IBM WebSphere Business Integration Adapters

Adapter for SWIFT User Guide

Version 1.9.x

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Note!
Before using this information and the product it supports, read the information in Appendix D, "Notices," on page 113.

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This edition of this document applies to IBM WebSphere Business Integration adapter for SWIFT (5724-H08), version 1.9.x.

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About this document

The IBM(R) WebSphere(R) Business Integration Adapter portfolio supplies integration connectivity for leading e-business technologies, enterprise applications, legacy, and mainframe systems. The product set includes tools and templates for customizing, creating, and managing components for business process integration.

This document describes the installation, configuration, business object development, and troubleshooting for the IBM WebSphere Business Integration adapter for SWIFT.

Audience

This document is for consultants, developers, and system administrators who support and manage the WebSphere business integration system at customer sites.

Prerequisites for this document

Users of this document should be familiar with

- the WebSphere business integration system (if you are using InterChange Server as your integration broker)
- the WebSphere MQ Integrator Broker (if you are using WebSphere MQ Integrator Broker as your integration broker)
- business object development
- the WebSphere MQ application
- the SWIFT product suite and protocol

Related documents

The complete set of documentation available with this product describes the features and components common to all IBM WebSphere Business Integration Adapters installations, and includes reference material on specific components.

You can install related documentation from the following sites:

- For general adapter information; for using adapters with WebSphere message brokers (WebSphere MQ Integrator, WebSphere MQ Integrator Broker, WebSphere Business Integration Message Broker); and for using adapters with WebSphere Application Server:
  - http://www.ibm.com/websphere/integration/wbiadapters/infocenter
- For using adapters with InterChange Server:
  - http://www.ibm.com/websphere/integration/wicserver/infocenter
  - http://www.ibm.com/websphere/integration/wbicollaborations/infocenter
- For more information about message brokers (WebSphere MQ Integrator Broker, WebSphere MQ Integrator, and WebSphere Business Integration Message Broker):
  - http://www.ibm.com/software/integration/mqfamily/library/manualsa/
- For more information about WebSphere Application Server:
  - http://www.ibm.com/software/webservers/appserv/library.html

These sites contain simple directions for downloading, installing, and viewing the documentation.

Note: Important information about this product may be available in Technical Support Technotes and Flashes issued after this document was published. These can be found on the WebSphere Business Integration Support Web site, http://www.ibm.com/software/integration/websphere/support/. Select the component area of interest and browse the Technotes and Flashes sections. Additional information might also be available in IBM Redbooks at http://www.redbooks.ibm.com/.

Typographic conventions

This document uses the following conventions:

`courier font`	Indicates a literal value, such as a command name, filename, information that you type, or information that the system prints on the screen.
bold	Indicates a new term the first time that it appears.
italic, *`italic`*	Indicates a variable name or a cross-reference.
blue outline	A blue outline, which is visible only when you view the manual online, indicates a cross-reference hyperlink. Click inside the outline to jump to the object of the reference.
ProductDir	Represents the directory where the product is installed.
{ }	In a syntax line, curly braces surround a set of options from which you must choose one and only one.
`[ ]`	In a syntax line, square brackets surround an optional parameter.
`...`	In a syntax line, ellipses indicate a repetition of the previous parameter. For example, `option[,...]` means that you can enter multiple, comma-separated options.
`< >`	In a naming convention, angle brackets surround individual elements of a name to distinguish them from each other, as in `<server_name><`*`connector_name`*`>tmp.log`.
/, \	In this document, backslashes (\) are used as the convention for directory paths. For UNIX installations, substitute slashes (/) for backslashes. All product pathnames are relative to the directory where the product is installed on your system.
`%text%` and *`$text`*	Text within percent (%) signs indicates the value of the Windows(TM) `text` system variable or user variable. The equivalent notation in a UNIX environment is *`$text`*, indicating the value of the *`text`* UNIX environment variable.

New in this release

New in release 1.9.x

The adapter for SWIFT has been updated to comply with SWIFT Standards Release Guide 2003 (SRG2003). The adapter now supports user-to-user messages (MT categories 1-9) SWIFT FIN SRG2003. Accordingly, the internal mapping engine that correlated business object ISO 7775-15022 mapping for SWIFT messages is no longer a component of the adapter.

The business object definition of the SWIFT application header has been enhanced.

Two connector-specific properties have been added: EnableMessageProducerCache and SessionPoolSizeForRequests. For further information, see "Connector-specific properties" on page 22.

When processing a response message to a synchronous request, the connector interprets the feedback code MQFB_NONE (the default feedback code if none is set) asVALCHANGE. For further information, see "Synchronous acknowledgment" on page 11.

As of version 1.9.x, the adapter is not supported on Solaris 7, so references to that platform version have been deleted from this guide.

New in release 1.8.x

Beginning with the 1.8.x version, the adapter for SWIFT is no longer supported on Microsoft Windows NT.

Adapter installation information has been moved from this guide. See Chapter 2, "Installing and configuring the connector," on page 19 for the new location of that information.

New in release 1.7.x

The connector's business object definitions have been updated to comply with the SWIFT Standards Release Guide 2002. Also, business object definitions for the following message types have been added:

- MT92
- MT95
- MT96
- MT121
- MT574

The connector runs on the following platforms:

- Microsoft Windows NT 4.0 Service Pack 6A or Windows 2000
- Solaris 7, 8 or AIX 5.1, 5.2 or HP UX 11.i

The adapter can now use WebSphere Application Server as an integration broker. For further information, see "Broker compatibility" on page 2.

New in release 1.6.x

Updated in March, 2003. The ″CrossWorlds″ name is no longer used to describe an entire system or to modify the names of components or tools, which are otherwise mostly the same as before. For example ″CrossWorlds System Manager″ is now ″System Manager,″ and ″CrossWorlds InterChange Server″ is now ″WebSphere InterChange Server.″

The guaranteed event delivery feature has been enhanced. For further information, see Connector Development Guide for Java.

You can now associate a data handler with an input queue. For further information, see “Mapping data handlers to InputQueues” on page 30..

The connector supports SWIFTAlliance Access 5.0, but only if you deploy MQSA version 2.2 on WebSphere MQ 5.2 on and run the connector on one of the following operating systems:

- AIX 5.1
- SunOS 5.8 or Solaris 8
- Windows 2000 SP2

New in release 1.5.x

Updated in March, 2003. The ″CrossWorlds″ name is no longer used to describe an entire system or to modify the names of components or tools, which are otherwise mostly the same as before. For example ″CrossWorlds System Manager″ is now ″System Manager,″ and ″CrossWorlds InterChange Server″ is now ″WebSphere InterChange Server.″

This release extends support for subfield parsing on the following message types:

- **Category 1**MT100, MT101, MT102, MT103, MT104, MT105, MT106, MT107, MT110, MT111, MT112, MT190, MT191, MT198, MT199
- **Category 2**MT200, MT201, MT202, MT203, MT204, MT205, MT206, MT207, MT210, MT256, MT290, MT291, MT293, MT298, MT299
- **Category 3**MT300, MT303, MT304, MT305, MT306, MT320, MT330, MT340, MT341, MT350, MT360, MT361, MT362, MT364, MT365, MT390, MT391, MT398, MT399
- **Category 4**MT400, MT405, MT410, MT412, MT416, MT420, MT422, MT430, MT450, MT455, MT456, MT490, MT491, MT498, MT499
- **Category 5**MT502, MT503, MT504, MT505, MT506, MT507, MT508, MT509, MT512, MT513, MT514, MT515, MT516, MT517, MT518, MT520, MT521, MT522, MT523, MT524, MT526, MT527, MT528, MT529, MT530, MT531, MT532, MT533, MT534, MT535, MT536, MT537, MT538, MT539, MT540, MT541, MT542, MT543, MT544, MT545, MT546, MT547, MT548, MT549, MT550, MT551, MT552, MT553, MT554, MT555, MT556, MT557, MT558, MT559, MT560, MT561, MT562, MT563, MT564, MT565, MT566, MT567, MT568, MT569, MT570, MT571, MT572, MT573, MT575, MT576, MT577, MT578, MT579, MT580, MT581, MT582, MT583, MT584, MT586, MT587, MT588, MT589, MT590, MT591, MT598, MT599
- **Category 6**MT600, MT601, MT604, MT605, MT606, MT607, MT608, MT609, MT643, MT644, MT645, MT646, MT649, MT690, MT691, MT698, MT699
- **Category 7**MT700, MT701, MT705, MT707, MT710, MT711, MT720, MT721, MT730, MT732, MT734, MT740, MT742, MT747, MT750, MT752, MT754, MT756, MT760, MT767, MT768, MT769, MT790, MT791, MT798, MT799

- **Category 8**MT800, MT801, MT802, MT810, MT812, MT813, MT820, MT821, MT822, MT823, MT824, MT890, MT891, MT898, MT899
- **Category 9**MT900, MT910, MT920, MT935, MT940, MT941, MT942, MT950, MT960, MT961, MT962, MT963, MT964, MT965, MT966, MT967, MT970, MT971, MT972, MT973, MT985, MT986, MT990, MT991, MT998, MT999

The InProgress queue is no longer required and may be disabled. For more information, see "InProgressQueue" on page 26.

The connector supports interoperability with applications via MQSeries 5.1, 5.2, and 5.3. For more information, see "Adapter dependencies" on page 3.

The connector now has a UseDefaults property for business object processing. For more information, see "UseDefaults" on page 26.

The connector can now apply a default verb when the data handler does not explicitly assign one to a business object. For more information, see "DefaultVerb" on page 24.

The ReplyToQueue can now be dictated via the dynamic child meta-object rather than by the ReplyToQueue connector property. For more information see "JMS headers, SWIFT message properties, and dynamic child meta-object attributes" on page 32.

You can use a message selector to identify, filter and otherwise control how the adapter identifies the response message for a given request. This JMS capability applies to synchronous request processing only. For more information, see "Synchronous acknowledgment" on page 11.

New in release 1.4.x

If you are using the guaranteed event delivery feature and ICS as your integration broker, you must install release 4.1.1.2 of ICS.

New in release 1.3.x

The IBM WebSphere Business Adapter for SWIFT can dynamically transform a business object representing an ISO 7775 SWIFT message into a business object representing the corresponding ISO 15022 SWIFT message and vice versa. The adapter supports business object ISO 7775-15022 mapping for SWIFT Category 5, Securities Markets, but only with the expanded business object definitions available with this release and described in this document, and only on the Solaris platform.

New in release 1.2.x

The IBM WebSphere Business Integration Adapter for SWIFT includes the connector for SWIFT. This adapter operates with both the InterChange Server (ICS) and WebSphere MQ Integrator integration brokers. An integration broker, which is an application that performs integration of heterogeneous sets of applications, provides services that include data routing. The adapter includes:

- An application component specific to SWIFT
- Sample business objects
- IBM WebSphere Adapter Framework, which consists of:
  - Connector Framework

- Development tools (including Business Object Designer and Connector Configurator))
- APIs (including CDK)

This manual provides information about using this adapter with both integration brokers: ICS and WebSphere MQ Integrator.

Important: Because the connector has not been internationalized, do not run it against ICS version 4.1.1 if you cannot guarantee that only ISO Latin-1 data will be processed.

New in release 1.1.x

The following new features are described in this guide:

- The connector for SWIFT is now enabled for AIX 4.3.3 Patch Level 9

Chapter 1. Overview

The connector for SWIFT is a runtime component of the WebSphere Business Integration Adapter for SWIFT. The connector allows the WebSphere integration broker to exchange business objects with SWIFT-enabled business processes.

Note: Throughout this document, SWIFT messages denote SWIFT FIN messages unless otherwise explicitly noted.

Connectors consist of an application-specific component and the connector framework. The application-specific component contains code tailored to a particular application. The connector framework, whose code is common to all connectors, acts as an intermediary between the integration broker and the application-specific component. The connector framework provides the following services between the integration broker and the application-specific component:

- Receives and sends business objects
- Manages the exchange of startup and administrative messages

This document contains information about the application-specific component and connector framework. It refers to both of these components as the connector.

For more information about the relationship of the integration broker to the connector, see the *IBM WebSphere InterChange Server System Administration Guide*, the *Implementing Adapters with WebSphere MQ Integrator Broker*, or *Implementing Adapters with WebSphere Application Server*

All WebSphere business integration adapters operate with an integration broker. The connector for SWIFT operates with both the WebSphere InterChange Server (ICS), the WebSphere MQ Integrator Broker, and the WebSphere Application Server (WAS) integration brokers.

The connector for SWIFT allows the ICS or WebSphere MQ Integrator Broker to exchange business objects with applications that send or receive data in the form of SWIFT messages.

Adapter environment

Before installing, configuring, and using the adapter, you must understand its environment requirements.

- "Adapter platforms"
- "Adapter dependencies" on page 3

Broker compatibility

The adapter framework that an adapter uses must be compatible with the version of the integration broker (or brokers) with which the adapter is communicating. Version 1.9.X of the adapter for SWIFT is supported on the following adapter framework and integration brokers:

- Adapter framework:
  - WebSphere Business Integration Adapter Framework, version 2.1.0, 2.2.0, 2.3.0, 2.3.1, 2.4.0
- Integration brokers:
  - WebSphere InterChange Server, version 4.1.1, 4.2.0, 4.2.1, 4.2.2
  - WebSphere MQ Integrator, version 2.1.0
  - WebSphere MQ Integrator Broker, version 2.1.0
  - WebSphere Business Integration Message Broker, version 5.0
  - WebSphere Application Server Enterprise, version 5.0.2, with WebSphere Studio Application Developer Integration Edition, version 5.0.1

See *Release Notes* for any exceptions.

Note: For instructions on installing the integration broker and its prerequisites, see the following documentation.

- For WebSphere InterChange Server (ICS), see the *System Installation Guide for UNIX* or *for Windows*.
- For message brokers (WebSphere MQ Integrator Broker, WebSphere MQ Integrator, and WebSphere Business Integration Message Broker), see Implementing Adapters with WebSphere Message Brokers, and the installation documentation for the message broker. Some of this can be found at the following Web site: http://www.ibm.com/software/integration/mqfamily/library/manualsa/
- For WebSphere Application Server, see *Implementing Adapters with WebSphere Application Server* and the documentation at http://www.ibm.com/software/webservers/appserv/library.html

Adapter standards

The adapter supports the following standards.

SWIFTAlliance Access

The SWIFTAlliance Access gateway is a window through which SWIFT messages flow to and from remote financial applications over IP or WebSphere MQ. The connector supports SWIFTAlliance Access 5.0.

Adapter platforms

The adapter runs on the following platforms:

- Windows 2000
- Solaris 8
- HP-UX 11i
- AIX(R) 5.1, 5.2

Adapter dependencies

The following software must be installed before you install and configure the connector for SWIFT:

- The connector supports interoperability with applications via WebSphere MQ, WebSphere MQ 5.1, 5.2,[1] and 5.3. Accordingly, you must have one of these software releases installed.

  Note: The adapter does not support Secure Socket Layers (SSL) in WebSphere MQ 5.3. For the WebSphere MQ software version appropriate to adapter framework-integration broker communication, see the Installation Guide for your platform (Windows/Unix).

- IBM WebSphere MQ Java client libraries (included with WebSphere MQ 5.3)

  Note: It's advisable to download the latest MA88 libraries from IBM.

- MQSA WebSphere MQ Interface for SWIFTAlliance 1.3

  Note: The SWIFTAlliance Access gateway is a window through which SWIFT messages flow to and from remote financial applications over IP or WebSphere MQ. The connector supports SWIFTAlliance Access 5.0.

Connector architecture

The connector allows WebSphere business processes to asynchronously exchange business objects with applications that issue or receive SWIFT messages when changes to data occur. (The connector also supports synchronous acknowledgment.)

SWIFT stands for Society for Worldwide Interbank Financial Telecommunications. It is a United Nations-sanctioned International Standards Organization (ISO) for the creation and maintenance of financial messaging standards.

As shown in Figure 1, the connector interacts with several components (WebSphere components are shown in **bold**) whose collective purpose is to bridge the world of WebSphere business objects with that of SWIFT messages.

1. If your environment implements the convert-on-the-get methodology for character-set conversions you must download the latest MA88 (JMS classes) from IBM. The patch level should be at least 5.2.2 (for MQ Series version 5.2). Doing so may avoid unsupported encoding errors.

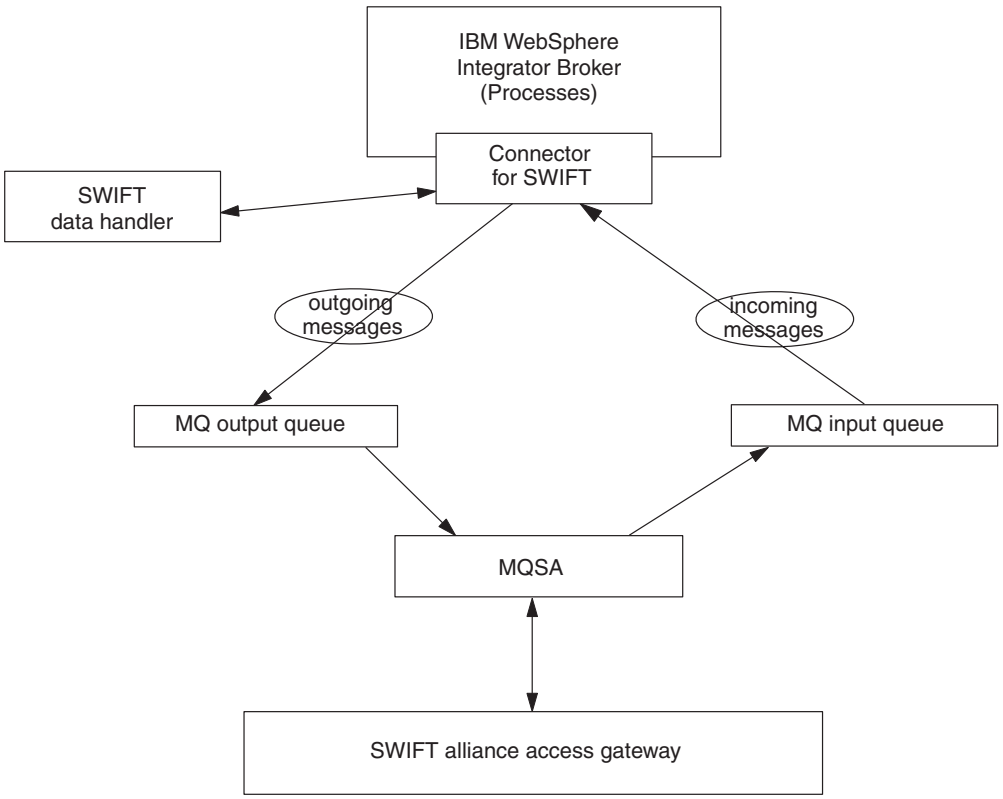


Figure 1. Connector for SWIFT architecture

The SWIFT environment is made up of various components that are described below.

Connector for SWIFT

The connector for SWIFT is metadata-driven. Message routing and format conversion are initiated by an event polling technique. The connector retrieves WebSphere MQ messages from queues, calls the SWIFT data handler to convert messages to their corresponding business objects, and then delivers the objects to the corresponding business processes. In the opposite direction, the connector receives business objects from the integration broker, converts them into SWIFT messages using the same data handler, and then delivers the messages to an WebSphere MQ queue.

The type of business object and verb used in processing a message are based on the metadata in the Format field of the WebSphere MQ message header. You construct a meta-object to store the business object name and verb to associate with the WebSphere MQ message header Format field text.

You can optionally construct a dynamic meta-object that is added as a child to the business object passed to the connector. The child meta-object values override those specified in the static meta-object that is specified for the connector as a whole. If the child meta-object is not defined or does not define a required conversion property, the connector, by default, examines the static meta-object for the value. You can specify one or more dynamic child meta-objects instead of, or to supplement, a single static connector meta-object.

The connector can poll multiple input queues, polling each in a round-robin manner and retrieving a configurable number of messages from each queue. For each message retrieved during polling, the connector adds a dynamic child meta-object (if specified in the business object). The child meta-object values can direct the connector to populate attributes with the format of the message as well as with the name of the input queue from which the message was retrieved.

When a message is retrieved from the input queue, the connector looks up the business object name associated with the `FORMAT` text field. The message, along with the business object name, is then passed to the data handler. If a business object is successfully populated with message content, the connector checks to see if it a collaboration subscribes to it, and then delivers it to the integration broker using the `gotApplEvents()` method.

SWIFT data handler and mapping engine

The connector calls the SWIFT data handler to convert business objects into SWIFT messages and vice versa. For more on the SWIFT data handler, see Chapter 4, "SWIFT Data Handler," on page 65.

WebSphere MQ

The connector for SWIFT uses an MQ implementation of the JavaTM Message Service (JMS), an API for accessing enterprise-messaging systems. This makes possible interaction with incoming and outgoing WebSphere MQ event queues.

MQSA

The WebSphere MQ event queues exchange messages with the WebSphere MQ Interface for SWIFTAlliance (MQSA). The MQSA software integrates WebSphere MQ messaging capabilities with SWIFT message types, performing delivery, acknowledgement, queue management, timestamping, and other functions.

SWIFTAlliance Access

The SWIFTAlliance Access gateway is a window through which SWIFT messages flow to and from remote financial applications over IP or WebSphere MQ. The connector supports SWIFTAlliance Access 5.0.

Application-connector communication method

The connector makes use of IBM's WebSphere MQ implementation of the Java Message Service (JMS). The JMS is an open-standard API for accessing enterprise-messaging systems. It is designed to allow business applications to asynchronously send and receive business data and events.

Message request

Figure 2 illustrates a message request communication.

1. The connector framework receives a business object representing a SWIFT message from an integration broker.
2. The connector passes the business object to the data handler.
3. The data handler converts the business object to a SWIFT message.
4. The connector dispatches the SWIFT message to the WebSphere MQ output queue.

5. The JMS layer makes the appropriate calls to open a queue session and routes the message to the MQSA, which issues the message to the SWIFT Alliance Gateway.

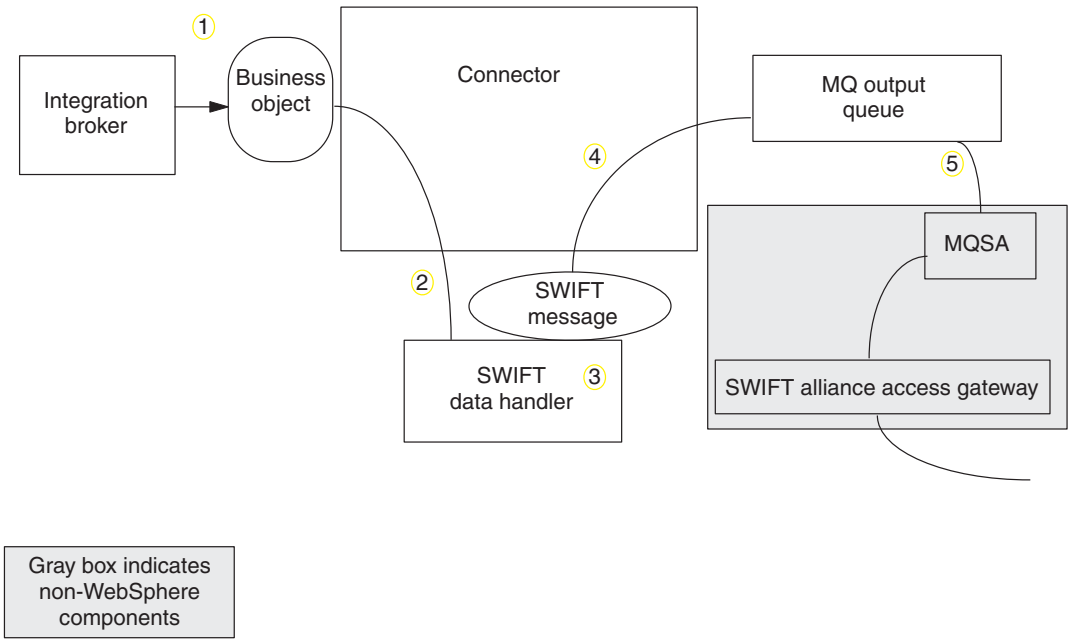


Figure 2. Application-connector communication method: Message request

Event delivery

Figure 3 illustrates the message return communication.

1. The polling method retrieves the next applicable SWIFT message from the WebSphere MQ input queue.
2. The message is staged in the in-progress queue, where it remains until processing is complete.
3. The connector passes the SWIFT message to the data handler.
4. The data handler converts the message into a business object.
5. The connector then determines whether the business object is subscribed to by the integration broker. If so, the connector framework delivers the business object to the integration broker, and the message is removed from the in-progress queue.

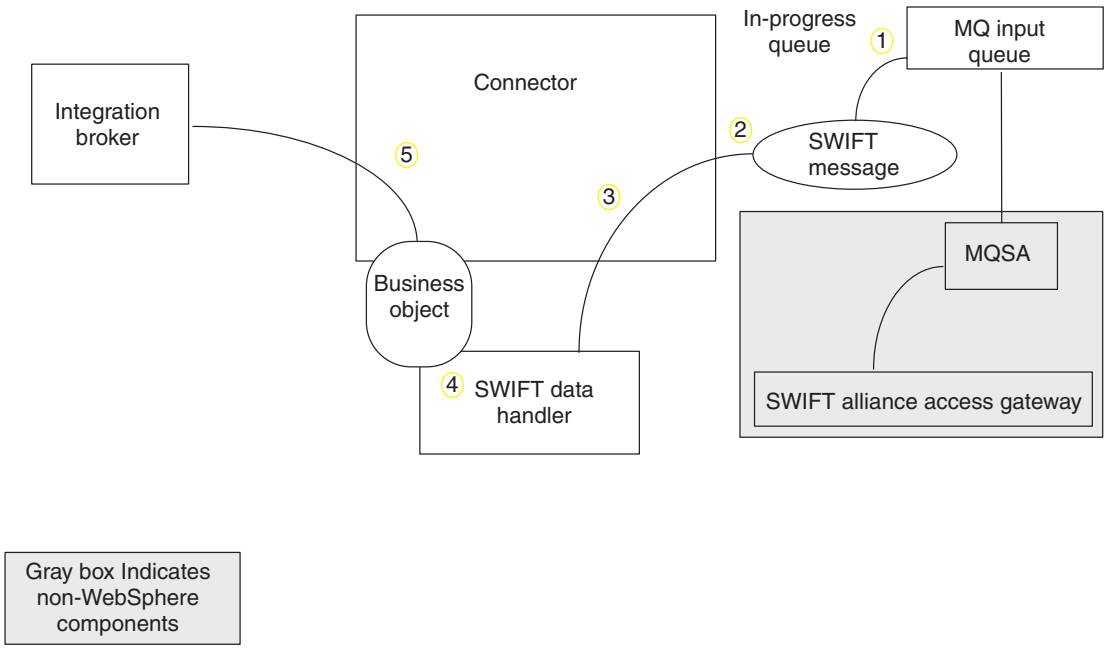


Figure 3. Application-connector communication method: Event delivery

Event handling

For event notification, the connector detects an event written to a queue by an application rather than by a database trigger. An event occurs when SWIFTAlliance generates SWIFT messages and stores them on the WebSphere MQ queue.

Retrieval

The connector uses a polling method to poll the WebSphere MQ input queue at regular intervals for messages. When the connector finds a message, it retrieves it from the WebSphere MQ input queue and examines it to determine its format. If the format has been defined in the connector's static or child meta-objects, the connector uses the data handler to generate an appropriate business object with a verb.

In-progress queue

The connector processes messages by first opening a transactional session to the WebSphere MQ queue. This transactional approach allows for a small chance that a business object could be delivered to a business process twice due to the connector successfully submitting the business object but failing to commit the transaction in the queue. To avoid this problem, the connector moves all messages to an in-progress queue. There, the message is held until processing is complete. If the connector shuts down unexpectedly during processing, the message remains in the in-progress queue instead of being reinstated to the original WebSphere MQ queue.

Note: Transactional sessions with a JMS service provider require that every requested action on a queue be performed and committed before events are removed from the queue. Accordingly, when the connector retrieves a message from the queue, it does not commit to the retrieval until: 1) The

message has been converted to a business object; 2) the business object is delivered to the integration broker, and 3) a return value is received.

Synchronous acknowledgment

To support applications that require feedback on the requests they issue, the connector for SWIFT can issue report messages to the applications detailing the outcome of their requests once they have been processed.

To achieve this, the connector posts the business data for such requests synchronously to the integration broker. If the business object is successfully processed, the connector sends a report back to the requesting application including the return code from the integration broker and any business object changes. If the connector or the integration broker fails to process the business object, the connector sends a report containing the appropriate error code and error message.

In either case, an application that sends a request to the connector for SWIFT is notified of its outcome.

If the connector for SWIFT receives any messages requesting positive or negative acknowledgment reports (PAN or NAN), it posts the content of the message synchronously to the integration broker and then incorporates the return code and modified business data in to a report message that is sent back to the requesting application.

Table 1 shows the required structure of messages sent to the connector to be processed synchronously.

Table 1. Required structure of synchronous WebSphere MQ messages

MQMD Field (message descriptor)	Description	Supported values (multiple values should be OR'd)
`MessageType`	Message type	`DATAGRAM`
`Report`	Options for report message requested	You can specify one or both of the following: • `MQRO_PAN` The connector sends a report message if the business object can be successfully processed. • `MQRO_NAN`The connector sends a report message if an error occurred while processing the business object. You can specify one of the following to control how the correlation ID of the report message is to be set: • `MQRO_COPY_MSG_ID_TO_CORREL_ID`The connector copies the message ID of the request message to the correlation ID of the report. This is the default action. • `MQRO_PASS_CORREL_ID`The connector copies the correlation ID of the request message to the correlation ID of the report.
`ReplyToQueue`	Name of reply queue	The name of the queue to which the report message should be sent.
`ReplyToQueueManager`	Name of queue manager	The name of the queue manager to which the report message should be sent.

Table 1. Required structure of synchronous WebSphere MQ messages (continued)

MQMD Field (message descriptor)	Description	Supported values (multiple values should be OR'd)
Message Body		A serialized business object in a format compatible with the data handler configured for the connector.

Upon receipt of a message as described in Table 1, the connector:

1. Reconstructs the business object in the message body using the configured data handler.
2. Looks up the business process specified for the business object and verb in the static metadata object.
3. Posts the business object synchronously to the specified process.
4. Generates a report encapsulating the result of the processing and any business object changes or error messages.
5. Sends the report to the queue specified in the `replyToQueue` and `replyToQueueManager` fields of the request.

Table 2 shows the structure of the report that is sent to the requesting application from the connector.

Table 2. Structure of the report returned to the requesting application

MQMD field	Description	Supported values (multiple values should be OR'd)
`MessageType`	Message type	`REPORT`
`feedback`	Type of report	One of the following: • `MQRO_PAN` If the business object is successfully processed. • `MQRO_NANI`If the connector or the integration broker encountered an error while processing the request.
Message Body		If the business object is successfully processed, the connector populates the message body with the business object returned by the integration broker. This default behavior can be overridden by setting the `DoNotReportBusObj` property to `true` in the static metadata object. If the request could not be processed, the connector populates the message body with the error message generated by the connector or the integration broker.

Recovery

Upon initialization, the connector checks the in-progress queue for messages that have not been completely processed, presumably due to a connector shutdown. The connector configuration property `InDoubtEvents` allows you to specify one of four options for handling recovery of such messages: fail on startup, reprocess, ignore, or log error.

Fail on startup

With the fail on startup option, if the connector finds messages in the in-progress queue during initialization, it logs an error and immediately shuts down. It is the responsibility of the user or system administrator to examine the message and take appropriate action, either to delete these messages entirely or move them to a different queue.

Reprocess

With the reprocessing option, if the connector finds any messages in the in-progress queue during initialization, it processes these messages first during subsequent polls. When all messages in the in-progress queue have been processed, the connector begins processing messages from the input queue.

Ignore

With the ignore option, if the connector finds any messages in the in-progress queue during initialization, the connector ignores them but does not shut down.

Log error

With the log error option, if the connector finds any messages in the in-progress queue during initialization, it logs an error but does not shut down.

Archiving

If the connector property `ArchiveQueue` is specified and identifies a valid queue, the connector places copies of all successfully processed messages in the archive queue. If `ArchiveQueue` is undefined, messages are discarded after processing.

Guaranteed event delivery

The guaranteed-event-delivery feature enables the connector framework to ensure that events are never lost and never sent twice between the connector's event store, the JMS event store, and the destination's JMS queue. To become JMS-enabled, you must configure the connector`DeliveryTransport` standard property to JMS. Thus configured, the connector uses the JMS transport and all subsequent communication between the connector and the integration broker occurs through this transport. The JMS transport ensures that the messages are eventually delivered to their destination. Its role is to ensure that once a transactional queue session starts, the messages are cached there until a commit is issued; if a failure occurs or a rollback is issued, the messages are discarded.

Note: Without use of the guaranteed-event-delivery feature, a small window of possible failure exists between the time that the connector publishes an event (when the connector calls the gotApplEvent() method within its pollForEvents() method) and the time it updates the event store by deleting the event record (or perhaps updating it with an "event posted" status). If a failure occurs in this window, the event has been sent but its event record remains in the event store with an "in progress" status. When the connector restarts, it finds this event record still in the event store and sends it, resulting in the event being sent twice.

You can configure the guaranteed-event-delivery feature for a JMS-enabled connector with, or without, a JMS event store. To configure the connector for guaranteed event delivery, see the *Connector Development Guide for Java.*

If connector framework cannot deliver the business object to the ICS integration broker, then the object is placed on a FaultQueue (instead of UnsubscribedQueue

and ErrorQueue) and generates a status indicator and a description of the problem. FaultQueue messages are written in MQRFH2 format.

Business object requests

Business object requests are processed when the integration broker issues a business object. Using the SWIFT data handler, the connector can convert the business object to a SWIFT message.

Message processing

The connector processes business objects passed to it by an integration broker based on the verb for each business object. The connector uses business object handlers to process the business objects that the connector supports.The business object handlers contain methods that interact with an application and that transform business object requests into application operations.

The connector supports the following business object verbs:

- Create
- Retrieve

Create

Processing of business objects with create depends on whether the objects are issued asynchronously or synchronously.

Asynchronous delivery

This is the default delivery mode for business objects with Create verbs. A message is created from the business object using a data handler and then written to the output queue. If the message is delivered, the connector returns BON_SUCCESS, else BON_FAIL.

Note: The connector has no way of verifying whether the message is received or if action has been taken.

Synchronous acknowledgment

If a `replyToQueue` has been defined in the connector properties and a `responseTimeout` exists in the conversion properties for the business object, the connector issues a request in synchronous mode. The connector then waits for a response to verify that appropriate action was taken by the receiving application.

For WebSphere MQ, the connector initially issues a message with a header as shown in Table 3.

Table 3. Request Message Descriptor Header (MQMD)

Field	Description	Value
Format	Format name	Output format as defined in the conversion properties and truncated to 8 characters to meet IBM requirements (example: `MQSTR`).
MessageType	Message type	`MQMT_DATAGRAM`[a]

Table 3. Request Message Descriptor Header (MQMD) (continued)

Field	Description	Value
Report	Options for report message requested.	When a response message is expected, this field is populated as follows: MQRO_PAN[a] to indicate that a positive-action report is required if processing is successful. MQRO_NAN[a] to indicate that a negative-action report is required if processing fails. MQRO_COPY_MSG_ID_TO_CORREL_ID[a] to indicate that the correlation ID of the report generated should equal the message ID of the request originally issued.
ReplyToQueue	Name of reply queue	When a response message is expected, this field is populated with the value of connector property ReplyToQueue.
Persistence	Message persistence	MQPER_PERSISTENT[a]
Expiry	Message lifetime	MQEI_UNLIMITED[a]

[a] Indicates constant defined by IBM.

The message header described in Table 3 is followed by the message body. The message body is a business object that has been serialized using the data handler.

The Report field is set to indicate that both positive and negative action reports are expected from the receiving application. The thread that issued the message waits for a response message that indicates whether the receiving application was able to process the request.

When an application receives a synchronous request from the connector, it processes the business object and issues a report message as described in Table 4, Table 5, and Table 6.

Table 4. Response Message Descriptor Header (MQMD)

Field	Description	Value
Format	Format name	Input format of busObj as defined in the conversion properties.
MessageType	Message type	MQMT_REPORT[a]

[a] Indicates constant defined by IBM.

Table 5. Population of response message

Verb	Feedback field	Message body
Create	SUCCESS VALCHANGE	(Optional) A serialized business object reflecting changes.
	VALDUPES FAIL	(Optional) An error message.

Table 6. Feedback codes and response values

WebSphere MQ feedback code	Equivalent WebSphere business integration system response[a]
MQFB_NONE(this is the default if no feedback code is specified)	VALCHANGE
MQFB_PAN or MQFB_APPL_FIRST	SUCCESS
MQFB_NAN or MQFB_APPL_FIRST + 1	FAIL
MQFB_APPL_FIRST + 2	VALCHANGE
MQFB_APPL_FIRST + 3	VALDUPES

Table 6. Feedback codes and response values (continued)

WebSphere MQ feedback code	Equivalent WebSphere business integration system response[a]
MQFB_APPL_FIRST + 4	MULTIPLE_HITS
MQFB_APPL_FIRST + 5	Not applicable
MQFB_APPL_FIRST + 6	Not applicable
MQFB_APPL_FIRST + 7	UNABLE_TO_LOGIN
MQFB_APPL_FIRST + 8	APP_RESPONSE_TIMEOUT (results in immediate termination of connector)
MQFB_NONE	What the connector receives if no feedback code is specified in the response message

[a] See the *connector development guide* for details.

If the business object can be processed, the application creates a report message with the feedback field set to MQFB_PAN (or a specific WebSphere business integration system value). Optionally the application populates the message body with a serialized business object containing any changes. If the business object cannot be processed, the application creates a report message with the feedback field set to MQFB_NAN (or a specific WebSphere business integration system value) and then optionally includes an error message in the message body. In either case, the application sets the correlationID field of the message to the messageID of the connector message and issues it to the queue specified by the ReplyTo field.

Upon retrieval of a response message, the connector by default matches the correlationID of the response to the messageID of a request message. The connector then notifies the thread that issued the request. Depending on the feedback field of the response, the connector either expects a business object or an error message in the message body. If the feedback code is MQFB_NONE (the default value if no feedback code is specified), the connector by default considers the return code to be VALCHANGE. If a business object was expected but the message body is not populated, the connector simply returns the same business object that was originally issued by the integration broker for the Request operation. If an error message was expected but the message body is not populated, a generic error message is returned to the integration broker along with the response code. However, you can also use a message selector to identify, filter and otherwise control how the adapter identifies the response message for a given request. This message selector capability is a JMS feature. It applies to synchronous request processing only and is described below.

Filtering response messages using a message selector: Upon receiving a business object for synchronous request processing, the connector checks for the presence of a response_selector string in the application-specific information of the verb. If the response_selector is undefined, the connector identifies response messages using the correlation ID as described above.

If response_selector is defined, the connector expects a name-value pair with the following syntax:

```
response_selector=JMSCorrelationID LIKE 'selectorstring'
```

The message selectorstring must uniquely identify a response and its values be enclosed in single quotes as shown in the example below:

```
response_selector=JMSCorrelationID LIKE 'Oshkosh'
```

In the above example, after issuing the request message, the adapter would monitor the ReplyToQueue for a response message with a `correlationID` equal to "Oshkosh." The adapter would retrieve the first message that matches this message selector and then dispatch it as the response.

Optionally, the adapter performs run-time substitutions enabling you to generate unique message selectors for each request. Instead of a message selector, you specify a placeholder in the form of an integer surrounded by curly braces, for example: `'{1}'`. You then follow with a colon and a list of comma-separated attributes to use for the substitution. The integer in the placeholder acts as an index to the attribute to use for the substitution. For example, the following message selector:

```
response_selector=JMSCorrelationID LIKE '{1}': MyDynamicMO.CorrelationID
```

would inform the adapter to replace `{1}` with the value of the first attribute following the selector (in this case the attribute named `CorrelationId` of the child-object named `MyDynamicMO`. If attribute `CorrelationID` had a value of `123ABC`, the adapter would generate and use a message selector created with the following criteria:

```
JMSCorrelation LIKE '123ABC'
```

to identify the response message.

You can also specify multiple substitutions such as the following:

```
response_selector=PrimaryId LIKE '{1}' AND AddressId LIKE '{2}' :
PrimaryId, Address[4].AddressId
```

In this example, the adapter would substitute `{1}` with the value of attribute `PrimaryId` from the top-level business object and `{2}` with the value of `AddressId` from the 5th position of child container object `Address`. With this approach, you can reference any attribute in the business object and meta-object in the response message selector. For more information on how deep retrieval is performed using `Address[4].AddressId`, see JCDK API manual (getAttribute method)

An error is reported at run-time when any of the following occurs:

- If you specify a non-integer value between the `'{}'` symbols
- If you specify an index for which no attribute is defined
- If the attribute specified does not exist in the business or meta-object
- If the syntax of the attribute path is incorrect

For example, if you include the literal value '{' or '}' in the message selector, you can use '{{' or "{}" respectively. You can also place these characters in the attribute value, in which case the first "{" is not needed. Consider the following example using the escape character: `response_selector=JMSCorrelation LIKE '{1}' and CompanyName='A{{P': MyDynamicMO.CorrelationID`

The connector would resolve this message selector as follows:

```
JMSCorrelationID LIKE '123ABC' and CompanyName='A{P'
```

When the connector encounters special characters such as '{', '}', ':' or ';' in attribute values, they are inserted directly into the query string. This allows you to include special characters in a query string that also serve as application-specific information delimiters.

The next example illustrates how a literal string substitution is extracted from the attribute value:

```
response_selector=JMSCorrelation LIKE '{1}' and CompanyName='A{{P':
MyDynamicMO.CorrelationID
```

If `MyDynamicMO.CorrelationID` contained the value `{A:B}C;D`, the connector would resolve the message selector as follows: `JMSCorrelationID LIKE '{A:B}C;D' and CompanyName='A{P'`

For more information on the response selector code, see JMS 1.0.1 specifications.

Creating custom feedback codes: You can extend the WebSphere MQ feedback codes to override default interpretations shown in Table 6 by specifying the connector property FeedbackCodeMappingMO. This property allows you to create a meta-object in which all WebSphere business integration system-specific return status values are mapped to the WebSphere MQ feedback codes. The return status assigned (using the meta-object) to a feedback code is passed to the integration broker. For more information, see "FeedbackCodeMappingMO" on page 24.

Retrieve

Business objects with the Retrieve verb support synchronous delivery only. The connector processes business objects with this verb as it does for the synchronous delivery defined for create. However, when using a Retrieve verb, the `responseTimeout` and `replyToQueue` are required. Furthermore, the message body must be populated with a serialized business object to complete the transaction.

Table 7 shows the response messages for these verbs.

Table 7. Population of response message

Verb	Feedback field	Message body
Retrieve	FAIL FAIL_RETRIEVE_BY_CONTENT	(Optional) An error message.
	MULTIPLE_HITS SUCCESS	A serialized business object.

Error handling

All error messages generated by the connector are stored in a message file named `SWIFTConnector.txt`. (The name of the file is determined by the `LogFileName` standard connector configuration property.) Each error has an error number followed by the error message:

`Message number`

`Message text`

The connector handles specific errors as described in the following sections.

Application timeout

The error message ABON_APPRESPONSETIMEOUT is returned when:

- The connector cannot establish a connection to the JMS service provider during message retrieval.
- The connector successfully converts a business object to a message but cannot deliver it to the outgoing queue due to connection loss.
- The connector issues a message but times out waiting for a response from a business object whose conversion property `TimeoutFatal` is equal to `True`.
- The connector receives a response message with a return code equal to APP_RESPONSE_TIMEOUT or UNABLE_TO_LOGIN.

Unsubscribed business object

The connector delivers a message to the queue specified by the `UnsubscribedQueue` property if:

- The connector retrieves a message that is associated with an unsubscribed business object.
- The connector retrieves a message but cannot associate the text in the Format field with a business object name.

Note: If the `UnsubscribedQueue` is not defined, unsubscribed messages are discarded.

Data handler conversion

If the data handler fails to convert a message to a business object, or if a processing error occurs that is specific to the business object (as opposed to the JMS provider), the message is delivered to the queue specified by `ErrorQueue`. If `ErrorQueue` is not defined, messages that cannot be processed due to errors are discarded.

If the data handler fails to convert a business object to a message, BON_FAIL is returned.

Tracing

Tracing is an optional debugging feature you can turn on to closely follow connector behavior. Trace messages, by default, are written to STDOUT. See the connector configuration properties in Chapter 2, "Installing and configuring the connector," on page 19, for more on configuring trace messages. For more information on tracing, including how to enable and set it, see the *Connector Development Guide*.

What follows is recommended content for connector trace messages.

Level 0	This level is used for trace messages that identify the connector version.
Level 1	Use this level for trace messages that provide key information on each business object processed or record each time a polling thread detects a new message in an input queue.
Level 2	Use this level for trace messages that log each time a business object is posted to the integration broker, either from `gotApplEvent()` or `executeCollaboration()`.
Level 3	Use this level for trace messages that provide information regarding message-to-business-object and business-object-to-message conversions or provide information about the delivery of the message to the output queue.

Level 4	Use this level for trace messages that identify when the connector enters or exits a function.
Level 5	Use this level for trace messages that indicate connector initialization, represent statements executed in the application, indicate whenever a message is taken off of or put onto a queue, or record business object dumps.

Chapter 2. Installing and configuring the connector

This chapter describes how to install and configure the connector and how to configure the message queues to work with the connector.

Overview of installation tasks

To install the connector for SWIFT, you must perform the following tasks.

Confirm adapter prerequisites

Before you install the adapter, confirm that all the environment prerequisites for installing and running the adapter are on your system. For details, see "Adapter environment" on page 1.

Install the integration broker

Installing the integration broker, a task that includes installing the WebSphere business integration system and starting the broker, is described in the documentation for your broker. For details about the brokers that the connector for SWIFT supports, see "Broker compatibility" on page 2.

For details about installing the broker, see the appropriate implementation documentation of the broker you are using.

Install the adapter for SWIFT and related files

For information on installing WebSphere Business Integration adapter products, refer to the *Installation Guide for WebSphere Business Integration Adapters*, located in the WebSphere Business Integration Adapters Infocenter at the following site:

http://www.ibm.com/websphere/integration/wbiadapters/infocenter

Installed file structure

The following subsections describe the installed file structure on UNIX and Windows systems.

Installed UNIX files

Table 8 describes the UNIX file structure used by the connector.

Table 8. Installed UNIX file structure for the connector

Subdirectory of *ProductDir*	Description
connectors/SWIFT/BIA_SWIFTConnector.jar	Connector jar file
connectors/SWIFT/start_SWIFT.sh	The startup script for the connector. The script is called from the generic connector manager script. When you click Install from Connector Configurator (WebSphere MQ Integrator Broker as the integration broker) or the Connector Configuration screen of System Manager (ICS as the integration broker), the installer creates a customized wrapper for this connector manager script. When the connector works with ICS, use this customized wrapper only to start and stop the connector. When the connector works with WebSphere MQ Integrator Broker, use this customized wrapper only to start the connector; use mqsiremotestopadapter to stop the connector.
connectors/messages/BIA_SWIFTConnector.txt	Connector message file
bin/Data/App/SWIFT/BIA_SWIFTConnectorTemplate	Connector definition
connectors/SWIFT/BIA_SWIFTDataHandler.jar	The SWIFT data handler jar
connectors/SWIFT/samples/BIA_SWIFT_MO_Sample.zip	Zipped file containing meta-object for SWIFT data handler (repository/DataHandlers/MO_DataHandler_SWIFT.xsd) and a sample configuration meta-object (connectors/SWIFT/samples/Sample_SWIFT_MO_Config.xsd)
connectors/SWIFT/samples/BO_Definitions/ BIA_SWIFT_objects.zip	Zipped file containing business object definitions for all supported SWIFT messages. in xsd format (connectors/SWIFT/samples/BO_Definitions/ SWIFT_ objects.xsd)

For more information on installing the connector component, refer to one of the following guides, depending on the integration broker you are using:

- *System Installation Guide for UNIX* (when ICS is used as integration broker)
- *Implementation Guide for WebSphere MQ Integrator Broker* (when MQ Integrator Broker is used as integration broker)

Installing Windows files

Table 9 describes the Windows file structure used by the connector.

Note: If you are installing a Web release of this connector, see the Release Notes for installation instructions.

Table 9. Installed Windows file structure for the connector

Subdirectory of ProductDir	Description
connectors\SWIFT\BIA_SWIFTConnector.jar	Connector jar file
connectors\SWIFT\start_SWIFT.bat	The startup file for the connector.
connectors\messages\BIA_SWIFTConnector.txt	Connector message file
bin\Data\App\BIA_SWIFTConnectorTemplate	Connector definition
connectors\SWIFT\BIA_SWIFTDataHandler.jar	The SWIFT data handler jar file
connectors\SWIFT\samples\BIA_SWIFT_MO_Sample.zip	Zipped file containing meta-object for SWIFT data handler (repository\DataHandlers\MO_DataHandler_SWIFT.xsd) and a sample configuration meta-object (connectors\SWIFT\samples\Sample_SWIFT_MO_Config.xsd)

Table 9. Installed Windows file structure for the connector (continued)

Subdirectory of ProductDir	Description
connectors\SWIFT\samples\BO_Definitions\ BIA_SWIFT_objects.zip	Zipped file containing business object definitions for all supported SWIFT messages. in xsd format (connectors/SWIFT/samples/BO_Definitions/ SWIFT_ objects.xsd)

For more information on installing the connector component, refer to one of the following guides, depending on the integration broker you are using:

- *IBM WebSphere InterChange Server System Installation Guide for Windows* (when ICS is used as integration broker)
- *IBM WebSphere Business Integration Adapters Implementation Guide for WebSphere MQ Integrator Broker* (when MQ Integrator Broker is used as integration broker)

Connector configuration

Connectors have two types of configuration properties: standard configuration properties and adapter-specific configuration properties. You must set the values of these properties before running the adapter.

You use Connector Configurator to configure connector properties:

- For a description of Connector Configurator and step-by-step procedures, see Appendix B, "Connector Configurator," on page 89.
- For a description of standard connector properties, see "Standard connector properties" and then Appendix A, "Standard configuration properties for connectors," on page 71.
- For a description of connector-specific properties, see "Connector-specific properties" on page 22.

A connector obtains its configuration values at startup. During a runtime session, you may want to change the values of one or more connector properties. Changes to some connector configuration properties, such as AgentTraceLevel, take effect immediately. Changes to other connector properties require component restart or system restart after a change. To determine whether a property is dynamic (taking effect immediately) or static (requiring either connector component restart or system restart), refer to the Update Method column in the Connector Properties window of Connector Configurator.

Standard connector properties

Standard configuration properties provide information that all connectors use. See Appendix A, "Standard configuration properties for connectors," on page 71 for documentation of these properties.

Note: When you set configuration properties in Connector Configurator, you specify your broker using the BrokerType property. Once this is set, the properties relevant to your broker will appear in the Connector Configurator window.

Connector-specific properties

Connector-specific configuration properties provide information needed by the connector at runtime. Connector-specific properties also provide a way of changing static information or logic within the connector without having to recode and rebuild the agent.

Note: Always check the values WebSphere MQ provides because they may be incorrect or unknown. If the provided values are incorrect, specify them explicitly.

Table 10 lists the connector-specific configuration properties for the connector for SWIFT. See the sections that follow for explanations of the properties.

Table 10. Connector-specific configuration properties

Name	Possible values	Default value	Required
"ApplicationPassword" on page 23	*Login password*		No
"ApplicationUserID" on page 23	*Login user ID*		No
"ArchiveQueue" on page 23	*Queue to which copies of successfully processed messages are sent*	`queue://CrossWorlds. Queue.Manager/MQCONN. ARCHIVE`	No
"Channel" on page 23	*MQ server connector channel*		Yes
"ConfigurationMetaObject" on page 23	*Name of configuration meta-object*		Yes
"DataHandlerClassName" on page 23	*Data handler class name*	`com.crossworlds. DataHandlers.swift. SwiftDataHandler`	No
"DataHandlerConfigMO" on page 23	*Data handler meta-object*	`MO_DataHandler_Default`	Yes
"DataHandlerMimeType" on page 24	*MIME type of file*	`swift`	No
"DefaultVerb" on page 24	*Any verb supported by the connector.*	`Create`	
"EnableMessageProducerCache" on page 24	true or false	`true`	No
"ErrorQueue" on page 24	*Queue for unprocessed messages*	`queue://crossworlds. Queue.manager/ MQCONN.ERROR`	No
"FeedbackCodeMappingMO" on page 24	Feedback code meta-object		No
"HostName" on page 25	*WebSphere MQ server*		No
"InDoubtEvents" on page 25	`FailOnStartup Reprocess Ignore LogError`	`Reprocess`	No
"InputQueue" on page 25	*Poll queues*	`queue://CrossWorlds. Queue.Manager/MQCONN.IN`	Yes
"InProgressQueue" on page 26	*In-progress event queue*	`queue://CrossWorlds. Queue.Manager/ MQCONN.IN_PROGRESS`	No
"PollQuantity" on page 26	*Number of messages to retrieve from each queue specified in the `InputQueue` property*	1	No
"Port" on page 26	*Port established for the WebSphere MQ listener*		No
"ReplyToQueue" on page 26	*Queue to which response messages are delivered when the connector issues requests*	`queue://CrossWorlds. Queue.Manager/MQCONN.REPLYTO`	No

Table 10. Connector-specific configuration properties (continued)

Name	Possible values	Default value	Required
"SessionPoolSizeForRequests" on page 26	*Maximum pool size for caching the sessions used during request processing*	10	No
"UnsubscribedQueue" on page 26	*Queue to which unsubscribed messages are sent*	`queue://CrossWorlds.QueueManager/MQCONN.UNSUBSCRIBE`	No
"UseDefaults" on page 26	true or false	false	

ApplicationPassword
Password used with the ApplicationUserID to log in to WebSphere MQ.

Default = None.

If the `ApplicationPassword` is left blank or removed, the connector uses the default password provided by WebSphere MQ.

ApplicationUserID
User ID used with the ApplicationPassword to log in to WebSphere MQ.

Default=None.

If the `ApplicationUserID` is left blank or removed, the connector uses the default user ID provided by WebSphere MQ.

ArchiveQueue
Queue to which copies of successfully processed messages are sent.

Default = `queue://crossworlds.Queue.manager/MQCONN.ARCHIVE`

Channel
MQ server connector channel through which the connector communicates with WebSphere MQ.

Default=None.

If the value of Channel is left blank or the property is removed, the connector uses the default server channel provided by WebSphere MQ.

ConfigurationMetaObject
Name of static meta-object containing configuration information for the connector.

Default = none.

DataHandlerClassName
Data handler class to use when converting messages to and from business objects.

Default = `com.crossworlds.DataHandlers.swift.SwiftDataHandler`

DataHandlerConfigMO
Meta-object passed to data handler to provide configuration information.

Default = `MO_DataHandler_Default`

DataHandlerMimeType
Allows you to request a data handler based on a particular MIME type.

Default = `swift`

DefaultVerb
Specifies the verb to be set within an incoming business object, if it has not been set by the data handler during polling.

Default= `Create`

EnableMessageProducerCache
Boolean property to specify that the adapter should enable a message producer cache for sending request messages.

Default= `true`

ErrorQueue
Queue to which messages that could not be processed are sent.

Default = `queue://crossworlds.Queue.manager/MQCONN.ERROR`

FeedbackCodeMappingMO
Allows you to override and reassign the default feedback codes used to synchronously acknowledge receipt of messages to the integration broker. This property enables you to specify a meta-object in which each attribute name is understood to represent a feedback code. The corresponding value of the feedback code is the return status that is passed to the integration broker. For a listing of the default feedback codes, see "Synchronous acknowledgment" on page 8. The connector accepts the following attribute values representing WebSphere MQ-specific feedback codes:

- MQFB_APPL_FIRST
- MQFB_APPL_FIRST_OFFSET_*N where N is an integer (interpreted as the value of* MQFB_APPL_FIRST + *N)*

The connector accepts the following WebSphere business integration system-specific status codes as attribute values in the meta-object:

- SUCCESS
- FAIL
- APP_RESPONSE_TIMEOUT
- MULTIPLE_HITS
- UNABLE_TO_LOGIN
- VALCHANGE
- VALDUPES

Table 11 shows a sample meta-object.

Table 11. Sample feedback code meta-object attributes

Attribute Name	Default Value
`MQFB_APPL_FIRST`	SUCCESS
`MQFB_APPL_FIRST + 1`	FAIL
`MQFB_APPL_FIRST + 2`	UNABLE_TO_LOGIN

Default = none.

HostName

The name of the server hosting WebSphere MQ.

Default=None.

If the `HostName` is left blank or removed, the connector allows WebSphere MQ to determine the host.

InDoubtEvents

Specifies how to handle in-progress events that are not fully processed due to unexpected connector shutdown. Choose one of four actions to take if events are found in the in-progress queue during initialization:

- `FailOnStartup.` Log an error and immediately shut down.
- `Reprocess.` Process the remaining events first, then process messages in the input queue.
- `Ignore.` Disregard any messages in the in-progress queue.
- `LogError.` Log an error but do not shut down.

Default = `Reprocess`.

InputQueue

Specifies the message queues that the connector polls for new messages. See the MQSA documentation to configure the WebSphere MQ queues for routing to SWIFTAlliance gateways.

The connector accepts multiple semicolon-delimited queue names. For example, to poll the queues `MyQueueA`, `MyQueueB`, and `MyQueueC`, the value for connector configuration property InputQueue is: `MyQueueA;MyQueueB;MyQueueC`.

The connector polls the queues in a round-robin manner and retrieves up to pollQuantity number of messages from each queue. For example, pollQuantity equals 2, and `MyQueueA` contains 2 messages, `MyQueueB` contains 1 message and `MyQueueC` contains 5 messages.

With pollQuanity set to 2, the connector retrieves at most 2 messages from each queue per call to pollForEvents. For the first cycle (1 of 2), the connector retrieves the first message from each of `MyQueueA`, `MyQueueB`, and `MyQueueC`. That completes the first round of polling. The connector starts a second round of polling (2 of 2) and retrieves one message each from `MyQueueA` and `MyQueueC`—it skips `MqQueueB` because that queue is now empty. After polling all queues twice, the call to the method pollForEvents is complete. The sequence of message retrieval is:

1. 1 message from `MyQueueA`
2. 1 message from `MyQueueB`
3. 1 message from `MyQueueC`
4. 1 message from `MyQueueA`
5. Skip `MyQueueB` because it is empty
6. 1 message from `MyQueueC`

Default = `queue://crossworlds.Queue.manager/MQCONN.IN`

InProgressQueue
Message queue where messages are held during processing. You can configure the connector to operate without this queue by using System Manager to remove the default InProgressQueue name from the connector-specific properties. Doing so prompts a warning at startup that event delivery may be compromised if the connector is shut down while are events pending.

Default= `queue://crossworlds.Queue.manager/MQCONN.IN_PROGRESS`

PollQuantity
Number of messages to retrieve from each queue specified in the InputQueue property during a pollForEvents scan.

Default =1

Port
Port established for the WebSphere MQ listener.

Default=None.

If the value of Port is left blank or the property is removed, the connector allows WebSphere MQ to determine the correct port.

ReplyToQueue
Queue to which response messages are delivered when the connector issues requests.

Default = `queue://crossworlds.Queue.manager/MQCONN.REPLYTO`

SessionPoolSizeForRequests
Maximum pool size for caching the sessions used during request processing.

Default = `10`

UnsubscribedQueue
Queue to which messages about business objects that are not subscribed to are sent.

Default = `queue://crossworlds.Queue.manager/MQCONN.UNSUBSCRIBED`

UseDefaults
On a Create operation, if UseDefaults is set to `true`, the connector checks whether a valid value or a default value is provided for each isRequired business object attribute. If a value is provided, the Create operation succeeds. If the parameter is set to `false`, the connector checks only for a valid value and causes the Create operation to fail if it is not provided. The default is `false`.

Queue Uniform Resource Identifiers (URI)
A URI uniquely identifies a queue. A URI for a queue begins with the sequence `queue://` followed by:

- The name of the queue manager on which the queue resides
- A forward slash (/)
- The name of the queue
- Optionally, a list of name-value pairs to set the remaining queue properties.

For example, the following URI connects to queue `IN` on queue manager `crossworlds.queue.manager` and causes all messages to be sent as SWIFT messages with priority 5.

```
queue://crossworlds.Queue.manager/MQCONN.IN?targetClient=1&priority=5
```

Table 12 shows property names for queue URIs.

Table 12. SWIFT-specific connector property names for queue URIs

Property name	Description	Values
`expiry`	Lifetime of the message in milliseconds.	0 = unlimited. positive integers = timeout (in ms).
`priority`	Priority of the message.	0-9, where 1 is the highest priority. A value of -1 means that the property is determined by the configuration of the queue. A value of -2 means that the connector can use its own default value.
persistence	Whether the message should be retained in persistent memory.	1 = non-persistent 2 = persistent A value of -1 means that the property is determined by the configuration of the queue. A value of -2 means that the connector uses its own default value.
CCSID[1]	Character set of the destination.	Integers - valid values listed in base WebSphere MQ documentation.
targetClient	Whether the receiving application is JMS compliant or not.	1 = MQ (MQMD header only) This value must be set to 1 for SWIFTAlliance.
`encoding`	How to represent numeric fields.	An integer value as described in the base WebSphere MQ documentation.

Notes:

1. The connector has no control over the character set (CCSID) or encoding attributes of data in MQMessages. For the connector to work properly, WebSphere MQ queues require an ASCII character set, and must be configured accordingly in MQSA. Because data conversion is applied as the data is retrieved from or delivered to the message buffer, the connector relies on the IBM WebSphere MQ implementation of JMS to convert data (see the IBM WebSphere MQ Java client library documentation). Accordingly, these conversions should be bi-directionally equivalent to those performed by the native WebSphere MQ API using option `MQGMO_CONVERT`. The connector has no control over differences or failures in the conversion process. It can retrieve message data of any CCSID or encoding supported by WebSphere MQ without additional modifications (such as those imposed by MQSA). To deliver a message of a specific CCSID or encoding, the output queue must be a fully qualified URI and specify values for `CCSID` and `encoding`. The connector passes this information to WebSphere MQ, which (via the JMS API) uses the information when encoding data for MQMessage delivery. Often, lack of support for CCSID and encoding can be resolved by downloading the most recent version of the IBM WebSphere MQ Java client library from the IBM website. For further information on MQSA requirements, see MQSA documentation. If problems specific to CCSID and encoding persist, contact IBM Technical Support to discuss the possibility of using another Java Virtual Machine to run the connector.

Meta-object attributes configuration

The connector for SWIFT can recognize and read two kinds of meta-objects:

- Static connector meta-object
- Dynamic child meta-object

The attribute values of the dynamic child meta-object duplicate and override those of the static meta-object.

Static meta-object

The static meta-object consists of a list of conversion properties defined for different business objects. To define the conversion properties for a business object, first create a string attribute and name it using the syntax `busObj_verb`. For example, to define the conversion properties for a Customer object with the verb Create, create an attribute named `Swift_MT502_Create`. In the application-specific text of the attribute, you specify the actual conversion properties.

Additionally, a reserved attribute named `Default` can be defined in the meta-object. When this attribute is present, its properties act as default values for all business object conversion properties.

Note: If a static meta-object is not specified, the connector cannot map a given message format to a specific business object type during polling. When this is the case, the connector passes the message text to the configured data handler without specifying a business object. If the data handler cannot create a business object based on the text alone, the connector reports an error indicating that this message format is unrecognized.

Table 13 describes the meta-object properties.

Table 13. Static meta-object properties

Property name	Description
`CollaborationName`	The collaboration name must be specified in the application-specific text of the attribute for the business object/verb combination. For example, if you expect to handle synchronous events for the business object Customer with the Create verb, the static metadata object must contain an attribute named `Swift_MT`*`nnn_Verb`*, where *nnn* is the Swift message type, for example, `Swift_MT502_Create`. The `Swift_MT502_Create` attribute must contain application-specific text that includes a name-value pair. For example, CollaborationName=MyCustomerProcessingCollab. See the "Application-specific information" on page 30 section for syntax details. Failure to do this results in runtime errors when the connector attempts to synchronously process a request involving the Customer business object. **Note:** This property is available only for synchronous requests.
`DoNotReportBusObj`	Optionally, you can include the `DoNotReportBusObj` property. By setting this property to `true`, all PAN report messages issued have a blank message body. This is recommended when you want to confirm that a request has been successfully processed but does not need notification of changes to the business object. This does not affect NAN reports. If this property is not found in the static meta-object, the connector defaults to `false` and populates the message report with the business object. **Note:** This property is available only for synchronous requests.

Table 13. Static meta-object properties (continued)

Property name	Description
InputFormat	The input format is the message format to associate with the given business object. When a message is retrieved and is in this format, it is converted to the given business object if possible. If this format is not specified for a business object, the connector does not handle subscription deliveries for the given business object. In the static MO, the InputQueue property and the InputFormat property can serve as criteria for the adapter to map a given message to a specific business object. This feature is not used by the adapter for the SWIFT protocol.
OutputFormat	The output format is set on messages created from the given business object. If a value for the OutputFormat property is not specified, the input format is used, if available. An OutputFormat property value defined in a dynamic child meta-object overrides the value defined in the static meta-object.
InputQueue	The input queue that the connector polls to detect new messages. The InputQueue property in the connector-specific properties defines which queues the adapter polls. This is the only property that the adapter uses to determine which queues to poll. In the static MO, the InputQueue property and the InputFormat property can serve as criteria for the adapter to map a given message to a specific business object. This feature is not used by the adapter for the SWIFT protocol.
OutputQueue	The output queue is the queue to which messages derived from the given business object are delivered. An OutputQueue property value defined in a dynamic child meta-object overrides the value defined in the static meta-object.
ResponseTimeout	The length of time in milliseconds to wait for a response before timing out. The connector returns SUCCESS immediately without waiting for a response if this property is undefined or has a value less than zero. A ResponseTimeout property value defined in a dynamic child meta-object overrides the value defined in the static meta-object.
TimeoutFatal	If this property is defined and has a value of true, the connector returns APP_RESPONSE_TIMEOUT when a response is not received within the time specified by ResponseTimeout. All other threads waiting for response messages immediately return APP_RESPONSE_TIMEOUT to the integration broker. This causes the integration broker to terminate the connection to the connector. A TimeoutFatal property defined in a dynamic child meta-object overrides the value defined in the static meta-object.

Note: The InputQueue property in the connector-specific properties defines which queues the adapter polls. This is the only property that the adapter uses to determine which queues to poll. In the static MO, the InputQueue property and the InputFormat property can serve as criteria for the adapter to map a given message to a specific business object. For the adapter for SWIFT, do not use this feature.

Application-specific information

The application-specific information is structured in name-value pair format, separated by semicolons. For example:

```
InputFormat=ORDER_IN;OutputFormat=ORDER_OUT
```

You can use application-specific information to map a data handler to an input queue.

Mapping data handlers to InputQueues

You can use the InputQueue property in the application-specific information of the static meta-object to associate a data handler with an input queue. This feature is useful when dealing with multiple trading partners who have different formats and conversion requirements. To do so you must:

1. Use connector-specific properties (see "InputQueue" on page 25) to configure one or more input queues.
2. For each input queue, specify the queue manager and input queue name as well as data handler class name and mime type in the application-specific information.

For example, the following attribute in a static meta-object associates a data handler with an InputQueue named CompReceipts:

```
[Attribute]
Name = Swift_MT502_Create
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = InputQueue=//queue.manager/CompReceipts;
  DataHandlerClassName=com.crossworlds.
DataHandlers.swift.disposition_notification;
  DataHandlerMimeType=message/
disposition_notification
IsRequiredServerBound = false
[End]
```

Overloading input formats

When retrieving a message, the connector normally matches the input format to one specific business object and verb combination. The connector then passes the business object name and the contents of the message to the data handler. This allows the data handler to verify that the message contents correspond to the business object that the user expects.

If, however, the same input format is defined for more than one business object, the connector cannot determine which business object the data represents before passing it to the data handler. In such cases, the connector passes the message contents only to the data handler and then looks up conversion properties based on the business object that is generated. Accordingly, the data handler must determine the business object based on the message content alone.

If the verb on the generated business object is not set, the connector searches for conversion properties defined for this business object with any verb. If only one set of conversion properties is found, the connector assigns the specified verb. If more properties are found, the connector fails the message because it is unable to distinguish among the verbs.

Dynamic child meta-object

If it is difficult or unfeasible to specify the necessary metadata through a static meta-object, the connector can optionally accept metadata specified at runtime for each business object instance.

The connector recognizes and reads conversion properties from a dynamic meta-object that is added as a child to the top-level business object passed to the connector. The attribute values of the dynamic child meta-object duplicate the conversion properties that you can specify via the static meta-object that is used to configure the connector.

Because dynamic child meta-object properties override those found in static meta-objects, if you specify a dynamic child meta-object, you need not include a connector property that specifies the static meta-object. Accordingly, you can use either a dynamic child meta-object or a static meta-object, or both.

Table 14 shows sample static meta-object properties for business object `Swift_MT502_Create`. Note that the application-specific text consists of semicolon-delimited name-value pairs

Table 14. Static meta-object structure for Swift_MT502_Create

Attribute name	Application-specific text

Swift_MT502_Create	`InputFormat=ORDER_IN;`
	`OutputFormat=ORDER_OUT;`
	`OutputQueue=QueueA;`
	`ResponseTimeout=10000;`
	`TimeoutFatal=False`

Table 15 shows a sample dynamic child meta-object for business object `Swift_MT_Create`.

Table 15. Dynamic child meta-object Structure for Swift_MT502_Create

Property name	Value
`OutputFormat`	`ORDER_OUT`
`OutputQueue`	`QueueA`
`ResponseTimeout`	`10000`
`TimeoutFatal`	`False`

The connector checks the application-specific text of the top-level business object received to determine whether tag `cw_mo_conn` specifies a child meta-object. If so, the dynamic child meta-object values override those specified in the static meta-object.

Population of the dynamic child meta-object during polling

In order to provide the integration broker with more information regarding messages retrieved during polling, the connector populates specific attributes of the dynamic meta-object, if already defined for the business object created.

Table Table 16 shows how a dynamic child meta-object might be structured for polling.

Table 16. JMS dynamic child meta-object structure for polling

Property name	Sample value
InputFormat	ORDER_IN
InputQueue	MYInputQueue
OutputFormat	CxIgnore
OutputQueue	CxIgnore
ResponseTimeout	CxIgnore
TimeoutFatal	CxIgnore

As shown in Table 16, you can define an additional property, InputQueue, in a dynamic child meta-object. This property contains the name of the queue from which a given message has been retrieved. If this property is not defined in the child meta-object, it will not be populated.

Example scenario:

- The connector retrieves a message with the format ORDER_IN from the queue WebSphere MQ queue.
- The connector converts this message to an order business object and checks the application-specific text to determine if a meta-object is defined.
- If so, the connector creates an instance of this meta-object and populates the InputQueue and InputFormat properties accordingly, then publishes the business object to available processes.

JMS headers, SWIFT message properties, and dynamic child meta-object attributes

You can add attributes to a dynamic meta-object to gain more information about, and more control over, the message transport. Adding such attributes allows you to modify JMS properties, to control the ReplyToQueue on a per-request basis (rather than using the default ReplyToQueue specified in the adapter properties), and to re-target a message CorrelationID. This section describes these attributes and how they affect event notification and request processing in both synchronous and asynchronous modes.

The following attributes, which reflect JMS and SWIFT header properties, are recognized in the dynamic meta-object.

Table 17. Dynamic meta-object header attributes

Header attribute name	Mode	Corresponding JMS header
CorrelationID	Read/Write	JMSCorrelationID
ReplyToQueue	Read/Write	JMSReplyTo
DeliveryMode	Read/Write	JMSDeliveryMode
Priority	Read/Write	JMSPriority
Destination	Read	JMSDestination
Expiration	Read	JMSExpiration
MessageID	Read	JMSMessageID
Redelivered	Read	JMSRedelivered
TimeStamp	Read	JMSTimeStamp
Type	Read	JMSType
UserID	Read	JMSXUserID

Table 17. Dynamic meta-object header attributes (continued)

Header attribute name	Mode	Corresponding JMS header
AppID	Read	JMSXAppID
DeliveryCount	Read	JMSXDeliveryCount
GroupID	Read	JMSXGroupID
GroupSeq	Read	JMSXGroupSeq
JMSProperties	Read/Write	

Read-only attributes are read from a message header during event notification and written to the dynamic meta-object. These properties also populate the dynamic MO when a response message is issued during request processing. Read/write attributes are set on message headers created during request processing. During event notification, read/write attributes are read from message headers to populate the dynamic meta-object.

The interpretation and use of these attributes are described in the sections below.

Note: None of the above attributes are required. You may add any attributes to the dynamic meta-object that relate to your business process.

JMS Properties: Unlike other attributes in the dynamic meta-object, JMSProperties must define a single-cardinality child object. Every attribute in this child object must define a single property to be read/written in the variable portion of the JMS message header as follows:

1. The name of the attribute has no semantic value.
2. The type of the attribute should always be String regardless of the JMS property type.
3. The application-specific information of the attribute must contain two name-value pairs defining the name and format of the JMS message property to which the attribute maps.

The table below shows application-specific information properties that you must define for attributes in the JMSProperties object.

Table 18. Application-specific information for JMS property attributes

Name	Possible values	Comments
Name	Any valid JMS property name	This is the name of the JMS property. Some vendors reserve certain properties to provide extended functionality. In general, users should not define custom properties that begin with JMS unless they are seeking access to these vendor-specific features.

Table 18. Application-specific information for JMS property attributes (continued)

Name	Possible values	Comments
Type	`String`, `Int`, `Boolean`, `Float`, `Double`, `Long`, `Short`	This is the type of the JMS property. The JMS API provides a number of methods for setting values in the JMS Message: `setIntProperty`, `setLongProperty`, `setStringProperty`, etc. The type of the JMS property specified here dictates which of these methods is used for setting the property value in the message.

The figure below shows attribute `JMSProperties` in the dynamic meta-object and definitions for four properties in the JMS message header: ID, GID, RESPONSE and RESPONSE_PERSIST. The application-specific information of the attributes defines the name and type of each. For example, attribute ID maps to JMS property `ID` of type `String`).

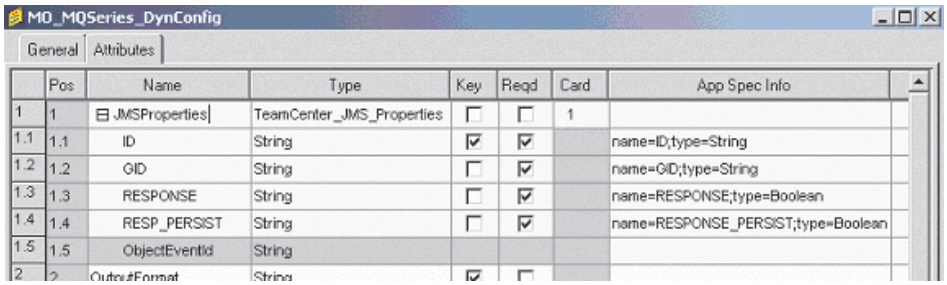


Figure 4. JMS properties attribute in a dynamic meta-object

Asynchronous event notification: If a dynamic meta-object with header attributes is present in the event business object, the connector performs the following steps (in addition to populating the meta-object with transport-related data):

1. Populates the `CorrelationId` attribute of the meta-object with the value specified in the `JMSCorrelationID` header field of the message.
2. Populates the `ReplyToQueue` attribute of the meta-object with the queue specified in the `JMSReplyTo` header field of the message. Since this header field is represented by a Java object in the message, the attribute is populated with the name of the queue (often a URI).
3. Populates the `DeliveryMode` attribute of the meta-object with the value specified in the `JMSDeliveryMode` header field of the message.
4. Populates the `Priority` attribute of the meta-object with the `JMSPriority` header field of the message.
5. Populates the `Destination` attribute of the meta-object with the name of the `JMSDestination` header field of the message. Since the `Destination` is represented by an object, the attribute is populated with the name of the `Destination` object.
6. Populates the `Expiration` attribute of the meta-object with the value of the `JMSExpiration` header field of the message.
7. Populates the `MessageID` attribute of the meta-object with the value of the `JMSMessageID` header field of the message.

8. Populates the Redelivered attribute of the meta-object with the value of the JMSRedelivered header field of the message.
9. Populates the TimeStamp attribute of the meta-object with the value of the JMSTimeStamp header field of the message.
10. Populates the Type attribute of the meta-object with the value of the JMSType header field of the message.
11. Populates the UserID attribute of the meta-object with the value of the JMSXUserID property field of the message.
12. Populates the AppID attribute of the meta-object with the value of the JMSXAppID property field of the message.
13. Populates the DeliveryCount attribute of the meta-object with the value of the JMSXDeliveryCount property field of the message.
14. Populates the GroupID attribute of the meta-object with the value of the JMSXGroupID property field of the message.
15. Populates the GroupSeq attribute of the meta-object with the value of the JMSXGroupSeq property field of the message.
16. Examines the object defined for the JMSProperties attribute of the meta-object. The adapter populates each attribute of this object with the value of the corresponding property in the message. If a specific property is undefined in the message, the adapter sets the value of the attribute to CxBlank.

Synchronous event notification: For synchronous event processing, the adapter posts an event and waits for a response from the integration broker before sending a response message back to the application. Any changes to the business data are reflected in the response message returned. Before posting the event, the adapter populates the dynamic meta-object just as described for asynchronous event notification. The values set in the dynamic meta-object are reflected in the response-issued header as described below (all other read-only header attributes in the dynamic meta-object are ignored.):

- **CorrelationID** If the dynamic meta-object includes the attribute CorrelationId, you must set it to the value expected by the originating application. The application uses the CorrelationID to match a message returned from the connector to the original request. Unexpected or invalid values for a CorrelationID will cause problems. It is helpful to determine how the application handles correlating request and response messages before using this attribute. You have four options for populating the CorrelationID in a synchronous request.
  1. Leave the value unchanged. The CorrelationID of the response message will be the same as the CorrelationID of the request message. This is equivalent to the WebSphere MQ option MQRO_PASS_CORREL_ID.
  2. Change the value to CxIgnore. The connector by default copies the message ID of the request to the CorrelationID of the response. This is equivalent to the WebSphere MQ option MQRO_COPY_MSG_ID_TO_CORREL_ID.
  3. Change the value to CxBlank. The connector will not set the CorrelationID on the response message.
  4. Change the value to a custom value. This requires that the application processing the response recognize the custom value.

  If you do not define attribute CorrelationID in the meta-object, the connector handles the CorrelationID automatically.
- **ReplyToQueue** If you update the dynamic meta-object by specifying a different queue for attribute ReplyToQueue, the connector sends the response message to the queue you specify. This is not recommended. Having the connector send

response messages to different queues may interfere with communication because an application that sets a specific reply queue in a request message is assumed to be waiting for a response on that queue.

- **JMS properties** The values set for the JMS Properties attribute in the dynamic meta-object when the updated business object is returned to the connector are set in the response message.

Asynchronous request processing: The connector uses the dynamic meta-object, if present, to populate the request message prior to issuing it. The connector performs the following steps before sending a request message:

1. If attribute `CorrelationID` is present in the dynamic meta-object, the connector sets the `CorrelationID` of the outbound request message to this value.
2. If attribute `ReplyToQueue` is specified in the dynamic meta-object, the connector passes this queue via the request message and waits on this queue for a response. This allows you to override the `ReplyToQueue`evalue specified in the connector configuration properties. If you additionally specify a negative `ResponseTimeout` (meaning that the connector should not wait for a response), the`ReplyToQueue` is set in the response message, even though the connector does not actually wait for a response.
3. If attribute `DeliveryMode` is set to 2, the message is sent persistently. If `DeliveryMode` is set to 1, the message is not sent persistently. Any other value may fail the connector. If `DeliveryMode` is not specified in the MO, then the JMS provider establishes the persistence setting.
4. If attribute `Priority` is specified, the connector sets the value in the outgoing request. The `Priority` attribute can take values 0 through 9; any other value may cause the connector to terminate.
5. If attribute `JMSProperties` is specified in the dynamic meta-object, the corresponding JMS properties specified in the child dynamic meta-object are set in the outbound message sent by the connector.

Note: If header attributes in the dynamic meta-object are undefined or specify CxIgnore, the connector follows its default settings.

Synchronous request processing: The connector uses the dynamic meta-object, if present, to populate the request message prior to issuing it. If the dynamic meta-object contains header attributes, the connector populates it with corresponding new values found in the response message. The connector performs the following steps (in addition to populating the meta-object with transport-related data) after receiving a response message:

1. If attribute `CorrelationID` is present in the dynamic meta-object, the adapter updates this attribute with the `JMSCorrelationID` specified in the response message.
2. If attribute `ReplyToQueue` is defined in the dynamic meta-object, the adapter updates this attribute with the name of the `JMSReplyTo` specified in the response message.
3. If attribute `DeliveryMode` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSDeliveryMode` header field of the message.
4. If attribute `Priority` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSPriority` header field of the message.

5. If attribute `Destination` is defined in the dynamic meta-object, the adapter updates this attribute with the name of the `JMSDestination` specified in the response message.
6. If attribute `Expiration` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSExpiration` header field of the message.
7. If attribute `MessageID` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSMessageID` header field of the message.
8. If attribute `Redelivered` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSRedelivered` header field of the message.
9. If attribute `TimeStamp` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSTimeStamp` header field of the message.
10. If attribute `Type` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSType` header field of the message.
11. If attribute `UserID` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSXUserID` header field of the message.
12. If attribute `AppID` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSXAppID` property field of the message.
13. If attribute `DeliveryCount` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSXDeliveryCount` header field of the message.
14. If attribute `GroupID` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSXGroupID` header field of the message.
15. If attribute `GroupSeq` is present in the dynamic meta-object, the adapter updates this attribute with the value of the `JMSXGroupSeq` header field of the message.
16. If attribute `JMSProperties` is defined in the dynamic meta-object, the adapter updates any properties defined in the child object with the values found in the response message. If a property defined in the child object does not exist in the message, the value is set to CxBlank.

Note: Using the dynamic meta-object to change the `CorrelationID` set in the request message does not affect the way the adapter identifies the response message—the adapter by default expects that the `CorrelationID` of any response message equals the message ID of the request sent by the adapter.

Error handling: If a JMS property cannot be read from or written to a message, the connector logs an error and the request or event fails. If a user-specified `ReplyToQueue` does not exist or cannot be accessed, the connector logs an error and the request fails. If a `CorrelationID` is invalid or cannot be set, the connector logs an error and the request fails. In all cases, the message logged is from the connector message file.

Startup file configuration

Before you start the connector for SWIFT, you must configure the startup file. The sections below describe how to do this for Windows and UNIX systems.

Windows

To complete the configuration of the connector for Windows platforms, you must modify the start_SWIFT.bat file:

1. Open the start_SWIFT.bat file.
2. Scroll to the section beginning with "Set the directory containing your MQ Java client libraries," and specify the location of your MQ Java client libraries.

UNIX

To complete the configuration of the connector for UNIX platforms, you must modify the start_SWIFT.sh file:

1. Open the start_SWIFT.sh file.
2. Scroll to the section beginning with "Set the directory containing your WebSphere MQ Java client libraries," and specify the location of your WebSphere MQ Java client libraries.

Creating multiple connector instances

Creating multiple instances of a connector is in many ways the same as creating a custom connector. You can set your system up to create and run multiple instances of a connector by following the steps below. You must:

- Create a new directory for the connector instance
- Make sure you have the requisite business object definitions
- Create a new connector definition file
- Create a new start-up script

Create a new directory

You must create a connector directory for each connector instance. This connector directory should be named:

```
ProductDir\connectors\connectorInstance
```

where connectorInstance uniquely identifies the connector instance.

If the connector has any connector-specific meta-objects, you must create a meta-object for the connector instance. If you save the meta-object as a file, create this directory and store the file here:

```
ProductDir\repository\connectorInstance
```

Create business object definitions

If the business object definitions for each connector instance do not already exist within the project, you must create them.

1. If you need to modify business object definitions that are associated with the initial connector, copy the appropriate files and use Business Object Designer to import them. You can copy any of the files for the initial connector. Just rename them if you make changes to them.
2. Files for the initial connector should reside in the following directory:

   ```
   ProductDir\repository\initialConnectorInstance
   ```

   Any additional files you create should be in the appropriate connectorInstance subdirectory of ProductDir\repository.

Create a connector definition

You create a configuration file (connector definition) for the connector instance in Connector Configurator. To do so:

1. Copy the initial connector's configuration file (connector definition) and rename it.
2. Make sure each connector instance correctly lists its supported business objects (and any associated meta-objects).
3. Customize any connector properties as appropriate.

Create a start-up script

To create a startup script:

1. Copy the initial connector's startup script and name it to include the name of the connector directory:

   dirname
2. Put this startup script in the connector directory you created in "Create a new directory" on page 38.
3. Create a startup script shortcut (Windows only).
4. Copy the initial connector's shortcut text and change the name of the initial connector (in the command line) to match the name of the new connector instance.

You can now run both instances of the connector on your integration server at the same time.

For more information on creating custom connectors, refer to the *Connector Development Guide for C++ or for Java*.

Starting the connector

A connector must be explicitly started using its **connector start-up script**. The startup script should reside in the connector's runtime directory:

ProductDir\connectors*connName*

where *connName* identifies the connector. The name of the startup script depends on the operating-system platform, as Table 19 shows.

Table 19. Startup scripts for a connector

Operating system	Startup script
UNIX-based systems	connector_manager_*connName*
Windows	start_*connName*.bat

You can invoke the connector startup script in any of the following ways:

- On Windows systems, from the **Start** menu

  Select **Programs>IBM WebSphere Business Integration Adapters>Adapters>Connectors**. By default, the program name is "IBM WebSphere Business Integration Adapters". However, it can be customized. Alternatively, you can create a desktop shortcut to your connector.
- From the command line
  - On Windows systems:

    start_*connName connName brokerName* [-c*configFile*]
  - On UNIX-based systems:

```
connector_manager_connName -start
```

where *connName* is the name of the connector and *brokerName* identifies your integration broker, as follows:

- For WebSphere InterChange Server, specify for *brokerName* the name of the ICS instance.
- For WebSphere message brokers (WebSphere MQ Integrator, WebSphere MQ Integrator Broker, or WebSphere Business Integration Message Broker) or WebSphere Application Server, specify for *brokerName* a string that identifies the broker.

Note: For a WebSphere message broker or WebSphere Application Server on a Windows system, you *must* include the `-c` option followed by the name of the connector configuration file. For ICS, the `-c` is optional.

- From Adapter Monitor (WebSphere Business Integration Adapters product only), which is launched when you start System Manager

  You can load, activate, deactivate, pause, shutdown or delete a connector using this tool.
- From System Monitor (WebSphere InterChange Server product only)

  You can load, activate, deactivate, pause, shutdown or delete a connector using this tool.
- On Windows systems, you can configure the connector to start as a Windows service. In this case, the connector starts when the Windows system boots (for an Auto service) or when you start the service through the Windows Services window (for a Manual service).

For more information on how to start a connector, including the command-line startup options, refer to one of the following documents:

- For WebSphere InterChange Server, refer to the *System Administration Guide*.
- For WebSphere message brokers, refer to *Implementing Adapters with WebSphere Message Brokers*.
- For WebSphere Application Server, refer to *Implementing Adapters with WebSphere Application Server*.

Stopping the connector

The way to stop a connector depends on the way that the connector was started, as follows:

- If you started the connector from the command line, with its connector startup script:
  - On Windows systems, invoking the startup script creates a separate “console” window for the connector. In this window, type “Q” and press Enter to stop the connector.
  - On UNIX-based systems, connectors run in the background so they have no separate window. Instead, run the following command to stop the connector:

    ```
    connector_manager_connName -stop
    ```

    where *connName* is the name of the connector.
- From Adapter Monitor (WebSphere Business Integration Adapters product only), which is launched when you start System Manager

  You can load, activate, deactivate, pause, shutdown or delete a connector using this tool.
- From System Monitor (WebSphere InterChange Server product only)

You can load, activate, deactivate, pause, shutdown or delete a connector using this tool.

- On Windows systems, you can configure the connector to start as a Windows service. In this case, the connector stops when the Windows system shuts down.

Chapter 3. Business objects

The connector for SWIFT is a metadata-driven connector. In WebSphere business objects, metadata is data about the application's data, which is stored in a business object definition and which helps the connector interact with an application. A metadata-driven connector handles each business object that it supports based on metadata encoded in the business object definition rather than on instructions hard-coded in the connector.

Business object metadata includes the structure of a business object, the settings of its attribute properties, and the content of its application-specific text. Because the connector is metadata-driven, it can handle new or modified business objects without requiring modifications to the connector code. However, the connector's configured data handler makes assumptions about the structure of its business objects, object cardinality, the format of the application-specific text, and the database representation of the business object. Therefore, when you create or modify a business object for SWIFT, your modifications must conform to the rules the connector is designed to follow, or the connector cannot process new or modified business objects correctly.

This chapter describes how the connector processes business objects and describes the assumptions the connector makes. You can use this information as a guide to implementing new business objects.

Connector business object requirements

The business object requirements for the connector reflect the way the SWIFT data handler converts a SWIFT message into a WebSphere business object, and vice versa

The sections below discuss the requirements for WebSphere business objects as well as the SWIFT message structure. For a step-by-step description of how the SWIFT data handler interacts with WebSphere business objects and SWIFT messages, see Chapter 4, "SWIFT Data Handler," on page 65.

A review of the following WebSphere documents is strongly recommended:

- *IBM WebSphere InterChange Server Technical Introduction to IBM WebSphere InterChange Server* (when ICS is the integration broker)
- *IBM WebSphere Business Integration Adapters Implementation Guide for WebSphere MQ Integrator Broker* (when MQ Integrator Broker is the integration broker)
- *Business Object Development Guide*

Business object hierarchy

WebSphere business objects can be flat or hierarchical. All the attributes of a **flat** business object are **simple** (that is, each attribute represents a single value, such as a `String` or `Integer` or `Date`).

In addition to containing simple attributes, a **hierarchical** business object has attributes that represent a child business object, an array of child business objects, or a combination of both. In turn, each child business object can contain a child business object or an array of business objects, and so on.

Important: A business object array can contain data whose type is a business object. It cannot contain data of any other type, such as `String` or `Integer`.

There are two types of relationships between parent and child business objects:

- **Single-cardinality—**When an attribute in a parent business object represents a single child business object. The attribute is of the same type as the child business object.
- **Multiple-cardinality—**When an attribute in the parent business object represents an array of child business objects. The attribute is an array of the same type as the child business objects.

WebSphere uses the following terms when describing business objects:

- **hierarchical**—Refers to a complete business object, including the top-level business object and its the child business objects at any level.
- **parent**—Refers to a business object that contains at least one child business object. A top-level business object is also a parent.
- **individual**—Refers to a single business object, independent of any child business objects it might contain or that contain it.
- **top-level**—Refers to the individual business object at the top of the hierarchy, which does not itself have a parent business object.
- **wrapper**—Refers to a top-level business object that contains information used to process its child business objects. For example, the XML connector requires the wrapper business object to contain information that determines the format of its child data business objects and routes the children.

Business object attribute properties

Business object architecture defines various properties that apply to attributes. This section describes how the connector interprets several of these properties. For further information on these properties, see Business Object Attributes and Attribute Properties in Chapter 2 of the *Business Object Development Guide.*

Name property

Each business object attribute must have a unique name within the business object. The name should describe the data that the attribute contains.

For an application-specific business object, check the connector or data handler guide for specific naming requirements.

The name can be up to 80 alphanumeric characters and underscores. It cannot contain spaces, punctuation, or special characters.

Type property

The Type property defines the data type of the attribute:

- For a simple attribute, the supported types are `Boolean`, `Integer`, `Float`, `Double`, `String`, `Date`, and `LongText`.

- If the attribute represents a child business object, specify the type as the name of the child business object definition (for example, `Type = MT502A`) and specify the cardinality as `1`.
- If the attribute represents an array of child business objects, specify the type as the name of the child business object definition and specify the cardinality as `n`.

Note: All attributes that represent child business objects also have a `ContainedObjectVersion` property (which specifies the child's version number) and a `Relationship` property (which specifies the value `Containment`).

Cardinality property

Each simple attribute has cardinality `1`. Each business object attribute that represents a child or array of child business objects has cardinality `1` or `n`, respectively.

Note: When specified for a required attribute, cardinality `1` indicates a child business object must exist, and cardinality `n` indicates zero to many instances of a child business object.

Key property

At least one attribute in each business object must be specified as the key. To define an attribute as a key, set this property to `true`.

When you specify as key an attribute that represents a child business object, the key is the concatenation of the keys in the child business object. When you specify as key an attribute that represents an array of child business objects, the key is the concatenation of the keys in the child business object at location 0 in the array.

Note: Key information is not available in the collaboration mapping process (relevant only when ICS is the integration broker).

Foreign key property

The Foreign Key property is typically used in application-specific business objects to specify that the value of an attribute holds the primary key of another business object, serving as a means of linking the two business objects. The attribute that holds the primary key of another business object is called a **foreign key**. Define the Foreign Key property as `true` for each attribute that represents a foreign key.

You can also use the Foreign Key property for other processing instructions. For example, this property can be used to specify what kind of foreign key lookup the connector performs. In this case, you might set Foreign Key to `true` to indicate that the connector checks for the existence of the entity in the database and creates the relationship only if the record for the entity exists.

Required property

The Required property specifies whether an attribute must contain a value. If a particular attribute in the business object that you are creating must contain a value, set the Required property for the attribute to `true`.

For information on enforcing the Required property for attributes, see the section on `initAndValidateAttributes()` in *Connector Reference: C++ Class Library* and *Connector Reference: Java Class Library*.

AppSpecificInfo

The AppSpecificInfo property is a `String` no longer than 255 characters that is specified primarily for an application-specific business object.

Note: Application-specific text is not available in the collaboration mapping process (relevant only when ICS is the integration broker).

Max length property

The Max Length property is set to the number of bytes that a `String`-type attribute can contain. Although this value is not enforced by the WebSphere system, specific connectors or data handlers may use this value. Check the guide for the connector or data handler that will process the business object to determine minimum and maximum allowed lengths.

Note: The Max Length property is very important when you use a fixed width data handler. Attribute length is not available in the collaboration mapping process (relevant only when ICS is the integration broker).

Default value property

The Default Value property can specify a default value for an attribute.

If this property is specified for an application-specific business object, and the UseDefaults connector configuration property is set to `true`, the connector can use the default values specified in the business object definition to provide values for attributes that have no values at runtime.

For more information on how the Default Value property is used, see the section on `initAndValidateAttributes()` in *Connector Reference: C++ Class Library* and *Connector Reference: Java Class Library*.

Comments property

The Comments property allows you to specify a human-readable comment for an attribute. Unlike the AppSpecificInfo property, which is used to process a business object, the Comments property provides only documentation information.

Special attribute value

Simple attributes in business object can have the special value, `CxIgnore`. When it receives a business object from an integration broker, the connector ignores all attributes with a value of `CxIgnore`. It is as if those attributes were invisible to the connector.

If no value is required, the connector sets the value of that attribute to `CxIgnore` by default.

Application-specific text at the attribute level

Note: Business object level application-specific text is not used by the connector.

For business object attributes, the application-specific text format consists of name-value parameters. Each name-value parameter includes the parameter name and its value. The format of attribute application-specific text is as follows:

name=value`[:`*name_n=value_n*`][...]`

Each parameter set is separated from the next by a colon (:) delimiter.

Table 20 describes the name-value parameters for attribute application-specific text.

Table 20. Name-value parameters in AppSpecificText for attributes

Parameter	Required	Description
`block`	Yes for top-level object only	The number of the block in the SWIFT message. Values range from 0-5. For information on the SWIFT message blocks, see "Overview of SWIFT message structure" on page 47.
`parse`	Yes for attributes of the top-level object only	Describes whether, and how, to parse the SWIFT message block. Values are: `fixlen`—parse as fixed length `delim`—parse as delimited text `field`—Block 4 only `no`—Do not parse; treat as a single string.
`tag`	Yes for attributes of type tag business object	The tag number of the field. For more on SWIFT message tags, see Appendix C, "SWIFT message structure," on page 105. For further information on sequence and field business objects, see "Block 4 business object structure" on page 54.
`letter=`*a*	Yes for each attribute that points to a tag business object	One or more supported letters appended to the tag in the SWIFT message format. For example `20A` or `[A|B|NULL]` (A or B or null). Note that `NULL` must be specified for tags where no letter is a possibility, or for tags that do not have a letter option at all. For example, tag 59.
`content`	No	The qualifier in the SWIFT message format. For example, in a SWIFT message MT502, tag20C, the qualifier = `SEME`.

Overview of SWIFT message structure

SWIFT messages consist of five blocks of data. In addition, the MQSA component adds two blocks that are used for queue management. The high-level structure of a SWIFT message is as follows:

MQSA UUID

- SWIFT 1:Basic Header Block
- SWIFT 2: Application Header Block
- SWIFT 3:User Header Block
- SWIFT 4: Text Block
- SWIFT 5: Trailer

MQSA S Block

Note: The MQSA component adds the UUID (User Unique Message Identifier) and S blocks. Neither are parsed by the SWIFT data handler. The S block has the same structure as SWIFT block 5, except that field tags consist of three `char` strings. For example, `{S:{COP:P}}`.

For further information on SWIFT message structure, see Appendix C, "SWIFT message structure," on page 105, and *All Things SWIFT: the SWIFT User Handbook.*

Overview of business objects for SWIFT

As shown in Figure 5 there are five kinds of business objects for SWIFT:

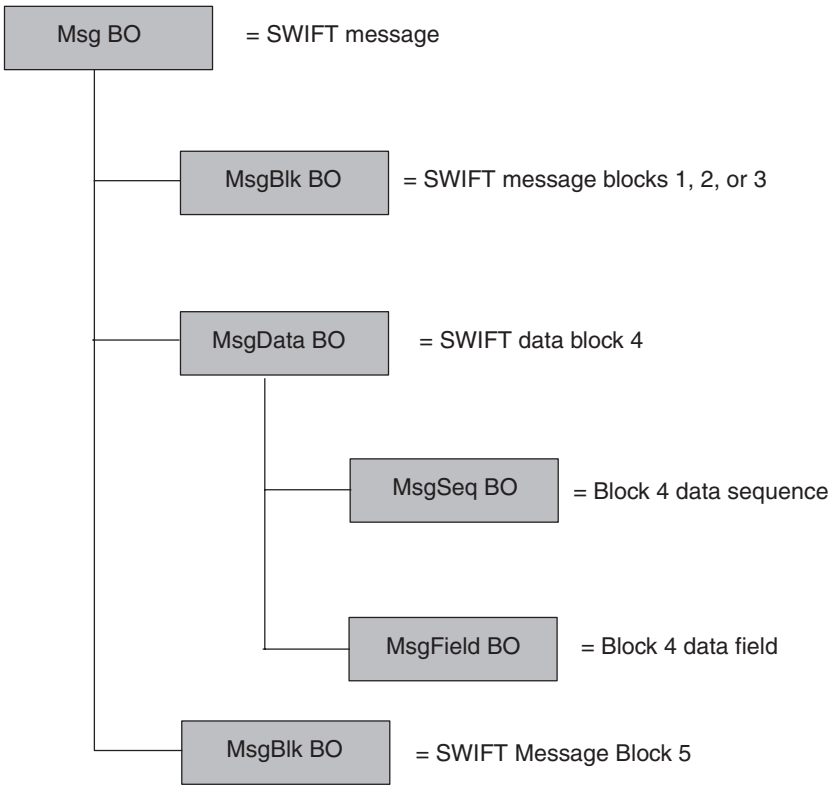


Figure 5. Business objects map to SWIFT message components

- **Message business object (Msg BO)** This is the top-level business object whose attributes correspond to the blocks in a SWIFT message. For further information, see "Top-level business object structure" on page 49.
- **Message block business object (MsgBlk BO)** A child object of the Msg BO that can represent blocks 1, 2, 3, or 5 in a SWIFT message. For further information, see "Block 1 business object structure" on page 51.
- **Message data business object (MsgData BO)** A child object of the Msg BO that represents block 4 of the SWIFT message. For further information, see "Block 4 business object structure" on page 54.
- **Message sequence business object (MsgSeq BO)** A child object of a MsgData BO or of another MsgSeq BO. A MsgSeq BO represents a sequence of fields occurring in block 4 of the SWIFT message. For further information, see "Sequence business object structure" on page 59.
- **Message field business object (MsgField BO)** A child object of the MsgData BO or of a MsgSeq BO that contains the content of a field. Fields correspond to tags in SWIFT messages. For further information, see "Field business object definitions" on page 60.

Each of these business objects consist of the following:

- **Name** The name of the business object consists of a SWIFT Message name, a SWIFT message sequence name, or a SWIFT field name. More detailed naming conventions, if any, are provided in the sections for each kind of business object listed below. For example:
  - `Swift_MT502` is the name of the Msg BO. For further information, see "Top-level business object structure" on page 49.

  - `Swift_ApplicationHeader` is the name of a MsgBlk BO. For further information, see "Block 1 business object structure" on page 51, "Block 2 business object structure" on page 52, and "Block 3 business object structure" on page 53.
  - `Swift_MT502Data` is the name of a MsgData BO. For further information, see "Block 4 business object structure" on page 54.
  - `Swift_MT502_B1` is the name of a MsgSeq BO. For further information, see "Sequence business object structure" on page 59.
  - `Swift_Tag_22` is the name of a MsgField BO. For further information, see "Field business object definitions" on page 60.
- **Version** The version of the business object is set to 1.1.0. For example:

  ```
  Version = 1.1.0
  ```
- **Attributes** Each business object contains one or more attributes. For more information see "Business object attribute properties" on page 44 and the sections below on each kind of business object.
- **Verbs** Each business object supports the following standard verbs:
  - Create
  - Retrieve

SWIFT message and business object data mapping

The IBM WebSphere Business Integration Adapter for SWIFT supports one kind of mapping:

- **SWIFT-message-to-WebSphere-business-object** The sections below describe the data mapping that occurs between SWIFT messages and WebSphere business objects.

Top-level business object structure

The structure of the top-level business object for a SWIFT message, or Msg BO, reflects that of the SWIFT message. WebSphere requires a business object for each SWIFT block. As shown in Table 21, the top-level business object must have at least 5 attributes, one for each SWIFT block.

Note: Only attribute properties of consequence are shown in Table 21.

Table 21. Top-level business object structure

Name	Type	Key	Required	Application specific info
UUID (MQSA prepended)	String	Yes	No	block=0;parse=no
Swift_01Header	Swift_BasicHeader	No	Yes	block=1; parse=fixlen
Swift_02Header	Swift_Application Header	No	No	block=2; parse=fixlen
Swift_03Header	Swift_UserHeader	No	No	block=3; parse=delim
Swift_Data	Swift_Text	No	No	block=4;parse=field
Swift_05Trailer	String	No	No	block=5;parse=no
Swift_BlockS (MQSA appended)	String	No	No	block=6;parse=no

The following rules apply to the top-level business object:

- The name of the top-level object must be constructed in the following way:

  *BOPrefix*_MT*MessageType*

  where:

  BOPrefix = an attribute of the meta-object (MO). For further information on the meta-object, see "Static meta-object" on page 28.

  _MT = a constant string.

  MessageType = an attribute of block 2 of the SWIFT message. For further information, see *All Things SWIFT: the SWIFT User Handbook*

  An example of a top-level business object name is Swift_MT502.
- UUID, prepended to the message by the MQSA, is represented with a String attribute
- Blocks 1-4 are represented with single-cardinality containers
- Block 5 is a string attribute, and is not extracted from the message by the SWIFT data handler.

Note: It is possible to create business objects for block 5 and block S using block 3 as a template.

See Table 20 for the attribute application-specific information.

Figure 6 shows a business object definition for a top-level business object of a SWIFT message. This Msg BO definition was created in the WebSphere development environment.

The application-specific information contains the block number and parsing parameters for each attribute. For further information on attribute application-specific text, see Table 20. The Swift_ attributes correspond to child business objects discussed in the following sections. Of special note is the type for the data block attribute, Swift_MT502Data, which indicates SWIFT message type 502, an order to buy or sell. This attribute corresponds to a child object of the top-level Msg BO that represents block 4 of the SWIFT message. The child object is a message data business object (MsgData BO).

All SWIFT top-level business object definitions are identical to that shown in Figure 6 with one exception: Block 4, shown as Swift_MT502Data, reflects the actual data definition of a specific SWIFT message.

Name	Type	Key	Required	Application-Specifi...
UUID	String	Yes	No	block=0;parse=no
⊞ Swift_01Header	Swift_BasicHeader	No	Yes	block=1;parse=fixlen
⊞ Swift_02Header	Swift_ApplicationHeader	No	No	block=2;parse=fixlen
⊞ Swift_03Header	Swift_UserHeader	No	No	block=3;parse=delim
⊞ Swift_MT502Data	Swift_MT502Data	No	No	block=4;parse=field
Swift_05Trailer	String	No	No	block=5;parse=no
Swift_BlockS	String	No	No	block=6;parse=no
ObjectEventId	String	No	No	

Figure 6. Definition for top-level business object of a SWIFT message

Note: To create a top-level business object definition for a SWIFT message, you must start Business Object Designer and then create all the child objects first.

Block 1 business object structure

The MsgBlck BO, `Swift_BasicHeader`, has the format and attributes shown in Table 22. The SWIFT data handler converts each of the SWIFT fields in this block into attributes in the `Swift_BasicHeader` business object. Note that there is no attribute application-specific information for this business object.

Note: Only attribute properties of consequence are shown in Table 22.

Table 22. Block 1 business object structure

Name	Type	Key	Foreign key	Required	Cardinality	Default	Max length
BlockIdentifier	String	Yes	No	Yes	1	1:[a]	2
ApplicationIdentifier	String	No	No	Yes	1		1
ServiceIdentifier	String	No	No	Yes	1		2
LTIdentifier	String	No	No	Yes	1		12
SessionNumber	String	No	No	Yes	1		4
SequenceNumber	String	No	No	No	1		4

[a] The BlockIdentifier attribute includes the delimiter ":" as in "1:".

See Table 20 for the attribute application-specific information.

Figure 7 shows a block 1 business object definition that has been manually created in a WebSphere development environment. Each attribute name (`ApplicationIdentifier`, `ServiceIdentifier`, and so on) corresponds to a field in this SWIFT message block. For further information on this SWIFT message block, see Appendix C, "SWIFT message structure," on page 105, and *All Things SWIFT: the SWIFT User Handbook. Specify Type* `String` *for each named attribute.* Note that there is no attribute application-specific information for the components of this business object.

Note: Be sure to specify the correct MaxLength values for the attribute names in this fixed-length block business definition.

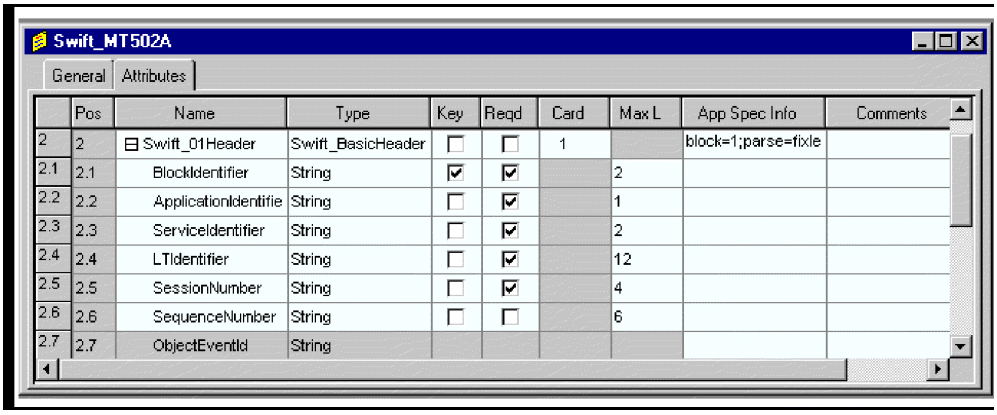


Figure 7. Block 1 business object definition

Note: To create a block 1 business object definition for a SWIFT message, start Business Object Designer and then enter values for the attributes shown in Table 22 and Figure 7.

Block 2 business object structure

The block 2 MsgBlk BO, `Swift_ApplicationHeader`, has the format and attributes shown in Table 23.. This application header is mapped to a business object, `Swift_ApplicationHeader`, that has two child objects. One child business object represents the group of input fields and the other child object represents the group of output fields. Note that there is no attribute application-specific information for these business objects.

Note: Only attribute properties of consequence are shown in Table 23.

Table 23. Block 2 business object structure

Name	Type	Key	Required	Cardinality	Default	Max length
Swift_02Header_IO						
Block Identifier	String	Yes	Yes	1	2:[a]	2
IOIdentifier	String	No	Yes	1	0	1
MessageType	String	No	Yes	1		3
Swift_02Header_Output				1		
InputTime	String	Yes	Yes			4
MessageInputReference	String	No	Yes			28
OutputDate	String	No	Yes			6
OutputTime	String	No	Yes			4
OutputMessagePriority	String	No	Yes			1
Swift_02Header_Input				1		
ReceiverAddress	String	Yes	Yes			12
MessagePriority	String	No	Yes			1
DeliveryMonitoring	String	No	No			1
ObsolescencePeriod	String	No	No			3

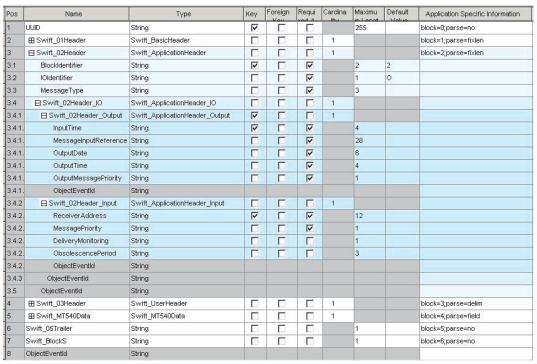
[a] The BlockIdentifier attribute includes the delimiter ":" as in "`2:`".

Attributes in the Swift_02Header_Input are populated during SWIFT-to-business-object conversion. Attributes in the Swift_02Header_Output are populated in business-object-to-SWIFT conversions. The CxIgnore property must be set for business-object-to-SWIFT conversions.

See Table 20 for the attribute application-specific information.

Figure 8 shows a block 2 business object definition that has been manually created in a WebSphere development environment. Each attribute name corresponds to a field in this SWIFT message block. For further information on this SWIFT message block, see Appendix C, "SWIFT message structure," on page 105, and *All Things SWIFT: the SWIFT User Handbook.* Specify type`String` for each named attribute. Note that there is no attribute application-specific information for the components of this business object.

Note: Be sure to specify the correct MaxLength values for the attribute names in this fixed-length block business definition.



Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application Specific Information
1	UUID	String	☑	☐	☐		255		block=0,parse=no
2	⊞ Swift_01Header	Swift_BasicHeader	☐	☐	☐	1			block=1,parse=fiden
3	⊟ Swift_02Header	Swift_ApplicationHeader	☐	☐	☐	1			block=2,parse=fiden
3.1	BlockIdentifier	String	☑	☐	☑		2	2	
3.2	IOIdentifier	String	☐	☐	☑		1	O	
3.3	MessageType	String	☐	☐	☑		3		
3.4	⊟ Swift_02Header_IO	Swift_ApplicationHeader_IO	☐	☐	☐	1			
3.4.1	⊟ Swift_02Header_Output	Swift_ApplicationHeader_Output	☑	☐	☐	1			
3.4.1.	InputTime	String	☑	☐	☑		4		
3.4.1.	MessageInputReference	String	☐	☐	☑		28		
3.4.1.	OutputDate	String	☐	☐	☑		6		
3.4.1.	OutputTime	String	☐	☐	☑		4		
3.4.1.	OutputMessagePriority	String	☐	☐	☑		1		
3.4.1.	ObjectEventId	String							
3.4.2	⊟ Swift_02Header_Input	Swift_ApplicationHeader_Input	☐	☐	☐	1			
3.4.2.	ReceiverAddress	String	☑	☐	☑		12		
3.4.2.	MessagePriority	String	☐	☐	☑		1		
3.4.2.	DeliveryMonitoring	String	☐	☐	☐		1		
3.4.2.	ObsolescencePeriod	String	☐	☐	☐		3		
3.4.2.	ObjectEventId	String							
3.4.3	ObjectEventId	String							
3.5	ObjectEventId	String							
4	⊞ Swift_03Header	Swift_UserHeader	☐	☐	☐	1			block=3,parse=delim
5	⊞ Swift_MT540Data	Swift_MT540Data	☐	☐	☐	1			block=4,parse=field
6	Swift_05Trailer	String	☐	☐	☐		1		block=5,parse=no
7	Swift_BlockS	String	☐	☐	☐		1		block=6,parse=no
8	ObjectEventId	String							

Figure 8. Block 2 business object definition

Note: To create a block 2 business object definition for a SWIFT message, start Business Object Designer and then enter values for the attributes shown in Table 23 on page 52 and Figure 8.

Block 3 business object structure

The block 3 MsgBlk BO, `Swift_UserHeader`, has the format and attributes shown in Table 24. Note that there is attribute application-specific information for this business object: the Tag parameter. For Tag parameters see Table 20.

Note: Only attribute properties of consequence are shown in Table 24.

Table 24. Block 3 business object structure

Name	Type	Key	Foreign	Required	Cardinality	Application specific information	Max length
Tag103	String	Yes	No	No	1	Tag=103	6
Tag113	String	No	No	No	1	Tag=113	6
Tag108	String	No	No	No	1	Tag=108	6
Tag119	String	No	No	No	1	Tag=119	6
Tag115	String	No	No	No	1	Tag=115	6

Figure 9 shows a block 3 business object definition that has been manually created in a WebSphere development environment. Each attribute name (`Tag103`, `Tag113`, and so on,) corresponds to a field in this SWIFT message block. For further information on this SWIFT message block, see Appendix C, "SWIFT message structure," on page 105, and *All Things SWIFT: the SWIFT User Handbook. Specify*

type `String` *for each named attribute.* Note that the application-specific information for the components of this business object are SWIFT tags.

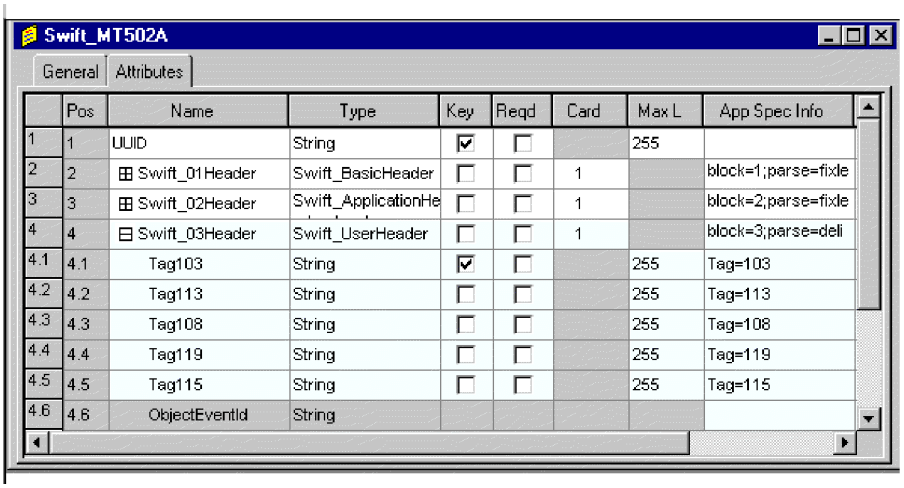


Figure 9. Block 3 business object definition

Note: To create a block 3 business object definition for a SWIFT message, start Business Object Designer and then enter values for the attributes shown in Table 24 on page 53 andFigure 9.

Block 4 business object structure

SWIFT block 4 contains the body of the SWIFT message. Block 4 is made up of fields of message tags and their contents on the one hand, and on the other, of sequences of message tags. This data content makes the block 4 business object structure unlike that of blocks 1, 2, and 3. The block 4 business object is the message data business object (MsgData BO).

Every tag and sequence in a SWIFT message is modeled as a child business object of the MsgData BO. Accordingly, a MsgData BO has child objects of two types: field business objects (MsgField BO) and sequence business objects (MsgSeq BO). These business objects reflect how the SWIFT data is formatted in block 4. More specifically, attributes in these business objects model the content (message tags and their content) and order (sequence) that is specified in a SWIFT message format specification. The sequence of the message tags is crucial if the business object definition is to faithfully represent the SWIFT message. For further information on MsgField BOs and MsgSeq BOs, see “Sequence and field business objects” on page 58.

As an example, view the format specification from the *SWIFT Standards Release Guide* for MT502, an order to buy or sell.Figure 10 below shows the portion of a business object definition that corresponds to MT502. The business object definition reflects the structure of the message tags and sequences in the SWIFT message:

- The Status—M (mandatory) or O (optional)—field in the SWIFT message is mapped to the Required property in the business object definition. For example, the status of SWIFT Tag 98a (shown in Figure 10) is O or optional; Figure 10 shows the corresponding business object attribute, Preparation_DateTime (of type `Swift_Tag_98`), for which the Required property is not checked.
- The Tag, Qualifier, and Content/Options fields from the SWIFT message are mapped as attribute application-specific text in the business object definition. For example, in the SWIFT message shown in Figure 10 Start of Block is Tag16R with

Content of GENL. The corresponding entry shown in Figure 10 is the attribute `Start_Of_Block` of type `Swift_Tag_16` with application-specific information property parameters that identify the Tag, the Tag's letter, and Content (`Tag=16;Letter=R;Content=GENL`).

- Data formats are often indicated in the Content/Options field in a SWIFT message. For example, Figure 10 shows the sender's reference for "Mandatory Sequence A General Information" as Tag20C, with a SEME qualifier and Content consisting of data format instructions (`:4!c[/4!c]`). Figure 10 shows the corresponding attribute application-specific text: only the Tag and Letter are shown in the AppSpecInfo field (`Tag=20;Letter=C`). The SWIFT data handler also parses the field's data content—the formatting information (`:4!c[/4!c]`) is included in the business object definition.
- Repeating sequences in SWIFT messages are indicated by "---->" in the SWIFT Format Specifications as shown in Figure 10. Non-repeating sequences are marked "-----|". In the business object definition, a repeating sequence is assigned cardinality n. For example, the repeating sequence Tag22F shown in Figure 10 is mapped to the attribute Indicator of type `Swift_Tag_22` with a cardinality property of n.

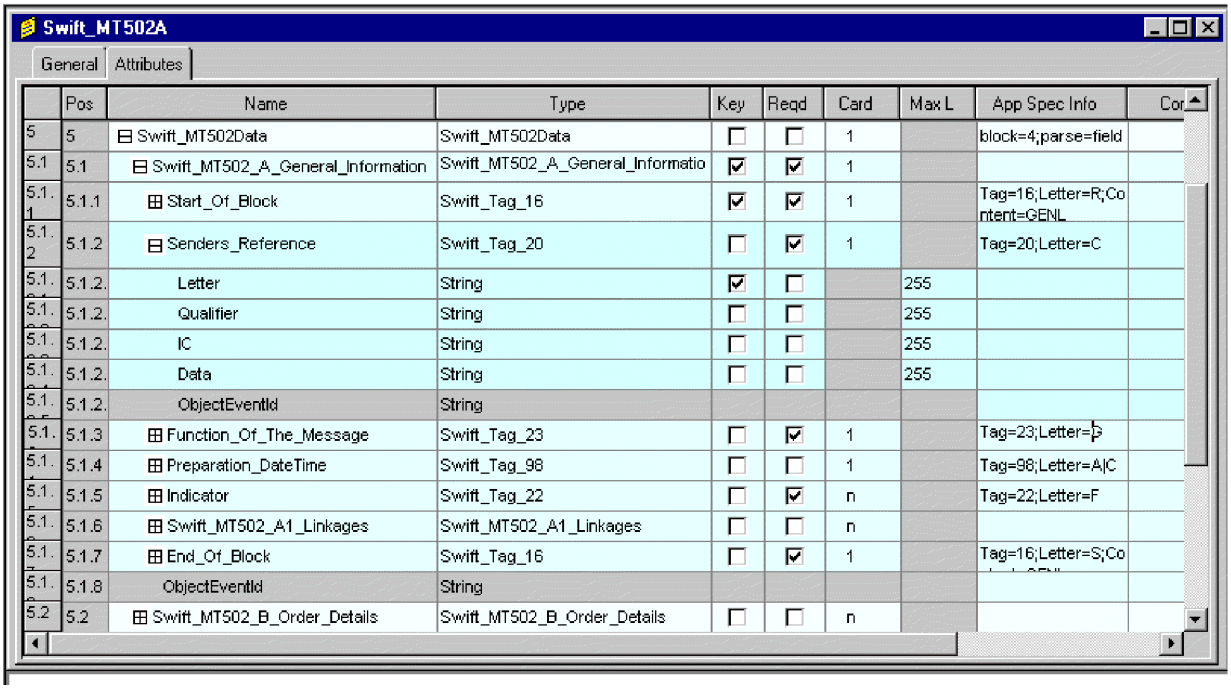


Figure 10. Partial block 4 business object definition

MsgData BO format

The format of a MsgData BO is summarized in the sections below.

MsgData BO name: The naming convention for the MsgData BO representing block 4 of a SWIFT message is as follows:

`Swift_MT<message_type>Data`

For example:

```
Name = Swift_MT502Data
```

MsgData BO attribute names: Each attribute of the MsgData BO represents one of the following:

- a MsgSeq BO
- a MsgField BO

Accordingly, the attribute names are the same as those for MsgSeq BOs and MsgField BOs. The naming convention for MsgField BO attributes is as follows:

```
Swift_<tag_number>_<position_in_the_SWIFT_message>
```

For example:

```
Name = Swift_94_1
```

The naming convention for MsgSeq BO attributes is as follows:

```
Swift_MT<message_type>_<SWIFT_sequence_name>
```

For example:

```
Name = Swift_MT502_B
```

For further information see "Sequence business object structure" on page 59 and "Field business object definitions" on page 60.

MsgData BO attribute types: The type for MsgData attributes is as follows:

For MsgField BO attributes:

```
Swift_Tag_<tag_number>
```

For example:

```
Type = Swift_Tag_94
```

For MsgSeq BO attributes:

```
Swift_MT<message_type>_<SWIFT_sequence_name>
```

For example:

```
Type = Swift_MT502_B
```

MsgData BO attribute ContainedObjectVersion: The contained object version for the MsgData BO as well as for the its MsgSeq BO attributes is 1.1.0. For example:

```
[Attribute]
Name = Swift_MT502_B
Type = Swift_MT502_B

...

ContainedObjectVersion = 1.1.0

...

[End]
```

Note: MsgField BO attributes are simple, and have no `ContainedObjectVersion`.

MsgData BO attribute relationship: The relationship attribute property for MsgData BO and its MsgSeq BO attributes is `Containment`. For example:

```
[Attribute]
Name = Swift_MT502Data
Type = Swift_MT502Data
```

```
...

Relationship = Containment

...

[End]
```

MsgData BO attribute cardinality: The MsgData BO and its MsgSeq BO attributes have a cardinality property of `n`. MsgField BO attributes that represent repeating fields also have cardinality `n`. All others attributes have cardinality 1. For example:

```
[Attribute]
Name = Swift_16_1
Type = Swift_Tag_16

...

Cardinality = n

...

[End]
```

MsgData BO attribute IsKey: Each MsgData BO definition must contain at least one attribute defined as the key attribute (`IsKey = true`). The rule is that the first single cardinality attribute in each BO definition must be defined as key attribute.

For example:

```
[Attribute]
Name = Swift_16.1
Type = Swift_Tag_16

...

Cardinality = 1

IsKey = true

[End]
```

MsgData BO attribute AppSpecificInfo: In MsgData BO definitions, only MsgField BO attributes have application-specific information; this property is always null for MsgSeq BO attributes. The convention for application-specific information for MsgField BO attributes is as follows:

```
Tag=nn;Letter=xx;Content=string
```

where `nn` is the SWIFT tag number of the field, *xx* is one or a list of supported letter options for the tag, and *string* is the value of the qualifier for a non-generic field as described in Table 20 on page 47. For example:

```
[Attribute]
Name = Swift_16_22
Type = Swift_Tag_16

...

AppSpecificInfo = Tag=16;Letter=S;Content=OTHRPRTY

...

[End]
```

When MsgField BO attributes appear in MsgSeq BOs and the application specific information indicates:

```
...;Union=True
```

The MsgField child object—a TagUnion business object and its child objects, TagLetterOption objects—will be populated instead of the DataField attribute. For information on TagUnion business objects, see "Field business object definitions" on page 60.

Sequence and field business objects

As noted above, the connector models sequences and tags in SWIFT messages as sequence business objects (MsgSeq BO) and field business objects (MsgField BO), respectively. Figure 11 illustrates the hierarchical relationship of these business objects.

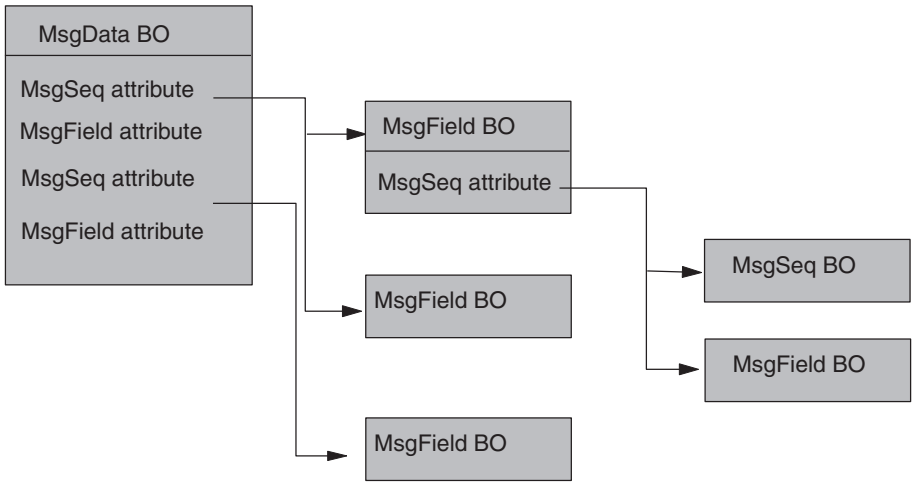


Figure 11. Field and sequence business objects in the (block 4) MsgData BO

Figure 12 shows part of a definition for a SWIFT message (MT502) that illustrates a sequence containing field and sequence attributes. The sequence attribute `Swift_MT02_B_Order_Details` not only includes several attributes of type Tag (for example, `Swift_Tag_16`, `Swift_Tag_94`), but also the subsequence `Swift_MT502_B1_Price`. This subsequence is a repeating optional sequence, and its properties reflect this (`Required= no`; `Cardinality=n`). Note that the sequences contain no application-specific information.

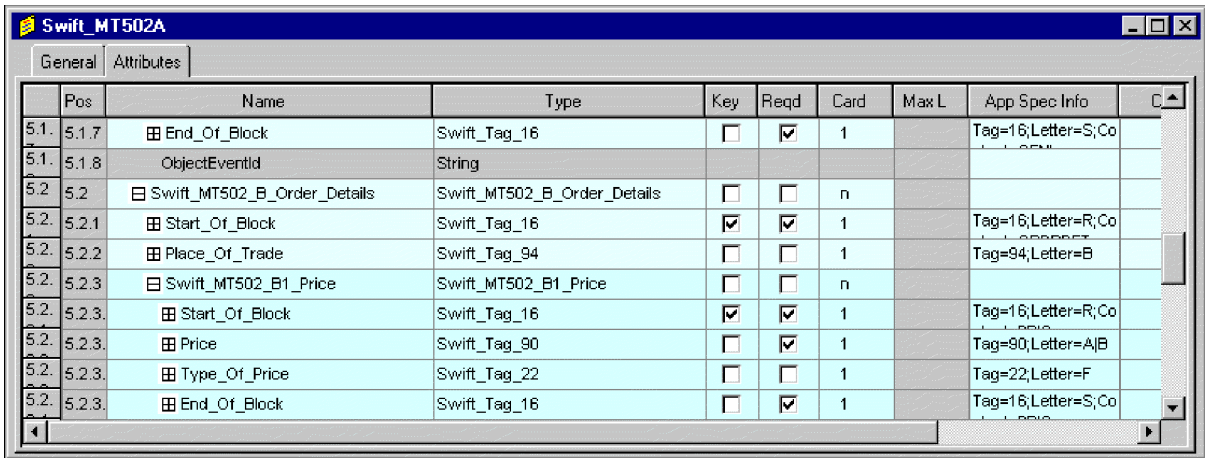


Figure 12. A Sequence containing tag and subsequence attributes

Sequence business object structure

As shown in Figure 13, each sequence business object (MsgSeq BO) attribute indicates one of the following:

- another MsgSeq BO, or subsequence
- a MsgField BO

There is no limit to the number of subsequences that a MsqSeq BO can nest.

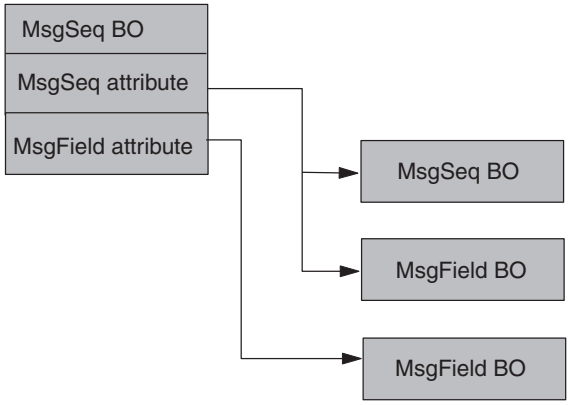
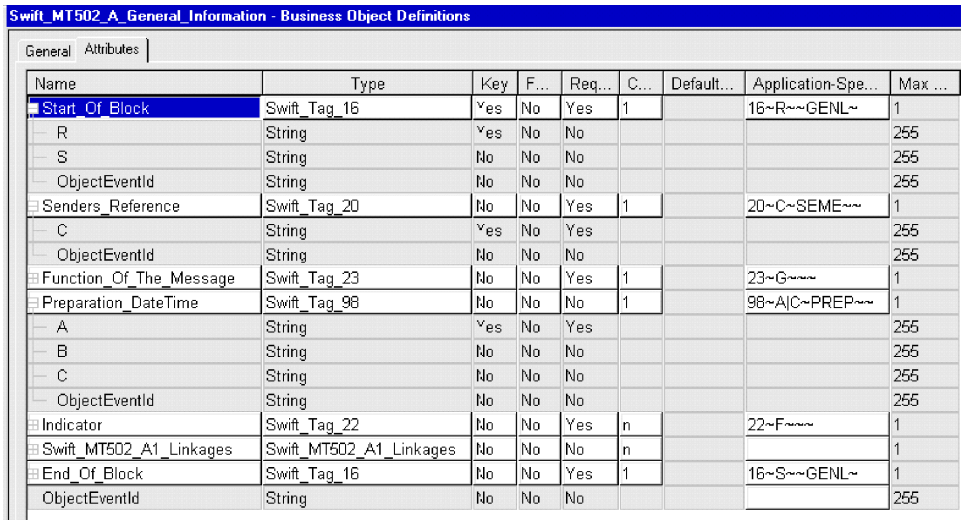


Figure 13. Field and Subsequence Business Objects in the MsgSeq BO

Figure 14 shows another excerpt of a MsgSeq BO. In this excerpt, the `Swift_Tag_` attributes represent MsgField BOs. The `Swift_MT502_A1_Linkages` attribute is for a child object that is a subsequence MsgSeq BO.



Name	Type	Key	F...	Req...	C...	Default...	Application-Spe...	Max ...
Start_Of_Block	Swift_Tag_16	Yes	No	Yes	1		16~R~~GENL~	1
R	String	Yes	No	No				255
S	String	No	No	No				255
ObjectEventId	String	No	No	No				255
Senders_Reference	Swift_Tag_20	No	No	Yes	1		20~C~SEME~~	1
C	String	Yes	No	Yes				255
ObjectEventId	String	No	No	No				255
Function_Of_The_Message	Swift_Tag_23	No	No	Yes	1		23~G~~~	1
Preparation_DateTime	Swift_Tag_98	No	No	No	1		98~A|C~PREP~~	1
A	String	Yes	No	Yes				255
B	String	No	No	No				255
C	String	No	No	No				255
ObjectEventId	String	No	No	No				255
Indicator	Swift_Tag_22	No	No	Yes	n		22~F~~~	1
Swift_MT502_A1_Linkages	Swift_MT502_A1_Linkages	No	No	No	n			1
End_Of_Block	Swift_Tag_16	No	No	Yes	1		16~S~~GENL~	1
ObjectEventId	String	No	No	No				255

Figure 14. Excerpt from a sequence business object (MsgSeq BO)

The following rules apply to sequence business objects:

- A subsequence business object is an attribute of a particular sequence business object type.
- A collection of more than one repeating field is treated as a subsequence.
- The application-specific information of a sequence attribute is always `NULL`.

MsgSeq BO format

Like a MsgData BO, a MsgSeq BO consists of attributes that are either MsgSeq BOs or MsgField BOs. For information on the format of these attributes, see "MsgData BO format" on page 55.

Field business object definitions

WebSphere represents every SWIFT tag as a field business object (MsgField BO). Each MsgField BO is modeled using the SWIFT generic field structure, even if the field is non-generic. WebSphere uses two additional business object models to represent the combination of letters and options used to represent and combine SWIFT message components as subfields in business objects:

- **Tag union business object (TagUnion BO)** This is a child object of the MsgField BO. A TagUnion BO contains all possible letter options for a specific tag, and is not specific to a particular message type.
- **Tag letter option business object (TagLetterOption BO)** This is a letter option child object of the TagUnion BO that defines the content of the subfield as well as its format including delimiters.

MsgField BO format

As shown in Figure 15, each MsgField BO contains five attributes, including one and only one TagUnion BO, with the data type shown in parentheses () below:

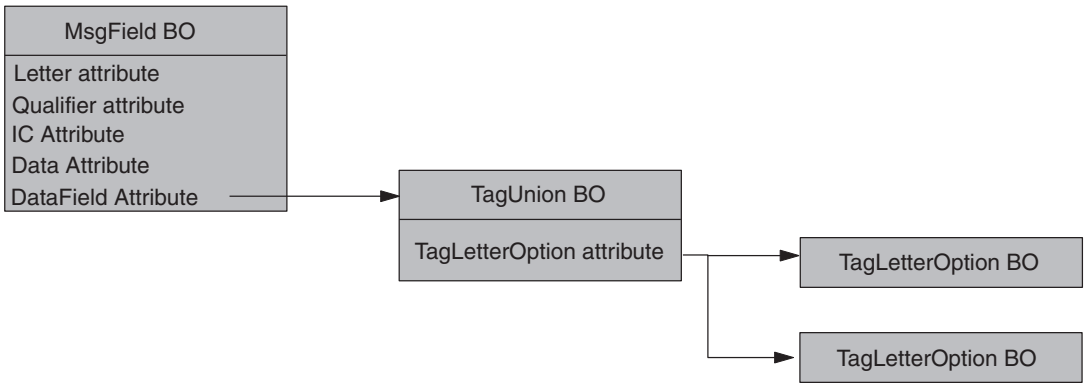


Figure 15. Attributes and business objects in the MsgField BO

The content and order of all subfields other than the SWIFT Qualifier and Issuer Code (IC) are captured in the child object of DataField, which is the TagUnion BO and its child objects, TagLetterOption BOs. The attributes and business objects shown in Figure 15 are discussed in the section below.

MsgField BO, TagUnion BO, and TagLetterOption BO names: The naming convention for a MsgField BO is as follows:

`Swift_Tag_<N>`

where N stands for the message number. For example:

```
Name = Swift_Tag_22
```

The naming convention for a TagUnion BO is as follows:

`Swift_Tag_Union_<tag_number>`

where `tag_number` is the numeric representation of tag number. For example:

```
Name = Swift_Tag_Union_20
```

The naming convention for a TagLetterOption BO is as follows:

`Swift_Tag_Union_<tag_number>_Opt_[<letter_option>]`

where `tag_number` is the numeric representation of tag number and `[<letter_option>]` is the letter option when a tag is associated with a letter. If the tag has no letter associated with it, then the name ends at `Opt`.For example:

```
Name = Swift_Tag_Union_20_Opt_C
```

MsgField BO, TagUnion BO, and TagLetter BO Attribute names: The names of the five attributes in a MsgField BO are as follows:

- `Letter`
- `Qualifier`
- `IC`
- `Data`
- `DataField`

The names of attributes in TagUnion BOs are as follows:

`Swift_<tag_number>_[<letter_option>]`

where tag_number is the numeric representation of the tag number and the square brackets signify that the letter is appended only when it is associated with the tag. For example:

```
Swift_20_C
```

The name of the attribute in TagLetterOption BOs is the concatenation of words in the subfield name shown in the SWIFT format specification table. The first letter of each word in the concatenated string is always capitalized, with subsequent letters in the word appearing in lowercase, regardless of how the words are spelled in the SWIFT format specification. Spaces and non-alphabetic symbols are left out of the concatenated name. If a field has no subfield, the word Subfield is used as an attribute name. For example, for the subfield "Proprietary Code" in 95R, the corresponding attribute name in the definition of TagLetterOption BO Swift_Tag_Union_95_Opt_R is as follows:

```
Name = ProprietaryCode
```

MsgField BO, TagUnion BO, and TagLetterOption BO attribute types: The type for MsgField attributes is as follows:

- Letter (String)
- Qualifier (String)
- Issuer Code (String)
- Data (String)
- DataField (*TagUnion_BO*)

For example, in a MsgField BO definition, the type for a Swift_Tag_20 attribute would be listed as follows:

```
[Attribute]
Name = DataField
Type = Swift_Tag_Union_20
```

The type for attributes in the TagUnion BO is the name of the TagLetterOption BO child object. For example, in a TagUnion BO definition for Swift_Tag_Union_20, the type for the TagLetterOption attribute is as follows:

```
[Attribute]
Name = Swift_20_C
Type = Swift_Tag_Union_20_Opt_C
```

The type for attributes in TagLetterOption BOs is always String.

MsgField BO, TagUnion BO, and TagLetterOption BO ContainedObjectVersion: The contained object version for the MsgField BO, the TagUnion BO, and the TagLetterOption BO is 1.1.0. For example:

as well as for the its MsgSeq BO attributes is 1.1.0. For example:

```
[Attribute]
Name = Swift_20_C
Type = Swift_Tag_Union_20_Opt_C

...

ContainedObjectVersion = 1.1.0

...
[End]
```

Note: MsgField BO attributes are simple, and have no ContainedObjectVersion.

MsgField BO, TagUnion BO, and TagLetterOption BO attribute cardinality: The cardinality of attributes in TagUnion BOs and TagLetterOption BOs is always set to 1. For example:

```
[Attribute]
Name = Swift_20_C
Type = Swift_Tag_Union_20_Opt_C

...

Cardinality = 1

...

[End]
```

MsgField BO, TagUnion BO, and TagLetterOption BO attribute IsKey: In each MsgField BO, the attribute `Letter` must be defined as the key attribute.

For example:

```
[Attribute]

Name = Letter
Type = String
IsKey = true

...

[End]
```

The first attribute of a TagUnionBO is defined as key.

The first attribute of TagLetterOption BO is defined as key.

TagLetterOption BO attribute AppSpecificInfo: The `AppSpecificInfo` attribute definition of a TagLetterOption BO provides crucial SWIFT message formatting information for business object subfields. The `AppSpecificInfo` attribute must contain the following information:

```
Format=***;Delim=$$$
```

where

*** stands for the SWIFT subfield format specification, which excludes delimiter information

$$$ stands for one or more letters that constitute the delimiter between the current subfield and the next subfield.

When the delimiters are CrLf, the symbol string `CrLf` specifies that a carriage return is immediately followed by a line feed.

For example, the `AppSpecificInfo` attribute for a TagLetterOption BO, `Swift_Tag_Union_95_Opt_C`, might appear as follows:

```
[Attribute]

Name = CountryCode
Type = String

...

AppSpecificInfo = Format=2!a;Delim=/
```

...

[End]

Chapter 4. SWIFT Data Handler

The SWIFT data handler is a data-conversion module whose primary roles are to convert business objects into SWIFT messages and SWIFT messages into business objects. Both default top-level data-handler meta-objects (connector and server) support the `swift` MIME type and therefore support use of the SWIFT data handler.

This chapter describes how the SWIFT data handler processes SWIFT messages. It also discusses how to configure the SWIFT data handler.

Configuring the SWIFT data handler

To configure a SWIFT data handler for use with the connector, you must do the following:

- Make sure that the class name of the SWIFT data handler is specified in the connector properties.
- Enter the appropriate values for the attributes of the SWIFT data handler child meta-object.

Note: For the SWIFT data handler to function properly, you must also create or modify business object definitions so that they support the data handler. For more information, see "SWIFT field structure" on page 105.

Configuring the connector meta-object

To configure the connector to interact with the SWIFT data handler, make sure that the connector-specific property `DataHandlerClassName` has the value `com.crossworlds.DataHandlers.swift.SwiftDataHandler`.

You must set the value of this property before running the connector. Doing so will enable the connector to access the SWIFT data handler when converting SWIFT messages to business objects and vice versa. For further information, see "Connector-specific properties" on page 22.

Configuring the data handler child meta-object

For the SWIFT data handler, WebSphere delivers the default meta-object `MO_DataHandler_Default`. This meta-object specifies a child attribute of type `MO_DataHandler_Swift`. Table 25 describes the attributes in the child meta-object, `MO_DataHandler_SWIFT`.

Table 25. Child Meta-Object Attributes for the SWIFT Data Handler

Attribute Name	Description	Delivered Default Value
BOPrefix	Prefix used by the default NameHandler class to build business object names. The default value must be changed to match the type of the business object. The attribute value is case-sensitive.	Swift
DefaultVerb	The verb used when creating business objects.	Create
ClassName	Name of the data handler class to load for use with the specified MIME type. The top-level data-handler meta-object has an attribute whose name matches the specified MIME type and whose type is the SWIFT child meta-object.	com.crossworlds.DataHandlers.swift.SwiftDataHandler
DummyKey	Key attribute; not used by the data handler but required by the integration broker.	1

The Delivered Default Value column in Table 25 lists the value that WebSphere provides for the default value of the associated meta-object attribute. You must ensure that all attributes in this child meta-object have a default value that is appropriate for your system and your SWIFT message type. Also, make sure that at least the ClassName and BOPrefix attributes have default values.

Note: Use Business Object Designer to assign default values to attributes in this meta-object.

Business object requirements

The SWIFT data handler uses business object definitions when it converts business objects or SWIFT messages. It performs the conversion using the structure of the business object and its application-specific text. To ensure that business object definitions conform to the requirements of the SWIFT data handler, follow the guidelines described in Chapter 3, “Business objects,” on page 43.

Converting business objects to SWIFT messages

To convert a business object to a SWIFT message, the SWIFT data handler loops through the attributes in the top-level business object in sequential order. It generates populated blocks of a SWIFT message recursively based on the order in which attributes appear in the business object and its children.

Attributes without a block number, or with values unrecognized by the parser properties, are ignored. Also ignored is block 0, the UUID header that is added by the MQSA.

The parse=value application-specific information property is used to determine how to format strings. This property parses the business object as follows:

- parse=no; The attribute MUST be of type String and is formatted as {*block number*:*attribute value*}The *block number* is the value of the block=*block value* application-specific text property.
- parse=fixlen; The attribute must be a single cardinality container. It is formatted as {*block number*:*attr0 value* a*ttr1 value....attrn value*}where *attrn value* is the attribute value of the *n*th attribute. All CxIgnore and CxBlank attributes are IGNORED.
- parse=delim; The attribute must be a single cardinality container. It is formatted as {*block number*:[*Tag*:*attr1 data*]...[*Tag*:*attr1 data*]}where: *Tag* is the value of the Tag property of attribute application-specific text *attrn data* is the value of the attribute. All CxIgnore and CxBlank attributes are IGNORED.

- `parse=field;` This setting can be used only on Block 4 messages. Fields are printed out in loop through non-CxIgnore and non-CxBlank attributes of the business object.
  - If `appText == NULL` and the attribute is a container, call `printBO(childBO)`. Handle multiple cardinality if required.
  - If `appText != NULL`, call `printFieldObj()`, which handles multiple cardinality and calls `printFieldBO()` to write out a tag.
- All fields are formatted as generic or non-generic fields. The tag number is determined by the value of the Tag business object attribute. All non-CxIgnore attributes of the tag business object are printed out. For more on generic or non-generic fields, see Appendix C, "SWIFT message structure," on page 105.

Converting SWIFT messages to business objects

All SWIFT messages as well as compliance with SWIFT formats and syntax, are validated by SWIFT before being processed by the SWIFT data handler. The SWIFT data handler performs validation of business object structure and compliance only.

The SWIFT data handler extracts data from a SWIFT message and sets corresponding attributes in a business object as follows:

1. The SWIFT parser is called to extract the first 4 blocks (UUID + blocks 1 through 3). For block 2, the SWIFT application header, only the input attributes are extracted.
2. The SWIFT data handler is called to extract the name of the business object from block 2 of the SWIFT message.
3. The SWIFT data handler creates an instance of the top-level object.
4. Based on the application-specific information parameters, the data handler processes SWIFT message blocks. The blocks are parsed in one of four different ways
   - `parse=no;` The block data is treated as type `String` and not parsed out.
   - `parse=fixlen;` The block data is parsed as a fixed-length structure, based on the values of the maximum length attributes of the block business object.
   - `parse=delim;` The block data is parsed as {*n*:*data*} delimited format.
   - `parse=field;` This setting is used only on block 4 data. Fields are parsed as generic and non-generic.
5. For block 4 data (`parse=field;`) the data handler either matches the field returned from the parser to a tag business object attribute, or finds the sequence business object that the field belongs to.
   a. If the application specific information of the attribute is `NULL`, the child business object is a sequence. The data handler checks if the first required attribute of the child business object matches the field:
      - If it does match, the data handler assigns the attribute multiple cardinality and populates the sequence for the child business object.
      - If it does not match, the data handler skips to the next attribute of the parent business object.
   b. If application-specific information is not NULL, the child is a tag business object. If the field matches the application-specific information, it is handled with the multiple cardinality and extracted, with the data handler setting the letter and data attributes of the tag business object.
6. If a non-NULL field is returned, the field is written to a log and an exception is thrown.

7. The data handler parses block 5 of the SWIFT message. The application-specific information for this block is always `block=5`; `parse=no` and is of type `String`. Block 5 is treated as a single string.

Chapter 5. Troubleshooting

This chapter describes problems that you may encounter when starting up or running the connector.

Startup problems

Problem	Potential solution / explanation
The connector shuts down unexpectedly during initialization and the following message is reported: `Exception in thread "main" java.lang.NoClassDefFoundError: javax/jms/JMSException...`	Connector cannot find file `jms.jar` from the IBM WebSphere MQ Java client libraries. Ensure that variable `MQSERIES_JAVA_LIB` in `start_connector.bat` points to the IBM WebSphere MQ Java client library folder.
The connector shuts down unexpectedly during initialization and the following message is reported: `Exception in thread "main" java.lang.NoClassDefFoundError: com/ibm/mq/jms/MQConnectionFactory...`	Connector cannot find file `com.ibm.mqjms.jar` in the IBM WebSphere MQ Java client libraries. Ensure that variable `MQSERIES_JAVA_LIB` in `start_connector.bat` points to the IBM WebSphere MQ Java client library folder.
The connector shuts down unexpectedly during initialization and the following message is reported: `Exception in thread "main" java.lang.NoClassDefFoundError: javax/naming/Referenceable...`	Connector cannot find file `jndi.jar` from the IBM WebSphere MQ Java client libraries. Ensure that variable `MQSERIES_JAVA_LIB` in `start_connector.bat` points to the IBM WebSphere MQ Java client library folder.
The connector reports `MQJMS2005: failed to create MQQueueManager for ':'`	Explicitly set values for the following properties: `HostName`, `Channel`, and `Port`.

Event processing

Problem	Potential solution / explanation
The connector delivers all messages with an MQRFH2 header.	To deliver messages with only the MQMD WebSphere MQ header, append `?targetClient=1` to the name of output queue URI. For example, if you output messages to queue `queue://my.queue.manager/OUT`, change the URI to `queue://my.queue.manager/OUT?targetClient=1`. See Chapter 2, "Installing and configuring the connector," on page 19 for more information.
The connector truncates all message formats to 8 characters upon delivery regardless of how the format has been defined in the connector meta-object.	This is a limitation of the WebSphere MQ MQMD message header and not the connector.

Appendix A. Standard configuration properties for connectors

This appendix describes the standard configuration properties for the connector component of WebSphere Business Integration adapters. The information covers connectors running on the following integration brokers:

- WebSphere InterChange Server (ICS)
- WebSphere MQ Integrator, WebSphere MQ Integrator Broker, and WebSphere Business Integration Message Broker, collectively referred to as the WebSphere Message Brokers (WMQI).
- WebSphere Application Server (WAS)

Not every connector makes use of all these standard properties. When you select an integration broker from Connector Configurator, you will see a list of the standard properties that you need to configure for your adapter running with that broker.

For information about properties specific to the connector, see the relevant adapter user guide.

Note: In this document, backslashes (\) are used as the convention for directory paths. For UNIX installations, substitute slashes (/) for backslashes and follow the conventions for each operating system.

New and deleted properties

These standard properties have been added in this release.

New properties

- XMLNameSpaceFormat

Deleted properties

- RestartCount

Configuring standard connector properties

Adapter connectors have two types of configuration properties:

- Standard configuration properties
- Connector-specific configuration properties

This section describes the standard configuration properties. For information on configuration properties specific to a connector, see its adapter user guide.

Using Connector Configurator

You configure connector properties from Connector Configurator, which you access from System Manager. For more information on using Connector Configurator, refer to the Connector Configurator appendix.

Note: Connector Configurator and System Manager run only on the Windows system. If you are running the connector on a UNIX system, you must have a Windows machine with these tools installed. To set connector properties

for a connector that runs on UNIX, you must start up System Manager on the Windows machine, connect to the UNIX integration broker, and bring up Connector Configurator for the connector.

Setting and updating property values

The default length of a property field is 255 characters.

The connector uses the following order to determine a property's value (where the highest number overrides other values):

1. Default
2. Repository (only if WebSphere InterChange Server is the integration broker)
3. Local configuration file
4. Command line

A connector obtains its configuration values at startup. If you change the value of one or more connector properties during a run-time session, the property's **Update Method** determines how the change takes effect. There are four different update methods for standard connector properties:

- **Dynamic**
  The change takes effect immediately after it is saved in System Manager. If the connector is working in stand-alone mode (independently of System Manager), for example with one of the WebSphere message brokers, you can only change properties through the configuration file. In this case, a dynamic update is not possible.
- **Agent restart (ICS only)**
  The change takes effect only after you stop and restart the application-specific component.
- **Component restart**
  The change takes effect only after the connector is stopped and then restarted in System Manager. You do not need to stop and restart the application-specific component or the integration broker.
- **Server restart**
  The change takes effect only after you stop and restart the application-specific component and the integration broker.

To determine how a specific property is updated, refer to the **Update Method** column in the Connector Configurator window, or see the Update Method column in Table 26 on page 73 below.

Summary of standard properties

Table 26 on page 73 provides a quick reference to the standard connector configuration properties. Not all the connectors make use of all these properties, and property settings may differ from integration broker to integration broker, as standard property dependencies are based on `RepositoryDirectory`.

You must set the values of some of these properties before running the connector. See the following section for an explanation of each property.

Note: In the "Notes"column in Table 26 on page 73, the phrase "Repository directory is REMOTE" indicates that the broker is the InterChange Server. When the broker is WMQI or WAS, the repository directory is set to LOCAL

Table 26. Summary of standard configuration properties

Property name	Possible values	Default value	Update method	Notes
AdminInQueue	Valid JMS queue name	*CONNECTORNAME* /ADMININQUEUE	Component restart	Delivery Transport is JMS
AdminOutQueue	Valid JMS queue name	*CONNECTORNAME*/ADMINOUTQUEUE	Component restart	Delivery Transport is JMS
AgentConnections	1-4	1	Component restart	Delivery Transport is MQ or IDL: Repository directory is <REMOTE> (broker is ICS)
AgentTraceLevel	0-5	0	Dynamic	
ApplicationName	Application name	Value specified for the connector application name	Component restart	
BrokerType	ICS, WMQI, WAS		Component restart	
CharacterEncoding	ascii7, ascii8, SJIS, Cp949, GBK, Big5, Cp297, Cp273, Cp280, Cp284, Cp037, Cp437 **Note:** This is a subset of supported values.	ascii7	Component restart	
ConcurrentEventTriggeredFlows	1 to 32,767	1	Component restart	Repository directory is <REMOTE> (broker is ICS)
ContainerManagedEvents	No value or JMS	No value	Component restart	Delivery Transport is JMS
ControllerStoreAndForwardMode	true or false	true	Dynamic	Repository directory is <REMOTE> (broker is ICS)
ControllerTraceLevel	0-5	0	Dynamic	Repository directory is <REMOTE> (broker is ICS)
DeliveryQueue		*CONNECTORNAME*/DELIVERYQUEUE	Component restart	JMS transport only
DeliveryTransport	MQ, IDL, or JMS	JMS	Component restart	If Repository directory is local, then value is JMS only

Table 26. Summary of standard configuration properties (continued)

Property name	Possible values	Default value	Update method	Notes
DuplicateEventElimination	`true or false`	`false`	Component restart	JMS transport only: Container Managed Events must be <NONE>
FaultQueue		*CONNECTORNAME*/FAULTQUEUE	Component restart	JMS transport only
jms.FactoryClassName	`CxCommon.Messaging.jms .IBMMQSeriesFactory` or `CxCommon.Messaging .jms.SonicMQFactory` or any Java class name	`CxCommon.Messaging. jms.IBMMQSeriesFactory`	Component restart	JMS transport only
jms.MessageBrokerName	If FactoryClassName is `IBM`, use `crossworlds.queue. manager`. If FactoryClassName is `Sonic`, use `localhost:2506`.	`crossworlds.queue.manager`	Component restart	JMS transport only
jms.NumConcurrentRequests	Positive integer	`10`	Component restart	JMS transport only
jms.Password	Any valid password		Component restart	JMS transport only
jms.UserName	Any valid name		Component restart	JMS transport only
JvmMaxHeapSize	Heap size in megabytes	`128m`	Component restart	Repository directory is <REMOTE> (broker is ICS)
JvmMaxNativeStackSize	Size of stack in kilobytes	`128k`	Component restart	Repository directory is <REMOTE> (broker is ICS)
JvmMinHeapSize	Heap size in megabytes	`1m`	Component restart	Repository directory is <REMOTE> (broker is ICS)
ListenerConcurrency	`1- 100`	`1`	Component restart	Delivery Transport must be `MQ`
Locale	`en_US`, `ja_JP`, `ko_KR`, `zh_CN`, `zh_TW`, `fr_FR`, `de_DE`, `it_IT`, `es_ES`, `pt_BR` **Note:** This is a subset of the supported locales.	`en_US`	Component restart	

Table 26. Summary of standard configuration properties (continued)

Property name	Possible values	Default value	Update method	Notes
LogAtInterchangeEnd	`true` or `false`	`false`	Component restart	Repository Directory must be <REMOTE> (broker is ICS)
MaxEventCapacity	`1-2147483647`	`2147483647`	Dynamic	Repository Directory must be <REMOTE> (broker is ICS)
MessageFileName	Path or filename	`CONNECTORNAMEConnector.txt`	Component restart	
MonitorQueue	Any valid queue name	*`CONNECTORNAME`*`/MONITORQUEUE`	Component restart	JMS transport only: DuplicateEvent Elimination must be true
OADAutoRestartAgent	`true` or `false`	`false`	Dynamic	Repository Directory must be <REMOTE> (broker is ICS)
OADMaxNumRetry	A positive number	`1000`	Dynamic	Repository Directory must be <REMOTE> (broker is ICS)
OADRetryTimeInterval	A positive number in minutes	`10`	Dynamic	Repository Directory must be <REMOTE> (broker is ICS)
PollEndTime	`HH:MM`	`HH:MM`	Component restart	
PollFrequency	A positive integer in milliseconds `no` (to disable polling) `key` (to poll only when the letter `p` is entered in the connector's Command Prompt window)	`10000`	Dynamic	
PollQuantity	`1-500`	`1`	Agent restart	JMS transport only: Container Managed Events is specified
PollStartTime	`HH:MM`(HH is 0-23, MM is 0-59)	`HH:MM`	Component restart	

Table 26. Summary of standard configuration properties (continued)

Property name	Possible values	Default value	Update method	Notes
RepositoryDirectory	Location of metadata repository		Agent restart	For ICS: set to <REMOTE> For WebSphere MQ message brokers and WAS: set to C:\crossworlds\ repository
RequestQueue	Valid JMS queue name	*CONNECTORNAME*/REQUESTQUEUE	Component restart	Delivery Transport is JMS
ResponseQueue	Valid JMS queue name	*CONNECTORNAME*/RESPONSEQUEUE	Component restart	Delivery Transport is JMS: required only if Repository directory is <REMOTE>
RestartRetryCount	0-99	3	Dynamic	
RestartRetryInterval	A sensible positive value in minutes: 1 - 2147483547	1	Dynamic	
RHF2MessageDomain	mrm, xml	mrm	Component restart	Only if Delivery Transport is JMS and WireFormat is CwXML.
SourceQueue	Valid WebSphere MQ name	*CONNECTORNAME*/SOURCEQUEUE	Agent restart	Only if Delivery Transport is JMS and Container Managed Events is specified
SynchronousRequestQueue		*CONNECTORNAME*/ SYNCHRONOUSREQUESTQUEUE	Component restart	Delivery Transport is JMS
SynchronousRequestTimeout	0 - any number (millisecs)	0	Component restart	Delivery Transport is JMS
SynchronousResponseQueue		*CONNECTORNAME*/ SYNCHRONOUSRESPONSEQUEUE	Component restart	Delivery Transport is JMS
WireFormat	CwXML, CwBO	CwXML	Agent restart	CwXML if Repository Directory is not <REMOTE>: CwBO if Repository Directory is <REMOTE>
WsifSynchronousRequestTimeout	0 - any number (millisecs)	0	Component restart	WAS only
XMLNameSpaceFormat	short, long	short	Agent restart	WebSphere MQ message brokers and WAS only

Standard configuration properties

This section lists and defines each of the standard connector configuration properties.

AdminInQueue

The queue that is used by the integration broker to send administrative messages to the connector.

The default value is `CONNECTORNAME/ADMININQUEUE`.

AdminOutQueue

The queue that is used by the connector to send administrative messages to the integration broker.

The default value is `CONNECTORNAME/ADMINOUTQUEUE`.

AgentConnections

Applicable only if `RepositoryDirectory` is <REMOTE>.

The AgentConnections property controls the number of ORB (Object Request Broker) connections opened by `orb.init[]`.

The default value of this property is set to 1. You can change it as required.

AgentTraceLevel

Level of trace messages for the application-specific component. The default is `0`. The connector delivers all trace messages applicable at the tracing level set or lower.

ApplicationName

Name that uniquely identifies the connector's application. This name is used by the system administrator to monitor the WebSphere business integration system environment. This property must have a value before you can run the connector.

BrokerType

Identifies the integration broker type that you are using. The options are ICS, WebSphere message brokers (WMQI, WMQIB or WBIMB) or WAS.

CharacterEncoding

Specifies the character code set used to map from a character (such as a letter of the alphabet, a numeric representation, or a punctuation mark) to a numeric value.

Note: Java-based connectors do not use this property. A C++ connector currently uses the value `ascii7` for this property.

By default, a subset of supported character encodings only is displayed in the drop-down list. To add other supported values to the drop-down list, you must manually modify the `\Data\Std\stdConnProps.xml` file in the product directory. For more information, see the appendix on Connector Configurator.

ConcurrentEventTriggeredFlows

Applicable only if RepositoryDirectory is <REMOTE>.

Determines how many business objects can be concurrently processed by the connector for event delivery. Set the value of this attribute to the number of business objects you want concurrently mapped and delivered. For example, set the value of this property to 5 to cause five business objects to be concurrently processed. The default value is 1.

Setting this property to a value greater than 1 allows a connector for a source application to map multiple event business objects at the same time and deliver them to multiple collaboration instances simultaneously. This speeds delivery of business objects to the integration broker, particularly if the business objects use complex maps. Increasing the arrival rate of business objects to collaborations can improve overall performance in the system.

To implement concurrent processing for an entire flow (from a source application to a destination application), you must:

- Configure the collaboration to use multiple threads by setting its Maximum number of concurrent events property high enough to use multiple threads.
- Ensure that the destination application's application-specific component can process requests concurrently. That is, it must be multi-threaded, or be able to use connector agent parallelism and be configured for multiple processes. Set the Parallel Process Degree configuration property to a value greater than 1.

The ConcurrentEventTriggeredFlows property has no effect on connector polling, which is single-threaded and performed serially.

ContainerManagedEvents

This property allows a JMS-enabled connector with a JMS event store to provide guaranteed event delivery, in which an event is removed from the source queue and placed on the destination queue as a single JMS transaction.

There is no default value.

When ContainerManagedEvents is set to JMS, you must configure the following properties to enable guaranteed event delivery:

- PollQuantity = 1 to 500
- SourceQueue = /SOURCEQUEUE

You must also configure a data handler with the MimeType, DHClass (data handler class), and DataHandlerConfigMOName (the meta-object name, which is optional) properties. To set those values, use the **Data Handler** tab in Connector Configurator.

Thes properties are adapter-specific, but **example** values are:

- MimeType = text\xml
- DHClass = com.crossworlds.DataHandlers.text.xml
- DataHandlerConfigMOName = MO_DataHandler_Default

The fields for these values in the Data Handler tab will be displayed only if you have set ContainerManagedEvents to JMS.

Note: When ContainerManagedEvents is set to JMS, the connector does *not* call its pollForEvents() method, thereby disabling that method's functionality.

This property only appears if the DeliveryTransport property is set to the value JMS.

ControllerStoreAndForwardMode

Applicable only if RepositoryDirectory is <REMOTE>.

Sets the behavior of the connector controller after it detects that the destination application-specific component is unavailable.

If this property is set to true and the destination application-specific component is unavailable when an event reaches ICS, the connector controller blocks the request to the application-specific component. When the application-specific component becomes operational, the controller forwards the request to it.

However, if the destination application's application-specific component becomes unavailable **after** the connector controller forwards a service call request to it, the connector controller fails the request.

If this property is set to false, the connector controller begins failing all service call requests as soon as it detects that the destination application-specific component is unavailable.

The default is true.

ControllerTraceLevel

Applicable only if RepositoryDirectory is <REMOTE>.

Level of trace messages for the connector controller. The default is 0.

DeliveryQueue

Applicable only if DeliveryTransport is JMS.

The queue that is used by the connector to send business objects to the integration broker.

The default value is CONNECTORNAME/DELIVERYQUEUE.

DeliveryTransport

Specifies the transport mechanism for the delivery of events. Possible values are MQ for WebSphere MQ, IDL for CORBA IIOP, or JMS for Java Messaging Service.

- If the RepositoryDirectory is remote, the value of the DeliveryTransport property can be MQ, IDL, or JMS, and the default is IDL.
- If the RepositoryDirectory is a local directory, the value may only be JMS.

The connector sends service call requests and administrative messages over CORBA IIOP if the value configured for the DeliveryTransport property is MQ or IDL.

WebSphere MQ and IDL

Use WebSphere MQ rather than IDL for event delivery transport, unless you must have only one product. WebSphere MQ offers the following advantages over IDL:

- Asynchronous communication:
  WebSphere MQ allows the application-specific component to poll and persistently store events even when the server is not available.
- Server side performance:
  WebSphere MQ provides faster performance on the server side. In optimized mode, WebSphere MQ stores only the pointer to an event in the repository database, while the actual event remains in the WebSphere MQ queue. This saves having to write potentially large events to the repository database.
- Agent side performance:
  WebSphere MQ provides faster performance on the application-specific component side. Using WebSphere MQ, the connector's polling thread picks up an event, places it in the connector's queue, then picks up the next event. This is faster than IDL, which requires the connector's polling thread to pick up an event, go over the network into the server process, store the event persistently in the repository database, then pick up the next event.

JMS

Enables communication between the connector and client connector framework using Java Messaging Service (JMS).

If you select JMS as the delivery transport, additional JMS properties such as `jms.MessageBrokerName`, `jms.FactoryClassName`, `jms.Password`, and `jms.UserName`, appear in Connector Configurator. The first two of these properties are required for this transport.

Important: There may be a memory limitation if you use the JMS transport mechanism for a connector in the following environment:

- AIX 5.0
- WebSphere MQ 5.3.0.1
- When ICS is the integration broker

In this environment, you may experience difficulty starting both the connector controller (on the server side) and the connector (on the client side) due to memory use within the WebSphere MQ client. If your installation uses less than 768M of process heap size, IBM recommends that you set:

- The `LDR_CNTRL` environment variable in the `CWSharedEnv.sh` script.

  This script resides in the `\bin` directory below the product directory. With a text editor, add the following line as the first line in the `CWSharedEnv.sh` script:

  ```
  export LDR_CNTRL=MAXDATA=0x30000000
  ```

  This line restricts heap memory usage to a maximum of 768 MB (3 segments * 256 MB). If the process memory grows more than this limit, page swapping can occur, which can adversely affect the performance of your system.
- The `IPCCBaseAddress` property to a value of `11` or `12`. For more information on this property, see the *System Installation Guide for UNIX*.

DuplicateEventElimination

When you set this property to `true`, a JMS-enabled connector can ensure that duplicate events are not delivered to the delivery queue. To use this feature, the connector must have a unique event identifier set as the business object's **ObjectEventId** attribute in the application-specific code. This is done during connector development.

This property can also be set to `false`.

Note: When DuplicateEventElimination is set to true, you must also configure the MonitorQueue property to enable guaranteed event delivery.

FaultQueue

If the connector experiences an error while processing a message then the connector moves the message to the queue specified in this property, along with a status indicator and a description of the problem.

The default value is CONNECTORNAME/FAULTQUEUE.

JvmMaxHeapSize

The maximum heap size for the agent (in megabytes). This property is applicable only if the RepositoryDirectory value is <REMOTE>.

The default value is 128m.

JvmMaxNativeStackSize

The maximum native stack size for the agent (in kilobytes). This property is applicable only if the RepositoryDirectory value is <REMOTE>.

The default value is 128k.

JvmMinHeapSize

The minimum heap size for the agent (in megabytes). This property is applicable only if the RepositoryDirectory value is <REMOTE>.

The default value is 1m.

jms.FactoryClassName

Specifies the class name to instantiate for a JMS provider. You *must* set this connector property when you choose JMS as your delivery transport mechanism (DeliveryTransport).

The default is CxCommon.Messaging.jms.IBMMQSeriesFactory.

jms.MessageBrokerName

Specifies the broker name to use for the JMS provider. You *must* set this connector property when you choose JMS as your delivery transport mechanism (DeliveryTransport).

The default is crossworlds.queue.manager. Use the default when connecting to a local message broker.

When you connect to a remote message broker, this property takes the following (mandatory) values:
QueueMgrName:<Channel>:<HostName>:<PortNumber>,
where the variables are:
QueueMgrName: The name of the queue manager.
Channel: The channel used by the client.
HostName: The name of the machine where the queue manager is to reside.
PortNumber: The port number to be used by the queue manager for listening.

For example:
`jms.MessageBrokerName = WBIMB.Queue.Manager:CHANNEL1:RemoteMachine:1456`

jms.NumConcurrentRequests

Specifies the maximum number of concurrent service call requests that can be sent to a connector at the same time. Once that maximum is reached, new service calls block and wait for another request to complete before proceeding.

The default value is 10.

jms.Password

Specifies the password for the JMS provider. A value for this property is optional.

There is no default.

jms.UserName

Specifies the user name for the JMS provider. A value for this property is optional.

There is no default.

ListenerConcurrency

This property supports multi-threading in MQ Listener when ICS is the integration broker. It enables batch writing of multiple events to the database, thus improving system performance. The default value is 1.

This property applies only to connectors using MQ transport. The `DeliveryTransport` property must be set to `MQ`.

Locale

Specifies the language code, country or territory, and, optionally, the associated character code set. The value of this property determines such cultural conventions as collation and sort order of data, date and time formats, and the symbols used in monetary specifications.

A locale name has the following format:
ll_TT.codeset

where:

ll	a two-character language code (usually in lower case)
TT	a two-letter country or territory code (usually in upper case)
codeset	the name of the associated character code set; this portion of the name is often optional.

By default, only a subset of supported locales appears in the drop-down list. To add other supported values to the drop-down list, you must manually modify the `\Data\Std\stdConnProps.xml` file in the product directory. For more information, see the appendix on Connector Configurator.

The default value is en_US. If the connector has not been globalized, the only valid value for this property is en_US. To determine whether a specific connector has been globalized, see the connector version list on these websites:

http://www.ibm.com/software/websphere/wbiadapters/infocenter, or
http://www.ibm.com/websphere/integration/wicserver/infocenter

LogAtInterchangeEnd

Applicable only if RespositoryDirectory is <REMOTE>.

Specifies whether to log errors to the integration broker's log destination. Logging to the broker's log destination also turns on e-mail notification, which generates e-mail messages for the MESSAGE_RECIPIENT specified in the InterchangeSystem.cfg file when errors or fatal errors occur.

For example, when a connector loses its connection to its application, if LogAtInterChangeEnd is set to true, an e-mail message is sent to the specified message recipient. The default is false.

MaxEventCapacity

The maximum number of events in the controller buffer. This property is used by flow control and is applicable only if the value of the RepositoryDirectory property is <REMOTE>.

The value can be a positive integer between 1 and 2147483647. The default value is 2147483647.

MessageFileName

The name of the connector message file. The standard location for the message file is \connectors\messages in the product directory. Specify the message filename in an absolute path if the message file is not located in the standard location.

If a connector message file does not exist, the connector uses InterchangeSystem.txt as the message file. This file is located in the product directory.

Note: To determine whether a specific connector has its own message file, see the individual adapter user guide.

MonitorQueue

The logical queue that the connector uses to monitor duplicate events. It is used only if the DeliveryTransport property value is JMS and DuplicateEventElimination is set to TRUE.

The default value is CONNECTORNAME/MONITORQUEUE

OADAutoRestartAgent

Valid only when the RepositoryDirectory is <REMOTE>.

Specifies whether the connector uses the automatic and remote restart feature. This feature uses the MQ-triggered Object Activation Daemon (OAD) to restart the connector after an abnormal shutdown, or to start a remote connector from System Monitor.

This property must be set to `true` to enable the automatic and remote restart feature. For information on how to configure the MQ-triggered OAD feature. see the *Installation Guide for Windows* or *for UNIX*.

The default value is `false`.

OADMaxNumRetry

Valid only when the `RepositoryDirectory` is <REMOTE>.

Specifies the maximum number of times that the MQ-triggered OAD automatically attempts to restart the connector after an abnormal shutdown. The `OADAutoRestartAgent` property must be set to `true` for this property to take effect.

The default value is `1000`.

OADRetryTimeInterval

Valid only when the `RepositoryDirectory` is <REMOTE>.

Specifies the number of minutes in the retry-time interval for the MQ-triggered OAD. If the connector agent does not restart within this retry-time interval, the connector controller asks the OAD to restart the connector agent again. The OAD repeats this retry process as many times as specified by the `OADMaxNumRetry` property. The `OADAutoRestartAgent` property must be set to `true` for this property to take effect.

The default is `10`.

PollEndTime

Time to stop polling the event queue. The format is `HH:MM`, where *HH* represents 0-23 hours, and *MM* represents 0-59 seconds.

You must provide a valid value for this property. The default value is `HH:MM`, but must be changed.

PollFrequency

This is the interval between the end of the last poll and the start of the next poll. `PollFrequency` specifies the amount of time (in milliseconds) between the end of one polling action, and the start of the next polling action. This is not the interval between polling actions. Rather, the logic is as follows:

- Poll to obtain the number of objects specified by the value of `PollQuantity`.
- Process these objects. For some adapters, this may be partly done on separate threads, which execute asynchronously to the next polling action.
- Delay for the interval specified by `PollFrequency`.
- Repeat the cycle.

Set `PollFrequency` to one of the following values:

- The number of milliseconds between polling actions (an integer).
- The word `key`, which causes the connector to poll only when you type the letter `p` in the connector's Command Prompt window. Enter the word in lowercase.
- The word `no`, which causes the connector not to poll. Enter the word in lowercase.

The default is 10000.

Important: Some connectors have restrictions on the use of this property. Where they exist, these restrictions are documented in the chapter on installing and configuring the adapter.

PollQuantity

Designates the number of items from the application that the connector should poll for. If the adapter has a connector-specific property for setting the poll quantity, the value set in the connector-specific property will override the standard property value.

FIX

An email message is also considerd an event. The connector behaves as follows when it is polled for email.

Polled once - connector goes to pick 1. the body of the message as it is also considered an attachment also. Since no DH was specified for this mime type, it it will ignore the body. 2. conector process first PO attachment. DH is avaiable for this mime type so it sends the business object to the Visual Test Connector. If the 3. accept in VTC again no BO should come thru Polled second time 1. conector process second PO attachment. DH is avaiable for this mime type so it sends teh BO to VTC2. accept in VTC again now the third PO attachment should come through. This is the correct behaviour.

PollStartTime

The time to start polling the event queue. The format is *HH:MM*, where *HH* represents 0-23 hours, and *MM* represents 0-59 seconds.

You must provide a valid value for this property. The default value is HH:MM, but must be changed.

RequestQueue

The queue that is used by the integration broker to send business objects to the connector.

The default value is CONNECTOR/REQUESTQUEUE.

RepositoryDirectory

The location of the repository from which the connector reads the XML schema documents that store the meta-data for business object definitions.

When the integration broker is ICS, this value must be set to <REMOTE> because the connector obtains this information from the InterChange Server repository.

When the integration broker is a WebSphere message broker or WAS, this value must be set to <*local directory*>.

ResponseQueue

Applicable only if DeliveryTransport is JMS and required only if RepositoryDirectory is <REMOTE>.

Designates the JMS response queue, which delivers a response message from the connector framework to the integration broker. When the integration broker is ICS, the server sends the request and waits for a response message in the JMS response queue.

RestartRetryCount

Specifies the number of times the connector attempts to restart itself. When used for a parallel connector, specifies the number of times the master connector application-specific component attempts to restart the slave connector application-specific component.

The default is 3.

RestartRetryInterval

Specifies the interval in minutes at which the connector attempts to restart itself. When used for a parallel connector, specifies the interval at which the master connector application-specific component attempts to restart the slave connector application-specific component. Possible values ranges from 1 to 2147483647.

The default is 1.

RHF2MessageDomain

WebSphere message brokers and WAS only.

This property allows you to configure the value of the field domain name in the JMS header. When data is sent to WMQI over JMS transport, the adapter framework writes JMS header information, with a domain name and a fixed value of `mrm`. A connfigurable domain name enables users to track how the WMQI broker processes the message data.

A sample header would look like this:

```
<mcd><Msd>mrm</Msd><Set>3</Set><Type>
Retek_POPhyDesc</Type><Fmt>CwXML</Fmt></mcd>
```

The default value is `mrm`, but it may also be set to `xml`. This property only appears when DeliveryTransport is set to `JMS`and WireFormat is set to `CwXML`.

SourceQueue

Applicable only if `DeliveryTransport` is JMS and ContainerManagedEvents is specified.

Designates the JMS source queue for the connector framework in support of guaranteed event delivery for JMS-enabled connectors that use a JMS event store. For further information, see “ContainerManagedEvents” on page 78.

The default value is `CONNECTOR/SOURCEQUEUE`.

SynchronousRequestQueue

Applicable only if `DeliveryTransport` is JMS.

Delivers request messages that require a synchronous response from the connector framework to the broker. This queue is necessary only if the connector uses synchronous execution. With synchronous execution, the connector framework

sends a message to the SynchronousRequestQueue and waits for a response back from the broker on the SynchronousResponseQueue. The response message sent to the connector bears a correlation ID that matches the ID of the original message.

The default is CONNECTORNAME/SYNCHRONOUSREQUESTQUEUE

SynchronousResponseQueue

Applicable only if DeliveryTransport is JMS.

Delivers response messages sent in reply to a synchronous request from the broker to the connector framework. This queue is necessary only if the connector uses synchronous execution.

The default is CONNECTORNAME/SYNCHRONOUSRESPONSEQUEUE

SynchronousRequestTimeout

Applicable only if DeliveryTransport is JMS.

Specifies the time in minutes that the connector waits for a response to a synchronous request. If the response is not received within the specified time, then the connector moves the original synchronous request message into the fault queue along with an error message.

The default value is 0.

WireFormat

Message format on the transport.

- If the RepositoryDirectory is a local directory, the setting is CwXML.
- If the value of RepositoryDirectory is <REMOTE>, the setting isCwBO.

WsifSynchronousRequestTimeout

WAS integration broker only.

Specifies the time in minutes that the connector waits for a response to a synchronous request. If the response is not received within the specified, time then the connector moves the original synchronous request message into the fault queue along with an error message.

The default value is 0.

XMLNameSpaceFormat

WebSphere message brokers and WAS integration broker only.

A strong property that allows the user to specify short and long name spaces in the XML format of business object definitions.

The default value is short.

Appendix B. Connector Configurator

This appendix describes how to use Connector Configurator to set configuration property values for your adapter.

You use Connector Configurator to:

- Create a connector-specific property template for configuring your connector
- Create a configuration file
- Set properties in a configuration file

Note:

In this document, backslashes (\) are used as the convention for directory paths. For UNIX installations, substitute slashes (/) for backslashes and follow the conventions for each operating system.

The topics covered in this appendix are:

Overview of Connector Configurator

Connector Configurator allows you to configure the connector component of your adapter for use with these integration brokers:

- WebSphere InterChange Server (ICS)
- WebSphere MQ Integrator, WebSphere MQ Integrator Broker, and WebSphere Business Integration Message Broker, collectively referred to as the WebSphere Message Brokers (WMQI)
- WebSphere Application Server (WAS)

You use Connector Configurator to:

- Create a **connector-specific property template** for configuring your connector.
- Create a **connector configuration file**; you must create one configuration file for each connector you install.
- Set properties in a configuration file.
  You may need to modify the default values that are set for properties in the connector templates. You must also designate supported business object definitions and, with ICS, maps for use with collaborations as well as specify messaging, logging and tracing, and data handler parameters, as required.

The mode in which you run Connector Configurator, and the configuration file type you use, may differ according to which integration broker you are running. For example, if WMQI is your broker, you run Connector Configurator directly, and not from within System Manager (see "Running Configurator in stand-alone mode" on page 90).

Connector configuration properties include both standard configuration properties (the properties that all connectors have) and connector-specific properties (properties that are needed by the connector for a specific application or technology).

Because **standard properties** are used by all connectors, you do not need to define those properties from scratch; Connector Configurator incorporates them into your configuration file as soon as you create the file. However, you do need to set the value of each standard property in Connector Configurator.

The range of standard properties may not be the same for all brokers and all configurations. Some properties are available only if other properties are given a specific value. The Standard Properties window in Connector Configurator will show the properties available for your particular configuration.

For **connector-specific properties**, however, you need first to define the properties and then set their values. You do this by creating a connector-specific property template for your particular adapter. There may already be a template set up in your system, in which case, you simply use that. If not, follow the steps in "Creating a new template" on page 91 to set up a new one.

Note: Connector Configurator runs only in a Windows environment. If you are running the connector in a UNIX environment, use Connector Configurator in Windows to modify the configuration file and then copy the file to your UNIX environment.

Starting Connector Configurator

You can start and run Connector Configurator in either of two modes:

- Independently, in stand-alone mode
- From System Manager

Running Configurator in stand-alone mode

You can run Connector Configurator independently and work with connector configuration files, irrespective of your broker.

To do so:

- From **Start>Programs**, click **IBM WebSphere InterChange Server>IBM WebSphere Business Integration Tools>Connector Configurator**.
- Select **File>New>Connector Configuration**.
- When you click the pull-down menu next to **System Connectivity Integration Broker**, you can select ICS, WebSphere Message Brokers or WAS, depending on your broker.

You may choose to run Connector Configurator independently to generate the file, and then connect to System Manager to save it in a System Manager project (see "Completing a configuration file" on page 95.)

Running Configurator from System Manager

You can run Connector Configurator from System Manager.

To run Connector Configurator:

1. Open the System Manager.

2. In the System Manager window, expand the **Integration Component Libraries** icon and highlight **Connectors**.
3. From the System Manager menu bar, click **Tools>Connector Configurator**. The Connector Configurator window opens and displays a **New Connector** dialog box.
4. When you click the pull-down menu next to **System Connectivity Integration Broker**, you can select ICS, WebSphere Message Brokers or WAS, depending on your broker.

To edit an existing configuration file:

- In the System Manager window, select any of the configuration files listed in the Connector folder and right-click on it. Connector Configurator opens and displays the configuration file with the integration broker type and file name at the top.
- From Connector Configurator, select **File>Open**. Select the name of the connector configuration file from a project or from the directory in which it is stored.
- Click the Standard Properties tab to see which properties are included in this configuration file.

Creating a connector-specific property template

To create a configuration file for your connector, you need a connector-specific property template as well as the system-supplied standard properties.

You can create a brand-new template for the connector-specific properties of your connector, or you can use an existing connector definition as the template.

- To create a new template, see "Creating a new template" on page 91.
- To use an existing file, simply modify an existing template and save it under the new name. You can find existing templates in your `\WebSphereAdapters\bin\Data\App` directory.

Creating a new template

This section describes how you create properties in the template, define general characteristics and values for those properties, and specify any dependencies between the properties. Then you save the template and use it as the base for creating a new connector configuration file.

To create a template in Connector Configurator:

1. Click **File>New>Connector-Specific Property Template**.
2. The **Connector-Specific Property Template** dialog box appears.
   - Enter a name for the new template in the **Name** field below **Input a New Template Name.** You will see this name again when you open the dialog box for creating a new configuration file from a template.
   - To see the connector-specific property definitions in any template, select that template's name in the **Template Name** display. A list of the property definitions contained in that template appears in the **Template Preview** display.
3. You can use an existing template whose property definitions are similar to those required by your connector as a starting point for your template. If you do not see any template that displays the connector-specific properties used by your connector, you will need to create one.

- If you are planning to modify an existing template, select the name of the template from the list in the **Template Name** table below **Select the Existing Template to Modify: Find Template.**
- This table displays the names of all currently available templates. You can also search for a template.

Specifying general characteristics

When you click **Next** to select a template, the **Properties - Connector-Specific Property Template** dialog box appears. The dialog box has tabs for General characteristics of the defined properties and for Value restrictions. The General display has the following fields:

- **General:**
  Property Type
  Updated Method
  Description
- **Flags**
  Standard flags
- **Custom Flag**
  Flag

After you have made selections for the general characteristics of the property, click the **Value** tab.

Specifying values

The **Value** tab enables you to set the maximum length, the maximum multiple values, a default value, or a value range for the property. It also allows editable values. To do so:

1. Click the **Value** tab. The display panel for Value replaces the display panel for General.
2. Select the name of the property in the **Edit properties** display.
3. In the fields for **Max Length** and **Max Multiple Values**, enter your values.

To create a new property value:

1. Select the property in the **Edit properties** list and right-click on it.
2. From the dialog box, select **Add**.
3. Enter the name of the new property value and click OK. The value appears in the **Value** panel on the right.

The **Value** panel displays a table with three columns:

The **Value** column shows the value that you entered in the **Property Value** dialog box, and any previous values that you created.

The **Default Value** column allows you to designate any of the values as the default.

The **Value Range** shows the range that you entered in the **Property Value** dialog box.

After a value has been created and appears in the grid, it can be edited from within the table display.

To make a change in an existing value in the table, select an entire row by clicking on the row number. Then right-click in the **Value** field and click **Edit Value**.

Setting dependencies

When you have made your changes to the **General** and **Value** tabs, click **Next**. The **Dependencies - Connector-Specific Property Template** dialog box appears.

A dependent property is a property that is included in the template and used in the configuration file *only if* the value of another property meets a specific condition. For example, `PollQuantity` appears in the template only if JMS is the transport mechanism and `DuplicateEventElimination` is set to `True`.
To designate a property as dependent and to set the condition upon which it depends, do this:

1. In the **Available Properties** display, select the property that will be made dependent.
2. In the **Select Property** field, use the drop-down menu to select the property that will hold the conditional value.
3. In the **Condition Operator** field, select one of the following:

   == (equal to)

   != (not equal to)

   > (greater than)

   < (less than)

   >= (greater than or equal to)

   <=(less than or equal to)
4. In the **Conditional Value** field, enter the value that is required in order for the dependent property to be included in the template.
5. With the dependent property highlighted in the **Available Properties** display, click an arrow to move it to the **Dependent Property** display.
6. Click **Finish**. Connector Configurator stores the information you have entered as an XML document, under `\data\app` in the`\bin` directory where you have installed Connector Configurator.

Creating a new configuration file

When you create a new configuration file, you must name it and select an integration broker.

- In the System Manager window, right-click on the **Connectors** folder and select **Create New Connector**. Connector Configurator opens and displays the **New Connector** dialog box.
- In stand-alone mode: from Connector Configurator, select **File>New>Connector Configuration**. In the New Connector window, enter the name of the new connector.

You also need to select an integration broker. The broker you select determines the properties that will appear in the configuration file. To select a broker:

- In the **Integration Broker** field, select ICS, WebSphere Message Brokers or WAS connectivity.
- drop-downte the remaining fields in the **New Connector** window, as described later in this chapter.

Creating a configuration file from a connector-specific template

Once a connector-specific template has been created, you can use it to create a configuration file:

1. Click **File>New>Connector Configuration**.
2. The **New Connector** dialog box appears, with the following fields:
   - **Name**

     Enter the name of the connector. Names are case-sensitive. The name you enter must be unique, and must be consistent with the file name for a connector that is installed on the system.

     Important: Connector Configurator does not check the spelling of the name that you enter. You must ensure that the name is correct.
   - **System Connectivity**

     Click ICS or WebSphere Message Brokers or WAS.
   - **Select Connector-Specific Property Template**

     Type the name of the template that has been designed for your connector. The available templates are shown in the **Template Name** display. When you select a name in the Template Name display, the **Property Template Preview** display shows the connector-specific properties that have been defined in that template.

     Select the template you want to use and click **OK**.
3. A configuration screen appears for the connector that you are configuring. The title bar shows the integration broker and connector name. You can fill in all the field values to drop-downte the definition now, or you can save the file and complete the fields later.
4. To save the file, click **File>Save>To File** or **File>Save>To Project**. To save to a project, System Manager must be running.
   If you save as a file, the **Save File Connector** dialog box appears. Choose `*.cfg` as the file type, verify in the File Name field that the name is spelled correctly and has the correct case, navigate to the directory where you want to locate the file, and click **Save**. The status display in the message panel of Connector Configurator indicates that the configuration file was successfully created.

   Important: The directory path and name that you establish here must match the connector configuration file path and name that you supply in the startup file for the connector.
5. To complete the connector definition, enter values in the fields for each of the tabs of the Connector Configurator window, as described later in this chapter.

Using an existing file

You may have an existing file available in one or more of the following formats:

- A connector definition file.
  This is a text file that lists properties and applicable default values for a specific connector. Some connectors include such a file in a `\repository` directory in their delivery package (the file typically has the extension `.txt`; for example, CN_XML.txt for the XML connector).
- An ICS repository file.
  Definitions used in a previous ICS implementation of the connector may be available to you in a repository file that was used in the configuration of that connector. Such a file typically has the extension `.in` or `.out`.
- A previous configuration file for the connector.
  Such a file typically has the extension *.cfg.

Although any of these file sources may contain most or all of the connector-specific properties for your connector, the connector configuration file will not be complete until you have opened the file and set properties, as described later in this chapter.

To use an existing file to configure a connector, you must open the file in Connector Configurator, revise the configuration, and then resave the file.

Follow these steps to open a *.txt, *.cfg, or *.in file from a directory:

1. In Connector Configurator, click **File>Open>From File**.
2. In the **Open File Connector** dialog box, select one of the following file types to see the available files:
   - Configuration (`*.cfg`)
   - ICS Repository (`*.in`, `*.out`)

     Choose this option if a repository file was used to configure the connector in an ICS environment. A repository file may include multiple connector definitions, all of which will appear when you open the file.
   - All files (*.*)

     Choose this option if a `*.txt` file was delivered in the adapter package for the connector, or if a definition file is available under another extension.
3. In the directory display, navigate to the appropriate connector definition file, select it, and click **Open**.

Follow these steps to open a connector configuration from a System Manager project:

1. Start System Manager. A configuration can be opened from or saved to System Manager only if System Manager has been started.
2. Start Connector Configurator.
3. Click **File>Open>From Project**.

Completing a configuration file

When you open a configuration file or a connector from a project, the Connector Configurator window displays the configuration screen, with the current attributes and values.

The title of the configuration screen displays the integration broker and connector name as specified in the file. Make sure you have the correct broker. If not, change the broker value before you configure the connector. To do so:

1. Under the **Standard Properties** tab, select the value field for the `BrokerType` property. In the drop-down menu, select the value `ICS`, `WMQI`, or `WAS`.
2. The Standard Properties tab will display the properties associated with the selected broker. You can save the file now or complete the remaining configuration fields, as described in “Specifying supported business object definitions” on page 98..
3. When you have finished your configuration, click **File>Save>To Project** or **File>Save>To File**.

   If you are saving to file, select `*.cfg` as the extension, select the correct location for the file and click **Save**.

   If multiple connector configurations are open, click **Save All to File** to save all of the configurations to file, or click **Save All to Project** to save all connector configurations to a System Manager project.

Before it saves the file, Connector Configurator checks that values have been set for all required standard properties. If a required standard property is missing a value, Connector Configurator displays a message that the validation failed. You must supply a value for the property in order to save the configuration file.

Setting the configuration file properties

When you create and name a new connector configuration file, or when you open an existing connector configuration file, Connector Configurator displays a configuration screen with tabs for the categories of required configuration values.

Connector Configurator requires values for properties in these categories for connectors running on all brokers:

- Standard Properties
- Connector-specific Properties
- Supported Business Objects
- Trace/Log File values
- Data Handler (applicable for connectors that use JMS messaging with guaranteed event delivery)

Note: For connectors that use JMS messaging, an additional category may display, for configuration of data handlers that convert the data to business objects.

For connectors running on **ICS**, values for these properties are also required:

- Associated Maps
- Resources
- Messaging (where applicable)

Important: Connector Configurator accepts property values in either English or non-English character sets. However, the names of both standard and connector-specific properties, and the names of supported business objects, must use the English character set only.

Standard properties differ from connector-specific properties as follows:

- Standard properties of a connector are shared by both the application-specific component of a connector and its broker component. All connectors have the same set of standard properties. These properties are described in Appendix A of each adapter guide. You can change some but not all of these values.
- Application-specific properties apply only to the application-specific component of a connector, that is, the component that interacts directly with the application. Each connector has application-specific properties that are unique to its application. Some of these properties provide default values and some do not; you can modify some of the default values. The installation and configuration chapters of each adapter guide describe the application-specific properties and the recommended values.

The fields for **Standard Properties** and **Connector-Specific Properties** are color-coded to show which are configurable:

- A field with a grey background indicates a standard property. You can change the value but cannot change the name or remove the property.

- A field with a white background indicates an application-specific property. These properties vary according to the specific needs of the application or connector. You can change the value and delete these properties.
- Value fields are configurable.
- The **Update Method** field is displayed for each property. It indicates whether a component or agent restart is necessary to activate changed values. You cannot configure this setting.

Setting standard connector properties

To change the value of a standard property:

1. Click in the field whose value you want to set.
2. Either enter a value, or select one from the drop-down menu if it appears.
3. After entering all the values for the standard properties, you can do one of the following:
   - To discard the changes, preserve the original values, and exit Connector Configurator, click **File>Exit** (or close the window), and click **No** when prompted to save changes.
   - To enter values for other categories in Connector Configurator, select the tab for the category. The values you enter for **Standard Properties** (or any other category) are retained when you move to the next category. When you close the window, you are prompted to either save or discard the values that you entered in all the categories as a whole.
   - To save the revised values, click **File>Exit** (or close the window) and click **Yes** when prompted to save changes. Alternatively, click **Save>To File** from either the File menu or the toolbar.

Setting application-specific configuration properties

For application-specific configuration properties, you can add or change property names, configure values, delete a property, and encrypt a property. The default property length is 255 characters.

1. Right-click in the top left portion of the grid. A pop-up menu bar will appear. Click **Add** to add a property. To add a child property, right-click on the parent row number and click **Add child**.
2. Enter a value for the property or child property.
3. To encrypt a property, select the **Encrypt** box.
4. Choose to save or discard changes, as described for "Setting standard connector properties."

The Update Method displayed for each property indicates whether a component or agent restart is necessary to activate changed values.

Important: Changing a preset application-specific connector property name may cause a connector to fail. Certain property names may be needed by the connector to connect to an application or to run properly.

Encryption for connector properties

Application-specific properties can be encrypted by selecting the **Encrypt** check box in the Connector-specific Properties window. To decrypt a value, click to clear the **Encrypt** check box, enter the correct value in the **Verification** dialog box, and click **OK**. If the entered value is correct, the value is decrypted and displays.

The adapter user guide for each connector contains a list and description of each property and its default value.

If a property has multiple values, the **Encrypt** check box will appear for the first value of the property. When you select **Encrypt**, all values of the property will be encrypted. To decrypt multiple values of a property, click to clear the **Encrypt** check box for the first value of the property, and then enter the new value in the **Verification** dialog box. If the input value is a match, all multiple values will decrypt.

Update method

Refer to the descriptions of update methods found in the *Standard configuration properties for connectors* appendix, under "Setting and updating property values" on page 72.

Specifying supported business object definitions

Use the **Supported Business Objects** tab in Connector Configurator to specify the business objects that the connector will use. You must specify both generic business objects and application-specific business objects, and you must specify associations for the maps between the business objects.

Note: Some connectors require that certain business objects be specified as supported in order to perform event notification or additional configuration (using meta-objects) with their applications. For more information, see the *Connector Development Guide for C++* or the *Connector Development Guide for Java*.

If ICS is your broker

To specify that a business object definition is supported by the connector, or to change the support settings for an existing business object definition, click the **Supported Business Objects** tab and use the following fields.

Business object name: To designate that a business object definition is supported by the connector, with System Manager running:

1. Click an empty field in the **Business Object Name** list. A drop-down list displays, showing all the business object definitions that exist in the System Manager project.
2. Click on a business object to add it.
3. Set the **Agent Support** (described below) for the business object.
4. In the File menu of the Connector Configurator window, click **Save to Project**. The revised connector definition, including designated support for the added business object definition, is saved to an ICL (Integration Component Library) project in System Manager.

To delete a business object from the supported list:

1. To select a business object field, click the number to the left of the business object.
2. From the **Edit** menu of the Connector Configurator window, click **Delete Row**. The business object is removed from the list display.
3. From the **File** menu, click **Save to Project**.

Deleting a business object from the supported list changes the connector definition and makes the deleted business object unavailable for use in this implementation

of this connector. It does not affect the connector code, nor does it remove the business object definition itself from System Manager.

Agent support: If a business object has Agent Support, the system will attempt to use that business object for delivering data to an application via the connector agent.

Typically, application-specific business objects for a connector are supported by that connector's agent, but generic business objects are not.

To indicate that the business object is supported by the connector agent, check the **Agent Support** box. The Connector Configurator window does not validate your Agent Support selections.

Maximum transaction level: The maximum transaction level for a connector is the highest transaction level that the connector supports.

For most connectors, `Best Effort` is the only possible choice.

You must restart the server for changes in transaction level to take effect.

If a WebSphere Message Broker is your broker

If you are working in stand-alone mode (not connected to System Manager), you must enter the business object name manually.

If you have System Manager running, you can select the empty box under the **Business Object Name** column in the **Supported Business Objects** tab. A combo box appears with a list of the business object available from the Integration Component Library project to which the connector belongs. Select the business object you want from the list.

The **Message Set ID** is an optional field for WebSphere Business Integration Message Broker 5.0, and need not be unique if supplied. However, for WebSphere MQ Integrator and Integrator Broker 2.1, you must supply a unique **ID**.

If WAS is your broker

When WebSphere Application Server is selected as your broker type, Connector Configurator does not require message set IDs. The **Supported Business Objects** tab shows a **Business Object Name** column only for supported business objects.

If you are working in stand-alone mode (not connected to System Manager), you must enter the business object name manually.

If you have System Manager running, you can select the empty box under the Business Object Name column in the Supported Business Objects tab. A combo box appears with a list of the business objects available from the Integration Component Library project to which the connector belongs. Select the business object you want from this list.

Associated maps (ICS only)

Each connector supports a list of business object definitions and their associated maps that are currently active in WebSphere InterChange Server. This list appears when you select the **Associated Maps** tab.

The list of business objects contains the application-specific business object which the agent supports and the corresponding generic object that the controller sends

to the subscribing collaboration. The association of a map determines which map will be used to transform the application-specific business object to the generic business object or the generic business object to the application-specific business object.

If you are using maps that are uniquely defined for specific source and destination business objects, the maps will already be associated with their appropriate business objects when you open the display, and you will not need (or be able) to change them.

If more than one map is available for use by a supported business object, you will need to explicitly bind the business object with the map that it should use.

The **Associated Maps** tab displays the following fields:

- **Business Object Name**

  These are the business objects supported by this connector, as designated in the **Supported Business Objects** tab. If you designate additional business objects under the Supported Business Objects tab, they will be reflected in this list after you save the changes by choosing **Save to Project** from the **File** menu of the Connector Configurator window.
- **Associated Maps**

  The display shows all the maps that have been installed to the system for use with the supported business objects of the connector. The source business object for each map is shown to the left of the map name, in the **Business Object Name** display.
- **Explicit**

  In some cases, you may need to explicitly bind an associated map.

  Explicit binding is required only when more than one map exists for a particular supported business object. When ICS boots, it tries to automatically bind a map to each supported business object for each connector. If more than one map takes as its input the same business object, the server attempts to locate and bind one map that is the superset of the others.

  If there is no map that is the superset of the others, the server will not be able to bind the business object to a single map, and you will need to set the binding explicitly.

  To explicitly bind a map:

  1. In the **Explicit** column, place a check in the check box for the map you want to bind.
  2. Select the map that you intend to associate with the business object.
  3. In the **File** menu of the Connector Configurator window, click **Save to Project**.
  4. Deploy the project to ICS.
  5. Reboot the server for the changes to take effect.

Resources (ICS)

The **Resource** tab allows you to set a value that determines whether and to what extent the connector agent will handle multiple processes concurrently, using connector agent parallelism.

Not all connectors support this feature. If you are running a connector agent that was designed in Java to be multi-threaded, you are advised not to use this feature, since it is usually more efficient to use multiple threads than multiple processes.

Messaging (ICS)

The messaging properties are available only if you have set MQ as the value of the `DeliveryTransport` standard property and ICS as the broker type. These properties affect how your connector will use queues.

Setting trace/log file values

When you open a connector configuration file or a connector definition file, Connector Configurator uses the logging and tracing values of that file as default values. You can change those values in Connector Configurator.

To change the logging and tracing values:

1. Click the **Trace/Log Files** tab.
2. For either logging or tracing, you can choose to write messages to one or both of the following:
   - To console (STDOUT):
     Writes logging or tracing messages to the STDOUT display.

     Note: You can only use the STDOUT option from the **Trace/Log Files** tab for connectors running on the Windows platform.
   - To File:
     Writes logging or tracing messages to a file that you specify. To specify the file, click the directory button (ellipsis), navigate to the preferred location, provide a file name, and click **Save**. Logging or tracing message are written to the file and location that you specify.

     Note: Both logging and tracing files are simple text files. You can use the file extension that you prefer when you set their file names. For tracing files, however, it is advisable to use the extension `.trace` rather than `.trc`, to avoid confusion with other files that might reside on the system. For logging files, `.log` and `.txt` are typical file extensions.

Data handlers

The data handlers section is available for configuration only if you have designated a value of JMS for DeliveryTransport and a value of JMS for ContainerManagedEvents. Not all adapters make use of data handlers.

See the descriptions under `ContainerManagedEvents` in Appendix A, Standard Properties, for values to use for these properties. For additional details, see the *Connector Development Guide for C++* or the *Connector Development Guide for Java.*

Saving your configuration file

When you have finished configuring your connector, save the connector configuration file. Connector Configurator saves the file in the broker mode that you selected during configuration. The title bar of Connector Configurator always displays the broker mode (ICS, WMQI or WAS) that it is currently using.

The file is saved as an XML document. You can save the XML document in three ways:

- From System Manager, as a file with a `*.con` extension in an Integration Component Library, or
- In a directory that you specify.

- In stand-alone mode, as a file with a `*.cfg` extension in a directory folder. By default, the file is saved to `\WebSphereAdapters\bin\Data\App`.
- You can also save it to a WebSphere Application Server project if you have set one up.

For details about using projects in System Manager, and for further information about deployment, see the following implementation guides:

- For ICS: *Implementation Guide for WebSphere InterChange Server*
- For WebSphere Message Brokers: *Implementing Adapters with WebSphere Message Brokers*
- For WAS: *Implementing Adapters with WebSphere Application Server*

Changing a configuration file

You can change the integration broker setting for an existing configuration file. This enables you to use the file as a template for creating a new configuration file, which can be used with a different broker.

Note: You will need to change other configuration properties as well as the broker mode property if you switch integration brokers.

To change your broker selection within an existing configuration file (optional):

- Open the existing configuration file in Connector Configurator.
- Select the **Standard Properties** tab.
- In the **BrokerType** field of the Standard Properties tab, select the value that is appropriate for your broker.
  When you change the current value, the available tabs and field selections on the properties screen will immediately change, to show only those tabs and fields that pertain to the new broker you have selected.

Completing the configuration

After you have created a configuration file for a connector and modified it, make sure that the connector can locate the configuration file when the connector starts up.

To do so, open the startup file used for the connector, and verify that the location and file name used for the connector configuration file match exactly the name you have given the file and the directory or path where you have placed it.

Using Connector Configurator in a globalized environment

Connector Configurator is globalized and can handle character conversion between the configuration file and the integration broker. Connector Configurator uses native encoding. When it writes to the configuration file, it uses UTF-8 encoding.

Connector Configurator supports non-English characters in:

- All value fields
- Log file and trace file path (specified in the **Trace/Log files** tab)

The drop list for the `CharacterEncoding` and `Locale` standard configuration properties displays only a subset of supported values. To add other values to the drop list, you must manually modify the `\Data\Std\stdConnProps.xml` file in the product directory.

For example, to add the locale en_GB to the list of values for the Locale property, open the stdConnProps.xml file and add the line in boldface type below:

```
<Property name="Locale"
isRequired="true"
updateMethod="component restart">
                <ValidType>String</ValidType>
            <ValidValues>
                                <Value>ja_JP</Value>
                                <Value>ko_KR</Value>
                                <Value>zh_CN</Value>
                                <Value>zh_TW</Value>
                                <Value>fr_FR</Value>
                                <Value>de_DE</Value>
                                <Value>it_IT</Value>
                                <Value>es_ES</Value>
                                <Value>pt_BR</Value>
                                <Value>en_US</Value>
                                <Value>en_GB</Value>
                    <DefaultValue>en_US</DefaultValue>
            </ValidValues>
    </Property>
```

Appendix C. SWIFT message structure

This appendix describes SWIFT message structure.

SWIFT message types

SWIFT messages consist of five blocks of data including three headers, message content, and a trailer. Message types are crucial to identifying content.

All SWIFT messages include the literal "MT" (Message Type). This is followed by a 3-digit number that denotes the message type, category, and group. Consider the following example, which is an order to buy or sell via a third party:

MT502

The first digit (5) represents the category. A category denotes messages that relate to particular financial instruments or services such as Precious Metals, Syndications, or Travelers Checks. The category denoted by 5 is Securities Markets.

The second digit (0) represents a group of related parts in a transaction life cycle. The group indicated by 0 is a Financial Institution Transfer.

The third digit (2) is the type that denotes the specific message. There are several hundred message types across the categories. The type represented by 2 is a Third-Party Transfer.

Each message is assigned unique identifiers. A 4-digit session number is assigned each time the user logs in. Each message is then assigned a 6-digit sequence number. These are then combined to form an ISN (Input Sequence Number) from the user's computer to SWIFT or an OSN (Output Sequence Number) from SWIFT to the user's computer. It is important to remember that terminology is always from the perspective of SWIFT and not the user.

The Logical Terminal Address (12 character BIC), Day, Session and Sequence numbers combine to form the MIR (Message Input Reference) and MOR (Message Output Reference), respectively.

For a full list of SWIFT message types, see *All Things SWIFT: the SWIFT User Handbook*.

SWIFT field structure

This section discusses the SWIFT field structure. A field is a logical subdivision of a message block A, which consists of a sequence of components with a starting field tag and delimiters.

A field is always prefaced by a field tag that consists of two digits followed, optionally, by an alphabetic character. The alphabetic character is referred to as an option. For example, 16R is a tag (16) with an option (R) that indicates the start of

a block; 16S is a tag (16) with an option (S) that indicates the end of a block. A field is always terminated by a field delimiter. The delimiter depends on the type of field used in a message block.

There are two types of fields used in SWIFT messages: generic and non-generic. The type of field used in a SWIFT message block is determined by the Message Type. What follows is a discussion of these SWIFT field structures. For more on generic and non-generic fields and how to distinguish between them, see Part III, Chapter 3 of the *SWIFT User Handbook*

Note: The symbol CRLF shown below is a control character and represents carriage return/line feed (0D0A in ASCII hex, 0D25 in EBCDIC hex).

Non-generic fields

The structure of non-generic fields in SWIFT message blocks is as follows:
:2!n[1a]: *data content*<CRLF>

where:

: = mandatory colon

2!n = numeric character, fixed length

[1a] = one optional alphabetic character, letter option

: = mandatory colon

data content = the data content, which is defined separately for every tag

<CRLF> = field delimiter

The following is an example of a non-generic field:

:20:1234<CRLF> :32A:...<CRLF>

Note: In some cases (such as with the tag 15A...*n*), the data content is optional.

Generic fields

The structure of generic fields in SWIFT messages is as follows:
:2!n1a::4!c'/'[8c]'/'*data content*

where

:2!n1a: = same format as non-generic fields, except that 1a is mandatory

: = mandatory second colon (required in all generic fields)

4!c = qualifier

'/' = first delimiter

[8c] = issuer code or Data Source Scheme (DSS)

'/' = second delimiter

data content = See Part III, Chapter 3 of the *SWIFT User Handbook* for the format definition

Note: Non-generic fields and generic fields cannot share the same field tag letter option letter. In order to distinguish between them easily, a colon is defined as the first character of the column Component Sequence. Generic fields are defined in the same section (Part III, Chapter 3 of the *SWIFT User Handbook*) as the non-generic fields.

The following character restrictions apply to generic field data content:

- Second and subsequent lines within the data content must start with the delimiter `CRLF`.
- Second and subsequent lines within the data content must never start with a colon (:) or a hyphen (-).
- The data content must end with the delimiter `CRLF`.

SWIFT message block structure

The connector supports SWIFT Financial Application (FIN) messages. They have the following structure:

{1: *Basic Header Block*} {2: *Application Header Block*} {3: *User Header Block*} {4: *Text Block or body*} {5: *Trailer Block*}

These five SWIFT message blocks include header information, the body of the message, and a trailer. All blocks have the same basic format:

{*n*:...}

The curly braces ({}) indicate the beginning and end of a block. *n* is the block identifier, in this case a single integer between 1 and 5. Each block identifier is associated with a particular part of the message. There is no carriage return or line feed (`CRLF`) between blocks.

Blocks 3, 4, and 5 may contain sub-blocks or fields delimited by field tags. Block 3 is optional. Many applications, however, populate block 3 with a reference number so that when SWIFT returns the acknowledgement, it can be used for reconciliation purposes.

Note: For further information on SWIFT message blocks, see Chapter 2 of the *SWIFT User Handbook FIN System Messages Document*.

{1: Basic Header Block}

The basic header block is fixed-length and continuous with no field delimiters. It has the following format:

```
{1:    F    01   BANKBEBB   2222   123456}
(a)   (b)  (c)     (d)       (e)      (f)
```

a) `1:` = Block ID (always `1`)

b) Application ID as follows:

- `F` = FIN (financial application)
- `A` = GPA (general purpose application)
- `L` = GPA (for logins, and so on)

c) Service ID as follows:
- 01 = FIN/GPA
- 21 = ACK/NAK

d) BANKBEBB = Logical terminal (LT) address. It is fixed at 12 characters; it must not have X in position 9.

e) 2222 = Session number. It is generated by the user's computer and is padded with zeros.

f) 123456 = Sequence number that is generated by the user's computer. It is padded with zeros.

{2: Application Header Block}

There are two types of application headers: Input and Output. Both are fixed-length and continuous with no field delimiters.

The input (to SWIFT) structure is as follows:

```
{2:    I     100    BANKDEFFXXXX    U       3       003}
(a)   (b)    (c)      (d)          (e)     (f)      (g)
```

a) 2: = Block ID (always 2)

b) I = Input

c) 100 = Message type

d) BANKDEFFXXXX = Receiver's address with X in position 9/ It is padded with Xs if no branch is required.

e) U = the message priority as follows:
- S = System
- N = Normal
- U = Urgent

f) 3 = Delivery monitoring field is as follows:
- 1 = Non delivery warning (MT010)
- 2 = Delivery notification (MT011)
- 3 = Both valid = U1 or U3, N2 or N

g) 003 = Obsolescence period. It specifies when a non-delivery notification is generated as follows:
- Valid for U = 003 (15 minutes)
- Valid for N = 020 (100 minutes)

The output (from SWIFT) structure is as follows:

```
{2:   O      100   1200   970103BANKBEBBAXXX2222123456   970103  1201   N}
(a)  (b)      (c)   (d)          (e)                       (f)    (g)   (h)
```

a) 2: = Block ID (always 2)

b) O = Output

c) 100 = Message type

d) 1200 = Input time with respect to the sender

e) The Message Input Reference (MIR), including input date, with Sender's address

f) 970103 = Output date with respect to Receiver

g) 1201 = Output time with respect to Receiver

h) N = Message priority as follows:

- S = System
- N = Normal
- U = Urgent

{3: User Header Block}

This is an optional block and has the following structure:

```
{3:  {113:xxxx}  {108:abcdefgh12345678}     }
(a)     (b)             ( c)
```

a) 3: = Block ID (always 3)

b) 113:xxxx = Optional banking priority code

c) This is the Message User Reference (MUR) used by applications for reconciliation with ACK.

Note: Other tags exist for this block. They include tags (such as 119, which can contain the code ISITC on an MT521) that may force additional code word and formatting rules to validate the body of the message as laid down by ISITC (Industry Standardization for Institutional Trade Communication). For further information, see *All Things SWIFT: the SWIFT User Handbook*.

{4: Text Block or body}

This block is where the actual message content is specified and is what most users see. Generally the other blocks are stripped off before presentation. The format, which is variable length and requires use of CRLF as a field delimiter, is as follows:

```
{4:CRLF
:20:PAYREFTB54302 CRLF
:32A:970103BEF1000000,CRLF
:50:CUSTOMER NAME CRLF
AND ADDRESS CRLF
:59:/123-456-789 CRLF
BENEFICIARY NAME CRLF
AND ADDRESS CRLF
-}
```

The symbol CRLF is a mandatory delimiter in block 4.

The example above is of type MT100 (Customer Transfer) with only the mandatory fields completed. It is an example of the format of an ISO 7775 message structure. Block 4 fields must be in the order specified for the message type in the appropriate volume of the *SWIFT User Handbook*.

The content of the text block is a collection of fields. For more on SWIFT fields, see "SWIFT field structure" on page 105. Sometimes, the fields are logically grouped into sequences. Sequences can be mandatory or optional, and can repeat. Sequences also can be divided into subsequences. In addition, single fields and groups of consecutive fields can repeat. For example, sequences such as those in the SWIFT Tags 16R and 16S may have beginning and ending fields. Other sequences, such as Tag 15, have only a beginning field. In yet other message types, no specific tags mark the start or end of a field sequence.

The format of block 4 field tags is:

:*nna*:

nn = Numbers

a = Optional letter, which may be present on selected tags

For example:

:20: = Transaction reference number

:58A: = Beneficiary bank

The length of a field is as follows:

nn = Maximum length

nn! = Fixed-length

nn-*nn* = Minimum and maximum length

nn * *nn* = Maimum number of lines times maximum line length

The format of the data is as follows:

n = Digits

d = Digits with decimal comma

h = Uppercase hexadecimal

a = Uppercase letters

c = Uppercase alphanumeric

e = Space

x = SWIFT character set

y = Uppercase level A ISO 9735 characters

z = SWIFT extended character set

Some fields are defined as optional. If optional fields are not required in a specific message, do not include them because blank fields are not allowed in the message.

/,word = Characters “as is”

[...] = Brackets indicate an optional element

For example:

4!c[/30x]	This is a fixed 4 uppercase alphanumeric, optionally followed by a slash and up to 30 SWIFT characters.
ISIN1!e12!c	This is a code word followed by a space and a 12 fixed uppercase alphanumeric.

Note: In some message types, certain fields are defined as conditional. For example, when a certain field is present, another field may change from optional to mandatory or forbidden. Certain fields may contain sub-fields, in which case there is no CRLF between them. Validation is not supported.

Certain fields have different formats that depend on the option that is chosen. The option is designated by a letter after the tag number, for example:

:32A:000718GBP1000000,00	Value Date, ISO Currency, and Amount
:32B:GBP1000000,00	ISO Currency and Amount

Note: The SWIFT standards for amount formats are: no thousand separators are allowed (10,000 is not allowed, but 10000 is allowed); use a comma (not a decimal point) for a decimal separator (1000,45 = one thousand and forty-five hundredths).

:58A:NWBKGB2L	Beneficiary SWIFT address
:58D:NatWest Bank Head Office London	Beneficiary full name and address

{5: Trailer Block}

A message always ends in a trailer with the following format:

```
{5: {MAC:12345678}{CHK:123456789ABC}
```

This block is for SWIFT system use and contains a number of fields that are denoted by keywords such as the following:

MAC Message Authentication Code calculated based on the entire contents of the message using a key that has been exchanged with the destination and a secret algorithm. Found on message categories 1,2,4,5,7,8, most 6s and 304.

CHK Checksum calculated for all message types.

PDE Possible Duplicate Emission added if user thinks the same message was sent previously

DLM Added by SWIFT if an urgent message (U) has not been delivered within 15 minutes, or a normal message (N) within 100 minutes.

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