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Adapter for TCP/IP User Guide

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Note!

Before using this information and the product it supports, read the information in “Notices” on page 69.

First Edition (30 June 2004)

This edition of this document applies toIBM WebSphere Business Integration Adapter for TCP/IP (5724-i47) version 1.0.0.

To send us your comments about IBM WebSphere Business Integration documentation, e-mail doc-comments@us.ibm.com. We look forward to hearing from you.

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Contents

About this document

The IBM(R) WebSphere(R) Business Integration Adapters portfolio supplies connectivity for leading e-business technologies, enterprise applications, and 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, troubleshooting, and business object development for the IBM WebSphere Business Integration Adapter for TCP/IP.

Audience

This document is for consultants, developers, and system administrators who use the adapter at customer sites.

Related documents

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

You can install the documentation or read it directly online at one of the following sites:

- If you are using WebSphere MQ Integrator Broker or WebSphere Application Server as your integration broker: www.ibm.com/software/websphere/wbiadapters/infocenter
- If you are using InterChange Server as your integration broker: www.ibm.com/websphere/integration/wicserver/infocenter

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

The documentation set consists primarily of Portable Document Format (PDF) files, with some additional files in HTML format. To read it, you need an HTML browser such as Netscape Navigator or Internet Explorer, and Adobe Acrobat Reader 4.0.5 or higher. For the latest version of Adobe Acrobat Reader for your platform, go to the Adobe website (www.adobe.com).

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.

Typographic conventions

This document uses the following conventions:

`courier font`	Indicates a literal value, such as a command name, file name, information that you type, or information that the system prints on the screen.

italic	Indicates a new term the first time that it appears, 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.
`{ }`	In a syntax line, curly braces surround a set of options from which you must choose one and only one.
|	In a syntax line, a pipe separates 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.
`< >`	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 path names are relative to the directory where the connector is installed on your machine.
ProductDir	Represents the directory where the IBM WebSphere Business Integration Adapters product is installed. The default directory is WebSphereAdapters.

New in this release

Version 1.0.0 is the first release of the WebSphere Business Integration Adapter for TCP/IP.

Chapter 1. Overview

This chapter provides a brief overview of the TCP/IP adapter, explaining terms you need to know, and describing adapter processing. It is important that you have a basic understand the adapter before installing, configuring, and using it.

Task roadmap

To use the adapter for TCP/IP, you must perform the tasks described in Table 1.

Table 1. Using the adapter: task roadmap

Task	Associated procedure (see...)	For more information (see...)
Installing the adapter	Chapter 2, "Installing the Connector," on page 5	*Installation Guide for WebSphere Business Integration Adapters*
Configuring business and meta- objects	Chapter 3, "Business Objects and Meta-Objects in the TCP/IP Adapter," on page 9	*Business Object Development Guide*
Configuring the connector	Chapter 4, "Configuring the Connector," on page 19 Appendix A, "Standard Configuration Properties," on page 41 Appendix B, "Connector Specific Properties And Required Business Object Properties," on page 59	*Connector Development Guide*
Running the connector	Chapter 5, "Running the connector," on page 33	*Connector Development Guide*
Maintaining the connector	Chapter 6, "Maintaining the Connector," on page 37	

Terminology

To understand the adapter, you must know these terms:

adapter
: The component in the WebSphere business integration system that provides components to support communication between an integration broker and either an application or a technology. An adapter always includes a connector, message files, and configuration tools. It can also include an Object Discovery Agent (ODA) or a data handler.

adapter framework
: The software that IBM provides to configure and run an adapter. The runtime components of the adapter framework include the Java runtime environment, the connector framework, and the Object Discovery Agent (ODA) runtime. This connector framework includes the connector libraries (C++ and Java) needed to develop new connectors. The ODA runtime

includes the library in the Object Development Kit (ODK) needed to develop new ODAs. The configuration components include the following tools:

- Business Object Designer,
- Connector Configurator,
- Log Viewer,
- System Manager,
- Adapter Monitor,
- Test Connector
- and, optionally, any Object Discovery Agents (ODAs) associated with an adapter.

Adapter Development Kit (ADK)
A development kit that provides some samples for adapter development, including sample connectors and Object Discovery Agents (ODAs).

connector
The component of an adapter that uses business objects to send information about an event to an integration broker (event notification) or receive information about a request from the integration broker (request processing). A connector consists of the connector framework and the connector's application (or technology)-specific component.

connector framework
The component of a connector that manages interactions between a connector's application (or technology)-specific component and the integration broker. This component provides all required management services and retrieves the meta-data that the connector requires from the repository. The connector framework, whose code is common to all connectors, is written in Java and includes a C++ extension to support application-specific components written in C++.

connector controller
A subcomponent of the connector framework used when the integration broker in the system is the InterChangeServer. This subcomponent interacts with collaborations, a feature of ICS. A connector controller runs within InterChangeServer and initiates mapping between application-specific and generic business objects, and manages collaboration subscriptions to business object definitions.

integration broker
The component in the WebSphere business integration system that integrates data among heterogeneous applications. An integration broker typically provides a variety of services that include: the ability to route data, a repository of rules that govern the integration process, connectivity to a variety of applications, and administrative capabilities that facilitate integration.

WebSphere business integration system
An enterprise solution that moves information among diverse sources to perform business exchanges, and that processes and routes information among disparate applications in the enterprise environment. The business integration system consists of an integration broker and one or more adapters.

Connector architecture

Figure 1 shows the connector components and their relationships to the WebSphere business integration system and to the TCP/IP network to which they are connected.

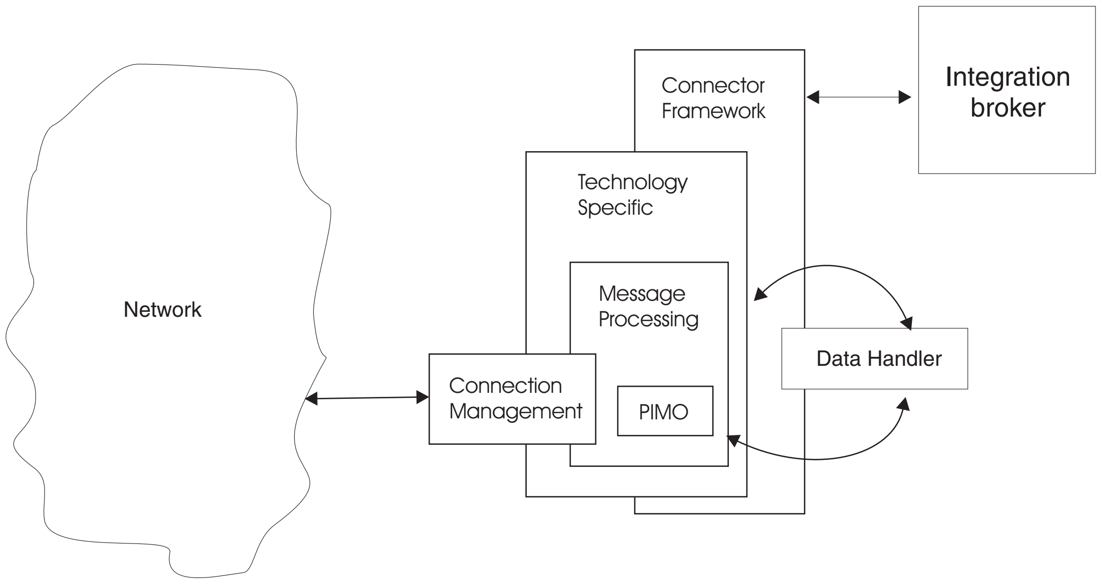


Figure 1. Architecture of the connector

There are industry specific message standards, such as the HL7 protocol in the health care industry, which allow data to be sent out directly over TCP/IP networks. The TCP/IP adapter provides a robust, highly scalable way to route such messages into or out of the WebSphere business integration system, regardless of the nature of the TCP application at the other end of the connection.

In event, or inbound, processing, the adapter's connector acts as a TCP server, listening on the designated socket, and setting up and managing the load on the socket once the connection with a client is established. The data goes from the connection management component to the message processing component, where some basic pre-processing is done, using a sub-component called the PIMO. After pre-processing is complete, the connector calls a pre-configured data handler to convert the message into the corresponding business object. Then the connector framework publishes that object to the integration broker. One TCP server can be configured per connector instance.

In request, or outbound, processing, the integration broker sends the connector a business object that represents the message it wishes to send to a pre-configured target host or application. A data handler converts the object into a message, which may also, if necessary, be sent for post-processing by the PIMO subcomponent. Then the connector, acting as a TCP client, contacts the appropriate server, establishes the connection, and manages sending the data out. If required, the connector also handles any responses that the target server may provide. Multiple TCP clients can be configured per connector instance.

Chapter 2. Installing the Connector

- "The adapter environment"
- "Installing the connector" on page 6
- "Verifying the installation" on page 6

This chapter provides a description of the tasks you must complete to install the TCP/IP connector.

The adapter environment

Before installing the adapter, you must understand its environmental requirements as described in the following sections:

- "Broker compatibility"
- "Processing locale-dependent data" on page 6

Broker compatibility

The adapter framework that an adapter uses must be compatible with the versions of the integration brokers with which the adapter is communicating. Version 1.0.x of the adapter for TCP/IP is supported on the following adapter framework and with the following integration brokers:

- **Adapter framework**: WebSphere Business Integration Adapter Framework versions 2.4.0. and 2.4.1.
- **Integration brokers**:
  - WebSphere InterChange Server, versions 4.2.x
  - WebSphere MQ Integrator, version 2.1.0
  - WebSphere MQ Integrator Broker version 2.1.0
  - WebSphere Business Integration Message Broker 5.0 with CSD02
  - WebSphere Application Server Enterprise, version 5.0.2, with WebSphere Studio Application Developer Integration Edition, version 5.0.1

See the *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.

Processing locale-dependent data

The connector has been internationalized so that it can support delivery of double-byte character sets (DBCS) going into an interface that also supports double-byte character sets, and deliver message text in the specified language. When the connector transfers data from a location that uses one character code to a location that uses a different code set, it performs character conversion to preserve the meaning of the data.

The Java run time environment within the Java Virtual Machine (JVM) represents data in the Unicode character code set. Unicode contains encodings for characters in most known character code sets (both single-byte and multibyte). Most components in the WebSphere business integration system are written in Java; therefore, when data is transferred between most integration components, there is no need for character conversion.

Installing the connector

This section describes the tasks you must perform to install the connector and its associated business objects. Refer to "The adapter environment" on page 5 for software prerequisites and compatibility.

After you have installed all prerequisite software on the machine, you can install the connector and the business objects.

For complete instructions on installing the adapter (which includes the connector and related files), refer to the *Installation Guide for WebSphere Business Integration Adapters*, located in the WebSphere Business Integration Adapters Infocenter at the following web site:

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

Verifying the installation

Once you have installed the connector, the files in the following tables should be installed on your machine. In the tables, *ProductDir* represents the directory in which you have installed the IBM WebSphere Business Integration Adapter Software.

Installed Windows File Structure

The table below describes the file structure used by the connector as installed in a Windows machine.

Table 2. Files installed with the connector - Windows

Directory	**Installed files**
ProductDir\bin\Data\App	BIA_TCPIPConnectorTemplate --The connector's configuration file template
ProductDir\connectors\TCPIP	BIA_TCPIP.jar--The main connector code start_TCPIP.bat--The connector startup batch file
ProductDir\messages	BIA_TCPIPConnector.txt—The connector message file, containing error messages and codes

Table 2. Files installed with the connector - Windows (continued)

Directory	**Installed files**
ProductDir\TCPIP\Samples	• Definition files for business and meta objects that the connector uses for internal processing • Sample applications configured with the TCP/IP connector, including samples for use with NCPDP, HL7 over LLP, and text/name-value

Installed UNIX File Structure

The table below describes the file structure used by the connector as installed on a UNIX machine.

Table 3. Files installed with the connector - UNIX

Directory	**Installed files**
ProductDir/bin/Data/App	BIA_TCPIPConnectorTemplate --The connector's configuration file template
ProductDir/connectors/TCPIP	BIA_TCPIP.jar--The main connector code start_TCPIP.sh--The connector startup shell file
ProductDir/messages	BIA_TCPIPConnector.txt—The connector message file , containing error messages and codes
ProductDir\TCPIP\Samples	• Definition files for business and meta objects that the connector uses for internal processing • Sample applications configured with the TCP/IP connector, including samples for use with NCPDP, HL7 over LLP, and text/name-value

Chapter 3. Business Objects and Meta-Objects in the TCP/IP Adapter

The connector, the runtime component of the adapter for TCP/IP, is designed as a general purpose conduit to route data transmitted directly over TCP/IP networks under well-known protocols, such as the HL7 protocol in the health care industry, into and out of the WebSphere Business Integration system. Inbound, or event, information is captured from the network message stream by the connector, transformed into a WBI business object, and published to the integration broker. Outbound, or service call request, information is received from the integration broker as a WBI business object, transformed into a network message stream, and sent back over the network. The nature of the WBI business object in this flow is completely dependent on the data handler, a data transformation plug-in that the connector calls based on settings in the connector configuration file. The data handler, and not the adapter itself, translates the messages to and from the appropriate WBI business object form.

But there are three other types of objects that facilitate data management and direct the flow of processing inside the connector itself:
- "Internal Business Objects"
- "General Meta Objects" on page 11
- "PIMO (Production Instruction Meta Object) Framework Meta Objects" on page 15

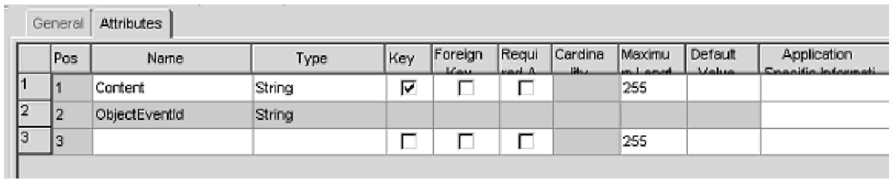
The following sections describe these objects, their function in the connector's internal processing, and their structure.

Internal Business Objects

The connector's internal business objects are used as transitional data wrappers, as data is pulled off the network (in event mode) and as it is being fed to the network (in service call request mode).

BIA_ContentBO

In event mode, the connector functions as a TCP server, listening on a socket for requests from remote applications to establish a channel to transmit data. The connection management subcomponent establishes the connection and manages the incoming data stream from the network, including load balancing and setting up parallel processes to handle multiple requests. As the data flows in, it is passed off to the message processing component where it is held in a BIA_ContentBO, the basic data wrapper.



	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application
1	1	Content	String	☑	☐	☐		255		
2	2	ObjectEventId	String							
3	3			☐	☐	☐		255		

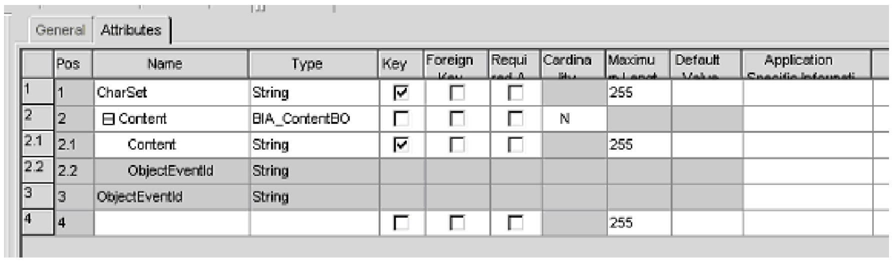
Figure 2. BIA_ContentBO in the Business Object Designer

The pertinent attributes of the BIA_ContentBO are as follows:

BO Level Attributes	Description
Content	Stores application or protocol data

BIA_InputMessage

The content object is contained in a BIA_InputMessage business object. The input message object may initially include complete and incomplete messages from the remote application. The connector separates complete and incomplete messages, queuing the incomplete messages until they are complete, and sending completed messages, wrapped in their BIA_InputMessage objects, to the PIMO framework where some forms of pre-processing may be done before they are passed on to the data handler for final processing.



	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application
1	1	CharSet	String	✓	☐	☐		255		
2	2	⊟ Content	BIA_ContentBO	☐	☐	☐	N			
2.1	2.1	Content	String	✓	☐	☐		255		
2.2	2.2	ObjectEventId	String							
3	3	ObjectEventId	String							
4	4			☐	☐	☐		255		

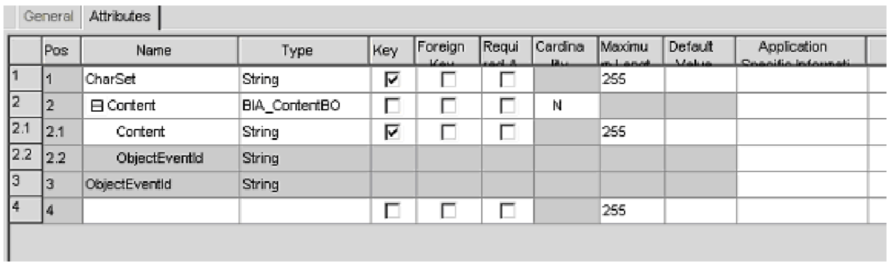
Figure 3. BIA_InputMessage in the Business Object Designer

The pertinent attributes of the BIA_InputMessage object are as follows:

BO Level Attributes	Description
CharSet	Encoding applied to the incoming bytes
Content	Stores content coming in the socket as BIA_ContentBOs. It is of N cardinality because attribute length is limited compared to length of incoming message

BIA_ApplicationMessage

In service call request mode, the WBI business objects that represent messages to be transmitted to the remote application are sent from the integration broker. These objects are translated into the appropriate message form by the data handler. The connector wraps this message data in a BIA_ContentBO which is contained in a BIA_ApplicationMessage object. The message data may be subject to PIMO post-processing, after which the connector, acting as a TCP client, sends the message data back out over the TCP/IP network to a target specified in the connector configuration file.



	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application
1	1	CharSet	String	✓	☐	☐		255		
2	2	⊟ Content	BIA_ContentBO	☐	☐	☐	N			
2.1	2.1	Content	String	✓	☐	☐		255		
2.2	2.2	ObjectEventId	String							
3	3	ObjectEventId	String							
4	4			☐	☐	☐		255		

Figure 4. BIA_ApplicationMessage in the Business Object Designer

The pertinent attributes of the BIA_ApplicationMessage object are as follows:

BO Level Attributes	**Description**
Charset	Encoding applied on incoming bytes
Content	Stores content coming in from the data handler as BIA_ContentBOs. It is of N cardinality because attribute length is limited compared to length of incoming message

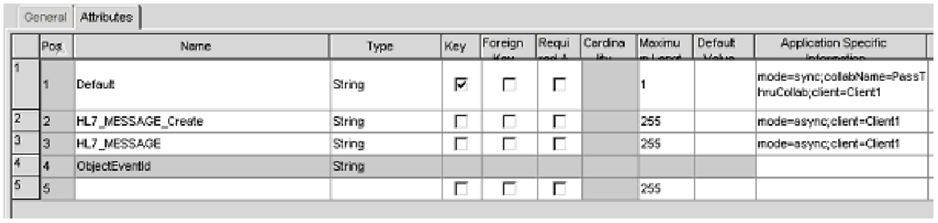
There are two other general internal business objects used by the connector: the BIA_ResponseMessage object, which contains any acknowledgement message--wrapped in a content object--from the remote application as a result of a service call request; and BIA_FinalMessage object, which contains information for the connection management subcomponent itself. The definition files for all internal business objects and meta objects are stored as XML schema files (.xsd) in the following directories: *ProductDir*\connectors\TCPIP\Samples for Windows and *ProductDir*/connectors/TCPIP/Samples for UNIX. They can be viewed either using the Business Object Designer or an XML-capable browser.

General Meta Objects

There are three groups of general meta objects in the connector that correspond to, and are set by, three properties in the connector configuration file: the configuration meta object, the service registration meta object (this is actually a nested set of objects), and data handler meta object (which is also a nested set).

Configuration Meta Object

The configuration meta object is a BIA_Static_MO. It stores static meta information for processing various message types as Application Specific Information (ASI) values.



	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application Specific
1	1	Default	String	✓	☐	☐		1		mode=sync;collabName=PassThruCollab;client=Client1
2	2	HL7_MESSAGE_Create	String	☐	☐	☐		255		mode=async;client=Client1
3	3	HL7_MESSAGE	String	☐	☐	☐		255		mode=async;client=Client1
4	4	ObjectEventId	String							
5	5			☐	☐	☐		255		

Figure 5. BIA_Static_MO in the Business Object Designer

The pertinent attributes of this example object are as follows:

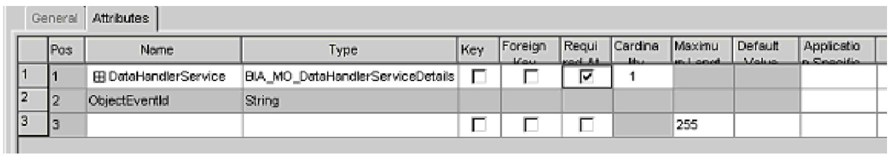
MO Level Attributes	Description
Default	Describes the default values.
HL7_Message_Create	Describes the static meta attribute values for the Create verb associated with HL7_Message objects
HL7_Message	Describes the static meta attribute values associated with HL7_Message objects

The types of static meta information for processing message types that are stored as ASI values for *each* specified message type are as follows:

Application Specific Information for each Message Type	Description
mode =	Possible values are sync or async. When ″sync″ the connector in event processing contacts the broker in a synchronous manner. When ″async″, the contact is asynchronous
collabName =	Relevant only in synchronous event processing. Names the collaboration that the connector needs to invoke
client = Clientx	Relevant for service call request processing. Names the remote server config stored in the connector configuration attribute Clientx

Service Registration Meta Object

The service registration meta object is a BIA_MO_Service. This is the top level object in a set of objects that describe multiple types of ″services″ that can be used in processing message types. A ″service″ is any reusable functionality. Only a Data Handler Service is defined for this release, but others, such as a Database Service for database access, could also be defined.



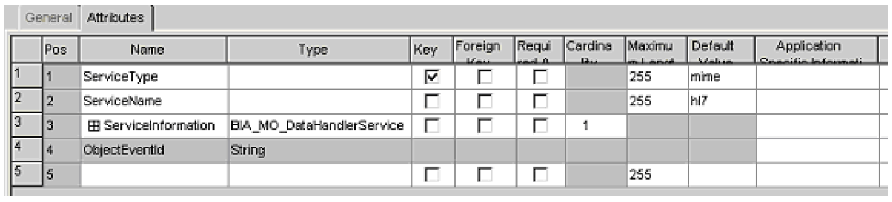
	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Applicatio
1	1	DataHandlerService	BIA_MO_DataHandlerServiceDetails	☐	☐	✓	1			
2	2	ObjectEventId	String							
3	3			☐	☐	☐		255		

Figure 6. BIA_MO_Service in the Business Object Designer

The pertinent attributes of the object are as follows:

MO Level Attributes	Description
DataHandlerService	References a BIA_MO_DataHandlerServiceDetails, which contains further information

The BIA_MO_DataHandlerServiceDetails object provides additional information for for data handler service.



General | Attributes

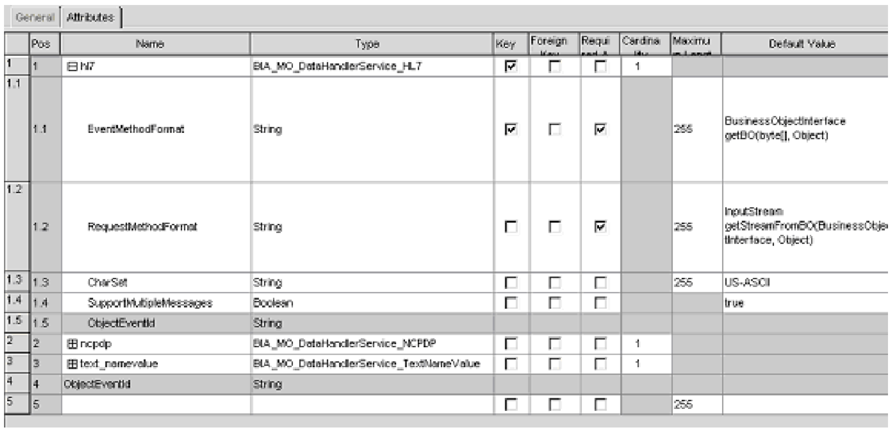
	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application
1	1	ServiceType		✓	☐	☐		255	mime	
2	2	ServiceName		☐	☐	☐		255	hl7	
3	3	⊞ ServiceInformation	BIA_MO_DataHandlerService	☐	☐	☐	1			
4	4	ObjectEventId	String							
5	5			☐	☐	☐		255		

Figure 7. BIA_MO_DataHandlerServiceDetails in the Business Object Designer

The pertinent attributes of the object are as follows:

MO Level Attribute	Description
Service Type	Contains additional information for specifying the service type. It is not used for connector processing
ServiceName	Specifies the Service Name. In the case of the DataHandlerService, this is the mime type of the message to be processed as it designated in the connector configuration file in the DataHandlerMimeType attribute
ServiceInformation	References a BIA_MO_DataHandlerService, which contains further information

The BIA_MO_DataHandlerService object provides specific information for invoking the appropriate data handler and its methods.



General | Attributes

	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default Value
1	1	⊟ hl7	BIA_MO_DataHandlerService_HL7	✓	☐	☐	1		
1.1	1.1	EventMethodFormat	String	✓	☐	✓		255	BusinessObjectInterface getBO(byte[], Object)
1.2	1.2	RequestMethodFormat	String	☐	☐	✓		255	InputStream getStreamFromBO(BusinessObje tInterface, Object)
1.3	1.3	CharSet	String	☐	☐	☐		255	US-ASCII
1.4	1.4	SupportMultipleMessages	Boolean	☐	☐	☐			true
1.5	1.5	ObjectEventId	String						
2	2	⊞ ncpdp	BIA_MO_DataHandlerService_NCPDP	☐	☐	☐	1		
3	3	⊞ text_namevalue	BIA_MO_DataHandlerService_TextNameValue	☐	☐	☐	1		
4	4	ObjectEventId	String						
5	5			☐	☐	☐		255	

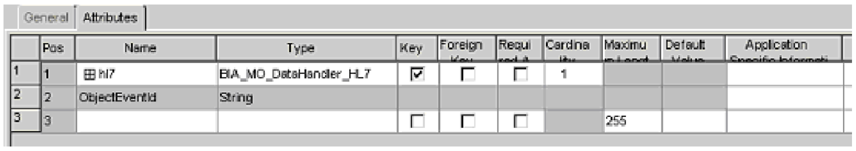
Figure 8. BIA_MO_DataHandlerService in the Business Object Designer

The pertinent attributes of the object are as follows:

MO Level Attributes	Description
hl7	Defines the handling for a specific mime type. The object (the example is a BIA_MO_DataHandlerService_HL7) referenced in this attribute contains specific information used by the data handler. The related child attributes below (indicated by a +) belong to the contained object. They are used if the mime type listed here matches the ServiceName attribute in the BIA_MO_DataHandlerServiceDetails object.
+EventMethodFormat	Stores the HL7 DataHandler method to be invoked for event processing
+RequestMethodFormat	Stores the HL7 DataHandler method to be invoked for service call request processing
+CharSet	Stores the CharSet of the message data coming into the socket
+SupportMultipleMessages	Tells the connector whether the data coming in contains single or multiple messages
ncpdp	Defines the handling for a second mime type through a reference to another type-specific object (the example here is a BIA_MO_DataHandlerService_NCPDP)

Data Handler Meta Object

The data handler meta object is a BIA_MO_DataHandler_Default. This is the top level object in a hierarchy that stores information used by the designated data handler. This information is distinct from the information stored in the Service Registration object hierarchy.



	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maximu	Default	Application
1	1	⊞ hl7	BIA_MO_DataHandler_HL7	☑	☐	☐	1			
2	2	ObjectEventId	String							
3	3			☐	☐	☐		255		

Figure 9. BIA_MO_DataHandlerDefault in the Business Object Designer

The pertinent attributes of the object are as follows:

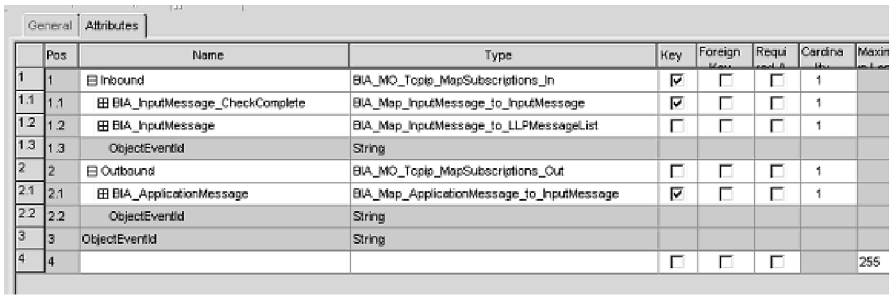
MO Level Attributes	Description
hl7	Defines the handling for a mime type, as designated in the connector configuration file in the DataHandlerMimeType attribute. The referenced object (in this example, a BIA_MO_DataHandler_HL7) contains type specific information used by the data handler

PIMO (Production Instruction Meta Object) Framework Meta Objects

The Production Instruction Meta Object framework provides an abstract mechanism for performing certain kinds of object manipulation inside the connector. In the adapter for TCP/IP, this mechanism is used to provide pre- and post-processing of message data. The mechanism itself is discussed in more detail in Appendix C, "Adapter Processing," on page 65, but the main meta objects used by the framework are presented here for completeness.

BIA_MO_Tcpip_MapSubscriptions

Processing in the PIMO is based on a series of transformations ordered by a set of mapping meta objects. At the top of the map hierarchy is the BIA_MO_Tcpip_MapSubscriptions object.



	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maxin
1	1	⊟ Inbound	BIA_MO_Tcpip_MapSubscriptions_In	✓	☐	☐	1	
1.1	1.1	⊞ BIA_InputMessage_CheckComplete	BIA_Map_InputMessage_to_InputMessage	✓	☐	☐	1	
1.2	1.2	⊞ BIA_InputMessage	BIA_Map_InputMessage_to_LLPMessageList	☐	☐	☐	1	
1.3	1.3	ObjectEventId	String					
2	2	⊟ Outbound	BIA_MO_Tcpip_MapSubscriptions_Out	☐	☐	☐	1	
2.1	2.1	⊞ BIA_ApplicationMessage	BIA_Map_ApplicationMessage_to_InputMessage	✓	☐	☐	1	
2.2	2.2	ObjectEventId	String					
3	3	ObjectEventId	String					
4	4			☐	☐	☐		255

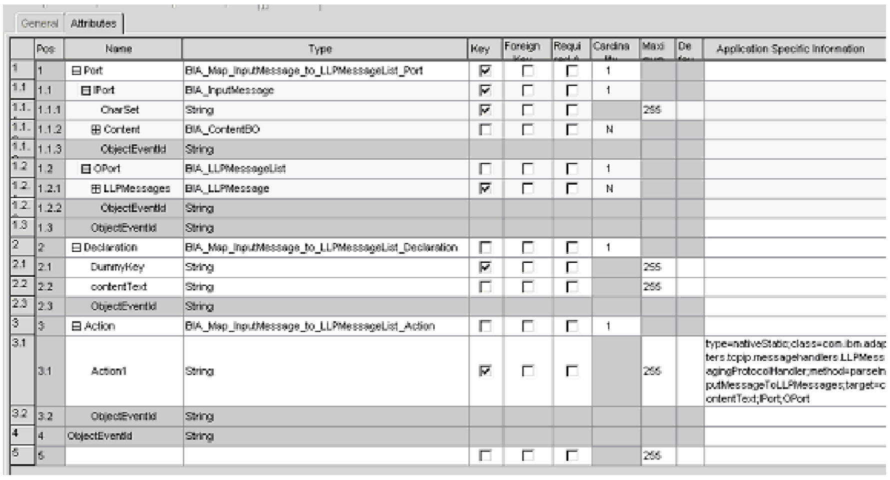
Figure 10. BIA_MO_Tcpip_MapSubscriptions in the Business Object Designer

The pertinent attributes of the object are as follows:

MO Level Attributes	Description
Inbound	Indicates the set of maps used by PIMO in event mode processing. In the example, two maps will be used.
+BIA_InputMessage_CheckComplete	Child attribute. Contains a mapping meta object (BIA_Map_InputMessage_to_InputMessage) used to separate multiple objects. Assumes that the SupportMultipleMessages value in the BIA_MO_DataHandlerService object is set to true.
+BIA_InputMessage	Child attribute. Contains a mapping meta object (BIA_Map_InputMessage _to_LLPMessageList) used to remove LLP headers and tailers from the main HL7 data. See below for further details.
Outbound	Indicates the set of maps used by PIMO in service call request mode processing. In the example, one map will be used.
+BIA_ApplicationMessage	Child attribute. Contains a mapping meta object (BIA_Map_ApplicationMessage _to_InputMessage)

BIA_Map_InputMessage_to_LLPMessageList

The BIA_Map_InputMessage_to_LLPMessageList map object contains the instructions PIMO needs to carry out the second stage of the inbound mapping process indicated in the example map subscription meta object above.


General | Attributes

	Pos	Name	Type	Key	Foreign	Requi	Cardina	Maxi	De	Application Specific Information
1	1	⊟ Port	BIA_Map_InputMessage_to_LLPMessageList_Port	☑	☐	☐	1			
1.1	1.1	⊟ IPort	BIA_InputMessage	☑	☐	☐	1			
1.1.	1.1.1	CharSet	String	☑	☐	☐		255		
1.1.	1.1.2	⊞ Content	BIA_ContentBO	☐	☐	☐	N			
1.1.	1.1.3	ObjectEventId	String							
1.2	1.2	⊟ OPort	BIA_LLPMessageList	☐	☐	☐	1			
1.2.	1.2.1	⊞ LLPMessages	BIA_LLPMessage	☑	☐	☐	N			
1.2.	1.2.2	ObjectEventId	String							
1.3	1.3	ObjectEventId	String							
2	2	⊟ Declaration	BIA_Map_InputMessage_to_LLPMessageList_Declaration	☐	☐	☐	1			
2.1	2.1	DummyKey	String	☑	☐	☐		255		
2.2	2.2	contentText	String	☐	☐	☐		255		
2.3	2.3	ObjectEventId	String							
3	3	⊟ Action	BIA_Map_InputMessage_to_LLPMessageList_Action	☐	☐	☐	1			
3.1	3.1	Action1	String	☑	☐	☐		255		type=nativeStatic;class=com.ibm.adapters.tcpip.messagehandlers.LLPMessagingProtocolHandler;method=parseInputMessageToLLPMessages;target=contentText;IPort;OPort
3.2	3.2	ObjectEventId	String							
4	4	ObjectEventId	String							
5	5			☐	☐	☐		255		

Figure 11. BIA_Map_InputMessage_to_LLPMessageList in the Business Object Designer

The pertinent attributes of the object are as follows:

Map BO Level Attributes	Description
Port	Each PIMO map object has two ports: the IPort and the OPort, defined in the example by the BIA_InputMessage_to _LLPMessageList_Port. These indicate the expected type of the source object (in the example, a BIA_InputMessage) and the destination object (in the example, a BIA_LLPMessageList).
Declaration	A PIMO map object may include declaration objects containing names for temporary variables to be used during processing. In the example the declaration object (a BIA_Map_InputMessage_to _LLPMessageList_Declaration) contains one such name, ″contentText″
Action	Each PIMO map object has at least one action object (here a BIA_Map_InputMessage_to _LLPMessageList) that stores information pointing to the actual class and method that does the processing

The ASI values for *each* action defined by action objects contained by PIMO map objects are as follows:

Application Specific Information for each Defined Action	Description
type ="nativeStatic"	Indicates a static method of a Java class that is being invoked. At present PIMO supports only static methods.
class =	The fully qualified name of the Java class. In the case of the example, the class is the `LLPMessagingProtocolHandler` class in the `com.ibm.adapters.tcpip.messagehandlers` package.
method =	The method being called. In the example the method is `parseInputMessageToLLPMessages` method.
target =	Where returned data should be stored. In the example, the data is to be stored in the variable `contentText` created in the declaration attribute.
var1, var2 ... varx	An open list of parameters to be passed into the method. The order and number of variables on this list must exactly match the order and number of parameters that the method expects. In the example, var1 is the IPort and var2 is the OPort from the Port attribute

Chapter 4. Configuring the Connector

The Connector Configurator is a tool supplied with the Adapter for TCP/IP that allows you to configure the supplied connector template.

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 20).

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 21 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 25.)

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 21.
- 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 27..
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" on page 26.

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 42.

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>
```

Chapter 5. Running the connector

This chapter describes the steps required to start and stop the connector and to run multiple instances of the connector on the same machine. It contains the following sections:

- "Starting the connector"
- "Stopping the connector" on page 34
- "Creating multiple instances of connectors on one server" on page 35

Starting the connector

There are several methods of starting the connector, depending on the platform you are running under and the integration broker you are using.

Startup script and methods

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

For Windows:

`ProductDir\connectors\connName`

or

For UNIX:

`ProductDir/connectors/connName`

where *connName* identifies the connector, and *ProductDir* is the directory in which you installed the product. For a connector running under Windows, this file is `ProductDir\connectors\TCPIP\start_TCPIP.bat.`

For a connector running under UNIX, this file is `ProductDir/connectors/TCPIP/start_TCPIP.sh.`

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

- In Windows, 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. You can also create a desktop shortcut to your connector.
- In Windows, from the command line, accessing the appropriate directory:

  `start_connName connName brokerName [-cconfigFile ]`

  where *connName* identifies your 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.

- In UNIX, from the command line, accessing the appropriate directory

  ```
  connector_manager -start TCPIP [-cconfigFile]
  ```
- 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.
- In Windows only, the connector can be run as a Windows service. For more information, refer to *Installation Guide for WebSphere Business Integration Adapters*.

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*.

Tasks performed during connector startup

When the connector is started, it performs the following tasks:

- Retrieves configuration information
- Retrieves the supported internal business object definitions
- Returns the connector version
- Returns a pointer to the internal business object handler
- Retrieves a pointer to the data handler

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:
  - Invoking the startup script creates a separate “console” window for the connector. In this window, type “Q” and press Enter to stop the connector.
- From Adaptor 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.

Creating multiple instances of connectors on one server

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:

For Windows:

```
ProductDir\connectors\connectorInstance
```

For UNIX:

```
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, store the file in the `connectorInstance` directory.

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 35.
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*.

Chapter 6. Maintaining the Connector

This chapter describes how the adapter handles errors. The chapter contains the following sections:

- "Error handling in the connector"
- "Tracing messages" on page 38

Error handling in the connector

The connector logs any abnormal condition that it encounters during processing, regardless of the trace level. It writes the error text to the connector log file; the name and location of this file are set by the LogFileName connector configuration property.

The message contains a detailed description of the condition and the outcome and may also include extra information that may aid in debugging, such as business object dumps or stack traces (for exceptions).

For a complete list of error messages, refer to the BIA_TCPIPConnector.txt message file installed in the *ProductDir*\connectors\messages directory. Table 4describes some of more common errors and how the connector handles those errors.

Table 4. Connector errors

Error description	Error type	Error handling	Steps to correct
Mandatory CFG properties not populated	Fatal	Error logged and connector terminates	Make sure properties are populated
Pre-requisite BO definitions not in repository	Fatal	Error logged and connector terminates	Make sure all .xsd files are in the repository
Only Client or only Server is configured in CFG	Warning	Warning logged and the connector processes only requests or events, respectively	If both functions are desired, make sure all properties in CFG are configured
CFG properties are of inappropriate type, e.g. negative values where positive are required	Fatal	Error logged and connector terminates	Make sure properties are of the appropriate type
Server that is configured for requests not available	Error	The request fails, but the connector does not terminate	Make sure a) application server is running and b) remote host is available from connector machine
Socket on server configured for request times out before request sent.	Error	Socket closure error logged. Connector continues. Failure status sent to broker.	See above

Table 4. Connector errors (continued)

Error description	Error type	Error handling	Steps to correct
Socket closes before complete event is received	Error	Error logged, and connector continues	Do not close socket immediately after sending data to the connector
Bind exception trying to bind socket to local port	Fatal	Error logged, and connector terminates	Make sure port is free
Maps specified in map MO missing	Error	Error logged, and connector terminates	Make sure map .xsd files available in repository
PIMO level error	Error	PIMO infrastructure logs error and connector terminates	Make sure that the maps and the related action are configured properly

Tracing messages

Tracing is an optional debugging feature you can turn on to closely follow the connector's behavior. Tracing messages are configurable and can be changed dynamically. You set various levels depending on the desired detail. The following sections describe tracing for the TCP/IP adapter.

Recommendation: Tracing should be turned off on a production system or set to the lowest possible level to improve performance and decrease file size.

Using tracing with the connector

Trace messages, by default, are written to STDOUT (screen). You can also configure tracing to write to a file.

Table 5 describes the types of tracing messages that the connector outputs at each trace level. All the trace messages appear in the file specified by the connector property TraceFileName. These messages are in addition to any tracing messages output by the IBM WebSphere Business Integration Adapter architecture.

Table 5. Tracing messages for the connector

Tracing level	Tracing messages
Level 0	Trace adapter version
Level 1	• Trace each time pollForEvents method is called. • Trace each time the adapter accepts a new socket connection in TCP/IP server mode. • Trace each time the adapter attempts a new socket connection in TCP/IP client mode. • Trace ASBO/ISBO name created by adapter to deliver to broker • Trace request ASBO/ISBO name created by broker to deliver to adapter
Level 2	• Trace each time doVerbFor () is called. Trace which Protocol Handler is processing this request. • Trace each time executeCollab() or gotApplEvent() is called

Table 5. Tracing messages for the connector (continued)

Tracing level	Tracing messages
Level 3	• Trace important ASI of the Business Object being processed • Trace important attributes of the Business Object being processed • Trace all data that passes through the TCP channel in both directions Note: The data will be formatted as hexadecimal
Level 4	• Trace spawning of threads • Trace all ASI processed • Trace entry and exit of important functions
Level 5	• Trace entry and exit for each important method • Trace all the Adapter properties • Trace dumps of BO sent to the broker • Trace dumps of BO sent by the broker

Appendix A. Standard Configuration Properties

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 6 on page 43 below.

Summary of standard properties

Table 6 on page 43 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 6 on page 43, 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 6. 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 6. 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 6. 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 6. 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 48.

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 Specific Properties And Required Business Object Properties

Table 7 provides a summary of the properties and values that are specific to the Adapter for TCP/IP. Plus signs (+) indicate child properties. Definitions and discussion of the properties follow the table. The Connector Configurator is used to set these values.

Table 7. Connector Specific Properties

Properties	Possible values	Default values	Update Method	Required?
ServerConfiguration			agent restart	No, but if this set is not populated, event processing is not enabled. A warning message will be logged.
+Port	Integer greater than 0		agent restart	Yes
+TransportProtocol	For this release, only tcp supported. In the future, others, including secure tcp/ip, possible	tcp	agent restart	Yes
+MaxRequest Processors	Integer greater than 0	2	agent restart	No
+MaxRequest PoolSize	Integer greater than 0	3	agent restart	No
+ServerQueueLength	Integer greater than 0		agent restart	No
+ReceiveBufferSize	Integer greater than 0		agent restart	No
+SendBufferSize	Integer greater than 0		agent restart	No
+KeepAlive	true or false	false	agent restart	No
+ServerSocket Timeout	Integer greater than 0		connector restart	No
+SocketTimeout	Integer greater than 0		agent restart	No
+RetryInterval	Integer 0 or greater	0	agent restart	No
+NumberofRetries	Integer 0 or greater	0	agent restart	No

Table 7. Connector Specific Properties (continued)

Properties	Possible values	Default values	Update Method	Required?
ClientConfiguration			agent restart	No, but if this set is not populated, service call request processing is not enabled. A warning message will be logged.
+Clients			agent restart	Yes. This is a hierarchical property that holds specific child client data. If it is not populated, a warning will be logged.
++Client1	Client name		agent restart	No
+++Host	Address of remote host		agent restart	Yes
+++Port	Port number of remote host		agent restart	Yes
+++TransportProtocol	Transport protocol this handler implements	tcp	agent restart	Yes
+++ReceiveBuffer Size	Integer greater than 0		agent restart	No
+++SendBufferSize	Integer greater than 0		agent restart	No
+++KeepAlive	true or false	false	agent restart	No
+++SocketTimeout	Integer greater than 0		agent restart	No
+++MaxAttempts ToRead	Integer greater than 0	1	agent restart	No
+++RetryInterval	Integer 0 or greater	0	connector restart	No
+++Numberof Retries	Integer 0 or greater	0	agent restart	No
++Client2	As above		agent restart	No
Configuration MetaObject	Static Meta Object	BIA _Static _MO	agent restart	Yes
Service RegistrationMO	Service Meta Object	BIA _MO _Service	agent restart	Yes
DataHandler MimeType	Mime types	text/ name value	connector restart	Yes

Table 7. Connector Specific Properties (continued)

Properties	Possible values	Default values	Update Method	Required?
DataHandler MetaObjectName	DataHandler Configuration Meta Object	BIA _MO _Data Handler _Default	agent restart	Yes

Connector Specific Configuration Properties

The following is a list of definitions of the above properties.

ServerConfiguration

The set of properties used by the TCP/IP connector for Event or inbound processing. In this case the connector functions as a TCP server, and listens for requests on the defined port. Only one server can be defined per connector.

Port

The local port on which the connector listens.

TransportProtocol

The transport protocol this listener implements. For this release, the only available value is ″tcp″. More values, such as secure TCP/IP, may be added in future releases.

MaxRequestProcessors

Sets the maximum number of threads to run concurrently for handling incoming requests on the defined port.

MaxRequestPoolSize

Sets the maximum number of incoming requests that are cached to be processed simultaneously. At any given moment, the connector can process at most (MaxRequestProcessors + MaxRequestPoolSize) requests.

ServerQueueLength

Sets the length of the server socket queue for incoming connection requests. This value specifies how many incoming requests can be stored at one time before the host starts refusing connections.

Note: The maximum queue length is operating system dependent.

ReceiveBufferSize

Sets the suggested network I/O buffer size. This value serves as a hint to the underlying platform's networking code. Increasing buffer size can increase the performance of network I/0 for high-volume connections while decreasing it can help reduce the backlog of incoming data.

SendBufferSize

Sets the suggested network I/O buffer size. This value serves as a hint to the underlying platform's networking code. Increasing buffer size can increase the performance of network I/0 for high-volume connections while decreasing it can help reduce the backlog of incoming data.

KeepAlive

Heartbeat probe. Periodically sends an empty data packet with its current sequence, acknowledgement and window numbers.

ServerSocketTimeout

Sets timeout blocking in milli-seconds for this ServerSocket. A timeout of zero is interpreted as an infinite timeout. With this option set to a non-zero timeout, a call to accept() for this ServerSocket will block for only this amount of time. If the timeout expires, a `java.io.InterruptedIOException` is raised, though the ServerSocket is still valid. The option must be enabled prior to entering the blocking operation to have effect.
If the listener thread does not receive a request in this interval, it will check to see if the Connector shutdown flag is set. If Connector shutdown flag is set, it will terminate. This value is applicable only when the Connector is acting as a TCP server accepting requests.

SocketTimeOut

Sets base timeout blocking in milli-seconds for the socket. With this option set to a non-zero timeout, a call to read() for this socket will block for only this amount of time. If the timeout expires, a `java.io.InterruptedIOException` is raised, though the socket is still valid. The option must be enabled prior to entering the blocking operation to have effect. A timeout of zero is interpreted as an infinite timeout.

RetryInterval

Sets the suggested interval the connector in TCP server mode will wait before retrying an operation that has failed. Such situations may include errors that take place while accepting the connection, opening streams for read/write, reading or writing to these streams, etc.

NumberofRetries

Sets the suggested number of retries the server will make in the above described error conditions.

ClientConfiguration

The set of properties used by the TCP/IP connector for Service Call Request or outbound processing. In this case the connector functions as a TCP client, and initiates connections with remote hosts defined in the configuration. Multiple clients can be defined per connector.

Clients

This is a hierarchical property that functions only to hold children that define client configurations.

Client1

Specifies the name of the client. Correlates with the ASI specified in the Configuration Meta Object.

Host

Sets the address of the remote host.

Port

Sets the remote host port to which the client needs to connect.

TransportProtocol

Sets the supported transport protocol. For this release, "tcp" is the only available value.

ReceiveBufferSize

Sets the suggested network I/O buffer size. This value serves as a hint to the underlying platform's networking code. Increasing buffer size can increase the performance of network I/0 for high-volume connections while decreasing it can help reduce the backlog of incoming data.

SendBufferSize

Sets the suggested network I/O buffer size. This value serves as a hint to the underlying platform's networking code. Increasing buffer size can increase the performance of network I/0 for high-volume connections while decreasing it can help reduce the backlog of incoming data.

KeepAlive

Heartbeat probe. Periodically sends an empty data packet with its current sequence, acknowledgement and window numbers.

SocketTimeout

Sets timeout blocking in milli-seconds for this socket. When this is set to a non-zero value, a `read()` call on the InputStream associated with this socket will block for only this amount of time. If the timeout expires, a `java.io.InterruptedIOException` is raised, though the socket is still valid. The option must be enabled prior to entering the blocking operation to have effect. A timeout of zero is interpreted as an infinite timeout.

MaxAttemptsToRead

Sets the maximum number of time the connector will read from the socket once it starts receiving data. This property allows for the reception of separate acknowledgement data. This approach differs from Event processing because it is assumed that the amount of data received in an acknowledgement will be small.

RetryInterval

Sets the suggested interval the connector in TCP client mode will wait before retrying an operation that has failed. Such situations may include errors that take place while opening streams for read/write, reading or writing to these streams, etc.

NumberofRetries

Sets the suggested number of retries the connector in TCP client mode will make in the above described error conditions.

Client2

The name of the next client configuration.

ConfigurationMetaObject

The meta object that holds static configuration information. See the description of `BIA_Static_MO` in"General Meta Objects" on page 11.

ServiceRegistrationMO

The top level meta object that holds service information. See the description of `BIA_MO_Service` in "General Meta Objects" on page 11.

DataHandlerMimeType

Sets the expected mime type of the incoming data. Used to specify the appropriate DataHandler.

DataHandlerMetaObjectName

The top level meta object that holds DataHandler configuration information other than that contained in the service object. See the description of the `BIA_MO_DataHandler_Default` in"General Meta Objects" on page 11

Supported Business Objects

The Connector Configurator should also be used to set up the Supported Business Objects tab. Table 8 shows the values that should be present in the case of HL7 processing. In other situations, other values may obtain.

Table 8. Supported Business Objects Properties

Business Object Name	Message Set ID
BIA_ApplicationMessage	1
BIA_FinalMessage	2
BIA_MO_DataHandler_Default	3
BIA_MO_Service	4
BIA_MO_Tcpip_MapSubscriptions	5
BIA_ResponseMessage	6
BIA_STATIC_MO	7
BIA_InputMessage	8
HL7_SGMSH	9
HL7_MESSAGE	10

For more information on these objects, please see "Internal Business Objects" on page 9.

Appendix C. Adapter Processing

This appendix presents a more detailed description of the processing flow inside the TCP/IP adapter, including a description of the PIMO infrastructure.

The TCP/IP protocol

TCP/IP is a set of protocols for the transmission of any sort of data over heterogeneous physical networks. It is the basis of the Internet and many other networks large and small. Data is encapsulated in packets that the stateless IP protocol carries through the network. Control of the stream of IP packets is taken care of by TCP, the Transmission Control Protocol. It is responsible for establishing a ″virtual circuit″ between the sending host and the receiving host and providing for reliable transmission. Software that implements the TCP protocol comes in two varieties: TCP clients, which initiate the connection, and TCP servers, which listen on assigned ports for initiation requests and then accept them. The structure of TCP is inherently full duplex, meaning that both TCP clients and TCP servers are capable of sending and receiving data concurrently.

The adapter for TCP/IP

The Websphere Business Integration Adapter for TCP/IP provides a way of routing data sent over raw TCP/IP connections into and out of the WBI system. Certain industry standard protocols for the transmission of domain specific messages, like the HL7 protocol in the health care industry, are designed to be sent directly over TCP/IP connections. The adapter for TCP/IP provides a way to capture such data and integrate it into a larger Integration flow.

Connection Management

The connector, the runtime component of the TCP/IP Adapter, is capable of serving as either a TCP server (in inbound, or event processing, mode) or a TCP client (in outbound, or service request, mode). The module in the connector that implements the actual TCP protocol is called the Connection Manager.

The Connection Manager has two parts: the Protocol Listener Framework and the Protocol Handler Framework. The Protocol Listener Framework serves as a TCP server, based on properties set in the `ServerConfiguration` section of the connector configuration file, the CFG. See Appendix B, “Connector Specific Properties And Required Business Object Properties,” on page 59 for more information on the CFG. The Framework listens for incoming requests and provides for parallel processing of multiple requests through a thread management component called the Request Pool. Every new incoming request becomes a new Request object in the Request Pool. The size of the Pool is set by the configuration property, `MaxRequestPoolSize`. Requests in the Pool are processed by worker threads, up to the number configured by the `MaxRequestProcessors` property in the CFG. At any given moment, the connector can process at most (`MaxRequestPoolSize + MaxRequestProcessors`) requests. Thread management and load balancing are also taken care of here. The worker threads package the incoming requests into byte arrays and hand them off to the Message Processing Framework.

The Protocol Handler Framework serves as the TCP client, taking service call request data and sending it to remote hosts based on properties set in the `ClientConfiguration` part of the CFG.

Message Processing Management

The Message Processing Framework manages the transformation of incoming event data into WBI-usable business objects and of outgoing service request business objects into various supported message structures sendable over TCP/IP. It is made up of three parts: the PIMO framework, PIMO maps or Message Handlers, and Data Handlers. Event data coming in from the Request Pool is run through the PIMO framework, where certain pre-processing operations are done using functionality found in Message Handlers. The data is then handed over to a Data Handler, an independent plugin used by many different adapters, to be built into a WBI-usable business object. The choice of data handlers is based on the `DataHandlerMimeType` and related properties in the CFG. The business object is passed on to the broker. The structure of the business object is completely determined by the data handler, so the TCP/IP adapter is capable of handling any sort of message data for which there is a related data handler.

Service call request processing follows the same stages in reverse: the data handler transforms the business object into appropriate message structures, the PIMO Framework performs post-processing using Message Handlers, and the messages are passed to the Protocol Handler Framework in the Connection Manager, which sends the service request out to the remote host.

The PIMO Framework

Message structures that come in over a TCP/IP connection may require a certain amount of pre-processing before they can be sent on to a data handler to be turned into WBI business objects.

Take, for example, the HL7 health care data standard. The details of network transmission error detection and correction are handled by the lower levels of most modern network protocols, so the main standard does not include specifications covering these. However many mini and mainframe computer systems, which may be part of the HL7 data flow, operate in communication environments that do not provide sufficient lower layer functionality. In these cases HL7 offers several alternate lower layer protocols, such as the Hybrid Low Layer Protocol and the Minimal Low Layer Protocol, to suit different environments. Messages sent using these protocols must be pre-processed to remove this protocol related information before the main body of data can be extracted.

The PIMO infrastructure in the TCP/IP connector is designed to do exactly this sort of pre-processing. The Production Instruction Meta Object Framework is a highly flexible, general purpose abstraction for effecting business logic processing at the connector level. The PIMO infrastructure is capable of a wide-range of operations, and is used, in differing forms, in other adapters. In the TCP/IP connector, it has been customized specifically to take care of these pre- and post-processing issues.

The PIMO Framework uses a set of specially designed meta objects to do its work. At the top of the adapter's PIMO hierarchy is the `BIA_MO_Tcpip_MapSubscriptions` object. The graphic "BIA_MO_Tcpip_MapSubscriptions" on page 15 shows what this object looks like in the Business Object Designer. This object designates both the inbound (event pre-processing) and outbound (service call request post-processing) paths that data will take. It contains two objects, the `BIA_MO_Tcpip_MapSubscriptions_In` and the equivalent Out object, each of which contains a reference to an appropriate PIMO map object. In the case of HL7 object above, the appropriate `In` PIMO map object might be the `BIA_Map_InputMessage_to_LLPMessageList`. You can look at "BIA_Map_InputMessage_to_LLPMessageList" on page 16 to see what this object looks like in the Business Object Designer.

This PIMO map object serves as the core PIMO object. PIMO objects consist of three basic attributes: Port, Declaration, and Action.

Each Port is made up in turn of two attributes: the IPort and the OPort. These indicate the expected type of the source object (for example, an BIA_InputMessage object, which is the internal wrapper object for event processing) and the destination object (a BIA_LLPMessage List object). The example on page 15 shows two input maps chained together, the first separating multiple messages into single messages, and the second stripping away the LLP information from the actual HL7 message. By separating the process into multiple steps, chaining maps can produce more complex types of processing. If chained maps are used, it is essential that the OPort type of step 1 be exactly the same as the IPort type of step 2, and so forth.

The declaration attribute is optional. It contains names for temporary variables to be used during processing. In the example the declaration object contains one such name, ″contentText″.

Finally, PIMO maps contain Action attributes. Each Action attribute consists of one or more defined Actions. The Application Specific Information or ASI for each defined action provides the information the PIMO needs to invoke the Message Handler, a native Java class designed to perform the actual data transform that is required. The example ASI from page 16 serves to illustrate the necessary information. It is as follows:

```
type=nativeStatic;
class=com.im.adapters.tcpip.messagehandlers.LLPMessagingProtocoHandler;
method=parseInputMessageToLLPMessages; target=contentText;IPort;Oport
```

The ASI contains the following information:

type = In this release, this value is always `nativeStatic`. The present PIMO structure only supports public static methods.

class =
This value is the fully qualified name of the Java class that contains the method. In the example this is `com.ibm.adapters.tcpip.messagehandlers.LLPMessagingProtocolHandler`.

method =
This value is the method to be called. The example is `parseInputMessageToLLPMessages`.

target =
This value is where returned data should be stored. In the example, the data is to be stored in the variable `contentText` created in the declaration attribute.

var1, var2 . . . varx
An open list of parameters to be passed into the method. The order and number of variables on this list must exactly match the order and number

of parameters that the method expects. In the example, var1 is the IPort business object and var2 is the OPort business object from the Port attribute.

The method at the heart of this set, `parseInputMessageToLLPMessages` knows how to separate out the LLP specific wrapper data, and then return a list which stores the individual parts of the LLPMessage (the header, the message itself, and the tailer) so that the message (as a BIA_ContentBO) can be handed off to the data handler. A set of these HL7 Message Handlers is included in the TCP/IP installation, but others can be developed as the need arises.

Once again, service call request processing would follow the same stages except in reverse: the PIMO Framework would be used to wrap messages in their protocol specific data before sending them to be forwarded to the remote host.

Notices

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Programming interface information, if provided, is intended to help you create application software using this program.

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