WebSphere Business Integration Server
Express and Express Plus

IBM

Adapter for XML User Guide

Version 4.3

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Contents

About this document

The products IBM^(R) WebSphere^(R) Business Integration Server Express and IBM^(R) WebSphere^(R) Business Integration Server Express Plus are made up of the following components: InterChange Server Express, the associated Toolset Express, CollaborationFoundation, and a set of software integration adapters. The tools in the Toolset help you to create, modify, and manage business processes. You can choose from among the prepackaged adapters for your business processes that span applications. The standard processes template--CollaborationFoundation-- allows you to quickly create customized processes.

Except where noted, all the information in this guide applies to both IBM^(R) WebSphere^(R) Business Integration Server Express and IBM^(R) WebSphere^(R) Business Integration Server Express Plus. The term WebSphere Business Integration Server Express and its variants refer to both products.

Audience

This document is for WebSphere consultants and customers who are implementing the connector as part of a WebSphere business-integration system. To use the information in this document, you should be knowledgeable in the following areas:

- Connector development
- Business object development
- HTTP and HTTPS based application architecture

Prerequisites for this document

You need to be familiar with the WebSphere Business Integration Server Express Adapters system, business object development, and data handlers. You also need to be familiar with the XML markup language and a schema language, either document type definition (DTD) or XSDL (for schema documents).

Related documents

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

You can download, install, and view the documentation at the following site: http://www.ibm.com/websphere/wbiserverexpress/infocenter

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, filename, information that you type, or information that the system prints on the screen.
bold	Indicates a new term the first time that it appears.
italic, italic	Indicates a variable name or a cross-reference.
blue text	Blue text, which is visible only when you view the manual online, indicates a cross-reference hyperlink. Click any blue text 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, square brackets surround an optional parameter.
...	In a syntax line, ellipses indicate a repetition of the previous parameter. For example, option[,...] means that you can enter multiple, comma-separated options.
< >	In a naming convention, angle brackets surround individual elements of a name to distinguish them from each other, as in <server_name><connector_name>tmp.log.
/, \	In this document, backslashes (\) are used as the convention for directory paths. All WebSphere Business Integration Server Express system product pathnames are relative to the directory where the product is installed on your system.
%text% and $text	Text within percent (%) signs indicates the value of the Windows text system variable or user variable.
ProductDir	Represents the directory where the product is installed.

New in this release

This is the first release of this guide.

Chapter 1. Overview of the XML adapter

This chapter describes the connector component of the IBM WebSphere Business Integration Server Express Adapter for XML. The connector enables the integration broker, InterChange Server Express, to exchange business objects with URLs by using HTTP and HTTPS protocols. A URL can be any destination such as a remote application or a servlet on a Web server. The connector supports XML version 1.0.

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

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

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

For more information about the relationship of InterChange Server Express to the connector, see the *System Administration Guide.*

Note: When working in an XML environment, you can use the product-delivered connector or you can build custom modules. See "Planning a connector implementation" on page 19 for guidelines on deciding which to use.

This chapter contains the following sections:
- "Connector components"
- "How the connector works" on page 4

Connector components

The adapter is written in Java and consists of three components:
- Connector
- XML data handler
- Protocol handler (HTTP and HTTPS)

The connector interacts with the XML data handler. For more on data handlers, see the *Data Handler Guide*.

Figure 1 illustrates the architecture of the connector components. The modular design of the connector enables you to design custom components to replace the product-delivered functionality.
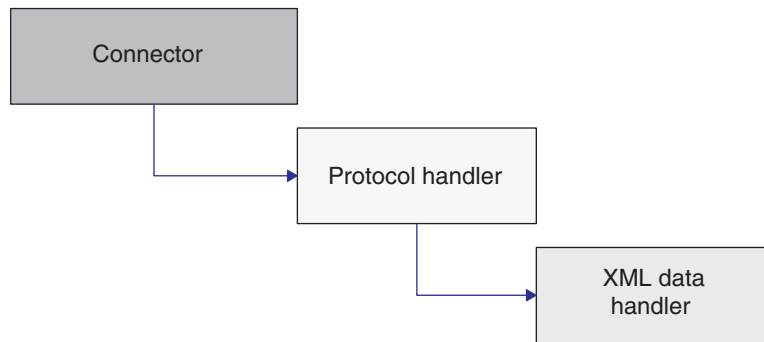
Figure 1. Connector architecture

Connector

The connector passes business objects between InterChange Server Express and a protocol handler. The connector:

- Receives business object requests from InterChange Server Express.
- Calls the Protocol Handler Framework and passes the URL string of a business object to invoke the appropriate instance of the protocol handler.
- Passes business object requests to protocol handlers.
- Receives business object responses or success/failure return code from protocol handlers. If the connector is using a synchronous protocol handler, then it receives business object responses. If the connector is using an asynchronous protocol handler, then it reports success or failure based on return code.

The primary methods used by the connector are `init()`, `doVerbFor()`, and `pollForEvents()`. The `init()` method reads all configuration values from InterChange Server Express's repository, sets proxy names (HTTP and HTTPS) and respective ports, and reads the Java class package names for the protocol handler (`JavaProtocolHandlerPkgs`) and XML data handler (`JavaDataHandlerPkgs`), and the value of properties of the data handler and protocol handler.

The `doVerbFor()` method handles the business object request/response operations. When the connector receives a top-level business object from InterChange Server Express, the `doVerbFor()` method extracts the request business object and the destination URL. The `doVerbFor()` method then creates the appropriate protocol handler instance.

When the connector receives a response from the destination URL, the `doVerbFor()` method populates the response business object as a child of the top-level business object and then returns the result to InterChange Server Express. In the connector, all errors are propagated as exceptions and are handled through the connector, where `BON_FAIL` is returned and Return Status Descriptor is set.

The `pollForEvents()` method is used for event notification. The connector has the ability to check for events from a URL by using business objects. For more information on event notification, see "Event notification" on page 6.

The connector sets a static property to contain the name of the top-level data handler meta-object as it is specified in the DataHandlerConfigMO connector configuration property.

Protocol handler (HTTP and HTTPS)

The protocol handler enables the connector to communicate with a URL by using the HTTP and HTTPS protocols. The protocol handler is an abstract base class that extends the Java `URLConnection` class. This class contains abstract methods that can be implemented to provide support for specific protocols, such as HTTP and HTTPS. An instance of the protocol handler is created by the Protocol Handler Framework, which is called by the connector.

The WebSphere Business Integration Server Express Adapter for XML includes asynchronous and synchronous protocol handlers. Synchronous protocol handlers return business objects from synchronous responses. Asynchronous protocol handlers do not expect a response business object; they return only a success or failure message based on the return code from the post operation. The asynchronous protocol handler does not support event notification.

Note: By using the Protocol Handler Framework, you can add support for other protocols such as FTP. The Protocol Handler Framework is an abstract base class called `CWURLConnection`.

The Protocol Handler Framework creates an instance of a protocol handler, and the connector passes a business object to the created instance. The protocol handler extracts the content type (such as `text/plain` or `text/xml`) from the business object and uses it to create an instance of the XML data handler.

When the protocol handler calls the `createHandler()` method, it passes in a content type. The data handler create method passes the content type by replacing the forward slash (/) characters with periods (.) and replacing all non-alphanumeric characters with an underscore (_). Then the create method looks for an attribute in the data handler top-level meta-object that matches the parsed string for the content type. If it does not t find a match, the method builds the class name as `com.crossworlds.DataHandlers.`*modified content_type*

The protocol handler performs the following operations:
- Receives a business object from the connector and passes it to the XML data handler. The protocol handler parses the MimeType attribute to determine which data handler instance to create.
- Receives an XML stream from the XML data handler and then passes it to the appropriate URL. The XML stream represents the request business object.

  If the data handler parses an XML string, the protocol handler converts the XML string into an XML stream before passing it to a URL.
- If it is synchronous, it then receives a response stream from a URL and passes it back to an XML data handler, which converts it back into a WebSphere Business Integration Server Express Adapters business object.
- If it is asynchronous, then it reports success or failure based on return code from the request operation to the URL.
- Sends the response business object back to the connector.

If your implementation of the connector needs to support additional protocols, you must build a custom protocol handler. For information on how to create a custom protocol handler, see Chapter 4, "Building a custom protocol handler," on page 25.

How the connector works

The following sections describe how the connector processes business objects, how meta-objects are used for configuration, and how the connector handles event notification.

Business object processing

The connector uses request/response operations to pass data between it and a URL. The connector receives business object requests from InterChange Server Express and converts the requests into XML streams. The request stream is passed to a URL by using the POST method, and a response stream is returned that may or may not have similar content. The response stream is converted into a response business object and returned with the original top-level business object to InterChange Server Express. Note that the type of business object request can differ from that of the business object response.

The complete request-response cycle is illustrated below.
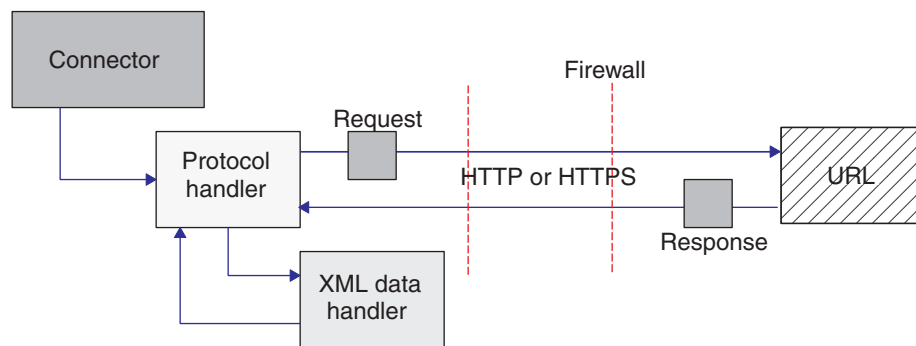
Figure 2. Business object processing

Request

When the connector receives a business object request from InterChange Server Express, it must convert it into a request stream that can be passed by using the appropriate protocol. The protocol handler and the XML data handler are used to convert and send a request business object to a URL.

Figure 4 illustrates the request process.
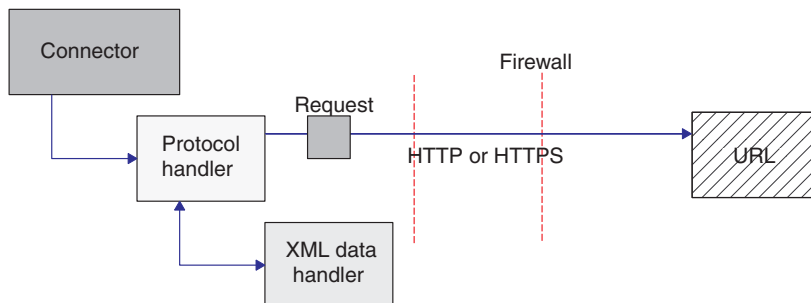
Figure 3. Request processing

Specifically, when the connector receives a top-level business object from InterChange Server Express, the following process flow occurs:

1. The connector calls `getAttrValue` ("URL") and retrieves the URL. It also calls `getAttrValue` ("MimeType") and `getAttrValue` ("BOPrefix") to retrieve the MimeType and BOPrefix attributes values from the business object.
2. The connector extracts the request business object from the top-level business object.
3. The connector calls the appropriate protocol handler (HTTP or HTTPS) based on the protocol specified in the URL field of the top-level business object, and the protocol handler package name specified.
4. The protocol handler calls the appropriate data handler based on the MimeType and BOPrefix attributes of the top-level business object (as configured in the top-level meta-object).
5. The data handler converts the business object into a request stream and then passes it back to the protocol handler.
6. The protocol handler sends the request stream to the destination URL specified in the top-level business object or passes the return code.

Request

When the connector receives a business object request from InterChange Server Express, it must convert it into a request stream that can be passed by using the appropriate protocol. The protocol handler and the XML data handler are used to convert and send a request business object to a URL. Figure 4 illustrates the request process.
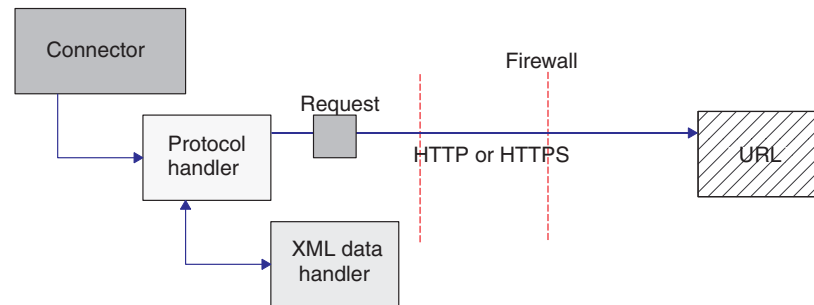
Figure 4. Request processing

Specifically, when the connector receives a top-level business object from InterChange Server Express, the following process flow occurs:
1. The connector calls `getAttrValue` ("URL") and retrieves the URL. It also calls `getAttrValue` ("MimeType") and `getAttrValue` ("BOPrefix") to retrieve the MimeType and BOPrefix attributes values from the business object.
2. The connector extracts the request business object from the top-level business object.
3. The connector calls the appropriate protocol handler (HTTP or HTTPS) based on the protocol specified in the URL field of the top-level business object, and the protocol handler package name specified.
4. The protocol handler calls the appropriate data handler based on the MimeType and BOPrefix attributes of the top-level business object (as configured in the top-level meta-object).
5. The data handler converts the business object into a request stream and then passes it back to the protocol handler.
6. The protocol handler sends the request stream to the destination URL specified in the top-level business object or passes the return code.

Response

If you are using a synchronous protocol handler, then when the response business object is returned from a URL, it is returned in the form of a response stream. If you are using an asynchronous protocol handler, then return code is simply passed back. The response processing is similar to the request processing, except the response stream must be translated back into a business object.

Note: The response stream may not always be represented by the same business object type as the request stream.

Figure 5 illustrates the process flow of the response business object returning to the connector.
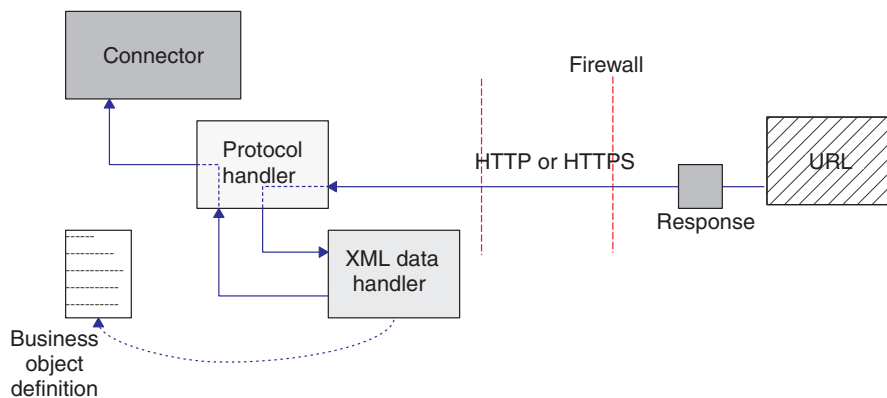
Figure 5. Process flow of data returning from a URL

Specifically, when the protocol handler receives a response stream from a URL, the following process flow occurs if the MIME type is `text/xml`:

1. The protocol handler calls the `getContentType ()`method to retrieve the MIME type value to determine which data handler to use.
2. The protocol handler calls the `DataHandler` class to create an instance of the XML data handler.

   Note that the data format in the response stream can be different from the data format in the original request business object.
3. The protocol handler converts the response stream into a string, which the protocol handler passes to the XML data handler.
4. The XML data handler obtains the business object name based on the message content and extracts the data from the request stream (XML document) into a business object.
5. The XML data handler passes the completed request business object to the protocol handler.
6. The protocol handler passes the request business object to the connector, which adds it to the original top-level business object.
7. The connector passes the original top-level business object containing the request business object back to InterChange Server Express.

Event notification

For event notification, the connector uses business objects to retrieve events from a URL. The connector polls a URL by sending a request XML document that is returned as a response XML document. The response contains child business

objects that the connector passes to InterChange Server Express as events. Each child business object is processed as a single event. The asynchronous protocol handler does not support event notification.

Note: Poll for events processing is the same as business object request processing except that there is an additional step to extract event objects from the response business object and send them to InterChange Server Express.

An event notification business object follows the same business object processing operations as the request and response business objects of an XML business object. All unsubscribed events are archived to a file in the WebSphere Business Integration Server Express Adapters standard business object dump format.

To enable event notification, you need to define event notification business objects and set up your URL (such as a Web servlet or `cgi-bin` script) to handle these business objects. The connector uses the POST method to send an XML event request document as a stream to the URL. The URL should read the XML document as a stream from STDIN and write an XML document which contains one or more event objects as a stream to STDOUT.

Figure 6 illustrates the basic process of event notification.
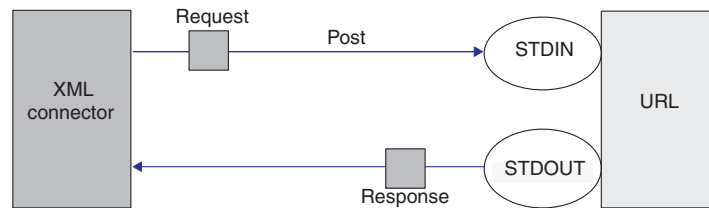
Figure 6. Event notification process

For more information on defining business objects, see Chapter 3, "Developing business objects for the connector," on page 19

Chapter 2. Installing and configuring the connector

This chapter describes the process of installing and configuring the connector. It contains the following sections:

- "Prerequisites for this document" on page vii
- "Installing the XML adapter"
- "Configuring the connector"
- "Configuring top-level meta-objects for the data handler" on page 14
- "Common configuration tasks" on page 14
- "Specifying a data handler" on page 15
- "Creating multiple connector instances" on page 15
- "Starting the connector" on page 17
- "Stopping the connector" on page 17

Prerequisites

To use the connector, your environment must have:

- JDK 1.2 or later
- Java Secure Socket Extension 1.0 (JSSE)

  WebSphere Business Integration Server Express Adapter delivers the international version. You might want to download one with domestic grade encryption and add it to the \connector\Xml\dependencies directory.
- Access to the destination URLs

Installing the XML adapter

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

http://www.ibm.com/websphere/wbiserverexpress/infocenter

Configuring the connector

Using InterChange Server Express, you configure connector properties from Connector Configurator Express, which you access from System Manager.

Configuring the data handler

Configure the meta-objects used for the XML data handler. For information on configuring meta objects, see "Configuring top-level meta-objects for the data handler" on page 14.

Standard connector properties

Standard configuration properties provide information that all connectors use. See Appendix A, "Standard configuration properties," on page 31 for documentation of these properties.

Table 1 provides information specific to this connector about a configuration property in the appendix.

Table 1. Property information specific to this connector

Property	Note
CharacterEncoding	This connector does not use this property.
Locale	Because this connector has been internationalized, you can change the value of this property.

You must provide a value for the `ApplicationName` configuration property before running the connector. You also must set at least the following standard connector configuration properties before running the connector.

- AgentTraceLevel
- ApplicationName
- ControllerStoreAndForwardMode
- ControllerTraceLevel
- DeliveryTransport

Connector-specific properties

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

Table 2 lists the connector-specific configuration properties for the connector. See the section that follows for explanations of the properties.

Table 2. Connector-specific configuration properties

Name	Possible values	Default value	Required?
ArchiveDirectory	*archive directory name*	\connectors\xml\ archive	
DataHandlerConfigMO	*data handler meta-object name*	MO_DataHandler_ Default	YES
HttpProxyHost	*http host name*		
HttpProxyPort	*http proxy port*	80	
HttpsDebug	Set the property to one of the values in Table 3 on page 12.		
HttpsProxyHost	https host name		
HttpsProxyPort	https proxy port	443	
JavaProtocolHandlerPkgs	protocol handler name	com.crossworlds. connectors.utils. ProtocolHandlers	YES
MaxNumRetries	positive integer	10	
PollingBusinessObjects	business object names		
ReturnBusObjResponse	true or false	true	
SecurityProvider	SSL implementation	com.ibm.jsse.JSSE	YES
UseCaches	true or false	false	
UseDefaults	true or false	false	
UseDigitalSignature	true or false	false	
HttpTimeout	Enter value in minutes/seconds (ex. for 30 secs, type 3000)	0	
Login	UserLogin		
Password	UserPassword		
ResponseTLO	true or false	false	

ArchiveDirectory

Directory containing archived events. Each event can be identified by its business object name and verb. By default, the create verb is appended to the business object name. The default is \connectors\xml\ archive.

DataHandlerConfigMO

Name of the top-level meta-object that the XML connector uses to determine its data handler support. This meta-object must contain the name of the child meta-object that the XML data handler uses to set configuration properties. This property is also used by the DataHandler base class to determine which DataHandler class to instantiate for a particular content type. The default is MO_DataHandler_ Default. For more information, see "Configuring top-level meta-objects for the data handler" on page 14.

HttpProxyHost

Name of the host that acts as the proxy for HTTP. This property is required only if the network uses a proxy server that uses the HTTP protocol.

HttpProxyPort

Proxy port number used to connect HTTP. This property is required only if the network uses a proxy server that uses the HTTP protocol. The default port number is 80.

HttpsDebug

Setting that determines what debugging information is generated for the HTTPS session. Table 3 lists the HTTPS debug values for the HTTPS protocol handler.

Table 3. HttpsDebug Values

Name	Meaning
all	Turn on all debugging
data	Hex dump of each handshake message. It can be used to widen handshake debugging.
handshake	Print each handshake message. It can be used with SSL.
keygen	Print key generation data. It can be used with SSL.
plaintext	Hex dump of record plain text. It can be used to extend record debugging.
record	Enable per-record tracing. It can be used with SSL.
session	Print session activity. It can be used with SSL.
ssl	Turn on SSL debugging only.
verbose	Print verbose handshake message. It can be used to extend record debugging.

HttpsProxyHost

HTTPS proxy machine name. This property is required only if the network uses a proxy server that uses the HTTPS protocol.

HttpsProxyPort

Proxy port number used to connect HTTPS. This property is required only if the network uses a proxy server that uses the HTTPS protocol.

JavaProtocolHandlerPkgs

If this attribute is present, it specifies the packages that are used as protocol handlers, instead of the default Java handler. These classes must conform to Java's Protocol Handler Framework. For example, to use a protocol handler named com.mycompany.http (for HTTP), set this field to com.mycompany. Also make sure that the .jar files of the corresponding class are in your classpath.

For more information on Java Protocol Handlers, see the tutorial at the following website:

http://developer.java.sun.com/developer/onlineTraining/protocolhandlers/

It is also possible to specify multiple packages for this value separated by vertical bars, "|". For example, com.crossworlds.Protocol Handlers|com.mycompany

WebSphere Business Integration Server Express Adapter delivers two packages:
- com.crossworlds.connectors.utils.ProtocolHandlers (synchronous protocol handler)
- com.crossworlds.connectors.utils.ProtocolHandlers.async (asynchronous protocol handler)

The default is com.crossworlds.connectors.utils.ProtocolHandlers.

MaxNumRetries

The asynchronous protocol handler uses the value in the HttpTimeout field along with the value in this field for the number of retries to attempt after the asynchronous protocol handler does not receive a response from the destination URL. If you do not specify a value, this property defaults to zero. The default is 0.

PollingBusinessObjects

Business objects used for event notification. Separate multiple entries with a comma (For example, XMLPoll_Cust, XMLPoll_Order). Each business object must be supported by the connector. This property is required if the connector is set up for event notification.

ReturnBusObjResponse

Determines whether the connector expects a business object to be returned from the protocol handler.If the value is set to true, then the connector expects a business object. If the value is set to false, then the connector does not expect a business object. It expects only a response of success or failure. The default is true.

Note: If you are configuring the asynchronous protocol handler, then the value must be set to false, because the asynchronous protocol handler does not expect a business object response.

SecurityProvider

Used by HTTPS during the SSL handshake. Comma-separated values of this attribute determine which SSL implementation to use when connecting to HTTPS URLs. If no value is set, HTTPS connections do not work. The default value is `com.ibm.jsse.JSSEProvider`

UseCaches

If this attribute is set to `false`, the connector attempts to retrieve a non-cached version of XML documents. This is merely a request; it cannot be strictly enforced by the connector. Set this value to `true` to retrieve cached XML documents only.

UseDefaults

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

UseDigitalSignature

Specifies whether a digital signature length (0 in binary) is added to the end of a message sent by using the HTTP or HTTPS protocol. If your connector supports digital signatures, set this property to `true`. The default is `false`.

Note: The product-provided connector does not support digital signatures.

HttpTimeout

For Synchronous Protocol Handler, this is the time up to which the connector waits for a response from the web server. For Asynchronous Protocol Handler, this field specifies that for each retry, the connector waits this amount of time to connect to the web server.

Login

This login is the UserLoginid with which the user gains access to a particular Realm.

Password

This password is the UserPassword with which the user gains access to a particular Realm.

ResponseTLO

This property is used to get the response during polling. If you set this property to *true*, the connector sends the TLO without checking if the co ntained child Objects are subscribed. If you set this property to *false*, the connector checks for each contained Object whether or not it is subscribed.

Configuring top-level meta-objects for the data handler

Meta-objects are business objects that contain configuration information. A data handler meta-object contains information to configure a data handler. The connector uses the information in the data handler meta-object to create an instance of the XML data handler.

Before running the connector, you must set up a data handler meta-object that specifies what data handler the connector will use based on the MIME type. When the connector receives a business object request, it uses information from the meta-object to dynamically create an instance of the appropriate data handler.

The connector gets the name of the top-level data handler meta-object from the connector configuration property DataHandlerConfigMO. The top-level meta-object is a hierarchical business object that can contain any number of child objects. Each child object is a flat object that represents a specific data handler instance. Child meta-objects have attributes that provide configuration values that enable a data handler instance to do its work. Different types of data handlers require different configuration properties, so the child meta-objects that support specific handlers have different attributes.

The XML connector uses the XML data handler to convert between business objects and XML documents. To configure the XML data handler for the connector, do the following:

- Set up the top-level data handler meta-object to have an attribute for each MIME type that the connector supports. The attribute name should be the name of the MIME type. The attribute represents a child meta-object for a data handler instance.

  For the XML connector, make sure that top-level meta-object contains an attribute for the `text/xml` MIME type. This attribute must also list the name of the child meta-object for the XML data handler.

- Set the default attribute values in each child meta-object. The configuration properties for the WebSphere Business Integration Server Express Adapter data handlers are described in the *Data Handler Guide*.

  In the child meta-object for the XML data handler, set the appropriate default attribute values.

For detailed information on setting up meta-objects for individual data handlers, see the *Data Handler Guide*.

Note: For the connector to instantiate a data handler, the data handler top-level meta-object must be part of the connector's supported objects list.

Common configuration tasks

This section describes common configuration tasks for the connector.

Setting up event notification

To enable event notification for the connector, follow these steps:

1. Create a top-level business object containing a child request and a response business object.

2. Configure your URL to handle the structure of the request and response business objects. For more information on defining business objects, see Chapter 3, "Developing business objects for the connector," on page 19

3. After you have defined your event notification business objects, set the PollingBusinessObjects and ArchiveDirectory configuration properties using Connector Configurator Express, which you access from System Manager.

Specifying a data handler

To specify a data handler to be used by the XML connector, use the following steps.

1. Determine the types of data formats that the connector will support.

   By default, the connector uses the XML data handler for the `text.xml` MIME type. If you are converting between business objects and some other MIME type, make sure that the MIME type is an attribute in the top-level data-handler meta-object (by default, `MO_DataHandler_Default`). Only one data handler can be used to convert any given format type.

2. Determine which data handler (or data handlers) the connector will use.

   The top-level data-handler meta-object associates MIME types with a child data-handler meta-object. The child data-handler meta-object determines which data handler is instantiated.

3. Use Business Object Designer Express to modify the data-handler meta-objects.

   Note: You can launch Business Object Designer Express from within System Manager.

4. In Connector Configurator Express or System Manager, add the data handler top-level meta-object to the list of supported objects for the connector. If the connector is not subscribed to the top-level data-handler meta-object, the connector does not load the meta-object at startup.

5. Specify the name of the top-level data-handler meta-object in the connector `DataHandlerConfigMO` configuration property. The product-delivered default is the `MO_DataHandler_Default` meta-object.

For more information about the data-handler meta-objects, see the *Data Handler Guide*.

Creating multiple connector instances

Creating multiple instances of a connector is in many ways the same as creating a custom connector.

Note: Each additional instance of any adapter supplied with WebSphere Business Integration Server Express will be treated as a separate adapter by the function that limits the total number of adapters that can be deployed.

You can set your system up to create and run multiple instances of a connector by following the steps below. You must:

- Create a new directory for the connector instance

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

Create a new directory

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

```
ProductDir\connectors\connectorInstance
```

where `connectorInstance` uniquely identifies the connector instance.

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

```
ProductDir\repository\connectorInstance
```

Create business object definitions

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

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

2. Files for the initial connector should reside in the following directory:

   ```
   ProductDir\repository\initialConnectorInstance
   ```

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

Create a connector definition

You create a configuration file (connector definition) for the connector instance in Connector Configurator Express. 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."

3. Create a startup script shortcut.

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.

Starting the connector

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

ProductDir\connectors*connName*

where *connName* identifies the connector. The name of the startup script depends on the operating-system platform, as Table 4 shows.

Table 4. Startup scripts for a connector

Operating system	Startup script
Windows	start_*connName*.bat

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

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

  Select **Programs>IBM WebSphere Business Integration Express>Adapters>Connectors>***your_connector_name*.

  By default, the program name is "IBM WebSphere Business Integration Express". However, it can be customized. Alternatively, you can create a desktop shortcut to your connector.

- From the command line
  - On Windows systems:

    start_*connName* *connName* **ICS** [-c*configFile*]

  where *connName* is the name of the connector.

- From System Monitor

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

- On Windows systems, you can configure the connector to start as a Windows service. In this case, the connector starts when the Windows system boots (for an Auto service) or when you start the service through the Windows Services window (for a Manual service).

For more information on how to start a connector, including the command-line startup options, refer to the *System Administration Guide*

Stopping the connector

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

- If you started the connector from the command line, with its connector startup script:
  - On Windows systems, invoking the startup script creates a separate "console" window for the connector. In this window, type "Q" and press Enter to stop the connector.
- From System Monitor

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

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

Chapter 3. Developing business objects for the connector

This chapter describes the structure of a top-level business object passed by the connector. It also describes the required attributes and describes how the connector processes the top-level business object. It contains the following sections:

- "Planning a connector implementation"
- "Connector business object structure" on page 20
- "Business objects for event notification" on page 23
- "Business objects based on XML DTDs or schema documents" on page 24

Planning a connector implementation

The connector is designed in a modular fashion so that components can be replaced or added without compromising the integrity of the connector. Before you begin configuring the connector and its components, take the time to analyze the system you need to develop.

Use the following information to determine whether you can use the connector components unchanged as they are delivered with the product. If the functionality of a component of the connector does not meet your needs, you can replace it with a custom component. For example, you might need to implement a custom data handler if your application expects data types other than XML.

Use Table 5 to determine whether you can use the connector components as delivered or whether you have to create a custom component.

Table 5. Using a WebSphere Business Integration Server Express Adapter component or building a custom component

Use WebSphere Business Integration Server Express Adapter-delivered component...	If all conditions are true...	Otherwise, build a...
Synchronous protocol handler (HTTP/HTTPS)	• Using the HTTP or HTTPS protocol • Do not require a user/password exchange • Do not require certification details • Require a response business object from a URL	Custom protocol handler, See *Chapter 4, "Building a custom protocol handler," on page 25*
Asynchronous protocol handler (HTTP/HTTPS)	• Using the HTTP or HTTPS protocol • Do not require a user/password exchange • Do not require certification details • Require only success or failure return code from a URL (do not require a response business object)	Custom protocol handler See *Chapter 4, "Building a custom protocol handler," on page 25*
XML data handler	Data format is XML 1.0 See *Data Handler Guide*	Custom data handler See *Data Handler Guide*
Name Resolver (XML data handler)	The business object name is determined by using the root element name in the XML document and the BOPrefix attribute in a child meta-object for the XML Data Handler (configurable).	Custom name resolver See *Data Handler Guide*

Table 5. Using a WebSphere Business Integration Server Express Adapter component or building a custom component (continued)

Use WebSphere Business Integration Server Express Adapter-delivered component...	If all conditions are true...	Otherwise, build a...
Entity Resolver (XML data handler)	• Ignore external entities • Search local file system for external entities	Custom entity resolver See *Data Handler Guide*
SAX Parser (XML data handler)	Data format is XML	Custom parser

Connector business object processing

The connector passes business objects between InterChange Server Express and protocol handlers. It sends request business objects to a protocol handler and receives response business objects from protocol handlers. However, it does not process any of the data in the business objects.

When InterChange Server Express passes a business object to the connector, the connector performs the following operations:

1. Extracts the request business object from the top-level business object. The connector expects the request business object to be the first child business object that does not have a value of `CxIgnore` or `CxBlank`.

2. Sends the request business object to a protocol handler.

3. When the protocol handler returns the response business object, the connector adds the response business object to the top-level business object and returns the complete top-level business object to InterChange Server Express.

Connector business object structure

The connector requires a hierarchical business object. The top-level business object contains attributes whose values are the destination URL string, the MIME type of the data, the business object prefix, and the request and response business objects.

Figure 7 illustrates the required basic structure of a top-level business object for the WebSphere Business Integration Server Express Adapter for XML.
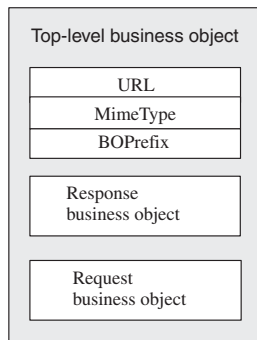
Figure 7. Basic Structure of a top-level business object

For example, if you create two business objects, XMLApp_CustCreateRequest and XMLApp_CustCreateResponse, then a top-level business object definition for the connector might look like:

```
XMLApp_CustCreate

URL     String
MimeType String
BOPrefix String
Response XMLApp_CustCreateResponse
Request  XMLApp_CustCreateRequest
```

Use Business Object Designer Express to create the request and response business objects. Create the top-level business object definition, and add the required attributes and the request and response business objects. Then configure the connector to support the top-level business object.

Required attributes for the top-level business object

The top-level business object must have at least one attribute for the URL string, MIME type, BOPrefix, request business object, and response business object. Each of these attributes must be marked `IsRequired = True`.

Table 6 describes the required attributes of a top-level business object. See the sections that follow for more information.

Table 6. Required attributes for a top-level XML business object

Attribute	Type	Description
URL	String	Destination URL.
MimeType	String	MIME type to be used for the transaction.
BOPrefix	String	Used with the MIME type to create an instance of the XML data handler.
Response	Business object	Business object that represents a response message. See "Request and response business objects" on page 22.
Request	Business object	The business object that represents a request message. In the top-level business object, place this attribute after the attribute for the response business object.

Note: The connector requires that you set at least one attribute as the key attribute. However, the connector does not need any attributes to be set as the key.

URL

The URL string defines the destination of the data in the business object and the protocol to use to pass the data. The string contains the entire destination, including the protocol (such as HTTP or HTTPS); therefore, a separate attribute that specifies the protocol is not required.

The URL string is used by the connector to open a connection to the destination URL. When a connection is opened, the connector uses the URL string to create an instance of the appropriate protocol handler.

For example, the string `http://www.ibm.com` specifies that the HTTP protocol is being used, and an instance of the HTTP Protocol Handler is created.

MIME type

The MIME type defines the content type and format for the data that is being passed to a URL. The connector uses the MIME type to invoke the appropriate data handler. A meta-object identifies the data handler instance for the MIME

type/BOPrefix combination. If the data handler implementation handles only one MIME type, the BOPrefix attribute in a child meta-object is optional. In a top-level business object, it is required.

The connector expects the MIME type to be `text/xml` by default, but you can configure the connector to use other MIME types.

BOPrefix

The connector uses the BOPrefix with the MimeType attribute to invoke the appropriate data handler instance. This attribute is required to guarantee the uniqueness of a business object name. For example, you can have two Purchase Order business objects for different applications: AppA_PO and AppB_PO.

Note: The BOPrefix attribute in a top-level business object is different from the BOPrefix attribute in a child meta-object for the XML data handler. For more information on XML data handler child meta-objects, see the *Data Handler Guide.*

When an XML stream returns from a URL, the XML data handler maps the root element name in the XML stream to the business object definition `BOPrefix_name`. The value of the root element name is always placed after the value of BOPrefix.

For example, if you have the root element as <Customer> in the XML document and `BOPrefix=AppA`, then the `BOPrefix_Name` is AppA_Customer.

Request and response business objects

The request and response business objects contain the actual data to be passed to a destination URL. When the connector receives a top-level business object, only the request business object is populated; the response business object is populated with the data returned from the destination URL.

Note these guidelines for defining request and response business objects in the top-level business object:
*   Place the response business object before the request business object if the following are true:
    *   The request and response business objects are of the same type
    *   The business object is to be used for collaboration requests (only when InterChange Server Express is the integration broker)
    *   The data in the request business object needs to be preserved (not overwritten by the response from the URL)
*   In the top-level business object, set the attribute value for the response business object to `CxIgnore` or `CxBlank`. The connector passes the first non-null attribute value to the protocol handler.
*   If the business object that represents the request is identical to the business object that represents the response, the types of the request and response attributes should be the same.
*   The request and response business objects can be different. For example, you can send out a customer purchase order business object and receive an order status business object.
*   You can define multiple response business objects to support each response XML document that is to be returned to the top-level business object. Multiple response business objects enable the connector to handle the possibility that

different types of XML documents (corresponding to different business object types) can be returned from a Web server.

Business object conformance with data handler requirements

Although you can include any WebSphere Business Integration Server Express Adapter business object in the top-level wrapper business object for the connector, the contained business objects must deliver data in a form that is compliant with the requirements of the data handler used to convert the data.

For example, for the BySize data handler, a business object definition must specify a value for the MaxLength attribute property for each business object attribute. For the XML data handler, the business object definition must include application-specific information that enables the data handler to generate an XML document.

Therefore, a good practice is to create your own business object for each type of data to be processed. In the business object, provide only the data required by the application and the information required by the data handler. You can then include these business objects in the top-level connector business object.

See the *Data Handler Guide* for information specific to each data handler.

Business objects for event notification

The structure of an event notification business object is similar to the structure of a request business object in that they both require attributes for a URL, MIME type, BOPrefix, response business object, and request business object. The only difference in business object processing is how the connector handles the contents of the response business object. For event notification, the connector expects the response business object to contain child business objects that represent events.

When defining an event notification business object, keep the following in mind:
- The top-level business object needs to have both a request and a response attribute. They both need to be required, and they need to be of different types.
- Place the request business object before the response business object.
- A response business object can return multiple child business objects of the same type. For example, you can design the response business object to return only customer events.
- A response business object can return multiple child business objects of different types. For example, you can design the response business object to return order and customer events.
- All unsubscribed child business objects are archived to the archive directory.
- The business object must have the 'DefaultVerbName' verb added to the Supported Verb column along with the default verb in the Application-Specific Information column of the business object definition. The default verb is the verb to be used for event notification so that subscriptions are checked properly. You must set the verb for each business object that is to be sent to InterChange Server Express.

Figure 8 illustrates the placement of the 'DefaultVerbName' in the Business Object Definitions.
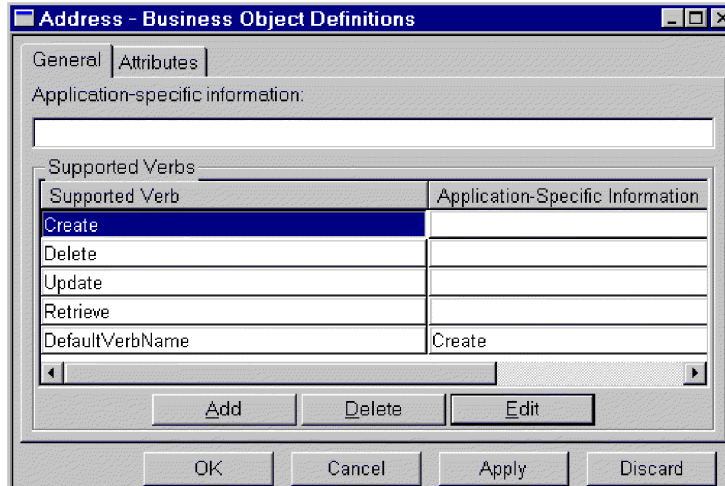
Figure 8. Placement of the 'DefaultVerbName' in the business object definitions

Business objects based on XML DTDs or schema documents

If you are creating request and response business objects based on an XML DTD or schema document, you must create a business object definition for each type of XML document to be processed. The business object definition contains structure information that is contained in the XML document's DTD or schema document. For example, if there is one request stream (a single DTD or schema document), but four possible response stream types (four separate DTDs or schema documents), you must define five business object definitions. On the other hand, if the request and response stream use the same schema, you need only one business object definition. You can use the XML Object Discovery Agent (ODA) to generate business object definitions based on DTDs or schema documents.

Note: When reading a DTD or schema, the XML ODA ignores FIXED attributes because the value of these attributes is optional in an XML instance, and the value is always fixed. If you would like these FIXED values to exist in the XML instances created from and read to BOs, you must manually add the FIXED attributes as BO attributes. You must check to ensure that these values are not changed at runtime.

For information about how to define business object definitions for XML documents, using either the XML ODA or manually, see the *Data Handler Guide*.

Chapter 4. Building a custom protocol handler

This chapter describes the Protocol Handler Framework and how to use it to build a custom protocol handler. It contains the following sections:

- "Protocol handler framework"
- "Creating a protocol handler class" on page 26
- "Protocol handler framework methods" on page 27
- "Custom protocol handler sample code" on page 29

Protocol handler framework

The WebSphere Business Integration Server Express Adapter Protocol Handler Framework enables developers to write protocol handlers for different types of protocols in a uniform manner. The Protocol Handler Framework has a class called `CWURLConnection`, which contains the abstract methods that need to be implemented to create a custom protocol handler. The framework is part of the `com.crossworlds.protocolhandler` package.

Protocol handler framework classes

Every custom protocol handler must have at least two classes:

- `Handler`
- `cw_protocol connection` (`cw_httpconnection` for HTTP protocol)

The `connection` class extends the `CWURLConnection` class.

Figure 9 illustrates the hierarchy of the `com.crossworlds.connectors.utils.protocolhandler` base class.
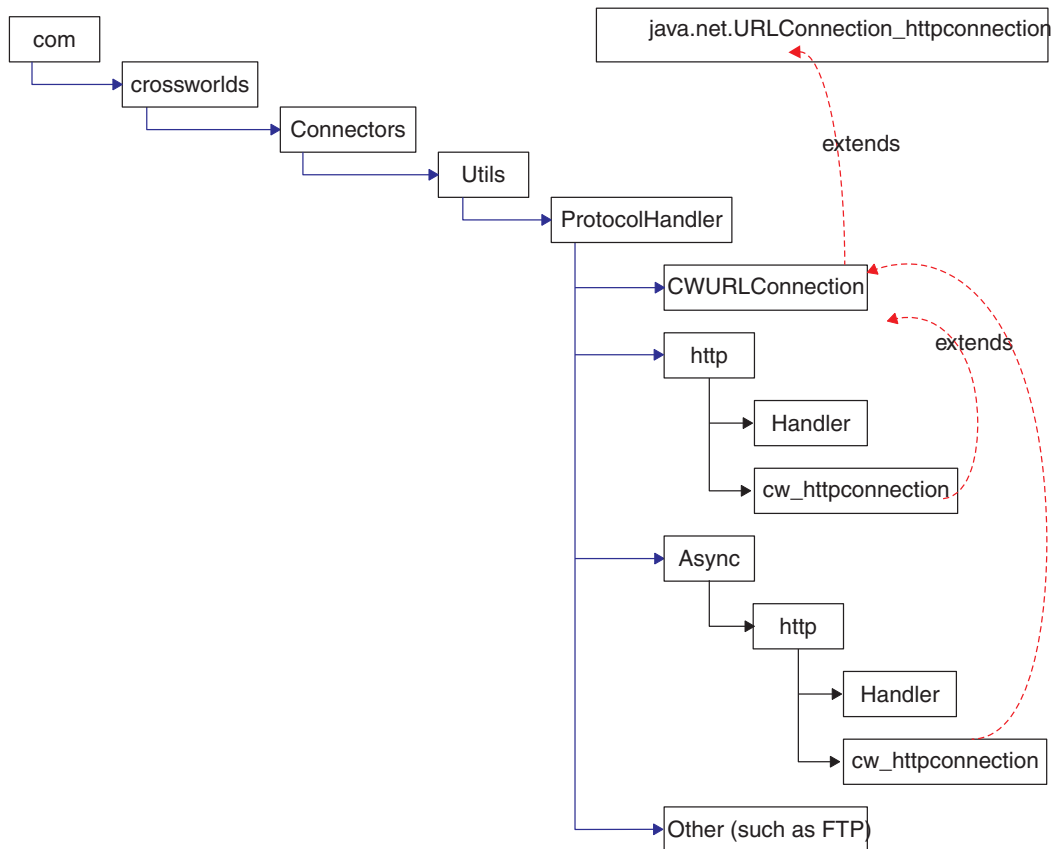
Figure 9. Protocol handler class hierarchy

To use the Protocol Handler Framework to develop a custom protocol handler, do the following:

- Create a ProtocolNameConnection Class, where ProtocolName is the name of your protocol.
- Provide at least one implementation of the `getContent()` method in the `connection` class.
- Create a Handler class.

Handler class summary

```
Public URLConnection openConnection(URL url); throws IOException
```

Connection class summary

```
public String getContent (object input, String mimeType,
Sting BOPrefix,Long ServerTimeout,String Credentials) throws IOException
public String getContentType()
public synchronized void connect() throws IOException
```

Creating a protocol handler class

When you install the connector, stub code and makefiles for the protocol handler are installed. The stub file contains Java code that defines an empty class that lists all the methods you must implement. You can use the stub file as a template for generating your custom protocol handler.

To implement your new protocol handler:

1. Modify (and rename) the `stubProtocolHandler.java` file.
2. Edit the makefile to contain the name of your source file.
3. Run the `makeProtocolHandler.bat` file to compile the class. The makefile compiles only the class. It does not add the class to the `.jar` file.
4. Add the new class to the `.jar` file. Use the following command:

   `jar cvf MyProtocolHandler.jar <classes>.`

   where:
   - `MyProtocolHandler.jar` is the protocol handler `.jar` file. This file must be in the classpath where the connector startup batch file, `start_xml.bat` (`start_xml.sh` for UNIX), resides.
   - `<classes>` are all of the classes for your protocol handler. List all classes and separate each entry with a space.
5. Make sure that the connector can pick up the new classes. Edit the `start_xml.bat` so that the new .jar file is included in the CLASSPATH.

Protocol handler framework methods

The following section describes the Protocol Handler Framework method used when designing a new protocol handler or modifying an existing protocol handler.

getContent ()

The `getContent()` method is used for business object processing. It does the following:

- Uses the MimeType and BOPrefix business object attributes to determine the appropriate data handler instance to create.
- Sends a business object to the appropriate data handler for conversion, and then sends the file to a URL.
- Receives a response stream from the destination URL and invokes a data handler instance to convert the stream into a WebSphere Business Integration Server Express Adapter business object.
- Returns a business object back to the original caller (such as the connector).

Syntax

```
public String getContent (object input, String mimeType,
Sting BOPrefix,Long ServerTimeout,String Credentials) throws IOException
```

Parameters

input	Specifies the business object interface (the business object to send)
mimeType	Specifies the MIME type of the data being passed to the data handler
BOprefix	Specifies the BOPrefix of the data being passed to the data handler
ServerTimeout	Specifies the timeout indicated in the connectorSpecific Property
Credentials	Specifies the Base64 Encoded value of Login:Password

Return values

Returns a business object interface

Calling the WebSphere Business Integration Server Express Adapter-provided protocol handler

The following code example illustrates how to call the WebSphere Business Integration Server Express Adapter-provided protocol handler.

```
try
{
// set the system property, so that Java knows where to look for
// the protocol handlers. You only need to do it once.
Properties prop = System.getProperties();
prop.put("java.protocol.handler.pkgs,"
"com.crossworlds.connectors.utils.ProtocolHandlers");

URL url = new URL("http://www.crossworlds.com");
CWURLConnection uc = (CWURLConnection) url.openConnection();
BusinessObjectInterface respBO = (BusinessObjectInterface)
uc.getContent (input, mime, prefix);

}
catch (Exception XX)
{
//flag error
}
```

Custom protocol handler sample code

The following sample code can be used as a guide when developing a custom protocol handler.

```
/**
 * This package hierarchy is used to write the Protocol Handler.
 * [ProtocolName] should be substituted with the name of the protocol
 * for which the handler is being written.
 * For example com.crossworlds.connectors.utils.ProtocolHandlers.ftp
   or com.crossworlds.connectors.utils.ProtocolHandlers.http
 */
package com.crossworlds.connectors.utils.ProtocolHandlers.[ProtocolName];


import CxCommon.BusinessObjectInterface;
import com.crossworlds.connectors.utils.ProtocolHandlers.CWURLConnection;
import com.crossworlds.DataHandlers.DataHandler;

import AppSide_Connector.JavaConnectorUtil;

import java.net.*;
import java.io.*;

/**
 * The handler class creates a ProtocolNameConnection class instance
 * It is invoked indirectly via Java's URL getContent() mechanism.
 *
 * how to use it:
 * System.setProperty ("java.protocol.handler.pkgs",
 *"com.crossworlds.ProtocolHandler");
 *URL url = new URL ("the URL");
 *CWURLConnection uc  = (CWURLConnection) url.openConnection ();
 * /
public class Handler
{
   // this will return the appropriate URLConnection
   // But the constructor takes only one argument - the URL.  As this
   // is called by Java Networking Framework.
   public URLConnection openConnection(URL url) throws IOException
   {
      // you can pass in any parameters here.
        return new MyURLConnection (url);
   }
}

class MyURLConnection extends CWURLConnection {

   /**
    * This is instantiated by URL.openConnection()
    */
   public MyURLConnection(URL url)
   {
      // store this URL some where
   }

   /**
    * This method returns the content type of the data
    */
   public String getContentType()
   {
      // here is where you have to determine the content Type (aka
      // Mimetype) of URL streams
   }

   /**
    *  This method is used to create a connection
```

```
 */
public synchronized void connect() throws IOException
{
   // you might call super().connect as it suffices most of the
   // time.
   // If it is custom protocol, do the handshaking stuff here
}

/**
 * getContent () : The getContent method used by CrossWorlds.
 * This method takes in 3 parameters
 *    - input Object,
 *    - content type for the data &
 *    - Business Object Prefix to * be used to create the Business
 *    Object name
 *    It returns an appropriate Object back to the caller.  This
 *    method interacts with the DataHandler using the exposed APIs
 *    for the DataHandler.
 */
public String getContent (object input, String mimeType,
Sting BOPrefix,Long ServerTimeout,String Credentials) throws IOException
{
   // log a message
   JavaConnectorUtil.logMessage
   ("logging a message", JavaConnectorUtil.XRD_INFO);

   // write a trace
   if (JavaConnectorUtil.isTraceEnabled (JavaConnectorUtil.LEVEL3))
      JavaConnectorUtil.traceWrite  (JavaConnectorUtil.LEVEL3,
      "Level 3 trace msg");


   // get a datahandler
   DataHandler dh = DataHandler.createHandler (null, mimeType, BOprefix);

   InputStream in = dh.getStreamFromBO
   ( (BusinessObjectInterface) input, null);

   // Send this to URL
      - read data from Input Stream
      - write to URL
      - repeat until input stream is drained.

   // Now read the response
   String replyString = // some how read the reply from URL
   String outputType = // get the mime of reply some how

// remember to get a fresh DH, as the incoming data may be of
// different mime type than was originally received by the
// protocol handler
   DataHandler dh2 = DataHandler.createHandler
   (null, outputType, BOprefix);

   BusinessObjectInterface replyBO = dh2.getBO
   (replyString, outputType);

   return replyBO;  // DONE!

}

}
```

Appendix A. Standard configuration properties

This appendix describes the standard configuration properties for the connector component of the adapters in WebSphere Business Integration Server Express, running on WebSphere InterChange Server Express.

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

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

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 Express

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

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
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.
* **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.

- **Agent restart**

  The change takes effect only after you stop and restart the application-specific component.

To determine how a specific property is updated, refer to the **Update Method** column in the Connector Configurator Express window, or see the Update Method column in the Property Summary table below.

Summary of standard properties

Table 7 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.

Table 7. 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 IDL
AgentTraceLevel	0-5	0	Dynamic	
ApplicationName	Application name	Value specified for the connector application name	Component restart	
BrokerType	ICS	ICS		
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>
ContainerManagedEvents	`No value or JMS`	`No value`	Component restart	Delivery Transport is JMS
ControllerStoreAndForwardMode	`true or false`	`truetrue`	Dynamic	Repository directory is <REMOTE>

Table 7. Summary of standard configuration properties (continued)

Property name	Possible values	Default value	Update method	Notes
ControllerTraceLevel	0-5	0	Dynamic	Repository directory is <REMOTE>
DeliveryQueue		*CONNECTORNAME*/DELIVERYQUEUE	Component restart	JMS transport only
DeliveryTransport	IDL or JMS	IDL	Component restart	
DuplicateEventElimination	true or false	false	Component restart	JMS transport only: Container Managed Events must be <NONE>
EnableOidForFlowMonitoring	true or false	false	Component restart	
FaultQueue		*CONNECTORNAME*/FAULTQUEUE	Component restart	JMS transport only
jms.FactoryClassName	CxCommon.Messaging.jms .IBMMQSeriesFactory or any Java class name	CxCommon.Messaging. jms.IBMMQSeriesFactory	Component restart	JMS transport only
jms.MessageBrokerName	crossworlds.queue. manager	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>
JvmMaxNativeStackSize	Size of stack in kilobytes	128k	Component restart	Repository directory is <REMOTE>
JvmMinHeapSize	Heap size in megabytes	1m	Component restart	Repository directory is <REMOTE>
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	
LogAtInterchangeEnd	true or false	false	Component restart	
MaxEventCapacity	1-2147483647	2147483647	Dynamic	Repository Directory is <REMOTE>
MessageFileName	Path or filename	InterchangeSystem.txt	Component restart	

Table 7. Summary of standard configuration properties (continued)

Property name	Possible values	Default value	Update method	Notes
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 is <REMOTE>
OADMaxNumRetry	A positive number	`1000`	Dynamic	Repository Directory is <REMOTE>
OADRetryTimeInterval	A positive number in minutes	`10`	Dynamic	Repository Directory is <REMOTE>
PollEndTime	`HH:MM` (HH is 0-23, MM is 0-59)	`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	
RepositoryDirectory	Location of metadata repository		Agent restart	Set to <REMOTE>
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:
RestartRetryCount	0-99	`3`	Dynamic	
RestartRetryInterval	A sensible positive value in minutes: 1 - 2147483547	`1`	Dynamic	
SourceQueue	Valid JMS queue name	`CONNECTORNAME`/`SOURCEQUEUE`	Agent restart	Only if Delivery Transport is JMS and Container Managed Events is specified
SynchronousRequestQueue	Valid JMS queue name	`CONNECTORNAME`/ `SYNCHRONOUSREQUESTQUEUE`	Component restart	Delivery Transport is JMS

Table 7. Summary of standard configuration properties (continued)

Property name	Possible values	Default value	Update method	Notes
SynchronousRequestTimeout	0 - any number (millisecs)	0	Component restart	Delivery Transport is JMS
SynchronousResponseQueue	Valid JMS queue name	*CONNECTORNAME*/ SYNCHRONOUSRESPONSEQUEUE	Component restart	Delivery Transport is JMS
WireFormat	CwBO	CwBO	Agent restart	

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

The AgentConnections property controls the number of ORB connections opened by orb.init[].

By default, the value of this property is set to 1. There is no need to change this default.

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 that you are using, which is ICS.

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 list. To add other supported values to the drop list, you must manually modify the `\Data\Std\stdConnProps.xml` file in the product directory. For more information, see the appendix on using Connector Configurator Express in this guide.

ConcurrentEventTriggeredFlows

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.

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

The default value is `No value`.

When ContainerManagedEvents is set to `JMS`, you must configure the following properties to enable guaranteed event delivery:
- PollQuantity = 1 to 500
- SourceQueue = `CONNECTORNAME/SOURCEQUEUE`

You must also configure a data handler with the MimeType, DHClass, and DataHandlerConfigMOName (optional) properties. To set those values, use the **Data Handler** tab in Connector Configurator Express. The fields for the values under 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.

ControllerStoreAndForwardMode

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

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 WebSphere InterChange Server Express.

The default value is `CONNECTORNAME/DELIVERYQUEUE`.

DeliveryTransport

Specifies the transport mechanism for the delivery of events. Possible values are `IDL` for CORBA IIOP or `JMS` for Java Messaging Service. The default is IDL.

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

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 Express. 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 running on WebSphere InterChange Server Express.

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.

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.

EnableOidForFlowMonitoring

When you set this property to `true`, the adapter framework will mark the incoming **ObjectEventId** as a foreign key for the purpose of flow monitoring.

The default is `false`.

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).

The default value is 128m.

JvmMaxNativeStackSize

The maximum native stack size for the agent (in kilobytes).

The default value is 128k.

JvmMinHeapSize

The minimum heap size for the agent (in megabytes).

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 (see DeliveryTransport).

The default is `crossworlds.queue.manager`.

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.

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 list. To add other supported values to the drop list, you must manually modify the `\Data\Std\stdConnProps.xml` file in the product directory. For more information, see the appendix on using Connector Configurator Express in this guide.

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

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.

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`. 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

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*.

The default value is `false`.

OADMaxNumRetry

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

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

The amount of time between polling actions. Set `PollFrequency` to one of the following values:
*   The number of milliseconds between polling actions.
*   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. To determine whether a specific connector does, see the installing and configuring chapter of its adapter guide.

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.

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 WebSphere InterChange Server Express 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.

This value must be set to <REMOTE> because the connector obtains this information from the InterChange Server Express repository.

ResponseQueue

Applicable only if `DeliveryTransport` is JMS.

Designates the JMS response queue, which delivers a response message from the connector framework to the integration broker. WebSphere InterChange Server Express 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.

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 36.

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

This is the message format on the transport. The setting is`CwBO`.

Appendix B. Connector Configurator Express

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

The topics covered in this appendix are:

Overview of Connector Configurator Express

Connector Configurator Express allows you to configure the connector component of your adapter for use with WebSphere InterChange Server Express.

You use Connector Configurator Express 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 maps for use with collaborations as well as specify messaging, logging and tracing, and data handler parameters, as required.

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 Express 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 Express.

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 Express 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 47 to set up a new one.

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

Starting Connector Configurator Express

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

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

Running Configurator Express in stand-alone mode

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

To do so:

- From **Start>Programs**, click **IBM WebSphere Business Integration Server Express> Toolset Express>Development>Connector Configurator Express**.
- Select **File>New>Configuration File**.

You may choose to run Connector Configurator Express 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 51.)

Running Configurator Express from System Manager

You can run Connector Configurator Express from System Manager.

To run Connector Configurator Express:

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 Express**. The Connector Configurator Express window opens and displays a **New Connector** dialog box.

To edit an existing configuration file:

1. In the System Manager window, select any of the configuration files listed in the Connector folder and right-click on it.
2. 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 file as the template.

- To create a new template, see "Creating a new template" on page 47.
- To use an existing file, simply modify an existing template and save it under the new name.

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:

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

      Enter a unique name that identifies the connector, or type of connector, for which this template will be used. You will see this name again when you open the dialog box for creating a new configuration file from a template.
   - **Old Template**, and **Select the Existing Template to Modify**

      The names of all currently available templates are displayed in the Template Name display.
   - 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 will appear in the **Template Preview** display. You can use an existing template whose property definitions are similar to those required by your connector as a starting point for your template.
3. Select a template from the **Template Name** display, enter that template name in the **Find Name** field (or highlight your selection in **Template Name**), and click **Next**.

If you do not see any template that displays the connector-specific properties used by your connector, you will need to create one.

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**, make any changes. The changes will not be accepted unless you also open the **Property Value** dialog box for the property, described in the next step.

4. Right-click the box in the top left-hand corner of the value table and click **Add**. A **Property Value** dialog box appears. Depending on the property type, the dialog box allows you to enter either a value, or both a value and range. Enter the appropriate value or range, and click **OK**.

5. The **Value** panel refreshes to display any changes you made in **Max Length** and **Max Multiple Values**. It 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 Express stores the information you have entered as an XML document, under \data\app in the\bin directory where you have installed Connector Configurator Express.

Creating a new configuration file

You create a connector configuration file from a connector-specific template or by modifying an existing configuration file.

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

     The default broker is ICS. You cannot change this value.
   - **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 names. You can fill in all the field values to complete 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 Express 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 Express window, as described later in this chapter.

Using an existing file

To use an existing file to configure a connector, you must open the file in Connector Configurator Express, revise the configuration, and then save the file as a configuration file (`*.cfg`).

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 InterChange Server Express repository file.
  Definitions used in a previous InterChange Server Express 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 Express, 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 Express, 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`)
   - InterChange Server Express Repository (`*.in`, `*.out`)

     Choose this option if a repository file was used to configure the connector. 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 Express.
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 Express window displays the configuration screen, with the current attributes and values.

Connector Configurator Express requires values for properties described in the following sections:
- "Setting standard connector properties"
- "Setting application-specific configuration properties" on page 52
- "Specifying supported business object definitions" on page 53
- "Associated maps" on page 54
- "Setting trace/log file values" on page 55

Note: For connectors that use JMS messaging, an additional category may display, for special configuration of data handlers that convert the data to business objects. For further information, see "Data handlers" on page 56.

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 Express displays a configuration screen with tabs for the categories of required configuration values.

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.
- You can configure Value fields.
- The **Update Method** displayed for each property indicates whether a component or agent restart is necessary to activate changed values.

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 Express, click **File>Exit** (or close the window), and click **No** when prompted to save changes.
   - To enter values for other categories in Connector Configurator Express, 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 51.

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 **Edit Property** 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 31.

Connector properties are almost all static and the **Update Method** is `Component restart`. For changes to take effect, you must restart the connector after saving the revised connector configuration file.

Specifying supported business object definitions

Use the **Supported Business Objects** tab in Connector Configurator Express 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.

For you to specify a supported business object, the business objects and their maps must exist in the system. Business object definitions, including those for data handler meta-objects, and map definitions should be saved into Integration Component Library (ICL) projects. For more information on ICL projects, see the *User Guide for WebSphere Business Integration Server Express*.

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 chapter on business objects in this guide as well as the *Business Object Development Guide*.

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 Express window, click **Save to Project**. The revised connector definition, including designated support for the added business object definition, is saved to the 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 Express 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 Express 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.

Associated maps

Each connector supports a list of business object definitions and their associated maps that are currently active in InterChange Server Express. 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 Express 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 InterChange Server Express 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 Express window, click **Save to Project**.
4. Deploy the project to InterChange Server Express.
5. Reboot the server for the changes to take effect.

Resources

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.

Setting trace/log file values

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

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. Adapters that make use of the guaranteed event delivery enable this tab.

See the descriptions under `ContainerManagedEvents` in the Standard Properties appendix for values to use for these properties.

Saving your configuration file

After you have created the configuration file and set its properties, you need to deploy it to the correct location for your connector. Save the configuration in an ICL project, and use System Manager to load the file into InterChange Server Express.

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.

For details about using projects in System Manager, and for further information about deployment, see the *User Guide for IBM WebSphere Business Integration Server Express.*

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 Express in a globalized environment

Connector Configurator Express is globalized and can handle character conversion between the configuration file and the integration broker. Connector Configurator Express uses native encoding. When it writes to the configuration file, it uses UTF-8 encoding.

Connector Configurator Express supports non-English characters in:
- All value fields
- Log file and trace file path (specified in the **Trace/Log files** tab)

The drop list for the `CharacterEncoding` and `Locale` standard configuration properties displays only a subset of supported values. To add other values to the drop list, you must manually modify the `\Data\Std\stdConnProps.xml` file in the product directory.

For example, to add the locale en_GB to the list of values for the Locale property,
open the stdConnProps.xml file and add the line in boldface type below:

```
<Property name="Locale"
isRequired="true"
updateMethod="component restart">
                <ValidType>String</ValidType>
          <ValidValues>
                                <Value>ja_JP</Value>
                                <Value>ko_KR</Value>
                                <Value>zh_CN</Value>
                                <Value>zh_TW</Value>
                                <Value>fr_FR</Value>
                                <Value>de_DE</Value>
                                <Value>it_IT</Value>
                                <Value>es_ES</Value>
                                <Value>pt_BR</Value>
                                <Value>en_US</Value>
                                <Value>en_GB</Value>

                <DefaultValue>en_US</DefaultValue>
          </ValidValues>
     </Property>
```

Appendix C. Overview of XML adapter sample scenarios

Consider the situation in which a company wants to use the WebSphere Business Integration Server Express Adapter for XML to read XML documents from and post XML documents to Web Servers. Below is a sample scenario designed to be simple and show the basic points of the XML Adapter's functionality with InterChange Server Express connectivity.

This fictitious scenario involves two integrations that represent the two directions of data exchange:

- The first integration starts with an "XML_REQUEST_Order" object sent from the PortConnector to the XML Adapter via the "Port_To_XML" collaboration object. The XML Adapter will invoke the XML DataHandler to convert the request business object to an XML Document. The XML is POSTed to a Webserver. The Webserver will respond to the XML Adapter, which converts the response XML to the response business object sent back to InterChange Server Express.

- In the second integration, the XML Adapter will poll a URL for an XML document. Once read, the XML Adapter will send the document through the XML DataHandler to convert it to a response business object that will be sent to InterChange Server Express. Then, via one of two collaborations, "XML_To_Port_Customer" or "XML_To_Port_Manifest," the events will be sent to the Port Connector.

Installation of the XML sample scenario with InterChange Server Express connectivity

Note: In this sample, the poll will return three business objects:

- XML_Order_Customer
- XML_Order_Manifest
- XML_Order_Receipt

Only two of these business objects have collaborations offering subscriptions (Customer and Manifest), so the third business object (Receipt) will be archived by the XML Adapter to a specified location.

The following are the steps for installing and verifying the sample scenario.

- Pre-installation notes and assumptions.
- Installation of the sample scenario.
- Running the service call request scenario.
- Running the poll senario.
- Summary.

Pre-installation notes and assumptions

1. You have installed and are experienced with WebSphere Business Integration Server Express Adapters.
2. You have installed and are experienced with InterChange Server Express.
3. You have installed the WebSphere Business Integration Server Express Adapter for XML.

4. You have a Webserver set up to handle java serlvets.
5. All environment variables and file separators are specified in the Windows 2000 format.

Installation of the sample scenario

1. **Load business objects into repository:**

   Start InterChange Server Express, and using your WebSphere Business Integration Server Express System Manager, select the "Open From File" menu item from the "File" menu of Business Object Designer Express. Load the repository file labeled "Sample_XML_Order_Objects.in" located in the %CROSSWORLDS%\connectors\XML\Samples\WebSphere InterChange Server Express folder. Confirm that the Business Objects have been loaded. There should be 12 in total.

2. **Load connectors into repository:**

   Using your WebSphere Business Integration Server Express System Manager, select the "Open From File" menu item from the "File" menu of Connector Designer . Load the repository file labeled "Sample_XML_Order_Connectors.in" located in the %CROSSWORLDS%\connectors\XML\Samples\WebSphereI nterChange Server Express folder. Confirm that the XMLConnector and PortConnector definitions have been loaded.

3. **Configure XML connector:**

   Using your WebSphere Business Integration Server Express System Manager, double-click on the XML CONNECTOR definition so that the Connector Designer is launched. The following Application Config Property values need to be modified for your specific file structure. These paths and/or files need to be created if they don't already exist:

   - ArchiveDirectory.

4. **Load collaboration templates and objects into repository:**

   Using your WebSphere Business Integration Server Express System Manager, select the "Open From File" menu item from the "File" menu. Load the repository file labeled "Sample_XML_Order_Collaborations.in" located in the %CROSSWORLDS%\connectors\XML\samples\WebSphereICS folder. Confirm that three template definitions and three collaboration objects have been loaded.

5. **Compile the colloration templates:**

   Using your WebSphere Business Integration Server Express System Manager, right click on the folder labeled *Collaboration Templates* and select **Compile all** from the drop down list.

6. **Modify the servelets for use in your enviornment:**

   The following changes must be made to the servlets:

   - For PollXMLOrder.java:

     On line 41 of the source file, the value of the outFileName String must be changed to be the name of the file on the local system to which the servlet should log the incoming XML message. On line 56 of the source file, the value passed to the FileInputStream constructor should be the exact file name on the local system for the delivered SamplePollingInput.xml file.

   - For MirrorXMLOrder.java:

     No Changes Necessary.

7. **Configure the XML Poll business object:**

   From the WebSphere Business IntegrationServer Express System Manager, open the business object labeled "XML_POLL_Order." The first attribute of this

business object should be named "URL." Change the URL attribute's default value to the location to which the XML Adapter will listen for XML responses (ie. PollXMLOrder.java). Save the business object to the server.

8. **Configure the Web server:**

   Compile the delivered servlets. The generated class files should be moved to the correct directory for the web server to pick them up and run them. Also, any additional steps to register the servlets should be done (the exact requirements will depend entirely on the web server being used).

9. **InterChange Server Express restart:**

   Reboot InterChange Server Express to ensure that all changes take effect. Use the System View from the WebSphere Business Integration Server Express System Manager to ensure that all of the collaboration objects and connector controllers are in a green state.

Running the service call request scenario

1. **Start:**
   - InterChange Server Express if not already running.
   - XML Adapter.
   - Web server.
   - One instance of the Visual Test Connector.

2. **Simulate the Port connector:**

   Using the Test Connector, define a profile for the "PortConnector." Select FILE -> CONNECT AGENT from the Test Connector's menu to begin simulating the agent.

3. **Load test data:**

   Using the Test Connector simulating the "PortConnector," Select EDIT -> LOAD BO from the menu. Load the following file:

   ```
   %CROSSWORLDS%\connectors\XML\samples\WebSphereICS\
   sampleOrderData.bo
   ```

4. **Set the URL:**

   Open the test data that was loaded into the Test Connector. Modify the value of the URL attribute to the location to which the XML Adapter should POST it's xml request.

5. **Send test data:**

   Using the Test Connector simulating the "PortConnector," click on the loaded Test BO. Select REQUEST -> SEND from the menu.

6. **Check for successful processing:**

   To ensure successful processing, check that the XML Adapter received an event, converted the BO to an XML document, posted it to the WebServer, received a response, parsed the response, and sent it back to the collaboration.

Running the Poll scenario

1. **Start**
   - InterChange Server Express if not already running.
   - XML Adapter.
   - Web server.
   - Start one instance of the Visual Test Connector.

2. **Simulate the Port connector:**

Using the Test Connector, define a profile for the "PortConnector." Select FILE -> CONNECT AGENT from the Test Connector's menu to begin simulating the agent.

3. **Poll sample data:**

    The PollFrequency has already been set to key. From the command window in which the XML Adapter was started, type the letter 'p' followed by the Enter key.

4. **Accept the request using the Port connector:**

    The XMLConnector will receive an XML document, convert it to a business object and pass it to InterChange Server Express. InterChange Server Express passes the event to two different collaborations that have subscriptions for this event. The collaborations will pass the events to the PortConnector. Accept the requests using the Test Connector, and reply with a successful response to both of the events.

5. **Check for successful processing:**

    To ensure successful processing, check that the data in the accepted request in the Test Connector and the Archive Directory correspond to the events from the SamplePollingInput.xml file provided in the sample.

Summary:

If you performed all the above steps successfully, you should have a working sample scenario that uses the XML Adapter and XML DataHandler to exchange XML documents between InterChange Server Express and a Webserver.

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