    18153.1                0            0    0
 15:19:01.831787    18153.1                0            0    0
 15:19:01.831800    18153.1         Thread stack
 15:19:01.838603    18153.1         -> zslWaitEC
 15:19:01.838612    18153.1         -> zslCheckIfRunning
 15:19:01.841757    18153.1         -> xcsInitialize
 15:19:01.841767    18153.1         -> xcsGetEnvironmentString
 15:19:01.841774    18153.1    ---{  xcsGetEnvironmentString
 15:19:01.841785    18153.1         xcsGetEnvironmentString[AMQ_SERVICE_MODULE]
                                                                      = NULL
 15:19:01.841793    18153.1    ---}! xcsGetEnvironmentString
                                                rc=xecE_E_ENV_VAR_NOT_FOUND
 15:19:01.841801    18153.1    ---{  xcsReleaseThreadMutexSem
```

Figure 26. Sample WebSphere MQ for HP-UX trace

Figure 27 on page 259 shows an extract from a WebSphere MQ for Solaris trace:

```
Timestamp        Process.Thread  Trace Data
============================================
 15:00:04.324190    12277.1         Version : 7.0.0.0    Level : p000-L050203
 15:00:04.325045    12277.1         Date : 07/02/05  Time : 15:00:04
 15:00:04.325375    12277.1         PID : 12277 Process : strmqm
 15:00:04.325403    12277.1         QueueManager : QM1
 15:00:04.325419    12277.1         --------------------------------
 15:00:04.325446    12277.1         Trace Control Memory:
 15:00:04.325471    12277.1         StrucId:
 15:00:04.325490    12277.1         EarlyTraceOptions:        0
 15:00:04.325507    12277.1         EarlyTraceMaxFileSize: 0
 15:00:04.325527    12277.1         ActiveEntries:     0
 15:00:04.325544    12277.1         Options MaxFileSize FileCount SubPoolName
 15:00:04.325566    12277.1           74ffff             0    0         elk
 15:00:04.325587    12277.1                0             0    0
 15:00:04.325609    12277.1                0             0    0
 15:00:04.325632    12277.1                0             0    0
 15:00:04.325654    12277.1                0             0    0
 15:00:04.325677    12277.1                0             0    0
 15:00:04.325698    12277.1                0             0    0
 15:00:04.325774    12277.1                0             0    0
 15:00:04.325798    12277.1                0             0    0
 15:00:04.325891    12277.1         Thread stack
 15:00:04.325971    12277.1         -> zslWaitEC
 15:00:04.326078    12277.1         -> zslCheckIfRunning
 15:00:04.326098    12277.1         -> xcsInitialize
 15:00:04.326147    12277.1         -> xcsGetEnvironmentString
 15:00:04.326186    12277.1     ---{  xcsGetEnvironmentString
 15:00:04.326241    12277.1         xcsGetEnvironmentString[AMQ_SERVICE_MODULE]
                                                     = NULL
```

Figure 27. Sample WebSphere MQ for Solaris trace

Figure 28 on page 260 shows an extract from a WebSphere MQ for Linux trace:

```
Timestamp        Process.Thread  Trace Data
============================================
 15:15:05.931699     1159.1         Version : 7.0.0.0    Level : p000-L050107
 15:15:05.931843     1159.1         Date : 02/07/05  Time : 15:15:05
 15:15:05.932016     1159.1         PID : 1159 Process : amqzdmaa
 15:15:05.932024     1159.1         QueueManager : QM1
 15:15:05.932028     1159.1         --------------------------------
 15:15:05.932037     1159.1         Trace Control Memory:
 15:15:05.932044     1159.1         StrucId:
 15:15:05.932049     1159.1         EarlyTraceOptions:        0
 15:15:05.932054     1159.1         EarlyTraceMaxFileSize: 0
 15:15:05.932059     1159.1         ActiveEntries:     0
 15:15:05.932064     1159.1         Options MaxFileSize FileCount SubPoolName
 15:15:05.932070     1159.1           74ffff             0    0         elk
 15:15:05.932075     1159.1                0             0    0
 15:15:05.932081     1159.1                0             0    0
 15:15:05.932086     1159.1                0             0    0
 15:15:05.932091     1159.1                0             0    0
 15:15:05.932097     1159.1                0             0    0
 15:15:05.932102     1159.1                0             0    0
 15:15:05.932107     1159.1                0             0    0
 15:15:05.932112     1159.1                0             0    0
 15:15:05.932138     1159.1         Thread stack
 15:15:05.932149     1159.1         -> xxxInitialize
 15:15:05.932158     1159.1    {  xxxInitialize
 15:15:05.932165     1159.1    -{  xcsSetlocale
 15:15:05.932189     1159.1         category(6) locale() buffer(0xbfffd340)
                                                     buflen(1285)
 15:15:05.932196     1159.1         Doing the first-thread-only
                                                     locale check . . . .
 15:15:05.932326     1159.1    -}  xcsSetlocale rc=OK
 15:15:05.932344     1159.1    -{  xcsGetMem
```

Figure 28. Sample WebSphere MQ for Linux trace

Figure 29 on page 261 shows an extract from a WebSphere MQ for AIX trace:

```
Timestamp        Process.Thread  Trace Data
============================================
 13:12:12.336214   286850.1         Version : 7.0.0.0    Level : p000-L050201
 13:12:12.336345   286850.1         Date : 02/15/05  Time : 13:12:12
 13:12:12.336419   286850.1         PID : 286850 Process : amqzlaa0_nd
 13:12:12.336444   286850.1         QueueManager : QM1
 13:12:12.336468   286850.1         --------------------------------
 13:12:12.336493   286850.1         Trace Control Memory:
 13:12:12.336518   286850.1         StrucId:
 13:12:12.336542   286850.1         EarlyTraceOptions:        0
 13:12:12.336567   286850.1         EarlyTraceMaxFileSize: 0
 13:12:12.336591   286850.1         ActiveEntries:     0
 13:12:12.336616   286850.1         Options MaxFileSize FileCount SubPoolName
 13:12:12.336641   286850.1           74ffff            0    0         elk
 13:12:12.336668   286850.1                0            0    0
 13:12:12.336692   286850.1                0            0    0
 13:12:12.336718   286850.1                0            0    0
 13:12:12.336742   286850.1                0            0    0
 13:12:12.336768   286850.1                0            0    0
 13:12:12.336792   286850.1                0            0    0
 13:12:12.336817   286850.1                0            0    0
 13:12:12.336842   286850.1                0            0    0
 13:12:12.336870   286850.1         Thread stack
 13:12:12.336897   286850.1         -> xxxInitialize
 13:12:12.336921   286850.1     {  xxxInitialize
 13:12:12.336947   286850.1     -{  xcsSetlocale
 13:12:12.336977   286850.1         category(-1) locale()
                                         buffer(fffffffffffcf08) buflen(1285)
 13:12:12.337005   286850.1      Doing the first-thread-only locale check . . .
 13:12:12.338602   286850.1     -}  xcsSetlocale rc=OK
```

Figure 29. Sample WebSphere MQ for AIX trace

Trace files

This introduces trace files for UNIX systems; their file paths and their file names.

Trace files are created in the directory `/var/mqm/trace` by default, or in a directory that you specify.

Note: You can accommodate production of large trace files by mounting a temporary file system over the directory that contains your trace files, or by using the command `strmqtrc -n` to specify a directory in a different file system.

Trace files are named `AMQ`*`ppppp.qq`*`.TRC`, where:

ppppp	Is the ID of the process reporting the error.
qq	Starts at 0. If the full filename already exists, this value is incremented by one until a unique trace filename is found. A trace filename can already exist if a process is reused.

Note:

1. The process identifier can contain fewer, or more, digits than shown in the example.
2. There is one trace file for each process running as part of the entity being traced.

To format or view a trace file, you must be either the creator of the trace file, or a member of the mqm group.

Tracing Secure Sockets Layer (SSL) iKeyman and IKEYCMD functions

To request iKeyman tracing, execute the iKeyman command for your platform with the following –D flags.

For UNIX:

```
gsk7ikm -Dkeyman.debug=true -Dkeyman.jnitracing=ON
```

For Windows:

```
strmqikm -Dkeyman.debug=true -Dkeyman.jnitracing=ON
```

To request IKEYCMD tracing, run the IKEYCMD command for your platform with the following –D flags.

For UNIX:

```
gsk7cmd -Dkeyman.debug=true -Dkeyman.jnitracing=ON
```

For Windows:

```
runmqckm -Dkeyman.debug=true -Dkeyman.jnitracing=ON
```

iKeyman and IKEYCMD write three trace files to the directory from which you start them, so consider starting iKeyman or IKEYCMD from the trace directory to which the run time SSL trace is written: `/var/mqm/trace` on UNIX and `<`*`mqmtop`*`>/trace` on Windows. The trace files iKeyman and IKEYCMD generate are:

ikmgdbg.log
Java related trace

ikmjdbg.log
JNI related trace

ikmcdbg.log
C related trace

These trace files are binary, so take care when you transfer the files from system to system using FTP. The trace files are typically approximately 1 MB each.

On UNIX and Windows systems, you can independently request trace information for iKeyman, IKEYCMD, the runtime SSL functions, or a combination of these.

The runtime SSL trace files have the names AMQ.SSL.TRC and AMQ.SSL.TRC.1. You cannot format any of the SSL trace files; send them unchanged to IBM support.

Tracing with the AIX system trace

In addition to the WebSphere MQ trace, WebSphere MQ for AIX users can use the standard AIX system trace. AIX system tracing is a two-step process:

1. Gathering the data
2. Formatting the results

WebSphere MQ uses two trace hook identifiers:

X'30D'
This event is recorded by WebSphere MQ on entry to or exit from a subroutine.

X'30E'
This event is recorded by WebSphere MQ to trace data such as that being sent or received across a communications network.

Trace provides detailed execution tracing to help you to analyze problems. IBM service support personnel might ask for a problem to be re-created with trace enabled. The files produced by trace can be **very** large so it is important to qualify a trace, where possible. For example, you can optionally qualify a trace by time and by component.

There are two ways to run trace:

1. Interactively.

   The following sequence of commands runs an interactive trace on the program `myprog` and ends the trace.

   ```
   trace -j30D,30E -o trace.file
   ->!myprog
   ->q
   ```

2. Asynchronously.

   The following sequence of commands runs an asynchronous trace on the program `myprog` and ends the trace.

   ```
   trace -a -j30D,30E -o trace.file
   myprog
   trcstop
   ```

You can format the trace file with the command:

```
trcrpt -t /usr/mqm/lib/amqtrc.fmt trace.file > report.file
```

`report.file` is the name of the file where you want to put the formatted trace output.

Note: All WebSphere MQ activity on the machine is traced while the trace is active.

Selective component tracing on WebSphere MQ for AIX:

Use the environment variable MQS_TRACE_OPTIONS to activate the high detail and parameter tracing functions individually. Because it enables tracing to be active without these functions, you can use it to reduce the overhead on execution speed when you are trying to reproduce a problem with tracing switched on.

Only set the environment variable MQS_TRACE_OPTIONS if you have been instructed to do so by your service personnel.

Typically MQS_TRACE_OPTIONS must be set in the process that starts the queue manager, and before the queue manager is started, or it is not recognized. Set MQS_TRACE_OPTIONS before tracing starts. If it is set after tracing starts it is not recognized.

SSL trace:

If you request SSL trace, note the following:

- SSL trace is written to the directory `/var/mqm/trace`.

- The SSL trace files are AMQ.SSL.TRC and AMQ.SSL.TRC.1.
- You cannot format SSL trace files; send them unchanged to IBM support.

An example of WebSphere MQ for AIX trace data:

The following example is an extract of an AIX trace:

```
ID     ELAPSED_SEC    DELTA_MSEC   APPL    SYSCALL KERNEL  INTERRUPT

30D    0.000000000      0.000000   MQS FNC Exit!..... 23298.1 ziiSendReceiveAgent
                                                                 rc=00000814
30D    0.000009512      0.009512   MQS FNC Entry...... 23298.1 zcpDeleteMessage
30D    0.000011869      0.002357   MQS FNC Exit....... 23298.1 zcpDeleteMessage
                                                                 rc=00000000
30D    0.000014196      0.002327   MQS FNC Exit!..... 23298.1 ziiSPIInq1
                                                                 rc=00000814
30D    0.000016727      0.002531   MQS FNC Exit!.... 23298.1 lpiSPIInq1
                                                                 rc=00000814
30D    0.000019847      0.003120   MQS FNC Entry.... 23298.1 lpiSPIInq1
30D    0.000022465      0.002618   MQS FNC Entry..... 23298.1 zstVerifyPCD
30D    0.000024792      0.002327   MQS FNC Exit...... 23298.1 zstVerifyPCD
                                                                 rc=00000000
30D    0.000027505      0.002713   MQS FNC Entry..... 23298.1 xcsCheckPointer
30D    0.000032436      0.004931   MQS FNC Exit...... 23298.1 xcsCheckPointer
                                                                 rc=00000000
30D    0.000034923      0.002487   MQS FNC Entry..... 23298.1 xcsCheckPointer
30D    0.000039716      0.004793   MQS FNC Exit...... 23298.1 xcsCheckPointer
                                                                 rc=00000000
30D    0.000042218      0.002502   MQS FNC Entry..... 23298.1 xcsCheckPointer
30D    0.000046982      0.004764   MQS FNC Exit...... 23298.1 xcsCheckPointer
                                                                 rc=00000000
30D    0.000049593      0.002611   MQS FNC Entry..... 23298.1 ziiSPIInq1
30D    0.000052116      0.002523   MQS FNC Entry.... 23298.1 ziiCreateIPCCMessage
30D    0.000054611      0.002495   MQS FNC Entry....... 23298.1 zcpCreateMessage
30E    0.000059062      0.004451   Terminus(0) RequestedSize(236)
30D    0.000061549      0.002487   MQS FNC Exit........ 23298.1 zcpCreateMessage
                                                                 rc=00000000
30D    0.000063884      0.002335   MQS FNC Exit..... 23298.1 ziiCreateIPCCMessage
                                                                 rc=00000000
```

Figure 30. Sample WebSphere MQ for AIX trace

First-failure support technology (FFST)

This section describes the role of first-failure support technology (FFST) for WebSphere MQ.

FFST: WebSphere MQ for Windows

Describes the contents of the First Failure Support Technology (FFST) file.

In WebSphere MQ for Windows, FFST information is recorded in a file in the `c:\Program Files\IBM\WebSphere MQ\errors` directory.

An FFST file contains one or more records. Each FFST record contains information about an error that is normally severe, and possibly unrecoverable. These records typically indicate either a configuration problem with the system or a WebSphere MQ internal error.

FFST files are named `AMQ`*`nnnnn.mm`*`.FDC`, where:

nnnnn	Is the ID of the process reporting the error
mm	Starts at 0. If the full filename already exists, this value is incremented by one until a unique FFST filename is found. An FFST filename can already exist if a process is reused.

An instance of a process will write all FFST information to the same FFST file. If multiple errors occur during a single execution of the process, an FFST file can contain many records.

When a process writes an FFST record it also sends a record to the Event Log. The record contains the name of the FFST file to assist in automatic problem tracking. The Event log entry is made at the application level.

A typical FFST log is shown in Figure 31 on page 266.

```
+-----------------------------------------------------------------------------+
| WebSphere MQ First Failure Symptom Report                                   |
| =========================================                                   |
|                                                                             |
| Date/Time         :- Mon January 28 2008 21:59:06 GMT                       |
| UTC Time/Zone     :- 1201539869.892015 0 GMT                                |
| Host Name         :- 99VXY09 (Windows XP Build 2600: Service Pack 1)        |
| PIDS              :- 5724H7200                                              |
| LVLS              :- 7.0.0.0                                                |
| Product Long Name :- WebSphere MQ for Windows                               |
| Vendor            :- IBM                                                    |
| Probe Id          :- HL010004                                               |
| Application Name  :- MQM                                                    |
| Component         :- hlgReserveLogSpace                                     |
| SCCS Info         :- lib/logger/amqhlge0.c, 1.26                            |
| Line Number       :- 246                                                    |
| Build Date        :- Jan 25 2008                                            |
| CMVC level        :- p000-L050202                                           |
| Build Type        :- IKAP - (Production)                                    |
| UserID            :- IBM_User                                               |
| Process Name      :- C:\Program Files\IBM\WebSphere MQ\bin\amqzlaa0.exe     |
| Process           :- 00003456                                               |
| Thread            :- 00000030                                               |
| QueueManager      :- qmgr2                                                  |
| ConnId(1) IPCC    :- 162                                                    |
| ConnId(2) QM      :- 45                                                     |
| Major Errorcode   :- hrcE_LOG_FULL                                          |
| Minor Errorcode   :- OK                                                     |
| Probe Type        :- MSGAMQ6709                                             |
| Probe Severity    :- 2                                                      |
| Probe Description :- AMQ6709: The log for the Queue manager is full.        |
| FDCSequenceNumber :- 0                                                      |
+-----------------------------------------------------------------------------+

MQM Function Stack
zlaMainThread
zlaProcessMessage
zlaProcessMQIRequest
zlaMQPUT
zsqMQPUT
kpiMQPUT
kqiPutIt
kqiPutMsgSegments
apiPutMessage
aqmPutMessage
aqhPutMessage
aqqWriteMsg
aqqWriteMsgData
aqlReservePutSpace
almReserveSpace
hlgReserveLogSpace
xcsFFST

MQM Trace History
-------------} hlgReserveLogSpace rc=hrcW_LOG_GETTING_VERY_FULL
-------------{ xllLongLockRequest
-------------} xllLongLockRequest rc=OK

...
```

Figure 31. Sample WebSphere MQ for Windows First Failure Symptom Report

The Function Stack and Trace History are used by IBM to assist in problem determination. In many cases there is little that the system administrator can do when an FFST record is generated, apart from raising problems through the IBM Support Center.

In certain circumstances a small dump file can be generated in addition to an FFST file and placed in the `c:\Program Files\IBM\WebSphere MQ\errors` directory. A dump file will have the same name as the FFST file, in the form `AMQnnnnn.mm.dmp`. These files can be used by IBM to assist in problem determination.

FFST: WebSphere MQ for UNIX systems

Describes the contents of the First Failure Support Technology (FFST) file.

For WebSphere MQ for UNIX systems, FFST information is recorded in a file in the `/var/mqm/errors` directory.

An FFST file contains one or more records. Each FFST record contains information about an error that is normally severe, and possibly unrecoverable. These records indicate either a configuration problem with the system or a WebSphere MQ internal error.

FFST files are named `AMQ`*`nnnnn.mm`*`.FDC`, where:

nnnnn	Is the ID of the process reporting the error
mm	Starts at 0. If the full filename already exists, this value is incremented by one until a unique FFST filename is found. An FFST filename can already exist if a process is reused.

An instance of a process will write all FFST information to the same FFST file. If multiple errors occur during a single execution of the process, an FFST file can contain many records.

In order to read the contents of a FFST file, you must be either the creator of the file, or a member of the mqm group.

When a process writes an FFST record, it also sends a record to syslog. The record contains the name of the FFST file to assist in automatic problem tracking. The syslog entry is made at the *user.error* level. See the operating-system documentation about `syslog.conf` for information about configuring this.

Some typical FFST data is shown in Figure 32 on page 268.

```
+-----------------------------------------------------------------------------+
|                                                                             |
| WebSphere MQ First Failure Symptom Report                                   |
| =========================================                                   |
|                                                                             |
| Date/Time         :- Mon January 28 2008 21:59:06 GMT                       |
| UTC Time/Zone     :- 1201539869.892015 0 GMT                                |
| Host Name         :- mqperfh2 (HP-UX B.11.23)                               |
| PIDS              :- 5724H7202                                              |
| LVLS              :- 7.0.0.0                                                |
| Product Long Name :- WebSphere MQ for HP-UX                                 |
| Vendor            :- IBM                                                    |
| Probe Id          :- XC034255                                               |
| Application Name  :- MQM                                                    |
| Component         :- xcsWaitEventSem                                        |
| SCCS Info         :- lib/cs/unix/amqxerrx.c, 1.204                          |
| Line Number       :- 6262                                                   |
| Build Date        :- Jan 25 2008                                            |
| CMVC level        :- p000-L050203                                           |
| Build Type        :- IKAP - (Production)                                    |
| UserID            :- 00000106 (mqperf)                                      |
| Program Name      :- amqzmuc0                                               |
| Addressing mode   :- 64-bit                                                 |
| Process           :- 15497                                                  |
| Thread            :- 1                                                      |
| QueueManager      :- CSIM                                                   |
| ConnId(2) QM      :- 4                                                      |
| Major Errorcode   :- OK                                                     |
| Minor Errorcode   :- OK                                                     |
| Probe Type        :- INCORROUT                                              |
| Probe Severity    :- 4                                                      |
| Probe Description :- AMQ6109: An internal WebSphere MQ error has occurred.  |
| FDCSequenceNumber :- 0                                                      |
|                                                                             |
+-----------------------------------------------------------------------------+

MQM Function Stack
amqzmuc0
xcsWaitEventSem
xcsFFST

MQM Trace History
Data: 0x00003c87
--} xcsCheckProcess rc=OK
--{ xcsRequestMutexSem
--} xcsRequestMutexSem rc=OK

...
```

Figure 32. FFST report for WebSphere MQ for UNIX systems

The Function Stack and Trace History are used by IBM to assist in problem determination. In many cases there is little that the system administrator can do when an FFST report is generated, apart from raising problems through the IBM Support Center.

However, there are some problems that the system administrator might be able to solve. If the FFST shows *out of resource* or *out of space on device* descriptions when calling one of the IPC functions (for example, **semop** or **shmget**), it is likely that the relevant kernel parameter limit has been exceeded.

If the FFST report shows a problem with **setitimer**, it is likely that a change to the kernel timer parameters is needed.

To resolve these problems, increase the IPC limits, rebuild the kernel, and restart the machine. See one of the following for further information:
- WebSphere MQ for AIX Quick Beginnings
- WebSphere MQ for HP-UX Quick Beginnings
- WebSphere MQ for Linux Quick Beginnings
- WebSphere MQ for Solaris Quick Beginnings

Problem determination with WebSphere MQ clients

An MQI client application receives MQRC_* reason codes in the same way as non-client MQI applications. However, there are additional reason codes for error conditions associated with clients. For example:
- Remote machine not responding
- Communications line error
- Invalid machine address

The most common time for errors to occur is when an application issues an **MQCONN** and receives the response MQRC_Q_MQR_NOT_AVAILABLE. An error message, written to the client log file, explains the cause of the error. Messages might also be logged at the server, depending on the nature of the failure.

Terminating clients

Even though a client has terminated, the process at the server can still hold its queues open. Normally, this is only for a short time until the communications layer detects that the partner has gone.

Java diagnostics

For Java components of WebSphere MQ, for example the WebSphere MQ Explorer and the Java implementation of WebSphere MQ Transport for SOAP, diagnostic information is output using the standard WebSphere MQ diagnostic facilities or by Java diagnostic classes.

Diagnostic information in this context consists of trace, first-failure data capture (FFDC) and error messages.

You can choose to have this information produced using WebSphere MQ facilities or the facilities of WebSphere MQ classes for Java or WebSphere MQ classes for JMS, as appropriate. You should generally use the WebSphere MQ diagnostic facilities if they are available on the local system.

You might want to use the Java diagnostics in the following circumstances:
- On a system on which queue managers are available, if the queue manager is managed separately from the software you are running.
- To reduce performance overhead of WebSphere MQ trace.

To request and configure diagnostic output, two system properties are used when starting a WebSphere MQ Java process:
- System property com.ibm.mq.commonservices specifies a standard Java property file, which contains a number of lines which are used to configure the diagnostic outputs. Each line of code in the file is free-format, and is terminated by a new line character.

- System property com.ibm.mq.commonservices.diagid associates trace and FFDC files with the process which created them.

For information about tracing

Using com.ibm.mq.commonservices

The com.ibm.mq.commonservices properties file contains the following entries relating to the output of diagnostics from the Java components of WebSphere MQ. Note that case is significant in all these entries.

Diagnostics.MQ=*enabled|disabled*
: Are WebSphere MQ diagnostics to be used? If Diagnostics.MQ is enabled, diagnostic output is as for other WebSphere MQ components; trace output is controlled by the parameters in the **strmqtrc** and **endmqtrc** control commands, or the equivalent. The default is *enabled*.

Diagnostics.Java=*options*
: Which components are traced using Java trace. Options are one or more of *explorer*, *soap*, and *wmqjavaclasses*, separated by commas, where ″explorer″ refers to the diagnostics from the WebSphere MQ Explorer, ″soap″ refers to the diagnostics from the running process within WebSphere MQ Transport for SOAP, and ″wmqjavaclasses″ refers to the diagnostics from the underlying WebSphere MQ Java classes. By default no components are traced.

Diagnostics.Java.Trace.Detail=*high|medium|low*
: Detail level for Java trace. The *high* and *medium* detail levels match those used in WebSphere MQ tracing but *low* is unique to Java trace. This property is ignored if Diagnostics.Java is not set. The default is *medium*.

Diagnostics.Java.Trace.Destination.File=*enabled|disabled*
: Whether Java trace is written to a file. This property is ignored if Diagnostics.Java is not set. The default is *disabled*.

Diagnostics.Java.Trace.Destination.Console=*enabled|disabled*
: Whether Java trace is written to the system console. This property is ignored if Diagnostics.Java is not set. The default is *disabled*.

Diagnostics.Java.Trace.Destination.Pathname=*dirname*
: The directory to which Java trace is written. This property is ignored if Diagnostics.Java is not set or Diagnostics.Java.Trace.Destination.File=disabled. On UNIX systems, the default is /var/mqm/trace if it is present, otherwise the Java console (System.err). On Windows, the default is the system console.

Diagnostics.Java.FFDC.Destination.Pathname=*dirname*
: The directory to which Java FFDC output is written. The default is the current working directory.

Diagnostics.Java.Errors.Destination.Filename=*filename*
: The fully qualified filename to which Java error messages are written. The default is AMQJAVA.LOG in the current working directory.

An example of a com.ibm.mq.commonservices properties file is given in Figure 33 on page 271. Lines beginning with the number sign (#) are treated as comments.

```
#
# Base WebSphere MQ diagnostics are disabled
#
Diagnostics.MQ=disabled
#
# Java diagnostics for WebSphere MQ Transport for SOAP
# and the WebSphere MQ Java Classes are both enabled
#
Diagnostics.Java=soap,wmqjavaclasses
#
# High detail Java trace
#
Diagnostics.Java.Trace.Detail=high
#
# Java trace is written to a file and not to the console.
#
Diagnostics.Java.Trace.Destination.File=enabled
Diagnostics.Java.Trace.Destination.Console=disabled
#
# Directory for Java trace file
#
Diagnostics.Java.Trace.Destination.Pathname=c:\\tracedir
#
# Directory for First Failure Data Capture
#
Diagnostics.Java.FFDC.Destination.Pathname=c:\\ffdcdir
#
# Directory for error logging
#
Diagnostics.Java.Errors.Destination.Filename=c:\\errorsdir\\SOAPERRORS.LOG
#
```

Figure 33. Sample com.ibm.mq.commonservices properties file

A sample properties file, WMQSoap_RAS.properties, is also supplied as part of the "Java messaging and SOAP transport" install option.

Java trace and FFDC files

When Java trace is generated for the WebSphere MQ Explorer or for WebSphere MQ Transport for SOAP it is written to a file with a name of the format `AMQ.`*`diagid`*`.`*`counter`*`.TRC` where *diagid* is the value of the system property com.ibm.mq.commonservices.diagid associated with this Java process, as described earlier in this section, and *counter* is an integer greater than or equal to 0. All letters in the name are in upper case. This matches the naming convention used for normal WebSphere MQ trace.

If com.ibm.mq.commonservices.diagid is not specified, the value of *diagid* is the current time, in the format `YYYYMMDDhhmmssmmm`.

The WebSphere MQ Java classes trace file has a name based on the equivalent WebSphere MQ Explorer or SOAP Java trace file. The name differs in that it has the string .JC added before the .TRC string, giving a format of `AMQ.`*`diagid`*`.`*`counter`*`.JC.TRC`.

When Java FFDC is generated for the WebSphere MQ Explorer or for WebSphere MQ Transport for SOAP it is written to a file with a name of the format `AMQ.`*`diagid`*`.`*`counter`*`.FDC` where *diagid* and *counter* are as described for Java trace files.

Java error message output for the WebSphere MQ Explorer and for WebSphere MQ Transport for SOAP is written to the file specified by *Diagnostics.Java.Errors.Destination.Filename* for the appropriate Java process. The format of these files matches closely the format of the standard WebSphere MQ error logs.

When a process is writing trace information to a file, it appends to a single trace output file for the lifetime of the process. Similarly, a single FFDC output file is used for the lifetime of a process.

All trace output is in the UTF-8 character set.

Note that none of the above applies to output of FFDC data or error messages for the WebSphere MQ Java classes. This occurs as part of exception logging as detailed in WebSphere MQ Using Java. The WebSphere MQ Java class trace is also detailed in WebSphere MQ Using Java.

Chapter 6. WebSphere MQ control commands

How to use WebSphere MQ control commands

This chapter describes how to use the WebSphere MQ control commands. If you want to issue control commands, your user ID must be a member of the mqm group. For more information about this, see "Authority to administer WebSphere MQ" on page 122. In addition, note the following environment-specific information:

WebSphere MQ for Windows
: All control commands can be issued from a command line. Command names and their flags are not case sensitive: you can enter them in uppercase, lowercase, or a combination of uppercase and lowercase. However, arguments to control commands (such as queue names) are case sensitive.

  In the syntax descriptions, the hyphen (-) is used as a flag indicator. You can use the forward slash (/) instead of the hyphen.

WebSphere MQ for UNIX systems
: All WebSphere MQ control commands can be issued from a shell. All commands are case-sensitive.

A subset of the control commands can be issued using the WebSphere MQ Explorer.

Names of WebSphere MQ objects

In general, the names of WebSphere MQ objects can have up to 48 characters. This rule applies to all the following objects:

- Queue managers
- Queues
- Process definitions
- Namelists
- Clusters
- Listeners
- Services
- Authentication information objects
- Topics

The maximum length of channel, and client connection channel names is 20 characters.Topic strings can be 10240 bytes.

The characters that can be used for all WebSphere MQ names are:

- Uppercase A–Z
- Lowercase a–z
- Numerics 0–9
- Period (.)
- Underscore (_)

- Forward slash (/) (see note 1)
- Percent sign (%) (see note 1)

Note:

1. Forward slash and percent are special characters. If you use either of these characters in a name, the name must be enclosed in double quotation marks whenever it is used.
2. Leading or embedded blanks are not allowed.
3. National language characters are not allowed.
4. Names can be enclosed in double quotation marks, but this is essential only if special characters are included in the name.

Syntax diagrams

The syntax for commands is presented in the form of a diagram. There are two types of syntax diagram: railroad diagrams and dotted decimal diagrams.

Either type of syntax diagram tells you what you can do with the particular command, and indicates relationships between different options and, sometimes, different values of an option. Railroad diagrams are a visual format suitable for sighted users. Dotted decimal diagrams are text-based diagrams that are more helpful for blind or partially-sighted users.

Only railroad diagrams are available in PDFs: dotted decimal diagrams are only avaliable in the Information Center.

How to read railroad diagrams

Each railroad diagram begins with a double right arrow and ends with a right and left arrow pair. Lines beginning with a single right arrow are continuation lines. You read a railroad diagram from left to right and from top to bottom, following the direction of the arrows.

Other conventions used in railroad diagrams are:

Table 23. How to read railroad diagrams

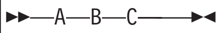
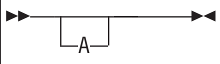
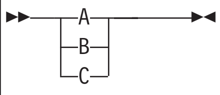
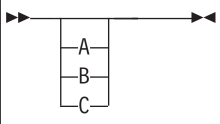
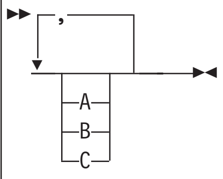
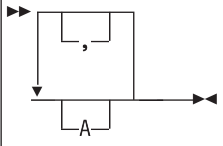
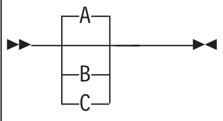
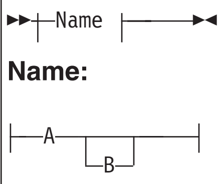
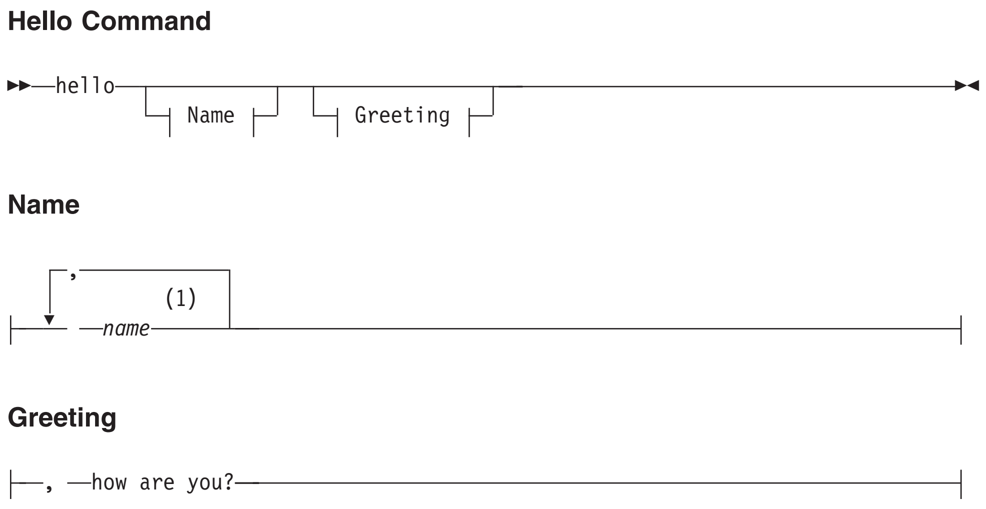
Convention	Meaning
	You must specify values A, B, and C. Required values are shown on the main line of a railroad diagram.
	You may specify value A. Optional values are shown below the main line of a railroad diagram.
	Values A, B, and C are alternatives, one of which you must specify.
	Values A, B, and C are alternatives, one of which you might specify.

Table 23. How to read railroad diagrams (continued)

Convention	Meaning
	You might specify one or more of the values A, B, and C. Any required separator for multiple or repeated values (in this example, the comma (,)) is shown on the arrow.
	You might specify value A multiple times. The separator in this example is optional.
	Values A, B, and C are alternatives, one of which you might specify. If you specify none of the values shown, the default A (the value shown above the main line) is used.
	The railroad fragment Name is shown separately from the main railroad diagram.
Punctuation and uppercase values	Specify exactly as shown.

Example syntax diagram

Here is an example syntax diagram that describes the **hello** command:



Notes:

1 You can code up to three names.

According to the syntax diagram, these are all valid versions of the **hello** command:

```
hello
hello name
hello name, name
hello name, name, name
hello, how are you?
hello name, how are you?
hello name, name, how are you?
hello name, name, name, how are you?
```

The space before the *name* value is significant, and that if you do not code *name* at all, you must still code the comma before `how are you?`.

Syntax help

You can obtain help for the syntax of any control command by entering the command followed by a question mark. WebSphere MQ responds by listing the syntax required for the selected command.

The syntax shows all the parameters and variables associated with the command. Different forms of parentheses are used to indicate whether a parameter is required. For example:

```
CmdName [-x OptParam ] ( -c | -b ) argument
```

where:

`CmdName`
Is the command name for which you have requested help.

`[-x OptParam ]`
Square brackets enclose one or more optional parameters. Where square brackets enclose multiple parameters, you can select no more than one of them.

(-c | -b)
: Brackets enclose multiple values, one of which you must select. In this example, you must select either flag c or flag b.

argument
: A mandatory argument.

Examples

1. Result of entering `endmqm ?`
   ```
   endmqm [-z][-c | -w | -i | -p] QMgrName
   ```
2. Result of entering `rcdmqimg ?`
   ```
   rcdmqimg [-z] [-m QMgrName] -t ObjType [GenericObjName]
   ```

The control commands

This collection of topics provides reference information for each of the WebSphere MQ control commands.

The WebSphere MQ control commands and their purposes are as follows:

Command name	Purpose
amqccert	Check certificate chains
amqmdain	Configure or control WebSphere MQ services (Windows systems only)
amqtcert	Transfer certificates
crtmqcvx	Convert data
crtmqm	Create a local queue manager
dltmqm	Delete a queue manager
dltmqbrk	Delete the Websphere MQ Version 6.0 broker state (the primary state queue and SYSTEM.BROKER.IQ.x.y) but do not remove the stream queues
dmpmqaut	Dump authorizations to an object
dmpmqlog	Dump a log
dspmq	Display queue managers
dspmqaut	Display authorizations to an object
dspmqcsv	Display the status of a command server
dspmqfls	Display file names
dspmqrte	WebSphere MQ display route application
dspmqtrc	Display formatted trace output (UNIX systems only)
dspmqrtn	Display details of transactions
dspmqver	Display version number
endmqbrk	Print an informational message and quits (does not stop the QPUBSUB interface).
endmqcsv	Stop the command server on a queue manager
endmqdnm	Stop .NET monitor
endmqlsr	Stop the listener process on a queue manager
endmqm	Stop a local queue manager
endmqtrc	Stop tracing for an entity
mqftapp	Run the File Transfer Application

mqftrcv	Receive file using the File Transfer Application (server)
mqftrcvc	Receive file using the File Transfer Application (client)
mqftsnd	Send file using the File Transfer Application (server)
mqftsndc	Send file using the File Transfer Application (client)
rcdmqimg	Write an image of an object to the log
rcrmqobj	Recreate an object from their image in the log
rsvmqtrn	Commit or back out a transaction
runmqbrk	Run the MQ pub/sub migration tool
runmqchi	Start a channel initiator process
runmqchl	Start a sender or requester channel
runmqdlq	Start the dead-letter queue handler
runmqdnm	Run .NET monitor
runmqlsr	Start a listener process
runmqsc	Issue MQSC commands to a queue manager
runmqtmc	Invoke a trigger monitor for a client (AIX clients only)
runmqtrm	Invoke a trigger monitor for a server
setmqaut	Change authorizations to an object
setmqcrl	Set certificate revocation list (CRL) LDAP server definitions (Windows systems only)
setmqprd	Enroll production license
setmqscp	Set service connection points (Windows systems only)
strmqbrk	Start the MQ pub/sub migration tool
strmqcfg	Start the WebSphere MQ Explorer
strmqcsv	Start the command server for a queue manager
strmqm	Start a local queue manager
strmqtrc	Enable tracing

amqccert (check certificate chains)

Purpose

The amqccert command applies to WebSphere MQ for Windows only.

The **amqccert** command is used during SSL Certificate Migration from WebSphere MQ for Windows Version 5.3, or Version 5.3.1. SSL Certificate Migration instructions are detailed in the WebSphere MQ Migration Information.

In this section when referring to a WebSphere MQ Certificate Store file, we are specifically referring to a WebSphere MQ for Windows Version 5.3, or Version 5.3.1, Certificate Store file.

To use **amqccert** you must be either an administrator or a member of the mqm group.

The **amqccert** control command is used to determine whether there are any incomplete certificate chains in a WebSphere MQ Certificate Store file. A report is generated that lists each incomplete certificate chain accompanied by information relating to the certificate chain.

Incomplete certificate chains must be completed before the SSL Certificate Migration process can continue. The following are available with WebSphere MQ for Windows Version 5.3, and Version 5.3.1, to help complete certificate chains:

- The control command **amqmcert** (manage certificates).
- The Services snap-in.

Syntax

```
►►──amqccert──FileName──────────────────────────────────────────────────►◄
```

Required parameters

FileName
: Specifies is the absolute (rather than relative) directory path name and filename (excluding the .sto suffix) of a WebSphere MQ Certificate Store.

Examples

In the following example reports the term, Microsoft Certificate Store, refers to a WebSphere MQ Certificate Store file.

`amqccert C:\SSL\Client`

Generates a report that details whether there are any incomplete certificate chains.

The following is an example of a report that details no incomplete certificate chains:

```
C:\ssl\client
5724-B41 (C) Copyright IBM Corp. 1994, 2005.  ALL RIGHTS RESERVED.
The number of certificates in the Microsoft Certificate Store
                                          'c:\ssl\client' is '13'.

Certificate chain checking has completed with no failures.
The Check Certificate Chains (amqccert) command has completed.
```

The following is an example of a report the details two incomplete certificate chains:

```
C:\ssl\client
5724-B41 (C) Copyright IBM Corp. 1994, 2005.  ALL RIGHTS RESERVED.
The number of certificates in the Microsoft Certificate Store
                                          'c:\ssl\client' is '13'.

The signer certificate 'GlobalSign Primary Class 1 CA' is missing for
                                           the following certificate.
Microsoft Certificate Store: 'c:\ssl\client'.
Certificate Subject:         'GlobalSign PersonalSign Class 1 CA'.
Certificate Issuer:          'GlobalSign Primary Class 1 CA'.
Certificate Serial Number:   '0400 0000 0000 FA3D EEE9 D9'.
Certificate Valid From:      '22/01/2004' to '28/01/2009'.

The signer certificate 'GlobalSign PersonalSign Class 1 CA' is missing
                                        for the following certificate.
```

```
Microsoft Certificate Store: 'c:\ssl\client'.
Certificate Subject:         'wm.shakespeare@hamlet.com'.
Certificate Issuer:          'GlobalSign PersonalSign Class 1 CA'.
Certificate Serial Number:   '0100 0000 0001 0170 978B 1E'.
Certificate Valid From:      '14/01/2005' to '14/02/2005'.

Certificate chain checking has completed with some failures.
The Check Certificate Chains (amqccert) command has completed.
```

Return codes

1	**amqccert** command usage error
2	User not authorized to run **amqccert** command
3	WebSphere MQ Certificate Store file not found
4	WebSphere MQ Certificate Store file is empty
5	WebSphere MQ Certificate Store file cannot be opened
6	No memory to allocate tables for storing root/intermediate certificates
7	Certificate is either an orphan or has expired
8	Windows operation failed

Related commands

amqtcert	Transfer certificates

amqmdain (WebSphere MQ services control)

Purpose

The amqmdain command applies to WebSphere MQ for Windows only.

In WebSphere MQ Version 6.0 all WebSphere MQ services were migrated to WebSphere MQ service or listener objects, with the exception of ROOT custom services and queue manager services.

Use **amqmdain** to define and administer ROOT custom services, define, and administer queue manager services, and perform other Windows specific administrative tasks.

Starting a queue manager service with **amqmdain** is equivalent to using the **strmqm** command with the option -ss. **amqmdain** makes the queue manager run in a non-interactive session under a different user account. However, to ensure all queue manager startup feedback is returned to the command line, use the `strmqm -ss` command rather than **amqmdain**.

To administer and define WebSphere MQ service and listener objects, use MQSC commands, PCF commands, or the WebSphere MQ Explorer.

Syntax

```
►►──amqmdain──┬─ qmgr start ──QMgrName──────────────────────────┬────────────►◄
              │                          ┌─ -c ─┐                │
              ├─ qmgr end ──QMgrName─────┼──────┼────────────────┤
              │                          ├─ -w ─┤                │
              │                          ├─ -i ─┤                │
              │                          └─ -p ─┘                │
              ├─ qmgr alter ──QMgrName── -i ──Initiation─────────┤
              ├─ refresh ────────────────────────────────────────┤
              ├─ svc list ───────────────────────────────────────┤
              ├─ svc view ──ServiceName──────────────────────────┤
              ├─ svc start ──ServiceName─────────────────────────┤
              ├─ svc end ──ServiceName───────────────────────────┤
              ├─ svc alter ──ServiceName──┤ Service options ├────┤
              ├─ svc delete ──ServiceName────────────────────────┤
              ├─ svc define ──ServiceName──┤ Service options ├───┤
              ├─ auto ──QMgrName─────────────────────────────────┤
              ├─ manual ──QMgrName───────────────────────────────┤
              ├─ status ─────────────────────────────────────────┤
              │          ├─QMgrName─┤                            │
              │          └─all──────┘                            │
              ├─ regsec ─────────────────────────────────────────┤
              ├─ spn ──QMgrName──┬─set───┬───────────────────────┤
              │                  └─unset─┘                       │
              └─ reg ──┬─────────────┬─RegParams─────────────────┘
                       ├─QMgrName────┤
                       └─ * ─────────┘
```

Service options:

```
├──┬──────────────────┬──┬───────────────────┬──┬───────────────┬──────────►
   └─ -m ──QMgrName───┘  └─ -i ──Initiation──┘  └─ -t ──Service─┘

►──┬───────────────┬──┬───────────────┬──┬────────────────────┬────────────┤
   └─ -s  command──┘  └─ -e  command──┘  └─ -x ──Execution────┘
```

Keywords and parameters

All parameters are required unless the description states they are optional.

In every case, *QMgrName* is the name of the queue manager service to which the command applies, and *ServiceName* is the name of the ROOT custom services to which the command applies.

qmgr start *QMgrName*
: Starts a queue manager service.

  This parameter can also be written in the form *start QMgrName*.

  If you start your queue manager as a service and need the queue manager to continue to run after logoff, use `strmqm -ss qmgr` instead of `amqmdain start qmgr`.

qmgr end *QMgrName*
: Ends a queue manager service.

This parameter can also be written in the form *end QMgrName*.

For consistency across platforms, use `endmqm qmgr` instead of `amqmdain end qmgr`.

-c Controlled (or quiesced) shutdown.

-w Wait shutdown.

-i Immediate shutdown.

-p Preemptive shutdown.

qmgr alter *QMgrName*
Alters a queue manager service.

-i *Initiation*
Specifies the initiation type. Possible values are:

auto	Sets the queue manager service to automatic startup (when the machine starts up, or more precisely when the AMQMSRVN process starts up). The syntax is: `amqmdain qmgr alter QmgrName –i auto`
interactive	Sets the queue manager service to manual startup that then runs under the logged on (interactive) user. The syntax is: `amqmdain qmgr alter QmgrName –i interactive`
service	Sets the queue manager service to manual startup that then runs as a service. The syntax is: `amqmdain qmgr alter QmgrName –i service`

refresh
Refreshes or checks the status of a queue manager. You will not see anything returned on the screen after executing this command.

svc list
Displays a list of currently defined ROOT custom services.

svc view *ServiceName*
Displays detailed information for a ROOT custom service.

svc start *ServiceName*
Starts a ROOT custom service.

svc end *ServiceName*
Ends a ROOT custom service.

svc delete *ServiceName*
Deletes a ROOT custom service.

svc alter *ServiceName ServiceOptions*
Alter a ROOT custom service with the options specified in *ServiceOptions*.

svc define *ServiceName ServiceOptions*
Define a ROOT custom service with the options specified in *ServiceOptions*.

auto *QMgrName*
Sets a queue manager service to automatic startup.

manual *QMgrName*
Sets a queue manager service to manual startup.

status *QMgrName* **| all**
These parameters are optional.

If no parameter is supplied:	Displays the status of the WebSphere MQ services.
If a *QMgrName* is supplied:	Displays the status of the named queue manager service.
If the parameter *all* is supplied:	Displays the status of all ROOT custom services.

`regsec`
Ensures that the security permissions assigned to the Registry keys are correct.

`spn` *`QMgrName`* **`set | unset`**
Allows you to set or unset the service principal name for a queue manager.

`reg` *`QMgrName`* **`| *`** *`RegParams`*
Parameters *QMgrName*, and * are optional.

If *RegParams* is specified alone:	Modifies **queue manager** configuration information in the Windows Registry related to the default queue manager.
If *QMgrName* and *RegParams* are specified:	Modifies **queue manager** configuration information in the Windows Registry related to the queue manager specified by *QMgrName*.
If * and *RegParams* are specified:	Modifies **WebSphere MQ** configuration information in the Windows Registry.

The parameter, *RegParams*, specifies the Registry stanzas to change, and the changes that are to be made. *RegParams* takes one of the following forms:

- `-c add -s` *`stanza`* `-v attribute=`*`value`*
- `-c remove -s` *`stanza`* `-v [attribute|*]`
- `-c display -s` *`stanza`* `-v [attribute|*]`

If you are specifying queue manager configuration information, the valid values for *`stanza`* are:

```
XAResourceManager\name
ApiExitLocal\name
CHANNELS
ExitPath
InstanceData
Log
QueueManagerStartup
TCP
LU62
SPX
NetBios
Connection
QMErrorLog
Broker
```

If you are modifying WebSphere MQ configuration information, the valid values for *`stanza`* are:

```
ApiExitCommon\name
ApiExitTemplate\name
ACPI
AllQueueManagers
CHANNELS
DefaultQueueManager
LogDefaults
ExitProperties
```

The following are usage considerations:

- **amqmdain** does not validate the values you specify for *name*, *attribute*, or *value*.
- When you specify add, and an attribute already exists, it is modified.
- If a stanza does not exist, **amqmdain** creates it.
- When you specify remove or display, you can use the value * to remove or display all attributes.
- If you use remove to delete the only attribute in a stanza, the stanza itself is deleted.
- Any modification you make to the Registry re-secures all WebSphere MQ Registry entries.

ServiceOptions

The options available when defining, or altering, a ROOT custom service.

-m *QMgrName*
The name of the associated queue manager.

If no parameter is supplied:	The service is defined as a ROOT custom service with no associated queue manager.
If *QMgrName* is supplied:	The queue manager specified by *QMgrName* is used.

If you omit this parameter, the service is defined as a ROOT custom service with no associated queue manager.

-i *Initiation*
Specifies the initiation type. Possible values are:

auto	Sets the ROOT custom service to automatic startup (when the machine starts up, or more precisely when the AMQMSRVN process starts up). For example: `amqmdain svc alter ServiceName –i auto`
interactive	Sets the ROOT custom service to manual startup that then runs under the logged on (interactive) user. For example: `amqmdain svc alter ServiceName –i interactive`
service	Sets the ROOT custom service to manual startup that then runs as a service. For example: `amqmdain svc alter ServiceName –i service`

amqmdain auto QmgrNameIf you omit this parameter, automatic startup is set.

-t *Service*
Specifies the ROOT custom service type. Possible values are:

process	The ROOT custom service is not expected to run to completion. To end the ROOT custom service, issue the *svc end ServiceName* command.
command	The ROOT custom service is expected to run to completion.

If you omit this parameter, *Service* is specified as **process**.

-s *command*
The command to execute when the ROOT custom service starts.

-e *command*
The command to execute when the ROOT custom service ends.

-x *Execution*

Specifies the execution type. Possible values are:

prefix	The ROOT custom service starts before the associated queue manager starts.
suffix	The ROOT custom service starts after the associated queue manager starts.

If you omit this parameter, *Execution* is specified as **suffix**.

Examples

The following example adds an XAResourceManager to queue manager TEST. The commands issued are:

```
amqmdain reg TEST -c add -s XAResourceManager\Sample -v SwitchFile=sf1
amqmdain reg TEST -c add -s XAResourceManager\Sample -v ThreadOfControl=THREAD
amqmdain reg TEST -c add -s XAResourceManager\Sample -v XAOpenString=openit
amqmdain reg TEST -c add -s XAResourceManager\Sample -v XACloseString=closeit
```

To display the values set by the commands above, use:

```
amqmdain reg TEST -c display -s XAResourceManager\Sample -v *
```

The display would look something like this:

```
0784726, 5639-B43 (C) Copyright IBM Corp. 1994, 2002. ALL RIGHTS RESERVED.
Displaying registry value for Queue Manager 'TEST'
        Attribute = Name, Value = Sample
        Attribute = SwitchFile, Value = sf1
        Attribute = ThreadOfControl, Value = THREAD
        Attribute = XAOpenString, Value = openit
        Attribute = XACloseString, Value = closeit
```

To remove the XAResourceManager from queue manager TEST, use:

```
amqmdain reg TEST -c remove -s XAResourceManager\Sample -v *
```

Return codes

0	Command completed normally
-2	Syntax error
-3	Failed to initialize COM library
-4	Failed to initialize COM components
-7	Failed to configure service
-9	Unexpected Registry error
-10	Unable to access required service interface (IMQDService)
-11	Unable to access required service interface (ICustomService)
-12	Unable to access required service interface (ICustomServices)
-13	Unable to access required service interface (IUnknown)
-14	Specified service not found
-15	Specified service name already exists
-16	Failed to configure service principal name
-17	Failed to start service
-18	Failed to end service
-19	Failed to delete service
-20	Failed to store service definition
-21	Service initiation type could not be configured
-22	Service flags could not be configured
-23	Service flags could not be read
-24	Service dependency could not be configured

-25	Service start command could not be configured
-26	Service end command could not be configured
-27	Service name could not be configured

Note:

1. If the *qmgr start QMgrName* command is issued, all return codes that can be returned with **strmqm**, can be returned here also. For a list of these return codes, see "strmqm (start queue manager)" on page 368.
2. If the *qmgr end QMgrName* command is issued, all return codes that can be returned with **endmqm**, can be returned here also. For a list of these return codes, see "endmqm (end queue manager)" on page 326.

amqtcert (transfer certificates)

Purpose

The amqtcert command applies to WebSphere MQ for Windows only.

The **amqtcert** command is used to migrate SSL Certificates from WebSphere MQ for Windows Version 5.3, or Version 5.3.1. SSL Certificate Migration instructions are detailed in the WebSphere MQ Migration Information. SSL Certificate Migration occurs after migrating WebSphere MQ for Windows Version 5.3, or Version 5.3.1.

In this section when referring to a WebSphere MQ Certificate Store file, we are specifically referring to a WebSphere MQ for Windows Version 5.3, or Version 5.3.1, Certificate Store file.

To use this command, you must be either an administrator or a member of the mqm group.

The **amqtcert** command is used to migrate certificates from a client's or queue manager's WebSphere MQ Certificate Store file to a GSKit key database file. The filename of the WebSphere MQ Certificate Store file is of the form *xxx*.sto, where *xxx* is your chosen name. The filename of the GSKit key database file is of the form *yyy*.kdb, where *yyy* is your chosen name.

The **amqtcert** command is used to perform the following types of migration:

Automatic migration
: The migration is deferred.

  The time at which the migration occurs depends on whether it is being done for a queue manager or a WebSphere MQ client. On a queue manager the migration occurs when the queue manager starts. On a WebSphere MQ client the migration occurs when the first SSL channel starts.

Manual migration
: The migration occurs immediately.

The command is also used to set the state information relating to automatic migration, held in the Windows registry, for each queue manager or client.

Syntax

```
►►──amqtcert──────────────────────────────────────────────────────────────►

►──┬─ -a ── -p ──Password──┬──────────────┬──┬─ -c ──FileName──┬──┬──────►◄
   │                       └─ -e ──ExpTime─┘  ├─ -m ──QMgrName──┤  │
   │                                          └─ -m *───────────┘  │
   ├─ -g ──FileName── -w ──FileName──┤ Manual migration options ├──┤
   ├─ -l ──┬─ -a ──────────────┬───────────────────────────────────┤
   │       ├─ -c ──FileName────┤                                   │
   │       └─ -m ──QMgrName────┘                                   │
   └─ -r ──┬─ -c *─────────────┬───────────────────────────────────┘
           ├─ -c ──FileName────┤
           ├─ -m ──QMgrName────┤
           └─ -m *─────────────┘
```

Manual migration options:

```
├── -p ──Password──┬──────────────┬───────────────────────────────────────►
                   └─ -e ──ExpTime─┘

►──┬──────────────────────────────────────┬───────────────────────────────┤
   ├─ -u ──ClntLogonID── -i ──ListNumber──┤
   └─ -m ──QMgrName───────────────────────┘
```

Keywords and parameters

-a Specifies automatic migration.

When used in conjunction with the **-m** or **-c** parameters, it prepares the specified queue manager or client to automatically migrate the WebSphere MQ Certificate Store.

When used in conjunction with the **-l** parameter, it lists the contents of the registry entries for automatic migration.

-c *FileName* **|** *****

FileName specifies the absolute (rather than relative) directory path name and filename (excluding the .sto suffix) of the client's WebSphere MQ Certificate Store. If there are any spaces in *FileName* then it must be enclosed in quotes. In manual migration, the **-c** parameter is not required.

FileName is used to identify a specific client WebSphere MQ Certificate Store. For automatic migration, the filename is stored in the registry and flagged as requiring automatic migration.

When the client connects to the queue manager, the key repository value (either MQSSLKEYR or the KeyRepository field of the MQSCO) being used by the client is compared against the list of stored filenames flagged as requiring automatic migration; if the values match then migration takes place. The filename is cleared from the registry list once successful migration has taken place.

-c * is used only in combination with the **-r** flag and specifies all client entries in the registry.

-e *ExpTime*
: The expiration time (in days) of the GSKit key database password. The default is 60 days.

-g *Filename*
: Use manual migration. The absolute (rather than relative) directory path name and filename (excluding the .kdb suffix) of a GSKit key database. If there are any spaces in *FileName* then it must be enclosed in quotes. The **-w** parameter must also be specified.

-l
: In combination with the **-c** *FileName* or **-m** *QMgrName* parameters, it lists the certificates in a WebSphere MQ Certificate Store.

  In combination with the **-a** parameter, it lists the contents of the registry entries for automatic migration.

-m *QMgrName*|*
: *QMgrName* specifies the name of an individual queue manager. * represents all queue managers.

  When specifying manual migration of a queue manager certificate store, the **-m** *QMgrName* parameter is mandatory. This allows the correct label to be given to the assigned personal certificate when it is written to the GSkit key database file (see the description of the **-u** parameter for more details). The * value is not valid for manual migration.

  When specifying automatic migration, the names of the source certificate store and the target key database file are derived from the queue manager's SSLKeyRepository attribute.

-p *Password*
: The password for the GSKit key database. This must be specified for automatic or manual migration. The maximum password length is 255 bytes.

-r
: Remove the registry state information relating to automatic migration.

-u *ClntLogonID*
: This parameter is only applicable when the command is used for manual migration of clients. The *-i ListNumber* parameter must also be specified.

  In the WebSphere MQ Certificate Store there is usually one certificate assigned to the client. During migration, the copy of this certificate is modified before it is stored in the GSKit database.

  The modification sets the certificate's Friendly Name attribute to the string `ibmwebspheremq`, followed in lower case by the client logon ID. The previous Friendly Name value, if any, is lost. This Friendly Name value becomes the label in the GSKit key database.

  If neither **-u** nor **-m** are specified on manual migration, it is assumed to be a client migration. The *ClntLogonId* used is the userid used by the current **amqtcert** user to logon.

-i *ListNumber*

: This parameter is only applicable when the command is used for manual migration of clients. The *-u ClntLogonID* parameter must also be specified.

  This parameter is used to identify a specific personal certificate which is to have its GSKit label set to the value specified by the *-u ClntLogonID* parameter.

  Prior to using **amqtcert** with *-i ListNumber* specified, you must execute **amqtcert** with *-l* specified to list the certificates in a WebSphere MQ Certificate

Store. You must identify the required personal certificate from the list, then execute **amqtcert** again, specifying *-i ListNumber* with the required certificate number.

For example, after executing `amqtcert -l -c C:\SSL\Client\key` you might identify the following personal certificate from the list displayed as the required certificate:

```
Certificate 14
Certificate Type:  Personal
Subject:           personalcert@ibm.com, personalcert@ibm.com
Issuer:            BE, GlobalSign nv-sa, PersonalSign Class 1 CA, GlobalSign
                                                       PersonalSign Class 1 CA
Valid From:        14/10/2004 to 14/11/2004
Certificate Usage: <All>
```

You will then execute **amqtcert** and specify *-i ListNumber* as `-i 14`.

ListNumber must be a number greater than 0.

If *ListNumber* references a valid personal certificate, which is not the currently assigned certificate, then:

- The assigned certificate is not modified.
- The assigned certificate is not given a label of the form `ibmwebspheremq<xxxxx>` in the GSkit key database file, and ceases to be assigned.
- The certificate referenced by *ListNumber* becomes the assigned certificate in the GSKit key database.

If *ListNumber* does not reference a valid personal certificate, then the command fails and no migration occurs for any certificates (personal or otherwise).

-w *FileName*
Use manual migration. *FileName* is the absolute (rather than relative) directory path name and filename (excluding the .sto suffix) of a WebSphere MQ Certificate Store. If there are any spaces in *FileName* then it must be enclosed in quotes. The **-g** parameter must also be specified.

Examples

Return codes

1	Error accessing certificate store
2	Auto migration failed
3	Invalid argument combination
4	Certificate expired
5	Certificate import failed
6	Certificate is an orphan
7	Create file failed
8	Duplicate registry entry
9	WebSphere MQ Certificate Store file is empty
16	WebSphere MQ Certificate Store file found
17	WebSphere MQ Certificate Store file not found
18	GSKit add certificate failed
19	GSKit error
20	GSKit initialization error
21	GSkit add CA certificate error
22	Load library failed
23	No memory to allocate tables for migrating root/intermediate certificates

24	No memory
25	WebSphere MQ Certificate Store file cannot be opened
32	User not authorized to run **amqtcert** command
33	Windows operation failed
34	Windows export of personal certificate failed
35	GSKit create new key database error
36	Windows registry error
37	**amqtcert** command usage error
38	Queue manager name error
39	Unexpected system return code
40	Local mqm group not found
41	Invalid arguments
48	Bad argument
49	Invalid *-i ListNumber* parameter

Related commands

amqccert	Check certificate chains

Listing the contents of certificate stores

`amqtcert -l -c C:\SSL\Client\key`
  Lists the contents of the client's WebSphere MQ Certificate Store.

`amqtcert -l -m QM1`
  Lists the contents of the QM1 queue manager's WebSphere MQ Certificate Store.

Manually migrating certificate stores

`amqtcert -g C:\SSL\Client\key -w C:\SSL\Client\key -p MyPassword`
  Manually migrates the client WebSphere MQ Certificate Store, specified by the **-w** parameter value, to the GSKit key database specified by the **-g** parameter value. It sets the password of the GSKit key database (called key.kdb) to `MyPassword`. It also sets the GSkit label (of the certificate which was assigned in the WebSphere MQ client store) to `ibmwebspheremq<mylogonid>`, where <*mylogonid*> stands for the logon id of the current user in lower case.

`amqtcert -g C:\GSKitSSL\Client\key -w C:\SSL\Client\key -p MyPassword -u MyClientID -i 14`
  Manually migrates a client's WebSphere MQ Certificate Store, specified by the **-w** parameter value, to the GSKit key database specified by the **-g** parameter value. This command sets the password of the GSKit key database (named key.kdb) to `MyPassword`. It also sets the GSKit label of the certificate specified by **-i** to `ibmwebspheremq<mylogonid>`, where <*mylogonid*> stands for the logon id of the current user in lower case.

`amqtcert -g "C:\Program Files\IBM\WebSphere MQ\Qmgrs\QM1\SSL\key" -w "C:\Program Files\IBM\WebSphere MQ\Qmgrs\QM1\SSL\key" -p MyPassword -m QM1`
  Manually migrates the WebSphere MQ Certificate Store for queue manager QM1, specified by the **-w** parameter value, to the GSKit key database specified by the **-g** parameter value. It sets the password of the GSKit key database (named key.kdb) to `MyPassword`. It also sets the GSkit label (of the certificate which was assigned to queue manager QM1) to `ibmwebspheremqqm1`.

Automatically migrating certificate stores

`amqtcert -a -p MyPassword -m QM1`
: Automatically migrates the WebSphere MQ Certificate Store for queue manager QM1, and sets the GSKit key database password to `MyPassword`

`amqtcert -a -p MyPassword -c C:\SSL\Client\key`
: Automatically migrates the specified client WebSphere MQ Certificate Store, and sets the GSKit key database password to ″MyPassword″.

`amqtcert -a -p MyPassword -m *`
: Automatically migrates the WebSphere MQ Certificate Stores for all queue managers, and sets the GSKit key database password to `MyPassword`.

Listing the contents of registry entries

`amqtcert -l -a`
: Lists the contents of the registry entries for automatic migration.

Removing state information

`amqtcert -r -c C:\SSL\Client\key`
: Removes the registry state information relating to automatic migration for the specified client WebSphere MQ Certificate Store.

`amqtcert -r -c *`
: Removes the registry state information relating to automatic migration for all clients.

`amqtcert -r -m QM1`
: Removes the registry state information relating to automatic migration for queue manager QM1.

`amqtcert -r -m *`
: Removes the registry state information relating to automatic migration for all queue managers.

crtmqcvx (data conversion)

Purpose

Use the **crtmqcvx** command to create a fragment of code that performs data conversion on data type structures. The command generates a C function that can be used in an exit to convert C structures.

The command reads an input file containing structures to be converted, and writes an output file containing code fragments to convert those structures.

For information about using this command, see the WebSphere MQ Application Programming Guide.

Syntax

```
►►──crtmqcvx──SourceFile──TargetFile──────────────────────────────────────►◄
```

Required parameters

SourceFile
: The input file containing the C structures to convert.

TargetFile
: The output file containing the code fragments generated to convert the structures.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

Examples

The following example shows the results of using the data conversion command against a source C structure. The command issued is:

```
crtmqcvx source.tmp target.c
```

The input file, `source.tmp` looks like this:

```
/* This is a test C structure which can be converted by the */
/* crtmqcvx utility                                          */

struct my_structure
{
    int    code;
    MQLONG value;
};
```

The output file, `target.c`, produced by the command is shown below. You can use these code fragments in your applications to convert data structures. However, if you do so, the fragment uses macros supplied in the header file `amqsvmha.h`.

```
MQLONG Convertmy_structure(
             PMQBYTE *in_cursor,
             PMQBYTE *out_cursor,
             PMQBYTE in_lastbyte,
             PMQBYTE out_lastbyte,
             MQHCONN hConn,
             MQLONG  opts,
             MQLONG  MsgEncoding,
             MQLONG  ReqEncoding,
             MQLONG  MsgCCSID,
             MQLONG  ReqCCSID,
             MQLONG  CompCode,
             MQLONG  Reason)
{
    MQLONG ReturnCode = MQRC_NONE;

    ConvertLong(1); /* code */

    AlignLong();
    ConvertLong(1); /* value */

Fail:
    return(ReturnCode);
}
```

crtmqm (create queue manager)

Purpose

Use the **crtmqm** command to create a local queue manager and define the default and system objects. The objects created by **crtmqm** are listed in Chapter 8, “System and default objects,” on page 525. When a queue manager has been created, use the **strmqm** command to start it.

Syntax

```
►►──crtmqm──┬──────────┬──┬──────────────────────────────┬──────────────►
            └─ -c ─Text─┘  └─ -d ─DefaultTransmissionQueue─┘

                                   ┌─ -lc ─┐
►──┬──────────────────────────┬──┼───────┼──┬──────────────┬────────────►
   └─ -h ─MaximumHandleLimit─┘  └─ -ll ─┘  └─ -ld ─LogPath─┘

►──┬─────────────────────┬──┬─────────────────────────┬─────────────────►
   └─ -lf ─LogFilePages─┘  └─ -lp ─LogPrimaryFiles─┘

                                                 ┌─ -ss ─┐
►──┬───────────────────────────┬──┬──────┬──┼───────┼───────────────────►
   └─ -ls ─LogSecondaryFiles─┘  └─ -q ─┘  ├─ -sa ─┤
                                            └─ -si ─┘

►──┬─────────────────────────┬──┬──────────────────────┬────────────────►
   └─ -g ─ApplicationGroup─┘  └─ -t ─IntervalValue─┘

►──┬────────────────────────┬──┬───────────────────────────────────┬──┬──────┬──►
   └─ -u ─DeadLetterQueue─┘  └─ -x ─MaximumUncommittedMessages─┘  └─ -z ─┘

►─QMgrName──────────────────────────────────────────────────────────────►◄
```

Required parameters

QMgrName
: The name of the queue manager to create. The name can contain up to 48 characters. This must be the last item in the command.

Optional parameters

-c *Text*
: Descriptive text for this queue manager. You can use up to 64 characters; the default is all blanks.

  If you include special characters, enclose the description in double quotes. The maximum number of characters is reduced if the system is using a double-byte character set (DBCS).

-d *DefaultTransmissionQueue*
: The name of the local transmission queue where remote messages are put if a transmission queue is not explicitly defined for their destination. There is no default.

-h *MaximumHandleLimit*
: The maximum number of handles that any one application can have open at the same time.

  Specify a value in the range 1 through 999 999 999. The default value is 256.

The next six parameter descriptions relate to logging, which is described in "Using the log for recovery" on page 227.

Note: Choose the logging arrangements with care, because some cannot be changed once they are committed.

-lc Use circular logging. This is the default logging method.

-ll Use linear logging.

-ld *`LogPath`*
The directory used to hold log files.

In WebSphere MQ for Windows, the default is `C:\Program Files\IBM\WebSphere MQ\log` (assuming that C is your data drive).

In WebSphere MQ for UNIX systems, the default is `/var/mqm/log`.

User ID mqm and group mqm must have full authorities to the log files. If you change the locations of these files, you must give these authorities yourself. This occurs automatically if the log files are in their default locations.

-lf *`LogFilePages`*
The log data is held in a series of files called log files. The log file size is specified in units of 4 KB pages.

In WebSphere MQ for UNIX systems, the default number of log file pages is 4096, giving a log file size of 16 MB. The minimum number of log file pages is 64 and the maximum is 65 535.

In WebSphere MQ for Windows systems, the default number of log file pages is 4096, giving a log file size of 16 MB. The minimum number of log file pages is 32 and the maximum is 65 535.

Note: The size of the log files specified during queue manager creation cannot be changed for a queue manager.

-lp *`LogPrimaryFiles`*
The log files allocated when the queue manager is created.

The minimum number of primary log files you can have is 2 and the maximum is 254 on Windows, or 510 on UNIX systems. The default is 3.

The total number of primary and secondary log files must not exceed 255 on Windows, or 511 on UNIX systems, and must not be less than 3.

Operating system limits can reduce the maximum possible log size.

The value is examined when the queue manager is created or started. You can change it after the queue manager has been created. However, a change in the value is not effective until the queue manager is restarted, and the effect might not be immediate.

For more information on primary log files, see "What logs look like" on page 218.

To calculate the size of the primary log files, see "Calculating the size of the log" on page 222.

-ls *`LogSecondaryFiles`*
The log files allocated when the primary files are exhausted.

The minimum number of secondary log files is 1 and the maximum is 253 on Windows, or 509 on UNIX systems. The default number is 2.

The total number of primary and secondary log files must not exceed 255 on Windows, or 511 on UNIX systems, and must not be less than 3.

Operating system limits can reduce the maximum possible log size.

The value is examined when the queue manager is started. You can change this value, but changes do not become effective until the queue manager is restarted, and even then the effect might not be immediate.

For more information on the use of secondary log files, see "What logs look like" on page 218.

To calculate the size of the secondary log files, see "Calculating the size of the log" on page 222.

-q Makes this queue manager the default queue manager. The new queue manager replaces any existing default queue manager.

If you accidentally use this flag and want to revert to an existing queue manager as the default queue manager, change the default queue manager as described in "Making an existing queue manager the default" on page 23.

-g *ApplicationGroup*

The name of the group containing members allowed to:

- Run MQI applications
- Update all IPCC resources
- Change the contents of some queue manager directories

This option applies only to WebSphere MQ for AIX, Solaris, HP-UX, and Linux.

The default value is -g all, which allows unrestricted access.

The -g *ApplicationGroup* value is recorded in the queue manager configuration file, qm.ini.

The mqm user ID and the user executing the command **must** belong to the specified ApplicationGroup.

-sa

Automatic queue manager startup.

The queue manager is configured to start automatically when the machine starts up, or more precisely, when the AMQMSRVN process starts up.

This is the default option if you create a queue manager from WebSphere MQ Explorer.

Queue managers created in WebSphere MQ releases earlier than V7 retain their existing startup type.

-si Interactive (manual) queue manager startup.

The queue manager is configured to start only when manually requested using the strmqm command. The queue manager then runs under the logged on (interactive) user. Queue managers configured with interactive startup end when the user who started them logs off.

-ss Service (manual) queue manager startup.

A queue manager configured to start only when manually requested using the strmqm command. The queue manager then runs as a child of the AMQMSRVN process. Queue managers configured with service startup continue to run even after the interactive user has logged off.

This is the default option if you create a queue manager from the command line.

-t *IntervalValue*
The trigger time interval in milliseconds for all queues controlled by this queue manager. This value specifies the time after receiving a trigger-generating message when triggering is suspended. That is, if the arrival of a message on a queue causes a trigger message to be put on the initiation queue, any message arriving on the same queue within the specified interval does not generate another trigger message.

You can use the trigger time interval to ensure that your application is allowed sufficient time to deal with a trigger condition before it is alerted to deal with another on the same queue. You might choose to see all trigger events that happen; if so, set a low or zero value in this field.

Specify a value in the range 0 through 999 999 999. The default is 999 999 999 milliseconds, a time of more than 11 days. Allowing the default to be used effectively means that triggering is disabled after the first trigger message. However, an application can enable triggering again by servicing the queue using a command to alter the queue to reset the trigger attribute.

-u *DeadLetterQueue*
The name of the local queue that is to be used as the dead-letter (undelivered-message) queue. Messages are put on this queue if they cannot be routed to their correct destination.

The default is no dead-letter queue.

-x *MaximumUncommittedMessages*
The maximum number of uncommitted messages under any one syncpoint. That is, the sum of:

- The number of messages that can be retrieved from queues
- The number of messages that can be put on queues
- Any trigger messages generated within this unit of work

This limit does not apply to messages that are retrieved or put outside a syncpoint.

Specify a value in the range 1 through 999 999 999. The default value is 10 000 uncommitted messages.

-z Suppresses error messages.

This flag is used within WebSphere MQ to suppress unwanted error messages. Because using this flag can result in loss of information, do not use it when entering commands on a command line.

Return codes

0	Queue manager created
8	Queue manager already exists
39	Invalid parameter specified
49	Queue manager stopping
69	Storage not available
70	Queue space not available
71	Unexpected error
72	Queue manager name error
74	The WebSphere MQ service is not started.
100	Log location invalid

111	Queue manager created. However, there was a problem processing the default queue manager definition in the product configuration file. The default queue manager specification might be incorrect.
115	Invalid log size
119	Permission denied (Windows only)

Examples

1. This command creates a default queue manager called `Paint.queue.manager`, with a description of `Paint shop`, and creates the system and default objects. It also specifies that linear logging is to be used:
   ```
   crtmqm -c "Paint shop" -ll -q Paint.queue.manager
   ```
2. This command creates a default queue manager called `Paint.queue.manager`, creates the system and default objects, and requests two primary and three secondary log files:
   ```
   crtmqm -c "Paint shop" -ll -lp 2 -ls 3 -q Paint.queue.manager
   ```
3. This command creates a queue manager called `travel`, creates the system and default objects, sets the trigger interval to 5000 milliseconds (or 5 seconds), and specifies SYSTEM.DEAD.LETTER.QUEUE as its dead-letter queue.
   ```
   crtmqm -t 5000 -u SYSTEM.DEAD.LETTER.QUEUE travel
   ```

Related commands

strmqm	Start queue manager
endmqm	End queue manager
dltmqm	Delete queue manager

dltmqm (delete queue manager)

The dltmqm command deletes a queue manager. There are some restrictions on its use.

Purpose

Use the **dltmqm** command to delete a specified queue manager and all objects associated with it. Before you can delete a queue manager you must end it using the **endmqm** command.

In WebSphere MQ for Windows, it is an error to delete a queue manager when queue manager files are open. If you get this error, close the files and reissue the command.

Syntax

```
►►──dltmqm──┬──────┬──QMgrName─────────────────────────────────────────►◄
            └─ -z ─┘
```

Required parameters

QMgrName
The name of the queue manager to delete.

Optional parameters

-z Suppresses error messages.

Return codes

0	Queue manager deleted
3	Queue manager being created
5	Queue manager running
16	Queue manager does not exist
24	A process that was using the previous instance of the queue manager has not yet disconnected.
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
74	The WebSphere MQ service is not started.
100	Log location invalid.
112	Queue manager deleted. However, there was a problem processing the default queue manager definition in the product configuration file. The default queue manager specification might be incorrect.
119	Permission denied (Windows only).

Examples

1. The following command deletes the queue manager `saturn.queue.manager`.
```
dltmqm saturn.queue.manager
```
2. The following command deletes the queue manager `travel` and also suppresses any messages caused by the command.
```
dltmqm -z travel
```

Usage notes

In WebSphere MQ for Windows, it is an error to delete a queue manager when queue manager files are open. If you get this error, close the files and reissue the command.

Deleting a cluster queue manager does not remove it from the cluster. To check whether the queue manager you want to delete is part of a cluster, issue the command DIS CLUSQMGR(*) and check if this queue manager is listed in the output. If it is listed as a cluster queue manager you must remove the queue manager from the cluster before deleting it. See the related link for instructions.

If you do delete a cluster queue manager without first removing it from the cluster, the cluster will continue to regard the deleted queue manager as a member of the cluster for at least 30 days. You can remove it from the cluster using the command RESET CLUSTER on a full repository queue manager. Note that recreating a queue manager with an identical name and then trying to remove that queue manager from the cluster does not result in the cluster queue manager being removed from the cluster, because the newly created queue manager, although having the same name, does not have the same queue manager ID (QMID) and is therefore treated as a different queue manager by the cluster.

Related commands

crtmqm	Create queue manager

strmqm	Start queue manager
endmqm	End queue manager

dmpmqaut (dump authority)

Purpose

Use the **dmpmqaut** command to dump the current authorizations to a specified object.

Syntax

```
►►──dmpmqaut──┬──────────────────┬──┬──────────────┬──┬─────────────────┬──────────────►
              └─ -m ──QMgrName───┘  ├─ -n ──Profile─┤  └─ -t ──ObjectType─┘
                                    └─ -l ──────────┘

►─┬────────────────────────┬──┬──────────────────────┬──┬──────┬───────────────────────►◄
  └─ -s ──ServiceComponent─┘  ├─ -p ──PrincipalName──┤  ├─ -e ─┤
                              └─ -g ──GroupName──────┘  └─ -x ─┘
```

Optional parameters

-m *QMgrName*
Dump authority records only for the queue manager specified. If you omit this parameter, only authority records for the default queue manager are dumped.

-n *Profile*
The name of the profile for which to dump authorizations. The profile name can be generic, using wildcard characters to specify a range of names as explained in "Using OAM generic profiles" on page 135.

-l Dump only the profile name and type. Use this option to generate a *terse* list of all defined profile names and types.

-t *ObjectType*
The type of object for which to dump authorizations. Possible values are:

authinfo	Authentication information object, for use with Secure Sockets Layer (SSL) channel security
channel or **chl**	A channel
clntconn or **clcn**	A client connection channel
listener or **lstr**	A listener
namelist or **nl**	A namelist
process or **prcs**	A process
queue or **q**	A queue or queues matching the object name parameter
qmgr	A queue manager
service or **srvc**	A service
topic or **top**	A topic

-s *ServiceComponent*
If installable authorization services are supported, specifies the name of the authorization service for which to dump authorizations. This parameter is optional; if you omit it, the authorization inquiry is made to the first installable component for the service.

-p *PrincipalName*
This parameter applies to WebSphere MQ for Windows only; UNIX systems keep only group authority records.

The name of a user for whom to dump authorizations to the specified object. The name of the principal can optionally include a domain name, specified in the following format:

```
userid@domain
```

For more information about including domain names on the name of a principal, see "Principals and groups" on page 125.

-g *GroupName*
The name of the user group for which to dump authorizations. You can specify only one name, which must be the name of an existing user group. On Windows systems, you can use only local groups.

-e Display all profiles used to calculate the cumulative authority that the entity has to the object specified in `-n` *Profile*. The variable *Profile* must not contain any wildcard characters.

The following parameters must also be specified:

- `-m` *QMgrName*
- `-n` *Profile*
- `-t` *ObjectType*

and either `-p` *PrincipalName*, or `-g` *GroupName*.

-x Display all profiles with exactly the same name as specified in `-n` *Profile*. This option does not apply to the **QMGR** object, so a dump request of the form `dmpmqaut -m QM -t QMGR ... -x` is not valid.

Examples

The following examples show the use of dmpmqaut to dump authority records for generic profiles:

1. This example dumps all authority records with a profile that matches queue a.b.c for principal user1.

   ```
   dmpmqaut -m qm1 -n a.b.c -t q -p user1
   ```

   The resulting dump would look something like this:

   ```
   profile:     a.b.*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse, put, inq
   ```

   Note: UNIX users cannot use the `-p` option; they must use `-g groupname` instead.
2. This example dumps all authority records with a profile that matches queue a.b.c.

   ```
   dmpmqaut -m qmgr1 -n a.b.c -t q
   ```

The resulting dump would look something like this:

```
profile:     a.b.c
object type: queue
entity:      Administrator
type:        principal
authority:   all
- - - - - - - - - - - - - - - - -
profile:     a.b.*
object type: queue
entity:      user1
type:        principal
authority:   get, browse, put, inq
- - - - - - - - - - - - - - - - -
profile:     a.**
object type: queue
entity:      group1
type:        group
authority:   get
```

3. This example dumps all authority records for profile a.b.*, of type queue.

   ```
   dmpmqaut -m qmgr1 -n a.b.* -t q
   ```

   The resulting dump would look something like this:

   ```
   profile:     a.b.*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse, put, inq
   ```

4. This example dumps all authority records for queue manager qmX.

   ```
   dmpmqaut -m qmX
   ```

   The resulting dump would look something like this:

   ```
   profile:     q1
   object type: queue
   entity:      Administrator
   type:        principal
   authority:   all
   - - - - - - - - - - - - - - - - -
   profile:     q*
   object type: queue
   entity:      user1
   type:        principal
   authority:   get, browse
   - - - - - - - - - - - - - - - - -
   profile:     name.*
   object type: namelist
   entity:      user2
   type:        principal
   authority:   get
   - - - - - - - - - - - - - - - - -
   profile:     pr1
   object type: process
   entity:      group1
   type:        group
   authority:   get
   ```

5. This example dumps all profile names and object types for queue manager qmX.

   ```
   dmpmqaut -m qmX -l
   ```

   The resulting dump would look something like this:

```
profile: q1, type: queue
profile: q*, type: queue
profile: name.*, type: namelist
profile: pr1, type: process
```

Note:

1. For WebSphere MQ for Windows only, all principals displayed include domain information, for example:
   ```
   profile:     a.b.*
   object type: queue
   entity:      user1@domain1
   type:        principal
   authority:   get, browse, put, inq
   ```
2. Each class of object has authority records for each group or principal. These records have the profile name `@CLASS` and track the `crt` (create) authority common to all objects of that class. If the `crt` authority for any object of that class is changed then this record is updated. For example:
   ```
   profile:     @class
   object type: queue
   entity:      test
   entity type: principal
   authority:   crt
   ```
   This shows that members of the group `test` have `crt` authority to the class `queue`.
3. For WebSphere MQ for Windows only, members of the “Administrators” group are by default given full authority. This authority, however, is given automatically by the OAM, and is not defined by the authority records. The **dmpmqaut** command displays authority defined only by the authority records. Unless an authority record has been explicitly defined, therefore, running the **dmpmqaut** command against the “Administrators” group will display no authority record for that group.

Related commands

dspmqaut	Display authority
setmqaut	Set or reset authority

dmpmqlog (dump log)

Purpose

Use the **dmpmqlog** command to dump a formatted version of the WebSphere MQ system log.

The log to be dumped must have been created on the same type of operating system as that being used to issue the command.

Syntax

```
►►──dmpmqlog──┬──────────────────────┬──┬──────────────┬──────────────────────────►
              ├─ -b ─────────────────┤  └─ -e ──EndLSN─┘
              ├─ -s ──StartLSN───────┤
              └─ -n ──ExtentNumber───┘

►──┬────────────────────┬──┬─────────────────┬─────────────────────────────────────►◄
   └─ -f ──LogFilePath──┘  └─ -m ──QMgrName──┘
```

Optional parameters

Dump start point

Use one of the following parameters to specify the log sequence number (LSN) at which the dump should start. If you omit this, dumping starts by default from the LSN of the first record in the active portion of the log.

-b Start dumping from the base LSN. The base LSN identifies the start of the log extent that contains the start of the active portion of the log.

-s *StartLSN*

Start dumping from the specified LSN. The LSN is specified in the format `nnnn:nnnn:nnnn:nnnn`.

If you are using a circular log, the LSN value must be equal to or greater than the base LSN value of the log.

-n *ExtentNumber*

Start dumping from the specified extent number. The extent number must be in the range 0–9 999 999.

This parameter is valid only for queue managers using linear logging.

-e *EndLSN*

End dumping at the specified LSN. The LSN is specified in the format `nnnn:nnnn:nnnn:nnnn`.

-f *LogFilePath*

The absolute (rather than relative) directory path name to the log files. The specified directory must contain the log header file (`amqhlctl.lfh`) and a subdirectory called `active`. The active subdirectory must contain the log files. By default, log files are assumed to be in the directories specified in the WebSphere MQ configuration information. If you use this option, queue names associated with queue identifiers are shown in the dump only if you use the -m option to name a queue manager name that has the object catalog file in its directory path.

On a system that supports long file names this file is called qmqmobjcat and, to map the queue identifiers to queue names, it must be the file used when the log files were created. For example, for a queue manager named qm1, the object catalog file is located in the directory `..\qmgrs\qm1\qmanager\`. To achieve this mapping, you might need to create a temporary queue manager, for example named tmpq, replace its object catalog with the one associated with the specific log files, and then start dmpmqlog, specifying `-m tmpq` and `-f` with the absolute directory path name to the log files.

-m *QMgrName*

The name of the queue manager. If you omit this parameter, the name of the default queue manager is used.

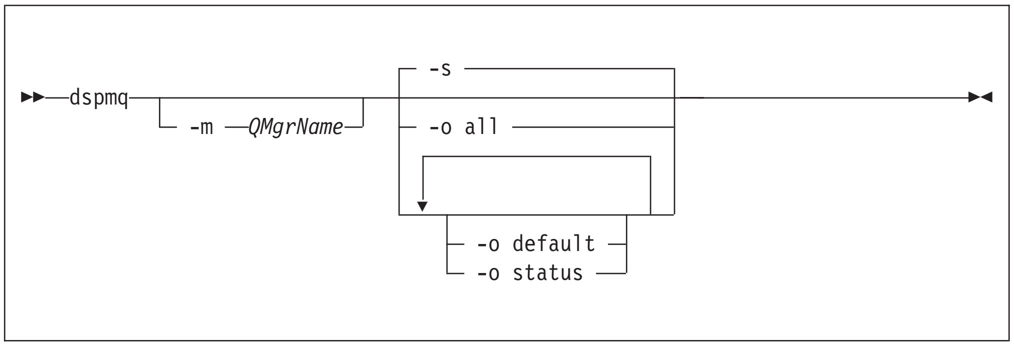
The queue manager must not be running when the **dmpmqlog** command is issued. Similarly, the queue manager must not be started while **dmpmqlog** is running.

dspmq (display queue managers)

Purpose

Use the **dspmq** command to display names and details of the queue managers on a system.

Syntax



Required parameters

None

Optional parameters

-m *QMgrName*

The queue manager for which to display details. If you give no name, all queue manager names are displayed.

-s Displays the operational status of the queue managers. This is the default status setting.

The parameter *-o status* is equivalent to *-s*.

-o *all*

Displays the operational status of the queue managers, and whether any are the default queue manager.

-o *default*

Displays whether any of the queue managers are the default queue manager.

-o *status*

Displays the operational status of the queue managers.

Queue Manager States

The following is a list of the different states a queue manager can be in:

Starting

Running
Quiescing
Ending immediately
Ending preemptively
Ended normally
Ended immediately
Ended unexpectedly
Ended preemptively

Return codes

0	Command completed normally
36	Invalid arguments supplied
71	Unexpected error
72	Queue manager name error

dspmqaut (display authority)

Purpose

Use the **dspmqaut** command to display the current authorizations to a specified object.

If a user ID is a member of more than one group, this command displays the combined authorizations of all the groups.

Only one group or principal can be specified.

For more information about authorization service components, see "Installable services" on page 106, "Service components" on page 108, and "Authorization service" on page 398.

Syntax

```
►►──dspmqaut──┬──────────────────┬── -n ──ObjectName── -t ──ObjectType──────────►
              └─ -m ──QMgrName──┘

►──┬─ -g ──GroupName─────┬──┬──────────────────────────┬─────────────────────────►◄
   └─ -p ──PrincipalName─┘  └─ -s ──ServiceComponent──┘
```

Required parameters

-n *ObjectName*
The name of the object on which to make the inquiry.

This parameter is required, unless you are displaying the authorizations of a queue manager, in which case you ***must not*** include it and instead specify the queue manager name using the *-m* parameter.

-t *ObjectType*
The type of object on which to make the inquiry. Possible values are:

authinfo	Authentication information object, for use with Secure Sockets Layer (SSL) channel security
channel or **chl**	A channel
clntconn or **clcn**	A client connection channel
listener or **lstr**	A Listener
namelist or **nl**	A namelist
process or **prcs**	A process
queue or **q**	A queue or queues matching the object name parameter
qmgr	A queue manager
service or **srvc**	A service
topic or **top**	A topic

Optional parameters

-m *QMgrName*
The name of the queue manager on which to make the inquiry. This parameter is optional if you are displaying the authorizations of your default queue manager.

-g *GroupName*
The name of the user group on which to make the inquiry. You can specify only one name, which must be the name of an existing user group. On Windows systems, you can use only local groups.

-p *PrincipalName*
The name of a user for whom to display authorizations to the specified object.

For WebSphere MQ for Windows only, the name of the principal can optionally include a domain name, specified in the following format:

```
userid@domain
```

For more information about including domain names on the name of a principal, see "Principals and groups" on page 125.

-s *ServiceComponent*
If installable authorization services are supported, specifies the name of the authorization service to which the authorizations apply. This parameter is optional; if you omit it, the authorization inquiry is made to the first installable component for the service.

Returned parameters

Returns an authorization list, which can contain none, one, or more authorization values. Each authorization value returned means that any user ID in the specified group or principal has the authority to perform the operation defined by that value.

Table 24 shows the authorities that can be given to the different object types.

Table 24. Specifying authorities for different object types

Authority	Queue	Process	Queue manager	Namelist	Topic	Auth info	Clntconn	Channel	Listener	Service
all	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 24. Specifying authorities for different object types (continued)

Authority	Queue	Process	Queue manager	Namelist	Topic	Auth info	Clntconn	Channel	Listener	Service
alladm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
allmqi	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
none	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
altusr	No	No	Yes	No	No	No	No	No	No	No
browse	Yes	No	No	No	No	No	No	No	No	No
chg	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
clr	Yes	No	No	No	Yes	No	No	No	No	No
connect	No	No	Yes	No	No	No	No	No	No	No
crt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ctrl	No	No	No	No	Yes	No	No	Yes	Yes	Yes
ctrlx	No	No	No	No	No	No	No	Yes	No	No
dlt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
dsp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
get	Yes	No	No	No	No	No	No	No	No	No
pub	No	No	No	No	Yes	No	No	No	No	No
put	Yes	No	No	No	Yes	No	No	No	No	No
inq	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
passall	Yes	No	No	No	Yes	No	No	No	No	No
passid	Yes	No	No	No	Yes	No	No	No	No	No
res	No	No	No	No	Yes	No	No	No	No	No
set	Yes	Yes	Yes	No	No	No	No	No	No	No
setall	Yes	No	Yes	No	Yes	No	No	No	No	No
setid	Yes	No	Yes	No	Yes	No	No	No	No	No
sub	No	No	No	No	Yes	No	No	No	No	No

The following list defines the authorizations associated with each value:

all	Use all operations relevant to the object.
alladm	Perform all administration operations relevant to the object.
allmqi	Use all MQI calls relevant to the object.
altusr	Specify an alternate user ID on an MQI call.
browse	Retrieve a message from a queue by issuing an **MQGET** call with the BROWSE option.
chg	Change the attributes of the specified object, using the appropriate command set.
clr	Clear a queue (PCF command Clear queue only) or a topic.
ctrl	Start, and stop the specified channel, listener, or service. And ping the specified channel.
ctrlx	Reset or resolve the specified channel.
connect	Connect the application to the specified queue manager by issuing an **MQCONN** call.
crt	Create objects of the specified type using the appropriate command set.
dlt	Delete the specified object using the appropriate command set.

dsp	Display the attributes of the specified object using the appropriate command set.
get	Retrieve a message from a queue by issuing an **MQGET** call.
inq	Make an inquiry on a specific queue by issuing an **MQINQ** call.
passall	Pass all context.
passid	Pass the identity context.
pub	Publish.
put	Put a message on a specific queue by issuing an **MQPUT** call.
res	Resume.
set	Set attributes on a queue from the MQI by issuing an **MQSET** call.
setall	Set all context on a queue.
setid	Set the identity context on a queue.
sub	Subscribe.

The authorizations for administration operations, where supported, apply to these command sets:

- Control commands
- MQSC commands
- PCF commands

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
133	Unknown object name
145	Unexpected object name
146	Object name missing
147	Object type missing
148	Invalid object type
149	Entity name missing

Examples

- The following example shows a command to display the authorizations on queue manager `saturn.queue.manager` associated with user group `staff`:

  ```
  dspmqaut -m saturn.queue.manager -t qmgr -g staff
  ```

  The results from this command are:

  ```
  Entity staff has the following authorizations for object:
          get
          browse
          put
          inq
          set
          connect
          altusr
          passid
          passall
          setid
  ```

- The following example displays the authorities user1 has for queue a.b.c:

  ```
  dspmqaut -m qmgr1 -n a.b.c -t q -p user1
  ```

The results from this command are:

```
Entity user1 has the following authorizations for object:
        get
        put
```

Related commands

dmpmqaut	Dump authority
setmqaut	Set or reset authority

dspmqcsv (display command server)

Purpose

Use the **dspmqcsv** command to display the status of the command server for the specified queue manager.

The status can be one of the following:
- Starting
- Running
- Running with SYSTEM.ADMIN.COMMAND.QUEUE not enabled for gets
- Ending
- Stopped

Syntax

```
►►──dspmqcsv──┬────────────┬─────────────────────────────────────────►◄
              └─QMgrName───┘
```

Required parameters

None

Optional parameters

QMgrName
: The name of the local queue manager for which the command server status is being requested.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

Examples

The following command displays the status of the command server associated with `venus.q.mgr`:

```
dspmqcsv venus.q.mgr
```

Related commands

strmqcsv	Start a command server
endmqcsv	End a command server

dspmqfls (display files)

Purpose

Use the **dspmqfls** command to display the real file system name for all WebSphere MQ objects that match a specified criterion. You can use this command to identify the files associated with a particular object. This is useful for backing up specific objects. See "Understanding WebSphere MQ file names" on page 16 for information about name transformation.

Syntax

```
►►──dspmqfls──┬─────────────────┬──┬───────────────┬──GenericObjName──────────►◄
              └─ -m ──QMgrName──┘  └─ -t ──ObjType─┘
```

Required parameters

GenericObjName
The name of the object. The name is a string with no flag and is a required parameter. Omitting the name returns an error.

This parameter supports a wild card character * at the end of the string.

Optional parameters

-m *QMgrName*
The name of the queue manager for which to examine files. If you omit this name, the command operates on the default queue manager.

-t *ObjType*
The object type. The following list shows the valid object types. The abbreviated name is shown first followed by the full name.

* or **all**	All object types; this is the default
authinfo	Authentication information object, for use with Secure Sockets Layer (SSL) channel security
channel or **chl**	A channel
clntconn or **clcn**	A client connection channel
catalog or **ctlg**	An object catalog
namelist or **nl**	A namelist
listener or **lstr**	A listener
process or **prcs**	A process
queue or **q**	A queue or queues matching the object name parameter
qalias or **qa**	An alias queue
qlocal or **ql**	A local queue

qmodel or **qm**	A model queue
qremote or **qr**	A remote queue
qmgr	A queue manager object
service or **srvc**	A service

Note:
1. The **dspmqfls** command displays the name of the directory containing the queue, ***not*** the name of the queue itself.
2. In WebSphere MQ for UNIX systems, you need to prevent the shell from interpreting the meaning of special characters, for example, *. The way you do this depends on the shell you are using, but might involve the use of single quotation marks, double quotation marks, or a backslash.

Return codes

0	Command completed normally
10	Command completed but not entirely as expected
20	An error occurred during processing

Examples
1. The following command displays the details of all objects with names beginning `SYSTEM.ADMIN` defined on the default queue manager.
   ```
   dspmqfls SYSTEM.ADMIN*
   ```
2. The following command displays file details for all processes with names beginning `PROC` defined on queue manager `RADIUS`.
   ```
   dspmqfls -m RADIUS -t prcs PROC*
   ```

dspmqrte (WebSphere MQ display route application)

You can use the WebSphere MQ display route application **dspmqrte** to help determine the route that a message has taken through a queue manager network.

Purpose

The WebSphere MQ display route application (dspmqrte) can be executed on all WebSphere MQ Version 7.0 queue managers, with the exception of WebSphere MQ for z/OS queue managers. You can execute the WebSphere MQ display route application as a client to a WebSphere MQ for z/OS Version 6.0 queue manager by specifying the -c parameter when issuing the dspmqrte command.

Note: To run a client application against a WebSphere MQ for z/OS queue manager, the Client Attachment feature must be installed.

The WebSphere MQ display route application generates and puts a trace-route message into a queue manager network. As the trace-route message travels through the queue manager network, activity information is recorded. When the trace-route message reaches its target queue, the activity information is collected by the WebSphere MQ display route application and displayed. For more information, and examples of using the WebSphere MQ display route application, see the Monitoring WebSphere MQ book.

Syntax

```
                                  ┌┤ Generation options ├──────────────┐
►►──dspmqrte──┬──────┬────────────┼────────────────────────────────────┼──────────────────►
              └─ -c ─┘            └─ -i ──CorrelId──┤ Display options ├─┘

►── -q ──TargetQName──┬───────────────────┬───────────────────────────────────────────────►◄
                      └─ -m ──QMgrName────┘
```

Generation options:

```
├──┬──────────────────┬──┬─────────────────┬──┬─────────────────┬──────────────────────────►
   └─ -ac ──┬──────┬──┘  └─ -d ──Deliver───┘  └─ -f ──Forward───┘
            └─ -ar ┘

►──┬──────────────────────────┬──┬──────┬──┬────────────────┬───────────────────────────────►
   │                      (1) │  └─ -o ─┘  └─ -p ──Priority─┘
   └─ -l ──Persistence────────┘

►──┬────────────────────────┬──┬──────────────────────────┬─────────────────────────────────►
   └─ -qm ──TargetQMgrName──┘  └─ -ro ──┬── none ──────────┬┘
                                        │ ┌─,──────────┐   │
                                        │ ▼            │   │
                                        └───ReportOption─┴─┘

►──┬─────────────────────────────────────────────┬──┬─────────────────────┬──────────────────►
   └─ -rq ──ReplyToQ──┬────────────────────────┬─┘  └─ -s ──Activities────┘
                      └─ -rqm ──ReplyToQMgr────┘

►──┬────────────────┬──┬──────────────────────┬──┬────────────────────┬──────────────────────►
   └─ -t ──Detail───┘  └─ -ts ──TopicString───┘  └─ -xp ──PassExpiry──┘

                         ┌┤ Display options ├┐
►──┬────────────────┬────┼───────────────────┼──────────────────────────────────────────────┤
   └─ -xs ──Expiry──┘    │          (2)      │
                         └─── -n ────────────┘
```

Display options:

```
                 ┌─ -v  summary ─────────────────────────────┐
├──┬────────┬────┼───────────────────────────────────────────┼─────────────────────────────►
   └─ -b ───┘    └─ -v ──┬── all ────────────────────────────┤
                         ├── none ───────────────────────────┤
                         └── outline ──┬─────────────────────┬┘
                                       │ ┌─,───────────────┐ │
                                       │ ▼                 │ │
                                       └─── DisplayOption ─┴─┘
```

```
►─┬────────────────┬──────────────────────────────────────────────────────────┤
  └─ -w ──WaitTime─┘
```

Notes:

1 If *Persistence* is specified as `yes`, and is accompanied by a request for a trace-route reply message (*-ar*), or any report generating options (*-ro ReportOption*), then you must specify the parameter *-rq ReplyToQ*. The reply-to queue must not resolve to a temporary dynamic queue.

2 If this parameter is accompanied by a request for a trace-route reply message (*`-ar`*), or any of the report generating options (*`-ro ReportOption`*), then a specific (non-model) reply-to queue must be specified using *`-rq ReplyToQ`*. By default, activity report messages are requested.

Required parameters

-q *`TargetQName`*
If the WebSphere MQ display route application is being used to send a trace-route message into a queue manager network, *TargetQName* specifies the name of the target queue.

If the WebSphere MQ display route application is being used to view previously gathered activity information, *TargetQName* specifies the name of the queue where the activity information is stored.

Optional parameters

-c Specifies that the WebSphere MQ display route application connects as a client application. For more information on how to set up client machines, see the WebSphere MQ Clients book.

If you do not specify this parameter, the WebSphere MQ display route application does not connect as a client application.

-i *`CorrelId`*
This parameter is used when the WebSphere MQ display route application is used to display previously accumulated activity information only. There can be many activity reports and trace-route reply messages on the queue specified by *-q TargetQName*. *CorrelId* is used to identify the activity reports, or a trace-route reply message, related to a trace-route message. Specify the message identifier of the original trace-route message in *CorrelId*.

The format of *CorrelId* is a 48 character hexadecimal string.

-m *`QMgrName`*
The name of the queue manager to which the WebSphere MQ display route application connects. The name can contain up to 48 characters.

If you do not specify this parameter, the default queue manager is used.

Generation options

The following parameters are used when the WebSphere MQ display route application is used to put a trace-route message into a queue manager network.

-ac
Specifies that activity information is to be accumulated within the trace-route message.

If you do not specify this parameter, activity information is **not** accumulated within the trace-route message.

-ar Requests that a trace-route reply message containing all accumulated activity information is generated in the following circumstances:

- The trace-route message is discarded by a WebSphere MQ Version 7.0 queue manager.
- The trace-route message is put to a local queue (target queue or dead-letter queue) by a WebSphere MQ Version 7.0 queue manager.
- The number of activities performed on the trace-route message exceeds the value of specified in *-s Activities*.

For more information on trace-route reply messages, see the Monitoring WebSphere MQ book.

If you do not specify this parameter, a trace-route reply message will **not** be requested.

-d *Deliver*

Specifies whether the trace-route message is to be delivered to the target queue on arrival. Possible values for *Deliver* are:

yes	On arrival, the trace-route message is put to the target queue, even if the queue manager does not support trace-route messaging.
no	On arrival, the trace-route message is **not** put to the target queue.

If you do not specify this parameter, the trace-route message is **not** put to the target queue.

-f *Forward*

Specifies the type of queue manager that the trace-route message can be forwarded to. Queue managers use an algorithm when determining whether to forward a message to a remote queue manager. For details of this algorithm, see Monitoring WebSphere MQ. The possible values for *Forward* are:

all	The trace-route message is forwarded to any queue manager. **Warning:** If forwarded to a WebSphere MQ queue manager prior to Version 6.0, the trace-route message will not be recognized and can be delivered to a local queue despite the value of the *-d Deliver* parameter.
supported	The trace-route message is only forwarded to a queue manager that will honor the *Deliver* parameter from the *TraceRoute* PCF group.

If you do not specify this parameter, the trace-route message will only be forwarded to a queue manager that will honor the *Deliver* parameter.

-l *Persistence*

Specifies the persistence of the generated trace-route message. Possible values for *Persistence* are:

yes	The generated trace-route message is persistent. (MQPER_PERSISTENT).
no	The generated trace-route message is **not** persistent. (MQPER_NOT_PERSISTENT).

q	The generated trace-route message inherits its persistence value from the queue specified by *-q TargetQName*. (MQPER_PERSISTENCE_AS_Q_DEF).

A trace-route reply message, or any report messages, returned will share the same persistence value as the original trace-route message.

If *Persistence* is specified as **yes**, you must specify the parameter *-rq ReplyToQ*. The reply-to queue must not resolve to a temporary dynamic queue.

If you do not specify this parameter, the generated trace-route message is **not** persistent.

-o Specifies that the target queue is not bound to a specific destination. Typically this parameter is used when the trace-route message is to be put across a cluster. The target queue is opened with option MQOO_BIND_NOT_FIXED.

If you do not specify this parameter, the target queue is bound to a specific destination.

-p *Priority*

Specifies the priority of the trace-route message. The value of *Priority* is either greater than or equal to 0, or MQPRI_PRIORITY_AS_Q_DEF. MQPRI_PRIORITY_AS_Q_DEF specifies that the priority value is taken from the queue specified by *-q TargetQName*.

If you do not specify this parameter, the priority value is taken from the queue specified by *-q TargetQName*.

-qm *TargetQMgrName*

Qualifies the target queue name; normal queue manager name resolution will then apply. The target queue is specified with *-q TargetQName*.

If you do not specify this parameter, the queue manager to which the WebSphere MQ display route application is connected is used as the reply-to queue manager.

-ro none | *ReportOption*

none	Specifies no report options are set.
ReportOption	Specifies report options for the trace-route message. Multiple report options can be specified using a comma as a separator. Possible values for *ReportOption* are:

activity	The report option MQRO_ACTIVITY is set.
coa	The report option MQRO_COA_WITH_FULL_DATA is set.
cod	The report option MQRO_COD_WITH_FULL_DATA is set.
exception	The report option MQRO_EXCEPTION_WITH_FULL_DATA is set.
expiration	The report option MQRO_EXPIRATION_WITH_FULL_DATA is set.
discard	The report option MQRO_DISCARD_MSG is set.

If neither *-ro ReportOption* nor *-ro none* are specified, then the MQRO_ACTIVITY and MQRO_DISCARD_MSG report options are specified.

-rq *ReplyToQ*

Specifies the name of the reply-to queue that all responses to the trace-route message are sent to. If the trace-route message is persistent, or if the *-n* parameter is specified, a reply-to queue must be specified that is **not** a temporary dynamic queue.

If you do not specify this parameter, the system default model queue, SYSTEM.DEFAULT.MODEL.QUEUE is used as the reply-to queue. Using this model queue causes a temporary dynamic queue, for the WebSphere MQ display route application, to be created.

-rqm *ReplyToQMgr*

Specifies the name of the queue manager where the reply-to queue resides. The name can contain up to 48 characters.

If you do not specify this parameter, the queue manager to which the WebSphere MQ display route application is connected is used as the reply-to queue manager.

-s *Activities*

Specifies the maximum number of recorded activities that can be performed on behalf of the trace-route message before it is discarded. This prevents the trace-route message from being forwarded indefinitely if caught in an infinite loop. The value of *Activities* is either greater than or equal to 1, or MQROUTE_UNLIMITED_ACTIVITIES. MQROUTE_UNLIMITED_ACTIVITIES specifies that an unlimited number of activities can be performed on behalf of the trace-route message.

If you do not specify this parameter, an unlimited number of activities can be performed on behalf of the trace-route message.

-t *Detail*

Specifies the activities that are recorded. The possible values for *Detail* are:

low	Activities performed by user-defined application are recorded only.
medium	Activities specified in **low** are recorded. Additionally, activities performed by MCAs are recorded.
high	Activities specified in **low**, and **medium** are recorded. MCAs do not expose any further activity information at this level of detail. This option is available to user-defined applications that are to expose further activity information only. For example, if a user-defined application determines the route a message takes by considering certain message characteristics, the routing logic could be included with this level of detail.

If you do not specify this parameter, medium level activities are recorded.

-ts *TopicString*

Specifies a topic string to which the WebSphere MQ display route application is to publish a trace-route message, and puts this application into topic mode. In this mode, the application traces all of the messages that result from the publish request.

-xp *PassExpiry*

Specifies whether the report option MQRO_DISCARD_MSG and the remaining expiry time from the trace-route message is passed on to the trace-route reply message. Possible values for *PassExpiry* are:

yes	The report option MQRO_PASS_DISCARD_AND_EXPIRY is specified in the message descriptor of the trace-route message. If a trace-route reply message, or activity reports, are generated for the trace-route message, the MQRO_DISCARD_MSG report option (if specified), and the remaining expiry time are passed on. This is the default value.
no	The report option MQRO_PASS_DISCARD_AND_EXPIRY is **not** specified. If a trace-route reply message is generated for the trace-route message, the discard option and remaining expiry time from the trace-route message are **not** passed on.

If you do not specify this parameter, the MQRO_PASS_DISCARD_AND_EXPIRY report option is not specified in the trace-route message.

-xs *Expiry*
Specifies the expiry time for the trace-route message, in seconds.

If you do not specify this parameter, the expiry time is specified as 60 seconds.

-n Specifies that activity information returned for the trace-route message is not to be displayed.

If this parameter is accompanied by a request for a trace-route reply message, (*-ar*), or any of the report generating options from (*-ro ReportOption*), then a specific (non-model) reply-to queue must be specified using *-rq ReplyToQ*. By default, activity report messages are requested.

After the trace-route message is put to the specified target queue, a 48 character hexadecimal string is returned containing the message identifier of the trace-route message. The message identifier can be used by the WebSphere MQ display route application to display the activity information for the trace-route message at a later time, using the *-i CorrelId* parameter.

If you do not specify this parameter, activity information returned for the trace-route message is displayed in the form specified by the *-v* parameter.

Display options

The following parameters are used when the WebSphere MQ display route application is used to display collected activity information.

-b Specifies that the WebSphere MQ display route application will only browse activity reports or a trace-route reply message related to a message. This allows activity information to be displayed again at a later time.

If you do not specify this parameter, the WebSphere MQ display route application will destructively get activity reports or a trace-route reply message related to a message.

-v summary | all | none | outline *DisplayOption*

summary	The queues that the trace-route message was routed through are displayed.
all	All available information is displayed.
none	No information is displayed.

`outline` *`DisplayOption`* Specifies display options for the trace-route message. Multiple display options can be specified using a comma as a separator.

If no values are supplied the following is displayed:

- The application name
- The type of each operation
- Any operation specific parameters

Possible values for *DisplayOption* are:

activity All non-PCF group parameters in *Activity* PCF groups are displayed.

identifiers
Values with parameter identifiers MQBACF_MSG_ID or MQBACF_CORREL_ID are displayed. This overrides *msgdelta*.

message
All non-PCF group parameters in *Message* PCF groups are displayed. When this value is specified, you cannot specify *msgdelta*.

msgdelta
All non-PCF group parameters in *Message* PCF groups, that have changed since the last operation, are displayed. When this value is specified, you cannot specify *message*.

operation
All non-PCF group parameters in *Operation* PCF groups are displayed.

traceroute
All non-PCF group parameters in *TraceRoute* PCF groups are displayed.

If you do not specify this parameter, a summary of the message route is displayed.

-w *`WaitTime`*
Specifies the time, in seconds, that the WebSphere MQ display route application will wait for activity reports, or a trace-route reply message, to return to the specified reply-to queue.

If you do not specify this parameter, the wait time is specified as the expiry time of the trace-route message, plus 60 seconds.

Return codes

0	Command completed normally
10	Invalid arguments supplied
20	An error occurred during processing

Examples

1. The following command puts a trace-route message into a queue manager network with the target queue specified as `TARGET.Q`. Providing queue managers on route are enabled for activity recording, activity reports are generated. Depending on the queue manager attribute, ACTIVREC, activity

reports are either delivered to the reply-to queue `ACT.REPORT.REPLY.Q`, or are delivered to a system queue. The trace-route message is discarded on arrival at the target queue.

```
dspmqrte -q TARGET.Q -rq ACT.REPORT.REPLY.Q
```

Providing one or more activity reports are delivered to the reply-to queue, `ACT.REPORT.REPLY.Q`, the WebSphere MQ display route application orders and displays the activity information.

2. The following command puts a trace-route message into a queue manager network with the target queue specified as `TARGET.Q`. Activity information is accumulated within the trace-route message, but activity reports are not generated. On arrival at the target queue the trace-route message is discarded. Depending on the value of the target queue manager attribute, ROUTEREC, a trace-route reply message can be generated and delivered to either the reply-to queue, `TRR.REPLY.TO.Q`, or to a system queue.

   ```
   dspmqrte -ac -ar -ro discard -rq TRR.REPLY.TO.Q -q TARGET.Q
   ```

   Providing a trace-route reply message is generated and is delivered to the reply-to queue `TRR.REPLY.TO.Q`, the WebSphere MQ display route application orders and displays the activity information that was accumulated in the trace-route message.

For more examples of using the WebSphere MQ display route application and its output, see the Monitoring WebSphere MQ book.

dspmqtrc (display formatted trace output)

This describes the dspmqtrc control command, which is used to format trace output.

Purpose

Use the **dspmqtrc** command to display WebSphere MQ formatted trace output.

Syntax

```
►►──dspmqtrc──┬──────────────────────┬──┬────┬──┬────┬──────────────►
              └─ -t ──FormatTemplate─┘  └─-h─┘  └─-s─┘

►──┬───────────────────────┬──InputFileName─────────────────────►◄
   └─ -o ──OutputFilename──┘
```

Required parameters

InputFileName
: The name of the file containing the unformatted trace, for example:

  ```
  /var/mqm/trace/AMQ12345.01.TRC
  ```

  If you provide one input file, **dspmqtrc** formats it either to stdout or to the output file you name. If you provide more than one input file, any output file you name is ignored, and formatted files are named `AMQ`*yyyyy.zz*`.FMT`, based on the PID of the trace file.

Optional parameters

-t *FormatTemplate*
The name of the template file containing details of how to display the trace. If this parameter is not supplied, the default template file location is used:

For AIX systems, the default value is as follows:

```
/usr/mqm/lib/amqtrc2.fmt
```

For all UNIX systems other than AIX systems, the default value is as follows:

```
/opt/mqm/lib/amqtrc.fmt
```

-h Omit header information from the report.

-s Extract trace header and put to stdout.

-o *output_filename*
The name of the file into which to write formatted data.

Related commands

endmqtrc	End trace
strmqtrc	Start trace

dspmqtrn (display transactions)

Purpose

Use the **dspmqtrn** command to display details of in-doubt transactions. This includes transactions coordinated by WebSphere MQ and by an external transaction manager.

For each in-doubt transaction, a transaction number (a human-readable transaction identifier), the transaction state, and the transaction ID are displayed. (Transaction IDs can be up to 128 characters long, hence the need for a transaction number.)

Syntax

```
►►──dspmqtrn──┬────┬──┬────┬──┬──────────────┬──────────────────────►◄
              └─-e─┘  └─-i─┘  └─-m QMgrName─┘
```

Optional parameters

-e Requests details of externally coordinated, in-doubt transactions. Such transactions are those for which WebSphere MQ has been asked to prepare to commit, but has not yet been informed of the transaction outcome.

-i Requests details of internally coordinated, in-doubt transactions. Such transactions are those for which each resource manager has been asked to prepare to commit, but WebSphere MQ has yet to inform the resource managers of the transaction outcome.

Information about the state of the transaction in each of its participating resource managers is displayed. This information can help you assess the affects of failure in a particular resource manager.

Note: If you specify neither -e nor -i, details of both internally and externally coordinated in-doubt transactions are displayed.

-m *QMgrName*
The name of the queue manager for which to display transactions. If you omit the name, the default queue manager's transactions are displayed.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
102	No transactions found

Related commands

rsvmqtrn	Resolve transaction

dspmqver (display version information)

Purpose

Use the **dspmqver** command to display WebSphere MQ version and build information.

Syntax

```
►►──dspmqver──┬──────────────────┬──┬──────────────┬──┬──────┬──┬──────┬──────────►◄
              └─ -p ──Components─┘  └─ -f ──Fields─┘  └─ -b──┘  └─ -v──┘
```

Optional parameters

-p *Components*
Display information for the components specified by *Component*. Either a single component, or multiple components can be specified. To specify multiple components, sum the values of the required components, then specify *Component* as the total of the summation. Available components and related values follow:

1	WebSphere MQ server, or client.
2	WebSphere MQ classes for Java.
4	WebSphere MQ classes for Java Message Service.
8	WebScale Distribution Hub

The default value is 1.

-f *Fields*
Display information for the fields specified by *Field*. Either a single field, or

multiple fields can be specified. To specify multiple fields, sum the values of the required fields, then specify *Field* as the total of the summation. Available fields and related values follow:

1	Name
2	Version, in the form `V.R.M.F`: Where `V`=Version, `R`=Release, `M`=Modification, and `F`=Fix pack
4	CMVC level
8	Build type

Information for each selected field is displayed on a separate line when the dspmqver command is run.

The default value is 15. This displays information for all fields.

-b Omit header information from the report.

-v Display verbose output.

Return codes

0	Command completed normally.
10	Command completed with unexpected results.
20	An error occurred during processing.

Examples

The following command displays WebSphere MQ version and build information, using the default settings for *-p Components* and *-f Fields*:

```
dspmqver
```

The following command displays version and build information for the WebSphere MQ classes for Java:

```
dspmqver -p 2
```

The following command displays the Common Services for Java Platform Standard Edition, IBM WebSphere MQ, Java Message Service Client, and WebSphere MQ classes for Java Message Service:

```
dspmqver -p 4
```

The following command displays the build level of the WebScale Distribution Hub:

```
dspmqver -p 8 -f 4
```

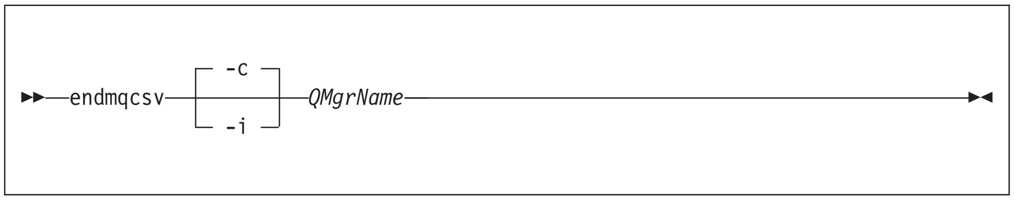
endmqcsv (end command server)

Purpose

Use the **endmqcsv** command to stop the command server on the specified queue manager.

If the queue manager attribute, SCMDSERV, is specified as QMGR then changing the state of the command server using **endmqcsv** does not effect how the queue manager acts upon the SCMDSERV attribute at the next restart.

Syntax



Required parameters

QMgrName
The name of the queue manager for which to end the command server.

Optional parameters

-c Stops the command server in a controlled manner. The command server is allowed to complete the processing of any command message that it has already started. No new message is read from the command queue.

This is the default.

-i Stops the command server immediately. Actions associated with a command message currently being processed might not complete.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

Examples

1. The following command stops the command server on queue manager `saturn.queue.manager`:

   ```
   endmqcsv  -c saturn.queue.manager
   ```

   The command server can complete processing any command it has already started before it stops. Any new commands received remain unprocessed in the command queue until the command server is restarted.
2. The following command stops the command server on queue manager `pluto` immediately:

   ```
   endmqcsv -i pluto
   ```

Related commands

strmqcsv	Start a command server
dspmqcsv	Display the status of a command server

endmqlsr (end listener)

Purpose

The endmqlsr command ends all listener processes for the specified queue manager.

You do not need to stop the queue manager before issuing the endmqlsr command. If any of the listeners are configured to have inbound channels running within the runmqlsr listener process, rather than within a pool process, the request to end that listener might fail if channels are still active. In this case a message is written indicating how many listeners were successfully ended and how many listeners are still running.

If the listener attribute, CONTROL, is specified as QMGR then changing the state of the listener using endmqlsr does not effect how the queue manager acts upon the CONTROL attribute at the next restart.

Syntax

```
►►──endmqlsr──┬──────┬──┬─────────────────┬────────────────────────►◄
              └─ -w ─┘  └─ -m ──QMgrName──┘
```

Optional parameters

-m *QMgrName*
The name of the queue manager. If you omit this, the command operates on the default queue manager.

-w Wait before returning control.

Control is returned to you only after all listeners for the specified queue manager have stopped.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

endmqdnm (stop .NET monitor)

Purpose

The endmqdnm command applies to WebSphere MQ for Windows only.

Use the **endmqdnm** control command to stop a .NET monitor.

Syntax

```
►►──endmqdnm── -q ──QueueName──┬─────────────────┬─────────────────►◄
                               └─ -m ──QMgrName──┘
```

Required parameters

-q *QueueName*
: The name of the application queue that the .NET monitor is monitoring.

Optional parameters

-m *QMgrName*
: The name of the queue manager that hosts the application queue.

  If omitted, the default queue manager is used.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
71	Unexpected error
72	Queue manager name error
133	Unknown object name error

endmqm (end queue manager)

Purpose

Use the **endmqm** command to end (stop) a specified local queue manager. This command stops a queue manager in one of three modes:

- Controlled or quiesced shutdown
- Immediate shutdown
- Preemptive shutdown

The attributes of the queue manager and the objects associated with it are not affected. You can restart the queue manager using the **strmqm** (Start queue manager) command.

To delete a queue manager, stop it and then use the **dltmqm** (Delete queue manager) command.

Issuing the **endmqm** command will effect any client application connected through a server-connection channel. The effect varies depending on the parameter used, but it is as though a STOP CHANNEL command was issued in one of the three possible modes. See WebSphere MQ Clients, for information on the effects of STOP CHANNEL modes on server-connection channels. The **endmqm** optional parameter descriptions state which STOP CHANNEL mode they will be equivalent to.

Syntax

```
            ┌─ -c ─┐
►►──endmqm──┼──────┼──┬──────┬──QMgrName──────────────────────────►◄
            ├─ -w ─┤  └─ -z ─┘
            ├─ -i ─┤
            └─ -p ─┘
```

Required parameters

`QMgrName`
The name of the message queue manager to be stopped.

Optional parameters

-c Controlled (or quiesced) shutdown. This is the default.

The queue manager stops, but only after all applications have disconnected. Any MQI calls currently being processed are completed.

Control is returned to you immediately and you are not notified of when the queue manager has stopped.

The effect on any client applications connected through a server-connection channel is equivalent to a STOP CHANNEL command issued in QUIESCE mode.

-w Wait shutdown.

This type of shutdown is equivalent to a controlled shutdown except that control is returned to you only after the queue manager has stopped. You receive the message `Waiting for queue manager` *`qmName`* `to end` while shutdown progresses.

The effect on any client applications connected through a server-connection channel is equivalent to a STOP CHANNEL command issued in QUIESCE mode.

-i Immediate shutdown. The queue manager stops after it has completed all the MQI calls currently being processed. Any MQI requests issued after the command has been issued fail. Any incomplete units of work are rolled back when the queue manager is next started.

Control is returned after the queue manager has ended.

The effect on any client applications connected through a server-connection channel is equivalent to a STOP CHANNEL command issued in FORCE mode.

-p Preemptive shutdown.

Use this type of shutdown only in exceptional circumstances. For example, when a queue manager does not stop as a result of a normal **endmqm** command.

The queue manager might stop without waiting for applications to disconnect or for MQI calls to complete. This can give unpredictable results for WebSphere MQ applications. The shutdown mode is set to *immediate shutdown*. If the queue manager has not stopped after a few seconds, the shutdown mode is escalated, and all remaining queue manager processes are stopped.

The effect on any client applications connected through a server-connection channel is equivalent to a STOP CHANNEL command issued in TERMINATE mode.

-z Suppresses error messages on the command.

Return codes

0	Queue manager ended
3	Queue manager being created
16	Queue manager does not exist
40	Queue manager not available
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
119	Permission denied

Examples

The following examples show commands that stop the specified queue managers.

1. This command ends the queue manager named `mercury.queue.manager` in a controlled way. All applications currently connected are allowed to disconnect.
   ```
   endmqm mercury.queue.manager
   ```
2. This command ends the queue manager named `saturn.queue.manager` immediately. All current MQI calls complete, but no new ones are allowed.
   ```
   endmqm -i saturn.queue.manager
   ```

Related commands

crtmqm	Create a queue manager
strmqm	Start a queue manager
dltmqm	Delete a queue manager

endmqtrc (end trace)

This describes the syntax and parameters of the endmqtrc command control, which ends trace, and provides examples of its use.

Purpose

Use the **endmqtrc** command to end tracing for the specified entity or all entities.The **endmqtrc** command ends only the trace that is described by its parameters.

Syntax

The syntax of this command is as follows:

```
►►──endmqtrc──┬─────────────────┬──┬───────────────┬──┬─────────────┬─────────►
              └─ -m ──QMgrName──┘  └─ -i ──PidTids─┘  └─ -p ──Apps──┘

►──┬──────┬──┬──────┬──────────────────────────────────────────────────────►◄
   └─ -e ─┘  └─ -a ─┘
```

Optional parameters

-m *QMgrName*
The name of the queue manager for which to end tracing.

A maximum of one -m flag and associated queue manager name can be supplied on the command.

The following wildcards are allowed: asterisk (*), replacing zero or more characters and question mark (?), replacing any single character.

You can specify the -m flag and a queue manager name on the same command as the -i flag, and the -p flag.

Note: In the following sequence of commands, the `endmqtrc -m *` command has no effect:

```
strmqtrc -m qm1
endmqtrc -m *
```

The command `endmqtrc -m *` ends only a trace that is started with `strmqtrc -m *`; start and end trace parameters must match exactly. To end all tracing safely, use `endmqtrc -a`.

-i *PidTids*
Process identifier (PID) and thread identifier (TID) for which to end tracing. You cannot use the -i flag with the -e flag. If you try to use the -i flag with the -e flag, then an error message is issued. This parameter should be used only under the guidance of IBM Service personnel.

-p *Apps*
The named processes for which to end tracing. *Apps* is a comma-separated list. You must specify each name in the list exactly as the program name would be displayed in the "Program Name" FDC header. Asterisk (*) or question mark (?) wildcards are allowed. You cannot use the -p flag with the -e flag. If you try to use the -p flag with the -e flag, then an error message is issued.

-e Ends early tracing of all processes.

Using endmqtrc with no parameters has the same effect as endmqtrc -e. You cannot specify the -e flag with the -m flag, the -i flag or the -p flag.

-a Ends all tracing.

This flag ***must*** be specified alone.

Return codes

AMQ5611	This message is issued if you supply invalid arguments to the command.

Examples

This command ends tracing of data for a queue manager called QM1.

```
endmqtrc -m QM1
```

The following examples are a sequence that shows how the **endmqtrc** command ends only the trace that is described by its parameters.

1. The following command enables tracing for queue manager QM1 and process amqxxx.exe:
   ```
   strmqtrc -m QM1 -p amqxxx.exe
   ```
2. The following command enables tracing for queue manager QM2:
   ```
   strmqtrc -m QM2
   ```
3. The following command ends tracing for queue manager QM2 only. Tracing of queue manager QM1 and process amqxxx.exe continues:
   ```
   endmqtrc -m QM2
   ```

Related commands

dspmqtrc	Display formatted trace output
strmqtrc	Start trace

mqftapp (run File Transfer Application GUI)

Purpose

The mqftapp command is available with the File Transfer Application on WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) servers only.

Use the **mqftapp** command to run the File Transfer Application graphical user interface (GUI).

Alternatively, on WebSphere MQ for Windows you can start the File Transfer Application by selecting it through the start menu.

When run for the first time, the graphical user interface must be configured. For instructions of how to do this, see “Configuring the GUI” on page 550.

Syntax

The syntax of this command follows:

```
►►──mqftapp──────────────────────────────────────────────────────────►◄
```

Related commands

mqftrcv	Receive file on server

mqftrcvc	Receive file on client
mqftsnd	Send file from server
mqftsndc	Send file from client

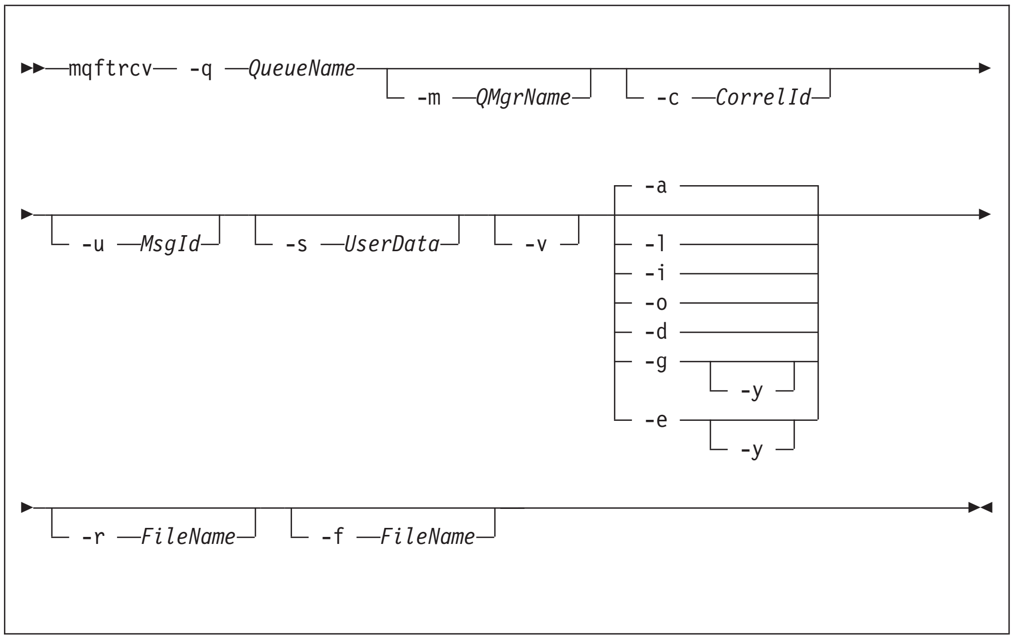
mqftrcv (receive file on server)

Purpose

The mqftrcv command is available with the File Transfer Application on WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) servers only.

Use the **mqftrcv** command to do one of the following:
- Receive a file.
- Extract a file.
- Delete a file.
- View sent files.

Syntax



Required parameters

-q *QueueName*
: The local name of the destination queue.

Optional parameters

-m *QMgrName*
: The name of the queue manager that hosts the destination queue. A queue manager that does not have the File Transfer Application installed can be specified. If you omit this parameter, the default queue manager is used.

-c `CorrelId`
: Select all files matching `CorrelId`. Selection can be combined with *-s UserData*, and *-f FileName*.

-u `MsgID`
: Select the message that has a message ID that matches `MsgID`. Used to select other messages.

-s `UserData`
: Select files by locating any occurrence of the character string `UserData`, in part or all of the file's **UserData**. The comparison is case sensitive, and wildcard characters cannot be used.

  Selection can be combined with *-c CorrelId*, and *-f FileName*.

-v Return the *CorrelId*, and *MsgId* of the file.

-a List all files and messages, in the following order:

1. Complete files, ordered by queue name
2. Incomplete files, ordered by queue name
3. Other messages, ordered by queue name

This is the default value. For more information on file status see "File status" on page 552.

-l List all complete files, ordered by queue name.

-i List all incomplete files, ordered by queue name.

-o List all other messages, ordered by queue name.

-d Delete the specified file, or the group of messages. If more than one file matches the selection criteria, no files are deleted and a return code is returned.

-g Receive a complete file. Message associated with the file are removed. If a file already exists of the same name, do one of the following:

- Specify the *-y* parameter, so that the existing file is overwritten.
- Specify the *-r FileName* parameter, so that the file is renamed.

-e Extract a complete, or incomplete file. Messages associated with the file are not removed. If a file already exists of the same name, do one of the following:

- Specify the *-y* parameter, so that the existing file is overwritten.
- Specify the *-r FileName* parameter, so that the file is renamed.

-y Replace an existing file of the same name. Used with optional parameters *-g*, and *-e*.

-r `FileName`
: Assign new file name and/or file location.

  Used to rename, or to relocate a file. The file is assigned the name specified in *FileName*. A fully qualified file name can be specified to relocate the file. If the file name, or path, contains embedded spaces, it must be specified in double quotes. One file can be specified only, and you cannot use wildcard characters.

-f `FileName`
: Select all files matching `FileName`. The fully qualified file name can be specified. If the file name contains embedded spaces, it must be specified in double quotes. You cannot use wildcard characters.

  Selection can be combined with *-c CorrelId*, and *-s UserData*.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
69	Storage not available
71	Unexpected error
163	Queue name required
164	Cannot open queue
165	Cannot open file
166	Cannot put to queue
167	No file name specified (Send)
168	Message length is too small to send data
169	Sending file has changed
170	Cannot get from queue
171	Cannot write to file
172	CorrelId is invalid
173	MsgId is invalid
174	No messages to receive
175	File for delete is not unique

Examples

This command lists all files and messages on the queue, `MY.QUEUE`, located on the default queue manager:

```
mqftrcv -q MY.QUEUE -a
```

This command gets the first complete file on the queue, `MY.QUEUE`, located on queue manager `QM1`:

```
mqftrcv -q MY.QUEUE -m QM1 -g
```

This command gets the complete file, named `My document.txt`, on the queue, `MY.QUEUE`, located on the default queue manager:

```
mqftrcv -q MY.QUEUE -g -f "My document.txt"
```

This command gets the complete file, named `My document.txt`, also marked `URGENT`, on the queue, `MY.QUEUE`, located on queue manager QM1 :

```
mqftrcv -q MY.QUEUE -m QM1 -g -f "My document.txt" -s "URGENT"
```

Related commands

mqftapp	Run File Transfer Application
mqftrcvc	Receive file on client
mqftsnd	Send file from server
mqftsndc	Send file from client

mqftrcvc (receive file on client)

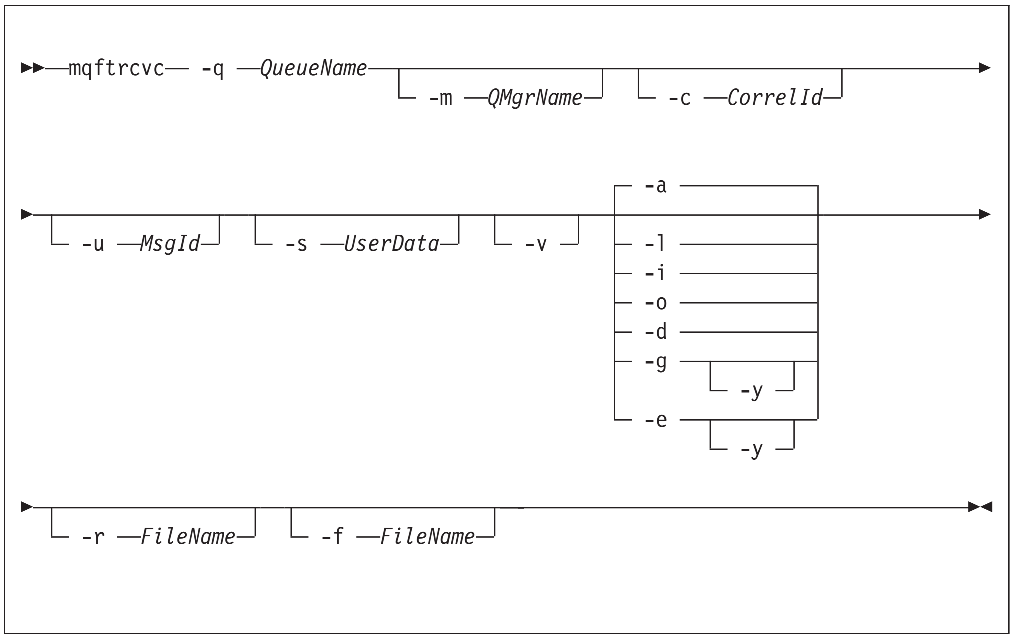
Purpose

The mqftrcvc command is available with the File Transfer Application on WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) clients only.

Use the **mqftrcvc** command to do one of the following:

- Receive a file from a connected server.
- Extract a file from a connected server.
- Delete a file from a connected server.
- View sent files on a connected server.

Syntax



Required parameters

-q *QueueName*
: The local name of the destination queue.

Optional parameters

-m *QMgrName*
: The name of the queue manager that hosts the destination queue. A queue manager that does not have the File Transfer Application installed can be specified. If you omit this parameter, the default queue manager is used.

-c *CorrelId*
: Select all files matching *CorrelId*. Selection can be combined with *-s UserData*, and *-f FileName*.

-u *MsgID*
: Select the message that has a message ID that matches *MsgID*. Used to select other messages.

-s *UserData*
: Select files by locating any occurrence of the character string *UserData*, in part or all of the file's **UserData**. The comparison is case sensitive, and wildcard characters cannot be used.

  Selection can be combined with *-c CorrelId*, and *-f FileName*.

-v Return the *CorrelId*, and *MsgId* of the file.

-a List all files and messages, in the following order:

1. Complete files, ordered by queue name
2. Incomplete files, ordered by queue name
3. Other messages, ordered by queue name

This is the default value. For more information on file status see "File status" on page 552.

-l List all complete files, ordered by queue name.

-i List all incomplete files, ordered by queue name.

-o List all other messages, ordered by queue name.

-d Delete the specified file, or the group of messages. If more than one file matches the selection criteria, no files are deleted and a return code is returned.

-g Receive a complete file. Message associated with the file are removed. If a file already exists of the same name, do one of the following:

- Specify the *-y* parameter, so that the existing file is overwritten.
- Specify the *-r FileName* parameter, so that the file is renamed.

-e Extract a complete, or incomplete file. Messages associated with the file are not removed. If a file already exists of the same name, do one of the following:

- Specify the *-y* parameter, so that the existing file is overwritten.
- Specify the *-r FileName* parameter, so that the file is renamed.

-y Replace an existing file of the same name. Used with optional parameters *-g*, and *-e*.

-r *FileName*
Assign new file name and/or file location.

Used to rename, or to relocate a file. The file is assigned the name specified in *FileName*. A fully qualified file name can be specified to relocate the file. If the file name, or path, contains embedded spaces, it must be specified in double quotes. One file can be specified only, and you cannot use wildcard characters.

-f *FileName*
Select all files matching *FileName*. The fully qualified file name can be specified. If the file name contains embedded spaces, it must be specified in double quotes. You cannot use wildcard characters.

Selection can be combined with *-c CorrelId*, and *-s UserData*.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
69	Storage not available
71	Unexpected error
163	Queue name required
164	Cannot open queue
165	Cannot open file
166	Cannot put to queue
167	No file name specified (Send)
168	Message length is too small to send data
169	Sending file has changed

170	Cannot get from queue
171	Cannot write to file
172	CorrelId is invalid
173	MsgId is invalid
174	No messages to receive
175	File for delete is not unique

Examples

This command lists all files and messages on the queue, `MY.QUEUE`, located on the default queue manager:

```
mqftrcvc -q MY.QUEUE -a
```

This command gets the first complete file on the queue, `MY.QUEUE`, located on queue manager `QM1`:

```
mqftrcvc -q MY.QUEUE -m QM1 -g
```

This command gets the complete file, named `My document.txt`, on the queue, `MY.QUEUE`, located on the default queue manager:

```
mqftrcvc -q MY.QUEUE -g -f "My document.txt"
```

This command gets the complete file, named `My document.txt`, also marked `URGENT`, on the queue, `MY.QUEUE`, located on queue manager `QM1` :

```
mqftrcvc -q MY.QUEUE -m QM1 -g -f "My document.txt" -s "URGENT"
```

Related commands

mqftapp	Run File Transfer Application
mqftrcv	Receive file on server
mqftsnd	Send file from server
mqftsndc	Send file from client

mqftsnd (send file from server)

Purpose

The mqftsnd command is available with the File Transfer Application on WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) servers only.

Use the **mqftsnd** command to send a file from a WebSphere MQ server using the File Transfer Application.

Syntax

```
►►──mqftsnd── -q ──QueueName──┬───────────────┬──┬─────────────────────┬──────►
                              └─ -m ──QMgrName─┘  └─ -t ──TargetQMgrName─┘

                                      ┌─ -p  yes───┐
►──┬──────┬──┬──────────────────┬─────┼────────────┼──┬────────────────┬────────►
   └─ -v ─┘  └─ -l ──MsgLength──┘     ├─ -p  no────┤  └─ -s ──UserData─┘
                                      └─ -p  queue─┘

►── -f ──FileName──────────────────────────────────────────────────────────────►◄
```

Required parameters

-q *QueueName*
The local name of the destination queue.

-f *FileName*
The name of the file to be transmitted. The fully qualified file name can be specified. If the file name contains embedded spaces, it must be specified in double quotes. One file can be specified only, and you cannot use wildcard characters.

Note: The file is not deleted from it's original location during a send.

Optional parameters

-m *QMgrName*
The name of the queue manager that has access to the file at it's origin. If you omit this parameter, the default queue manager is used.

-t *TargetQMgrName*
The name of the queue manager that hosts the destination queue. If you omit this parameter, the queue manager specified by *QMgrName* is used.

-v Return the *CorrelId* of the file.

-l *MessageSize*
The maximum size of a segmented message in bytes.

If a file is too large to be sent as a single message, the file is segmented into a number smaller messages, known as segments, and all these segments are transmitted instead. When all the segments reach their destination, the target queue manager reassembles them to form the original file.

Specify a value between 250 and the queue manager's maximum message length. To determine the maximum message length, use the MQIA_MAX_MSG_LENGTH selector with the MQINQ call.

The default value is 100000.

-p *yes*
Messages are persistent. This is the default value.

-p *no*
: Messages are not persistent.

-p *queue*
: Messages persistence is defined by the queue.

-s *UserData*
: An character string that contains user information relevant to the file being sent. The content of this data is of no significance to the target queue manager.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
69	Storage not available
71	Unexpected error
163	Queue name required
164	Cannot open queue
165	Cannot open file
166	Cannot put to queue
167	No file name specified (Send)
168	Message length is too small to send data
169	Sending file has changed
170	Cannot get from queue
171	Cannot write to file
172	CorrelId is invalid
173	MsgId is invalid
174	No messages to receive
175	File for delete is not unique

Examples

This command sends a file from the default queue manager, to the queue DEST.Q, located on queue manager QM2:

```
mqftsnd -q DEST.Q -t QM2 -f "My document.txt"
```

This command sends a file as non-persistent messages from queue manager QM1, to the queue DEST.Q, located on the default queue manager, setting the maximum segment size to 50000 bytes:

```
mqftsnd -q DEST.Q -m QM1 -l 50000 -p no -f "C:\My Downloads\My document.idd"
```

Related commands

mqftapp	Run File Transfer Application
mqftrcv	Receive file on server
mqftrcvc	Receive file on client
mqftsndc	Send file from client

mqftsndc (send file from client)

Purpose

The mqftsndc command is available with the File Transfer Application on WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) clients only.

Use the **mqftsndc** command to send a file from a WebSphere MQ client using the File Transfer Application.

Syntax

```
►►──mqftsndc── -q ──QueueName──┬────────────────┬──┬──────────────────────┬──►
                               └─ -m ──QMgrName─┘  └─ -t ──TargetQMgrName─┘

                                      ┌─ -p  yes───┐
►──┬──────┬──┬────────────────┬──┼────────────┼──┬────────────────┬──────────►
   └─ -v ─┘  └─ -l ──MsgLength─┘  ├─ -p  no────┤  └─ -s ──UserData─┘
                                      └─ -p  queue─┘

►── -f ──FileName───────────────────────────────────────────────────────────►◄
```

Required parameters

-q *QueueName*
: The local name of the destination queue.

-f *FileName*
: The name of the file to be transmitted. The fully qualified file name can be specified. If the file name contains embedded spaces, it must be specified in double quotes. One file can be specified only, and you cannot use wildcard characters.

  Note: The file is not deleted from it's original location during a send.

Optional parameters

-m *QMgrName*
: The name of the queue manager that has access to the file at it's origin. If you omit this parameter, the default queue manager is used.

-t *TargetQMgrName*
: The name of the queue manager that hosts the destination queue. If you omit this parameter, the queue manager specified by *QMgrName* is used.

-v Return the *CorrelId* of the file.

-l *MessageSize*
: The maximum size of a segmented message in bytes.

If a file is too large to be sent as a single message, the file is segmented into a number smaller messages, known as segments, and all these segments are transmitted instead. When all the segments reach their destination, the target queue manager reassembles them to form the original file.

Specify a value between 250 and the queue manager's maximum message length. To determine the maximum message length, use the MQIA_MAX_MSG_LENGTH selector with the MQINQ call.

The default value is 100000.

-p *yes*
Messages are persistent. This is the default value.

-p *no*
Messages are not persistent.

-p *queue*
Messages persistence is defined by the queue.

-s *UserData*
An character string that contains user information relevant to the file being sent. The content of this data is of no significance to the target queue manager.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
69	Storage not available
71	Unexpected error
163	Queue name required
164	Cannot open queue
165	Cannot open file
166	Cannot put to queue
167	No file name specified (Send)
168	Message length is too small to send data
169	Sending file has changed
170	Cannot get from queue
171	Cannot write to file
172	CorrelId is invalid
173	MsgId is invalid
174	No messages to receive
175	File for delete is not unique

Examples

This command sends a file from the default queue manager, to the queue DEST.Q, located on queue manager QM2:

```
mqftsndc -q DEST.Q -t QM2 -f "My document.txt"
```

This command sends a non-persistent file from queue manager QM1, to the queue DEST.Q, located on the default queue manager, setting the maximum segment size to 50000 bytes:

```
mqftsndc -q DEST.Q -m QM1 -l 50000 -p no -f "C:\My Downloads\My document.idd"
```

Related commands

mqftapp	Run File Transfer Application
mqftrcv	Receive file on server
mqftrcvc	Receive file on client
mqftsnd	Send file from server

rcdmqimg (record media image)

Purpose

Use the **rcdmqimg** command to write an image of an object, or group of objects, to the log for use in media recovery. This command can only be used when using linear logging. Use the associated command **rcrmqobj** to recreate the object from the image.

You use this command with an active queue manager. Further activity on the queue manager is logged so that, although the image becomes out of date, the log records reflect any changes to the object.

Syntax

```
►►──rcdmqimg──┬────────────────┬──┬──────┬──┬──────┬──-t ObjectType──────────►
              └─-m ──QMgrName──┘  └─-z ──┘  └─-l ──┘

►─GenericObjName──────────────────────────────────────────────────────────────►◄
```

Required parameters

GenericObjName
: The name of the object to record. This parameter can have a trailing asterisk to record that any objects with names matching the portion of the name before the asterisk.

  This parameter is required ***unless*** you are recording a queue manager object or the channel synchronization file. Any object name you specify for the channel synchronization file is ignored.

-t *ObjectType*
: The types of object for which to record images. Valid object types are:

* or **all**	All the object types
authinfo	Authentication information object, for use with Secure Sockets Layer (SSL) channel security
channel or **chl**	Channels
clntconn or **clcn**	Client connection channels
catalog or **ctlg**	An object catalog
listener or **lstr**	Listeners
namelist or **nl**	Namelists
process or **prcs**	Processes

queue or **q**	All types of queue
qalias or **qa**	Alias queues
qlocal or **ql**	Local queues
qmodel or **qm**	Model queues
qremote or **qr**	Remote queues
qmgr	Queue manager object
service or **srvc**	Service
syncfile	Channel synchronization file.
topic or **top**	Topics

Note: When using WebSphere MQ for UNIX systems, you need to prevent the shell from interpreting the meaning of special characters, for example, *. How you do this depends on the shell you are using, but might involve the use of single quotation marks, double quotation marks, or a backslash.

Optional parameters

-m *QMgrName*
: The name of the queue manager for which to record images. If you omit this, the command operates on the default queue manager.

-z Suppresses error messages.

-l Writes messages containing the names of the oldest log files needed to restart the queue manager and to perform media recovery. The messages are written to the error log and the standard error destination. (If you specify both the -z and -l parameters, the messages are sent to the error log, but not to the standard error destination.)

When issuing a sequence of **rcdmqimg** commands, include the -l parameter only on the last command in the sequence, so that the log file information is gathered only once.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
68	Media recovery not supported
69	Storage not available
71	Unexpected error
72	Queue manager name error
119	User not authorized
128	No objects processed
131	Resource problem
132	Object damaged
135	Temporary object cannot be recorded

Examples

The following command records an image of the queue manager object `saturn.queue.manager` in the log.

```
rcdmqimg -t qmgr -m saturn.queue.manager
```

Related commands

rcrmqobj	Recreate a queue manager object

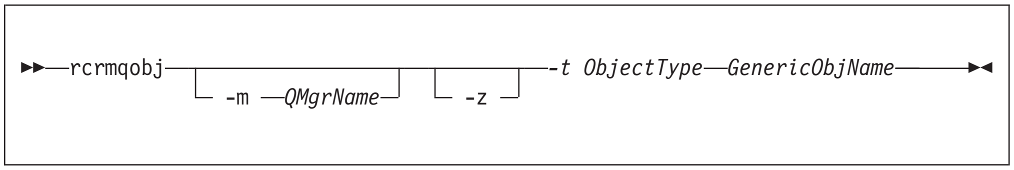
rcrmqobj (recreate object)

Purpose

Use this command to recreate an object, or group of objects, from their images contained in the log. This command can only be used when using linear logging. Use the associated command, **rcdmqimg**, to record the object images to the log.

Use this command on a running queue manager. All activity on the queue manager after the image was recorded is logged. To recreate an object, replay the log to recreate events that occurred after the object image was captured.

Syntax



Required parameters

GenericObjName
: The name of the object to re-create. This parameter can have a trailing asterisk to re-create any objects with names matching the portion of the name before the asterisk.

  This parameter is required ***unless*** the object type is the channel synchronization file; any object name supplied for this object type is ignored.

-t ObjectType
: The types of object to re-create. Valid object types are:

* or **all**	All object types
authinfo	Authentication information object, for use with Secure Sockets Layer (SSL) channel security
channel or **chl**	Channels
clntconn or **clcn**	Client connection channels
clchltab	Client channel table
listener or **lstr**	Listener
namelist or **nl**	Namelists
process or **prcs**	Processes
queue or **q**	All types of queue
qalias or **qa**	Alias queues
qlocal or **ql**	Local queues
qmodel or **qm**	Model queues

qremote or **qr**	Remote queues
service or **srvc**	Service
syncfile	Channel synchronization file. You can use this option when circular logs are configured but syncfile will fail if the channel scratchpad files, which are used to rebuild syncfile, are damaged or missing.
topic or **top**	Topics

Note: When using WebSphere MQ for UNIX systems, you need to prevent the shell from interpreting the meaning of special characters, for example, *. How you do this depends on the shell you are using, but might involve the use of single quotation marks, double quotation marks, or a backslash.

Optional parameters

-m *QMgrName*
The name of the queue manager for which to recreate objects. If omitted, the command operates on the default queue manager.

-z Suppresses error messages.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
66	Media image not available
68	Media recovery not supported
69	Storage not available
71	Unexpected error
72	Queue manager name error
119	User not authorized
128	No objects processed
135	Temporary object cannot be recovered
136	Object in use

Examples

1. The following command recreates all local queues for the default queue manager:
   ```
   rcrmqobj -t ql *
   ```
2. The following command recreates all remote queues associated with queue manager `store`:
   ```
   rcrmqobj -m store -t qr *
   ```

Related commands

rcdmqimg	Record an object in the log

rsvmqtrn (resolve transactions)

Purpose

Use the **rsvmqtrn** command to commit or back out internally or externally coordinated in-doubt transactions.

Use this command only when you are certain that transactions cannot be resolved by the normal protocols. Issuing this command might result in the loss of transactional integrity between resource managers for a distributed transaction.

Syntax

```
►►──rsvmqtrn──┬─ -a ─────────────────────────────┬─ -m ──QMgrName──────────────►◄
              └─ -b ───────────┬──Transaction──┘
              ├─ -c ───────────┤
              └─ -r ──RMID ────┘
```

Required parameters

-m *QMgrName*
: The name of the queue manager.

Optional parameters

-a The queue manager resolves all internally-coordinated, in-doubt transactions (that is, all global units of work).

-b Backs out the named transaction. This flag is valid for externally-coordinated transactions (that is, for external units of work) only.

-c Commits the named transaction. This flag is valid for externally-coordinated transactions (that is, external units of work) only.

-r *RMID*
: The resource manager whose participation in the in-doubt transaction can be ignored. This flag is valid for internally-coordinated transactions only, and for resource managers that have had their resource manager configuration entries removed from the queue manager configuration information.

: **Note:** The queue manager does not call the resource manager. Instead, it marks the resource manager's participation in the transaction as being complete.

Transaction
: The transaction number of the transaction being committed or backed out. Use the **dspmqtrn** command to find the relevant transaction number. This parameter is required with the -b, -c, and -r *RMID* parameters.

Return codes

0	Successful operation
32	Transactions could not be resolved

34	Resource manager not recognized
35	Resource manager not permanently unavailable
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
85	Transactions not known

Related commands

dspmqtrn	Display list of prepared transactions

runmqchi (run channel initiator)

Purpose

Use the **runmqchi** command to run a channel initiator process. For more information about the use of this command, refer to WebSphere MQ Intercommunication.

The channel initiator is started by default as part of the queue manager.

Syntax

```
►►──runmqchi──┬────────────────────┬──┬─────────────┬──────────────►◄
              └─ -q ──InitiationQName─┘  └─ -m ──QMgrName─┘
```

Optional parameters

-q *InitiationQName*
The name of the initiation queue to be processed by this channel initiator. If you omit it, SYSTEM.CHANNEL.INITQ is used.

-m *QMgrName*
The name of the queue manager on which the initiation queue exists. If you omit the name, the default queue manager is used.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

If errors occur that result in return codes of either 10 or 20, review the queue manager error log that the channel is associated with for the error messages, and the system error log for records of problems that occur before the channel is associated with the queue manager. For more information about error logs, see "Error logs" on page 251.

runmqchl (run channel)

Purpose

Use the **runmqchl** command to run either a sender (SDR) or a requester (RQSTR) channel.

The channel runs synchronously. To stop the channel, issue the MQSC command STOP CHANNEL.

Syntax

```
►►──runmqchl── -c ──ChannelName──┬──────────────────┬──────────────────────►◄
                                 └─ -m ──QMgrName──┘
```

Required parameters

-c *ChannelName*
The name of the channel to run.

Optional parameters

-m *QMgrName*
The name of the queue manager with which this channel is associated. If you omit the name, the default queue manager is used.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

If return codes 10 or 20 are generated, review the error log of the associated queue manager for the error messages, and the system error log for records of problems that occur before the channel is associated with the queue manager.

runmqdlq (run dead-letter queue handler)

Purpose

Use the **runmqdlq** command to start the dead-letter queue (DLQ) handler, which monitors and handles messages on a dead-letter queue.

Syntax

```
►►──runmqdlq──┬─────────────────────────────┬──────────────────────────►◄
              └─ QName ──┬──────────────┬──┘
                         └─ QMgrName ──┘
```

Description

Use the dead-letter queue handler to perform various actions on selected messages by specifying a set of rules that can both select a message and define the action to be performed on that message.

The **runmqdlq** command takes its input from `stdin`. When the command is processed, the results and a summary are put into a report that is sent to `stdout`.

By taking `stdin` from the keyboard, you can enter **runmqdlq** rules interactively.

By redirecting the input from a file, you can apply a rules table to the specified queue. The rules table must contain at least one rule.

If you use the DLQ handler without redirecting stdin from a file (the rules table), the DLQ handler reads its input from the keyboard. In WebSphere MQ for AIX, Solaris, HP-UX, and Linux, the DLQ handler does not start to process the named queue until it receives an end_of_file (Ctrl+D) character. In WebSphere MQ for Windows, it does not start to process the named queue until you press the following sequence of keys: Ctrl+Z, Enter, Ctrl+Z, Enter.

For more information about rules tables and how to construct them, see "The DLQ handler rules table" on page 194.

Optional parameters

The MQSC command rules for comment lines and for joining lines also apply to the DLQ handler input parameters.

QName
: The name of the queue to be processed.

  If you omit the name, the dead-letter queue defined for the local queue manager is used. If you enter one or more blanks (' '), the dead-letter queue of the local queue manager is explicitly assigned.

QMgrName
: The name of the queue manager that owns the queue to be processed.

  If you omit the name, the default queue manager for the installation is used. If you enter one or more blanks (' '), the default queue manager for this installation is explicitly assigned.

runmqdnm (run .NET monitor)

Purpose

The runmqdnm command applies to WebSphere MQ for Windows only.

runmqdnm can be run from the command line, or as a triggered application.

Use the **runmqdnm** control command to start processing messages on an application queue with a .NET monitor.

Syntax

```
►►──runmqdnm── -q ──QueueName── -a ──AssemblyName──┬───────────────┬──────────►
                                                   └─ -m ──QMgrName─┘

►──┬─────────────────┬──┬─────────────────────┬──┬───────────────────┬─────────►
   └─ -c ──ClassName─┘  └─ -u ──UserParameter─┘  └─ -s ──Syncpoint─┘

►──┬──────────────────┬──┬───────────────────┬──┬────────────────┬─────────────►
   └─ -d ──Conversion─┘  └─ -n ──MaxThreads─┘  └─ -t ──Timeout─┘

►──┬────────────────────────┬──┬─────────────────┬──┬─────────────────────┬───►◄
   └─ -b ──BackoutThreshold─┘  └─ -r ──QueueName─┘  └─ -p ──ContextOption─┘
```

Required parameters

-q *QueueName*
: The name of the application queue to monitor.

-a *AssemblyName*
: The name of the .NET assembly.

Optional parameters

-m *QMgrName*
: The name of the queue manager that hosts the application queue.

  If omitted, the default queue manager is used.

-c *ClassName*
: The name of the .NET class that implements the IMQObjectTrigger interface. This class must reside in the specified assembly.

  If omitted, the specified assembly is searched to identify classes that implement the IMQObjectTrigger interface:

  - If one class is found, then *ClassName* takes the name of this class.
  - If no classes or multiple classes are found, then the .NET monitor is not started and a message is written to the console.

-u *UserData*
: User defined data. This data is passed to the Execute method when the .NET monitor calls it. User data must be comprised of ASCII characters only, with no double-quotes, NULLs, or carriage returns.

  If omitted, null is passed to the Execute method.

-s *Syncpoint*
: Specifies whether syncpoint control is required when messages are retrieved from the application queue. Possible values are:

YES	Messages are retrieved under syncpoint control (MQGMO_SYNCPOINT).
NO	Messages are not retrieved under syncpoint control (MQGMO_NO_SYNCPOINT).

PERSISTENT	Persistent messages are retrieved under syncpoint control (MQGMO_SYNCPOINT_IF_PERSISTENT).

If omitted, the value of *Syncpoint* is dependent on your transactional model:

- If distributed transaction coordination (DTC) is being used, then *Syncpoint* is specified as YES.
- If distributed transaction coordination (DTC) is not being used, then *Syncpoint* is specified as PERSISTENT.

-d *Conversion*
Specifies whether data conversion is required when messages are retrieved from the application queue. Possible values are:

YES	Data conversion is required (MQGMO_CONVERT).
NO	Data conversion is not required (no get message option specified).

If omitted, *Conversion* is specified as NO.

-n *MaxThreads*
The maximum number of active worker threads.

If omitted, *MaxThreads* is specified as 20.

-t *Timeout*
The time, in seconds, that the .NET monitor will wait for further messages to arrive on the application queue. If you specify -1, the .NET monitor will wait indefinitely.

If omitted when run from the command line, the .NET monitor will wait indefinitely.

If omitted when run as a triggered application, the .NET monitor will wait for 10 seconds.

-b *BackoutThreshold*
Specifies the backout threshold for messages retrieved from the application queue. Possible values are:

-1	The backout threshold is taken from the application queue attribute, BOTHRESH.
0	The backout threshold is not set.
1 or more	Explicitly sets the backout threshold.

If omitted, *BackoutThreshold* is specified as -1.

-r *QueueName*
The queue to which messages, whose backout count exceeds the backout threshold, are put.

If omitted, the value of *QueueName* is dependent on the value of the BOQNAME attribute from the application queue:

- If BOQNAME is non-blank, then *QueueName* takes the value of BOQNAME.
- If BOQNAME is blank, then *QueueName* is specified as the queue manager dead letter queue. If a dead letter queue has not been assigned to the queue manager, then backout processing is not available.

-p *ContextOption*
Specifies whether context information from a message that is being backed out is passed to the backed out message. Possible values are:

NONE	No context information is passed.
IDENTITY	Identity context information is passed only.
ALL	All context information is passed.

If omitted, *ContextOption* is specified as ALL.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
71	Unexpected error
72	Queue manager name error
133	Unknown object name error

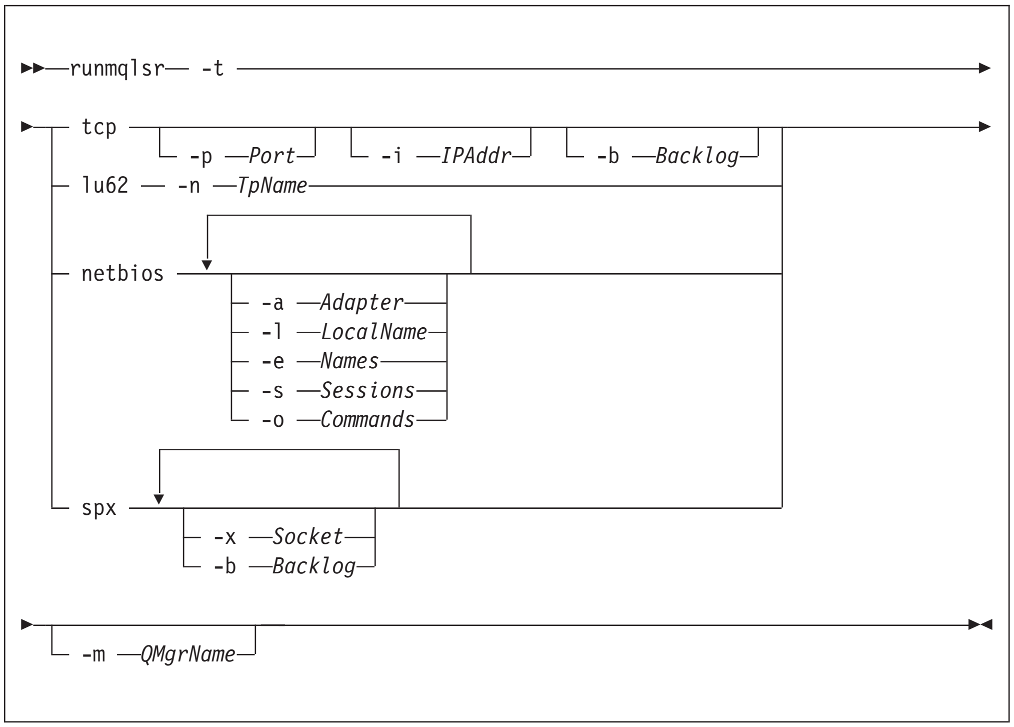
runmqlsr (run listener)

Purpose

Use the **runmqlsr** command to start a listener process.

This command is run synchronously and will wait until the listener process has finished before returning to the caller.

Syntax



Required parameters

-t The transmission protocol to be used:

`tcp`	Transmission Control Protocol / Internet Protocol (TCP/IP)
`lu62`	SNA LU 6.2 (Windows only)
`netbios`	NetBIOS (Windows only)
`spx`	SPX (Windows only)

Optional parameters

-p *Port*
: The port number for TCP/IP. This flag is valid for TCP only. If you omit the port number, it is taken from the queue manager configuration information, or from defaults in the program. The default value is 1414.

-i *IPAddr*
: The IP address for the listener, specified in one of the following formats:

- IPv4 dotted decimal
- IPv6 hexadecimal notation
- Alphanumeric format

This flag is valid for TCP/IP only.

On systems that are both IPv4 and IPv6 capable you can split the traffic by running two separate listeners, one listening on all IPv4 addresses and one listening on all IPv6 addresses. If you omit this parameter, the listener listens on all configured IPv4 and IPv6 addresses.

-n *TpName*
: The LU 6.2 transaction program name. This flag is valid only for the LU 6.2 transmission protocol. If you omit the name, it is taken from the queue manager configuration information.

-a *Adapter*
: The adapter number on which NetBIOS listens. By default the listener uses adapter 0.

-l *LocalName*
: The NetBIOS local name that the listener uses. The default is specified in the queue manager configuration information.

-e *Names*
: The number of names that the listener can use. The default value is specified in the queue manager configuration information.

-s *Sessions*
: The number of sessions that the listener can use. The default value is specified in the queue manager configuration information.

-o *Commands*
: The number of commands that the listener can use. The default value is specified in the queue manager configuration information.

-x *Socket*
: The SPX socket on which SPX listens. The default value is hexadecimal 5E86.

-m *QMgrName*
: The name of the queue manager. By default the command operates on the default queue manager.

-b *Backlog*
The number of concurrent connection requests that the listener supports. See "LU62, NETBIOS, TCP, and SPX" on page 114 for a list of default values and further information.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing: the AMQMSVRN process did not start.

Examples

The following command runs a listener on the default queue manager using the NetBIOS protocol. The listener can use a maximum of five names, five commands, and five sessions. These resources must be within the limits set in the queue manager configuration information.

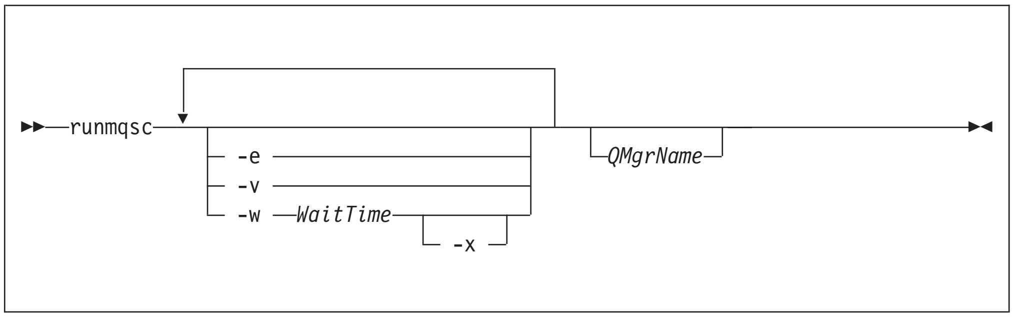
```
runmqlsr -t netbios -e 5 -s 5 -o 5
```

runmqsc (run MQSC commands)

Purpose

Use the **runmqsc** command to issue MQSC commands to a queue manager. MQSC commands enable you to perform administration tasks, for example defining, altering, or deleting a local queue object. MQSC commands and their syntax are described in the WebSphere MQ Script (MQSC) Command Reference.

Syntax



Description

You can invoke the **runmqsc** command in three ways:

Verify command
Verify MQSC commands but do not run them. An output report is generated indicating the success or failure of each command. This mode is available on a local queue manager only.

Run command directly
Send MQSC commands directly to a local queue manager.

Run command indirectly
Run MQSC commands on a remote queue manager. These commands are

put on the command queue on a remote queue manager and run in the order in which they were queued. Reports from the commands are returned to the local queue manager.

Indirect mode operation is performed through the default queue manager.

The **runmqsc** command takes its input from `stdin`. When the commands are processed, the results and a summary are put into a report that is sent to `stdout`.

By taking `stdin` from the keyboard, you can enter MQSC commands interactively.

By redirecting the input from a file, you can run a sequence of frequently-used commands contained in the file. You can also redirect the output report to a file.

Optional parameters

-e Prevents source text for the MQSC commands from being copied into a report. This is useful when you enter commands interactively.

-v Verifies the specified commands without performing the actions. This mode is only available locally. The -w and -x flags are ignored if they are specified at the same time.

-w *WaitTime*
Run the MQSC commands on another queue manager. You must have the required channel and transmission queues set up for this. See “Preparing channels and transmission queues for remote administration” on page 60 for more information.

WaitTime
The time, in seconds, that **runmqsc** waits for replies. Any replies received after this are discarded, but the MQSC commands still run. Specify a time between 1 and 999 999 seconds.

Each command is sent as an Escape PCF to the command queue (SYSTEM.ADMIN.COMMAND.QUEUE) of the target queue manager.

The replies are received on queue SYSTEM.MQSC.REPLY.QUEUE and the outcome is added to the report. This can be defined as either a local queue or a model queue.

Indirect mode operation is performed through the default queue manager.

This flag is ignored if the -v flag is specified.

-x The target queue manager is running under z/OS. This flag applies only in indirect mode. The -w flag must also be specified. In indirect mode, the MQSC commands are written in a form suitable for the WebSphere MQ for z/OS command queue.

QMgrName
The name of the target queue manager on which to run the MQSC commands, by default, the default queue manager.

Return codes

00	MQSC command file processed successfully
10	MQSC command file processed with errors; report contains reasons for failing commands
20	Error; MQSC command file not run

Examples

1. Enter this command at the command prompt:

   ```
   runmqsc
   ```

   Now you can enter MQSC commands directly at the command prompt. No queue manager name is specified, so the MQSC commands are processed on the default queue manager.
2. Use one of these commands, as appropriate in your environment, to specify that MQSC commands are to be verified only:

   ```
   runmqsc -v BANK < "/u/users/commfile.in"

   runmqsc -v BANK < "c:\users\commfile.in"
   ```

   This command verifies the MQSC commands in file `commfile.in`. The queue manager name is `BANK`. The output is displayed in the current window.
3. These commands run the MQSC command file `mqscfile.in` against the default queue manager.

   ```
   runmqsc < "/var/mqm/mqsc/mqscfile.in" > "/var/mqm/mqsc/mqscfile.out"

   runmqsc < "c:\Program Files\IBM\WebSphere MQ\mqsc\mqscfile.in" >
    "c:\Program Files\IBM\WebSphere MQ\mqsc\mqscfile.out"
   ```

   In this example, the output is directed to file `mqscfile.out`.

runmqtmc (start client trigger monitor)

Use the **runmqtmc** command to invoke a trigger monitor for a client.

Purpose

Use the **runmqtmc** command to invoke a trigger monitor for a client. For further information about using trigger monitors, refer to the WebSphere MQ Application Programming Guide.

Once a trigger monitor has started, it will continuously monitor the specified initiation queue. The trigger monitor will not stop until the queue manager ends, see "endmqm (end queue manager)" on page 326. While the client trigger monitor is running it keeps the dead letter queue open.

Syntax

```
►►──runmqtmc──┬─────────────────┬──┬──────────────────────┬──────────────►◄
              └─ -m ──QMgrName──┘  └─ -q ──InitiationQName─┘
```

Optional parameters

-m *QMgrName*
: The name of the queue manager on which the client trigger monitor operates, by default the default queue manager.

-q *InitiationQName*
The name of the initiation queue to be processed, by default SYSTEM.DEFAULT.INITIATION.QUEUE.

Return codes

0	Not used. The client trigger monitor is designed to run continuously and therefore not to end. The value is reserved.
10	Client trigger monitor interrupted by an error.
20	Error; client trigger monitor not run.

Examples

For examples of using this command, refer to the WebSphere MQ Application Programming Guide.

runmqtrm (start trigger monitor)

Purpose

Use the **runmqtrm** command to invoke a trigger monitor. For further information about using trigger monitors, refer to the WebSphere MQ Application Programming Guide.

Once a trigger monitor has started, it will continuously monitor the specified initiation queue. The trigger monitor will not stop until the queue manager ends, see “endmqm (end queue manager)” on page 326. While the trigger monitor is running it keeps the dead letter queue open.

Syntax

```
►►──runmqtrm──┬──────────────────┬──┬────────────────────────┬──────────────────►◄
              └─ -m ──QMgrName───┘  └─ -q ──InitiationQName──┘
```

Optional parameters

-m *QMgrName*
The name of the queue manager on which the trigger monitor operates, by default the default queue manager.

-q *InitiationQName*
Specifies the name of the initiation queue to be processed, by default SYSTEM.DEFAULT.INITIATION.QUEUE.

Return codes

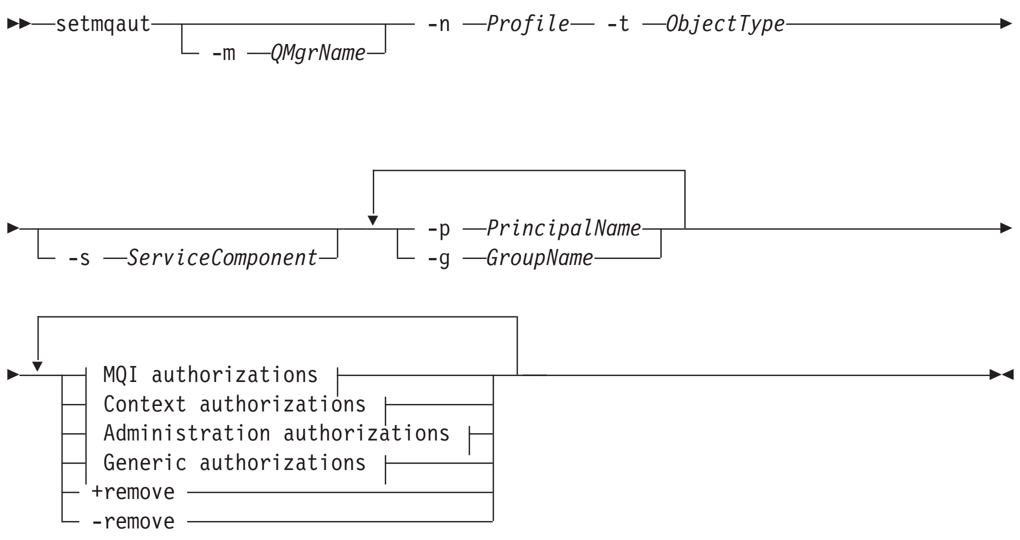
0	Not used. The trigger monitor is designed to run continuously and therefore not to end. Hence a value of 0 would not be seen. The value is reserved.
10	Trigger monitor interrupted by an error.
20	Error; trigger monitor not run.

setmqaut (grant or revoke authority)

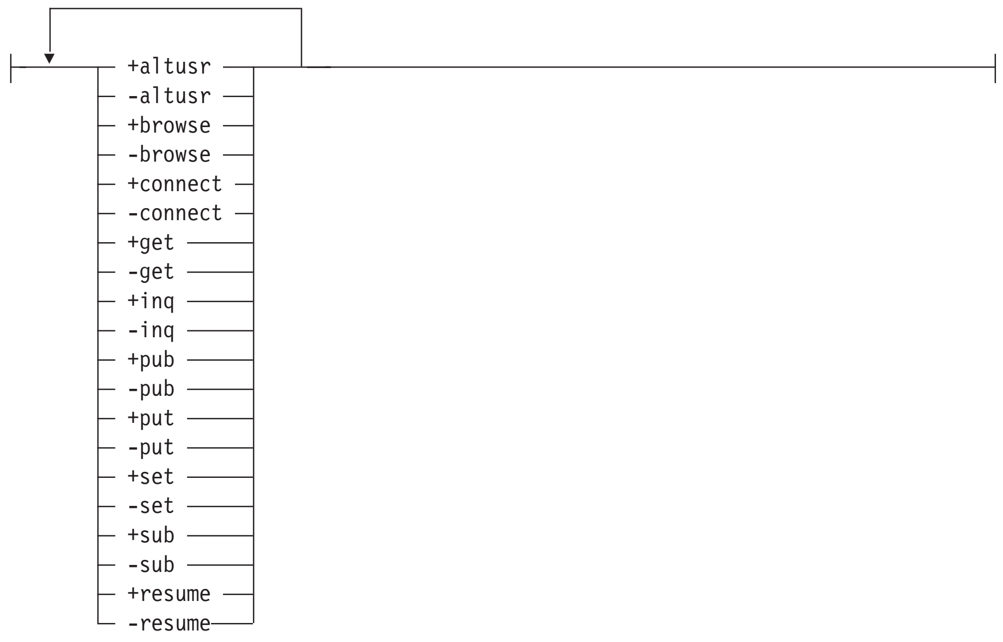
Use the **setmqaut** command to change the authorizations to a profile, object, or class of objects. Authorizations can be granted to, or revoked from, any number of principals or groups.

For more information about authorization service components, see “Installable services” on page 106, “Service components” on page 108, and “Authorization service” on page 398.

Syntax



MQI authorizations:



Context authorizations:

```
   ┌──────────────────────┐
   ▼                      │
├────┬─ +passall ─┬───────┴──────────────────────────────────────────┤
     ├─ -passall ─┤
     ├─ +passid ──┤
     ├─ -passid ──┤
     ├─ +setall ──┤
     ├─ -setall ──┤
     ├─ +setid ───┤
     └─ -setid ───┘
```

Administration authorizations:

```
   ┌───────────────────┐
   ▼                   │
├────┬─ +chg ───┬──────┴─────────────────────────────────────────────┤
     ├─ -chg ───┤
     ├─ +clr ───┤
     ├─ -clr ───┤
     ├─ +crt ───┤
     ├─ -crt ───┤
     ├─ +dlt ───┤
     ├─ -dlt ───┤
     ├─ +dsp ───┤
     ├─ -dsp ───┤
     ├─ +ctrl ──┤
     ├─ -ctrl ──┤
     ├─ +ctrlx ─┤
     └─ -ctrlx ─┘
```

Generic authorizations:

```
   ┌────────────────────┐
   ▼                    │
├────┬─ +all ────┬──────┴────────────────────────────────────────────┤
     ├─ -all ────┤
     ├─ +alladm ─┤
     ├─ -alladm ─┤
     ├─ +allmqi ─┤
     ├─ -allmqi ─┤
     └─ +none ───┘
```

Description

Use **setmqaut** both to *grant* an authorization, that is, give a principal or user group permission to perform an operation, and to *revoke* an authorization, that is, remove the permission to perform an operation. You must specify the principals and user groups to which the authorizations apply, the queue manager, object type, and the profile name identifying the object or objects.

The authorizations that can be given are categorized as follows:

- Authorizations for issuing MQI calls
- Authorizations for MQI context

- Authorizations for issuing commands for administration tasks
- Generic authorizations

Each authorization to be changed is specified in an authorization list as part of the command. Each item in the list is a string prefixed by a plus sign (+) or a minus sign (-). For example, if you include +put in the authorization list, you grant authority to issue MQPUT calls against a queue. Alternatively, if you include -put in the authorization list, you revoke the authority to issue MQPUT calls.

You can specify any number of principals, user groups, and authorizations in a single command, but you must specify at least one principal or user group.

If a principal is a member of more than one user group, the principal effectively has the combined authorities of all those user groups. On Windows systems, the principal also has all the authorities that have been granted to it explicitly using the **setmqaut** command.

On UNIX systems, all authorities are held by user groups internally, not by principals. This has the following implications:

- If you use the **setmqaut** command to grant an authority to a principal, the authority is actually granted to the primary user group of the principal. This means that the authority is effectively granted to all members of that user group.
- If you use the **setmqaut** command to revoke an authority from a principal, the authority is actually revoked from the primary user group of the principal. This means that the authority is effectively revoked from all members of that user group.

To alter authorizations for a cluster sender channel that has been automatically generated by a repository, see WebSphere MQ Queue Manager Clusters. This book describes how the authority is inherited from a cluster receiver channel object.

Required parameters

-t *ObjectType*

The type of object for which to change authorizations.

Possible values are:

authinfo	An authentication information object
channel or **chl**	A channel
clntconn or **clcn**	A client connection channel
lstr or **listener**	A listener
namelist or **nl**	A namelist
process or **prcs**	A process
queue or **q**	A queue
qmgr	A queue manager
srvc or **service**	A service
topic or **top**	A topic

-n *Profile*

The name of the profile for which to change authorizations. The authorizations apply to all WebSphere MQ objects with names that match the profile name specified. The profile name can be generic, using wildcard characters to specify a range of names as explained in “Using OAM generic profiles” on page 135.

If you give an explicit profile name (without any wildcard characters), the object identified must exist.

This parameter is required, unless you are changing the authorizations of a queue manager, in which case you must *not* include it. To change the authorizations of a queue manager use the queue manager name, for example

```
setmqaut -m QMGR -t qmgr -p user1 +connect
```

where *QMGR* is the name of the queue manager and *user1* is the user requesting the change.

Optional parameters

-m *QMgrName*
The name of the queue manager of the object for which to change authorizations. The name can contain up to 48 characters.

This parameter is optional if you are changing the authorizations of your default queue manager.

-p *PrincipalName*
The name of the principal for which to change authorizations.

For WebSphere MQ for Windows only, the name of the principal can optionally include a domain name, specified in the following format:

```
userid@domain
```

For more information about including domain names on the name of a principal, see “Principals and groups” on page 125.

You must have at least one principal or group.

-g *GroupName*
The name of the user group for which to change authorizations. You can specify more than one group name, but each name must be prefixed by the -g flag. On Windows systems, you can use only local groups.

-s *ServiceComponent*
The name of the authorization service to which the authorizations apply (if your system supports installable authorization services). This parameter is optional; if you omit it, the authorization update is made to the first installable component for the service.

+remove or -remove
Remove the specified profile. The authorizations associated with the profile no longer apply to WebSphere MQ objects with names that match the profile.

This option cannot be used with the option **-t qmgr**.

Authorizations
The authorizations to be granted or revoked. Each item in the list is prefixed by a plus sign (+), indicating that authority is to be granted, or a minus sign (-), indicating that authority is to be revoked.

For example, to grant authority to issue MQPUT calls, specify +put in the list. To revoke the authority to issue MQPUT calls, specify -put.

Table 25 on page 361 shows the authorities that can be given to the different object types.

Table 25. Specifying authorities for different object types

Authority	Queue	Process	Queue manager	Namelist	Topic	Auth info	Clntconn	Channel	Listener	Service
all	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
alladm[1]	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
allmqi[2]	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
none	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
altusr	No	No	Yes	No	Yes	No	No	No	No	No
browse	Yes	No	No	No	No	No	No	No	No	No
chg	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
clr	Yes	No	No	No	Yes	No	No	No	No	No
connect	No	No	Yes	No	No	No	No	No	No	No
crt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ctrl	No	No	No	No	Yes	No	No	Yes	Yes	Yes
ctrlx	No	No	No	No	No	No	No	Yes	No	No
dlt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
dsp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
get	Yes	No	No	No	No	No	No	No	No	No
put	Yes	No	No	No	No	No	No	No	No	No
inq	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
passall	Yes	No	No	No	No	No	No	No	No	No
passid	Yes	No	No	No	No	No	No	No	No	No
set	Yes	Yes	Yes	No	No	No	No	No	No	No
setall	Yes	No	Yes	No	No	No	No	No	No	No
setid	Yes	No	Yes	No	No	No	No	No	No	No
pub	No	No	No	No	Yes	No	No	No	No	No
sub	No	No	No	No	Yes	No	No	No	No	No
resume	No	No	No	No	Yes	No	No	No	No	No

Note:

1. **alladm** authority is equivalent to the subset of the individual authorities chg, clr, crt, dlt, dsp, ctrl, and ctrlx appropriate to the object type.
2. **allmqi** authority is equivalent to the subset of the individual authorities altusr, browse, connect, get, inq, pub, put, resume, set, and sub appropriate to the object type.

Return codes

0	Successful operation
36	Invalid arguments supplied
40	Queue manager not available
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
133	Unknown object name
145	Unexpected object name
146	Object name missing

147	Object type missing
148	Invalid object type
149	Entity name missing
150	Authorization specification missing
151	Invalid authorization specification

Examples

1. This example shows a command that specifies that the object on which authorizations are being given is the queue orange.queue on queue manager saturn.queue.manager. If the queue does not exist, the command fails.

   ```
   setmqaut -m saturn.queue.manager -n orange.queue -t queue
            -g tango +inq +alladm
   ```

   The authorizations are given to a user group called tango, and the associated authorization list specifies that the user group can:
   - Issue MQINQ calls
   - Perform all administration operations on that object
2. In this example, the authorization list specifies that a user group called foxy:
   - Cannot issue any MQI calls to the specified queue
   - Can perform all administration operations on the specified queue

   If the queue does not exist, the command fails.

   ```
   setmqaut -m saturn.queue.manager -n orange.queue -t queue
            -g foxy -allmqi +alladm
   ```
3. This example gives user1 full access to all queues with names beginning a.b. on queue manager qmgr1. The profile is persistent and applies to any object with a name that matches the profile.

   ```
   setmqaut -m qmgr1 -n a.b.* -t q -p user1 +all
   ```
4. This example deletes the specified profile.

   ```
   setmqaut -m qmgr1 -n a.b.* -t q -p user1 -remove
   ```
5. This example creates a profile with no authority.

   ```
   setmqaut -m qmgr1 -n a.b.* -t q -p user1 +none
   ```

Related commands

“dmpmqaut (dump authority)” on page 300“dspmqaut (display authority)” on page 306

Authorizations for MQI calls

altusr	Use another user’s authority for MQOPEN and MQPUT1 calls.
browse	Retrieve a message from a queue using an MQGET call with the BROWSE option.
connect	Connect the application to the specified queue manager using an MQCONN call.
get	Retrieve a message from a queue using an MQGET call.
inq	Make an inquiry on a specific queue using an MQINQ call.
pub	Publish a message on a topic using the MQPUT call.
put	Put a message on a specific queue using an MQPUT call.
resume	Resume a subscription using the MQSUB call.
set	Set attributes on a queue from the MQI using an MQSET call.
sub	Create, alter or resume a subscription to a topic using the MQSUB call.

Note: If you open a queue for multiple options, you must be authorized for each option.

Authorizations for context

passall	Pass all context on the specified queue. All the context fields are copied from the original request.
passid	Pass identity context on the specified queue. The identity context is the same as that of the request.
setall	Set all context on the specified queue. This is used by special system utilities.
setid	Set identity context on the specified queue. This is used by special system utilities.

Authorizations for commands

chg	Change the attributes of the specified object.
clr	Clear the specified queue or a topic.
crt	Create objects of the specified type.
dlt	Delete the specified object.
dsp	Display the attributes of the specified object.
ctrl	For listeners and services, start and stop the specified channel, listener, or service. For channels, start, stop, and ping the specified channel. For topics, define, alter, or delete subscriptions.
ctrlx	Reset or resolve the specified channel.

Authorizations for generic operations

all	Use all operations applicable to the object.
alladm	Use all administration operations applicable to the object.
allmqi	Use all MQI calls applicable to the object.
none	No authority. Use this to create profiles without authority.

setmqcrl (set certificate revocation list (CRL) LDAP server definitions)

Purpose

The setmqcrl command applies to WebSphere MQ for Windows only.

Use the **setmqcrl** command to configure and administer support for publishing CRL (certificate revocation list) LDAP definitions in an Active Directory.

A domain administrator must use this command, or **setmqscp**, initially to prepare the Active Directory for WebSphere MQ usage and to grant WebSphere MQ users and administrators the relevant authorities to access and update the WebSphere MQ Active Directory objects. You can also use the **setmqcrl** command to display all the currently configured CRL server definitions available on the Active Directory, that is, those definitions referred to by the queue manager's CRL namelist.

The only types of CRL servers supported are LDAP servers.

Syntax

```
►►──setmqcrl──┬──────────────────────┬──┬──────────────────────┬──────────────►
              └─ -a ─┬───────────────┤  └─ -r ─┬───────────────┤
                     └─ -m ─QMgrName─┘         └─ -m ─QMgrName─┘

►──┬──────┬───────────────────────────────────────────────────────────────────►◄
   └─ -d ─┘
```

Optional parameters

You must specify one of `-a` (add), `-r` (remove) or `-d` (display).

-a Adds the WebSphere MQ client connections Active Directory container, if it does not already exist. You must be a user with the appropriate privileges to create subcontainers in the *System* container of your domain. The WebSphere MQ folder is called `CN=IBM-MQClientConnections`. Do not delete this folder in any other way than by using the **setmqscp** command.

-d Displays the WebSphere MQ CRL server definitions.

-r Removes the WebSphere MQ CRL server definitions.

-m [* | qmgr]
Modifies the specified parameter (`-a` or `-r`) so that only the specified queue manager is affected. You must include this option with the `-a` parameter.

*** | qmgr**
* specifies that all queue managers are affected. This enables you to migrate a specific WebSphere MQ CRL server definitions file from one queue manager alone.

Examples

The following command creates the IBM-MQClientConnections folder and allocates the required permissions to WebSphere MQ administrators for the folder, and to child objects created subsequently. (In this, it is functionally equivalent to `setmqscp -a`.)

```
setmqcrl -a
```

The following command migrates existing CRL server definitions from a local queue manager, Paint.queue.manager, to the Active Directory, **deleting any other CRL definitions from the Active Directory first**:

```
setmqcrl -a -m Paint.queue.manager
```

setmqprd (enroll production license)

Use the setmqprd command to enroll a WebSphere MQ production license.

A license is normally enrolled as part of the installation process. For further information about the installation process, see the WebSphere MQ *Quick Beginnings* guide for your operating system.

Syntax

```
►►──setmqprd──LicenseFile──────────────────────────────────────────────►◄
```

Required parameters

LicenseFile
: Specifies the fully-qualified name of the production license certificate file.

This is usually **amqpcert.lic**.

setmqscp (set service connection points)

Purpose

The setmqscp command applies to WebSphere MQ for Windows only.

Use the **setmqscp** command to configure and administer support for publishing client connection channel definitions in an Active Directory.

Initially, this command is used by a domain administrator to:
- Prepare the Active Directory for WebSphere MQ use
- Grant WebSphere MQ users and administrators the relevant authorities to access and update the WebSphere MQ Active Directory objects

You can also use the **setmqscp** command to display all the currently configured client connection channel definitions available on the Active Directory.

Syntax

```
►►──setmqscp──┬─────────────────────────┬──┬─────────────────────────┬──────►
              └─ -a ─┬─────────────────┬┘  └─ -r ─┬─────────────────┬┘
                     └─ -m ──QMgrName──┘          └─ -m ──QMgrName──┘

►──┬──────┬──────────────────────────────────────────────────────────────►◄
   └─ -d ─┘
```

Optional parameters

You must specify one of -a (add), -r (remove) or -d (display).

-a Adds the WebSphere MQ client connections Active Directory container, if it does not already exist. You must be a user with the appropriate privileges to create subcontainers in the *System* container of your domain. The WebSphere MQ folder is called `CN=IBM-MQClientConnections`. Do not delete this folder in any other way than by using the `setmqscp -r` command.

-d Displays the service connection points.

-r Removes the service connection points. If you omit -m, and no client connection definitions exist in the IBM-MQClientConnections folder, the folder itself is removed from the Active Directory.

-m [* | qmgr]
Modifies the specified parameter (-a or -r) so that only the specified queue manager is affected.

*** | qmgr**
* specifies that all queue managers are affected. This enables you to migrate a specific client connection table file from one queue manager alone, if required.

Examples

The following command creates the IBM-MQClientConnections folder and allocates the required permissions to WebSphere MQ administrators for the folder, and to child objects created subsequently:

```
setmqscp -a
```

The following command migrates existing client connection definitions from a local queue manager, Paint.queue.manager, to the Active Directory:

```
setmqscp -a -m Paint.queue.manager
```

The following command migrates all client connection definitions on the local server to the Active Directory:

```
setmqscp -a -m *
```

strmqcfg (start WebSphere MQ Explorer)

Purpose

The strmqcfg command is available on WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) only.

Use the **strmqcfg** command to start the WebSphere MQ Explorer.

For WebSphere MQ for Windows only, note that if you use **runas** to execute this command, you must define the Environment Variable *APPDATA*.

On Linux, the WebSphere MQ Explorer might fail to start if you have more than one Eclipse installation. If this happens, start the WebSphere MQ Explorer using a different user ID to the one you use for the other Eclipse installation.

Syntax

The syntax of this command follows:

```
►►──strmqcfg──┬──────┬──┬──────┬──────────────────────────────────►◄
              └─ -c ─┘  └─ -i ─┘
```

Optional parameters

-c -clean is passed to Eclipse. This causes Eclipse to delete any cached data used by the Eclipse runtime.

-i -init is passed to Eclipse. This causes Eclipse to discard configuration information used by the Eclipse runtime.

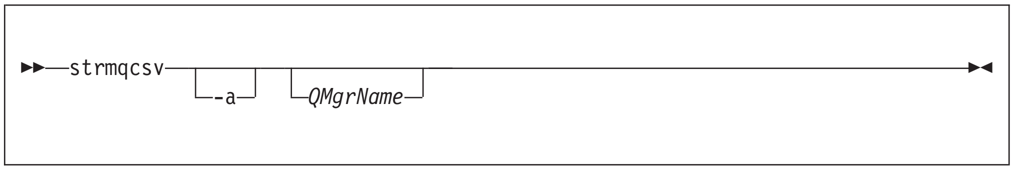
strmqcsv (start command server)

Purpose

Use the **strmqcsv** command to start the command server for the specified queue manager. This enables WebSphere MQ to process commands sent to the command queue.

If the queue manager attribute, SCMDSERV, is specified as QMGR then changing the state of the command server using **strmqcsv** does not effect how the queue manager acts upon the SCMDSERV attribute at the next restart.

Syntax



Required parameters

None

Optional parameters

-a Blocks the following PCF commands from modifying or displaying authority information:

- Inquire authority records (**MQCMD_INQUIRE_AUTH_RECS**)
- Inquire entity authority (**MQCMD_INQUIRE_ENTITY_AUTH**)
- Set authority record (**MQCMD_SET_AUTH_REC**).
- Delete authority record (**MQCMD_DELETE_AUTH_REC**).

QMgrName
The name of the queue manager on which to start the command server. If omitted, the default queue manager is used.

Return codes

0	Command completed normally
10	Command completed with unexpected results
20	An error occurred during processing

Examples

The following command starts a command server for queue manager `earth`:

```
strmqcsv earth
```

Related commands

endmqcsv	End a command server
dspmqcsv	Display the status of a command server

strmqm (start queue manager)

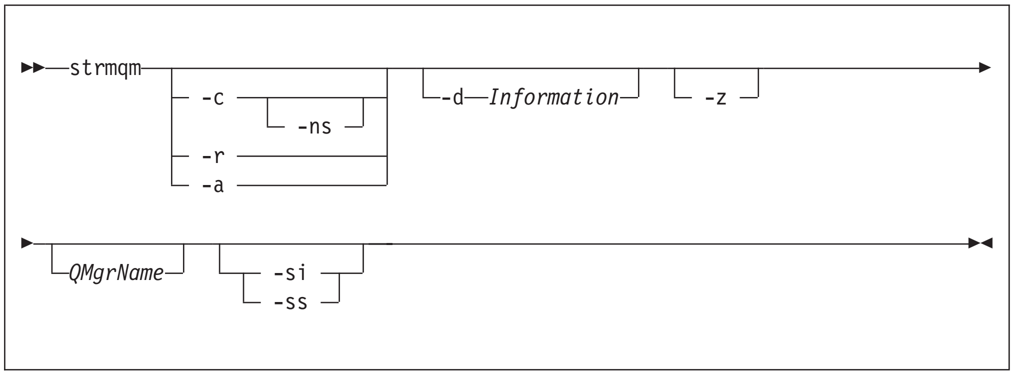
The strmqm command starts a queue manager. Parameters control how the queue manager starts.

Purpose

Use the **strmqm** command to start a local queue manager.

If the queue manager start up takes more than a few seconds WebSphere MQ will show intermittent messages detailing the start up progress. For more information about these messages see WebSphere MQ Messages.

Syntax



Optional parameters

-c Starts the queue manager, redefines the default and system objects, then stops the queue manager. Any existing system and default objects belonging to the queue manager are replaced if you specify this flag, and any non-default system object values will be reset (for example, the value of MCAUSER is set to blank).

Use the **crtmqm** command to create the default and system objects for a queue manager.

-ns

Prevents any of the following processes from starting automatically when the queue manager starts:

- The channel initiator
- The command server
- Listeners
- Services

-r Updates the backup queue manager. The backup queue manager is not started.

WebSphere MQ updates the backup queue manager's objects by reading the queue manager log and replaying updates to the object files.

For more information on using backup queue managers, see "Backing up and restoring WebSphere MQ" on page 230.

-a Activate the specified backup queue manager. The backup queue manager is not started.

When activated, a backup queue manager can be started using the control command `strmqm` *`QMgrName`*. The requirement to activate a backup queue manager prevents accidental startup.

When activated, a backup queue manager can no longer be updated.

For more information on using backup queue managers, see "Backing up and restoring WebSphere MQ" on page 230.

-d *Information*
Specifies whether information messages are displayed. Possible values for *Information* follow:

all	All information messages are displayed. This is the default value.
minimal	The minimal number of information messages are displayed.
none	No information messages are displayed. This parameter is equivalent to **-z**.

The -z parameter takes precedence over this parameter.

-z Suppresses error messages.

This flag is used within WebSphere MQ to suppress unwanted information messages. Because using this flag could result in loss of information, do not use it when entering commands on a command line.

This parameter takes precedence over the **-d** parameter.

`QMgrName`
The name of a local queue manager. If omitted, the default queue manager is used.

-si Interactive (manual) queue manager startup type. This option is available on WebSphere MQ for Windows only.

The queue manager runs under the logged on (interactive) user. Queue managers configured with interactive startup end when the user who started them logs off.

If you set this parameter, it overrides any startup type set previously by the crtmqm command, the amqmdain command, or the WebSphere MQ Explorer.

If you do not specify a startup type of either -si or -ss, the queue manager startup type specified on the crtmqm command is used.

-ss Service (manual) queue manager startup type. This option is available on WebSphere MQ for Windows only.

The queue manager runs as a service. Queue managers configured with service startup continue to run even after the interactive user has logged off.

If you set this parameter, it overrides any startup type set previously by the crtmqm command, the amqmdain command, or the WebSphere MQ Explorer.

Return codes

0	Queue manager started
3	Queue manager being created
5	Queue manager running
16	Queue manager does not exist
23	Log not available
24	A process that was using the previous instance of the queue manager has not yet disconnected.
39	Invalid parameter specified
49	Queue manager stopping
69	Storage not available
71	Unexpected error
72	Queue manager name error
74	The WebSphere MQ service is not started.
100	Log location invalid
119	User not authorized to start the queue manager

Examples

The following command starts the queue manager `account`:

```
strmqm account
```

Related commands

crtmqm	Create a queue manager
dltmqm	Delete a queue manager
endmqm	End a queue manager

strmqtrc (Start trace)

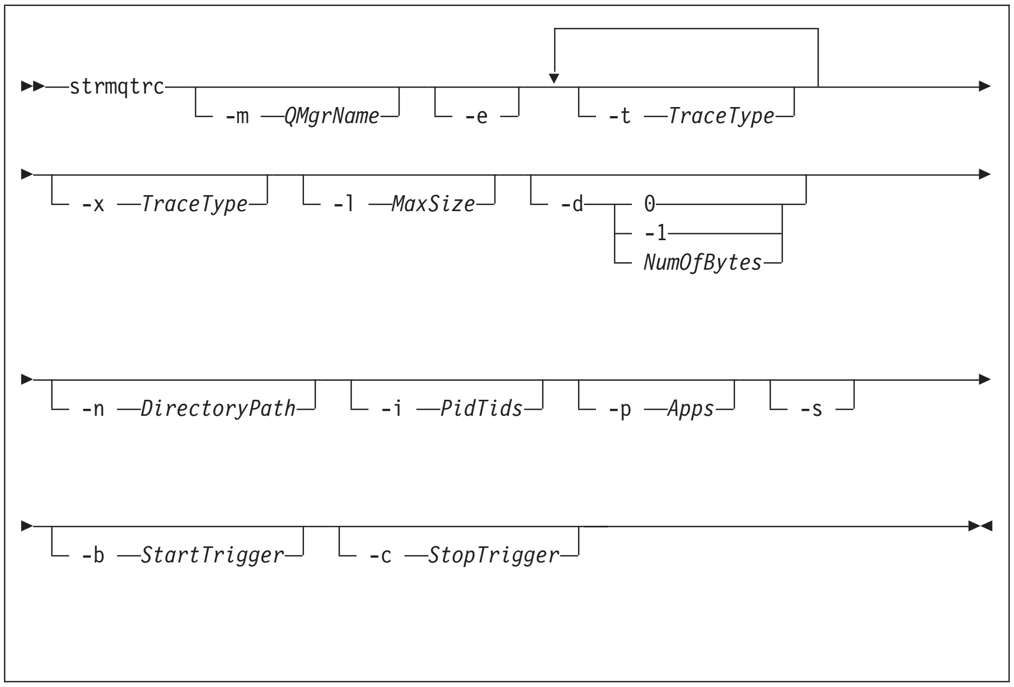
This describes the syntax and parameters of the strmqtrc command control, which starts trace, and provides examples of its use.

Purpose

Use the **strmqtrc** command to enable tracing.

Syntax

The syntax of this command is as follows:



Description

The strmqtrc command enables tracing. The command has optional parameters that specify the level of tracing you want:

- One or more queue managers
- Levels of trace detail
- One or more Websphere MQ processes. The processes can be either part of the Websphere MQ product or customer applications that use the Websphere MQ API
- Specific threads within customer applications, either by WebSphere MQ thread number or by operating system thread number
- Events. These can be either the entry or exit from internal WebSphere MQ functions or the occurrence of a first failure data capture (FDC).

Each combination of parameters on an individual invocation of the command are interpreted by WebSphere MQ as having a logical AND between them. You can invoke the strmqtrc command multiple times, regardless of whether tracing is already enabled. If tracing is already enabled, the trace options that are in effect are modified to those specified on the most recent invocation of the command. Multiple invocations of the command, without an intervening enqmqtrc command, are interpreted by WebSphere MQ as having a logical OR between them. The maximum number of concurrent strmqtrc commands that can be in effect at one time is 16.

In WebSphere MQ for Windows, the output file is created in the `\<mqmwork>\trace` directory, where `<mqmwork>` is the directory selected to hold WebSphere MQ data files. You can use the -n flag with *DirectoryPath* to specify the path of a different directory.

In WebSphere MQ for AIX, HP-UX, Solaris, and Linux, the output file is created in the directory `/var/mqm/trace`. You can use the -n flag with *DirectoryPath* to specify the path of a different directory.

For examples of trace data generated by this command see "Tracing" on page 255.

Optional parameters

-m `QMgrName`
The name of the queue manager to trace.

If more than one trace specification applies to a given entity being traced, the actual trace includes all the specified options.

The following wildcards are allowed: asterisk (*), replacing zero or more characters and question mark (?), replacing any single character.

-e Requests early tracing of all processes, making it possible to trace the creation or startup of a queue manager. If you include this flag, any process belonging to any component of any queue manager traces its early processing. The default is not to perform early tracing.

You cannot use the -e flag with the _m flag, -i flag, the -p flag or the -b flag. If you try to use the -e flag with the -i flag, the -p flag or the -b flag, then an error message is issued.

-t `TraceType`
The points to trace and the amount of trace detail to record. By default **all** trace points are enabled and a default-detail trace is generated.

Alternatively, you can supply one or more of the options in the following list. For each *tracetype* value you specify, including `-t all`, specify either `-t parms` or `-t detail` to obtain the appropriate level of trace detail. If you do not specify either `-t parms` or `-t detail` for any particular trace type, only a default-detail trace is generated for that trace type.

If you supply multiple trace types, each must have its own -t flag. You can include any number of -t flags, provided that each has a valid trace type associated with it.

It is not an error to specify the same trace type on multiple -t flags.

all	Output data for every trace point in the system (the default). The all parameter activates tracing at default detail level.
api	Output data for trace points associated with the MQI and major queue manager components.
commentary	Output data for trace points associated with comments in the WebSphere MQ components.
comms	Output data for trace points associated with data flowing over communications networks.
csdata	Output data for trace points associated with internal data buffers in common services.
csflows	Output data for trace points associated with processing flow in common services.
detail	Activate tracing at high-detail level for flow processing trace points.
Explorer	Output data for trace points associated with the WebSphere MQ Explorer.
java	Output data for trace points associated with applications using the WebSphere MQ classes for Java API.
lqmdata	Output data for trace points associated with internal data buffers in the local queue manager.

lqmflows	Output data for trace points associated with processing flow in the local queue manager.
otherdata	Output data for trace points associated with internal data buffers in other components.
otherflows	Output data for trace points associated with processing flow in other components.
parms	Activate tracing at default-detail level for flow processing trace points.
remotedata	Output data for trace points associated with internal data buffers in the communications component.
remoteflows	Output data for trace points associated with processing flow in the communications component.
servicedata	Output data for trace points associated with internal data buffers in the service component.
serviceflows	Output data for trace points associated with processing flow in the service component.
soap	Output data for trace points associated with WebSphere MQ Transport for SOAP.
ssl	Output data associated with using GSKit to enable Secure Sockets Layer (SSL) channel security.
versiondata	Output data for trace points associated with the version of WebSphere MQ running.

-x *TraceType*

The points **not** to trace. By default **all** trace points are enabled and a default-detail trace is generated. The trace points you can specify are those listed for the -t flag.

You can use the `-x` flag with *tracetype* values to exclude those entry points you do not want to record. This is useful in reducing the amount of trace produced.

If you supply multiple trace types, each must have its own -x flag. You can include any number of -x flags, provided that each has a valid *tracetype* associated with it.

-l *MaxSize*

The maximum size of a trace file (`AMQ`*`ppppp.qq`*`.TRC`) in megabytes (MB). For example, if you specify a MaxSize of 1, the size of the trace is limited to 1 MB.

When a trace file reaches the specified maximum, it is renamed to `AMQ`*`ppppp.qq`*`.TRS` and a new `AMQ`*`ppppp.qq`*`.TRC` file is started. If a previous copy of an `AMQ`*`ppppp.qq`*`.TRS` file exists, it is deleted.

The highest value that *MaxSize* can be set to is 2048 MB.

-d `0`

Trace no user data.

-d `-1 or all`

Trace all user data.

-d *NumOfBytes*

- For a communication trace; trace the specified number of bytes of data including the transmission segment header (TSH).

- For an MQPUT or MQGET call; trace the specified number of bytes of message data held in the message buffer.
- Values between one and 15 are not allowed.

-n *DirectoryPath*
A path that overrides the default directory where trace files are output. The path can be either relative to the current directory or an absolute path. The format of the path that you specify in the -n parameter is dependent on your operating system.

If you specify an invalid path, the strmqtrc command is rejected, there is no change to tracing, and the output file is created in the default directory. If tracing is already active, it is not possible to change the directory name. When the strmqtrc command completes, if it is not possible to output the trace files for any reason then no trace file is output.

If you do not use this parameter, trace files are written to the default directory. In WebSphere MQ for Windows, the default directory is `\<mqmwork>\trace`. In WebSphere MQ for AIX®, HP-UX, Solaris, and Linux®, the default directory is `/var/mqm/trace`.

-i *PidTids*
Process identifier (PID) and thread identifier (TID) to which the trace generation is restricted. You cannot use the -i flag with the -e flag. If you try to use the -i flag with the -e flag, then an error message is issued. This parameter should be used only under the guidance of IBM Service personnel.

-p *Apps*
The named processes to which the trace generation is restricted. *Apps* is a comma-separated list. You must specify each name in the list exactly as the program name would be displayed in the ″Program Name″ FDC header. Asterisk (*) or question mark (?) wildcards are allowed. You cannot use the -p flag with the -e flag. If you try to use the -p flag with the -e flag, then an error message is issued.

-s Reports the tracing options that are currently in effect. You must use this parameter on its own with no other parameters.

A limited number of slots are available for storing trace commands. When all slots are in use, then no more trace commands can be accepted unless they replace an existing slot. Slot numbers are not fixed, so if the command in slot number 0 is removed, for example by an endmqtrc command, then all the other slots move up, with slot 1 becoming slot 0, for example. An asterisk (*) in a field means that no value is defined, and is equivalent to the asterisk wildcard.

An example of the output from this command is as follows:

```
Listing Trace Control Array

Used slots = 2 of 15

EarlyTrace    [OFF]
TimedTrace    [OFF]
TraceUserData [0]
MaxSize       [0]
Trace Path    [C:\Program Files\IBM\WebSphere MQ\trace]
Trace Type    [1]

Slot position 1

Untriggered
Queue Manager [avocet]
```

```
Application   [*]
PID.TID       [?]
TraceOptions  [1f4ffff]
TraceInterval    [0]
Trace Start Time [0]
Trace Stop  Time [0]
Start Trigger [KN346050K]
Start Trigger [KN346080]

Slot position 2

Untriggered
Queue Manager [*]
Application   [*]
PID.TID       [?]
TraceOptions  [1fcffff]
TraceInterval    [0]
Trace Start Time [0]
Trace Stop  Time [0]
Start Trigger [KN346050K]
Start Trigger [KN346080]
```

-b *Start_Trigger*
FDC probe IDs for which tracing should be turned on. *Start_Trigger* is a comma-separated list of FDC probe IDs. You can use asterisk (*) and question mark (?) wildcards in the specification of probe IDs. You cannot use the -b flag with the -e flag. If you try to use the -b flag with the -e flag, then an error message is issued. This parameter should be used only under the guidance of IBM Service personnel.

Table 26.

Start_Trigger	***Effect***
FDC=comma-separated list of FDC probe IDs.	Turns tracing on when any FDCs with the specified FDC probe IDs are generated.

-c *Stop_Trigger*
FDC probe IDs for which tracing should be turned off, or interval in seconds after which tracing should be turned off. *Stop_Trigger* is a comma-separated list of FDC probe IDs. You can use asterisk (*) and question mark (?) wildcards in the specification of probe IDs. This parameter should be used only under the guidance of IBM Service personnel.

Table 27.

Stop_Trigger	***Effect***
FDC=comma-separated list of FDC probe IDs.	Turns tracing off when any FDCs with the specified FDC probe IDs are generated.
interval=n where n is an unsigned integer between 1 and 32,000,000.	Turns tracing off n seconds after it starts or, if it tracing is already enabled, turns tracing off n seconds after this instance of the command is issued.

Return codes

AMQ7024	Non-valid arguments supplied to the command.
AMQ8304	Nine concurrent traces (the maximum) already running.

Examples

This command enables tracing of processing flow from common services and the local queue manager for a queue manager called QM1 in WebSphere MQ for UNIX systems. Trace data is generated at the default level of detail.

```
strmqtrc -m QM1 -t csflows -t lqmflows -t parms
```

This command disables tracing of SSL activity on a queue manager called QM1. Other trace data is generated at the parms level of detail.

```
strmqtrc -m QM1 -x ssl -t parms
```

This command enables high-detail tracing of the processing flow for all components:

```
strmqtrc -t all -t detail
```

This command enables tracing when FDC KN346050 or FDC KN346080 occur on any process that is using queue manager QM1:

```
strmqtrc -m QM1 -b FDC=KN346050,KN346080
```

This command enables tracing when FDC KN34650 occurs, and stops tracing when FDC KN346080 occurs. In both cases the FDC must occur on a process that is using queue manager QM1:

```
strmqtrc -m QM1 -b FDC=KN346050 -c FDC=KN346080
```

The next examples use the -p and -m flags to show the following:

- How a combination of parameters on an individual invocation of the command are interpreted by Websphere MQ as having a logical AND between them.
- How multiple invocations of the command, without an intervening enqmqtrc command, are interpreted by Websphere MQ as having a logical OR between them:

1. This command enables tracing for all threads that result from any executing process called amqxxx.exe:

   ```
   strmqtrc -p amqxxx.exe
   ```

2.
   - If you invoke the following command after the command in step 1, without an intervening endmqtrc command, then tracing is limited to all threads that result from any executing process called amqxxx.exe *and* that are using queue manager QM2:

     ```
     strmqtrc -p amqxxx.exe -m QM2
     ```

   - If you invoke the following command after the command in step 1, without an intervening endmqtrc command, then tracing is limited to all processes and threads that result from executing amqxxx.exe *or* that are using queue manager QM2:

     ```
     strmqtrc -m QM2
     ```

Related commands

dspmqtrc	Display formatted trace output
endmqtrc	End trace

Managing keys and certificates

To manage keys, certificates, and certificate requests, use one of the following:

The gsk7cmd command

The **gsk7cmd** command is available on UNIX systems only.

The **gsk7cmd** command provides functions that are similar to those of the iKeyman GUI, described in WebSphere MQ Security. The gsk7cmd command provides a shell script to run iKeycmd.

The runmqckm command

The **runmqckm** command is available on Windows systems only.

The **runmqckm** command provides functions that are similar to those of the iKeyman GUI, described in WebSphere MQ Security.

The gsk7capicmd command

The **gsk7capicmd** command is available on Windows and UNIX systems.

The gsk7capicmd command provides functions that are similar to those of the iKeyman GUI, described in WebSphere MQ Security. The gsk7capicmd command provides a shell script to run GSKCapiCmd. The command syntax for gsk7capicmd is the same as the syntax for runmqckm.

If you need to manage SSL certificates in a way that is FIPS and Common Criteria compliant, use the gsk7capicmd command instead of the gsk7cmd or runmqckm commands. This is because the gsk7capicmd command supports stronger encryption than the other commands.

Before you run gsk7capicmd on Windows, set your PATH environment variable to include the GSkit binary and library directories. For example, at the command line, enter:

```
set PATH=%PATH%;C:\Program Files\IBM\gsk7\bin;C:\Program Files\IBM\gsk7\lib
```

Use the **gsk7cmd**, **runmqckm**, and **gsk7capicmd** commands to do the following:
- Create the type of CMS key database files that WebSphere MQ requires
- Create certificate requests
- Import personal certificates
- Import CA certificates
- Manage self-signed certificates

Both the **gsk7cmd** and **runmqckm** commands execute an underlying WebSphere MQ component called iKeycmd. A default properties file, `ikeycmd.properties`, is provided as a sample file that you can modify.

The **gsk7capicmd** command executes an underlying WebSphere MQ component called GSKCapiCmd. There is no default properties file provided.

This chapter contains the following sections:
- "Preparing to use the gsk7cmd and gsk7capicmd commands" on page 378
- "gsk7cmd, runmqckm, and gsk7capicmd commands" on page 378
- "gsk7cmd, runmqckm, and gsk7capicmd options" on page 387

Preparing to use the gsk7cmd and gsk7capicmd commands

The gsk7cmd command is available on UNIX systems only. The gsk7capicmd command is available on both UNIX and Windows systems.

To run the gsk7cmd and gsk7capicmd command line interfaces, set your **PATH** environment variable to include **/usr/bin** and **/bin**. For example, on UNIX:

```
export PATH=$PATH:/usr/bin:/bin
```

Additionally, for the gsk7cmd command only, set the **JAVA_HOME** environment variable to one of the following:

AIX	`export JAVA_HOME=/usr/mqm/ssl/jre`
HP-UX	`export JAVA_HOME=/opt/mqm/ssl/jre`
Linux	`export JAVA_HOME=/opt/mqm/ssl/jre`
Solaris	`export JAVA_HOME=/opt/mqm/ssl`

gsk7cmd, runmqckm, and gsk7capicmd commands

Each command specifies at least one *object*. Commands for PKCS #11 device operations might specify additional objects. Commands for key database, certificate, and certificate request objects also specify an *action*.

This section describes commands according to the object of the command. The object can be one of the following:

–keydb
Actions apply to a key database

–cert
Actions apply to a certificate

–certreq
Actions apply to a certificate request

–help
Displays help

–version
Displays version information

The following sections describe the actions that you can take on key database, certificate, and certificate request objects:

- "Commands for a CMS key database only"
- "Commands for CMS or PKCS #12 key databases" on page 379
- "Commands for cryptographic device operations" on page 383

See "gsk7cmd, runmqckm, and gsk7capicmd options" on page 387 for a description of the options on these commands.

Commands for a CMS key database only

–keydb –changepw
Change the password for a CMS key database:

Using the gsk7cmd and runmqckm commands:

```
-keydb -changepw -db filename -pw password -new_pw new_password
    -expire days -stash
```

Using the gsk7capicmd command:

```
-keydb -changepw -db filename -pw password -new_pw new_password
    -expire days -stash -fips -strong
```

–keydb –create
Create a CMS key database:

Using the gsk7cmd and runmqckm commands:

```
-keydb -create -db filename -pw password -type cms -expire days -stash
```

Using the gsk7capicmd command:

```
-keydb -create -db filename -pw password -type cms -expire days -stash
    -fips -strong
```

–keydb –stashpw
Stash the password of a CMS key database into a file:

Using the gsk7cmd and runmqckm commands:

```
-keydb -stashpw -db filename -pw password
```

Using the gsk7capicmd command:

```
-keydb -stashpw -db filename -pw password -fips
```

–cert –getdefault
Get the default personal certificate:

Using the gsk7cmd and runmqckm commands:

```
-cert -getdefault -db filename -pw password
```

Using the gsk7capicmd command:

```
-cert -getdefault -db filename -pw password -fips
```

–cert –modify
Modify a certificate.

Note: Currently, the only field that can be modified is the Certificate Trust field.

Using the gsk7cmd and runmqckm commands:

```
-cert -modify -db filename -pw password -label label
    -trust enable | disable
```

Using the gsk7capicmd command:

```
-cert -modify -db filename -pw password -label label
    -trust enable | disable -fips
```

–cert –setdefault
Set the default personal certificate:

Using the gsk7cmd and runmqckm commands:

```
-cert -setdefault -db filename -pw password -label label
```

Using the gsk7capicmd command:

```
-cert -setdefault -db filename -pw password -label label -fips
```

Commands for CMS or PKCS #12 key databases

–keydb –changepw
Change the password for a key database:

For the gsk7cmd and runmqckm commands:

```
-keydb -changepw -db filename -pw password -new_pw new_password -expire days
```

For the gsk7capicmd command:

```
-keydb -changepw -db filename -pw password -new_pw new_password -expire days
    -fips -strong
```

–keydb –convert

For the gsk7cmd and runmqckm commands, convert the key database from one format to another:

```
-keydb -convert -db filename -pw password
    -old_format cms | pkcs12 -new_format cms
```

For the gsk7capicmd command, convert an old version CMS key database to the new version CMS key database:

```
-keydb -convert -db filename -pw password
    -new_db filename -new_pw password -strong -fips
```

–keydb –create

Create a key database:

Using the gsk7cmd and runmqckm commands:

```
-keydb -create -db filename -pw password -type cms | pkcs12
```

Using the gsk7capicmd command:

```
-keydb -create -db filename -pw password -type cms -fips -strong
```

–keydb –delete

Delete a key database:

```
-keydb -delete -db filename -pw password
```

–keydb –list

List currently-supported types of key database:

Using the gsk7cmd and runmqckm commands:

```
-keydb -list
```

Using the gsk7capicmd command:

```
-keydb -list -fips
```

–cert –add

Add a certificate from a file into a key database:

```
-cert -add -db filename -pw password -label label -file filename
    -format ascii | binary
```

Using the gsk7capicmd command:

```
-cert -add -db filename -pw password -label label -file filename
    -format ascii | binary -fips
```

–cert –create

Create a self-signed certificate:

Using the gsk7cmd or runmqckmcommands:

```
-cert -create -db filename -pw password -label label -dn distinguished_name
    -size 1024 | 512 -x509version 3 | 1 | 2 -expire days
```

Using the gsk7capicmd command:

```
-cert -create -db filename -pw password -label label -dn distinguished_name
    -size 2048 | 1024 | 512 -x509version 3 | 1 | 2 -expire days
    -fips -sigalg md5 | sha1 | sha224 | sha256 | sha384 | sha512
```

–cert –delete

Delete a certificate:

Using the gsk7cmd or runmqckmcommands:

```
-cert -delete -db filename -pw password -label label
```

Using the gsk7capicmd command:

```
-cert -delete -db filename -pw password -label label -fips
```

–cert –details

List the detailed information for a specific certificate:

Using the gsk7cmd or runmqckm commands:

```
-cert -details -db filename -pw password -label label
```

Using the gsk7capicmd command:

```
-cert -details -db filename -pw password -label label -fips
```

–cert –export

Export a personal certificate and its associated private key from a key database into a PKCS #12 file, or to another key database:

Using the gsk7cmd or runmqckm commands:

```
-cert -export -db filename -pw password -label label -type cms | pkcs12
    -target filename -target_pw password -target_type cms | pkcs12
```

Using the gsk7capicmd command:

```
-cert -export -db filename -pw password -label label -type cms | pkcs12
    -target filename -target_pw password -target_type cms | pkcs12
    -encryption strong | weak -fips
```

–cert –extract

Extract a certificate from a key database:

Using the gsk7cmd or runmqckm commands:

```
-cert -extract -db filename -pw password -label label -target filename
    -format ascii | binary
```

Using the gsk7capicmd command:

```
-cert -extract -db filename -pw password -label label -target filename
    -format ascii | binary -fips
```

–cert –import

Import a personal certificate from a key database:

For the gsk7cmd and runmqckm commands:

```
 -cert -import -file filename -pw password -type pkcs12 -target filename
       -target_pw password -target_type cms -label label
```

The -label option is required and specifies the label of the certificate that is to be imported from the source key database.

The -new_label option is optional and allows the imported certificate to be given a different label in the target key database from the label in the source database.

For the gsk7capicmd command:

```
 -cert -import -file filename -pw password -type cms -target filename
       -target_pw password -target_type cms -label label -fips
```

The -label option is required and specifies the label of the certificate that is to be imported from the source key database.

The -new_label option is optional and allows the imported certificate to be given a different label in the target key database from the label in the source database.

–cert –list

List all certificates in a key database:

For the gsk7cmd and runmqckm commands:

```
-cert -list all | personal | CA
    -db filename -pw password
```

For the gsk7capicmd command:

```
-cert -list all | personal | CA
    -db filename -pw password -fips
```

–cert –receive

Receive a certificate from a file:

For the gsk7cmd and runmqckm commands:

```
-cert -receive -file filename -db filename -pw password
    -format ascii | binary -default_cert yes | no
```

For the gsk7capicmd command:

```
-cert -receive -file filename -db filename -pw password
    -format ascii | binary -default_cert yes | no -fips
```

–cert –sign

Sign a certificate:

For the gsk7cmd and runmqckm commands:

```
-cert -sign -db filename -file filename  -pw password
   -label label -target filename
   -format ascii | binary -expire days
```

For the gsk7capicmd command:

```
-cert -sign -db filename -file filename  -pw password
   -label label -target filename
   -format ascii | binary -expire days -fips
   -sigalg md5 | sha1 | sha224 | sha256 | sha384 | sha512
```

–certreq –create

Create a certificate request:

For the gsk7cmd and runmqckm commands:

```
-certreq -create -db filename -pw password
    -label label -dn distinguished_name
    -size 1024 | 512 -file filename
```

For the gsk7capicmd command:

```
-certreq -create -db filename -pw password
    -label label -dn distinguished_name
    -size 2048 | 1024 | 512 -file filename -fips
    -sigalg md5 | sha1 | sha224 | sha256 | sha384 | sha512
```

–certreq –delete

Delete a certificate request:

For the gsk7cmd and runmqckm commands:

```
-certreq -delete -db filename -pw password -label label
```

For the gsk7capicmd command:

```
-certreq -delete -db filename -pw password -label label -fips
```

–certreq –details

List the detailed information of a specific certificate request:

For the gsk7cmd and runmqckm commands:

```
-certreq -details -db filename -pw password -label label
```

For the gsk7capicmd command:

```
-certreq -details -db filename -pw password -label label -fips
```

List the detailed information about a certificate request and show the full certificate request:

Using the gsk7cmd and runmqckm commands:

```
-certreq -details -showOID -db filename
    -pw password -label label
```

Using the gsk7capicmd command:

```
-certreq -details -showOID -db filename
    -pw password -label label -fips
```

–certreq –extract

Extract a certificate request from a certificate request database into a file:

For the gsk7cmd and runmqckm commands:

```
-certreq -extract -db filename -pw password
     -label label -target filename
```

Using the gsk7capicmd command:

```
-certreq -extract -db filename -pw password
     -label label -target filename -fips
```

–certreq –list

List all certificate requests in the certificate request database:

For the gsk7cmd and runmqckm commands:

```
-certreq -list -db filename -pw password
```

Using the gsk7capicmd command:

```
-certreq -list -db filename -pw password -fips
```

–certreq –recreate

Recreate a certificate request:

For the gsk7cmd and runmqckm commands:

```
-certreq -recreate -db filename -pw password
    -label label -target filename
```

Using the gsk7capicmd command:

```
-certreq -recreate -db filename -pw password
    -label label -target filename -fips
```

Commands for cryptographic device operations

–keydb –changepw

Change the password for a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-keydb -changepw -crypto module_name -tokenlabel token_label
    -pw password -new_pw new_password
```

Using the gsk7capicmd command:

```
-keydb -changepw -db filename -crypto module_name -tokenlabel token_label
    -pw password -new_pw new_password -fips -strong
```

–keydb –list

List currently-supported types of key database:

Using the gsk7cmd and runmqckm commands:

```
-keydb -list
```

Using the gsk7capicmd command:

```
-keydb -list -fips
```

–cert –add

Add a certificate from a file to a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-cert -add -crypto module_name -tokenlabel token_label
    -pw password -label label -file filename -format ascii | binary
```

Using the gsk7capicmd command:

```
-cert -add -crypto module_name -tokenlabel token_label
    -pw password -label label -file filename -format ascii | binary
    -fips
```

–cert –create

Create a self-signed certificate on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-cert -create -crypto module_name -tokenlabel token_label
    -pw password -label label -dn distinguished_name -size 1024 | 512
    -x509version 3 | 1 | 2 -default_cert no | yes -expire days
```

Note: You cannot import a certificate containing multiple OU (organizational unit) attributes in the distinguished name.

Using the gsk7capicmd command:

```
-cert -create -crypto module_name -tokenlabel token_label
    -pw password -label label -dn distinguished_name
    -size 2048 | 1024 | 512 -x509version 3 | 1 | 2
    -default_cert no | yes -expire days
    -fips -sigalg md5 | sha1 | sha224 | sha256 | sha384
```

–cert –delete

Delete a certificate on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-cert -delete -crypto module_name -tokenlabel token_label
    -pw password -label label
```

Using the gsk7capicmd command:

```
-cert -delete -crypto module_name -tokenlabel token_label
    -pw password -label label -fips
```

–cert –details

List the detailed information for a specific certificate on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-cert -details -crypto module_name -tokenlabel token_label
    -pw password -label label
```

Using the gsk7capicmd command:

```
-cert -details -crypto module_name -tokenlabel token_label
    -pw password -label label -fips
```

List the detailed information and show the full certificate for a specific certificate on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-cert -details -showOID -crypto module_name -tokenlabel token_label
    -pw password -label label
```

Using the gsk7capicmd command:

```
-cert -details -showOID -crypto module_name -tokenlabel token_label
    -pw password -label label -fips
```

–cert –extract

Extract a certificate from a key database:

Using the gsk7cmd and runmqckm commands:

```
-cert -extract -crypto module_name -tokenlabel token_label
    -pw password -label label -target filename -format ascii | binary
```

Using the gsk7capicmd command:

```
-cert -extract -crypto module_name -tokenlabel token_label
    -pw password -label label -target filename -format ascii | binary
    -fips
```

–cert –import

Import a certificate to a cryptographic device with secondary key database support:

Using the gsk7cmd and runmqckm commands:

```
-cert -import -db filename -pw password -label label -type cms
    -crypto module_name -tokenlabel token_label -pw password
    -secondaryDB filename -secondaryDBpw password
```

Using the gsk7capicmd command:

```
-cert -import -db filename -pw password -label label -type cms
    -crypto module_name -tokenlabel token_label -pw password
    -secondaryDB filename -secondaryDBpw password -fips
```

Import a PKCS #12 certificate to a cryptographic device with secondary key database support:

Using the gsk7cmd and runmqckm commands:

```
-cert -import -file filename -pw password -type pkcs12
    -crypto module_name -tokenlabel token_label -pw password
    -secondaryDB filename -secondaryDBpw password
```

Using the gsk7capicmd command:

```
-cert -import -file filename -pw password -type pkcs12
    -crypto module_name -tokenlabel token_label -pw password
    -secondaryDB filename -secondaryDBpw password -fips
```

Note: You cannot import a certificate containing multiple OU (organizational unit) attributes in the distinguished name.

–cert –list

List all certificates on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-cert -list all | personal | CA
    -crypto module_name -tokenlabel token_label -pw password
```

Using the gsk7capicmd command:

```
-cert -list all | personal | CA
    -crypto module_name -tokenlabel token_label -pw password -fips
```

–cert –receive
Receive a certificate from a file to a cryptographic device with secondary key database support:

Using the gsk7cmd and runmqckm commands:

```
-cert -receive -file filename -crypto module_name -tokenlabel token_label
    -pw password  -default_cert yes | no
    -secondaryDB filename -secondaryDBpw password -format ascii | binary
```

Using the gsk7capicmd command:

```
-cert -receive -file filename -crypto module_name -tokenlabel token_label
    -pw password  -default_cert yes | no
    -secondaryDB filename -secondaryDBpw password -format ascii | binary
    -fips
```

–certreq –create
Create a certificate request on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-certreq -create -crypto module_name -tokenlabel token_label
    -pw password -label label -dn distinguished_name
    -size 1024 | 512 -file filename
```

Note: You cannot import a certificate containing multiple OU (organizational unit) attributes in the distinguished name.

Using the gsk7capicmd command:

```
-certreq -create -crypto module_name -tokenlabel token_label
    -pw password -label label -dn distinguished_name
    -size 2048 | 1024 | 512 -file filename -fips
    -sigalg md5 | sha1 | sha224 | sha256 | sha384 | sha512
```

–certreq –delete
Delete a certificate request from a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-certreq -delete -crypto module_name -tokenlabel token_label
    -pw password -label label
```

Using the gsk7capicmd command:

```
-certreq -delete -crypto module_name -tokenlabel token_label
    -pw password -label label -fips
```

–certreq –details
List the detailed information of a specific certificate request on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-certreq -details -crypto module_name -tokenlabel token_label
    -pw password -label label
```

Using the gsk7capicmd command:

```
-certreq -details -crypto module_name -tokenlabel token_label
    -pw password -label label -fips
```

List the detailed information about a certificate request and show the full certificate request on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-certreq -details -showOID -crypto module_name -tokenlabel token_label
    -pw password -label label
```

Using the gsk7capicmd command:

```
-certreq -details -showOID -crypto module_name -tokenlabel token_label
    -pw password -label label -fips
```

–certreq –extract
Extract a certificate request from a certificate request database on a cryptographic device into a file:

Using the gsk7cmd and runmqckm commands:

```
-certreq -extract -crypto module_name -tokenlabel token_label
    -pw password -label label -target filename
```

Using the gsk7capicmd command:

```
-certreq -extract -crypto module_name -tokenlabel token_label
    -pw password -label label -target filename -fips
```

–certreq –list
List all certificate requests in the certificate request database on a cryptographic device:

Using the gsk7cmd and runmqckm commands:

```
-certreq -list -crypto module_name -tokenlabel token_label
    -pw password
```

Using the gsk7capicmd command:

```
-certreq -list -crypto module_name -tokenlabel token_label
    -pw password -fips
```

gsk7cmd, runmqckm, and gsk7capicmd options

Table 28 lists the options that can be present on the command line. Note that the meaning of an option can depend on the object and action specified in the command.

Table 28. Options that can be used with gsk7cmd, runmqckm , and gsk7capicmd

Option	Description
-crypto	Name of the module to manage a PKCS #11 cryptographic device. The value after –crypto is optional if you specify the module name in the properties file. Properties files are provided for gsk7cmd and runmqckm only.
-db	Fully qualified path name of a key database.
-default_cert	Sets a certificate as the default certificate. The value can be `yes` or `no`. The default is `no`.

Table 28. Options that can be used with gsk7cmd, runmqckm , and gsk7capicmd (continued)

Option	Description
-dn	X.500 distinguished name. The value is a string enclosed in double quotes, for example “`CN=John Smith,O=IBM,OU=Test,C=GB`”. Note that the CN, O, and C attributes are required. Note that only the CN attribute is required. **Note:** Avoid using multiple OU attributes in distinguished names when you create self-signed certificates. When you create such certificates, only the **last entered** OU value is accepted into the certificate. **Note:** You can use multiple OU attributes in distinguished names when you create self-signed certificates. Add additional OU key and value pairs to the specified distinguished name. For example: `"CN=weblinux.Raleigh.ibm.com,O=ibm,OU=IBM HTTP Server,OU=GSKit\\, Gold Coast,L=RTP,ST=NC,C=US"`
-encryption	Strength of encryption used in certificate export command. The value can be `strong` or `weak`. The default is `strong`.
-expire	Expiration time in days of either a certificate or a database password. The default is 365 days for a certificate password. There is no default time for a database password: use the -expire option to set a database password expiration time explicitly.
-file	File name of a certificate or certificate request.
-fips	specifies that the command is run in FIPS mode. This mode disables the use of the BSafe cryptographic library. Only the ICC component is used and this component must be successfully initialized in FIPS mode. When in FIPS mode, the ICC component uses algorithms that have been FIPS 140-2 validated. If the ICC component does not initialize in FIPS mode, the gsk7capicmd command fails.
-format	Format of a certificate. The value can be `ascii` for Base64_encoded ASCII or `binary` for Binary DER data. The default is `ascii`.
-label	Label attached to a certificate or certificate request.
-new_format	New format of key database (applicable to gsk7cmd and runmqckm only)..
-new_label	Used on a certificate import command, this option allows a certificate to be imported with a different label from the label it had in the source key database.
-new_pw	New database password.
-old_format	Old format of key database (applicable to gsk7cmd and runmqckm only).
-pw	Password for the key database or PKCS #12 file.
-secondaryDB	Name of a secondary key database for PKCS #11 device operations.
-secondaryDBpw	Password for the secondary key database for PKCS #11 device operations.
-showOID	Displays the full certificate or certificate request.
-sigalg	The hashing algorithm used during the creation of a certificate request, a self-signed certificate, or the signing of a certificate. This hashing algorithm is used to create the signature associated with the newly-created certificate or certificate request. The value can be md5, sha1, sha224, sha256, sha384, or sha512. The default is sha1.

Table 28. Options that can be used with gsk7cmd, runmqckm , and gsk7capicmd (continued)

Option	Description
-size	Key size. For gsk7cmd, runmqckm, the value can be 512 or 1024. The default is 1024. For the gsk7capicmd command, the value can be 512, 1024, or 2048. The default is 1024.
-stash	Stash the key database password to a file.
-strong	Check that the password entered satisfies the minimum requirements for the passwords strength. The minimum requirements for a password are as follows: • The password must be a minimum length of 14 characters. • The password must contain a minimum of one lower case character, one upper case character, and one digit or special character. Special characters include the asterisk (*), the dollar sign ($), the number sign (#) and the percent sign (%). A space is classified as a special character. • Each character can only occur a maximum of three times in a password. • A maximum of two consecutive characters in the password can be identical. • All characters described above are in the standard ASCII printable character set within the range from 0x20 to 0x7E inclusive.
-target	Destination file or database.
-target_pw	Password for the key database if -target specifies a key database.
-target_type	Type of database specified by -target operand. See -type option for permitted values.
-tokenLabel	Label of a PKCS #11 cryptographic device.
-trust	Trust status of a CA certificate. The value can be `enable` or `disable`. The default is `enable`.
-type	Type of database. The value can be: • `cms` for a CMS key database • `pkcs12` for a PKCS #12 file.
-x509version	Version of X.509 certificate to create. The value can be 1, 2, or 3. The default is 3.

Chapter 7. WebSphere MQ installable services and the API exit

Installable services and components

This chapter introduces the installable services and the functions and components associated with them. We document the interface to these functions so that you, or software vendors, can supply components.

The chapter includes:
- "Why installable services?"
- "Functions and components" on page 392
- "Initialization" on page 394
- "Configuring services and components" on page 394
- "Creating your own service component" on page 396
- "Using multiple service components" on page 397

The installable services interface is described in "Installable services interface reference information" on page 404.

Why installable services?

The main reasons for providing WebSphere MQ installable services are:
- To provide you with the flexibility of choosing whether to use components provided by WebSphere MQ products, or replace or augment them with others.
- To allow vendors to participate, by providing components that might use new technologies, without making internal changes to WebSphere MQ products.
- To allow WebSphere MQ to exploit new technologies faster and cheaper, and so provide products earlier and at lower prices.

Installable services and *service components* are part of the WebSphere MQ product structure. At the center of this structure is the part of the queue manager that implements the function and rules associated with the Message Queue Interface (MQI). This central part requires a number of service functions, called *installable services*, in order to perform its work. The installable services are:
- Authorization service
- Name service

Each installable service is a related set of functions implemented using one or more *service components*. Each component is invoked using a properly-architected, publicly-available interface. This enables independent software vendors and other third parties to provide installable components to augment or replace those provided by the WebSphere MQ products. Table 29 on page 392 summarizes the services and components that can be used.

Table 29. Installable service components summary

Installable service	Supplied component	Function	Requirements
Authorization service	Object Authority Manager (OAM)	Provides authorization checking on commands and MQI calls. Users can write their own component to augment or replace the OAM.	(Appropriate platform authorization facilities are assumed)
Name service	None	• User defined **Note:** Shared queues must have their *Scope* attribute set to CELL.	• A third-party or user-written name manager

Functions and components

Each service consists of a set of related functions. For example, the name service contains function for:

- Looking up a queue name and returning the name of the queue manager where the queue is defined
- Inserting a queue name into the service's directory
- Deleting a queue name from the service's directory

It also contains initialization and termination functions.

An installable service is provided by one or more service components. Each component can perform some or all of the functions that are defined for that service. For example, in WebSphere MQ for AIX, the supplied authorization service component, the OAM, performs all the available functions. See "Authorization service interface" on page 401 for more information. The component is also responsible for managing any underlying resources or software (for example, an LDAP directory) that it needs to implement the service. Configuration files provide a standard way of loading the component and determining the addresses of the functional routines that it provides.

Figure 34 on page 393 shows how services and components are related:

- A service is defined to a queue manager by stanzas in a configuration file.
- Each service is supported by supplied code in the queue manager. Users cannot change this code and therefore cannot create their own services.
- Each service is implemented by one or more components; these can be supplied with the product or user-written. Multiple components for a service can be invoked, each supporting different facilities within the service.
- Entry points connect the service components to the supporting code in the queue manager.

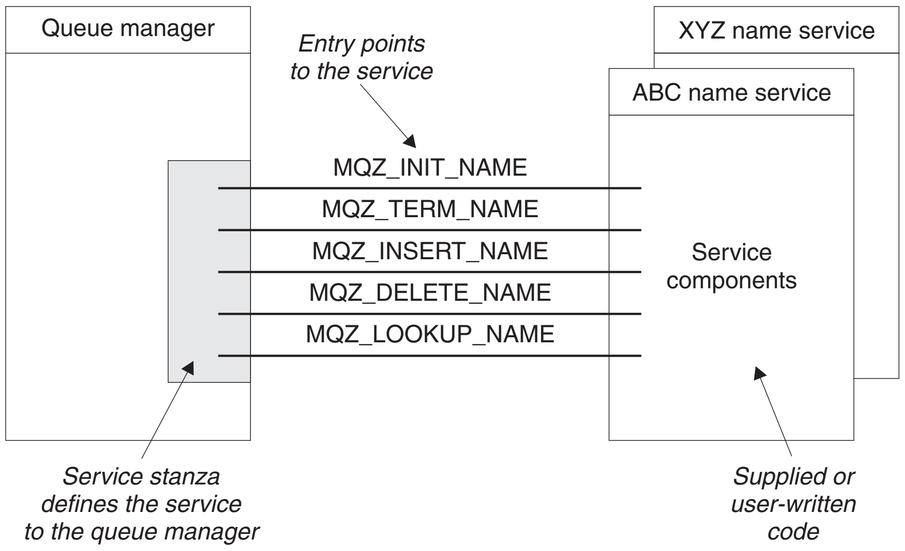


Figure 34. Understanding services, components, and entry points

Entry-points

Each service component is represented by a list of the entry-point addresses of the routines that support a particular installable service. The installable service defines the function to be performed by each routine.

The ordering of the service components when they are configured defines the order in which entry-points are called in an attempt to satisfy a request for the service.

In the supplied header file `cmqzc.h`, the supplied entry points to each service have an MQZID_ prefix.

Return codes

Service components provide return codes to the queue manager to report on a variety of conditions. They report the success or failure of the operation, and indicate whether the queue manager is to proceed to the next service component. A separate *Continuation* parameter carries this indication.

Component data

A single service component might require data to be shared between its various functions. Installable services provide an optional data area to be passed on each invocation of a given service component. This data area is for the exclusive use of the service component. It is shared by all the invocations of a given function, even if they are made from different address spaces or processes. It is guaranteed to be addressable from the service component whenever it is called. You must declare the size of this area in the *`ServiceComponent`* stanza.

Initialization

When the component initialization routine is invoked, it must call the queue manager **MQZEP** function for each entry-point supported by the component. **MQZEP** defines an entry-point to the service. All the undefined exit points are assumed to be NULL.

Primary initialization

A component is always invoked with this option once, before it is invoked in any other way.

Secondary initialization

A component can be invoked with this option on certain platforms. For example, it can be invoked once for each operating system process, thread, or task by which the service is accessed.

If secondary initialization is used:

- The component can be invoked more than once for secondary initialization. For each such call, a matching call for secondary termination is issued when the service is no longer needed.

  For naming services this is the MQZ_TERM_NAME call.

  For authorization services this is the MQZ_TERM_AUTHORITY call.
- The entry points must be re-specified (by calling MQZEP) each time the component is called for primary and secondary initialization.
- Only one copy of component data is used for the component; there is not a different copy for each secondary initialization.
- The component is not invoked for any other calls to the service (from the operating system process, thread, or task, as appropriate) before secondary initialization has been carried out.
- The component must set the *Version* parameter to the same value for primary and secondary initialization.

Primary termination

The primary termination component is always invoked with this option once, when it is no longer required. No further calls are made to this component.

Secondary termination

The secondary termination component is invoked with this option, if it has been invoked for secondary initialization.

Configuring services and components

Configure service components using the queue manager configuration files, except on Windows systems, where each queue manager has its own stanza in the Registry. Each service used must have a *Service* stanza, which defines the service to the queue manager.

For each component within a service, there must be a *ServiceComponent* stanza. This identifies the name and path of the module containing the code for that component.

The authorization service component, known as the Object Authority Manager (OAM), is supplied with the product. When you create a queue manager, the queue manager configuration file (or the Registry on Windows systems) is automatically updated to include the appropriate stanzas for the authorization service and for the default component (the OAM). For the other components, you must configure the queue manager configuration file manually.

The code for each service component is loaded into the queue manager when the queue manager is started, using dynamic binding, where this is supported on the platform.

Service stanza format

The format of the *Service* stanza is:

```
Service:
  Name=<service_name>
  EntryPoints=<entries>
```

where:

<service_name>
: The name of the service. This is defined by the service.

<entries>
: The number of entry-points defined for the service. This includes the initialization and termination entry points.

Service stanza format for Windows systems

On Windows systems, the *Service* stanza includes a `SecurityPolicy` attribute.

The format of the stanza is:

```
Service:
  Name=<service_name>
  EntryPoints=<entries>
  SecurityPolicy=<policy>
```

where:

<service_name>
: The name of the service. This is defined by the service.

<entries>
: The number of entry-points defined for the service. This includes the initialization and termination entry points.

<policy>
: `NTSIDsRequired` (the Windows Security Identifier), or `Default`. If you do not specify `NTSIDsRequired`, the `Default` value is used. This attribute is valid only if `Name` has a value of `AuthorizationService`.

See also “Configuring authorization service stanzas: Windows systems” on page 400.

Service component stanza format

The format of the *Service component* stanza is:

```
ServiceComponent:
  Service=<service_name>
  Name=<component_name>
  Module=<module_name>
  ComponentDataSize=<size>
```

where:

<service_name>
: The name of the service. This must match the Name specified in a service stanza.

<component_name>
: A descriptive name of the service component. This must be unique, and contain only the characters that are valid for the names of WebSphere MQ objects (for example, queue names). This name occurs in operator messages generated by the service. We recommend that you use a name starting with a company trademark or similar distinguishing string.

<module_name>
: The name of the module to contain the code for this component. Specify a full path name.

<size>
: The size in bytes of the component data area passed to the component on each call. Specify zero if no component data is required.

These two stanzas can appear in any order and the stanza keys under them can also appear in any order. For either of these stanzas, all the stanza keys must be present. If a stanza key is duplicated, the last one is used.

At startup time, the queue manager processes each service component entry in the configuration file in turn. It then loads the specified component module, invoking the entry-point of the component (which must be the entry-point for initialization of the component), passing it a configuration handle.

Creating your own service component

To create your own service component:

- For all platforms, ensure that the header file cmqzc.h is included in your program.
- **For UNIX systems**: Create the shared library by compiling the program and linking it with the shared libraries libmqm* and libmqmzf*. (The threading suffixes and file extensions vary by platform.)

  Note: Because the agent can run in a threaded environment, you must build the OAM and Name Service to run in a threaded environment. This includes using the threaded versions of libmqm and libmqmzf.
- **For Windows**: Create a DLL by compiling the program, and linking it with the libraries MQM.LIB and MQMZF.LIB.

  See the WebSphere MQ Application Programming Guide for details of how to compile and link code for shared libraries.
- Add stanzas to the queue manager configuration file to define the service to the queue manager and to specify the location of the module. Refer to the individual chapters for each service, for more information.
- Stop and restart the queue manager to activate the component.

Using multiple service components

You can install more than one component for a given service. This allows components to provide only partial implementations of the service, and to rely on other components to provide the remaining functions.

Example of using multiple components

Suppose you create two a name services components called `ABC_name_serv` and `XYZ_name_serv`.

`ABC_name_serv`
: This component supports inserting a name in, or deleting a name from, the service directory, but does not support looking up a queue name.

`XYZ_name_serv`
: This component supports looking up a queue name, but does not support inserting a name in, or deleting a name from, the service directory.

What the components do:

Component `ABC_name_serv` holds a database of queue names, and uses two simple algorithms to either insert, or delete, a name from the service directory.

Component `XYZ_name_serv` uses a simple algorithm that returns a fixed queue-manager name for any queue name with which it is invoked. It does not hold a database of queue names, and therefore does not support the insert and delete functions.

How the component is used:

The components are installed on the same queue manager. The *`ServiceComponent`* stanzas are ordered so that component `ABC_name_serv` is invoked first. Any calls to insert or delete a queue in a component directory are handled by component `ABC_name_serv`; it is the only one that implements these functions. However, a lookup call that component `ABC_name_serv` cannot resolve is passed on to the lookup-only component, `XYZ_name_serv`. This component supplies a queue-manager name from its simple algorithm.

Omitting entry points when using multiple components

If you decide to use multiple components to provide a service, you can design a service component that does not implement certain functions. The installable services framework places no restrictions on which you can omit. However, for specific installable services, omission of one or more functions might be logically inconsistent with the purpose of the service.

Example of entry points used with multiple components

Table 30 on page 398 shows an example of the installable name service for which the two components have been installed. Each supports a different set of functions associated with this particular installable service. For insert function, the ABC component entry-point is invoked first. Entry points that have not been defined to the service (using **MQZEP**) are assumed to be NULL. An entry-point for initialization is provided in the table, but this is not required because initialization is carried out by the main entry-point of the component.

When the queue manager has to use an installable service, it uses the entry-points defined for that service (the columns in Table 30). Taking each component in turn, the queue manager determines the address of the routine that implements the required function. It then calls the routine, if it exists. If the operation is successful, any results and status information are used by the queue manager.

Table 30. Example of entry-points for an installable service

Function number	**ABC name service component**	**XYZ name service component**
MQZID_INIT_NAME (Initialize)	ABC_initialize()	XYZ_initialize()
MQZID_TERM_NAME (Terminate)	ABC_terminate()	XYZ_terminate()
MQZID_INSERT_NAME (Insert)	ABC_Insert()	NULL
MQZID_DELETE_NAME (Delete)	ABC_Delete()	NULL
MQZID_LOOKUP_NAME (Lookup)	NULL	XYZ_Lookup()

If the routine does not exist, the queue manager repeats this process for the next component in the list. In addition, if the routine does exist but returns a code indicating that it could not perform the operation, the attempt continues with the next available component. Routines in service components might return a code that indicates that no further attempts to perform the operation should be made.

Authorization service

The authorization service is an installable service that enables queue managers to invoke authorization facilities, for example, checking that a user ID has authority to open a queue.

This service is a component of the WebSphere MQ security enabling interface (SEI), which is part of the WebSphere MQ framework.

This chapter discusses:
- "Object authority manager (OAM)"
- "Authorization service on UNIX systems" on page 399
- "Authorization service on Windows systems" on page 400
- "Authorization service interface" on page 401

Object authority manager (OAM)

The authorization service component supplied with the WebSphere MQ products is called the Object Authority Manager (OAM). By default, the OAM is active and works with the control commands **dspmqaut** (display authority),**dmpmqaut** (dump authority), and **setmqaut** (set or reset authority).

The syntax of these commands and how to use them are described in "The control commands" on page 277.

The OAM works with the *entity* of a principal or group. These entities vary from platform to platform.

When an MQI request is made or a command is issued, the OAM checks the authorization of the entity associated with the operation to see whether it can:

- Perform the requested operation.
- Access the specified queue manager resources.

The authorization service enables you to augment or replace the authority checking provided for queue managers by writing your own authorization service component.

Defining the service to the operating system

The authorization service stanzas in the queue manager configuration file `qm.ini` (or Registry on Windows systems), define the authorization service to the queue manager. See "Configuring services and components" on page 394 for information about the types of stanza.

Refreshing the OAM after changing a user's authorization

In WebSphere MQ, you can update the OAM's authorization group information immediately after changing a user's authorization group membership, reflecting changes made at the operating system level, without needing to stop and restart the queue manager.

Note: When you change authorizations with the **setmqaut** command, the OAM implements such changes immediately.
Queue managers store authorization data on a local queue called SYSTEM.AUTH.DATA.QUEUE. This data is managed by **amqzfuma.exe**.

Migrating from MQSeries Version 5.1

All authorization data is migrated from the authorization files to the authorization queue the first time that you restart the queue manager after migrating from MQSeries Version 5.1. If the OAM detects a missing file:

1. If the authorization applies to a single object, the OAM gives the mqm group (or Administrator on Windows systems) access to the object and continues with the migration. Message AMQ5528 is written to the queue manager's error log. Refer to WebSphere MQ Messages for more information about message AMQ5528.
2. If the authorization applies to a class of objects, the OAM stops the migration. The queue manager does not start until the file has been replaced.

Authorization service on UNIX systems

On these platforms:

Principal
Is a UNIX system user ID, or an ID associated with an application program running on behalf of a user.

Group Is a UNIX system-defined collection of principals.

Authorizations can be granted or revoked at the group level only. A request to grant or revoke a user's authority updates the primary group for that user.

Configuring authorization service stanzas: UNIX systems

On UNIX systems, each queue manager has its own queue manager configuration file.

For example, on AIX, the default path and file name of the queue manager configuration file for queue manager QMNAME is `/var/mqm/qmgrs/QMNAME/qm.ini`.

The *Service* stanza and the *ServiceComponent* stanza for the default authorization component are added to `qm.ini` automatically, but can be overridden by `mqsnoaut`. Any other *ServiceComponent* stanzas must be added manually.

For example, the following stanzas in the queue manager configuration file define two authorization service components on WebSphere MQ for AIX:

```
Service:
   Name=AuthorizationService
   EntryPoints=13

ServiceComponent:
   Service=AuthorizationService
   Name=MQSeries.UNIX.auth.service
   Module=/usr/mqm/lib/amqzfu
   ComponentDataSize=0

ServiceComponent:
   Service=AuthorizationService
   Name=user.defined.authorization.service
   Module=/usr/bin/udas01
   ComponentDataSize=96
```

Figure 35. UNIX authorization service stanzas in qm.ini

The service component stanza (`MQSeries.UNIX.auth.service`) defines the default authorization service component, the OAM. If you remove this stanza and restart the queue manager, the OAM is disabled and no authorization checks are made.

Authorization service on Windows systems

On Windows systems:

Principal
Is a Windows user ID, or an ID associated with an application program running on behalf of a user.

Group Is a Windows group.

Authorizations can be granted or revoked at the principal or group level.

Configuring authorization service stanzas: Windows systems

On WebSphere MQ for Windows each queue manager has its own stanza in the registry.

The *Service* stanza and the *ServiceComponent* stanza for the default authorization component are added to the Registry automatically, but can be overridden using `mqsnoaut`. Any other *ServiceComponent* stanzas must be added manually.

You can also add the `SecurityPolicy` attribute using the WebSphere MQ services. The `SsecurityPolicy` attribute applies only if the service specified on the *Service* stanza is the authorization service, that is, the default OAM. The `SecurityPolicy` attribute allows you to specify the security policy for each queue manager. The possible values are:

`Default`
: Specify `Default` if you want the default security policy to take effect. If a Windows security identifier (NT SID) is not passed to the OAM for a particular user ID, an attempt is made to obtain the appropriate SID by searching the relevant security databases.

`NTSIDsRequired`
: Requires that an NT SID is passed to the OAM when performing security checks.

For information about the Service stanza format, see "Service stanza format for Windows systems" on page 395. For more general information about security, see "WebSphere MQ security" on page 122.

The service component stanza, `MQSeries.WindowsNT.auth.service` defines the default authorization service component, the OAM. If you remove this stanza and restart the queue manager, the OAM is disabled and no authorization checks are made.

Authorization service interface

The authorization service provides the following entry points for use by the queue manager:

MQZ_AUTHENTICATE_USER
: Authenticates a user ID and password, and can set identity context fields.

MQZ_CHECK_AUTHORITY
: Checks whether an entity has authority to perform one or more operations on a specified object.

MQZ_COPY_ALL_AUTHORITY
: Copies all the current authorizations that exist for a referenced object to another object.

MQZ_DELETE_AUTHORITY
: Deletes all authorizations associated with a specified object.

MQZ_ENUMERATE_AUTHORITY_DATA
: Retrieves all the authority data that matches the selection criteria specified.

MQZ_FREE_USER
: Frees associated allocated resources.

MQZ_GET_AUTHORITY
: Gets the authority that an entity has to access a specified object.

MQZ_GET_EXPLICIT_AUTHORITY
: Gets either the authority that a named group has to access a specified object (but without the additional authority of the **nobody** group) or the authority that the primary group of the named principal has to access a specified object.

MQZ_INIT_AUTHORITY
: Initializes authorization service component.

MQZ_INQUIRE
: Queries the supported functionality of the authorization service.

MQZ_REFRESH_CACHE
Refresh all authorizations.

MQZ_SET_AUTHORITY
Sets the authority that an entity has to a specified object.

MQZ_TERM_AUTHORITY
Terminates authorization service component.

In addition, on WebSphere MQ for Windows, the authorization service provides the following entry points for use by the queue manager:
- **MQZ_CHECK_AUTHORITY_2**
- **MQZ_GET_AUTHORITY_2**
- **MQZ_GET_EXPLICIT_AUTHORITY_2**
- **MQZ_SET_AUTHORITY_2**

These entry points support the use of the Windows Security Identifier (NT SID).

These names are defined as **typedef**s, in the header file `cmqzc.h`, which can be used to prototype the component functions.

The initialization function (**MQZ_INIT_AUTHORITY**) must be the main entry point for the component. The other functions are invoked through the entry point address that the initialization function has added into the component entry point vector.

See "Creating your own service component" on page 396 for more information.

Name service

The name service is an installable service that provides support to the queue manager for looking up the name of the queue manager that owns a specified queue. No other queue attributes can be retrieved from a name service.

The name service enables an application to open remote queues for output as if they were local queues. A name service is not invoked for objects other than queues.

Note: The remote queues ***must*** have their *Scope* attribute set to `CELL`.

When an application opens a queue, it looks for the name of the queue first in the queue manager's directory. If it does not find it there, it looks in as many name services as have been configured, until it finds one that recognizes the queue name. If none recognizes the name, the open fails.

The name service returns the owning queue manager for that queue. The queue manager then continues with the MQOPEN request as if the command had specified the queue and queue manager name in the original request.

The name service interface (NSI) is part of the WebSphere MQ framework.

This chapter discusses:
- "How the name service works" on page 403

How the name service works

If a queue definition specifies the *Scope* attribute as queue manager, that is, SCOPE(QMGR) in MQSC, the queue definition (along with all the queue attributes) is stored in the queue manager's directory only. This cannot be replaced by an installable service.

If a queue definition specifies the *Scope* attribute as cell, that is, SCOPE(CELL) in MQSC, the queue definition is again stored in the queue manager's directory, along with all the queue attributes. However, the queue and queue-manager name are also stored in a name service. If no service is available that can store this information, a queue with the *Scope* cell cannot be defined.

The directory in which the information is stored can be managed by the service, or the service can use an underlying service, for example, an LDAP directory, for this purpose. In either case, definitions stored in the directory must persist, even after the component and queue manager have terminated, until they are explicitly deleted.

Note:

1. To send a message to a remote host's local queue definition (with a scope of CELL) on a different queue manager within a naming directory cell, you need to define a channel.
2. You cannot get messages directly from the remote queue, even when it has a scope of CELL.
3. No remote queue definition is required when sending to a queue with a scope of CELL.
4. The naming service centrally defines the destination queue, although you still need a transmission queue to the destination queue manager and a pair of channel definitions. In addition, the transmission queue on the local system must have the same name as the queue manager owning the target queue, with the scope of cell, on the remote system.

   For example, if the remote queue manager has the name QM01, the transmission queue on the local system must also have the name QM01. See WebSphere MQ Intercommunication for further information.

Name service interface

A name service provides the following entry points for use by the queue manager:

MQZ_INIT_NAME
Initialize the name service component.

MQZ_TERM_NAME
Terminate the name service component.

MQZ_LOOKUP_NAME
Look up the queue-manager name for the specified queue.

MQZ_INSERT_NAME
Insert an entry containing the owning queue-manager name for the specified queue into the directory used by the service.

MQZ_DELETE_NAME
Delete the entry for the specified queue from the directory used by the service.

If there is more than one name service configured:

- For lookup, the MQZ_LOOKUP_NAME function is invoked for each service in the list until the queue name is resolved (unless any component indicates that the search should stop).
- For insert, the MQZ_INSERT_NAME function is invoked for the first service in the list that supports this function.
- For delete, the MQZ_DELETE_NAME function is invoked for the first service in the list that supports this function.

Do not have more than one component that supports the insert and delete functions. However, a component that only supports lookup is feasible, and could be used, for example, as the last component in the list to resolve any name that is not known by any other name service component to a queue manager at which the name can be defined.

In the C programming language the names are defined as function datatypes using the typedef statement. These can be used to prototype the service functions, to ensure that the parameters are correct.

The header file that contains all the material specific to installable services is `cmqzc.h` for the C language.

Apart from the initialization function (MQZ_INIT_NAME), which must be the component's main entry point, functions are invoked by the entry point address that the initialization function has added, using the MQZEP call.

The following examples of UNIX configuration file stanzas for the name service specify a name service component provided by the (fictitious) ABC company.

```
# Stanza for name service
 Service:
    Name=NameService
    EntryPoints=5

# Stanza for name service component, provided by ABC
 ServiceComponent:
    Service=NameService
    Name=ABC.Name.Service
    Module=/usr/lib/abcname
    ComponentDataSize=1024
```

Figure 36. Name service stanzas in qm.ini (for UNIX systems)

Note: On Windows systems, name service stanza information is stored in the Registry.

Installable services interface reference information

This chapter provides reference information for the installable services. It includes:

- "How the functions are shown" on page 405
- "MQZEP – Add component entry point" on page 405
- "MQZ_AUTHENTICATE_USER – Authenticate user" on page 407
- "MQZ_CHECK_AUTHORITY – Check authority" on page 410
- "MQZ_CHECK_AUTHORITY_2 – Check authority (extended)" on page 415
- "MQZ_COPY_ALL_AUTHORITY – Copy all authority" on page 420

- "MQZ_DELETE_AUTHORITY – Delete authority" on page 422
- "MQZ_ENUMERATE_AUTHORITY_DATA – Enumerate authority data" on page 425
- "MQZ_FREE_USER – Free user" on page 428
- "MQZ_GET_AUTHORITY – Get authority" on page 430
- "MQZ_GET_AUTHORITY_2 – Get authority (extended)" on page 433
- "MQZ_GET_EXPLICIT_AUTHORITY – Get explicit authority" on page 436
- "MQZ_GET_EXPLICIT_AUTHORITY_2 – Get explicit authority (extended)" on page 439
- "MQZ_INIT_AUTHORITY – Initialize authorization service" on page 442
- "MQZ_INQUIRE – Inquire authorization service" on page 445
- "MQZ_REFRESH_CACHE – Refresh all authorizations" on page 449
- "MQZ_SET_AUTHORITY – Set authority" on page 450
- "MQZ_SET_AUTHORITY_2 – Set authority (extended)" on page 453
- "MQZ_TERM_AUTHORITY – Terminate authorization service" on page 456
- "MQZAC – Application context" on page 458
- "MQZAD – Authority data" on page 461
- "MQZED – Entity descriptor" on page 464
- "MQZIC – Identity context" on page 465
- "MQZFP – Free parameters" on page 467
- "MQZ_DELETE_NAME – Delete name" on page 468
- "MQZ_INIT_NAME – Initialize name service" on page 470
- "MQZ_INSERT_NAME – Insert name" on page 472
- "MQZ_LOOKUP_NAME – Lookup name" on page 474
- "MQZ_TERM_NAME – Terminate name service" on page 476

The functions and data types are in alphabetic order within the group for each service type.

How the functions are shown

For each function there is a description, including the function identifier (for MQZEP).

The *parameters* are shown listed in the order they must occur. They must all be present.

Parameters and data types

Each parameter name is followed by its data type in parentheses. These are the elementary data types described in the WebSphere MQ Application Programming Reference manual.

The C language invocation is also given, after the description of the parameters.

MQZEP – Add component entry point

This function is invoked by a service component, during initialization, to add an entry point to the entry point vector for that service component.

Syntax

MQZEP *(Hconfig, Function, EntryPoint, CompCode, Reason)*

Parameters

The MQZEP call has the following parameters.

Hconfig (MQHCONFIG) – input:

Configuration handle.

This handle represents the component which is being configured for this particular installable service. It must be the same as the one passed to the component configuration function by the queue manager on the component initialization call.

Function (MQLONG) – input:

Function identifier.

Valid values for this are defined for each installable service.

If MQZEP is called more than once for the same function, the last call made provides the entry point which is used.

EntryPoint (PMQFUNC) – input:

Function entry point.

This is the address of the entry point provided by the component to perform the function.

The value NULL is valid, and indicates that the function is not provided by this component. NULL is assumed for entry points which are not defined using MQZEP.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_FUNCTION_ERROR
(2281, X'8E9') Function identifier not valid.

MQRC_HCONFIG_ERROR
(2280, X'8E8') Configuration handle not valid.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZEP (Hconfig, Function, EntryPoint, &CompCode, &Reason);
```

Declare the parameters as follows:

```
MQHCONFIG  Hconfig;     /* Configuration handle */
MQLONG     Function;    /* Function identifier */
PMQFUNC    EntryPoint;  /* Function entry point */
MQLONG     CompCode;    /* Completion code */
MQLONG     Reason;      /* Reason code qualifying CompCode */
```

MQHCONFIG – Configuration handle

The MQHCONFIG data type represents a configuration handle, that is, the component that is being configured for a particular installable service. A configuration handle must be aligned on its natural boundary.

Note: Applications must test variables of this type for equality only.

C declaration

```
typedef void MQPOINTER MQHCONFIG;
```

PMQFUNC – Pointer to function

Pointer to a function.

C declaration

```
typedef void MQPOINTER PMQFUNC;
```

MQZ_AUTHENTICATE_USER – Authenticate user

This function is provided by a MQZAS_VERSION_5 authorization service component, and is invoked by the queue manager to authenticate a user, or to set identity context fields. It is invoked when WebSphere MQ's user application context is established. This happens during connect calls at the point where the application's user context is initialized, and at each point where the application's user context is changed. Each time a connect call is made, the application's user context information is reacquired in the *IdentityContext* field.

The function identifier for this function (for MQZEP) is MQZID_AUTHENTICATE_USER.

Syntax

MQZ_AUTHENTICATE_USER *(QMgrName, SecurityParms, ApplicationContext, IdentityContext, CorrelationPtr, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_AUTHENTICATE_USER call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

SecurityParms (MQCSP) – input:

Security parameters.

Data relating to the user ID, password, and authentication type. If the *AuthenticationType* attribute of the MQCSP structure is specified as MQCSP_AUTH_USER_ID_AND_PWD, both the user ID and password are compared against the equivalent fields in the *IdentityContext* (MQZIC) parameter to determine whether they match. For more information, see the WebSphere MQ Application Programming Reference.

During an MQCONN MQI call this parameter contains null, or default values.

ApplicationContext (MQZAC) – input:

Application context.

Data relating to the calling application. See “MQZAC – Application context” on page 458 for details.

During every MQCONN or MQCONNX MQI call, the user context information in the MQZAC structure is reacquired.

IdentityContext (MQZIC) – input/output:

Identity context.

On input to the authenticate user function, this identifies the current identity context. The authenticate user function can change this, at which point the queue manager adopts the new identity context. See “MQZIC – Identity context” on page 465 for more details on the MQZIC structure.

CorrelationPtr (MQPTR) – output:

Correlation pointer.

Specifies the address of any correlation data. This pointer is subsequently passed on to other OAM calls.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation flag.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on other components.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

C invocation

```
MQZ_AUTHENTICATE_USER (QMgrName, SecurityParms, ApplicationContext,
                  IdentityContext, &CorrelationPtr, ComponentData,
                  &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;           /* Queue manager name */
MQCSP     SecurityParms;      /* Security parameters */
MQZAC     ApplicationContext; /* Application context */
MQZIC     IdentityContext;    /* Identity context */
MQPTR     CorrelationPtr;     /* Correlation pointer */
MQBYTE    ComponentData[n];   /* Component data */
MQLONG    Continuation;       /* Continuation indicator set by
                                 component */
MQLONG    CompCode;           /* Completion code */
MQLONG    Reason;             /* Reason code qualifying CompCode */
```

MQZ_CHECK_AUTHORITY – Check authority

This function is provided by a MQZAS_VERSION_1 authorization service component, and is invoked by the queue manager to check whether an entity has authority to perform a particular action, or actions, on a specified object.

The function identifier for this function (for MQZEP) is MQZID_CHECK_AUTHORITY.

Syntax

MQZ_CHECK_AUTHORITY *(QMgrName, EntityName, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_CHECK_AUTHORITY call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityName (MQCHAR12) – input:

Entity name.

The name of the entity whose authorization to the object is to be checked. The maximum length of the string is 12 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

It is not essential for this entity to be known to the underlying security service. If it is not known, the authorizations of the special **nobody** group (to which all entities are assumed to belong) are used for the check. An all-blank name is valid and can be used in this way.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityName*. It is one of the following:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object to which access is required. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

Authority (MQLONG) – input:

Authority to be checked.

If one authorization is being checked, this field is equal to the appropriate authorization operation (MQZAO_* constant). If more than one authorization is being checked, it is the bitwise OR of the corresponding MQZAO_* constants.

The following authorizations apply to use of the MQI calls:

MQZAO_CONNECT
Ability to use the MQCONN call.

MQZAO_BROWSE
Ability to use the MQGET call with a browse option.

This allows the MQGMO_BROWSE_FIRST, MQGMO_BROWSE_MSG_UNDER_CURSOR, or MQGMO_BROWSE_NEXT option to be specified on the MQGET call.

MQZAO_INPUT
Ability to use the MQGET call with an input option.

This allows the MQOO_INPUT_SHARED, MQOO_INPUT_EXCLUSIVE, or MQOO_INPUT_AS_Q_DEF option to be specified on the MQOPEN call.

MQZAO_OUTPUT
Ability to use the MQPUT call.

This allows the MQOO_OUTPUT option to be specified on the MQOPEN call.

MQZAO_INQUIRE
Ability to use the MQINQ call.

This allows the MQOO_INQUIRE option to be specified on the MQOPEN call.

MQZAO_SET
Ability to use the MQSET call.

This allows the MQOO_SET option to be specified on the MQOPEN call.

MQZAO_PASS_IDENTITY_CONTEXT
Ability to pass identity context.

This allows the MQOO_PASS_IDENTITY_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_PASS_IDENTITY_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_PASS_ALL_CONTEXT
Ability to pass all context.

This allows the MQOO_PASS_ALL_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_PASS_ALL_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_SET_IDENTITY_CONTEXT
Ability to set identity context.

This allows the MQOO_SET_IDENTITY_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_SET_IDENTITY_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_SET_ALL_CONTEXT
Ability to set all context.

This allows the MQOO_SET_ALL_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_SET_ALL_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_ALTERNATE_USER_AUTHORITY
Ability to use alternate user authority.

This allows the MQOO_ALTERNATE_USER_AUTHORITY option to be specified on the MQOPEN call, and the MQPMO_ALTERNATE_USER_AUTHORITY option to be specified on the MQPUT1 call.

MQZAO_ALL_MQI
All of the MQI authorizations.

This enables all of the authorizations described above.

The following authorizations apply to administration of a queue manager:

MQZAO_CREATE
Ability to create objects of a specified type.

MQZAO_DELETE
Ability to delete a specified object.

MQZAO_DISPLAY
Ability to display the attributes of a specified object.

MQZAO_CHANGE
Ability to change the attributes of a specified object.

MQZAO_CLEAR
Ability to delete all messages from a specified queue.

MQZAO_AUTHORIZE
Ability to authorize other users for a specified object.

MQZAO_CONTROL
Ability to start or stop a listener, service, or non-client channel object, and the ability to ping a non-client channel object.

MQZAO_CONTROL_EXTENDED
Ability to reset a sequence number, or resolve an indoubt message on a non-client channel object.

MQZAO_ALL_ADMIN
All of the administration authorizations, other than MQZAO_CREATE.

The following authorizations apply to both use of the MQI and to administration of a queue manager:

MQZAO_ALL
All authorizations, other than MQZAO_CREATE.

MQZAO_NONE
No authorizations.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_CHECK_AUTHORITY this has the same effect as MQZCI_STOP.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_CHECK_AUTHORITY (QMgrName, EntityName, EntityType, ObjectName,
                     ObjectType, Authority, ComponentData,
                     &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR12  EntityName;        /* Entity name */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority to be checked */
```

```
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_CHECK_AUTHORITY_2 – Check authority (extended)

This function is provided by a MQZAS_VERSION_2 authorization service component, and is invoked by the queue manager to check whether an entity has authority to perform a particular action, or actions, on a specified object.

The function identifier for this function (for MQZEP) is MQZID_CHECK_AUTHORITY.

MQZ_CHECK_AUTHORITY_2 is similar to MQZ_CHECK_AUTHORITY, but with the *EntityName* parameter replaced by the *EntityData* parameter.

Syntax

MQZ_CHECK_AUTHORITY_2 *(QMgrName*, *EntityData*, *EntityType*, *ObjectName*, *ObjectType*, *Authority*, *ComponentData*, *Continuation*, *CompCode*, *Reason)*

Parameters

The MQZ_CHECK_AUTHORITY_2 call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityData (MQZED) – input:

Entity data.

Data relating to the entity whose authorization to the object is to be checked. See "MQZED – Entity descriptor" on page 464 for details.

It is not essential for this entity to be known to the underlying security service. If it is not known, the authorizations of the special **nobody** group (to which all entities are assumed to belong) are used for the check. An all-blank name is valid and can be used in this way.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityData*. It is one of the following:

MQZAET_PRINCIPAL
: Principal.

MQZAET_GROUP
: Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object to which access is required. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
: Authentication information.

MQOT_CHANNEL
: Channel.

MQOT_CLNTCONN_CHANNEL
: Client connection channel.

MQOT_LISTENER
: Listener.

MQOT_NAMELIST
: Namelist.

MQOT_PROCESS
: Process definition.

MQOT_Q
: Queue.

MQOT_Q_MGR
: Queue manager.

MQOT_SERVICE
: Service.

MQOT_TOPIC
: Topics.

Authority (MQLONG) – input:

Authority to be checked.

If one authorization is being checked, this field is equal to the appropriate authorization operation (MQZAO_* constant). If more than one authorization is being checked, it is the bitwise OR of the corresponding MQZAO_* constants.

The following authorizations apply to use of the MQI calls:

MQZAO_CONNECT
Ability to use the MQCONN call.

MQZAO_BROWSE
Ability to use the MQGET call with a browse option.

This allows the MQGMO_BROWSE_FIRST, MQGMO_BROWSE_MSG_UNDER_CURSOR, or MQGMO_BROWSE_NEXT option to be specified on the MQGET call.

MQZAO_INPUT
Ability to use the MQGET call with an input option.

This allows the MQOO_INPUT_SHARED, MQOO_INPUT_EXCLUSIVE, or MQOO_INPUT_AS_Q_DEF option to be specified on the MQOPEN call.

MQZAO_OUTPUT
Ability to use the MQPUT call.

This allows the MQOO_OUTPUT option to be specified on the MQOPEN call.

MQZAO_INQUIRE
Ability to use the MQINQ call.

This allows the MQOO_INQUIRE option to be specified on the MQOPEN call.

MQZAO_SET
Ability to use the MQSET call.

This allows the MQOO_SET option to be specified on the MQOPEN call.

MQZAO_PASS_IDENTITY_CONTEXT
Ability to pass identity context.

This allows the MQOO_PASS_IDENTITY_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_PASS_IDENTITY_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_PASS_ALL_CONTEXT
Ability to pass all context.

This allows the MQOO_PASS_ALL_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_PASS_ALL_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_SET_IDENTITY_CONTEXT
Ability to set identity context.

This allows the MQOO_SET_IDENTITY_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_SET_IDENTITY_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_SET_ALL_CONTEXT
Ability to set all context.

This allows the MQOO_SET_ALL_CONTEXT option to be specified on the MQOPEN call, and the MQPMO_SET_ALL_CONTEXT option to be specified on the MQPUT and MQPUT1 calls.

MQZAO_ALTERNATE_USER_AUTHORITY
Ability to use alternate user authority.

This allows the MQOO_ALTERNATE_USER_AUTHORITY option to be specified on the MQOPEN call, and the MQPMO_ALTERNATE_USER_AUTHORITY option to be specified on the MQPUT1 call.

MQZAO_ALL_MQI
All of the MQI authorizations.

This enables all of the authorizations described above.

The following authorizations apply to administration of a queue manager:

MQZAO_CREATE
Ability to create objects of a specified type.

MQZAO_DELETE
Ability to delete a specified object.

MQZAO_DISPLAY
Ability to display the attributes of a specified object.

MQZAO_CHANGE
Ability to change the attributes of a specified object.

MQZAO_CLEAR
Ability to delete all messages from a specified queue.

MQZAO_AUTHORIZE
Ability to authorize other users for a specified object.

MQZAO_CONTROL
Ability to start or stop a listener, service, or non-client channel object, and the ability to ping a non-client channel object.

MQZAO_CONTROL_EXTENDED
Ability to reset a sequence number, or resolve an indoubt message on a non-client channel object.

MQZAO_ALL_ADMIN
All of the administration authorizations, other than MQZAO_CREATE.

The following authorizations apply to both use of the MQI and to administration of a queue manager:

MQZAO_ALL
All authorizations, other than MQZAO_CREATE.

MQZAO_NONE
No authorizations.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_CHECK_AUTHORITY_2 this has the same effect as MQZCI_STOP.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_CHECK_AUTHORITY_2 (QMgrName, &EntityData, EntityType,
                       ObjectName, ObjectType, Authority, ComponentData,
                       &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQZED     EntityData;        /* Entity data */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority to be checked */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_COPY_ALL_AUTHORITY – Copy all authority

This function is provided by an authorization service component. It is invoked by the queue manager to copy all of the authorizations that are currently in force for a reference object to another object.

The function identifier for this function (for MQZEP) is MQZID_COPY_ALL_AUTHORITY.

Syntax

MQZ_COPY_ALL_AUTHORITY *(QMgrName, RefObjectName, ObjectName, ObjectType, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_COPY_ALL_AUTHORITY call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

RefObjectName (MQCHAR48) – input:

Reference object name.

The name of the reference object, the authorizations for which are to be copied. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object for which accesses are to be set. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

ObjectType (MQLONG) – input:

Object type.

The type of object specified by *RefObjectName* and *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_COPY_ALL_AUTHORITY this has the same effect as MQZCI_STOP.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
: Successful completion.

MQCC_FAILED
: Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
: (0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR
: (2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
: (2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_REF_OBJECT
: (2294, X'8F6') Reference object unknown.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_COPY_ALL_AUTHORITY (QMgrName, RefObjectName, ObjectName, ObjectType,
                        ComponentData, &Continuation, &CompCode,
                        &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR48  RefObjectName;     /* Reference object name */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_DELETE_AUTHORITY – Delete authority

This function is provided by an authorization service component, and is invoked by the queue manager to delete all of the authorizations associated with the specified object.

The function identifier for this function (for MQZEP) is MQZID_DELETE_AUTHORITY.

Syntax

MQZ_DELETE_AUTHORITY *(QMgrName, ObjectName, ObjectType, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_DELETE_AUTHORITY call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object for which accesses are to be deleted. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
    Service.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
    Continuation dependent on queue manager.

    For MQZ_DELETE_AUTHORITY this has the same effect as MQZCI_STOP.

MQZCI_CONTINUE
    Continue with next component.

MQZCI_STOP
    Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
    Successful completion.

MQCC_FAILED
    Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
    (0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR
    (2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
    (2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_DELETE_AUTHORITY (QMgrName, ObjectName, ObjectType, ComponentData,
                     &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_ENUMERATE_AUTHORITY_DATA – Enumerate authority data

This function is provided by an MQZAS_VERSION_4 authorization service component, and is invoked repeatedly by the queue manager to retrieve all of the authority data that matches the selection criteria specified on the first invocation.

The function identifier for this function (for MQZEP) is MQZID_ENUMERATE_AUTHORITY_DATA.

Syntax

MQZ_ENUMERATE_AUTHORITY_DATA *(QMgrName, StartEnumeration, Filter, AuthorityBufferLength, AuthorityBuffer, AuthorityDataLength, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_ENUMERATE_AUTHORITY_DATA call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

StartEnumeration (MQLONG) – input:

Flag indicating whether call should start enumeration.

This indicates whether the call should start the enumeration of authority data, or continue the enumeration of authority data started by a previous call to MQZ_ENUMERATE_AUTHORITY_DATA. The value is one of the following:

MQZSE_START

Start enumeration.

The call is invoked with this value to start the enumeration of authority data. The *Filter* parameter specifies the selection criteria to be used to select the authority data returned by this and successive calls.

MQZSE_CONTINUE

Continue enumeration.

The call is invoked with this value to continue the enumeration of authority data. The *Filter* parameter is ignored in this case, and can be specified as the null pointer (the selection criteria are determined by the *Filter* parameter specified by the call that had *StartEnumeration* set to MQZSE_START).

Filter (MQZAD) – input:

Filter.

If *StartEnumeration* is MQZSE_START, *Filter* specifies the selection criteria to be used to select the authority data to return. If *Filter* is the null pointer, no selection criteria are used, that is, all authority data is returned. See "MQZAD – Authority data" on page 461 for details of the selection criteria that can be used.

If *StartEnumeration* is MQZSE_CONTINUE, *Filter* is ignored, and can be specified as the null pointer.

AuthorityBufferLength (MQLONG) – input:

Length of *AuthorityBuffer*.

This is the length in bytes of the *AuthorityBuffer* parameter. The authority buffer must be big enough to accommodate the data to be returned.

AuthorityBuffer (MQZAD) – output:

Authority data.

This is the buffer in which the authority data is returned. The buffer must be big enough to accommodate an MQZAD structure, an MQZED structure, plus the longest entity name and longest domain name defined.

Note: This parameter is defined as an MQZAD, as the MQZAD always occurs at the start of the buffer. However, if the buffer is actually declared as an MQZAD, the buffer will be too small – it needs to be bigger than an MQZAD so that it can accommodate the MQZAD, MQZED, plus entity and domain names.

AuthorityDataLength (MQLONG) – output:

Length of data returned in *AuthorityBuffer*.

This is the length of the data returned in *AuthorityBuffer*. If the authority buffer is too small, *AuthorityDataLength* is set to the length of the buffer required, and the call returns completion code MQCC_FAILED and reason code MQRC_BUFFER_LENGTH_ERROR.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_ENUMERATE_AUTHORITY_DATA this has the same effect as MQZCI_CONTINUE.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_BUFFER_LENGTH_ERROR
(2005, X'7D5') Buffer length parameter not valid.

MQRC_NO_DATA_AVAILABLE
(2379, X'94B') No data available.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_ENUMERATE_AUTHORITY_DATA (QMgrName, StartEnumeration, &Filter,
                              AuthorityBufferLength,
                              &AuthorityBuffer,
                              &AuthorityDataLength, ComponentData,
                              &Continuation, &CompCode,
                              &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;              /* Queue manager name */
MQLONG    StartEnumeration;      /* Flag indicating whether call should
                                    start enumeration */
MQZAD     Filter;                /* Filter */
MQLONG    AuthorityBufferLength; /* Length of AuthorityBuffer */
MQZAD     AuthorityBuffer;       /* Authority data */
MQLONG    AuthorityDataLength;   /* Length of data returned in
                                    AuthorityBuffer */
MQBYTE    ComponentData[n];      /* Component data */
MQLONG    Continuation;          /* Continuation indicator set by
                                    component */
MQLONG    CompCode;              /* Completion code */
MQLONG    Reason;                /* Reason code qualifying CompCode */
```

MQZ_FREE_USER – Free user

This function is provided by a MQZAS_VERSION_5 authorization service component, and is invoked by the queue manager to free associated allocated resource. It is invoked when an application has finished running under all user contexts, for example during an MQDISC MQI call.

The function identifier for this function (for MQZEP) is MQZID_FREE_USER.

Syntax

MQZ_FREE_USER *(QMgrName, FreeParms, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_FREE_USER call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

FreeParms (MQZFP) – input:

Free parameters.

A structure containing data relating to the resource to be freed. See "MQZFP – Free parameters" on page 467 for details.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

Continuation (MQLONG) – output:

Continuation flag.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on other components.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

C invocation

```
MQZ_AUTHENTICATE_USER (QMgrName, SecurityParms, ApplicationContext,
                    IdentityContext, CorrelationPtr, ComponentData,
                    &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQZFP     FreeParms;         /* Resource to be freed */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
```

```
                                     component */
MQLONG    CompCode;           /* Completion code */
MQLONG    Reason;             /* Reason code qualifying CompCode */
```

MQZ_GET_AUTHORITY – Get authority

This function is provided by a MQZAS_VERSION_1 authorization service component, and is invoked by the queue manager to retrieve the authority that an entity has to access the specified object.

The function identifier for this function (for MQZEP) is MQZID_GET_AUTHORITY.

Syntax

MQZ_GET_AUTHORITY *(QMgrName, EntityName, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_GET_AUTHORITY call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityName (MQCHAR12) – input:

Entity name.

The name of the entity whose access to the object is to be retrieved. The maximum length of the string is 12 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityName*. The following value can be specified:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object for which the entity's authority is to be retrieved. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

Authority (MQLONG) – output:

Authority of entity.

If the entity has one authority, this field is equal to the appropriate authorization operation (MQZAO_* constant). If it has more than one authority, this field is the bitwise OR of the corresponding MQZAO_* constants.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_GET_AUTHORITY this has the same effect as MQZCI_CONTINUE.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_ENTITY
(2292, X'8F4') Entity unknown to service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_GET_AUTHORITY (QMgrName, EntityName, EntityType, ObjectName,
                   ObjectType, &Authority, ComponentData,
                   &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR12  EntityName;        /* Entity name */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority of entity */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_GET_AUTHORITY_2 – Get authority (extended)

This function is provided by a MQZAS_VERSION_2 authorization service component, and is invoked by the queue manager to retrieve the authority that an entity has to access the specified object.

The function identifier for this function (for MQZEP) is MQZID_GET_AUTHORITY.

MQZ_GET_AUTHORITY_2 is similar to MQZ_GET_AUTHORITY, but with the *EntityName* parameter replaced by the *EntityData* parameter.

Syntax

MQZ_GET_AUTHORITY_2 *(QMgrName, EntityData, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_GET_AUTHORITY_2 call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityData (MQZED) – input:

Entity data.

Data relating to the entity whose access to the object is to be retrieved. See “MQZED – Entity descriptor” on page 464 for details.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityData*. The following value can be specified:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object for which the entity's authority is to be retrieved. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

Authority (MQLONG) – output:

Authority of entity.

If the entity has one authority, this field is equal to the appropriate authorization operation (MQZAO_* constant). If it has more than one authority, this field is the bitwise OR of the corresponding MQZAO_* constants.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_GET_AUTHORITY_2 this has the same effect as MQZCI_CONTINUE.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_ENTITY
(2292, X'8F4') Entity unknown to service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_GET_AUTHORITY_2 (QMgrName, &EntityData, EntityType, ObjectName,
                    ObjectType, &Authority, ComponentData,
                    &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQZED     EntityData;        /* Entity data */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority of entity */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_GET_EXPLICIT_AUTHORITY – Get explicit authority

This function is provided by a MQZAS_VERSION_1 authorization service component, and is invoked by the queue manager to retrieve the authority that a named group has to access a specified object (but without the additional authority of the **nobody** group), or the authority that the primary group of the named principal has to access a specified object.

The function identifier for this function (for MQZEP) is MQZID_GET_EXPLICIT_AUTHORITY.

Syntax

MQZ_GET_EXPLICIT_AUTHORITY *(QMgrName, EntityName, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_GET_EXPLICIT_AUTHORITY call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityName (MQCHAR12) – input:

Entity name.

The name of the entity whose access to the object is to be retrieved. The maximum length of the string is 12 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityName*. The following value can be specified:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object for which the entity's authority is to be retrieved. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

Authority (MQLONG) – output:

Authority of entity.

If the entity has one authority, this field is equal to the appropriate authorization operation (MQZAO_* constant). If it has more than one authority, this field is the bitwise OR of the corresponding MQZAO_* constants.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
: Continuation dependent on queue manager.

  For MQZ_GET_EXPLICIT_AUTHORITY this has the same effect as MQZCI_CONTINUE.

MQZCI_CONTINUE
: Continue with next component.

MQZCI_STOP
: Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
: Successful completion.

MQCC_FAILED
: Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
: (0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_ENTITY
(2292, X'8F4') Entity unknown to service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_GET_EXPLICIT_AUTHORITY (QMgrName, EntityName, EntityType,
                            ObjectName, ObjectType, &Authority,
                            ComponentData, &Continuation,
                            &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR12  EntityName;        /* Entity name */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority of entity */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_GET_EXPLICIT_AUTHORITY_2 – Get explicit authority (extended)

This function is provided by a MQZAS_VERSION_2 authorization service component, and is invoked by the queue manager to retrieve the authority that a named group has to access a specified object (but without the additional authority of the **nobody** group), or the authority that the primary group of the named principal has to access a specified object.

The function identifier for this function (for MQZEP) is MQZID_GET_EXPLICIT_AUTHORITY.

MQZ_GET_EXPLICIT_AUTHORITY_2 is similar to MQZ_GET_EXPLICIT_AUTHORITY, but with the *EntityName* parameter replaced by the *EntityData* parameter.

Syntax

MQZ_GET_EXPLICIT_AUTHORITY_2 *(QMgrName, EntityData, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_GET_EXPLICIT_AUTHORITY_2 call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityData (MQZED) – input:

Entity data.

Data relating to the entity whose access to the object is to be retrieved. See "MQZED – Entity descriptor" on page 464 for details.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityData*. The following value can be specified:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object for which the entity's authority is to be retrieved. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

Authority (MQLONG) – output:

Authority of entity.

If the entity has one authority, this field is equal to the appropriate authorization operation (MQZAO_* constant). If it has more than one authority, this field is the bitwise OR of the corresponding MQZAO_* constants.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the `ComponentDataLength` parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_GET_EXPLICIT_AUTHORITY_2 this has the same effect as MQZCI_CONTINUE.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
: Successful completion.

MQCC_FAILED
: Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
: (0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
: (2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
: (2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
: (2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_ENTITY
: (2292, X'8F4') Entity unknown to service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_GET_EXPLICIT_AUTHORITY_2 (QMgrName, &EntityData, EntityType,
                              ObjectName, ObjectType, &Authority,
                              ComponentData, &Continuation,
                              &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQZED     EntityData;        /* Entity data */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority of entity */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_INIT_AUTHORITY – Initialize authorization service

This function is provided by an authorization service component, and is invoked by the queue manager during configuration of the component. It is expected to call MQZEP in order to provide information to the queue manager.

The function identifier for this function (for MQZEP) is MQZID_INIT_AUTHORITY.

Syntax

MQZ_INIT_AUTHORITY *(Hconfig, Options, QMgrName, ComponentDataLength, ComponentData, Version, CompCode, Reason)*

Parameters

The MQZ_INIT_AUTHORITY call has the following parameters.

Hconfig (MQHCONFIG) – input:

Configuration handle.

This handle represents the particular component being initialized. It is to be used by the component when calling the queue manager with the MQZEP function.

Options (MQLONG) – input:

Initialization options.

It is one of the following:

MQZIO_PRIMARY
Primary initialization.

MQZIO_SECONDARY
Secondary initialization.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

ComponentDataLength (MQLONG) – input:

Length of component data.

Length in bytes of the *ComponentData* area. This length is defined in the component configuration data.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This is initialized to all zeroes before calling the component’s primary initialization function. This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions (including the initialization function) provided by this component are preserved, and presented the next time one of this component’s functions is called.

Version (MQLONG) – input/output:

Version number.

On input to the initialization function, this identifies the *highest* version number that the queue manager supports. The initialization function must change this, if necessary, to the version of the interface which *it* supports. If on return the queue manager does not support the version returned by the component, it calls the component's MQZ_TERM_AUTHORITY function and makes no further use of this component.

The following values are supported:

MQZAS_VERSION_1
Version 1.

MQZAS_VERSION_2
Version 2.

MQZAS_VERSION_3
Version 3.

MQZAS_VERSION_4
Version 4.

MQZAS_VERSION_5
Version 5.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_INITIALIZATION_FAILED
(2286, X'8EE') Initialization failed for an undefined reason.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_INIT_AUTHORITY (Hconfig, Options, QMgrName, ComponentDataLength,
                   ComponentData, &Version, &CompCode,
                   &Reason);
```

The parameters passed to the service are declared as follows:

```
MQHCONFIG  Hconfig;              /* Configuration handle */
MQLONG     Options;              /* Initialization options */
MQCHAR48   QMgrName;             /* Queue manager name */
MQLONG     ComponentDataLength;  /* Length of component data */
MQBYTE     ComponentData[n];     /* Component data */
MQLONG     Version;              /* Version number */
MQLONG     CompCode;             /* Completion code */
MQLONG     Reason;               /* Reason code qualifying CompCode */
```

MQZ_INQUIRE – Inquire authorization service

This function is provided by a MQZAS_VERSION_5 authorization service component, and is invoked by the queue manager to query the supported functionality. Where multiple service components are used, service components are called in reverse order to the order they were installed in.

The function identifier for this function (for MQZEP) is MQZID_INQUIRE.

Syntax

MQZ_INQUIRE
(QMgrName, SelectorCount, Selectors, IntAttrCount, IntAttrs, CharAttrLength, CharAttrs, SelectorReturned, ComponentData, Continuation, CompCode, Reason)

Parameters

The MQZ_INQUIRE call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

SelectorCount (MQLONG) – input:

Number of selectors.

The number of selectors supplied in the Selectors parameter.

The value must be between zero and 256.

Selectors (MQLONG×SelectorCount) – input:

Selectors.

Array of selectors. Each selector identifies a required attribute and must be of one of the following types:

- MQIACF_* (integer)
- MQCACF_* (character)

Selectors can be specified in any order. The number of selectors in the array is indicated by the SelectorCount parameter.

Integer attributes identified by selectors are returned in the IntAttrs parameter in the same order as they appear in Selectors.

Character attributes identified by selectors are returned in the CharAttrs parameter in the same order as they in appear Selectors.

IntAttrCount (MQLONG) – input:

Number of integer attributes.

The number of integer attributes supplied in the IntAttrs parameter.

The value must be between zero and 256.

IntAttrs (MQLONG×IntAttrCount) – output:

Integer attributes.

Array of integer attributes. The integer attributes are returned in the same order as the corresponding integer selectors in the Selectors array.

CharAttrCount (MQLONG) – input:

Length of the character attributes buffer.

The length in bytes of the CharAttrs parameter.

The value must at least sum of the lengths of the requested character attributes. If no character attributes are requested, zero is a valid value.

CharAttrs (MQLONG×CharAttrCount) – output:

Character attributes buffer.

Buffer containing character attributes, concatenated together. The character attributes are returned in the same order as the corresponding character selectors in the Selectors array.

The length of the buffer is given by the CharAttrCount parameter.

SelectorReturned (MQLONG×SelectorCount) – input:

Selector returned.

Array of values identifying which attributes have been returned from the set requested for by the selectors in the Selectors parameter. The number of values in this array is indicated by the SelectorCount parameter. Each value in the array relates to the selector from the corresponding position in the Selectors array. Each value is one of the following:

MQZSL_RETURNED
: The attribute requested by the corresponding selector in the Selectors parameter has been returned.

MQZSL_NOT_RETURNED
: The attribute requested by the corresponding selector in the Selectors parameter has not been returned.

The array is initialized with all values as *MQZSL_NOT_RETURNED*. When an authorization service component returns an attribute, it sets the appropriate value in the array to *MQZSL_RETURNED*. This allows any other authorization service components, to which the inquire call is made, to identify which attributes have already been returned.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation flag.

The following values can be specified:

MQZCI_DEFAULT
: Continuation dependent on other components.

MQZCI_STOP
: Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
: Successful completion.

MQCC_WARNING
: Partial completion.

MQCC_FAILED
: Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_WARNING:

MQRC_CHAR_ATTRS_TOO_SHORT
Not enough space for character attributes.

MQRC_INT_COUNT_TOO_SMALL
Not enough space for integer attributes.

If *CompCode* is MQCC_FAILED:

MQRC_SELECTOR_COUNT_ERROR
Number of selectors is not valid.

MQRC_SELECTOR_ERROR
Attribute selector not valid.

MQRC_SELECTOR_LIMIT_EXCEEDED
Too many selectors specified.

MQRC_INT_ATTR_COUNT_ERROR
Number of integer attributes is not valid.

MQRC_INT_ATTRS_ARRAY_ERROR
Integer attributes array not valid.

MQRC_CHAR_ATTR_LENGTH_ERROR
Number of character attributes is not valid.

MQRC_CHAR_ATTRS_ERROR
Character attributes string is not valid.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

C invocation

```
MQZ_INQUIRE (QMgrName, SelectorCount, Selectors, IntAttrCount,
                   &IntAttrs, CharAttrLength, &CharAttrs,
                   SelectorReturned, ComponentData, &Continuation,
                   &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48   QMgrName;               /* Queue manager name */
MQLONG     SelectorCount;          /* Selector count */
MQLONG     Selectors[n];           /* Selectors */
MQLONG     IntAttrCount;           /* IntAttrs count */
MQLONG     IntAttrs[n];            /* Integer attributes */
MQLONG     CharAttrCount;          /* CharAttrs count */
MQLONG     CharAttrs[n];           /* Chatacter attributes */
MQLONG     SelectorReturned[n];    /* Selector returned */
MQBYTE     ComponentData[n];       /* Component data */
MQLONG     Continuation;           /* Continuation indicator set by
                                      component */
MQLONG     CompCode;               /* Completion code */
MQLONG     Reason;                 /* Reason code qualifying CompCode */
```

MQZ_REFRESH_CACHE – Refresh all authorizations

This function is provided by an MQZAS_VERSION_3 authorization service component, and is invoked by the queue manager to refresh the list of authorizations held internally by the component.

The function identifier for this function (for MQZEP) is MQZID_REFRESH_CACHE (8L).

Syntax

MQZ_REFRESH_CACHE *(QMgrName*, *ComponentData*, *Continuation*, *CompCode*, *Reason)*

Parameters

QMgrName **(MQCHAR48) — input**

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

ComponentData **(MQBYTE×***ComponentDataLength***) — input/output**

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation **(MQLONG) — output**

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT

Continuation dependent on queue manager.

For MQZ_REFRESH_CACHE this has the same effect as MQZCI_CONTINUE.

MQZCI_CONTINUE

Continue with next component.

MQZCI_STOP

Do not continue with next component.

CompCode **(MQLONG) — output**

Completion code.

It is one of the following:

MQCC_OK

Successful completion.

MQCC_FAILED

Call failed.

Reason **(MQLONG) — output**

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE

(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR

(2289, X'8F1') Unexpected error occurred accessing service.

For more information on this reason code, see the WebSphere MQ Application Programming Reference book.

C invocation

```
MQZ_REFRESH_CACHE (QMgrName, ComponentData,
                   &Continuation, &CompCode, &Reason);
```

Declare the parameters as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_SET_AUTHORITY – Set authority

This function is provided by a MQZAS_VERSION_1 authorization service component, and is invoked by the queue manager to set the authority that an entity has to access the specified object.

The function identifier for this function (for MQZEP) is MQZID_SET_AUTHORITY.

Note: This function overrides any existing authorities. To preserve any existing authorities you must set them again with this function.

Syntax

MQZ_SET_AUTHORITY *(QMgrName, EntityName, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_SET_AUTHORITY call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityName (MQCHAR12) – input:

Entity name.

The name of the entity whose access to the object is to be set. The maximum length of the string is 12 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityName*. The following value can be specified:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object to which access is required. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

Authority (MQLONG) – input:

Authority to be checked.

If one authorization is being set, this field is equal to the appropriate authorization operation (MQZAO_* constant). If more than one authorization is being set, it is the bitwise OR of the corresponding MQZAO_* constants.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_SET_AUTHORITY this has the same effect as MQZCI_STOP.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_ENTITY
(2292, X'8F4') Entity unknown to service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_SET_AUTHORITY (QMgrName, EntityName, EntityType, ObjectName,
                   ObjectType, Authority, ComponentData,
                   &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR12  EntityName;        /* Entity name */
MQLONG    EntityType;        /* Entity type */
MQCHAR48  ObjectName;        /* Object name */
MQLONG    ObjectType;        /* Object type */
MQLONG    Authority;         /* Authority to be checked */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_SET_AUTHORITY_2 – Set authority (extended)

This function is provided by a MQZAS_VERSION_2 authorization service component, and is invoked by the queue manager to set the authority that an entity has to access the specified object.

The function identifier for this function (for MQZEP) is MQZID_SET_AUTHORITY.

Note: This function overrides any existing authorities. To preserve any existing authorities you must set them again with this function.

MQZ_SET_AUTHORITY_2 is similar to MQZ_SET_AUTHORITY, but with the *EntityName* parameter replaced by the *EntityData* parameter.

Syntax

MQZ_SET_AUTHORITY_2 *(QMgrName, EntityData, EntityType, ObjectName, ObjectType, Authority, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_SET_AUTHORITY_2 call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

EntityData (MQZED) – input:

Entity data.

Data relating to the entity whose access to the object is to be set. See "MQZED – Entity descriptor" on page 464 for details.

EntityType (MQLONG) – input:

Entity type.

The type of entity specified by *EntityData*. The following value can be specified:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

ObjectName (MQCHAR48) – input:

Object name.

The name of the object to which access is required. The maximum length of the string is 48 characters; if it is shorter than that it is padded to the right with blanks. The name is not terminated by a null character.

If *ObjectType* is MQOT_Q_MGR, this name is the same as *QMgrName*.

ObjectType (MQLONG) – input:

Object type.

The type of entity specified by *ObjectName*. It is one of the following:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

MQOT_TOPIC
Topic.

Authority (MQLONG) – input:

Authority to be checked.

If one authorization is being set, this field is equal to the appropriate authorization operation (MQZAO_* constant). If more than one authorization is being set, it is the bitwise OR of the corresponding MQZAO_* constants.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the `ComponentDataLength` parameter of the MQZ_INIT_AUTHORITY call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

For MQZ_SET_AUTHORITY_2 this has the same effect as MQZCI_STOP.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_NOT_AUTHORIZED
(2035, X'7F3') Not authorized for access.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_ENTITY
(2292, X'8F4') Entity unknown to service.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_SET_AUTHORITY_2 (QMgrName, &EntityData, EntityType, ObjectName,
                    ObjectType, Authority, ComponentData,
                    &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;         /* Queue manager name */
MQZED     EntityData;       /* Entity data */
MQLONG    EntityType;       /* Entity type */
MQCHAR48  ObjectName;       /* Object name */
MQLONG    ObjectType;       /* Object type */
MQLONG    Authority;        /* Authority to be checked */
MQBYTE    ComponentData[n]; /* Component data */
MQLONG    Continuation;     /* Continuation indicator set by
                               component */
MQLONG    CompCode;         /* Completion code */
MQLONG    Reason;           /* Reason code qualifying CompCode */
```

MQZ_TERM_AUTHORITY – Terminate authorization service

This function is provided by an authorization service component, and is invoked by the queue manager when it no longer requires the services of this component. The function must perform any cleanup required by the component.

The function identifier for this function (for MQZEP) is MQZID_TERM_AUTHORITY.

Syntax

MQZ_TERM_AUTHORITY *(Hconfig, Options, QMgrName, ComponentData,*
CompCode, Reason)

Parameters

The MQZ_TERM_AUTHORITY call has the following parameters.

Hconfig (MQHCONFIG) – input:

Configuration handle.

This handle represents the particular component being terminated.

Options (MQLONG) – input:

Termination options.

It is one of the following:

MQZTO_PRIMARY
Primary termination.

MQZTO_SECONDARY
Secondary termination.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the authorization service interface does not require the component to make use of it in any defined manner.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter on the MQZ_INIT_AUTHORITY call.

When the MQZ_TERM_AUTHORITY call has completed, the queue manager discards this data.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
: Successful completion.

MQCC_FAILED
: Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
: (0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_NOT_AVAILABLE
: (2285, X'8ED') Underlying service not available.

MQRC_TERMINATION_FAILED
: (2287, X'8FF') Termination failed for an undefined reason.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_TERM_AUTHORITY (Hconfig, Options, QMgrName, ComponentData,
                    &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQHCONFIG  Hconfig;          /* Configuration handle */
MQLONG     Options;          /* Termination options */
MQCHAR48   QMgrName;         /* Queue manager name */
MQBYTE     ComponentData[n]; /* Component data */
MQLONG     CompCode;         /* Completion code */
MQLONG     Reason;           /* Reason code qualifying CompCode */
```

MQZAC – Application context

The MQZAC structure is used on the MQZ_AUTHENTICTAE_USER call for the *ApplicationContext* parameter. This parameter specifies data related to the calling application

Fields

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQZAC_STRUC_ID
: Identifier for application context structure.

: For the C programming language, the constant MQZAC_STRUC_ID_ARRAY is also defined; this has the same value as MQZAC_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the service.

Version (MQLONG):

Structure version number.

The value is:

MQZAC_VERSION_1
Version-1 application context structure.

The following constant specifies the version number of the current version:

MQZAC_CURRENT_VERSION
Current version of application context structure.

This is an input field to the service.

ProcessId (MQPID):

Process identifier.

The process identifier of the application.

ThreadId (MQTID):

Thread identifier.

The thread identifier of the application.

ApplName (MQCHAR28):

Application name.

The application name.

UserID (MQCHAR12):

User identifier.

On UNIX systems this field specifies the application's real user ID. On Windows this field specifies the application's user ID.

EffectiveUserID (MQCHAR12):

Effective user identifier.

On UNIX systems this field specifies the application's effective user ID. On Windows this field is blank.

Environment (MQLONG):

Environment.

This field specifies the environment from which the call was made.

The value is one of the following:

MQXE_COMMAND_SERVER
Command server.

MQXE_MQSC
: **runmqsc** command interpreter.

MQXE_MCA
: Message channel agent

MQXE_OTHER
: Undefined environment

CallerType (MQLONG):

Caller Type.

This field specifies the type of program that made the call.

The value is one of the following:

MQXACT_EXTERNAL
: The call is external to the queue manager.

MQXACT_INTERNAL
: The call is internal to the queue manager.

AuthenticationType (MQLONG):

Authentication Type.

This field specifies the type of authentication being performed.

The value is one of the following:

MQZAT_INITIAL_CONTEXT
: The authentication call is due to user context being initialized. This value is used during an **MQCONN** or **MQCONNX** call.

MQZAT_CHANGE_CONTEXT
: The authentication call is due to the user context being changed. This value is used when the MCA changes the user context.

BindType (MQLONG):

Bind Type.

This field specifies the type of binding in use.

The value is one of the following:

MQCNO_FASTPATH_BINDING
: Fastpath binding.

MQCNO_SHARED_BINDING
: Shared binding.

MQCNO_ISOLATED_BINDING
: Isolated binding.

C declaration

```
typedef struct tagMQZAC MQZAC;
struct tagMQZAC {
  MQCHAR4   StrucId;           /* Structure identifier */
  MQLONG    Version;           /* Structure version number */
  MQPID     ProcessId;          /* Process identifier */
  MQTID     ThreadId;           /* Thread identifier */
  MQCHAR28  ApplName;           /* Application name */
  MQCHAR12  UserID;             /* User identifier */
  MQCHAR12  EffectiveUserID;    /* Effective user identifier */
  MQLONG    Environment;        /* Environment */
  MQLONG    CallerType;         /* Caller type */
  MQLONG    AuthenticationType; /* Authentication type */
  MQLONG    BindType;           /* Bind type */
};
```

MQZAD – Authority data

The MQZAD structure is used on the MQZ_ENUMERATE_AUTHORITY_DATA call for two parameters:

- MQZAD is used for the *Filter* parameter which is input to the call. This parameter specifies the selection criteria that are to be used to select the authority data returned by the call.
- MQZAD is also used for the *AuthorityBuffer* parameter which is output from the call. This parameter specifies the authorizations for one combination of profile name, object type, and entity.

Fields

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQZAD_STRUC_ID
Identifier for authority data structure.

For the C programming language, the constant MQZAD_STRUC_ID_ARRAY is also defined; this has the same value as MQZAD_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the service.

Version (MQLONG):

Structure version number.

The value is:

MQZAD_VERSION_1
Version-1 authority data structure.

The following constant specifies the version number of the current version:

MQZAD_CURRENT_VERSION
Current version of authority data structure.

This is an input field to the service.

ProfileName (MQCHAR48):

Profile name.

For the *Filter* parameter, this field is the profile name whose authority data is required. If the name is entirely blank up to the end of the field or the first null character, authority data for all profile names is returned.

For the *AuthorityBuffer* parameter, this field is the name of a profile that matches the specified selection criteria.

ObjectType (MQLONG):

Object type.

For the *Filter* parameter, this field is the object type for which authority data is required. If the value is MQOT_ALL, authority data for all object types is returned.

For the *AuthorityBuffer* parameter, this field is the object type to which the profile identified by *ProfileName* applies.

The value is one of the following; for the *Filter* parameter, the value MQOT_ALL is also valid:

MQOT_AUTH_INFO
Authentication information.

MQOT_CHANNEL
Channel.

MQOT_CLNTCONN_CHANNEL
Client connection channel.

MQOT_LISTENER
Listener.

MQOT_NAMELIST
Namelist.

MQOT_PROCESS
Process definition.

MQOT_Q
Queue.

MQOT_Q_MGR
Queue manager.

MQOT_SERVICE
Service.

Authority (MQLONG):

Authority.

For the *Filter* parameter, this field is ignored.

For the *AuthorityBuffer* parameter, this field represents the authorizations that the entity has to the objects identified by *ProfileName* and *ObjectType*. If the entity has only one authority, the field is equal to the appropriate authorization value (MQZAO_* constant). If the entity has more than one authority, the field is the bitwise OR of the corresponding MQZAO_* constants.

EntityDataPtr (PMQZED):

Address of MQZED structure identifying an entity.

For the *Filter* parameter, this field points to an MQZED structure that identifies the entity whose authority data is required. If *EntityDataPtr* is the null pointer, authority data for all entities is returned.

For the *AuthorityBuffer* parameter, this field points to an MQZED structure that identifies the entity whose authority data has been returned.

EntityType (MQLONG):

Entity type.

For the *Filter* parameter, this field specifies the entity type for which authority data is required. If the value is MQZAET_NONE, authority data for all entity types is returned.

For the *AuthorityBuffer* parameter, this field specifies the type of the entity identified by the MQZED structure pointed to by *EntityDataPtr*.

The value is one of the following; for the *Filter* parameter, the value MQZAET_NONE is also valid:

MQZAET_PRINCIPAL
Principal.

MQZAET_GROUP
Group.

Options (MQAUTHOPT):

Options.

This field specifies options that give control over the profiles that are displayed.

One of the following must be specified:

MQAUTHOPT_NAME_ALL_MATCHING
Displays all profiles

MQAUTHOPT_NAME_EXPLICIT
Displays profiles that have exactly the same name as specified in the *ProfileName* field.

In addition, one of the following must also be specified:

MQAUTHOPT_ENTITY_SET
Display all profiles used to calculate the cumulative authority that the entity has to the object specified by *ProfileName*. The *ProfileName* field must not contain any wildcard characters.

- If the specified entity is a principal, for each member of the set {entity, groups} the most applicable profile that applies to the object is displayed.
- If the specified entity is a group, the most applicable profile from the group that applies to the object is displayed.
- If this value is specified, then the values of *ProfileName*, *ObjectType*, *EntityType*, and the entity name specified in the *EntityDataPtr* MQZED structure, must all be non-blank.

If you have specified *MQAUTHOPT_NAME_ALL_MATCHING*, you can also specify the following:

MQAUTHOPT_ENTITY_EXPLICIT
Displays profiles that have exactly the same entity name as the entity name specified in the *EntityDataPtr* MQZED structure.

C declaration

```
typedef struct tagMQZAD MQZAD;
struct tagMQZAD {
  MQCHAR4   StrucId;        /* Structure identifier */
  MQLONG    Version;        /* Structure version number */
  MQCHAR48  ProfileName;    /* Profile name */
  MQLONG    ObjectType;     /* Object type */
  MQLONG    Authority;      /* Authority */
  PMQZED    EntityDataPtr;  /* Address of MQZED structure identifying an
                               entity */
  MQLONG    EntityType;     /* Entity type */
  MQAUTHOPT Options;        /* Options */
};
```

MQZED – Entity descriptor

The MQZED structure describes the information that is passed to the MQZAS_VERSION_2 authorization service calls.

Fields

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQZED_STRUC_ID
Identifier for entity descriptor structure.

For the C programming language, the constant MQZED_STRUC_ID_ARRAY is also defined; this has the same value as MQZED_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the service.

Version (MQLONG):

Structure version number.

The value is:

MQZED_VERSION_1
Version-1 entity descriptor structure.

The following constant specifies the version number of the current version:

MQZED_CURRENT_VERSION
Current version of entity descriptor structure.

This is an input field to the service.

EntityNamePtr (PMQCHAR):

Address of entity name.

This is a pointer to the name of the entity whose authorization is to be checked.

EntityDomainPtr (PMQCHAR):

Address of entity domain name.

This is a pointer to the name of the domain containing the definition of the entity whose authorization is to be checked.

SecurityId (MQBYTE40):

Security identifier.

This is the security identifier whose authorization is to be checked.

CorrelationPtr (MQPTR):

Correlation pointer.

This facilitates the passing of correlational data between the authenticate user function and other appropriate OAM functions.

C declaration

```
typedef struct tagMQZED MQZED;
struct tagMQZED {
  MQCHAR4   StrucId;          /* Structure identifier */
  MQLONG    Version;          /* Structure version number */
  PMQCHAR   EntityNamePtr;    /* Address of entity name */
  PMQCHAR   EntityDomainPtr;  /* Address of entity domain name */
  MQBYTE40  SecurityId;       /* Security identifier */
  MQPTR     CorrelationPtr;   /* Address of correlation data */
```

MQZIC – Identity context

The MQZIC structure is used on the MQZ_AUTHENTICATE_USER call for the *IdentityContext* parameter.

The MQZIC structure contains identity context information, that identifies the user of the application that first put the message on a queue:

- The queue manager fills the UserIdentifier field with a name that identifies the user, the way that the queue manager can do this depends on the environment in which the application is running.
- The queue manager fills the AccountingToken field with a token or number that it determined from the application that put the message.
- Applications can use the ApplIdentityData field for any extra information that they want to include about the user (for example, an encrypted password).

Suitably authorized applications may set the identity context using the MQZ_AUTHENTICTAE_USER function.

A Windows systems security identifier (SID) is stored in the AccountingToken field when a message is created under WebSphere MQ for Windows. The SID can be used to supplement the UserIdentifier field and to establish the credentials of a user.

Fields

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQZIC_STRUC_ID
: Identifier for identity context structure.

  For the C programming language, the constant MQZIC_STRUC_ID_ARRAY is also defined; this has the same value as MQZIC_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the service.

Version (MQLONG):

Structure version number.

The value is:

MQZIC_VERSION_1
: Version-1 identity context structure.

The following constant specifies the version number of the current version:

MQZIC_CURRENT_VERSION
: Current version of identity context structure.

This is an input field to the service.

UserIdentifier (MQCHAR12):

User identifier.

This is part of the **identity context** of the message.

UserIdentifier specifies the user identifier of the application that originated the message. The queue manager treats this information as character data, but does not define the format of it. For more information on the *UserIdentifier* field, see WebSphere MQ Application Programming Reference.

AccountingToken (MQBYTE32):

Accounting token.

This is part of the **identity context** of the message.

AccountingToken allows an application to cause work done as a result of the message to be appropriately charged. The queue manager treats this information as a string of bits and does not check its content. For more information on the *AccountingToken* field, see WebSphere MQ Application Programming Reference.

ApplIdentityData (MQCHAR32):

Application data relating to identity.

This is part of the **identity context** of the message.

ApplIdentityData is information that is defined by the application suite that can be used to provide additional information about the origin of the message. For example, it could be set by applications running with suitable user authority to indicate whether the identity data is trusted. For more information on the *ApplIdentityData* field, see WebSphere MQ Application Programming Reference.

C declaration

```
typedef struct tagMQZED MQZED;
struct tagMQZED {
  MQCHAR4   StrucId;          /* Structure identifier */
  MQLONG    Version;          /* Structure version number */
  MQCHAR12  UserIdentifier;   /* User identifier */
  MQBYTE32  AccountingToken;  /* Accounting token */
  MQCHAR32  ApplIdentityData; /* Application data relating to identity */
};
```

MQZFP – Free parameters

The MQZFP structure is used on the MQZ_FREE_USER call for the *FreeParms* parameter. This parameter specifies data related to resource to be freed.

Fields

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQZFP_STRUC_ID
Identifier for free parameters structure.

For the C programming language, the constant MQZFP_STRUC_ID_ARRAY is also defined; this has the same value as MQZFP_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the service.

Version (MQLONG):

Structure version number.

The value is:

MQZFP_VERSION_1
Version-1 free parameters structure.

The following constant specifies the version number of the current version:

MQZFP_CURRENT_VERSION
Current version of free parameters structure.

This is an input field to the service.

Reserved (MQBYTE8):

Reserved field.

The initial value is null.

CorrelationPtr (MQPTR):

Correlation pointer.

Address of correlation data relating to the resource to be freed.

C declaration

```
typedef struct tagMQZFP MQZFP;
struct tagMQZFP {
  MQCHAR4   StrucId;          /* Structure identifier */
  MQLONG    Version;          /* Structure version number */
  MQBYTE8   Reserved;         /* Reserved field */
  MQPTR     CorrelationPtr;   /* Address of correlation data */
};
```

MQZ_DELETE_NAME – Delete name

This function is provided by a name service component, and is invoked by the queue manager to delete an entry for the specified queue.

The function identifier for this function (for MQZEP) is MQZID_DELETE_NAME.

Syntax

MQZ_DELETE_NAME *(QMgrName, QName, ComponentData, Continuation,*
        CompCode, Reason)

Parameters

The MQZ_DELETE_NAME call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the name service interface does not require the component to make use of it in any defined manner.

QName (MQCHAR48) – input:

Queue name.

The name of the queue for which an entry is to be deleted. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_NAME call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

For MQZ_DELETE_NAME, the queue manager does not attempt to invoke another component, whatever is returned in *Continuation*.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_WARNING
Warning (partial completion).

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_WARNING:

MQRC_UNKNOWN_Q_NAME
(2288, X'8F0') Queue name not found.

Note: It may not be possible to return this code if the underlying service simply responds with success for this case.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_DELETE_NAME (QMgrName, QName, ComponentData, &Continuation,
                 &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR48  QName;             /* Queue name */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_INIT_NAME – Initialize name service

This function is provided by a name service component, and is invoked by the queue manager during configuration of the component. It is expected to call MQZEP in order to provide information to the queue manager.

The function identifier for this function (for MQZEP) is MQZID_INIT_NAME.

Syntax

MQZ_INIT_NAME *(Hconfig, Options, QMgrName, ComponentDataLength, ComponentData, Version, CompCode, Reason)*

Parameters

The MQZ_INIT_NAME call has the following parameters.

Hconfig (MQHCONFIG) – input:

Configuration handle.

This handle represents the particular component being initialized. It is to be used by the component when calling the queue manager with the MQZEP function.

Options (MQLONG) – input:

Initialization options.

It is one of the following:

MQZIO_PRIMARY
Primary initialization.

MQZIO_SECONDARY
Secondary initialization.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the name service interface does not require the component to make use of it in any defined manner.

ComponentDataLength (MQLONG) – input:

Length of component data.

Length in bytes of the `ComponentData` area. This length is defined in the component configuration data.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This is initialized to all zeroes before calling the component's primary initialization function. This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions (including the initialization function) provided by this component are preserved, and presented the next time one of this component's functions is called.

Component data is in shared memory accessible to all processes. Therefore primary initialization is the first process initialization and secondary initialization is any subsequent process initialization.

Version (MQLONG) – input/output:

Version number.

On input to the initialization function, this identifies the *highest* version number that the queue manager supports. The initialization function must change this, if necessary, to the version of the interface which *it* supports. If on return the queue manager does not support the version returned by the component, it calls the component's MQZ_TERM_NAME function and makes no further use of this component.

The following value is supported:

MQZNS_VERSION_1
Version 1.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
: (0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_INITIALIZATION_FAILED
: (2286, X'8EE') Initialization failed for an undefined reason.

MQRC_SERVICE_NOT_AVAILABLE
: (2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_INIT_NAME (Hconfig, Options, QMgrName, ComponentDataLength,
              ComponentData, &Version, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQHCONFIG  Hconfig;             /* Configuration handle */
MQLONG     Options;             /* Initialization options */
MQCHAR48   QMgrName;            /* Queue manager name */
MQLONG     ComponentDataLength; /* Length of component data */
MQBYTE     ComponentData[n];    /* Component data */
MQLONG     Version;             /* Version number */
MQLONG     CompCode;            /* Completion code */
MQLONG     Reason;              /* Reason code qualifying CompCode */
```

MQZ_INSERT_NAME – Insert name

This function is provided by a name service component, and is invoked by the queue manager to insert an entry for the specified queue, containing the name of the queue manager that owns the queue. If the queue is already defined in the service, the call fails.

The function identifier for this function (for MQZEP) is MQZID_INSERT_NAME.

Syntax

MQZ_INSERT_NAME *(QMgrName, QName, ResolvedQMgrName, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_INSERT_NAME call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the name service interface does not require the component to make use of it in any defined manner.

QName (MQCHAR48) – input:

Queue name.

The name of the queue for which an entry is to be inserted. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

ResolvedQMgrName (MQCHAR48) – input:

Resolved queue manager name.

The name of the queue manager to which the queue resolves. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_NAME call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

For MQZ_INSERT_NAME, the queue manager does not attempt to invoke another component, whatever is returned in *Continuation*.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_Q_ALREADY_EXISTS
(2290, X'8F2') Queue object already exists.

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_INSERT_NAME (QMgrName, QName, ResolvedQMgrName, ComponentData,
                &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR48  QName;             /* Queue name */
MQCHAR48  ResolvedQMgrName;  /* Resolved queue manager name */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_LOOKUP_NAME – Lookup name

This function is provided by a name service component, and is invoked by the queue manager to retrieve the name of the owning queue manager, for a specified queue.

The function identifier for this function (for MQZEP) is MQZID_LOOKUP_NAME.

Syntax

MQZ_LOOKUP_NAME *(QMgrName, QName, ResolvedQMgrName, ComponentData, Continuation, CompCode, Reason)*

Parameters

The MQZ_LOOKUP_NAME call has the following parameters.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the name service interface does not require the component to make use of it in any defined manner.

QName (MQCHAR48) – input:

Queue name.

The name of the queue which is to be resolved. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

ResolvedQMgrName (MQCHAR48) – output:

Resolved queue manager name.

If the function completes successfully, this is the name of the queue manager that owns the queue.

The name returned by the service component must be padded on the right with blanks to the full length of the parameter; the name *must not* be terminated by a null character, or contain leading or embedded blanks.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

Component data is in shared memory accessible to all processes.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter of the MQZ_INIT_NAME call.

Continuation (MQLONG) – output:

Continuation indicator set by component.

For MQZ_LOOKUP_NAME, the queue manager decides whether to invoke another name service component, as follows:
- If *CompCode* is MQCC_OK, no further components are invoked, whatever value is returned in *Continuation*.
- If *CompCode* is not MQCC_OK, a further component is invoked, unless *Continuation* is MQZCI_STOP. This value should not be set without good reason.

The following values can be specified:

MQZCI_DEFAULT
Continuation dependent on queue manager.

MQZCI_CONTINUE
Continue with next component.

MQZCI_STOP
Do not continue with next component.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_ERROR
(2289, X'8F1') Unexpected error occurred accessing service.

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_UNKNOWN_Q_NAME
(2288, X'8F0') Queue name not found.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_LOOKUP_NAME (QMgrName, QName, ResolvedQMgrName, ComponentData,
                &Continuation, &CompCode, &Reason);
```

The parameters passed to the service are declared as follows:

```
MQCHAR48  QMgrName;          /* Queue manager name */
MQCHAR48  QName;             /* Queue name */
MQCHAR48  ResolvedQMgrName;  /* Resolved queue manager name */
MQBYTE    ComponentData[n];  /* Component data */
MQLONG    Continuation;      /* Continuation indicator set by
                                component */
MQLONG    CompCode;          /* Completion code */
MQLONG    Reason;            /* Reason code qualifying CompCode */
```

MQZ_TERM_NAME – Terminate name service

This function is provided by a name service component, and is invoked by the queue manager when it no longer requires the services of this component. The function must perform any cleanup required by the component.

The function identifier for this function (for MQZEP) is MQZID_TERM_NAME.

Syntax

MQZ_TERM_NAME *(Hconfig, Options, QMgrName, ComponentData,*
CompCode, Reason)

Parameters

The MQZ_TERM_NAME call has the following parameters.

Hconfig (MQHCONFIG) – input:

Configuration handle.

This handle represents the particular component being terminated.

Options (MQLONG) – input:

Termination options.

It is one of the following:

MQZTO_PRIMARY
Primary termination.

MQZTO_SECONDARY
Secondary termination.

QMgrName (MQCHAR48) – input:

Queue manager name.

The name of the queue manager calling the component. This name is padded with blanks to the full length of the parameter; the name is not terminated by a null character.

The queue-manager name is passed to the component for information; the name service interface does not require the component to make use of it in any defined manner.

ComponentData (MQBYTE×ComponentDataLength) – input/output:

Component data.

This data is kept by the queue manager on behalf of this particular component; any changes made to it by any of the functions provided by this component are preserved, and presented the next time one of this component's functions is called.

Component data is in shared memory accessible to all processes.

The length of this data area is passed by the queue manager in the *ComponentDataLength* parameter on the MQZ_INIT_NAME call.

When the MQZ_TERM_NAME call has completed, the queue manager discards this data.

CompCode (MQLONG) – output:

Completion code.

It is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

Reason (MQLONG) – output:

Reason code qualifying *CompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_SERVICE_NOT_AVAILABLE
(2285, X'8ED') Underlying service not available.

MQRC_TERMINATION_FAILED
(2287, X'8FF') Termination failed for an undefined reason.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQZ_TERM_NAME (Hconfig, Options, QMgrName, ComponentData, &CompCode,
              &Reason);
```

The parameters passed to the service are declared as follows:

```
MQHCONFIG  Hconfig;           /* Configuration handle */
MQLONG     Options;           /* Termination options */
MQCHAR48   QMgrName;          /* Queue manager name */
MQBYTE     ComponentData[n];  /* Component data */
MQLONG     CompCode;          /* Completion code */
MQLONG     Reason;            /* Reason code qualifying CompCode */
```

API exits

API exits let you write code that changes the behavior of WebSphere MQ API calls, such as MQPUT and MQGET, and then insert that code immediately before or immediately after those calls. The insertion is automatic; the queue manager drives the exit code at the registered points.

This chapter explains why you might want to use API exits, then describes what administration tasks are involved in enabling them. The sections are:

- "Why use API exits" on page 479
- "How you use API exits" on page 479
- "What happens when an API exit runs?" on page 480
- "Configuring API exits" on page 481

We give a brief introduction to writing API exits in "How to write an API exit" on page 480. For detailed information about writing API exits, aimed at application programmers, see the WebSphere MQ Application Programming Guide.

Why use API exits

There are many reasons why you might want to insert code that modifies the behavior of applications at the level of the queue manager. Each of your applications has a specific job to do, and its code should do that task as efficiently as possible. At a higher level, you might want to apply standards or business processes to a particular queue manager for **all** the applications that use that queue manager. It is more efficient to do this above the level of individual applications, and thus without having to change the code of each application affected.

Here are a few suggestions of areas in which API exits might be useful:

- For *security*, you can provide authentication, checking that applications are authorized to access a queue or queue manager. You can also police applications' use of the API, authenticating the individual API calls, or even the parameters they use.
- For *flexibility*, you can respond to rapid changes in your business environment without changing the applications that rely on the data in that environment. You could, for example, have API exits that respond to changes in interest rates, currency exchange rates, or the price of components in a manufacturing environment.
- For *monitoring* use of a queue or queue manager, you can trace the flow of applications and messages, log errors in the API calls, set up audit trails for accounting purposes, or collect usage statistics for planning purposes.

How you use API exits

This section gives a brief overview of the tasks involved in setting up API exits.

How to configure WebSphere MQ for API exits

You configure WebSphere MQ to enable API exits by changing the configuration information in the usual ways:

- On WebSphere MQ for Windows, use the WebSphere MQ Explorer or the **amqmdain** command to make changes to configuration information within the Windows Registry.
- On WebSphere MQ for Linux (x86 platform), use the WebSphere MQ Explorer to update the WebSphere MQ configuration files, mqs.ini and qm.ini.
- On other systems directly update WebSphere MQ configuration files, mqs.ini and qm.ini.

In either case, you provide information to:

- Name the API exit
- Identify the module and entry point of the API exit code to run
- Optionally pass data with the exit
- Identify the sequence of this exit in relation to other exits

For detailed information on this configuration, see "Configuring API exits" on page 481. For a description of how API exits run, see "What happens when an API exit runs?" on page 480.

How to write an API exit

This section introduces writing API exits. For detailed information, aimed at application programmers, see the WebSphere MQ Application Programming Guide.

You write your exits using the C programming language. To help you do so, we provide a sample exit, amqsaxe0, that generates trace entries to a named file. When you start writing exits, we recommend that you use this as your starting point.

Exits are available for every API call, as follows:
- MQCONN/MQCONNX, to provide a queue manager connection handle for use on subsequent API calls
- MQDISC, to disconnect from a queue manager
- MQBEGIN, to begin a global unit of work (UOW)
- MQBACK, to back out a UOW
- MQCMIT, to commit a UOW
- MQOPEN, to open an MQSeries resource for subsequent access
- MQCLOSE, to close an MQSeries resource that had previously been opened for access
- MQGET, to retrieve a message from a queue that has previously been opened for access
- MQPUT1, to place a message on to a queue
- MQPUT, to place a message on to a queue that has previously been opened for access
- MQINQ, to inquire on the attributes of an MQSeries resource that has previously been opened for access
- MQSET, to set the attributes of a queue that has previously been opened for access

Within API exits, these calls take the general form:

```
MQ_call_EXIT (parameters)
```

where `call` is the API call name (PUT, GET, and so on), and the `parameters` control the function of the exit, primarily providing communication between the exit and the external control blocks MQAXP (the exit parameter structure) and MQAXC (the exit context structure).

What happens when an API exit runs?

The API exit routines to run are identified in stanzas on UNIX systems, and in Registry entries on Windows systems. In this section we talk about the stanzas in the configuration files mqs.ini and qm.ini, however equivalent information is available in the Registry on Windows systems, accessible through the WebSphere MQ Explorer.

The definition of the routines can occur in three places:
1. ApiExitCommon, in the mqs.ini file, identifies routines, for the whole of WebSphere MQ, applied when queue managers start up. These can be overridden by routines defined for individual queue managers.
2. ApiExitTemplate, in the mqs.ini file, identifies routines, for the whole of WebSphere MQ, copied to the ApiExitLocal set when a new queue manager is created.

3. ApiExitLocal, in the qm.ini file, identifies routines applicable to a particular queue manager.

When a new queue manager is created, the ApiExitTemplate definitions in mqs.ini are copied to the ApiExitLocal definitions in qm.ini for the new queue manager. When a queue manager is started, both the ApiExitCommon and ApiExitLocal definitions are used. The ApiExitLocal definitions replace the ApiExitCommon definitions if both identify a routine of the same name. The `Sequence` attribute, described in "Attributes for all stanzas" determines the order in which the routines defined in the stanzas run.

Configuring API exits

This section tells you how to configure API exits. We start in "Configuring API exits on UNIX systems," explaining how to add the stanzas, followed by "Configuring API exits on Windows systems" on page 483, which tells you how to use the WebSphere MQ Explorer.

Configuring API exits on UNIX systems

You define your API exits in new stanzas in the mqs.ini and qm.ini files. The sections below describe these stanzas, and the attributes within them that define the exit routines and the sequence in which they run. For guidance on the process of changing these stanzas, see "Changing the configuration information" on page 483.

On Linux (x86 platform) systems you can use the WebSphere MQ Explorer to edit these entries in mqs.ini and qm.ini.

Stanzas in mqs.ini are:

ApiExitCommon
: When any queue manager starts, the attributes in this stanza are read, and then overridden by the API exits defined in qm.ini.

ApiExitTemplate
: When any queue manager is created, the attributes in this stanza are copied into the newly created qm.ini file under the ApiExitLocal stanza.

The stanza in qm.ini is:

ApiExitLocal
: When the queue manager starts, API exits defined here override the defaults defined in mqs.ini.

Attributes for all stanzas:

All these stanzas have the following attributes:

Name=ApiExit_name
: The descriptive name of the API exit passed to it in the ExitInfoName field of the MQAXP structure.

: This name must be unique, no longer than 48 characters, and contain only valid characters for the names of WebSphere MQ objects (for example, queue names).

Function=function_name
: The name of the function entry point into the module containing the API exit code. This entry point is the MQ_INIT_EXIT function.

  The length of this field is limited to MQ_EXIT_NAME_LENGTH.

Module=module_name
: The module containing the API exit code.

  If this field contains the full path name of the module it is used as is.

  If this field contains just the module name, the module is located using the `ExitsDefaultPath` attribute in the `ExitPath` in qm.ini.

  On platforms that support separate threaded libraries (AIX, HP/UX, and Linux), you must provide both a non-threaded and a threaded version of the API exit module. The threaded version must have an `_r` suffix. The threaded version of the WebSphere MQ application stub implicitly appends `_r` to the given module name before it is loaded.

  The length of this field is limited to the maximum path length the platform supports.

Data=data_name
: Data to be passed to the API exit in the ExitData field of the MQAXP structure.

  If you include this attribute, leading and trailing blanks are removed, the remaining string is truncated to 32 characters, and the result is passed to the exit. If you omit this attribute, the default value of 32 blanks is passed to the exit.

  The maximum length of this field is 32 characters.

Sequence=sequence_number
: The sequence in which this API exit is called relative to other API exits. An exit with a **low** sequence number is called before an exit with a **higher** sequence number. There is no need for the sequence numbering of exits to be contiguous; a sequence of 1, 2, 3 has the same result as a sequence of 7, 42, 1096. If two exits have the same sequence number, the queue manager decides which one to call first. You can tell which was called *after* the event by putting the time or a marker in ExitChainArea indicated by the ExitChainAreaPtr in MQAXP or by writing your own log file.

  This attribute is an unsigned numeric value.

Sample stanzas:

The mqs.ini file below contains the following stanzas:

ApiExitTemplate
: This stanza defines an exit with the descriptive name `OurPayrollQueueAuditor`, module name `auditor`, and sequence number 2. A data value of 123 is passed to the exit.

ApiExitCommon
: This stanza defines an exit with the descriptive name `MQPoliceman`, module name `tmqp`, and sequence number 1. The data passed is an instruction (`CheckEverything`).

```
mqs.ini

   ApiExitTemplate:
      Name=OurPayrollQueueAuditor
      Sequence=2
      Function=EntryPoint
      Module=/usr/ABC/auditor
      Data=123
   ApiExitCommon:
      Name=MQPoliceman
      Sequence=1
      Function=EntryPoint
      Module=/usr/MQPolice/tmqp
      Data=CheckEverything
```

The qm.ini file below contains an ApiExitLocal definition of an exit with the descriptive name `ClientApplicationAPIchecker`, module name `ClientAppChecker`, and sequence number 3.

```
qm.ini

   ApiExitLocal:
      Name=ClientApplicationAPIchecker
      Sequence=3
      Function=EntryPoint
      Module=/usr/Dev/ClientAppChecker
      Data=9.20.176.20
```

Changing the configuration information:

The WebSphere MQ configuration file, mqs.ini, contains information relevant to all the queue managers on a particular node. You can find it in the `/var/mqm` directory.

A queue manager configuration file, qm.ini, contains information relevant to a specific queue manager. There is one queue manager configuration file for each queue manager, held in the root of the directory tree occupied by the queue manager. For example, the path and the name for a configuration file for a queue manager called QMNAME is:

```
/var/mqm/qmgrs/QMNAME/qm.ini
```

Before editing a configuration file, back it up so that you have a copy you can revert to if the need arises.

You can edit configuration files either:
- Automatically, using commands that change the configuration of queue managers on the node
- Manually, using a standard text editor

If you set an incorrect value on a configuration file attribute, the value is ignored and an operator message is issued to indicate the problem. (The effect is the same as missing out the attribute entirely.)

Configuring API exits on Windows systems

You configure API exits on Windows systems using the WebSphere MQ Explorer or the **amqmdain** command to update the Windows Registry.

When using the WebSphere MQ Explorer you can modify the ApiExitCommon, ApiExitTemplate and ApiExitLocal stanzas as follows:
- The ApiExitCommon and ApiExitTemplate stanza are defined on the WebSphere MQ properties page, under Exits.
- The ApiExitLocal stanza is defined on the queue manager properties page, under Exits.

When entering, or changing, the attributes for an exit, the attributes are those defined in “Attributes for all stanzas” on page 481.

API exit reference information

This chapter provides reference information for the API exit. It includes:

- Data structures used by an API exit function:
  - “MQACH – API exit chain header” on page 486
  - “MQAXC – API exit context” on page 488
  - “MQAXP – API exit parameter” on page 492
  - “MQXEPO – Register entry point options” on page 503
- Calls an API exit function can issue:
  - “MQXEP – Register entry point” on page 500
- Definitions of the API exit functions:
  - “MQ_BACK_EXIT – Back out changes” on page 505
  - “MQ_BEGIN_EXIT – Begin unit of work” on page 505
  - “MQ_CLOSE_EXIT – Close object” on page 508
  - “MQ_CMIT_EXIT – Commit changes” on page 509
  - “MQ_CONNX_EXIT – Connect queue manager (extended)” on page 509
  - “MQ_DISC_EXIT – Disconnect queue manager” on page 511
  - “MQ_GET_EXIT – Get message” on page 512
  - “MQ_INIT_EXIT – Initialize exit environment” on page 513
  - “MQ_INQ_EXIT – Inquire object attributes” on page 514
  - “MQ_OPEN_EXIT – Open object” on page 516
  - “MQ_PUT_EXIT – Put message” on page 517
  - “MQ_PUT1_EXIT – Put one message” on page 518
  - “MQ_SET_EXIT – Set object attributes” on page 520
  - “MQ_TERM_EXIT – Terminate exit environment” on page 523

The data structures, calls, and exits are described in the order shown above (alphabetic order within each type).

General usage notes

This section contains general usage notes that relate to all API exit functions.

1. All exit functions can issue the MQXEP call; this call is designed specifically for use from API exit functions.
2. The MQ_INIT_EXIT function cannot issue any MQ calls other than MQXEP.
3. All other exit functions can issue the following MQ calls:
   - MQBACK, MQBEGIN, MQCLOSE, MQCMIT, MQCONN, MQCONNX, MQDISC, MQGET, MQINQ, MQOPEN, MQPUT, MQPUT1, MQSET
4. If an exit function issues the MQCONN call, or the MQCONNX call with the MQCNO_HANDLE_SHARE_NONE option, the call completes with reason code MQRC_ALREADY_CONNECTED, and the handle returned is the same as the one passed to the exit as a parameter.
5. In general when an API exit function issues an MQI call, API exits are not be called recursively. However, if an exit function issues the MQCONNX call with the MQCNO_HANDLE_SHARE_BLOCK or

MQCNO_HANDLE_SHARE_NO_BLOCK options, the call returns a new shared handle. This provides the exit suite with a connection handle of its own, and hence a unit of work that is independent of the application's unit of work. The exit suite can use this handle to put and get messages within its own unit of work, and commit or back out that unit of work; all of this can be done without affecting the application's unit of work in any way.

   Because the exit function is using a connection handle that is different from the handle being used by the application, MQ calls issued by the exit function result in the relevant API exit functions being invoked. Exit functions can therefore be invoked recursively. Note that both the *ExitUserArea* field in MQAXP and the exit chain area have connection-handle scope. Consequently, an exit function cannot use those areas to signal to another instance of itself invoked recursively that it is already active.

6. Exit functions can also put and get messages within the application's unit of work. When the application commits or backs out the unit of work, all messages within the unit of work are committed or backed out together, regardless of who placed them in the unit of work (application or exit function). However, the exit can cause the application to exceed system limits sooner than would otherwise be the case (for example, by exceeding the maximum number of uncommitted messages in a unit of work).

   When an exit function uses the application's unit of work in this way, the exit function should usually avoid issuing the MQCMIT call, as this commits the application's unit of work and might impair the correct functioning of the application. However, the exit function might sometimes need to issue the MQBACK call, if the exit function encounters a serious error that prevents the unit of work being committed (for example, an error putting a message as part of the application's unit of work). When MQBACK is called, take care to ensure that the application unit of work boundaries are not changed. In this situation the exit function must set the appropriate values to ensure that completion code MQCC_WARNING and reason code MQRC_BACKED_OUT are returned to the application, so that the application can detect the fact that the unit of work has been backed out.

   If an exit function uses the application's connection handle to issue MQ calls, those calls do not themselves result in further invocations of API exit functions.

7. If an MQXR_BEFORE exit function terminates abnormally, the queue manager might be able to recover from the failure. If it can, the queue manager continues processing as though the exit function had returned MQXCC_FAILED. If the queue manager cannot recover, the application is terminated.

8. If an MQXR_AFTER exit function terminates abnormally, the queue manager might be able to recover from the failure. If it can, the queue manager continues processing as though the exit function had returned MQXCC_FAILED. If the queue manager cannot recover, the application is terminated. Be aware that in the latter case, messages retrieved outside a unit of work are lost (this is the same situation as the application failing immediately after removing a message from the queue).

9. The MCA process performs a two phase commit.

   If an API exit intercepts an MQCMIT from a prepared MCA process and attempts to perform an action within the unit of work, then the action will fail with reason code MQRC_UOW_NOT_AVAILABLE.

MQACH – API exit chain header

The MQACH structure describes the header information that must be present at the start of each exit chain area.

- The address of the first area in the chain in given by the *ExitChainAreaPtr* field in MQAXP. If there is no chain, *ExitChainAreaPtr* is the null pointer.
- The address of the next area in the chain is given by the *NextChainAreaPtr* field in MQACH. For the last area in the chain, *NextChainAreaPtr* is the null pointer.

Any exit function can create a chain area in dynamically-obtained storage (for example, by using `malloc`), and add that area to the chain at the desired location (start, middle, or end). The exit function must ensure that it sets all fields in MQACH to valid values.

The exit suite that creates the chain area is responsible for destroying that chain area before termination (the MQ_TERM_EXIT function is a convenient point at which to do this). However, adding and removing chain areas from the chain must be done only by an exit function when it is invoked by the queue manager; this restriction is necessary to avoid serialization problems.

Exit chain areas are made available to all exit suites, and must not be used to hold private data. Use *ExitUserArea* in MQAXP to hold private data.

In general there is no correspondence between the chain of exit functions that are invoked for an API call, and the chain of exit chain areas:

- Some exit functions might not have chain areas.
- Other exit functions might each have multiple chain areas.
- The order of the chain areas might be different from the order of the exit functions that own those chain areas.

Fields

The MQACH structure contains the following fields:

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQACH_STRUC_ID
Identifier for API exit chain header structure.

For the C programming language, the constant MQACH_STRUC_ID_ARRAY is also defined; this has the same value as MQACH_STRUC_ID, but is an array of characters instead of a string.

This initial value of this field is MQACH_STRUC_ID.

Version (MQLONG):

Structure version number.

The value is:

MQACH_VERSION_1
Version-1 API exit chain header structure.

The following constant specifies the version number of the current version:

MQACH_CURRENT_VERSION
Current version of API exit chain header structure.

Note: When a new version of the MQACH structure is introduced, the layout of the existing part is not changed. The exit function must therefore check that the version number is equal to or greater than the lowest version that contains the fields that the exit function needs to use.

The initial value of this field is MQACH_CURRENT_VERSION.

StrucLength (MQLONG):

Length of MQACH structure.

This is the length of the MQACH structure itself; this length *excludes* the exit-defined data that follows the MQACH structure (see the `ChainAreaLength` field).

- The exit function that creates the MQACH structure must set this field to the length of the MQACH.
- An exit function that wants to access the exit-defined data should use `StrucLength` as the offset of the exit-defined data from the start of the MQACH structure.

The following value is defined:

MQACH_LENGTH_1
Length of version-1 MQACH structure.

The following constant specifies the length of the current version:

MQACH_CURRENT_LENGTH
Length of current version of exit chain area header.

The initial value of this field is MQACH_CURRENT_LENGTH.

ChainAreaLength (MQLONG):

Total length of chain area.

This is the total length of the chain area. It is equal to the sum of the length of the MQACH plus the length of the exit-defined data that follows the MQACH.

The initial value of this field is zero.

ExitInfoName (MQCHAR48):

Exit information name.

This is a name that is used to identify the exit suite to which the chain area belongs.

The length of this field is given by MQ_EXIT_INFO_NAME_LENGTH. The initial value of this field is the null string in C.

NextChainAreaPtr (PMQACH):

Address of next MQACH structure in chain.

This is the address of the next chain area in the chain. If the current chain area is the last one in the chain, *NextChainAreaPtr* is the null pointer.

The initial value of this field is the null pointer.

C declaration

```
typedef struct tagMQACH MQACH;
struct tagMQACH {
  MQCHAR4   StrucId;           /* Structure identifier */
  MQLONG    Version;           /* Structure version number */
  MQLONG    StrucLength;       /* Length of MQACH structure */
  MQLONG    ChainAreaLength;   /* Total length of chain area */
  MQCHAR48  ExitInfoName;      /* Exit information name */
  PMQACH    NextChainAreaPtr;  /* Address of next MQACH structure in
                                  chain */
};
```

MQAXC – API exit context

The MQAXC structure describes the context information that is passed to an API exit. The context information relates to the environment in which the application is running.

Fields

The MQAXC structure contains the following fields:

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQAXC_STRUC_ID
: Identifier for API exit parameter structure.

  For the C programming language, the constant MQAXC_STRUC_ID_ARRAY is also defined; this has the same value as MQAXC_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the exit.

Version (MQLONG):

Structure version number.

The value is:

MQAXC_VERSION_1
: Version-1 API exit parameter structure.

The following constant specifies the version number of the current version:

MQAXC_CURRENT_VERSION
: Current version of API exit parameter structure.

Note: When a new version of the MQAXC structure is introduced, the layout of the existing part is not changed. The exit should therefore check that the version number is equal to or greater than the lowest version which contains the fields that the exit needs to use.

This is an input field to the exit.

Environment (MQLONG):

Environment.

This indicates the environment from which the API call was issued. The value is one of the following:

MQXE_COMMAND_SERVER
Command server.

MQXE_MQSC
The “runmqsc” command interpreter.

MQXE_MCA
Message channel agent.

MQXE_MCA_SVRCONN
Message channel agent acting on behalf of a client.

MQXE_OTHER
Environment not defined.

This is an input field to the exit.

UserId (MQCHAR12):

User identifier.

This is the user identifier associated with the program that issued the API call. For a client connection (MQXE_MCA_SVRCONN), `UserId` contains the user identifier of the adopted user, and not the user identifier of the MCA.

The length of this field is given by MQ_USER_ID_LENGTH. This is an input field to the exit.

SecurityId (MQBYTE40):

Security identifier.

This is the security identifier associated with the program that issued the API call. For a client connection (MQXE_MCA_SVRCONN), `SecurityId` contains the security identifier of the adopted user, and not the security identifier of the MCA. If the security identifier is not known, `SecurityId` has the value:

MQSID_NONE
No security identifier specified.

The value is binary zero for the length of the field.

For the C programming language, the constant MQSID_NONE_ARRAY is also defined; this has the same value as MQSID_NONE, but is an array of characters instead of a string.

The length of this field is given by MQ_SECURITY_ID_LENGTH. This is an input field to the exit.

ConnectionName (MQCHAR264):

Connection name.

For a client connection (MQXE_MCA_SVRCONN), this field contains the address of the client (for example, the TCP/IP address). In other cases, this field is blank.

The length of this field is given by MQ_CONN_NAME_LENGTH. This is an input field to the exit.

LongMCAUserIdLength (MQLONG):

Length of long MCA user identifier.

For MQXE_MCA and MQXE_MCA_SVRCONN, this is the length in bytes of the full MCA user identifier pointed to by *LongMCAUserIdPtr*. In other cases, this field is zero.

This is an input field to the exit.

LongRemoteUserIdLength (MQLONG):

Length of long remote user identifier.

For MQXE_MCA and MQXE_MCA_SVRCONN, this is the length in bytes of the full remote user identifier pointed to by *LongRemoteUserIdPtr*. In other cases, this field is zero.

This is an input field to the exit.

LongMCAUserIdPtr (MQPTR):

Address of long MCA user identifier.

For MQXE_MCA and MQXE_MCA_SVRCONN, this is the address of the full MCA user identifier. The length of the full identifier is given by *LongMCAUserIdLength*. In other cases, this field is the null pointer.

This is an input field to the exit.

LongRemoteUserIdPtr (MQPTR):

Address of long remote user identifier.

For MQXE_MCA and MQXE_MCA_SVRCONN, this is the address of the full remote user identifier. The length of the full identifier is given by *LongRemoteUserIdLength*. In other cases, this field is the null pointer.

This is an input field to the exit.

ApplName (MQCHAR28):

Application name.

This is the name of the application that issued the API call. This name is obtained in the same way as the default value for the *PutApplName* field in MQMD.

The length of this field is given by MQ_APPL_NAME_LENGTH. This is an input field to the exit.

ApplType (MQLONG):

Application type.

This is the type of the application that issued the API call. The value is the same as MQAT_DEFAULT for the environment for which the application was compiled.

This is an input field to the exit.

ProcessId (MQPID):

The WebSphere MQ process identifier.

This is the same identifier used in WebSphere MQ trace and FFST dumps, but might be different from the operating system process identifier. Where applicable, the exit handler sets this field on entry to each exit function.

This is an input field to the exit.

ThreadId (MQTID):

The WebSphere MQ thread identifier.

This is the same identifier used in WebSphere MQ trace and FFST dumps, but might be different from the operating system thread identifier. Where applicable, the exit handler sets this field on entry to each exit function.

This is an input field to the exit.

C declaration

```
typedef struct tagMQAXC MQAXC;
struct tagMQAXC {
  MQCHAR4    StrucId;                 /* Structure identifier */
  MQLONG     Version;                 /* Structure version number */
  MQLONG     Environment;             /* Environment */
  MQCHAR12   UserId;                  /* User identifier */
  MQBYTE40   SecurityId;              /* Security identifier */
  MQCHAR264  ConnectionName;          /* Connection name */
  MQLONG     LongMCAUserIdLength;     /* Length of long MCA user
                                         identifier */
  MQLONG     LongRemoteUserIdLength;  /* Length of long remote user
                                         identifier */
  MQPTR      LongMCAUserIdPtr;        /* Address of long MCA user
                                         identifier */
  MQPTR      LongRemoteUserIdPtr;     /* Address of long remote user
                                         identifier */
  MQCHAR28   ApplName;                /* Application name */
  MQLONG     ApplType;                /* Application type */
  MQPID      ProcessId;               /* Process identifier */
  MQTID      ThreadId;                /* Thread identifier */
};
```

MQAXP – API exit parameter

The MQAXP structure describes the information that is passed to an API exit.

Fields

The MQAXP structure contains the following fields:

StrucId (MQCHAR4):

Structure identifier.

The value is:

MQAXP_STRUC_ID
Identifier for API exit parameter structure.

For the C programming language, the constant MQAXP_STRUC_ID_ARRAY is also defined; this has the same value as MQAXP_STRUC_ID, but is an array of characters instead of a string.

This is an input field to the exit.

Version (MQLONG):

Structure version number.

The value is:

MQAXP_VERSION_1
Version-1 API exit parameter structure.

The following constant specifies the version number of the current version:

MQAXP_CURRENT_VERSION
Current version of API exit parameter structure.

Note: When a new version of the MQAXP structure is introduced, the layout of the existing part is not changed. The exit should therefore check that the version number is equal to or greater than the lowest version which contains the fields that the exit needs to use.

This is an input field to the exit.

ExitId (MQLONG):

Type of exit.

This indicates the type of exit being called. The value is:

MQXT_API_EXIT
API exit.

This is an input field to the exit.

ExitReason (MQLONG):

Reason for invoking exit.

This indicates the reason why the exit is being called. Possible values are:

MQXR_CONNECTION
Connection level processing.

The exit is invoked with this value twice for each connection:

- Before the MQCONN or MQCONNX call, so that the exit can perform connection-level initialization. The `Function` field has the value MQXF_INIT in this case.

  The MQXF_INIT exit function should be used for general initialization of the exit suite, and the MQXF_CONN or MQXF_CONNX exit functions should be used specifically for processing the MQCONN or MQCONNX calls.
- After the MQDISC call, so that the exit can perform connection-level termination. The `Function` field has the value MQXF_TERM in this case.

  The MQXF_TERM exit function should be used for general termination of the exit suite, and the MQXF_DISC exit function should be used specifically for processing the MQDISC call.

MQXR_BEFORE
Before API execution.

The `Function` field can have any of the MQXF_* values other than MQXF_INIT or MQXF_TERM.

For the MQGET call, this value occurs with the:

- MQXF_GET exit function before API execution
- MQXF_DATA_CONV_ON_GET exit function after API execution but before data conversion

MQXR_AFTER
After API execution.

The `Function` field can have any of the MQXF_* values other than MQXF_INIT, MQXF_TERM, or MQXF_DATA_CONV_ON_GET.

For the MQGET call, this value occurs with the:

- MQXF_GET exit function after both API execution and data conversion have been completed

This is an input field to the exit.

ExitResponse (MQLONG):

Response from exit.

This is set by the exit function to indicate the outcome of the processing performed by the exit. It must be one of the following:

MQXCC_OK
Exit completed successfully.

This value can be set by all MQXR_* exit functions. The `ExitResponse2` field must be set by the exit function to indicate how processing should continue.

Note: Returning MQXCC_OK does *not* imply that the completion code for the API call is MQCC_OK, or that the reason code is MQRC_NONE.

MQXCC_FAILED

Exit failed.

This value can be set by all MQXR_* exit functions. It causes the queue manager to set the completion code for the API call to MQCC_FAILED, and the reason code to one of the following values:

Exit function	Reason code set by queue manager
MQXF_INIT	MQRC_API_EXIT_INIT_ERROR
MQXF_TERM	MQRC_API_EXIT_TERM_ERROR
All others	MQRC_API_EXIT_ERROR

However, the values set by the queue manager can be altered by an exit function later in the chain.

The *ExitResponse2* field is ignored; the queue manager continues processing as though MQXR2_SUPPRESS_CHAIN had been returned:

- For an MQXR_BEFORE exit function, processing continues with the MQXR_AFTER exit function that matches this MQXR_BEFORE exit function (that is, all intervening MQXR_BEFORE and MQXR_AFTER exit functions, plus the API call itself, are skipped).
- For an MQXR_AFTER exit function, processing continues with the next MQXR_AFTER exit function in the chain.

MQXCC_SUPPRESS_FUNCTION

Suppress function.

If an MQXR_BEFORE exit function returns this value, the queue manager sets the completion code for the API call to MQCC_FAILED, the reason code to MQRC_SUPPRESSED_BY_EXIT, and the API call is skipped. If returned by the MQXF_DATA_CONV_ON_GET exit function, data conversion is skipped.

The *ExitResponse2* field must be set by the exit function to indicate whether the remaining MQXR_BEFORE exit functions and their matching MQXR_AFTER exit functions should be invoked. Any of these exit functions can alter the completion code and reason code of the API call that were set by the queue manager.

If an MQXR_AFTER or MQXR_CONNECTION exit function returns this value, the queue manager continues processing as though the exit had returned MQXCC_FAILED.

MQXCC_SKIP_FUNCTION

Skip function.

This is the same as MQXCC_SUPPRESS_FUNCTION, except the exit function can set the completion code and reason code of the API call.

MQXCC_SUPPRESS_EXIT

Suppress exit.

If an MQXR_BEFORE or MQXR_AFTER exit function returns this value, the queue manager deregisters immediately all of the exit functions belonging to this exit suite. The only exception is the MQXF_TERM exit function, which will be invoked at termination of the connection if registered when MQXCC_SUPPRESS_EXIT is returned. Note that if an MQXR_BEFORE exit function returns this value, the matching MQXR_AFTER exit function will *not* be invoked after the API call, since that exit function will no longer be registered.

The *ExitResponse2* field must be set by the exit function to indicate whether the remaining MQXR_BEFORE exit functions and their matching MQXR_AFTER exit functions should be invoked.

If an MQXR_CONNECTION exit function returns this value, the queue manager continues processing as though the exit had returned MQXCC_FAILED.

If the exit function sets *ExitResponse* to a value that is not valid, the queue manager continues processing as though the exit had returned MQXCC_FAILED.

On entry to the exit function, *ExitResponse* has the value MQXCC_OK.

This is an output field from the exit.

ExitResponse2 (MQLONG):

Secondary response from exit.

This is the secondary exit response code that can be set by an MQXR_BEFORE exit function to provide additional information to the queue manager. If set by an MQXR_AFTER or MQXR_CONNECTION exit function, the value is ignored. The value must be one of the following:

MQXR2_DEFAULT_CONTINUATION
Default continuation.

Continuation with the next exit function in the chain depends on the value of the *ExitResponse* field:
- If *ExitResponse* is MQXCC_OK or MQXCC_SUPPRESS_EXIT, the next MQXR_BEFORE exit function in the chain is invoked.
- If *ExitResponse* is MQXCC_SUPPRESS_FUNCTION or MQXCC_SKIP_FUNCTION, no further MQXR_BEFORE exit functions are invoked for this particular API call.

MQXR2_CONTINUE_CHAIN
Continue with next MQXR_BEFORE exit function in chain.

MQXR2_SUPPRESS_CHAIN
Skip remaining MQXR_BEFORE exit functions in chain.

All subsequent MQXR_BEFORE exit functions in the chain, and their matching MQXR_AFTER exit functions, are skipped for this particular API call. The MQXR_AFTER exit functions that match the current exit function and earlier MQXR_BEFORE exit functions are not skipped.

If the exit function sets *ExitResponse2* to a value that is not valid, the queue manager continues processing as though the exit had returned MQXR2_DEFAULT_CONTINUATION.

This is an output field from the exit.

Feedback (MQLONG):

Feedback.

This is a field that allows the exit functions belonging to an exit suite to communicate feedback codes both to each other, and to exit functions belonging to other exit suites. The field is initialized to MQFB_NONE before the first invocation of the first exit function in the first exit suite (the MQXF_INIT exit function), and thereafter any changes made to this field by exit functions are preserved across the invocations of the exit functions.

This is an input/output field to the exit.

APICallerType (MQLONG):

API caller type.

This indicates the type of program that issued the API call that caused the exit function to be invoked. The value is one of the following:

MQXACT_EXTERNAL
Caller is external to the queue manager.

MQXACT_INTERNAL
Caller is internal to the queue manager.

This is an input field to the exit.

ExitUserArea (MQBYTE16):

Exit user area.

This is a field that allows exit functions belonging to the same exit suite to share data with each other, but not with other exit suites. The field is initialized to MQXUA_NONE (binary zero) before the first invocation of the first exit function in the exit suite (the MQXF_INIT exit function), and thereafter any changes made to this field by exit functions are preserved across the invocations of the exit functions. The queue manager resets the field to MQXUA_NONE when control returns from the MQXF_TERM exit function to the queue manager.

The following value is defined:

MQXUA_NONE
No user information.

The value is binary zero for the length of the field.

For the C programming language, the constant MQXUA_NONE_ARRAY is also defined; this has the same value as MQXUA_NONE, but is an array of characters instead of a string.

The length of this field is given by MQ_EXIT_USER_AREA_LENGTH. This is an input/output field to the exit.

ExitData (MQCHAR32):

Exit data.

On input to each exit function, this field is set to the character data associated with the definition of the exit suite to which the exit function belongs. If no value has been defined for that data, *ExitData* is blank.

The length of this field is given by MQ_EXIT_DATA_LENGTH. This is an input field to the exit.

ExitInfoName (MQCHAR48):

Exit information name.

This is a name that is used to identify the exit suite to which the exit function belongs.

The length of this field is given by MQ_EXIT_INFO_NAME_LENGTH. This is an input field to the exit.

ExitPDArea (MQBYTE48):

Problem determination area.

This is a field that is available for the exit to use, to assist with problem determination. The field is initialized to MQXPDA_NONE (binary zero) before each invocation of the exit function. The exit function can set this field to any value it chooses. When the exit returns control to the queue manager, the contents of *ExitPDArea* are written to the trace file, if tracing is active.

The following value is defined:

MQXPDA_NONE

No problem-determination information.

The value is binary zero for the length of the field.

For the C programming language, the constant MQXPDA_NONE_ARRAY is also defined; this has the same value as MQXPDA_NONE, but is an array of characters instead of a string.

The length of this field is given by MQ_EXIT_PD_AREA_LENGTH. This is an input/output field to the exit.

QMgrName (MQCHAR48):

Name of local queue manager.

This is the name of the queue manager that invoked the exit function. *QMgrName* is never blank.

The length of this field is given by MQ_Q_MGR_NAME_LENGTH. This is an input field to the exit.

ExitChainAreaPtr (PMQACH):

Address of first MQACH structure in chain.

The exit chain area allows exit functions belonging to one exit suite to share data with exit functions belonging to another exit suite. The exit chain area is a chain of MQACH structures that is made available to all exit functions. The address of the first MQACH structure in the chain is passed to each exit function in the *ExitChainAreaPtr* field. The exit function can scan the chain, and examine or alter the data contained within it. However, this should be done only with the prior agreement of the owner of the data.

If there is no current exit chain area, *ExitChainAreaPtr* is the NULL pointer. An exit function can at any time create an MQACH structure in storage obtained dynamically (for example, by using the C function `malloc`), and add it to the chain.

The exit suite which creates an MQACH is responsible for freeing the storage associated with the MQACH before the exit suite terminates.

If data is to be shared between different exit functions belonging to the same exit suite, but that data is *not* to be made available to other exit suites, the *ExitUserArea* field should be used in preference to *ExitChainAreaPtr*.

This is an input/output field to the exit.

Hconfig (MQHCONFIG):

Configuration handle.

This handle represents the set of exit functions that belong to the exit suite whose name is given by the *ExitInfoName* field. The queue manager generates a new configuration handle when the MQXF_INIT exit function is invoked, and passes that handle to the other exit functions that belong to the exit suite. This handle must be specified on the MQXEP call in order to register the entry point for an exit function.

This is an input field to the exit.

Function (MQLONG):

API function identifier.

This is the identifier of the API call that is about to be executed (when *ExitReason* has the value MQXR_BEFORE), or the API call that has just been executed (when *ExitReason* has the value MQXR_AFTER). If *ExitReason* has the value MQXR_CONNECTION, *Function* indicates whether the exit should perform initialization or termination. The value is one of the following:

MQXF_INIT
Initialization of exit suite.

MQXF_TERM
Termination of exit suite.

MQXF_CONN
MQCONN call.

MQXF_CONNX
MQCONNX call.

MQXF_DISC
MQDISC call.

MQXF_OPEN
MQOPEN call.

MQXF_CLOSE
MQCLOSE call.

MQXF_PUT1
MQPUT1 call.

MQXF_PUT
MQPUT call.

MQXF_GET
MQGET call.

MQXF_DATA_CONV_ON_GET
Data conversion on MQGET call.

MQXF_INQ
MQINQ call.

MQXF_SET
MQSET call.

MQXF_BEGIN
MQBEGIN call.

MQXF_CMIT
MQCMIT call.

MQXF_BACK
MQBACK call.

MQXF_SUB
MQSUB call

MQXF_SUBRQ
MQSUBRQ call

This is an input field to the exit.

ExitMsgHandle (MQHMSG):

When *Function* is MQXF_GET and *ExitReason* is MQXR_AFTER, a valid message handle is returned in this field allowing the API exit access to the message descriptor fields and any other properties matching the *ExitProperties* string specified in the MQXEPO structure when registering the API exit.

Any non-message descriptor properties that are returned in the *ExitMsgHandle* will not be available from the *MsgHandle* in the MQGMO structure if one was specified, or in the message data.

When *Function* is MQXF_GET and *ExitReason* is MQXR_BEFORE, if the exit program sets this field to MQHM_NONE then it will suppress the populating of the ExitMsgHandle properties.

This field is not set if *Version* is less then MQAXP_VERSION_2.

This is an input/output field to the exit.

C declaration

```
typedef struct tagMQAXP MQAXP;
struct tagMQAXP {
   MQCHAR4    StrucId;           /* Structure identifier */
   MQLONG     Version;           /* Structure version number */
   MQLONG     ExitId;            /* Type of exit */
   MQLONG     ExitReason;        /* Reason for invoking exit */
   MQLONG     ExitResponse;      /* Response from exit */
   MQLONG     ExitResponse2;     /* Secondary response from exit */
   MQLONG     Feedback;          /* Feedback */
   MQLONG     APICallerType;     /* API caller type */
   MQBYTE16   ExitUserArea;      /* Exit user area */
   MQCHAR32   ExitData;          /* Exit data */
   MQCHAR48   ExitInfoName;      /* Exit information name */
   MQBYTE48   ExitPDArea;        /* Problem determination area */
   MQCHAR48   QMgrName;          /* Name of local queue manager */
   PMQACH     ExitChainAreaPtr;  /* Address of first MQACH
```

```
                                      structure in chain */
  MQHCONFIG  Hconfig;           /* Configuration handle */
  MQLONG     Function;          /* API function identifier */
  MQHMSG     ExitMsgHandle;     /* Exit message handle */
 };
```

MQXEP – Register entry point

This call is used by an exit function to register the entry points of other exit functions in the exit suite. This is usually done by the MQ_INIT_EXIT function, but can be done by any exit function in the exit suite.

The MQXEP call is also used to deregister entry points. This is usually done by the MQ_TERM_EXIT function, but can be done by any exit function in the exit suite.

Syntax

MQXEP *(Hconfig, ExitReason, Function, EntryPoint, ExitOpts,*
pCompCode, pReason)

Parameters

The MQXEP call has the following parameters.

Hconfig (MQHCONFIG) – input:

Configuration handle.

This handle represents the exit suite to which the current exit function belongs. The queue manager generates this configuration handle when the MQ_INIT_EXIT function is invoked, and uses the *Hconfig* field in the MQAXP structure to pass the handle to each exit function in the exit suite.

ExitReason (MQLONG) – input:

Exit reason.

This specifies when to call the entry point being registered or deregistered. It must be one of the following:

MQXR_CONNECTION
Connection level processing.

The *Function* parameter must have the value MQXF_INIT or MQXF_TERM.

MQXR_BEFORE
Before API execution.

The *Function* parameter can have any of the MQXF_* values other than MQXF_INIT or MQXF_TERM.

MQXR_AFTER
After API execution.

The *Function* parameter can have any of the MQXF_* values other than MQXF_INIT, MQXF_TERM, or MQXF_DATA_CONV_ON_GET.

Function (MQLONG) – input:

Function identifier.

This specifies the API call for which the entry point is being registered or deregistered. It must be one of the following:

MQXF_INIT
Initialization of exit suite.

MQXF_TERM
Termination of exit suite.

MQXF_CONN
MQCONN call.

MQXF_CONNX
MQCONNX call.

MQXF_DISC
MQDISC call.

MQXF_OPEN
MQOPEN call.

MQXF_CLOSE
MQCLOSE call.

MQXF_PUT1
MQPUT1 call.

MQXF_PUT
MQPUT call.

MQXF_GET
MQGET call.

MQXF_DATA_CONV_ON_GET
Data conversion on MQGET call.

MQXF_INQ
MQINQ call.

MQXF_SET
MQSET call.

MQXF_BEGIN
MQBEGIN call.

MQXF_CMIT
MQCMIT call.

MQXF_BACK
MQBACK call.

If the MQXEP call is used more than once to register different entry points for a particular combination of `Function` and `ExitReason`, the last call made provides the entry point that is used.

EntryPoint (PMQFUNC) – input:

Exit function entry point.

This is the address of the entry point being registered.

If the value specified is the null pointer, it indicates either that the exit function is not provided, or that a previously-registered exit function is being deregistered. The null pointer is assumed for entry points which are not defined using MQXEP.

ExitOpts (MQXEPO) – input:

Exit reason.

The MQXEPO structure allows API exits to register for specific properties to be returned in the *ExitMsgHandle* of the MQAXP structure.

If a null pointer is specified for this field then the default values of the MQXEPO structure are assumed.

See "MQXEPO – Register entry point options" on page 503 for details.

pCompCode (PMQLONG) – output:

Completion code.

The value returned is one of the following:

MQCC_OK
Successful completion.

MQCC_FAILED
Call failed.

pReason (PMQLONG) – output:

Reason code qualifying *pCompCode*.

If *CompCode* is MQCC_OK:

MQRC_NONE
(0, X'000') No reason to report.

If *CompCode* is MQCC_FAILED:

MQRC_EXIT_REASON_ERROR
(2377, X'949') Exit reason not valid.

MQRC_FUNCTION_ERROR
(2281, X'8E9') Function identifier not valid.

MQRC_HCONFIG_ERROR
(2280, X'8E8') Configuration handle not valid.

MQRC_PROPERTY_NAME_ERROR
(2442, X'098A') Exit properties field is not valid.

MQRC_RESERVED_VALUE_ERROR
(2378, X'94A') Reserved value not valid.

MQRC_RESOURCE_PROBLEM
(2102, X'836') Insufficient system resources available.

MQRC_UNEXPECTED_ERROR
(2195, X'893') Unexpected error occurred.

MQRC_XEPO_ERROR
(2507, X'09CB') Exit options structure not valid.

For more information on these reason codes, see the WebSphere MQ Application Programming Reference.

C invocation

```
MQXEP (Hconfig, ExitReason, Function, EntryPoint, &ExitOpts,
      &CompCode, &Reason);
```

Declare the parameters as follows:

```
MQHCONFIG Hconfig;    /* Configuration handle */
MQLONG    ExitReason; /* Exit reason */
MQLONG    Function;   /* Function identifier */
PMQFUNC   EntryPoint; /* Exit function entry point */
MQPTR     ExitOpts;   /* Exit options structure */
MQLONG    CompCode;   /* Completion code */
MQLONG    Reason;     /* Reason code qualifying CompCode */
```

MQXEPO – Register entry point options

The following table summarizes the fields in the structure.

Field	Description	Topic
StrucId	Structure identifier	StrucId
Version	Structure version number	Version
Options	Options	Options
ExitProperties	Exit properties	ExitProperties

Overview

The MQXEPO structure allows applications to specify options that control how API exit entry points are registered.

The structure is an input parameter on the MQXEP call.

Fields

The MQXEPO structure contains the following fields; the fields are described in **alphabetic order**:

ExitProperties (MQCHARV):

This specifies the set of properties that are made available from the *ExitMsgHandle* field of the MQAXP structure.

The ExitProperties name indicates the prefix for all properties belonging to the exit. For example, an ExitProperties name of "ABC" causes all properties with the prefix of "ABC." to be made available from the ExitMsgHandle field of the MQAXP structure after an MQGET call. If you include a period "." or the wildcard character "%" in the ExitProperties name the MQXEP call fails with MQRC_PROPERTY_NAME_ERROR.

Any properties added to the *ExitMsgHandle* field are not made available to the application getting the data, from the *MsgHandle* field of the MQGMO structure, if one was specified, or in the message data.

This field only applies for the exit after the MQGET call, and is ignored if the entry point being registered is not MQXF_GET for ExitReason MQXR_AFTER.

This is always an input field. The initial value of this field is MQCHARV_DEFAULT.

Options (MQLONG):

Register entry point options structure - `Options` field.

The value must be:

MQXEPO_NONE
No options specified

This is always an input field. The initial value of this field is MQXEPO_NONE.

StrucId (MQCHAR4):

This is the structure identifier. The value must be:

MQXEPO_STRUC_ID
Identifier for register entry point options structure.

For the C programming language, the constant QXEPO_STRUC_ID_ARRAY is also defined, and has the same value as MQXEPO _STRUC_ID. However, QXEPO_STRUC_ID_ARRAY is an array of characters instead of a string.

This is always an input field. The initial value of this field is MQXEPO_STRUC_ID.

Version (MQLONG):

This is the structure version number. The value must be:

MQXEPO_VERSION_1
Version-1 register entry point options structure.

The following constant specifies the version number of the current version:

MQXEPO_CURRENT_VERSION
Current version of register entry point options structure.

This is always an input field. The initial value of this field is MQXEPO_VERSION_1.

Language declarations

This structure is supported in the following programming languages.

C declaration:

```
typedef struct tagMQXEPO MQXEPO;
struct tagMQXEPO {
  MQCHAR4  StrucId;         /* Structure identifier */
  MQLONG   Version;         /* Structure version number */
  MQLONG   Options;         /* Options that control the
                               action of MQXEP */
  MQCHARV  ExitProperties;  /* Exit properties */
};
```

MQ_BACK_EXIT – Back out changes

Exit providers can supply an MQ_BACK_EXIT function to intercept the MQBACK call. If the unit of work is being coordinated by an external unit-of-work manager, MQ_BACK_EXIT is also invoked in response to the application issuing the unit-of-work manager's back-out call.

Syntax

MQ_BACK_EXIT *(pExitParms, pExitContext, pHconn, pCompCode, pReason)*

Parameters

The MQ_BACK_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_BACK_EXIT (&ExitParms, &ExitContext, &Hconn,
             &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PMQLONG   pCompCode;     /* Completion code */
PMQLONG   pReason;       /* Reason code qualifying CompCode */
```

MQ_BEGIN_EXIT – Begin unit of work

Exit providers can supply an MQ_BEGIN_EXIT function to intercept the MQBEGIN call.

Syntax

MQ_BEGIN_EXIT *(pExitParms, pExitContext, pHconn, ppBeginOptions, pCompCode, pReason)*

Parameters

The MQ_BEGIN_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppBeginOptions (PPMQBO) – input/output:

Options that control the action of MQBEGIN.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_BEGIN_EXIT (&ExitParms, &ExitContext, &Hconn,
              &pBeginOptions, &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;      /* Exit parameter structure */
PMQAXC    pExitContext;    /* Exit context structure */
PMQHCONN  pHconn;          /* Connection handle */
PPMQBO    ppBeginOptions;  /* Options that control the action of
                              MQBEGIN */
PMQLONG   pCompCode;       /* Completion code */
PMQLONG   pReason;         /* Reason code qualifying CompCode */
```

MQ_CALLBACK_EXIT – Callback

Exit providers can supply an MQ_CALLBACK_EXIT function to intercept messages and notifications sent to a message consumer. The exit is called before and after the consumer function has been called.

Syntax

MQ_CALLBACK_EXIT *(pExitParms, pExitContext, pHconn, ppMsgDesc, ppGetMsgOpts, ppBuffer, ppMQCBContext)*

Parameters

The MQ_CALLBACK_EXIT call has the following parameters:

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppHobj (PPMQHOBJ) – input/output:

Object handle.

ppMsgDesc (PPMQMD) – input/output:

Message descriptor.

ppGetMsgOpts (PPMQGMO) – input/output:

Options that control the action of MQGET.

ppBuffer (PPMQVOID) – input/output:

Area to contain the message data.

ppContext (PPMCBC) – input/output:

Context data for the callback.

Usage notes

1. The Callback exit is invoked before the consumer is invoked and after the consumer's consumer function has completed. Although the MQMD and MQGMO structures are alterable, changing the values in the before exit does not redrive the retrieval of a message from the queue as the message has already been removed from the queue to be delivered to the consumer function

C invocation

```
MQ_CALLBACK_EXIT (&ExitParms, &ExitContext, &Hconn, &pMsgDesc,
                  &pGetMsgOpts, &pBuffer, &pContext);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PPMQMD    ppMsgDesc;     /* Message descriptor */
PPMQGMO   ppGetMsgOpts;  /* Options that define the operation of the consumer */
PPMQVOID  ppBuffer;      /* Area to conatin the message data */
PPMQCBC   ppContext;     /* Context data for the callback */
```

MQ_CLOSE_EXIT – Close object

Exit providers can supply an MQ_CLOSE_EXIT function to intercept the MQCLOSE call.

Syntax

MQ_CLOSE_EXIT *(pExitParms, pExitContext, pHconn, ppHobj, pOptions, pCompCode, pReason)*

Parameters

The MQ_CLOSE_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppHobj (PPMQHOBJ) – input/output:

Object handle.

pOptions (PMQLONG) – input/output:

Options that control the action of MQCLOSE.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_CLOSE_EXIT (&ExitParms, &ExitContext, &Hconn, &pHobj,
               &Options, &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PPMQHOBJ  ppHobj;        /* Object handle */
PMQLONG   pOptions;      /* Options that control the action of MQCLOSE */
PMQLONG   pCompCode;     /* Completion code */
PMQLONG   pReason;       /* Reason code qualifying CompCode */
```

MQ_CMIT_EXIT – Commit changes

Exit providers can supply an MQ_CMIT_EXIT function to intercept the MQCMIT call. If the unit of work is being coordinated by an external unit-of-work manager, MQ_CMIT_EXIT is also invoked in response to the application issuing the unit-of-work manager's commit call.

Syntax

MQ_CMIT_EXIT *(pExitParms, pExitContext, pHconn, pCompCode, pReason)*

Parameters

The MQ_CMIT_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_CMIT_EXIT (&ExitParms, &ExitContext, &Hconn,
              &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PMQLONG   pCompCode;     /* Completion code */
PMQLONG   pReason;       /* Reason code qualifying CompCode */
```

MQ_CONNX_EXIT – Connect queue manager (extended)

Exit providers can supply an MQ_CONNX_EXIT function to intercept the MQCONN and MQCONNX calls.

Syntax

MQ_CONNX_EXIT *(pExitParms, pExitContext, pQMgrName, ppConnectOpts, ppHconn, pCompCode, pReason)*

Parameters

The MQ_CONNX_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pQMgrName (PMQCHAR48) – input/output:

Name of queue manager.

ppConnectOpts (PPMQCNO) – input/output:

Options that control the action of MQCONNX.

ppHconn (PPMQHCONN) – input/output:

Connection handle.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

Usage notes

1. The MQ_CONNX_EXIT function interface described here is used for both the MQCONN call and the MQCONNX call. However, separate entry points are defined for these two calls. To intercept *both* calls, the MQXEP call must be used at least twice – once with function identifier MQXF_CONN, and again with MQXF_CONNX.

   Because the MQ_CONNX_EXIT interface is the same for MQCONN and MQCONNX, a single exit function can be used for both calls; the *Function* field in the MQAXP structure indicates which call is in progress. Alternatively, the MQXEP call can be used to register different exit functions for the two calls.
2. When a message channel agent (MCA) responds to an inbound client connection, the MCA can issue a number of MQ calls before the client state is fully known. These MQ calls result in the API exit functions being invoked with the MQAXC structure containing data relating to the MCA, and not to the client (for example, user identifier and connection name). However, once the client state is fully known, subsequent MQ calls result in the API exit functions being invoked with the appropriate client data in the MQAXC structure.

3. All MQXR_BEFORE exit functions are invoked before any parameter validation is performed by the queue manager. The parameters might therefore be invalid (including invalid pointers for the addresses of parameters).

   The MQ_CONNX_EXIT function is invoked before any authorization checks are performed by the queue manager.
4. The exit function must not change the name of the queue manager specified on the MQCONN or MQCONNX call. If the name is changed by the exit function, the results are undefined.
5. An MQXR_BEFORE exit function for the MQ_CONNX_EXIT cannot issue MQ calls other than MQXEP.

C invocation

```
MQ_CONNX_EXIT (&ExitParms, &ExitContext, QMgrName,
              &pConnectOpts, &pHconn, &CompCode,
              &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP     pExitParms;     /* Exit parameter structure */
PMQAXC     pExitContext;   /* Exit context structure */
PMQCHAR48  pQMgrName;      /* Name of queue manager */
PPMQCNO    ppConnectOpts;  /* Options that control the action of
                              MQCONNX */
PPMQHCONN  ppHconn;        /* Connection handle */
PMQLONG    pCompCode;      /* Completion code */
PMQLONG    pReason;        /* Reason code qualifying CompCode */
```

MQ_DISC_EXIT – Disconnect queue manager

Exit providers can supply an MQ_DISC_EXIT function to intercept the MQDISC call.

Syntax

MQ_DISC_EXIT *(pExitParms, pExitContext, ppHconn, pCompCode, pReason)*

Parameters

The MQ_DISC_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

ppHconn (PPMQHCONN) – input/output:

Connection handle.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_DISC_EXIT (&ExitParms, &ExitContext, &pHconn,
              &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP     pExitParms;    /* Exit parameter structure */
PMQAXC     pExitContext;  /* Exit context structure */
PPMQHCONN  ppHconn;       /* Connection handle */
PMQLONG    pCompCode;     /* Completion code */
PMQLONG    pReason;       /* Reason code qualifying CompCode */
```

MQ_GET_EXIT – Get message

Exit providers can supply an MQ_GET_EXIT function to intercept the MQGET call. The same exit function interface is used for the MQXF_DATA_CONV_ON_GET exit function.

Syntax

MQ_GET_EXIT *(pExitParms, pExitContext, pHconn, pHobj, ppMsgDesc, ppGetMsgOpts, pBufferLength, ppBuffer, ppDataLength, pCompCode, pReason)*

Parameters

The MQ_GET_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

pHobj (PMQHOBJ) – input/output:

Object handle.

ppMsgDesc (PPMQMD) – input/output:

Message descriptor.

ppGetMsgOpts (PPMQGMO) – input/output:

Options that control the action of MQGET.

pBufferLength (PMQLONG) – input/output:

Length in bytes of the *ppBuffer* area.

ppBuffer (PPMQVOID) – input/output:

Area to contain the message data.

ppDataLength (PPMQLONG) – input/output:

Length of the message.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

Usage notes

1. The MQ_GET_EXIT function interface described here is used for both the MQXF_GET exit function and the MQXF_DATA_CONV_ON_GET exit function. However, separate entry points are defined for these two exit functions, so to intercept *both* the MQXEP call must be used twice – once with function identifier MQXF_GET, and again with MQXF_DATA_CONV_ON_GET.

   Because the MQ_GET_EXIT interface is the same for MQXF_GET and MQXF_DATA_CONV_ON_GET, a single exit function can be used for both; the *Function* field in the MQAXP structure indicates which exit function has been invoked. Alternatively, the MQXEP call can be used to register different exit functions for the two cases.
2. There is no MQXR_AFTER exit function for MQXF_DATA_CONV_ON_GET; the MQXR_AFTER exit function for MQXF_GET provides the required capability for exit processing after data conversion.

C invocation

```
MQ_GET_EXIT (&ExitParms, &ExitContext, &Hconn, &Hobj,
            &pMsgDesc, &pGetMsgOpts, &BufferLength,
            &pBuffer, &pDataLength, &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;     /* Exit parameter structure */
PMQAXC    pExitContext;   /* Exit context structure */
PMQHCONN  pHconn;         /* Connection handle */
PMQHOBJ   pHobj;          /* Object handle */
PPMQMD    ppMsgDesc;      /* Message descriptor */
PPMQGMO   ppGetMsgOpts;   /* Options that control the action of MQGET */
PMQLONG   pBufferLength;  /* Length in bytes of the pBuffer area */
PPMQVOID  ppBuffer;       /* Area to contain the message data */
PPMQLONG  ppDataLength;   /* Length of the message */
PMQLONG   pCompCode;      /* Completion code */
PMQLONG   pReason;        /* Reason code qualifying CompCode */
```

MQ_INIT_EXIT – Initialize exit environment

Exit providers can supply an MQ_INIT_EXIT function to perform connection-level initialization.

Syntax

MQ_INIT_EXIT *(pExitParms, pExitContext, pCompCode, pReason)*

Parameters

The MQ_INIT_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

Usage notes

1. The MQ_INIT_EXIT function can issue the MQXEP call to register the addresses of the exit functions for the particular MQ calls to be intercepted. It is not necessary to intercept all MQ calls, or to intercept both MQXR_BEFORE and MQXR_AFTER calls. For example, an exit suite could choose to intercept only the MQXR_BEFORE call of MQPUT.
2. Storage that is to be used by exit functions in the exit suite can be acquired by the MQ_INIT_EXIT function. Alternatively, exit functions can acquire storage when they are invoked, as and when needed. However, all storage should be freed before the exit suite is terminated; the MQ_TERM_EXIT function can free the storage, or an exit function invoked earlier.
3. If MQ_INIT_EXIT returns MQXCC_FAILED in the *ExitResponse* field of MQAXP, or fails in some other way, the MQCONN or MQCONNX call that caused MQ_INIT_EXIT to be invoked also fails, with the *CompCode* and *Reason* parameters set to appropriate values.
4. An MQ_INIT_EXIT function cannot issue MQ calls other than MQXEP.

C invocation

```
MQ_INIT_EXIT (&ExitParms, &ExitContext, &CompCode,
              &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP   pExitParms;    /* Exit parameter structure */
PMQAXC   pExitContext;  /* Exit context structure */
PMQLONG  pCompCode;     /* Completion code */
PMQLONG  pReason;       /* Reason code qualifying CompCode */
```

MQ_INQ_EXIT – Inquire object attributes

Exit providers can supply an MQ_INQ_EXIT function to intercept the MQINQ call.

Syntax

MQ_INQ_EXIT *(pExitParms, pExitContext, pHconn, pHobj, pSelectorCount, ppSelectors, pIntAttrCount, ppIntAttrs, pCharAttrLength, ppCharAttrs, pCompCode, pReason)*

Parameters

The MQ_INQ_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

pHobj (PMQHOBJ) – input/output:

Object handle.

pSelectorCount (PMQLONG) – input/output:

Count of selectors.

ppSelectors (PPMQLONG) – input/output:

Array of attribute selectors.

pIntAttrCount (PMQLONG) – input/output:

Count of integer attributes.

ppIntAttrs (PPMQLONG) – input/output:

Array of integer attributes.

pCharAttrLength (PMQLONG) – input/output:

Length of character attributes buffer.

ppCharAttrs (PPMQCHAR) – input/output:

Character attributes.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_INQ_EXIT (&ExitParms, &ExitContext, &Hconn, &Hobj,
             &SelectorCount, &pSelectors, &IntAttrCount,
             &pIntAttrs, &CharAttrLength, &pCharAttrs,
             &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;       /* Exit parameter structure */
PMQAXC    pExitContext;     /* Exit context structure */
PMQHCONN  pHconn;           /* Connection handle */
PMQHOBJ   pHobj;            /* Object handle */
PMQLONG   pSelectorCount;   /* Count of selectors */
PPMQLONG  ppSelectors;      /* Array of attribute selectors */
PMQLONG   pIntAttrCount;    /* Count of integer attributes */
PPMQLONG  ppIntAttrs;       /* Array of integer attributes */
PMQLONG   pCharAttrLength;  /* Length of character attributes buffer */
PPMQCHAR  ppCharAttrs;      /* Character attributes */
PMQLONG   pCompCode;        /* Completion code */
PMQLONG   pReason;          /* Reason code qualifying CompCode */
```

MQ_OPEN_EXIT – Open object

Exit providers can supply an MQ_OPEN_EXIT function to intercept the MQOPEN call.

Syntax

MQ_OPEN_EXIT *(pExitParms, pExitContext, pHconn, ppObjDesc,*
pOptions, ppHobj, pCompCode, pReason)

Parameters

The MQ_OPEN_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppObjDesc (PPMQOD) – input/output:

Object descriptor.

pOptions (PMQLONG) – input/output:

Options that control the action of MQ_OPEN_EXIT.

ppHobj (PPMQHOBJ) – input/output:

Object handle.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_OPEN_EXIT (&ExitParms, &ExitContext, &Hconn,
             &pObjDesc, &Options, &pHobj, &CompCode,
             &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PPMQOD    ppObjDesc;     /* Object descriptor */
PMQLONG   pOptions;      /* Options that control the action of
                          MQ_OPEN_EXIT */
PPMQHOBJ  ppHobj;        /* Object handle */
PMQLONG   pCompCode;     /* Completion code */
PMQLONG   pReason;       /* Reason code qualifying CompCode */
```

MQ_PUT_EXIT – Put message

Exit providers can supply an MQ_PUT_EXIT function to intercept the MQPUT call.

Syntax

MQ_PUT_EXIT *(pExitParms, pExitContext, pHconn, pHobj, ppMsgDesc, ppPutMsgOpts, pBufferLength, ppBuffer, pCompCode, pReason)*

Parameters

The MQ_PUT_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

pHobj (PMQHOBJ) – input/output:

Object handle.

ppMsgDesc (PPMQMD) – input/output:

Message descriptor.

ppPutMsgOpts (PPMQPMO) – input/output:

Options that control the action of MQPUT.

pBufferLength (PMQLONG) – input/output:

Length of the message in *pBuffer*.

ppBuffer (PPMQVOID) – input/output:

Message data.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

Usage notes

- Report messages generated by the queue manager skip the normal call processing. As a result, such messages cannot be intercepted by the MQ_PUT_EXIT function or the MQPUT1 function. However, report messages generated by the message channel agent are processed normally, and hence can be intercepted by the MQ_PUT_EXIT function or the MQ_PUT1_EXIT function. To be sure to intercepting all of the report messages generated by the MCA, both MQ_PUT_EXIT and MQ_PUT1_EXIT should be used.

C invocation

```
MQ_PUT_EXIT (&ExitParms, &ExitContext, &Hconn, &Hobj,
            &pMsgDesc, &pPutMsgOpts, &BufferLength,
            &pBuffer, &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;     /* Exit parameter structure */
PMQAXC    pExitContext;   /* Exit context structure */
PMQHCONN  pHconn;         /* Connection handle */
PMQHOBJ   pHobj;          /* Object handle */
PPMQMD    ppMsgDesc;      /* Message descriptor */
PPMQPMO   ppPutMsgOpts;   /* Options that control the action of MQPUT */
PMQLONG   pBufferLength;  /* Length of the message in pBuffer */
PPMQVOID  ppBuffer;       /* Message data */
PMQLONG   pCompCode;      /* Completion code */
PMQLONG   pReason;        /* Reason code qualifying CompCode */
```

MQ_PUT1_EXIT – Put one message

Exit providers can supply an MQ_PUT1_EXIT function to intercept the MQPUT1 call.

Syntax

MQ_PUT1_EXIT *(pExitParms*, *pExitContext*, *pHconn*, *ppObjDesc*,
ppMsgDesc, *ppPutMsgOpts*, *pBufferLength*, *ppBuffer*, *pCompCode*, *pReason)*

Parameters

The MQ_PUT1_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppObjDesc (PPMQOD) – input/output:

Object descriptor.

ppMsgDesc (PPMQMD) – input/output:

Message descriptor.

ppPutMsgOpts (PPMQPMO) – input/output:

Options that control the action of MQPUT1.

pBufferLength (PMQLONG) – input/output:

Length of the message in *ppBuffer*.

ppBuffer (PPMQVOID) – input/output:

Message data.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_PUT1_EXIT (&ExitParms, &ExitContext, &Hconn,
             &pObjDesc, &pMsgDesc, &pPutMsgOpts,
             &BufferLength, &pBuffer, &CompCode,
             &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;     /* Exit parameter structure */
PMQAXC    pExitContext;   /* Exit context structure */
PMQHCONN  pHconn;         /* Connection handle */
PPMQOD    ppObjDesc;      /* Object descriptor */
PPMQMD    ppMsgDesc;      /* Message descriptor */
PPMQPMO   ppPutMsgOpts;   /* Options that control the action of MQPUT1 */
PMQLONG   pBufferLength;  /* Length of the message in pBuffer */
```

```
PPMQVOID  ppBuffer;       /* Message data */
PMQLONG   pCompCode;      /* Completion code */
PMQLONG   pReason;        /* Reason code qualifying CompCode */
```

MQ_SET_EXIT – Set object attributes

Exit providers can supply an MQ_SET_EXIT function to intercept the MQSET call.

Syntax

MQ_SET_EXIT *(pExitParms, pExitContext, pHconn, pHobj, pSelectorCount, ppSelectors, pIntAttrCount, ppIntAttrs, pCharAttrLength, ppCharAttrs, pCompCode, pReason)*

Parameters

The MQ_SET_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

pHobj (PMQHOBJ) – input/output:

Object handle.

pSelectorCount (PMQLONG) – input/output:

Count of selectors.

ppSelectors (PPMQLONG) – input/output:

Array of attribute selectors.

pIntAttrCount (PMQLONG) – input/output:

Count of integer attributes.

ppIntAttrs (PPMQLONG) – input/output:

Array of integer attributes.

pCharAttrLength (PMQLONG) – input/output:

Length of character attributes buffer.

ppCharAttrs (PPMQCHAR) – input/output:

Character attributes.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_SET_EXIT (&ExitParms, &ExitContext, &Hconn, &Hobj,
            &SelectorCount, &pSelectors, &IntAttrCount,
            &pIntAttrs, &CharAttrLength, &pCharAttrs,
            &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;       /* Exit parameter structure */
PMQAXC    pExitContext;     /* Exit context structure */
PMQHCONN  pHconn;           /* Connection handle */
PMQHOBJ   pHobj;            /* Object handle */
PMQLONG   pSelectorCount;   /* Count of selectors */
PPMQLONG  ppSelectors;      /* Array of attribute selectors */
PMQLONG   pIntAttrCount;    /* Count of integer attributes */
PPMQLONG  ppIntAttrs;       /* Array of integer attributes */
PMQLONG   pCharAttrLength;  /* Length of character attributes buffer */
PPMQCHAR  ppCharAttrs;      /* Character attributes */
PMQLONG   pCompCode;        /* Completion code */
PMQLONG   pReason;          /* Reason code qualifying CompCode */
```

MQ_SUB_EXIT – Register subscription

Exit providers can supply an MQ_SUB_EXIT function to intercept the MQSUB call.

Syntax

MQ_SUB_EXIT
(pExitParms, pExitContext, pHconn, ppSubDesc, ppHobj, ppHsub, pCompCode, pReason)

Parameters

The MQ_SUB_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppSubDesc (PPMQSD) – input/output:

Array of attribute selectors.

ppHobj (PPMQHOBJ) – input/output:

Object handle.

ppHsub (PPMQHOBJ) – input/output:

Array of integer attributes.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_SUB_EXIT (&ExitParms, &ExitContext, &Hconn, &pObjDesc, &Options,
&pHobj, &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PPMQSD    ppSubDesc;     /* Subscription Descriptor */
PPMQHOBJ  ppHobj;        /* Object handle */
PPMQHOBJ  ppHsub;        /* Subscription handle */
PMQLONG   pCompCode;     /* Completion code */
PMQLONG   pReason;       /* Reason code qualifying CompCode */
```

MQ_SUBRQ_EXIT – Subscription request

Exit providers can supply an MQ_SUBRQ_EXIT function to intercept the MQSUBRQ call.

Syntax

MQ_SUBRQ_EXIT
(pExitParms, pExitContext, pHconn, ppHsub, pAction, ppSubRqOpts, pCompCode, pReason)

Parameters

The MQ_SUBRQ_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pHconn (PMQHCONN) – input/output:

Connection handle.

ppHSub (PPMQHOBJ) – input/output:

Subscription handle

pAction (PMQLONG) – input/output:

Action

ppSubRqOpts (PPMQSRO) – input/output:

Subscription request options

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

C invocation

```
MQ_SUBRQ_EXIT (&ExitParms, &ExitContext, &Hconn, &pHsub, &Action, &pSubRqOpts,
 &CompCode, &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP    pExitParms;    /* Exit parameter structure */
PMQAXC    pExitContext;  /* Exit context structure */
PMQHCONN  pHconn;        /* Connection handle */
PPMQHOBJ  ppHsub;        /* Subscription handle */
PMQLONG   pAction;       /* Action */
PPMQSRO   ppSubRqOpts;   /* Subscription Request Options */
PMQLONG   pCompCode;     /* Completion code */
PMQLONG   pReason;       /* Reason code qualifying CompCode */
```

MQ_TERM_EXIT – Terminate exit environment

Exit providers can supply an MQ_INIT_EXIT function to perform connection-level termination.

Syntax

MQ_TERM_EXIT *(pExitParms, pExitContext, pCompCode, pReason)*

Parameters

The MQ_TERM_EXIT call has the following parameters.

pExitParms (PMQAXP) – input/output:

Exit parameter structure.

pExitContext (PMQAXC) – input/output:

Exit context structure.

pCompCode (PMQLONG) – input/output:

Completion code.

pReason (PMQLONG) – input/output:

Reason code qualifying *pCompCode*.

Usage notes

1. The MQ_TERM_EXIT function is optional. It is not necessary for an exit suite to register a termination exit if there is no termination processing to be done.

   If functions belonging to the exit suite acquire resources during the connection, an MQ_TERM_EXIT function is a convenient point at which to free those resources, for example, freeing storage obtained dynamically.
2. If an MQ_TERM_EXIT function is registered when the MQDISC call is issued, the exit function is invoked after all of the MQDISC exit functions have been invoked.
3. If MQ_TERM_EXIT returns MQXCC_FAILED in the *ExitResponse* field of MQAXP, or fails in some other way, the MQDISC call that caused MQ_TERM_EXIT to be invoked also fails, with the *CompCode* and *Reason* parameters set to appropriate values.

C invocation

```
MQ_TERM_EXIT (&ExitParms, &ExitContext, &CompCode,
              &Reason);
```

The parameters passed to the exit are declared as follows:

```
PMQAXP   pExitParms;    /* Exit parameter structure */
PMQAXC   pExitContext;  /* Exit context structure */
PMQLONG  pCompCode;     /* Completion code */
PMQLONG  pReason;       /* Reason code qualifying CompCode */
```

Chapter 8. System and default objects

When you create a queue manager using the **crtmqm** control command, the system objects and the default objects are created automatically.

- The system objects are those WebSphere MQ objects needed to operate a queue manager or channel.
- The default objects define all the attributes of an object. When you create an object, such as a local queue, any attributes that you do not specify explicitly are inherited from the default object.

The following tables list the system and default objects created by **crtmqm**:

- Table 31 lists the system and default queue objects.
- Table 32 on page 526 lists the system and default topic objects.
- Table 33 on page 526 lists the system and default channel objects.
- Table 34 on page 527 lists the system and default authentication information objects.
- Table 35 on page 527 lists the system and default listener objects.
- Table 36 on page 527 lists the system and default namelist objects.
- Table 37 on page 527 lists the system and default process objects.
- Table 38 on page 527 lists the system and default service objects.

Table 31. System and default objects: queues

Object name	Description
SYSTEM.ADMIN.ACCOUNTING.QUEUE	The queue that holds accounting monitoring data.
SYSTEM.ADMIN.ACTIVITY.QUEUE	The queue that holds returned activity reports.
SYSTEM.ADMIN.CHANNEL.EVENT	Event queue for channels.
SYSTEM.ADMIN.COMMAND.QUEUE	Administration command queue. Used for remote MQSC commands and PCF commands.
SYSTEM.ADMIN.CONFIG.EVENT	Event queue for configuration events.
SYSTEM.ADMIN.PERFM.EVENT	Event queue for performance events.
SYSTEM.ADMIN.QMGR.EVENT	Event queue for queue manager events.
SYSTEM.ADMIN.STATISTICS.QUEUE	The queue that holds statistics monitoring data.
SYSTEM.ADMIN.TRACE.ROUTE.QUEUE	The queue that holds returned trace-route reply messages.
SYSTEM.AUTH.DATA.QUEUE	The queue that holds access control lists for the queue manager.
SYSTEM.CHANNEL.INITQ	Channel initiation queue.
SYSTEM.CHANNEL.SYNCQ	The queue that holds the synchronization data for channels.
SYSTEM.CICS.INITIATION.QUEUE	Default CICS initiation queue.
SYSTEM.CLUSTER.COMMAND.QUEUE	The queue used to carry messages to the repository queue manager.
SYSTEM.CLUSTER.REPOSITORY.QUEUE	The queue used to store all repository information.

Table 31. System and default objects: queues (continued)

Object name	Description
SYSTEM.CLUSTER.TRANSMIT.QUEUE	The transmission queue for all messages to all clusters.
SYSTEM.DEAD.LETTER.QUEUE	Dead-letter (undelivered-message) queue.
SYSTEM.DEFAULT.ALIAS.QUEUE	Default alias queue.
SYSTEM.DEFAULT.INITIATION.QUEUE	Default initiation queue.
SYSTEM.DEFAULT.LOCAL.QUEUE	Default local queue.
SYSTEM.DEFAULT.MODEL.QUEUE	Default model queue.
SYSTEM.DEFAULT.REMOTE.QUEUE	Default remote queue.
SYSTEM.MQEXPLORER.REPLY.MODEL	The WebSphere MQ Explorer reply-to queue. This is a model queue that creates a temporary dynamic queue for replies to the WebSphere MQ Explorer.
SYSTEM.MQSC.REPLY.QUEUE	MQSC command reply-to queue. This is a model queue that creates a temporary dynamic queue for replies to remote MQSC commands.
SYSTEM.PENDING.DATA.QUEUE	Support deferred messages in JMS.

Table 32. System and default objects: topics

Object name	Description
SYSTEM.BASE.TOPIC	Base topic for ASPARENT resolution. If a particular topic has no parent administrative topic objects, or those parent objects also have ASPARENT, any remaining ASPARENT attributes are inherited from this object.
SYSTEM.DEFAULT.TOPIC	Default topic definition.

Table 33. System and default objects: channels

Object name	Description
SYSTEM.AUTO.RECEIVER	Dynamic receiver channel.
SYSTEM.AUTO.SVRCONN	Dynamic server-connection channel.
SYSTEM.DEF.CLUSRCVR	Default receiver channel for the cluster, used to supply default values for any attributes not specified when a CLUSRCVR channel is created on a queue manager in the cluster.
SYSTEM.DEF.CLUSSDR	Default sender channel for the cluster, used to supply default values for any attributes not specified when a CLUSSDR channel is created on a queue manager in the cluster.
SYSTEM.DEF.RECEIVER	Default receiver channel.
SYSTEM.DEF.REQUESTER	Default requester channel.
SYSTEM.DEF.SENDER	Default sender channel.
SYSTEM.DEF.SERVER	Default server channel.
SYSTEM.DEF.SVRCONN	Default server-connection channel.
SYSTEM.DEF.CLNTCONN	Default client-connection channel.

Table 34. System and default objects: authentication information objects

Object name	Description
SYSTEM.DEFAULT.AUTHINFO.CRLLDAP	Default authentication information object.

Table 35. System and default objects: listeners

Object name	Description
SYSTEM.DEFAULT.LISTENER.TCP	Default TCP listener.
SYSTEM.DEFAULT.LISTENER.LU62 (Windows only)	Default LU62 listener.
SYSTEM.DEFAULT.LISTENER.NETBIOS (Windows only)	Default NETBIOS listener.
SYSTEM.DEFAULT.LISTENER.SPX (Windows only)	Default SPX listener.

Table 36. System and default objects: namelists

Object name	Description
SYSTEM.DEFAULT.NAMELIST	Default namelist.

Table 37. System and default objects: processes

Object name	Description
SYSTEM.DEFAULT.PROCESS	Default process definition.

Table 38. System and default objects: services

Object name	Description
SYSTEM.DEFAULT.SERVICE	Default service.
SYSTEM.BROKER	Publish/subscribe broker

Windows default configuration objects

On Windows systems, you set up a default configuration using the WebSphere MQ Postcard application.

Note: You cannot set up a default configuration if other queue managers exist on your computer.

Many of the names used for the Windows default configuration objects involve the use of a short TCP/IP name. This is the TCP/IP name of the computer, without the domain part; for example the short TCP/IP name for the computer `mycomputer.hursley.ibm.com` is `mycomputer`. In all cases, where this name has to be truncated, if the last character is a period (.), it is removed.

Any characters within the short TCP/IP name that are not valid for WebSphere MQ object names (for example, hyphens) are replaced by an underscore character.

Valid characters for WebSphere MQ object names are: a to z, A to Z, 0 to 9, and the four special characters / % . and _.

The cluster name for the Windows default configuration is DEFAULT_CLUSTER.

If the queue manager is not a repository queue manager, the objects listed in Table 39 are created.

Table 39. Objects created by the Windows default configuration application

Object	**Name**
Queue manager	The short TCP/IP name prefixed with the characters QM_. The maximum length of the queue manager name is 48 characters. Names exceeding this limit are truncated at 48 characters. If the last character of the name is a period (.), this is replaced by a space ( ). The queue manager has a command server, a channel listener, and channel initiator associated with it. The channel listener listens on the standard WebSphere MQ port, port number 1414. Any other queue managers created on this machine must not use port 1414 while the default configuration queue manager still exists.
Generic cluster receiver channel	The short TCP/IP name prefixed with the characters TO_QM_. The maximum length of the generic cluster receiver name is 20 characters. Names exceeding this limit are truncated at 20 characters. If the last character of the name is a period (.), this is replaced by a space ( ).
Cluster sender channel	The cluster sender channel is initially created with the name TO_+QMNAME+. Once WebSphere MQ has established a connection to the repository queue manger for the default configuration cluster, this name is replaced with the name of the repository queue manager for the default configuration cluster, prefixed with the characters TO_. The maximum length of the cluster sender channel name is 20 characters. Names exceeding this limit are truncated at 20 characters. If the last character of the name is a period (.), this is replaced by a space ( ).
Local message queue	The local message queue is called `default`.
Local message queue for use by the WebSphere MQ Postcard application	The local message queue for use by the WebSphere MQ Postcard application is called `postcard`.
Server connection channel	The server connection channel allows clients to connect to the queue manager. Its name is the short TCP/IP name, prefixed with the characters S_. The maximum length of the server connection channel name is 20 characters. Names exceeding this limit are truncated at 20 characters. If the last character of the name is a period (.), this is replaced by a space ( ).

If the queue manager is a repository queue manager, the default configuration is similar to that described in Table 39, but with the following differences:

- The queue manager is defined as a repository queue manager for the default configuration cluster.
- There is no cluster-sender channel defined.
- A local cluster queue that is the short TCP/IP name prefixed with the characters clq_default_ is created. The maximum length of this name is 48 characters. Names exceeding this length are truncated at 48 characters.

If you request remote administration facilities, the server connection channel, SYSTEM.ADMIN.SVRCONN is also created.

SYSTEM.BASE.TOPIC

Base topic for ASPARENT resolution. If a particular topic has no parent administrative topic objects, or those parent objects also have ASPARENT, any remaining ASPARENT attributes are inherited from this object.

The default values of the SYSTEM.BASE.TOPIC are:

Table 40. Default values of SYSTEM.BASE.TOPIC

Parameter	**Value**
TOPICSTR	″
DEFPRTY	0
DEFPRESP	SYNC
DEFPSIST	NO
DESCR	'Base topic for resolving attributes'
DURSUB	YES
MDURMDL	SYSTEM.DURABLE.MODEL.QUEUE
MNDURMDL	SYSTEM.NDURABLE.MODEL.QUEUE
MASTER	YES
NPMSGDLV	ALLAVAIL
PMSGDLV	ALLDUR
PUB	ENABLE
SUB	ENABLE

If this object does not exist, its default values are still used by WebSphere MQ for ASPARENT attributes that are not resolved by parent topics further up the topic tree.

Chapter 9. Directory structure (Windows systems)

Table 41 shows the directories found under the root `c:\Program Files\IBM\WebSphere MQ\`.If you are using 64-bit Windows, the root directory is c:\Program Files\IBM\WebSphere MQ (x86)\ If you have installed WebSphere MQ for Windows under a different directory, the root is modified appropriately.

Table 41. WebSphere MQ for Windows directory structure

\bin	Contains binary files (commands and DDLs).
\bin64	Contains binary files (commands and DDLs 64-bit only).
\config	Contains configuration information.
\conv	Contains files for data conversion in folder `\table`.
\doc	Contains files for Wizard help.
\errors	Contains the system error log files: • AMQERR01.LOG • AMQERR02.LOG • AMQERR03.LOG These files contain information related errors that are not associated with a particular queue manager. AMQERR01.LOG contains the most recent error information. This folder also holds any FFST files that are produced.
\eclipse	Contains files for Help Center
\eclipse\SDK33	Contains files for Eclipse system
\exits	Contains channel exit programs.
\exits64	Contains channel exit programs (64-bit only).
\gskit	Contains GSKit files.
\java	Contains Java files.
\licenses	Contains a folder for each national language. Each folder contains license information.
\log	Contains a folder for each queue manager. The following subdirectories and files will exist for each queue manager after you have been using that queue manager for some time. **AMQHLCTL.LFH** Log control file. **Active** This directory contains the log files numbered S0000000.LOG, S0000001.LOG, S00000002.LOG, and so on.
\Non_IBM_License	Contains non-IBM license files.
\qmgrs	Contains a folder for each queue manager; the contents of these folders are described in Table 42 on page 532. Also contains the folder \@SYSTEM\errors,
\tivoli	Contains the signature file used by Tivoli®.
\tools	Contains all the WebSphere MQ sample programs. These are described in WebSphere MQ for Windows Quick Beginnings.
\trace	Contains all trace files.
\uninst	Contains files necessary to uninstall WebSphere MQ.

Table 42 shows the directory structure for each queue manager in the `c:\Program Files\IBM\WebSphere MQ\qmgrs\` folder. The queue manager might have been transformed as described in "Understanding WebSphere MQ file names" on page 16.

Table 42. Content of a \queue-manager-name\ folder for WebSphere MQ for Windows

@app	Contains files used internally by Websphere MQ
@ipcc	Contains files used internally by Websphere MQ
@qmpersist	Contains files used internally by Websphere MQ
amqalchk.fil	Contains a checkpoint file containing information about the last checkpoint.
AMQRSYNA.DAT	Contains files used internally by Websphere MQ
\authinfo	Contains a file for each authentication information object.
\channel	Contains a file for each channel object.
\clntconn	Contains a file for each client connection channel object.
\errors	Contains error log files associated with the queue manager: • AMQERR01.LOG • AMQERR02.LOG • AMQERR03.LOG AMQERR01.LOG contains the most recent error information.
\listener	Contains a file for each listener object.
\namelist	Contains a file for each WebSphere MQ namelist.
\Plugcomp	Directory reserved for use by WebSphere MQ installable services.
\Procdef	Contains a file for each WebSphere MQ process definition. Where possible, the file name matches the associated process definition name, but some characters have to be altered. There might be a directory called @MANGLED here containing process definitions with transformed or mangled names.
\Qmanager	Contains the following files: **Qmanager** The queue manager object. **QMQMOBJCAT** The object catalogue containing the list of all WebSphere MQ objects, used internally. **Note:** If you are using a FAT system, this name is transformed and a subdirectory created containing the file with its name transformed. **QAADMIN** File used internally for controlling authorizations.
\Queues	Each queue has a directory here containing a single file called Q. Where possible, the directory name matches the associated queue name but some characters have to be altered. There might be a directory called @MANGLED here containing queues with transformed or mangled names.
\services	Contains a file for each service object.
\ssl	Contains SSL certificate stores.
\Startprm	Contains temporary files used internally.
\topic	Contains one directory for each topic.

Chapter 10. Directory structure (UNIX systems)

Figure 37 on page 534 shows the general layout of the data and log directories associated with a specific queue manager. The directories shown apply to the default installation. If you change this, the locations of the files and directories are modified accordingly. For information about the location of the product files, see one of the following:

- WebSphere MQ for AIX Quick Beginnings
- WebSphere MQ for HP-UX Quick Beginnings
- WebSphere MQ for Solaris Quick Beginnings
- WebSphere MQ for Linux Quick Beginnings

In Figure 37 on page 534, the layout is representative of WebSphere MQ after a queue manager has been in use for some time. The actual structure that you have depends on which operations have occurred on the queue manager.

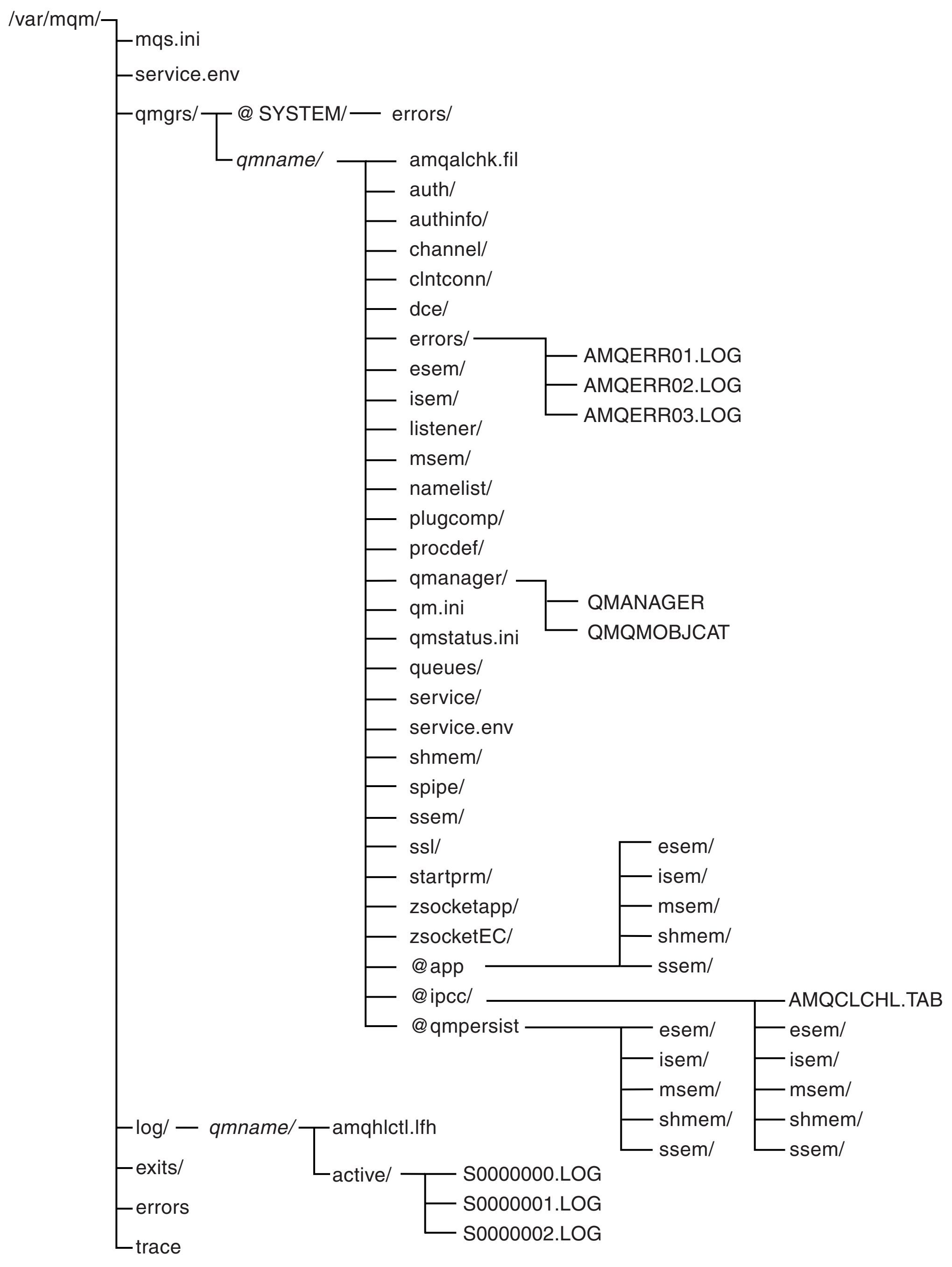


Figure 37. Default directory structure (UNIX systems) after a queue manager has been started

By default, the following directories and files are located in the directory `/var/mqm/qmgrs/`*`qmname`*`/` (where *qmname* is the name of the queue manager).

Table 43. Default content of a `/var/mqm/qmgrs/qmname/` directory on UNIX systems

amqalchk.fil	Checkpoint file containing information about the last checkpoint.
auth/	Contained subdirectories and files associated with authority in WebSphere MQ prior to Version 6.0.

Table 43. Default content of a `/var/mqm/qmgrs/qmname/` directory on UNIX systems (continued)

authinfo/	Each WebSphere MQ authentication information definition is associated with a file in this directory. The file name matches the authentication information definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
channel/	Each WebSphere MQ channel definition is associated with a file in this directory. The file name matches the channel definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
clntconn/	Each WebSphere MQ client connection channel definition is associated with a file in this directory. The file name matches the client connection channel definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
dce/	Used for DCE support prior to WebSphere MQ Version 6.0.
errors/	Directory containing FFSTs, client application errors, and operator message files from newest to oldest: • AMQERR01.LOG • AMQERR02.LOG • AMQERR03.LOG
esem/	Directory containing files used internally.
isem/	Directory containing files used internally.
listener/	Each WebSphere MQ listener definition is associated with a file in this directory. The file name matches the listener definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
msem/	Directory containing files used internally.
namelist/	Each WebSphere MQ namelist definition is associated with a file in this directory. The file name matches the namelist definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
plugcomp/	Empty directory reserved for use by installable services.
procdef/	Each WebSphere MQ process definition is associated with a file in this directory. The file name matches the process definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
qmanager/	**QMANAGER** The queue manager object. **QMQMOBJCAT** The object catalog containing the list of all WebSphere MQ objects; used internally.
qm.ini	Queue manager configuration file.
queues/	Each queue has a directory in here containing a single file called q. The file name matches the queue name, subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
services/	Each WebSphere MQ service definition is associated with a file in this directory. The file name matches the service definition name—subject to certain restrictions; see "Understanding WebSphere MQ file names" on page 16.
shmem/	Directory containing files used internally.

Table 43. Default content of a /var/mqm/qmgrs/*qmname*/ directory on UNIX systems (continued)

spipe/	Used internally by channel processes.
ssem/	Directory containing files used internally.
ssl/	Directory for SSL key database files.
startprm/	Directory containing temporary files used internally.
zsocketapp/	Used internally for isolated bindings.
zsocketEC/	Used internally for isolated bindings.
@ipcc/	**AMQCLCHL.TAB** Client channel table file. **esem/** Directory containing files used internally. **isem/** Directory containing files used internally. **msem/** Directory containing files used internally. **shmem/** Directory containing files used internally. **ssem/** Directory containing files used internally.
@qmpersist	**esem/** Directory containing files used internally. **isem/** Directory containing files used internally. **msem/** Directory containing files used internally. **shmem/** Directory containing files used internally. **ssem/** Directory containing files used internally.
@qmpersist	**esem/** Directory containing files used internally. **isem/** Directory containing files used internally. **msem/** Directory containing files used internally. **shmem/** Directory containing files used internally. **ssem/** Directory containing files used internally.
@app	**esem/** Directory containing files used internally. **isem/** Directory containing files used internally. **msem/** Directory containing files used internally. **shmem/** Directory containing files used internally. **ssem/** Directory containing files used internally.

By default, the following directories and files are found in /var/mqm/log/*qmname*/ (where *qmname* is the name of the queue manager).

The following subdirectories and files exist after you have installed WebSphere MQ, created and started a queue manager, and have been using that queue manager for some time.

amqhlctl.lfh	Log control file.

active/	This directory contains the log files numbered S0000000.LOG, S0000001.LOG, S0000002.LOG, and so on.

Chapter 11. Stopping and removing queue managers manually

If the standard methods for stopping and removing queue managers fail, try the methods described here.

Stopping a queue manager manually

The standard way of stopping queue managers, using the **endmqm** command, should work even in the event of failures within the queue manager. In exceptional circumstances, if this method of stopping a queue manager fails, you can use one of the procedures described here to stop it manually.

Stopping queue managers in WebSphere MQ for Windows

Stopping queue managers in WebSphere MQ for Windows

To stop a queue manager running under WebSphere MQ for Windows:

1. List the names (IDs) of the processes currently running using the Windows Task Manager, or the tasklist command.
2. End the processes using Task Manager, or the taskkill command, in the following order (if they are running):

AMQZMUC0	Critical process manager
AMQZXMA0	Execution controller
AMQZFUMA	OAM process
AMQZLAA0	LQM agents
AMQZLSA0	LQM agents
AMQZMGR0	Process controller
AMQZMUR0	Restartable process manager
AMQRMPPA	Process pooling process
AMQRRMFA	The repository process (for clusters)
AMQZDMAA	Deferred message processor
AMQPCSEA	The command server
AMQXSSVN	Shared memory servers
AMQZTRCN	Trace

3. Stop the WebSphere MQ service from `Services` on the Windows Control Panel.
4. If you have tried all methods and the queue manager has not stopped, reboot your system.

The Windows Task Manager and the tasklist command give limited information about tasks. For more information to help to determine which processes relate to a particular queue manager, consider using a tool such as *Process Explorer* (procexp.exe), available for download from the Microsoft Web site (www.microsoft.com).

Stopping queue managers in WebSphere MQ for UNIX systems

To stop a queue manager running under WebSphere MQ for UNIX systems:

1. Find the process IDs of the queue manager programs that are still running using the **ps** command. For example, if the queue manager is called `QMNAME`, use the following command:

   ```
   ps -ef | grep QMNAME
   ```
2. End any queue manager processes that are still running. Use the **kill** command, specifying the process IDs discovered using the **ps** command.

   End the processes in the following order:

amqzmuc0	Critical process manager
amqzxma0	Execution controller
amqzfuma	OAM process
amqzlaa0	LQM agents
amqzlsa0	LQM agents
amqzmgr0	Process controller
amqzmur0	Restartable process manager
amqrmppa	Process pooling process
amqrrmfa	The repository process (for clusters)
amqzdmaa	Deferred message processor
amqpcsea	The command server

Note: Processes that fail to stop can be ended using **kill -9**.

If you stop the queue manager manually, FFSTs might be taken, and FDC files placed in `/var/mqm/errors.` Do not regard this as a defect in the queue manager.

The queue manager should restart normally, even after you have stopped it using this method.

Removing queue managers manually

If you want to delete the queue manager after stopping it manually, use the **dltmqm** command. If, for some reason, this command fails to delete the queue manager, use the manual processes described here.

Removing queue managers in WebSphere MQ for Windows

If you encounter problems with the **dltmqm** command in WebSphere MQ for Windows, use the following procedure to delete a queue manager:

1. Type `REGEDIT` from the command prompt to start the Registry Editor.
2. Select the HKEY_LOCAL_MACHINE window.
3. Navigate the tree structure in the left-hand pane of the Registry Editor to the following key:

   ```
   HKEY_LOCAL_MACHINE\SOFTWARE\IBM\MQSeries\CurrentVersion
   ```

   Make a note of the values within this key called WorkPath and LogPath. Within each of the directories named by these values, you are going to delete a subdirectory containing the data for the queue manager that you are trying to delete. You now need to find out the name of the subdirectory which corresponds to your queue manager.
4. Navigate the tree structure to the following key:

   ```
   HKEY_LOCAL_MACHINE\SOFTWARE\IBM\MQSeries\CurrentVersion\
   Configuration\QueueManager
   ```

Within this key there is a key for each of the queue managers on this computer containing the configuration information for the queue manager. The name of this queue manager key is the name of the subdirectory in which the queue manager's data is stored in the file system. By default, this name is the same as the queue manager name, but the name might be a transformation of the queue manager name.

5. Examine the keys within the current key. Look for the key that contains a value called `Name`. `Name` contains the name of the queue manager you are trying to delete. Make a note of the name of the key containing the name of the queue manager you are trying to delete. This is the subdirectory name.
6. Locate the queue manager data directory. The name of this directory is the WorkPath followed by the subdirectory name. Delete this directory, and all subdirectories and files.
7. Locate the queue manager's log directory. The name of this directory is the LogPath followed by the subdirectory name. Delete this directory, and all subdirectories and files.
8. Remove the registry entries that refer to the deleted queue manager. First, navigate the tree structure in the Registry Editor to the following key:
```
HKEY_LOCAL_MACHINE\SOFTWARE\IBM\MQSeries\CurrentVersion\
Configuration\DefaultQueueManager
```
9. If the value called Name within this key matches the name of the queue manager you are deleting, delete the DefaultQueueManager key.
10. Navigate the tree to the following key:
```
HKEY_LOCAL_MACHINE\SOFTWARE\IBM\MQSeries\CurrentVersion\
Configuration\Services
```
11. Within this key, delete the key whose name matches the subdirectory name of the queue manager which you are deleting.
12. Navigate the tree to the following key:
```
HKEY_LOCAL_MACHINE\SOFTWARE\IBM\MQSeries\CurrentVersion\
Configuration\QueueManager
```
13. Within this key, delete the key whose name matches the subdirectory name of the queue manager which you are deleting.

Removing queue managers from the automatic startup list

If for any reason the WebSphere MQ Explorer cannot be used to change the startup state of a particular queue manager, use the following routine to carry out the same procedure manually:

1. Stop the WebSphere MQ Explorer either from the task bar icon or from the control panel.
2. Type `REGEDIT` on the command line.
3. Select the HKEY_LOCAL_MACHINE window.
4. Navigate the tree structure to find the following key:
```
LOCAL_MACHINE\Software\IBM\MQSeries\CurrentVersion\Configuration\
Services\<QMgrName>\QueueManager
```
5. Change the startup value to 0. (1 means automatic and 0 means manual.)
6. Close the Registry Editor.
7. Run **amqmdain regsec**.

Removing queue managers in WebSphere MQ for UNIX systems

The manual removal of a queue manager is potentially very disruptive, particularly if multiple queue managers are being used on a single system. This is because, to completely remove a queue manager, you must delete files, shared memory, and semaphores.

If you need to delete a queue manager manually, use the following procedure:

1. Stop the queue manager running, and execute the following command, as user mqm:

   ```
   amqiclen -x -m QMGR
   ```

   This ensures that all IPC resources that are specifically reserved for queue manager *QMGR* are removed.
2. Locate the queue manager directory from the configuration file `/var/mqm/mqs.ini`. To do this, look for the `QueueManager` stanza naming the queue manager to be deleted.

   Its Prefix and Directory attributes identify the queue manager directory. For a Prefix attribute of <Prefix> and a Directory attribute of <Directory>, the full path to the queue manager directory is: `<Prefix>/qmgrs/<Directory>`
3. Locate the queue manager log directory from the qm.ini configuration file in the queue manager directory. The LogPath attribute of the `Log` stanza identifies this directory.
4. Delete the queue manager directory, all subdirectories and files.
5. Delete the queue manager log directory, all subdirectories and files.
6. Remove the queue manager's `QueueManager` stanza from the `/var/mqm/mqs.ini` configuration file.
7. If the queue manager being deleted is also the default queue manager, remove the `DefaultQueueManager` stanza from the `/var/mqm/mqs.ini` configuration file.

Chapter 12. File Transfer Application

This chapter explains how to use the File Transfer Application.

The chapter includes:

Introduction

The File Transfer Application allows you to send and receive files in the form of WebSphere MQ messages. You can use the File Transfer Application to send and receive binary files (for example, image files, wordprocessor files, spreadsheet files, or zip files).

The File Transfer Application is available on both WebSphere MQ for Windows, and WebSphere MQ for Linux (x86 platform) servers, and clients.

The File Transfer Application includes a graphical user interface (GUI), and a command-line interface. Both interfaces invoke the same underlying WebSphere MQ functionality and can be used to transfer the same types of file.

There are three principal users of the File Transfer Application:

System administrators
Set up the File Transfer Application for end-users, by defining queues as sources and destinations in the File Transfer Application GUI.

Non-experienced end-users
These are non-expert IT users working within the business, for example car showroom managers. Users in this group want to send and receive files such as daily sales figures and stock reports, using the File Transfer Application GUI.

Experienced end-users
These are expert IT users working within the business, who have an understanding of WebSphere MQ. Users in this group want to send and receive files from the command-line.

Advantages

- *Files of any type can be transferred*. Because the File Transfer Application does not distinguish between files of different types, you can send and receive files in any format (for example, spreadsheets, memos, letters). You can even send and receive image and sound files.
- *File transfer is technology independent*. Files can be transferred between dissimilar operating platforms (for example Windows, UNIX), using TCP/IP.
- *Transferred files cannot be accidentally duplicated*. Files are sent once-and-once-only to a specified destination.
- *Files are transferred securely*. High-level data security and integrity is provided if SSL (secure sockets layer) encrypted message channels are used.

- *The sender and receiver run independently*. The sender and receiver do not both have to be running at the same time.

  If the receiver is currently unavailable or busy, the file is held on a queue. When the receiver becomes available, the file is then automatically transferred. The persistent option assures maximum reliability (non-persistent messages are automatically deleted from the queue on the receiving machine, when the queue manager restarts).
- *The system is scalable*. An administrator can add new sources and destinations to the File Transfer Application GUI, so that they become accessible to users.
- *The File Transfer Application GUI*. The File Transfer Application provides a GUI.

Components

The File Transfer Application consists of the following main components:

Sender
This is a program that puts a file stored in the local file system onto a queue, as one or more WebSphere MQ messages.

Receiver
This is a program that receives files and stores them in a local file system.

File Transfer Application GUI
The GUI allows non-experienced users to send files, receive files, and create a list of sent/received files in an intuitive way. Users of the GUI need no knowledge of how the underlying WebSphere MQ technology works.

Available when installed from a WebSphere MQ server CD.

A command line interface
This provides a way for experienced users to send and receive files by issuing commands from the command line. Additional functionality is available with the File Transfer Application GUI. Users of the command line interface need to have an understanding of how WebSphere MQ works.

Installing and configuring

The File Transfer Application is used to transfer files between remote machines. The File Transfer Application can be installed on a WebSphere MQ server or on a WebSphere MQ client. For a file to be transferred between two remote machines, the File Transfer Application must be installed on both the sender machine and the receiver machine. Having installed the File Transfer Application additional setup and configuration tasks must be performed.

Installing the File Transfer Application on a WebSphere MQ server

A WebSphere MQ installation server CD must be used to install the File Transfer Application on a WebSphere MQ server. To install the File Transfer Application on a WebSphere MQ server, do one of the following:

- Install the File Transfer Application during an initial installation of a WebSphere MQ server.
- Add the File Transfer Application by modifying a WebSphere MQ server installation after the initial installation has taken place.

During the initial installation

To install the File Transfer Application on a WebSphere MQ server during the initial installation of WebSphere MQ, do the following:

1. Follow the WebSphere MQ custom installation instructions on the appropriate platform to the point where you specify the components that will be installed:
   - For the WebSphere MQ server installation instructions on Windows, see the WebSphere MQ for Windows Quick Beginnings.
   - For the WebSphere MQ server installation instructions on Linux (x86 platform), see the WebSphere MQ for Linux Quick Beginnings.
2. Ensure that **Server File Transfer** is selected.
3. Follow the WebSphere MQ server installation instructions to completion.

The File Transfer Application is now installed.

Modifying the installation

To install the File Transfer Application on a WebSphere MQ server by modifying the installation after the initial installation has taken place, do the following:

1. Follow the instructions for modifying an installation on the appropriate platform to the point where you specify the components that are to be added:
   - For the instructions for modifying an installation on Windows, see the WebSphere MQ for Windows Quick Beginnings.
   - For the instructions for modifying an installation on Linux (x86 platform), see the WebSphere MQ for Linux Quick Beginnings.
2. Ensure that **Server File Transfer** is selected.
3. Follow the instructions for modifying the installation to completion.

The File Transfer Application is now installed.

Installing the File Transfer Application on a WebSphere MQ client

Either a WebSphere MQ installation server CD, or a WebSphere MQ installation client CD, can be used to install the File Transfer Application on a WebSphere MQ client.

Note: If you require the File Transfer Application GUI, use a WebSphere MQ installation server CD.

To install the File Transfer Application on a WebSphere MQ client, do one of the following:

- Install the File Transfer Application during an initial installation of a WebSphere MQ client.
- Add the File Transfer Application by modifying an installation after the initial installation has taken place.

During the initial installation

To install the File Transfer Application on a WebSphere MQ client during the initial installation, do the following:

1. Follow the WebSphere MQ custom installation instructions on the appropriate platform to the point where you specify the components that will be installed:

- For the WebSphere MQ client installation instructions on Windows, see the WebSphere MQ for Windows Quick Beginnings.
- For the WebSphere MQ client installation instructions on Linux (x86 platform), see the WebSphere MQ for Linux Quick Beginnings.

2. Ensure that **Client File Transfer** is selected.
3. Follow the WebSphere MQ installation instructions to completion.

The File Transfer Application is now installed.

Modifying the installation

To install the File Transfer Application on a WebSphere MQ client by modifying the installation after the initial installation has taken place, do the following:

1. Follow the instructions for modifying an installation on the appropriate platform to the point where you specify the components that are to be added:
   - For the instructions for modifying an installation on Windows, see the WebSphere MQ for Windows Quick Beginnings.
   - For the instructions for modifying an installation on Linux (x86 platform), see the WebSphere MQ for Linux Quick Beginnings.
2. Ensure that **Client File Transfer** is selected.
3. Follow the instructions for modifying an installations to completion.

The File Transfer Application is now installed

Setup tasks

The setup tasks are required when the File Transfer Application is used to send files between a queue manager and a remote WebSphere MQ client, or between two remote queue managers. If files are sent between local queue managers or clients, the following setup tasks are not required.

Sending files between remote queue managers

This section shows how to setup two queue managers to allow the File Transfer Application to be used to send and receive files between them. For illustration, queue managers `HEAD.OFFICE.QM`, and `SHOWROOM.QM` are used. Figure 38 summarizes the configuration that the following instructions form.

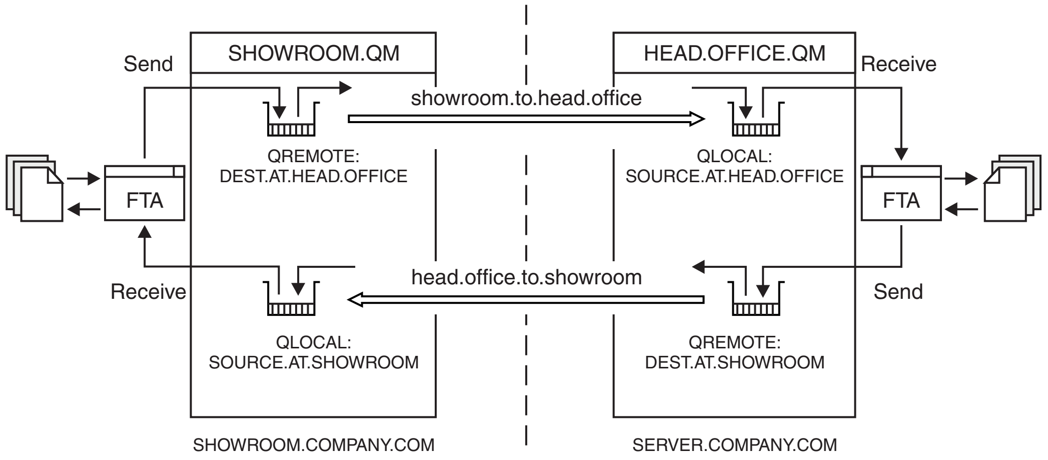


Figure 38. Using the File Transfer Application to send files between remote queue managers

These instruction outline how to setup sender and receiver channels, however other channel configurations can be used, see WebSphere MQ Intercommunication.

1. Issue the following commands on the queue manager `HEAD.OFFICE.QM`, to create the channels, listener, and the transmission queue:
   a. Define the sender channel:
      ```
      DEFINE CHANNEL (OFFICE.TO.SHOWROOM) +
             CHLTYPE(SDR) +
             CONNAME (SHOWROOM.COMPANY.COM) +
             XMITQ (SHOWROOM.QM) +
             TRPTYPE(TCP)
      ```
   b. Define the receiver channel:
      ```
      DEFINE CHANNEL (SHOWROOM.TO.OFFICE) +
             CHLTYPE(RCVR) +
             TRPTYPE(TCP)
      ```
   c. Define the listener:
      ```
      DEFINE LISTENER (HEAD.OFFICE) +
             TRPTYPE (TCP) +
             PORT (1414)
      ```
   d. Define the transmission queue:
      ```
      DEFINE QLOCAL (SHOWROOM.QM) +
             USAGE (XMITQ)
      ```

   Note:
   a. The TCP/IP connection names specified for the CONNAME attribute in the sender channel definitions are for illustration only. This is the network name of the machine at the *other* end of the connection. Use the values appropriate for your network.
   b. Sender and receiver channels have been used however other channel configurations are available, see the WebSphere MQ Intercommunication manual.
2. Issue the following commands on the queue manager `SHOWROOM.QM`, to create the channels, listener, and the transmission queue:
   a. Define the sender channel:
      ```
      DEFINE CHANNEL (SHOWROOM.TO.OFFICE) +
             CHLTYPE(SDR) +
             CONNAME (SERVER.COMPANY.COM) +
             XMITQ (HEAD.OFFICE.QM) +
             TRPTYPE(TCP)
      ```
   b. Define the receiver channel:
      ```
      DEFINE CHANNEL (OFFICE.TO.SHOWROOM) +
             CHLTYPE(RCVR) +
             TRPTYPE(TCP)
      ```
   c. Define the listener:
      ```
      DEFINE LISTENER (SHOWROOM) +
             TRPTYPE (TCP) +
             PORT (1414)
      ```
   d. Define the transmission queue:
      ```
      DEFINE QLOCAL (HEAD.OFFICE.QM) +
             USAGE (XMITQ)
      ```
3. Start the listener and sender channel on the queue manager `HEAD.OFFICE.QM` by using the following MQSC commands:
   a. Start the listener:
      ```
      START LISTENER (HEAD.OFFICE)
      ```
   b. Start the sender channel:

```
START CHANNEL (OFFICE.TO.SHOWROOM)
```

Note: The receiver channels do not need to be started because it is the sender channels that initiate the delivery of messages.

4. Start the listener and sender channel on the queue manager `SHOWROOM.QM` by using the following MQSC commands:
   a. Start the listener:
      ```
      START LISTENER (SHOWROOM)
      ```
   b. Start the sender channel:
      ```
      START CHANNEL (SHOWROOM.TO.OFFICE)
      ```
5. Define a remote queue definition for the destination queue and a source queue on the queue manager `HEAD.OFFICE.QM`, using the following MQSC commands:
   a. Define a remote queue definition for the destination queue (the queue where files will be sent):
      ```
      DEFINE QREMOTE (DEST.AT.SHOWROOM) +
             RNAME (SOURCE.AT.SHOWROOM) +
             RQMNAME (SHOWROOM.QM)
      ```
   b. Define a source queue (the queue where files will be received):
      ```
      DEFINE QLOCAL (SOURCE.AT.HEAD.OFFICE)
      ```

   It is recommended that local queues are dedicated to the File Transfer Application.
6. Define a remote queue definition for the destination queue and a source queue on the queue manager `SHOWROOM.QM`, using the following MQSC commands:
   a. Define a remote queue definition for the destination queue (the queue where files will be sent):
      ```
      DEFINE QREMOTE (DEST.AT.HEAD.OFFICE) +
             RNAME (SOURCE.AT.HEAD.OFFICE) +
             RQMNAME (HEAD.OFFICE.QM)
      ```
   b. Define a source queue (the queue where files will be received):
      ```
      DEFINE QLOCAL (SOURCE.AT.SHOWROOM)
      ```

   It is recommended that local queues are dedicated to the File Transfer Application.
7. Ensure that all the users of the File Transfer Application are members of the mqm group, or alternatively the local Administrators group on Windows.

You have now setup both queue managers for use with the File Transfer Application.

Sending files between a queue manager and a remote WebSphere MQ client

This section shows how to setup a queue manager and a remote WebSphere MQ client to allow the File Transfer Application to be used to send and receive files between them. For illustration, the queue manager `HEAD.OFFICE.QM`, and the WebSphere MQ client `CARSHOWROOM` are used. Figure 39 on page 549 summarizes the configuration that the following instructions form.

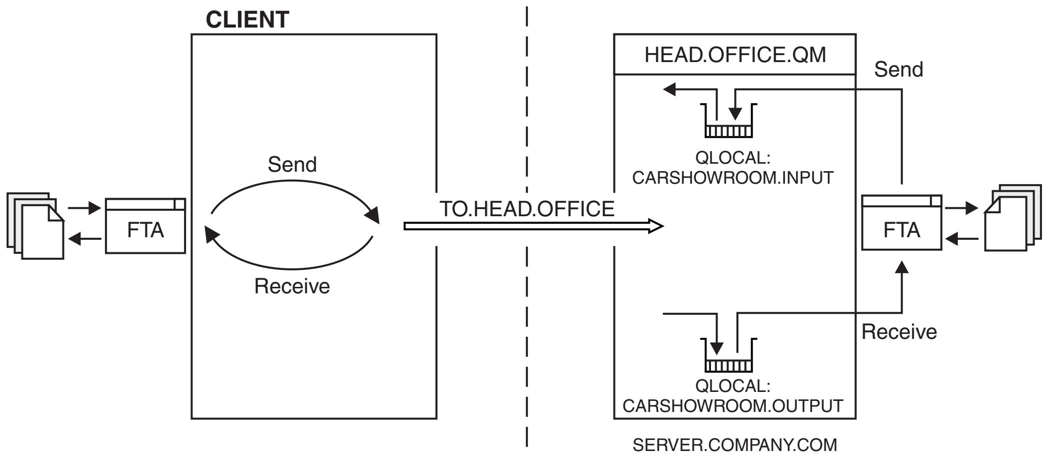


Figure 39. Using the File Transfer Application to send files between a queue manager and a remote client

To configure the queue manager `HEAD.OFFICE.QM`, and the remote WebSphere MQ client, do the following:

1. Define a server communication channel on the queue manager `HEAD.OFFICE.QM`, using the following MQSC command:
   a. Define a server communication channel:
   ```
   DEFINE CHANNEL (TO.HEAD.OFFICE) +
          CHLTYPE(SVRCONN) +
          TRPTYPE(TCP) +
          MCAUSER (string)
   ```
   Note: For `MCAUSER (string)`, specify *string* as a user from the mqm group, or administrators group on the queue manager `HEAD.OFFICE`.
2. Define and start a listener on the queue manager `HEAD.OFFICE.QM`, using the following MQSC command:
   a. Define a listener:
   ```
   DEFINE LISTENER (HEAD.OFFICE) +
          TRPTYPE (TCP) +
          PORT (1414)
   ```
   b. Start the listener:
   ```
   START LISTENER (HEAD.OFFICE)
   ```
3. Define a source queue, and a destination queue on the queue manager `HEAD.OFFICE.QM` to be used by the WebSphere MQ client, using the following MQSC commands:
   a. Define a destination queue (the queue where the WebSphere MQ client will send files):
   ```
   DEFINE QLOCAL (CARSHOWROOM.OUTPUT)
   ```
   b. Define a source queue (the queue from which the WebSphere MQ client will receive files):
   ```
   DEFINE QLOCAL (CARSHOWROOM.INPUT)
   ```
   It is recommended that local queues are dedicated to the File Transfer Application.
4. On the WebSphere MQ client, create an MQI channel by defining the MQSERVER environment variable as follows:
   ```
   TO.HEAD.OFFICE/TCP/SERVER.COMPANY.COM(1414)
   ```

For more information on specifying the environment variable MQSERVER, see the WebSphere MQ Clients book.

Note: If you intend to implement SSL security, you must establish the MQI channel using a client channel definition table, and not by specifying the environment variable MQSERVER.
For more information on establishing MQI channels, see the WebSphere MQ Clients book.

5. Ensure that all the users of the File Transfer Application are members of the mqm group, or alternatively the local Administrators group on Windows.

Configuring the GUI

For every WebSphere MQ server or client system on which you intend to run the File Transfer Application GUI, you must perform some initial configuration tasks on the GUI. Before you can configure the File Transfer Application GUI, you must have setup up your system, see "Setup tasks" on page 546.

For information on what the File Transfer Application GUI provides, see "Components" on page 544.

To configure the File Transfer Application GUI, do the following:

1. Start the File Transfer Application by issuing the control command **mqftapp**, or by selecting it through the start menu.

   The first time you start File Transfer Application, a message prompts you to complete the initial setup.
2. Click **OK**. The Queue Manager panel is displayed.
3. In the Name field, type the name of the queue manager to which the File Transfer Application is connecting.

   Note: Ensure the queue manager is running.
4. Select either the **Local** or **Remote** radio button.

   If connecting to a local queue manager, click the **Local** radio button.

   If connecting to a remote queue manager, click the **Remote** radio button.
5. Click **OK**. The File Transfer panel is displayed, showing a list of queues.
6. Check the tick box next to every queue that is to be used as a destination queue.
7. Select the **Sources** tab.
8. Check the tick box next to every queue that is to be used as a source queue.
9. Click **OK**.

The File Transfer Application GUI is now configured.

File Transfer Application channel security

When using the File Transfer Application, a file is transferred over a message channel or an MQI channel. To ensure channels are secure you can use the Secure Sockets Layer (SSL), or channel exits. For information on channel security, see "Channel security" on page 140.

Using the File Transfer Application

Once a system administrator has set up the File Transfer Application for use, files can be sent and received using WebSphere MQ messaging. This section explains how a sender of a file, or receiver of a file, uses the File Transfer Application.

Sending a file

This task shows you how to send a file to another destination using the File Transfer Application GUI. You can also send files from the command line, or shell, by using **mqftsnd** on a WebSphere MQ server, or **mqftsndc** on a WebSphere MQ client, see "Using the command line" on page 552.

1. Start the File Transfer Application by issuing the control command **mqftapp**, or by selecting it through the start menu.
2. Click the **Send** tab.
3. Click the **Browse** button.
4. In the browser dialog, select the file to transfer, then click **OK**.
5. In the **Comments** field, type any accompanying comments. This field can be used to help identify different versions of the same file, for example: `Week 3 sales - version 2`.
6. In the **Destination** pane, click the required destination, for example: `DESTINATION.AT.HEAD.OFFICE`.
7. Click **Send**.
8. Look for confirmation that the file was sent in the **Show files sent and received** list.

The File Transfer Application transfers the specified file to the selected location. You can check that the file was sent by looking in the **Session log**.

Receiving a file

This task shows how to receive a file from another destination using the File Transfer Application GUI. You can also receive files from the command line, or shell, by using **mqftrcv** on a WebSphere MQ server, or **mqftrcvc** on a WebSphere MQ client, see "Using the command line" on page 552.

1. Start the File Transfer Application by issuing the control command **mqftapp**, or by selecting it through the start menu.
2. Click the **Receive** tab.
3. Click the **Files from** drop-down list to display the source where the file to be received is held, for example: `SOURCE.AT.SHOWROOM`.
4. Select the source to display the files stored there.
5. Select the file to receive, for example: `Stocks 14 Aug 03.doc`.
6. Look for confirmation that the file was received in the **Show files sent and received** list.

The selected file is received, and an icon representing the file is automatically displayed on the desktop. Double-click the icon to view the file. You can also check that the file was received by looking in the **Session log**.

Listing all sent and received files

This task shows how to create a list of all files sent and received using the File Transfer Application GUI.

1. Start the File Transfer Application by issuing the control command **mqftapp**, or by selecting it through the start menu.
2. In the Session Log pane, click **History Log...**.
3. View the list of all files sent or received. The list shows all files sent or received since the File Transfer Application was first used, or since the log was last cleared.
4. Click **Save as**.
5. Navigate to a folder on the hard drive (`c:`) on your machine where you want to save the list.
6. In the **File name** field, type a meaningful file name, for example: `File log 9 Apr 03`.
7. In the **Save as type** field, type `.txt`.
8. Click the **Save** button.
9. Click the **Done** button.

File status

When a File Transfer Application receiver receives files, they can be listed using the File Transfer Application GUI, or by using either of the **receive file** control commands. For information on the **receive file** control commands see "mqftrcv (receive file on server)" on page 331, and "mqftrcvc (receive file on client)" on page 333. Information about files in the source queue are returned as one of the following:

Complete file

When a file is too large to be transferred as a single WebSphere MQ message, the file is segmented into a number of smaller messages, known as segments. These segments are then transmitted.

A complete file is a file where every message that forms the file has been transferred to the destination queue.

Incomplete file

An incomplete file, is a file where a subset of the messages that form the file have been transferred to the queue. If you are using the File Transfer Application GUI, by clicking **Receive** again, you will see the file's `percentage complete figure` increase.

Other message

Other messages, are messages that have not been sent using the File Transfer Application. They are not related to a file.

If a dead letter queue has been associated with the queue manager and a **receive file** command is issued, then other messages are put on the dead letter queue. If a dead letter queue has not been associated with the queue manager, then other messages are left on the queue.

Using the command line

This section describes how to use the File Transfer Application commands directly, without the use of the File Transfer Application GUI. If you want to use the File

Transfer Application, your user ID must be a member of the mqm group. For more information about this, see "Setup tasks" on page 546. In addition, note the following environment-specific information:

WebSphere MQ for Windows
: All File Transfer Application commands can be issued from a command line. Command names and their flags are not case sensitive: you can enter them in uppercase, lowercase, or a combination of uppercase and lowercase. However, arguments to specify objects (such as queue names) are case sensitive. In the syntax descriptions, the hyphen (-) is used as a flag indicator. You can use the forward slash (/) instead of the hyphen.

WebSphere MQ for Linux (x86 platform)
: All File Transfer Application commands can be issued from a shell. All commands are case-sensitive.

The control commands available with the File Transfer Application follow:

Table 44. File Transfer Application command files

Command name	**Purpose**
mqftapp	Run the File Transfer Application GUI. For more information, see "mqftapp (run File Transfer Application GUI)" on page 330.
mqftsnd	Send a file from a WebSphere MQ server. For more information, see "mqftsnd (send file from server)" on page 336.
mqftrcv	Receive a file on a WebSphere MQ server. For more information, see "mqftrcv (receive file on server)" on page 331.
mqftsndc	Send a file from a WebSphere MQ client. For more information, see "mqftsndc (send file from client)" on page 339.
mqftrcvc	Receive a file on a WebSphere MQ client. For more information, see "mqftrcvc (receive file on client)" on page 333.

The command line interface, sender, and receiver components are included as part of the WebSphere MQ clients for Windows and Linux (x86 platform). The clients are available as free downloads:

`www-3.ibm.com/software/info1/websphere/index.jsp`

Chapter 13. Comparing command sets

The tables in this appendix compare the facilities available from the different administration command sets, and state whether you can perform each function from within the WebSphere MQ Explorer.

Note: The following tables do not apply to WebSphere MQ for z/OS or WebSphere MQ for i5/OS. For information on how to use PCF commands on z/OS and on i5/OS, see WebSphere MQ Programmable Command Formats and Administration Interface. For information on how to use MQSC commands on z/OS and on i5/OS, see WebSphere MQ Script (MQSC) Command Reference.

Queue manager commands

Table 45. Queue manager commands

Description	PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Queue Manager	Change Queue Manager	ALTER QMGR	No equivalent	Yes
Create queue manager	No equivalent	No equivalent	**crtmqm**	Yes
Delete queue manager	No equivalent	No equivalent	**dltmqm**	Yes
Inquire Queue Manager	Inquire Queue Manager	DISPLAY QMGR	No equivalent	Yes
Inquire Queue Manager Status	Inquire Queue Manager Status	DISPLAY QMSTATUS	**dspmq**	Yes
Ping Queue Manager	Ping Queue Manager	PING QMGR	No equivalent	No
Refresh Queue Manager	No equivalent	REFRESH QMGR	No equivalent	No
Reset Queue Manager	Reset Queue Manager	RESET QMGR	No equivalent	No
Start queue manager	No equivalent	No equivalent	**strmqm**	Yes
Stop queue manager	No equivalent	No equivalent	**endmqm**	Yes

Command server commands

Table 46. Commands for command server administration

Description	PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Display command server	Inquire Queue Manager Status	DISPLAY QMSTATUS	**dspmqcsv**	Yes
Start command server	Change Queue Manager	ALTER QMGR	**strmqcsv**	Yes
Stop command server	No equivalent	No equivalent	**endmqcsv**	Yes

Authority commands

Table 47. Commands for authority administration

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Delete authority record	No equivalent	**setmqaut**	Yes
Inquire authority records	No equivalent	**dmpmqaut**	Yes
Inquire entity authority	No equivalent	**dspmqaut**	Yes
Refresh Security	REFRESH SECURITY	No equivalent	Yes
Set authority record	No equivalent	**setmqaut**	Yes

Cluster commands

Table 48. Cluster commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Inquire Cluster Queue Manager	DISPLAY CLUSQMGR	No equivalent	Yes
Refresh Cluster	REFRESH CLUSTER	No equivalent	Yes
Reset Cluster	RESET CLUSTER	No equivalent	No
Resume Queue Manager Cluster	RESUME QMGR	No equivalent	Yes
Suspend Queue Manager Cluster	SUSPEND QMGR	No equivalent	Yes

Authentication information commands

Table 49. Authentication information commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Authentication Information Object	ALTER AUTHINFO	No equivalent	Yes
Copy Authentication Information Object	DEFINE AUTHINFO(x) LIKE(y)	No equivalent	Yes
Create Authentication Information Object	DEFINE AUTHINFO	No equivalent	Yes
Delete Authentication Information Object	DELETE AUTHINFO	No equivalent	Yes
Inquire Authentication Information Object	DISPLAY AUTHINFO	No equivalent	Yes

Channel commands

Table 50. Channel commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Channel	ALTER CHANNEL	No equivalent	Yes
Copy Channel	DEFINE CHANNEL(x) LIKE(y)	No equivalent	Yes
Create Channel	DEFINE CHANNEL	No equivalent	Yes
Delete Channel	DELETE CHANNEL	No equivalent	Yes
Inquire Channel	DISPLAY CHANNEL	No equivalent	Yes
Inquire Channel Names	DISPLAY CHANNEL	No equivalent	Yes
Inquire Channel Status	DISPLAY CHSTATUS	No equivalent	Yes
Ping Channel	PING CHANNEL	No equivalent	Yes
Reset Channel	RESET CHANNEL	No equivalent	Yes
Resolve Channel	RESOLVE CHANNEL	No equivalent	Yes
Start Channel	START CHANNEL	**runmqchl**	Yes
Start Channel Initiator	START CHINIT	**runmqchi**	No
Stop Channel	STOP CHANNEL	No equivalent	Yes

Listener commands

Table 51. Listener commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Listener	ALTER LISTENER	No equivalent	Yes
Copy Listener	DEFINE LISTENER(x) LIKE(y)	No equivalent	Yes
Create Listener	DEFINE LISTENER	No equivalent	Yes
Delete Listener	DELETE LISTENER	No equivalent	Yes
Inquire Listener	DISPLAY LISTENER	No equivalent	Yes
Inquire Listener Status	DISPLAY LSSTATUS	No equivalent	Yes
Start Channel Listener	START LISTENER [1]	**runmqlsr**	Yes
Stop Listener	STOP LISTENER	**endmqlsr** [2]	Yes
Notes: 1. Used with listener objects only 2. Stops all active listeners			

Namelist commands

Table 52. Namelist commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Namelist	ALTER NAMELIST	No equivalent	Yes

Table 52. Namelist commands (continued)

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Copy Namelist	DEFINE NAMELIST(x) LIKE(y)	No equivalent	Yes
Create Namelist	DEFINE NAMELIST	No equivalent	Yes
Delete Namelist	DELETE NAMELIST	No equivalent	Yes
Inquire Namelist	DISPLAY NAMELIST	No equivalent	Yes
Inquire Namelist Names	DISPLAY NAMELIST	No equivalent	Yes

Process commands

Table 53. Process commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Process	ALTER PROCESS	No equivalent	Yes
Copy Process	DEFINE PROCESS(x) LIKE(y)	No equivalent	Yes
Create Process	DEFINE PROCESS	No equivalent	Yes
Delete Process	DELETE PROCESS	No equivalent	Yes
Inquire Process	DISPLAY PROCESS	No equivalent	Yes
Inquire Process Names	DISPLAY PROCESS	No equivalent	Yes

Queue commands

Table 54. Queue commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Queue	ALTER QLOCAL ALTER QALIAS ALTER QMODEL ALTER QREMOTE	No equivalent	Yes
Clear Queue	CLEAR QLOCAL	No equivalent	Yes
Copy Queue	DEFINE QLOCAL(x) LIKE(y) DEFINE QALIAS(x) LIKE(y) DEFINE QMODEL(x) LIKE(y) DEFINE QREMOTE(x) LIKE(y)	No equivalent	Yes
Create Queue	DEFINE QLOCAL DEFINE QALIAS DEFINE QMODEL DEFINE QREMOTE	No equivalent	Yes

Table 54. Queue commands (continued)

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Delete Queue	DELETE QLOCAL DELETE QALIAS DELETE QMODEL DELETE QREMOTE	No equivalent	Yes
Inquire Queue	DISPLAY QUEUE	No equivalent	Yes
Inquire Queue Names	DISPLAY QUEUE	No equivalent	Yes
Inquire Queue Status	DISPLAY QSTATUS	No equivalent	Yes
Reset Queue Statistics	No equivalent	No equivalent	No

Service commands

Table 55. Service commands

PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Change Service	ALTER SERVICE	No equivalent	Yes
Copy Service	DEFINE SERVICE(x) LIKE(y)	No equivalent	Yes
Create Service	DEFINE SERVICE	No equivalent	Yes
Delete Service	DELETE SERVICE	No equivalent	Yes
Inquire Service	DISPLAY SERVICE	No equivalent	Yes
Inquire Service Status	DISPLAY SVSTATUS	No equivalent	Yes
Start Service	START SERVICE	No equivalent	Yes
Stop Service	STOP SERVICE	No equivalent	Yes

Other commands

Table 56. Other commands

Description	PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Create conversion exit	No equivalent	No equivalent	**crtmqcvx**	No
Display files used by objects	No equivalent	No equivalent	**dspmqfls**	No
Display formatted trace	No equivalent	No equivalent	**dspmqtrc** [1]	No
Display version information	No equivalent	No equivalent	**dspmqver**	No
Display transactions	No equivalent	No equivalent	**dspmqtrn**	No
Dump log	No equivalent	No equivalent	**dmpmqlog**	No
End trace	No equivalent	No equivalent	**endmqtrc**	Yes
Escape	Escape	No equivalent	No equivalent	No
Record media image	No equivalent	No equivalent	**rcdmqimg**	No

Table 56. Other commands (continued)

Description	PCF command	MQSC command	Control command	WebSphere MQ Explorer equivalent?
Recreate media object	No equivalent	No equivalent	**rcrmqobj**	No
Resolve transactions	No equivalent	No equivalent	**rsvmqtrn**	No
Run client trigger monitor	No equivalent	No equivalent	**runmqtmc**	No
Run dead-letter queue handler	No equivalent	No equivalent	**runmqdlq**	No
Run MQSC commands	No equivalent	No equivalent	**runmqsc**	No
Run trigger monitor	No equivalent	No equivalent	**runmqtrm**	No
Set service connection points	No equivalent	No equivalent	**setmqscp** 2	No
Start WebSphere MQ trace	No equivalent	No equivalent	**strmqtrc**	Yes
WebSphere MQ Services control	No equivalent	No equivalent	**amqmdain** 2	No

Notes:
1. Not supported on WebSphere MQ for Windows.
2. Supported by WebSphere MQ for Windows only.

Chapter 14. WebSphere MQ and UNIX System V IPC resources

This information applies to WebSphere MQ running on UNIX systems only.

WebSphere MQ uses System V interprocess communication (IPC) resources (*semaphores* and *shared memory segments*) to store and pass data between system components. These resources are used by queue manager processes and applications that connect to the queue manager. WebSphere MQ clients do not use IPC resources, except for WebSphere MQ trace control. Use the UNIX command ipcs -a to get full information on the number and size of the IPC resources currently in use on the machine.

Clearing WebSphere MQ shared memory resources

When a WebSphere MQ queue manager is ended normally, the queue manager removes the majority of the IPC resources that it was using. A small number of IPC resources remain and this is as designed: some of the IPC resources are intended to persist between queue manager restarts. The number of IPC resources remaining varies to some extent, depending on the operating conditions.

There are some situations when a larger proportion of the IPC resources in use by a queue manager might persist after that queue manager has ended:

- If applications are connected to the queue manager when it stops (perhaps because the queue manager was shut down using `endmqm -i` or `endmqm -p`), the IPC resources used by these applications might not be released.
- If the queue manager ends abnormally (for example, if an operator issues the system kill command), some IPC resources might be left allocated after all queue manager processes have terminated.

In these cases, the IPC resources are not released back to the system until you restart (strmqm) or delete (dltmqm) the queue manager.

IPC resources allocated by WebSphere MQ are maintained automatically by the allocating queue managers. You are strongly recommended **not** to perform manual actions on or remove these IPC resources.

However, if it is necessary to remove IPC resources owned by `mqm`, follow these instructions. WebSphere MQ provides a utility to release the residual IPC resources allocated by a queue manager. This utility clears the internal queue manager state at the same time as it removes the corresponding IPC resource. Thus, this utility ensures that the queue manager state and IPC resource allocation are kept in step. To free residual IPC resources, follow these steps:

1. End the queue manager and all connecting applications.
2. Log on as user `mqm`.
3. Type the following:

   On Solaris, HP-UX, and Linux:

   ```
   /opt/mqm/bin/amqiclen -x -m QMGR
   ```

   On AIX:

   ```
   /usr/mqm/bin/amqiclen -x -m QMGR
   ```

This command does not report any status. However, if some WebSphere MQ-allocated resources could not be freed, the return code is nonzero.

4. Explicitly remove any remaining IPC resources that were created by user `mqm`.

Note: If a non-mqm application attempted to connect to WebSphere MQ before starting any queue managers, there might still be some WebSphere MQ IPC resources remaining even after following the above steps. These remaining resources were not created by user `mqm` and there is no straightforward way to reliably recognize them. However, these resources are very small and are reused when WebSphere MQ is next restarted.

Shared memory on AIX

If certain application types fail to connect because of an AIX memory limitation, in most cases this can be resolved by setting the environment variable EXTSHM=ON.

Some 32-bit processes on AIX might encounter an operating system limitation that affects their ability to connect to WebSphere MQ queue managers. Every standard connection to WebSphere MQ uses shared memory, but unlike other UNIX platforms, AIX allows 32-bit processes to attach only 11 shared memory sets.

Most 32-bit processes will not encounter this limit, but applications with high memory requirements might fail to connect to WebSphere MQ with reason code 2102: MQRC_RESOURCE_PROBLEM. The following application types might see this error:

- Programs running in 32-bit Java virtual machines
- Programs using the large or very large memory models
- Programs connecting to many queue managers or databases
- Programs that attach to shared memory sets on their own

AIX offers an extended shared memory feature for 32-bit processes that allows them to attach more shared memory. To run an application with this feature, export the environment variable EXTSHM=ON before starting your queue managers and your program. The EXTSHM=ON feature prevents this error in most cases, but it is incompatible with programs that use the SHM_SIZE option of the shmctl function.

WebSphere MQ client applications and all 64-bit processes are unaffected by this limitation. They can connect to WebSphere MQ queue managers regardless of whether EXTSHM has been set.

Chapter 15. WebSphere MQ and UNIX Process Priority

This information applies to WebSphere MQ running on UNIX systems only.

If you run a process in the background, that process can be given a higher *nice* value (and hence lower priority) by the invoking shell. This might have general WebSphere MQ performance implications. In highly-stressed situations, if there are many ready-to-run threads at a higher priority and some at a lower priority, operating system scheduling characteristics can deprive the lower priority threads of CPU time.

It is strongly recommended that independently started processes associated with queue managers, such as **runmqlsr**, have the same *nice* values as the queue manager they are associated with. Ensure the shell does not assign a higher *nice* value to these background processes. For example, in ksh, use the setting "`set +o bgnice`" to stop ksh from raising the *nice* value of background processes. You can verify the *nice* values of running processes by examining the *NI* column of a "ps -efl" listing.

It is also recommended that you start WebSphere MQ application processes with the same *nice* value as the queue manager. If they run with different *nice* values, an application thread might block a queue manager thread, or vice versa, causing performance to degrade.

Chapter 16. Common Criteria

Common Criteria is a scheme for independent assessment, analysis, and testing of IT products to a set of security requirements. The Common Criteria Scheme provides consumers with an impartial security assurance of a product to predefined levels. These levels range from EAL0 to EAL7, each assurance level places increased demands on the developer for evidence of testing, and provides increased assurance within the product.

WebSphere MQ V6.0.1.1 has been evaluated to Common Criteria EAL4. This provides assurance that the product has been methodically designed, tested, and reviewed.

Under the Common Criteria Recognition Arrangement (CCRA), countries agree to recognize Common Criteria certificates that have been produced by any certificate authorizing participant, in accordance with the terms laid out in the CCRA. Currently, the CCRA is comprised of 22 member nations: Australia, Austria, Canada, the Czech Republic, Finland, France, Germany, Greece, Hungary, India, Israel, Italy, Japan, the Netherlands, New Zealand, Norway, the Republic of Singapore, Spain, Sweden, Turkey, the United Kingdom, and the United States. New members are expected to join in the near future.

You can find further information on the Common Criteria scheme at the following Web site:http://www.niap-ccevs.org/cc-scheme/

Environmental Considerations

In order that WebSphere MQ operates in accordance with its Common Criteria certificate, the environmental requirements defined in this section need to be met.

- There must be one or more competent individuals that are assigned to manage WebSphere MQ and the security of the information that it contains. Such personnel are assumed not to be careless, wilfully negligent, or hostile.
- The operating system must be configured in accordance with the manufacturer’s installation guides and where applicable, in its evaluated configuration. It must be securely configured such that the operating system protects WebSphere MQ from any unauthorized users or processes.
- SSL must be configured to run in FIPS mode.
- It is the responsibility of the system administrator to ensure that any connections over the Internet are secured by the appropriate protocol (for example, HTTPS or SFTP) and that any external URLs are trusted sites.
- The operating system environment must be configured to allow local login for a single user only.
- Remote logins to the operating system must be disabled. This includes Telnet, rlogin, SSH, and any similar remote login services.
- The system administrator must set the system time to the appropriate date and time of the server
- The operating system supported is AIX V5.2.

WebSphere MQ relies on the operating system to provide user and group IDs and time and date information. In addition, you need an application to read the event logs so that the audit records produced by WebSphere MQ can be read.

The evaluation of WebSphere MQ does not include the following aspects:

- The operating system
- Remote administration
- WebSphere MQ Explorer
- Windows Default Configuration application
- Third-party or user-written authorization services not supplied with the WebSphere MQ product.

Configuring WebSphere MQ for Common Criteria

When you use WebSphere MQ in Common Criteria mode, you must comply with the following guidance:

- Use certificates that pass the PKIX validation specified in RFC 3280.
- Always use the GSKCapiCmd command line tool to manage certificates and keys. Do not use iKeyman or IKEYCMD.
- The WebSphere MQ key database file is protected by a password. To allow unattended access to the key database file WebSphere MQ provides a stash file to store the password. This stash file must be protected by an ACL or permission bits while it resides on the system and by encrypting the stash file when it is backed up.
- Ensure key database files are protected by a randomly-chosen strong password. At a minimum ensure the password adheres to the following rules:
  - The password must be a minimum length of 14 characters.
  - The password must contain a minimum of one lower case character, one upper case character, and one digit or special character.
  - Each character can only occur a maximum of three times in a password.
  - A maximum of two consecutive characters in the password can be identical.
- Use key database files that have been created using strong encryption. That is, you must specify the parameters **strong** and **FIPS** when you use GSKCapiCmd command line tool to create key database files.
- When you change the password for a key database file using the GSKCapiCmd tool, you must specify the parameters **strong** and **FIPS**.
- When you convert an existing key database file in the old format to the newer secure mode using the GSKCapiCmd tool, you must specify the parameters **strong** and **FIPS**.
- When you create a certificate request, a self-signed certificate, or sign a certificate using the GSKCapiCmd tool, you must specify the sha1 option for the **sigalg** parameter.
- If you use the GSKCapiCmd tool to export a certificate, do not use the **target** parameter to automatically create a target key database file. You must have already created a target key database file in FIPS mode.
- Do not configure WebSphere MQ to exploit hardware key database file or hardware cipher acceleration. That is, you must not use the **crypto**, **tokenlabel**, **secondaryDB** or **secondaryDBpw** parameters in the GSKCapiCmd tool.
- Do not use a value of 512 for the **size** parameter when using the GSKCapiCmd tool. The value of the **size** parameter must be a minimum of 1024.
- Only allow certificates with Basic Constraint extension present to participate in a certification validation chain. When validating a certificate chain WebSphere MQ can operate such that certificates with no Basic Constraint extension present are allowed to participate in a certificate validation chain as a non end-entity. In order to operate WebSphere MQ in Common Criteria mode certificates with no

Basic Constraint extension present must not be configured in this way. Instead certificates missing the Basic Constraint extension must be configured as end-entities.
- When tracing is switched on for problem determination, be aware that WebSphere MQ is not in Common Criteria mode.
- If you have applications that use WebSphere MQ and that also have other trusted and untrusted applications on the same system, run applications to use the maximum operating system protection and minimize the risk to privileged applications from unprivileged user IDs.

  An application running under a privileged user, like root, might have access to process environments containing TSF data. To prevent untrusted applications harming your system, avoid this privileged mode of operation.
- If you use certificate revocation lists (CRLs) for certificate validation, the WebSphere MQ administrator is responsible for providing current and correct CRLs. The WebSphere MQ administrator must ensure that the CRL provided to WebSphere MQ includes all revoked certificates from any Certification Authorities (CAs) recognized by WebSphere MQ.

  CRLs can be retrieved using an LDAP server in the WebSphere MQ Common Criteria environment. This requires an LDAP server provided or accessed by the WebSphere MQ administrator. In Common Criteria mode, the administrator must only configure one LDAP CRL server to WebSphere MQ.

  WebSphere MQ establishes a TCP/IP connection to the LDAP server and retrieves the CRL. Finally, this CRL is used for certificate validation. If no CRL can be obtained (for example due to LDAP failure), the certificate to be validated is considered invalid.

  Ensure the connection between WebSphere MQ and the LDAP server is an internal communication link within a trusted network, because this connection is made over an unprotected TCP/IP connection.

Configuration Requirements

In order that auditing of authority events is implemented, execute the following MQSC command:

```
ALTER QMGR AUTHOREV (ENABLED)
```

If AUTHOREV is disabled, auditing will no longer be performed and WebSphere MQ will not operate in accordance with the evaluated configuration. To confirm whether auditing of the authority events is enabled, execute the following MQSC command:

```
DISPLAY QMGR
```

Obtaining the latest information

Always refer to the IBM Web site for the latest WebSphere MQ support information and for the latest versions of the WebSphere MQ documentation.

You can find information about the support available for WebSphere MQ here: http://www.ibm.com/software/integration/mqfamily/support/

You can view the latest version of the WebSphere MQ Information Center here: http://publib.boulder.ibm.com/infocenter/wmqv7/v7r0/index.jsp and you can also download a zip file of the WebSphere MQ Information Center for Windows or Linux here: ftp://ftp.software.ibm.com/software/integration/wmq/docs/V7.0/

The WebSphere MQ books are also available in PDF format. You can find the V7.0 PDFs from here: http://www..ibm.com/software/integration/wmq/library/index.html

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