Guide to the IBM WebSphere Business Integration Adapter for SWIFT

Connector Version 1.3.x

Supported on IBM CrossWorlds Infrastructure version 4.1.0 and 4.1.1 (if the environment uses ISO Latin-1 data only), and IBM WebSphere Business Integration Adapter Framework version 2.0
See Release Notes for any exceptions.
(For support on version 3.1.x or 4.0.1, contact Technical Support.)

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New in This Release

New in Release 1.3.x

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

New in Release 1.2.x

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

- An application component specific to SWIFT
- Sample business objects
- IBM WebSphere Adapter Framework, which consists of:
  - Connector Framework
  - Development tools (including Business Object Designer and Connector Configurator))
  - APIs (including CDK)

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

Important

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

New in Release 1.1.x

The following new features are described in this guide:

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

About This Document

The IBM(R) WebSphere(R) business integration system is a suite of software integration products that supply connectivity for leading e-business technologies and enterprise applications. The system includes:

- Prebuilt components for common business integration processes
- Tools and templates for customizing and creating components
- A flexible, easy-to-use platform for configuring and managing the components

This document describes how to use the business integration technology that WebSphere supplies for SWIFT.

Audience

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

Prerequisites for This Document

Users of this document should be familiar with

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

Related Documents

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

To access the documentation, go to the directory where you installed the product and open the documentation subdirectory. If a `welcome.html` file is present, open it for hyperlinked access to all documentation. If no documentation is present, you can install it or read it directly online at one of the following sites:

- If you are using MQ Integrator as your integration broker: http://www.ibm.com/software/websphere/wbiadapters/infocenter
- If you are using InterChange Server as your integration broker: http://www.ibm.com/websphere/crossworlds/library/infocenter

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

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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. For UNIX installations, substitute slashes (/) for backslashes. All product pathnames are relative to the directory where the product is installed on your system.
UNIX: / **Windows:**	Paragraphs beginning with either of these indicate notes listing operating system differences.
◆	This symbol indicates the end of a **UNIX** / **Windows** paragraph; it can also indicate the end of a multiparagraph note.
%*text*% and $*text*	Text within percent (%) signs indicates the value of the Windows *text* system variable or user variable. The equivalent notation in a UNIX environment is $*text*, indicating the value of the *text* UNIX environment variable.

CHAPTER 1

Overview

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

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

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

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

For more information about the relationship of the integration broker to the connector, see the *IBM CrossWorlds System Administration Guid*e, or the *WebSphere Business Integration Adapters Implementation Guide for MQ Integrator*.

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

The connector for SWIFT allows the ICS or WMQI integration broker to exchange business objects with applications that send or receive data in the form of SWIFT messages.

Important

The connector supports SWIFT message transformation from ISO 7775 to corresponding ISO 15022 formats and vice versa, but only with the expanded business object definitions and ISO mapping described in this document. For further information, see Chapter 3, "Business Objects," and Chapter 4, "ISO 7775 to ISO 15022 Mapping."

The chapter contains the following sections:

"Connector Architecture"	page 2
"Application-Connector Communication Method"	page 4
"Event Handling"	page 6
"Business Object Requests"	page 10
"Message Processing"	page 11
"Error Handling"	page 14
"Tracing"	page 15

Connector Architecture

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

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

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

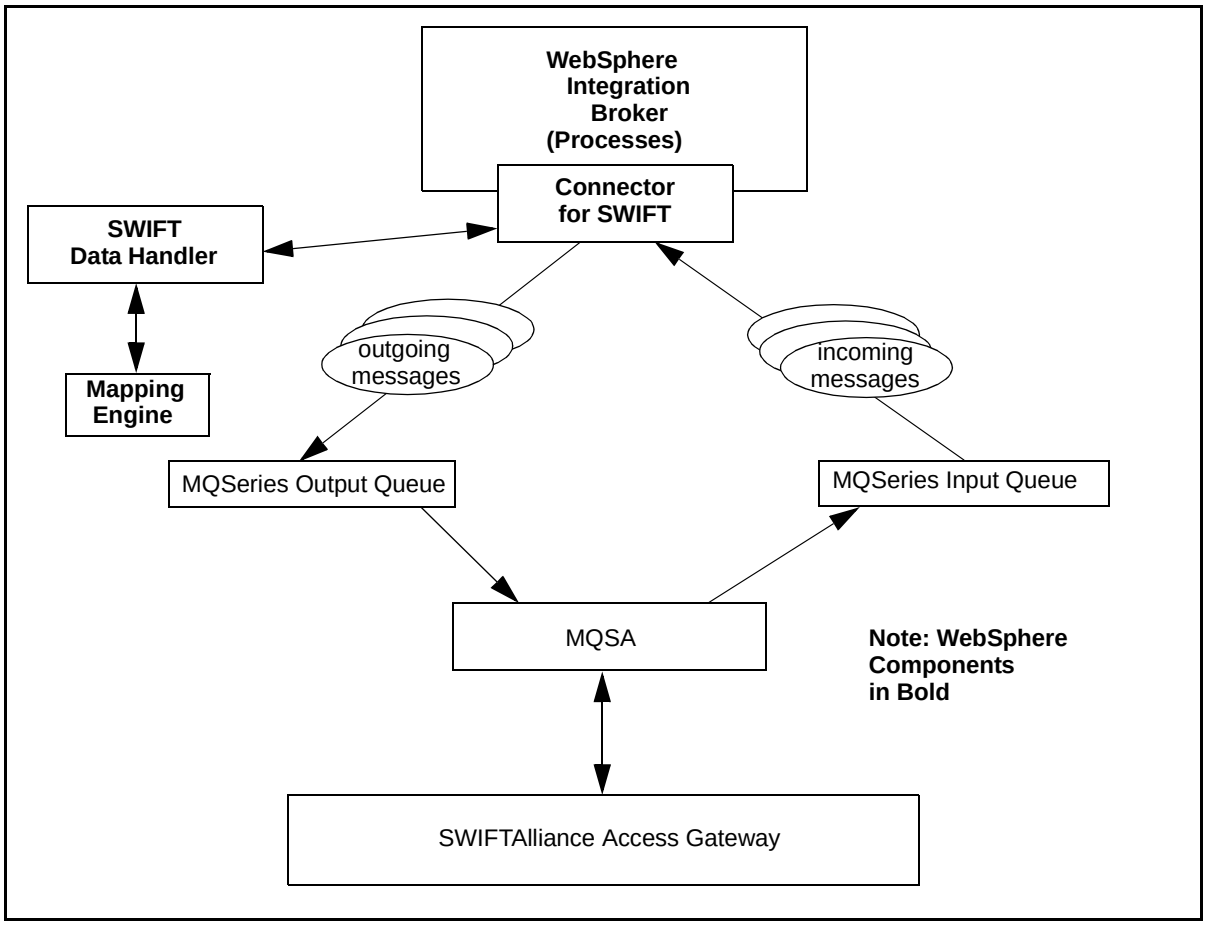


Figure 1-1 Connector for SWIFT Architecture

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

Connector for SWIFT

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

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

You can optionally construct a dynamic meta-object that is added as a child to the business object passed to the connector. The child meta-object values override those specified in the static meta-object that is specified for the connector as a whole. If the child meta-object is not defined or does not define a required conversion property, the

connector, by default, examines the static meta-object for the value. You can specify one or more dynamic child meta-objects instead of, or to supplement, a single static connector meta-object.

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

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

SWIFT Data Handler and Mapping Engine

The connector calls the SWIFT data handler to convert business objects into SWIFT messages and vice versa. The data handler is coupled with a mapping engine, which uses a map to perform transformations between business objects representing ISO 7775 and ISO 15022 SWIFT message formats. For more on the SWIFT data handler, see Chapter 5, "SWIFT Data Handler." For more on mapping, see Chapter 4, "ISO 7775 to ISO 15022 Mapping."

MQSeries

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

MQSA

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

SWIFTAlliance Access

The SWIFTAlliance Access gateway is a window through which SWIFT messages flow to and from remote financial applications over IP or MQSeries.

Application-Connector Communication Method

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

Message Request

Figure 1-2 illustrates a message request communication.

1. The connector framework receives a business object representing an ISO 7775 SWIFT message from an integration broker.
2. The connector passes the business object to the data handler.
3. If specified in the map subscription meta-object, the data handler passes the ISO 7775 object to the mapping engine.
4. Using a production instruction meta-object (PIMO), the mapping engine transforms the ISO 7775 object into an ISO 15022 business object and passes it to the data handler.
5. The data handler converts the ISO 15022 business object into an ISO 15022-compliant SWIFT message.
6. The connector dispatches the ISO 15022 SWIFT message to the MQSeries output queue.
7. The JMS layer makes the appropriate calls to open a queue session and routes the message to the MQSA, which issues the message to the SWIFT Alliance Gateway.

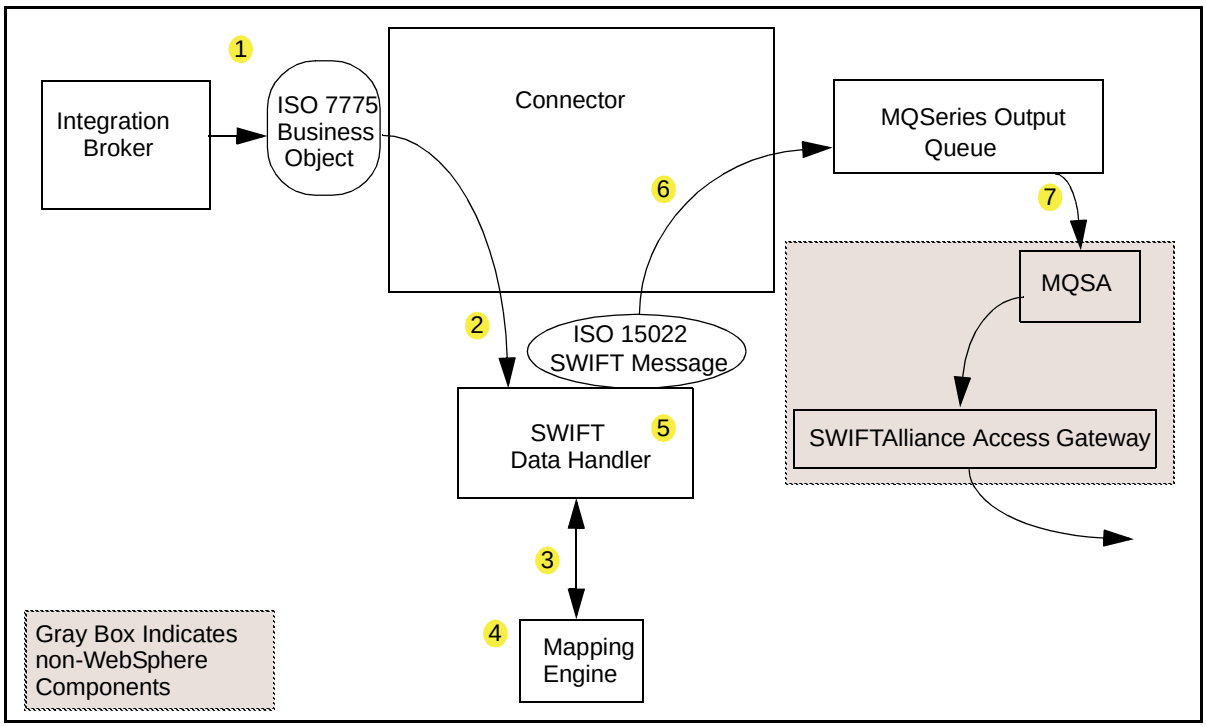


Figure 1-2 Application-Connector Communication Method: Message Request

Event Delivery

Figure 1-3 illustrates the message return communication.

1. The polling method retrieves the next applicable ISO 15022 SWIFT message from the MQSeries input queue.
2. The message is staged in the in-progress queue, where it remains until processing is complete.
3. The data handler converts the message into an ISO 15022 business object.

4 Using the map subscription meta-object, the connector determines whether the message type is supported and, if supported, requires transformation into an ISO 7775 business object. If so, the data handler passes the ISO 15022 business object to the mapping engine.

5 Using a PIMO, the mapping engine processes the sub-fields of business object data, creating an ISO 7775-compliant business object, which is passed to the data handler.

6 The SWIFT data handler receives the ISO 7775 business object and sets the verb in it to the default verb specified in the data handler-specific meta-object.

7 The connector then determines whether the business object is subscribed to by the integration broker. If so, the connector framework delivers the business object to the integration broker, and the message is removed from the in-progress queue.

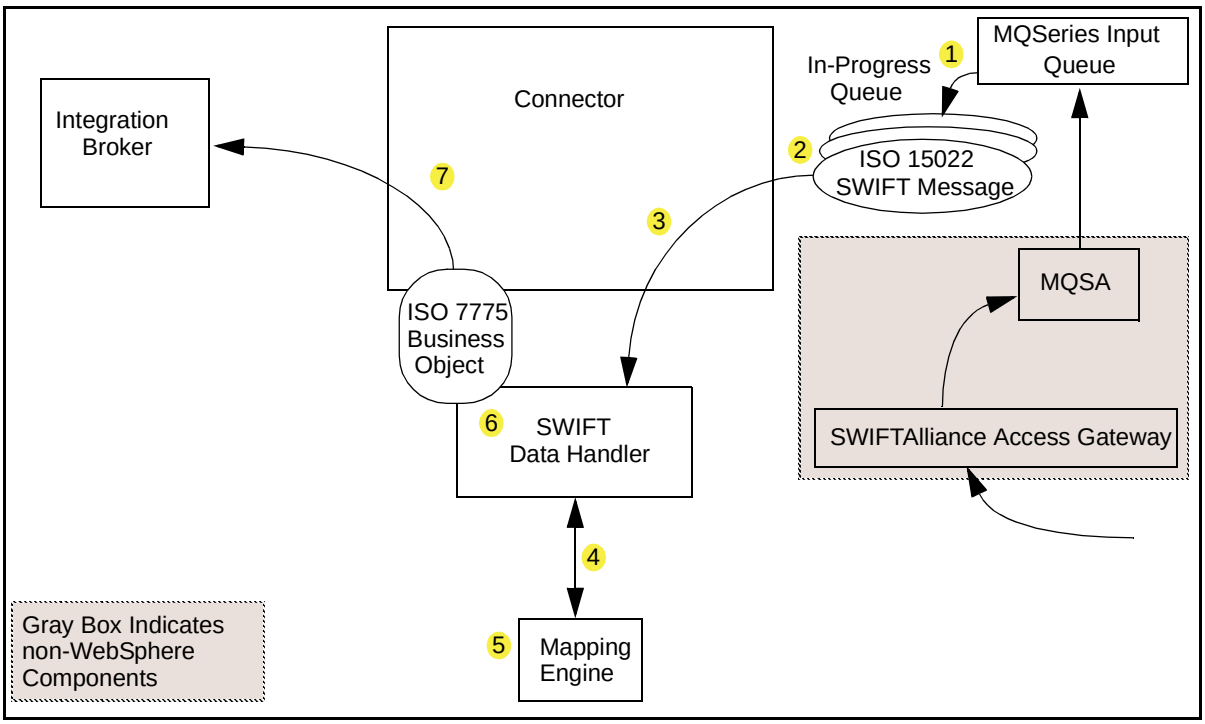


Figure 1-3 Application-Connector Communication Method: Event Delivery

Event Handling

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

Retrieval

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

In-Progress Queue

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

Note: Transactional sessions with a JMS service provider require that every requested action on a queue be performed and committed before events are removed from the queue. Accordingly, when the connector retrieves a message from the queue, it does not commit to the retrieval until: 1) The message has been converted to a business object; 2) the business object is delivered to the integration broker, and 3) a return value is received.

Synchronous Acknowledgment

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

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

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

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

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

Table 1-1 Required Structure of Synchronous MQSeries Messages

MQMD Field (Message Descriptor)	Description	Supported Values (multiple values should be OR'd)
MessageType	Message type	DATAGRAM

Table 1-1 Required Structure of Synchronous MQSeries Messages

MQMD Field (Message Descriptor)	Description	Supported Values (multiple values should be OR'd)
`Report`	Options for report message requested	You can specify one or both of the following: ■ `MQRO_PAN` The connector sends a report message if the business object can be successfully processed. ■ `MQRO_NAN` The connector sends a report message if an error occurred while processing the business object. You can specify one of the following to control how the correlation ID of the report message is to be set: ■ `MQRO_COPY_MSG_ID_TO_CORREL_ID` The connector copies the message ID of the request message to the correlation ID of the report. This is the default action. ■ `MQRO_PASS_CORREL_ID` The connector copies the correlation ID of the request message to the correlation ID of the report.
`ReplyToQueue`	Name of reply queue	The name of the queue to which the report message should be sent.
`ReplyToQueue Manager`	Name of queue manager	The name of the queue manager to which the report message should be sent.
Message Body		A serialized business object in a format compatible with the data handler configured for the connector.

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

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

Table 1-2 shows the structure of the report that is sent to the requesting application from the connector.

Table 1-2 Structure of the Report Returned to the Requesting Application

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

Recovery

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

Fail on Startup

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

Reprocess

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

Ignore

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

Log Error

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

Archiving

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

Guaranteed Event Delivery

You can enable guaranteed event delivery. This feature enables the connector framework to remove a message from the source queue and place it on the destination queue as a single transaction.

For configuration information, see "ContainerManagedEvents," on page 144 and page 151.

Business Object Requests

Business object requests are processed when the integration broker issues a business object. Using the SWIFT data handler and mapping engine, and depending on the requirements specified in the subscription meta-object, the connector can transform an ISO 7775 object to an ISO 15022 object before converting the business object to a SWIFT message and issuing it.

Business Object Mapping

The map subscription meta-object determines whether mapping between ISO 7775 and ISO 15022 business objects occurs. For example, a child map subscription meta-object (`MO_Swift_MapSubscriptions_In`) with an attribute `Map_Swift_MT523_to_MT543` indicates that the business object definition corresponding to SWIFT message type 523 must be mapped to a business object definition representing SWIFT message type 543. For more information on the map subscription meta-object, see "Map Subscription Meta-Object," on page 28.

The transformation of business object definitions from those representing ISO 7775 messages to those representing ISO 15022 and vice versa takes place in the mapping engine. There, a production instruction meta-object (PIMO) governs the mapping process. The PIMO is a meta-object, but one designed to handle mapping only. Each PIMO specifies attribute-by-attribute processing instructions for a specific transformation, for example, from SWIFT message type 523 to message type 543. You can modify PIMOs using Business Object Designer. For more information on mapping and PIMOs, see Chapter 4, "ISO 7775 to ISO 15022 Mapping."

Message Processing

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

The connector supports the following business object verbs:

- Create
- Retrieve

Create

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

Asynchronous Delivery

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

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

Synchronous Acknowledgment

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

For MQSeries, the connector initially issues a message with a header as shown in Table 1-3.

Table 1-3 Request Message Descriptor Header (MQMD)

Field	Description	Value
Format	Format name	Output format as defined in the conversion properties and truncated to 8 characters to meet IBM requirements (example: `MQSTR`).
MessageType	Message type	`MQMT_DATAGRAM`[a]
Report	Options for report message requested.	When a response message is expected, this field is populated as follows: `MQRO_PAN`[a] to indicate that a positive-action report is required if processing is successful. `MQRO_NAN`[a] to indicate that a negative-action report is required if processing fails. `MQRO_COPY_MSG_ID_TO_CORREL_ID`[a] to indicate that the correlation ID of the report generated should equal the message ID of the request originally issued.

Table 1-3 Request Message Descriptor Header (MQMD)

ReplyToQueue	Name of reply queue	When a response message is expected, this field is populated with the value of connector property `ReplyToQueue`.
Persistence	Message persistence	`MQPER_PERSISTENT`[a]
Expiry	Message lifetime	`MQEI_UNLIMITED`[a]

a.Indicates constant defined by IBM.

The message header described in Table 1-3 is followed by the message body. The message body is a business object that has been serialized using the data handler.

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

When an application receives a synchronous request from the connector, it processes the business object and issues a report message as described in Table 1-4, Table 1-5, and Table 1-6.

Table 1-4 Response Message Descriptor Header (MQMD)

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

a.Indicates constant defined by IBM.

Table 1-5 Population of Response Message

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

Table 1-6 Feedback Codes and Response Values

MQSeries Feedback Code	Equivalent IBM CrossWorlds Response[a]
MQFB_PAN or MQFB_APPL_FIRST	SUCCESS
MQFB_NAN or MQFB_APPL_FIRST + 1	FAIL
MQFB_APPL_FIRST + 2	VALCHANGE
MQFB_APPL_FIRST + 3	VALDUPES
MQFB_APPL_FIRST + 4	MULTIPLE_HITS
MQFB_APPL_FIRST + 5	Not applicable
MQFB_APPL_FIRST + 6	Not applicable
MQFB_APPL_FIRST + 7	UNABLE_TO_LOGIN
MQFB_APPL_FIRST + 8	APP_RESPONSE_TIMEOUT (results in immediate termination of connector)
MQFB_NONE	What the connector receives if no feedback code is specified in the response message

a.See the *Connector Development Guide* for details.

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

Upon retrieval of a response message, the connector matches the `correlationID` of the response to the `messageID` of a request message. The connector then notifies the thread that issued the request. Depending on the feedback field of the response, the connector either expects a business object or an error message in the message body. If a business object was expected but the message body is not populated, the connector simply returns the same business object that was originally issued by the integration broker for the Request operation. If an error message was expected but the message body is not populated, a generic error message is returned to the integration broker along with the response code.

Creating Custom Feedback Codes

You can extend the MQSeries feedback codes to override default interpretations shown in Table 1-6 by specifying the connector property FeedbackCodeMappingMO. This property allows you to create a meta-object in which all IBM CrossWorlds-specific return status values are mapped to the MQSeries feedback codes. The return status assigned (using the meta-object) to a feedback code is passed to the integration broker. For more information, see "FeedbackCodeMappingMO," on page 23.

Retrieve

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

Table 1-7 shows the response messages for these verbs.

Table 1-7 Population of Response Message

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

Error Handling

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

```
Message number
Message text
```

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

Application Timeout

The error message ABON_APPRESPONSETIMEOUT is returned when:

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

Unsubscribed Business Object

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

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

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

Data Handler Conversion

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

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

Tracing

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

What follows is recommended content for connector trace messages.

Level 0	This level is used for trace messages that identify the connector version.
Level 1	Use this level for trace messages that provide key information on each business object processed or record each time a polling thread detects a new message in an input queue.
Level 2	Use this level for trace messages that log each time a business object is posted to the integration broker, either from `gotApplEvent()` or `executeCollaboration()`.
Level 3	Use this level for trace messages that provide information regarding message-to-business-object and business-object-to-message conversions or provide information about the delivery of the message to the output queue.
Level 4	Use this level for trace messages that identify when the connector enters or exits a function.
Level 5	Use this level for trace messages that indicate connector initialization, represent statements executed in the application, indicate whenever a message is taken off of or put onto a queue, or record business object dumps.

CHAPTER 2

Configuring the Connector

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

The chapter contains the following sections:

"Prerequisites"	page 17
"Installing the Connector"	page 18
"Connector Configuration"	page 20
"Queue Uniform Resource Identifiers (URI)"	page 26
"Meta-Object Attributes Configuration"	page 27
"Startup File Configuration"	page 38
"Startup"	page 38

Prerequisites

Prerequisite Software

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

- IBM CrossWorlds software version 4.1.0 or later or WebSphere Business Integration Adapter Framework version 2.0
- MQSeries 5.1 and 5.2
- IBM MQSeries Java client libraries

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

Windows: Microsoft Windows NT 4.0 Service Pack 6A or Windows 2000

UNIX: Solaris 7 or AIX 4.3.3 Patch Level 7

- MQSA MQSeries Interface for SWIFTAlliance 1.3

For client setup with an NT server, see the description in the IBM publication *MQSeries Quick Beginnings for NT*.

Installing the Connector

The following subsections describe how to install the connector on a UNIX or Windows system.

After your business integration system is installed, you can install additional adapters from the CD at any time. To do this, insert the CD, run the installation program, and choose the adapters that you want to install.

Installing on a UNIX System

To install the connector on a UNIX system, run the Installer for IBM WebSphere Business Integration Adapter and select the WebSphere Business Integration Adapter for SWIFT. Installer installs *all* UNIX-supported connectors.

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

Table 2-1 describes the UNIX file structure used by the connector.

Table 2-1 Installed UNIX File Structure for the Connector

Subdirectory of $CROSSWORLDS	Description
`connectors/SWIFT/CWSwift.jar`	Connector jar files
`connectors/SWIFT/CWJMSCommon.jar`	
`connectors/SWIFT/start_SWIFT.sh`	The startup script for the connector. The script is called from the generic connector manager script. When you click Install from Connector Configurator (WMQI as the integration broker) or the Connector Configuration screen of CSM (ICS as the integration broker), the installer creates a customized wrapper for this connector manager script. When the connector works with ICS, use this customized wrapper only to start and stop the connector. When the connector works with WMQI, use this customized wrapper only to start the connector; use `mqsiremotestopadapter` to stop the connector.
`connectors/messages/SWIFTConnector.txt`	Connector message file
`repository/SWIFT/CN_SWIFT.txt`	Connector definition
`DataHandlers/CwDataHandler.jar`	The SWIFT data handler

Table 2-1 Installed UNIX File Structure for the Connector (Continued)

Subdirectory of $CROSSWORLDS	Description
repository/DataHandlers/ MO_DataHandler_SWIFT.txt	Meta-object for SWIFT data handler
repository/DataHandlers/ MO_DataHandler_Default.txt	Data handler default object
connectors/SWIFT/samples/ Sample_SWIFT_MO_Config.txt	Sample configuration object
connectors/SWIFT/samples/ BO_Definitions/SWIFT_objects.txt	SWIFT message business object definitions
connectors/SWIFT/samples/ Map_Definitions/Map_objects.txt	ISO 7775-ISO 15022 maps
connectors/SWIFT/samples/ MAP_SWIFT_SUBSCRIPTIONS.txtg	Map subscription meta-object

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

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

Installing on a Windows System

To install the connector on a Windows system, run the Installer for IBM WebSphere Business Integration Adapter and select the WebSphere Business Integration Adapter for SWIFT. Installer installs standard files associated with the connector. Table 2-2 describes the Windows file structure used by the connector.

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

Table 2-2 Installed Windows File Structure for the Connector

Subdirectory of %CROSSWORLDS%	Description
connectors\SWIFT\CWSwift.jar	Connector jar files
connectors\SWIFT\CWJMSCommon.jar	
connectors\SWIFT\start_SWIFT.bat	The startup file for the connector.
connectors\messages\SWIFTConnector .txt	Connector message file
repository\SWIFT\CN_SWIFT.txt	Connector definition
DataHandlers\CwDataHandler.jar	The SWIFT data handler
repository\DataHandlers\MO_DataHan dler_SWIFT.txt	Meta-object for SWIFT data handler

Table 2-2 Installed Windows File Structure for the Connector (Continued)

Subdirectory of %CROSSWORLDS%	Description
repository\DataHandlers\MO_DataHandler_Default.txt	Data handler default object
connectors\SWIFT\samples\Sample_SWIFT_MO_Config.txt	Sample configuration object
connectors\SWIFT\samples\BO_Definitions\SWIFT_objects.txt	SWIFT message business object definitions
connectors\SWIFT\samples\Map_Definitions\Map_objects.txt	ISO 7775-ISO 15022 maps
connectors\SWIFT\samples\MAP_SWIFT_SUBSCRIPTIONS.txtg	Map subscription meta-object

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

- *System Installation Guide for Windows* (when ICS is used as integration broker)
- *WebSphere Business Integration Adapter Implementation Guide for MQ Integrator* (when MQ Integrator is used as integration broker)

Connector Configuration

Connectors have two types of configuration properties: standard configuration properties and connector-specific configuration properties. You must set the values of these properties before running the connector. Use one of the following tools to set a connector's configuration properties:

- Connector Designer (if ICS is the integration broker)—Access to this tool is from the CrossWorlds System Manager (CSM).
- Connector Configurator (if WMQI is the integration broker)—Access this tool from the WebSphere Business Integration Adapter program folder. For more information see Appendix B, "Connector Configurator."

Standard Connector Properties

Standard configuration properties provide information that all connectors use. See Appendix A, "Standard Configuration Properties for Connectors," for documentation of these properties.

Important

Because this connector supports both the ICS and WMQI integration broker, configuration properties for both brokers are relevant to the connector.

Connector-Specific Properties

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

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

Table 2-3 lists the connector-specific configuration properties for the connector for SWIFT. See the sections that follow for explanations of the properties.

Table 2-3 Connector-Specific Configuration Properties

Name	Possible Values	Default Value	Required
"ApplicationPassword"	Login password		No
"ApplicationUserID"	Login user ID		No
"ArchiveQueue"	Queue to which copies of successfully processed messages are sent	`queue://CrossWorlds.QueueManager/MQCONN.ARCHIVE`	No
"Channel"	MQ server connector channel		Yes
"ConfigurationMetaObject"	Name of configuration meta-object		Yes
"DataHandlerClassName"	Data handler class name	`com.crossworlds.DataHandlers.swift.ExtendedSwiftDataHandler`	No
"DataHandlerConfigMO"	Data handler meta-object	`MO_DataHandler_Default`	Yes
"DataHandlerMimeType"	MIME type of file	`swift`	No
"ErrorQueue"	Queue for unprocessed messages	`queue://crossworlds.Queue.manager/MQCONN.ERROR`	No
"FeedbackCodeMappingMO"	Feedback code meta-object		No
"HostName"	MQSeries server		No

"InDoubtEvents"	`FailOnStartup`
	`Reprocess`
	`Ignore`
	`LogError`
		`Reprocess`	No

Table 2-3 Connector-Specific Configuration Properties (Continued)

Name	Possible Values	Default Value	Required
"InputQueue"	Poll queues	queue://CrossWorlds.QueueManager/MQCONN.IN	Yes
"InProgressQueue"	In-progress event queue	queue://CrossWorlds.QueueManager/MQCONN.IN_PROGRESS	Yes
"PollQuantity"	Number of messages to retrieve from each queue specified in the InputQueue property	1	No
"Port"	Port established for the MQSeries listener		No
"ReplyToQueue"	Queue to which response messages are delivered when the connector issues requests	queue://CrossWorlds.QueueManager/MQCONN.REPLYTO	No
"UnsubscribedQueue"	Queue to which unsubscribed messages are sent	queue://CrossWorlds.QueueManager/MQCONN.UNSUBSCRIBE	No

ApplicationPassword

Password used with the ApplicationUserID to log in to MQSeries.

Default = None.

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

ApplicationUserID

User ID used with the ApplicationPassword to log in to MQSeries.

Default=None.

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

ArchiveQueue

Queue to which copies of successfully processed messages are sent.

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

Channel

MQ server connector channel through which the connector communicates with MQSeries.

Default=None.

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

ConfigurationMetaObject

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

Default = none.

DataHandlerClassName

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

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

DataHandlerConfigMO

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

Default = `MO_DataHandler_Default`

DataHandlerMimeType

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

Default = `swift`

ErrorQueue

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

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

FeedbackCodeMappingMO

Allows you to override and reassign the default feedback codes used to synchronously acknowledge receipt of messages to the integration broker. This property enables you to specify a meta-object in which each attribute name is understood to represent a feedback code. The corresponding value of the feedback code is the return status that is passed to the integration broker. For a listing of the default feedback codes, see "Synchronous Acknowledgment," on page 11. The connector accepts the following attribute values representing MQSeries-specific feedback codes:

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

The connector accepts the following IBM CrossWorlds-specific status codes as attribute values in the meta-object:

- SUCCESS

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

Table 2-4 shows a sample meta-object.

Table 2-4 Sample Feedback Code Meta-Object Attributes

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

Default = none.

HostName

The name of the server hosting MQSeries.

Default=None.

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

InDoubtEvents

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

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

Default = `Reprocess`.

InputQueue

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

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

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

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

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

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

InProgressQueue

Message queue where messages are held during processing.

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

PollQuantity

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

Default =1

Port

Port established for the MQSeries listener.

Default=None.

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

ReplyToQueue

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

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

UnsubscribedQueue

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

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

Queue Uniform Resource Identifiers (URI)

A URI uniquely identifies a queue. A URI for a queue begins with the sequence `queue://` followed by:

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

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

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

Table 2-5 shows property names for queue URIs.

Table 2-5 SWIFT-Specific Connector Property Names for Queue URIs

Property Name	Description	Values
`expiry`	Lifetime of the message in milliseconds.	0 = unlimited. positive integers = timeout (in ms).
`priority`	Priority of the message.	0-9, where 1 is the highest priority. A value of -1 means that the property is determined by the configuration of the queue. A value of -2 means that the connector can use its own default value.
`persistence`	Whether the message should be retained in persistent memory.	1 = non-persistent 2 = persistent A value of -1 means that the property is determined by the configuration of the queue. A value of -2 means that the connector uses its own default value.
`CCSID`[a]	Character set of the destination.	Integers - valid values listed in base MQSeries documentation.

Table 2-5 SWIFT-Specific Connector Property Names for Queue URIs (Continued)

Property Name	Description	Values
`targetClient`	Whether the receiving application is JMS compliant or not.	1 = MQ (MQMD header only) This value must be set to 1 for SWIFTAlliance.
`encoding`	How to represent numeric fields.	An integer value as described in the base MQSeries documentation.

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

Meta-Object Attributes Configuration

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

- **Map Subscription meta-object** specifies business object mapping between ISO 7775 and ISO 15022 message types. For a description and configuration information, see "Map Subscription Meta-Object," on page 28.
- **Production Instruction meta-object (PIMO)** specifies the attribute-by-attribute processing instructions for a specific transformation, for example, from SWIFT message type 523 to message type 543. No configuration is required after installation. For more information on PIMOs and mapping, see Chapter 4, "ISO 7775 to ISO 15022 Mapping."
- **Static meta-object** specifies verb and message formats for business objects as well as transport layer options. For more information, see "Static Meta-Object," on page 29.

- **Dynamic child meta-object** The attribute values of the dynamic child meta-object duplicate and override those of the static meta-object. For more information see "Dynamic Child Meta-Object," on page 33.

Map Subscription Meta-Object

The map subscription meta-object, `MO_Swift_MapSubscriptions`, contains two child objects, `MO_Swift_MapSubscriptions_In` and `MO_Swift_MapSubscriptions_Out`. The inbound child object, `MO_Swift_MapSubscriptions_In`, contains attributes for transforming business objects representing ISO 7775 SWIFT messages to objects representing ISO 15022 SWIFT messages. The outbound (from SWIFT) child object, `MO_Swift_MapSubscriptions_Out`, contains attributes identifying business object transformations from ISO 15022 to ISO 7775 SWIFT messages.

You can alter or add attributes to the child objects as you modify or extend the number of ISO 7775-15022 transformations. When you do so, you must reload the map subscription meta-object into the repository and restart the adapter.

Here is an excerpt from `MO_Swift_MapSubscriptions_In`. The excerpt specifies maps for transformations of business objects representing SWIFT messages. For example, the `Type` for attribute `Swift_MT520`, `Map_Swift_MT520_to_MT540`, tells the connector that the business object must be transformed from one representing SWIFT message type 520 (ISO 7775) to message type 540 (ISO 15022).

```
[ReposCopy]

Version = 3.1.0
RepositoryID =
[End]
[BusinessObjectDefinition]
Name = MO_Swift_MapSubscriptions_In
Version = 3.0.0

[Attribute]
Name = Swift_MT520
Type = Map_Swift_MT520_to_MT540
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = true
IsForeignKey = false
IsRequired =true
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_MT52
Type = Map_Swift_MT521_to_MT541
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = true
```

```
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_MT522
Type = Map_Swift_MT522_to_MT542
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
```

Static Meta-Object

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

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

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

Table 2-6 describes the meta-object properties.

Table 2-6 Static Meta-Object Properties

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

Table 2-6 Static Meta-Object Properties (Continued)

Property Name	Description
OutputFormat	The output format is set on messages created from the given business object. If a value for the OutputFormat property is not specified, the input format is used, if available. An OutputFormat property value defined in a dynamic child meta-object overrides the value defined in the static meta-object.
OutputQueue	The output queue is the queue to which messages derived from the given business object are delivered. An OutputQueue property value defined in a dynamic child meta-object overrides the value defined in the static meta-object.
ResponseTimeout	The length of time in milliseconds to wait for a response before timing out. The connector returns SUCCESS immediately without waiting for a response if this property is undefined or has a value less than zero. A ResponseTimeout property value defined in a dynamic child meta-object overrides the value defined in the static meta-object.
TimeoutFatal	If this property is defined and has a value of true, the connector returns APP_RESPONSE_TIMEOUT when a response is not received within the time specified by ResponseTimeout. All other threads waiting for response messages immediately return APP_RESPONSE_TIMEOUT to the integration broker. This causes the integration broker to terminate the connection to the connector. A TimeoutFatal property defined in a dynamic child meta-object overrides the value defined in the static meta-object.

Application-Specific Text

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

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

Overloading Input Formats

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

If, however, the same input format is defined for more than one business object, the connector cannot determine which business object the data represents before passing it to the data handler. In such cases, the connector passes the message contents only to

the data handler and then looks up conversion properties based on the business object that is generated. Accordingly, the data handler must determine the business object based on the message content alone.

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

A Sample Static Meta-Object

The static meta-object shown below configures the connector to convert `SWIFT_MT502` business objects using verbs Create and Retrieve. Note that attribute `Default` is defined in the meta-object. The connector uses the conversion properties of this attribute:

```
OutputQueue=CustomerQueue1;ResponseTimeout=5000;TimeoutFatal=true
```

as default values for all other conversion properties. Thus, unless specified otherwise by an attribute or overridden by a dynamic child meta-object value, the connector issues all business objects to queue `CustomerQueue1` and then waits for a response message. If a response does not arrive within 5000 milliseconds, the connector terminates immediately.

Business Object with Verb Create

Attribute `Swift_MT502_Create` indicates to the connector that any messages of format `NEW` should be converted to a business object with the verb Create. Because an output format is not defined, the connector sends messages representing this object-verb combination using the format defined for input (in this case `NEW`).

Business Object with Verb Retrieve

Attribute `Swift_MT502_Retrieve` specifies that business objects with verb Retrieve should be sent as messages with format `RETRIEVE`. Note that the default response time has been overridden so that the connector can wait up 10000 milliseconds before timing out (it still terminates if a response is not received).

```
[ReposCopy]
Version = 3.1.0
Repositories = 1cHyILNuPTc=
[End]
[BusinessObjectDefinition]
Name = Sample_MO
Version = 1.0.0

[Attribute]
Name = Default
Type = String
Cardinality = 1
MaxLength = 1
IsKey = true
IsForeignKey = false
IsRequired = false
AppSpecificInfo =
OutputQueue=CustomerQueue1;ResponseTimeout=5000;TimeoutFatal=true
IsRequiredServerBound = false
[End]
[Attribute]
```

```
Name = Swift_MT502_Create
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = InputFormat=NEW
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_MT502_Retrieve
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = OutputFormat=RETRIEVE;ResponseTimeout=10000
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]

[End]
```

Dynamic Child Meta-Object

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

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

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

Table 2-7 shows sample static meta-object properties for business object `Swift_MT502_Create`. Note that the application-specific text consists of semicolon-delimited name-value pairs

Table 2-7 Static Meta-Object Structure for Swift_MT502_Create

Attribute Name	Application-Specific Text

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

Table 2-8 shows a sample dynamic child meta-object for business object `Swift_MT_Create`.

Table 2-8 Dynamic Child Meta-Object Structure for Swift_MT502_Create

Attribute Name	Value
`OutputFormat`	`ORDER_OUT`
`OutputQueue`	`QueueA`
`ResponseTimeout`	`10000`
`TimeoutFatal`	`False`

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

Population of the Dynamic Child Meta-Object During Polling

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

Table Table 2-9 shows how a dynamic child meta-object might be structured for polling.

Table 2-9 JMS Dynamic Child Meta-Object Structure for Polling

Attribute Name	Sample Value
`InputFormat`	`ORDER_IN`
`InputQueue`	`MYInputQueue`
`OutputFormat`	`CxIgnore`
`OutputQueue`	`CxIgnore`

Table 2-9 JMS Dynamic Child Meta-Object Structure for Polling (Continued)

Attribute Name	Sample Value
ResponseTimeout	CxIgnore
TimeoutFatal	CxIgnore

As shown in Table 2-9, you can define an additional attribute, `InputQueue`, in a dynamic child meta-object. This attribute contains the name of the queue from which a given message has been retrieved. If this property is not defined in the child meta-object, it will not be populated.

Example scenario:

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

Sample Dynamic Child Meta-Object

```
[BusinessObjectDefinition]
Name = MO_Sample_Config
Version = 1.0.0

[Attribute]
Name = OutputFormat
Type = String
MaxLength = 1
IsKey = true
IsForeignKey = false
IsRequired = false
DefaultValue = ORDER
IsRequiredServerBound = false
[End]
[Attribute]
Name = OutputQueue
Type = String
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
DefaultValue = OUT
IsRequiredServerBound = false
[End]
[Attribute]
Name = ResponseTimeout
Type = String
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
DefaultValue = -1
```

```
IsRequiredServerBound = false
[End]
[Attribute]
Name = TimeoutFatal
Type = String
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
DefaultValue = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = InputFormat
Type = String
MaxLength = 1
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = InputQueue
Type = String
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]


[Verb]
Name = Retrieve
[End]

[End]
[BusinessObjectDefinition]
Name = Swift_MT502
Version = 1.0.0
AppSpecificInfo = cw_mo_conn=MyConfig

[Attribute]
Name = FirstName
Type = String
MaxLength = 1
```

```
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = LastName
Type = String
MaxLength = 1
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = Telephone
Type = String
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = MyConfig
Type = MO_Sample_Config
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]

[End]
```

Startup File Configuration

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

Windows

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

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

UNIX

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

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

Startup

For information on starting a connector, stopping a connector, and the connector's temporary startup log file, see the see the startup chapter in the *System Installation Guide* for your platform.

CHAPTER 3

Business Objects

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

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

Important

The connector supports business object mapping between the ISO 7775-15022 message formats for SWIFT Category 5, Securities Markets, but only with the expanded business object definitions available with release 1.3 (and later) of this connector. To install the object definition files, see Chapter 2, "Configuring the Connector." *If you use business object definitions from release 1.2 or earlier, the connector cannot perform ISO 7775-15022 business object transformations.*

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

"Connector Business Object Requirements"	page 40
"Overview of SWIFT Message Structure"	page 44
"SWIFT Message and Business Object Data Mapping"	page 46

Connector Business Object Requirements

The business object requirements for the connector reflect the way the SWIFT data handler converts:

- a SWIFT message into a WebSphere business object, and vice versa
- a business object representing a SWIFT ISO 7775 message into a business object representing the corresponding SWIFT ISO 15022 message, and vice versa.

The sections below discuss the requirements for WebSphere business objects as well as the SWIFT message structure. For a step-by-step description of how the SWIFT data handler interacts with WebSphere business objects and SWIFT messages, see Chapter 5, "SWIFT Data Handler."

A review of the following WebSphere documents is strongly recommended:

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

Business Object Hierarchy

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

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

Important

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

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

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

WebSphere uses the following terms when describing business objects:

- **hierarchical**—Refers to a complete business object, including the top-level business object and its the child business objects at any level.
- **parent**—Refers to a business object that contains at least one child business object. A top-level business object is also a parent.
- **individual**—Refers to a single business object, independent of any child business objects it might contain or that contain it.

- **top-level**—Refers to the individual business object at the top of the hierarchy, which does not itself have a parent business object.
- **wrapper**—Refers to a top-level business object that contains information used to process its child business objects. For example, the XML connector requires the wrapper business object to contain information that determines the format of its child data business objects and routes the children.

Business Object Attribute Properties

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

Name Property

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

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

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

Type Property

The Type property defines the data type of the attribute:

- For a simple attribute, the supported types are `Boolean`, `Integer`, `Float`, `Double`, `String`, `Date`, and `LongText`.
- If the attribute represents a child business object, specify the type as the name of the child business object definition (for example, `Type = MT502A`) and specify the cardinality as `1`.
- If the attribute represents an array of child business objects, specify the type as the name of the child business object definition and specify the cardinality as `n`.

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

Cardinality Property

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

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

Key Property

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

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

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

Foreign Key Property

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

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

Required Property

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

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

AppSpecificInfo

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

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

Max Length Property

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

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

Default Value Property

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

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

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

Comments Property

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

Special Attribute Value

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

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

Application-Specific Text at the Attribute Level

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

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

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

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

Table 3-1 describes the name-value parameters for attribute application-specific text.

Table 3-1 Name-Value Parameters in AppSpecificText for Attributes

Parameter	Required	Description
`block`	Yes for top-level object only	The number of the block in the SWIFT message. Values range from 0-5. For information on the SWIFT message blocks, see "Overview of SWIFT Message Structure," on page 44.
`parse`	Yes for attributes of the top-level object only	Describes whether, and how, to parse the SWIFT message block. Values are: `fixlen`—parse as fixed length `delim`—parse as delimited text `field`—Block 4 only `no`—Do not parse; treat as a single string.

Table 3-1 Name-Value Parameters in AppSpecificText for Attributes (Continued)

Parameter	Required	Description
`tag`	Yes for attributes of type tag business object	The tag number of the field. For more on SWIFT message tags, see Appendix D, SWIFT Message Structure. For further information on sequence and field business objects, see "Block 4 Business Object Structure," on page 59.
`letter=`*a*	Yes for each attribute that points to a tag business object	One or more supported letters appended to the tag in the SWIFT message format. For example 20A or [A|B|NULL] (A or B or null). Note that `NULL` must be specified for tags where no letter is a possibility, or for tags that do not have a letter option at all. For example, tag 59.
`content`	No	The qualifier in the SWIFT message format. For example, in a SWIFT message MT502, tag20C, the qualifier = `SEME`.

Note: The application-specific information for production instruction meta-objects (PIMOs) contains name-value pairs that indicate compute instructions. For more information, see Chapter 4, "ISO 7775 to ISO 15022 Mapping."

Overview of SWIFT Message Structure

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

MQSA UUID

SWIFT 1:Basic Header Block

SWIFT 2: Application Header Block

SWIFT 3:User Header Block

SWIFT 4: Text Block

SWIFT 5: Trailer

MQSA S Block

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

For further information on SWIFT message structure, see Appendix D, SWIFT Message Structure, and *All Things SWIFT: the SWIFT User Handbook*.

Overview of Business Objects for SWIFT

As shown in Figure 3-1 there are five kinds of business objects for SWIFT:

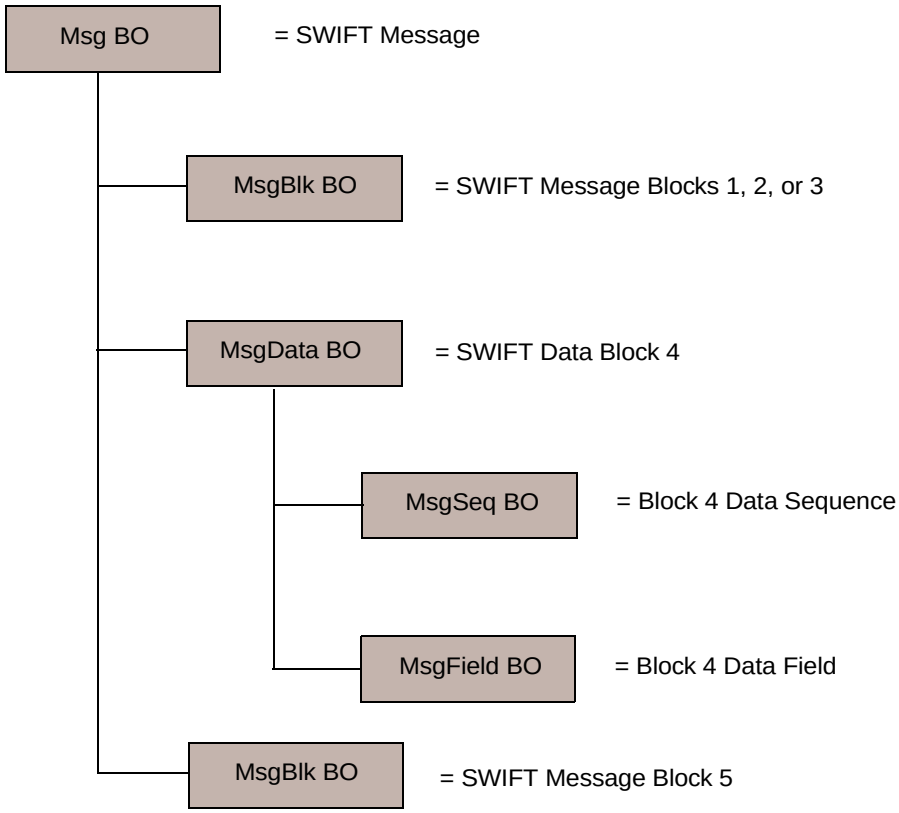


Figure 3-1 Business Objects Map to SWIFT Message Components

- **Message business object (Msg BO)** This is the top-level business object whose attributes correspond to the blocks in a SWIFT message. For further information, see "Top-Level Business Object Structure," on page 46.
- **Message block business object (MsgBlk BO)** A child object of the Msg BO that can represent blocks 1, 2, 3, or 5 in a SWIFT message. For further information, see "Block 1 Business Object Structure," on page 50.
- **Message data business object (MsgData BO)** A child object of the Msg BO that represents block 4 of the SWIFT message. For further information, see "Block 4 Business Object Structure," on page 59.
- **Message sequence business object (MsgSeq BO)** A child object of a MsgData BO or of another MsgSeq BO. A MsgSeq BO represents a sequence of fields occurring in block 4 of the SWIFT message. For further information, see "Sequence Business Object Structure," on page 65.
- **Message field business object (MsgField BO)** A child object of the MsgData BO or of a MsgSeq BO that contains the content of a field. Fields correspond to tags in SWIFT messages. For further information, see "Field Business Object Definitions," on page 68.

Each of these business objects consist of the following:

- **Name** The name of the business object consists of a SWIFT Message name, a SWIFT message sequence name, or a SWIFT field name. More detailed naming conventions, if any, are provided in the sections for each kind of business object listed below. For example:
  - `Swift_MT502` is the name of the Msg BO. For further information, see "Top-Level Business Object Structure," on page 46.
  - `Swift_ApplicationHeader` is the name of a MsgBlk BO. For further information, see "Block 1 Business Object Structure," on page 50, "Block 2 Business Object Structure," on page 53, and "Block 3 Business Object Structure," on page 56.
  - `Swift_MT502Data` is the name of a MsgData BO. For further information, see "Block 4 Business Object Structure," on page 59.
  - `Swift_MT502_B1` is the name of a MsgSeq BO. For further information, see "Sequence Business Object Structure," on page 65.
  - `Swift_Tag_22` is the name of a MsgField BO. For further information, see "Field Business Object Definitions," on page 68.
- **Version** The version of the business object is set to 1.1.0. For example:

  ```
  Version = 1.1.0
  ```
- **Attributes** Each business object contains one or more attributes. For more information see "Business Object Attribute Properties," on page 41 and the sections below on each kind of business object.
- **Verbs** Each business object supports the following standard verbs:
  - Create
  - Retrieve

SWIFT Message and Business Object Data Mapping

The IBM WebSphere Business Integration Adapter for SWIFT supports two kinds of mapping:

- **SWIFT-message-to-WebSphere-business-object** The sections below describe the data mapping that occurs between SWIFT messages and WebSphere business objects.
- **Business-object-to-business-object** The mapping used to transform a business object that represents an ISO 7775 SWIFT message into a business object that represents the corresponding ISO 15022 SWIFT message, and vice versa. For further information, see Chapter 4, "ISO 7775 to ISO 15022 Mapping."

Top-Level Business Object Structure

The structure of the top-level business object for a SWIFT message, or Msg BO, reflects that of the SWIFT message. WebSphere requires a business object for each SWIFT block. As shown in Table 3-2, the top-level business object must have at least 5 attributes, one for each SWIFT block.

Note: Only attribute properties of consequence are shown in Table 3-2. For a listing of all attribute properties, see "Sample Top-Level Business Object (Msg BO) Definition," on page 48.

Table 3-2 Top-Level Business Object Structure

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

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

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

  *BOPrefix*_MT*MessageType*

  where:

  BOPrefix = an attribute of the meta-object (MO). For further information on the meta-object, see "Static Meta-Object," on page 29.

  _MT = a constant string.

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

  An example of a top-level business object name is Swift_MT502.

- UUID, prepended to the message by the MQSA, is represented with a String attribute
- Blocks 1-4 are represented with single-cardinality containers
- Block 5 is a string attribute, and is not extracted from the message by the SWIFT data handler.

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

See Table 3-1 for the attribute application-specific information.

Figure 3-2 shows a business object definition for a top-level business object of a SWIFT message. This Msg BO definition was created in the WebSphere development environment.

The application-specific information contains the block number and parsing parameters for each attribute. For further information on attribute application-specific text, see Table 3-1. The Swift_ attributes correspond to child business objects discussed in the following sections. For a full specification of this sample business object definition, see "Sample Top-Level Business Object (Msg BO) Definition," on

page 48. Of special note is the type for the data block attribute, `Swift_MT502Data`, which indicates SWIFT message type 502, an order to buy or sell. This attribute corresponds to a child object of the top-level Msg BO that represents block 4 of the SWIFT message. The child object is a message data business object (MsgData BO).

All SWIFT top-level business object definitions are identical to that shown in Figure 3-2 with one exception: Block 4, shown as `Swift_MT502Data`, reflects the actual data definition of a specific SWIFT message.

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

Figure 3-2 Definition for Top-Level Business Object of a SWIFT Message

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

Sample Top-Level Business Object (Msg BO) Definition

This section presents a sample definition of a top-level business object, or Msg BO, for a SWIFT message of type MT502—an order to buy or sell.

```
[BusinessObjectDefinition]
Name = Swift_MT502
Version = 1.1.0

[Attribute]
Name = UUID
Type = String
Cardinality = 1
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
AppSpecificInfo = block=0;parse=no
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_01Header
Type = Swift_BasicHeader
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = block=1;parse=fixlen
```

```
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_02Header
Type = Swift_ApplicationHeader
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = block=2;parse=fixlen
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_03Header
Type = Swift_UserHeader
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = block=3;parse=delim
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_MT502Data
Type = Swift_MT502Data
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = block=4;parse=field
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_05Trailer
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = block=5;parse=no
IsRequiredServerBound = false
[End]
[Attribute]
Name = Swift_BlockS
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
```

```
IsRequired = false
AppSpecificInfo = block=6;parse=no
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]
```

Block 1 Business Object Structure

The MsgBlck BO, `Swift_BasicHeader`, has the format and attributes shown in Table 3-3. The SWIFT data handler converts each of the SWIFT fields in this block into attributes in the `Swift_BasicHeader` business object. Note that there is no attribute application-specific information for this business object.

Note: Only attribute properties of consequence are shown in Table 3-3. For a listing of all attribute properties, see "Sample Block 1 Business Object Definition," on page 51.

Table 3-3 Block 1 Business Object Structure

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

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

See Table 3-1 for the attribute application-specific information.

Figure 3-3 shows a block 1 business object definition that has been manually created in a WebSphere development environment. Each attribute name (`ApplicationIdentifier`, `ServiceIdentifier`, and so on) corresponds to a field in this SWIFT message block. For further information on this SWIFT message

block, see Appendix D, "SWIFT Message Structure," and *All Things SWIFT: the SWIFT User Handbook*. Specify Type `String` for each named attribute. Note that there is no attribute application-specific information for the components of this business object.

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

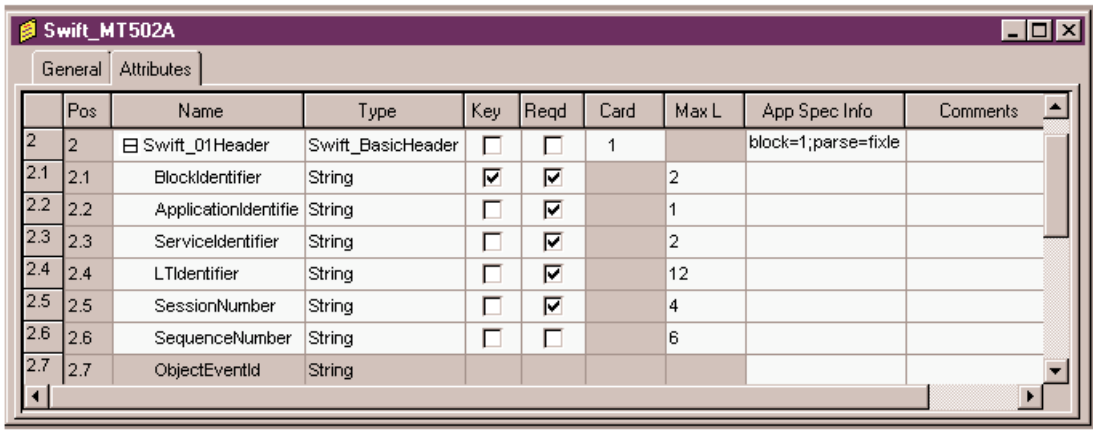


Figure 3-3 Block 1 Business Object Definition

Note: To create a block 1 business object definition for a SWIFT message, start Business Object Designer and then enter values for the attributes shown in "Sample Block 1 Business Object Definition," on page 51.

Sample Block 1 Business Object Definition

This section presents a sample definition of a block 1 business object for a SWIFT message of type MT502—an order to buy or sell.

```
[BusinessObjectDefinition]
Name = Swift_BasicHeader
Version = 1.1.0

[Attribute]
Name = BlockIdentifier
Type = String
Cardinality = 1
MaxLength = 2
IsKey = true
IsForeignKey = false
IsRequired = true
DefaultValue = 1:
IsRequiredServerBound = false
[End]
[Attribute]
Name = ApplicationIdentifier
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
```

```
[Attribute]
Name = ServiceIdentifier
Type = String
Cardinality = 1
MaxLength = 2
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = LTIdentifier
Type = String
Cardinality = 1
MaxLength = 12
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = SessionNumber
Type = String
Cardinality = 1
MaxLength = 4
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = SequenceNumber
Type = String
Cardinality = 1
MaxLength = 6
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
Cardinality = 1
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]
```

Block 2 Business Object Structure

The block 2 MsgBlk BO, `Swift_ApplicationHeader`, has the format and attributes shown in Table 3-4. The SWIFT data handler converts each of the SWIFT fields in this block into attributes in the `Swift_ApplicationHeader` business object. Note that there is no attribute application-specific information for this business object.

Note: Only attribute properties of consequence are shown in Table 3-4. For a listing of all attribute properties, see "Sample Block 2 Business Object Definition," on page 54.

Table 3-4 Block 2 Business Object Structure

Name	Type	Key	Required	Cardinality	Default	Max Length
Block Identifier	String	No	Yes	1	2:[a]	2
IOIdentifier	String	No	Yes	1		1
MessageType	String	No	Yes	1		3
I_ReceiverAddress	String	No	Yes	1		12
I_MessagePriority	String	No	Yes	1		1
I_DeliveryMonitoring	String	No	No	1		1
I_ObsolescencePeriod	String	No	No	1		3
O_InputTime	String	No	Yes	1		4
O_MessageInputReference	String	No	Yes	1		28
O_OutputDate	String	No	No	1		6
O_OutputMessagePriority	String	No	No	1		6

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

The first three attributes in Table 3-4 are I/O attributes. Attributes that start with I_ are input attributes and are populated during SWIFT-to-business-object conversion. Attributes that start with O_ are output attributes and are populated in business-object-to-SWIFT conversions. The CxIgnore property must be set for business-object-to-SWIFT conversions.

See Table 3-1 for the attribute application-specific information.

Figure 3-4 shows a block 2 business object definition that has been manually created in a WebSphere development environment. Each attribute name (`BlockIdentifier, IOIdentifier`, and so on) corresponds to a field in this SWIFT message block. The definition shown is for the input attributes (`I_`) are populated during SWIFT-to-business-object conversion. For further information on this SWIFT message block, see Appendix D, "SWIFT Message Structure," and *All Things SWIFT: the SWIFT User Handbook*. Specify type `String` for each named attribute. Note that there is no attribute application-specific information for the components of this business object.

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

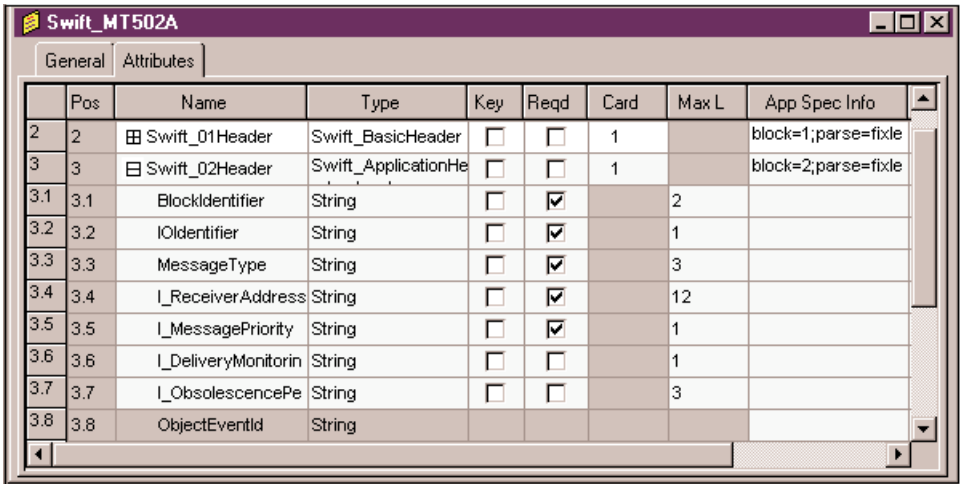


Figure 3-4 Block 2 Business Object Definition

Note: To create a block 2 business object definition for a SWIFT message, start Business Object Designer and then enter values for the attributes shown in "Sample Block 2 Business Object Definition," on page 54.

Sample Block 2 Business Object Definition

This section presents a sample definition of a block 2 business object for a SWIFT message of type MT502—an order to buy or sell.

```
[BusinessObjectDefinition]
Name = Swift_ApplicationHeader
Version = 1.1.0

[Attribute]
Name = BlockIdentifier
Type = String
Cardinality = 1
MaxLength = 2
IsKey = false
IsForeignKey = false
IsRequired = true
DefaultValue = 2:
IsRequiredServerBound = false
[End]
[Attribute]
Name = IOIdentifier
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
DefaultValue = O
IsRequiredServerBound = false
[End]
[Attribute]
Name = MessageType
Type = String
Cardinality = 1
```

```
MaxLength = 3
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = O_InputTime
Type = String
Cardinality = 1
MaxLength = 4
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = O_MessageInputReference
Type = String
Cardinality = 1
MaxLength = 28
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = O_OutputDate
Type = String
Cardinality = 1
MaxLength = 6
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = O_OutputTime
Type = String
Cardinality = 1
MaxLength = 4
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = O_OutputMessagePriority
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = I_ReceiverAddress
Type = String
```

```
Cardinality = 1
MaxLength = 12
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = I_MessagePriority
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
IsRequiredServerBound = false
[End]
[Attribute]
Name = I_DeliveryMonitoring
Type = String
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = I_ObsolescencePeriod
Type = String
Cardinality = 1
MaxLength = 3
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
Cardinality = 1
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]
```

Block 3 Business Object Structure

The block 3 MsgBlk BO, `Swift_UserHeader`, has the format and attributes shown in Table 3-5. Note that there is attribute application-specific information for this business object: the Tag parameter. For Tag parameters see Table 3-1.

Note: Only attribute properties of consequence are shown in Table 3-5. For a listing of all attribute properties, see "Sample Block 3 Business Object Definition," on page 57.

Table 3-5 Block 3 Business Object Structure

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

Figure 3-5 shows a block 3 business object definition that has been manually created in a WebSphere development environment. Each attribute name (`Tag103`, `Tag113`, and so on,) corresponds to a field in this SWIFT message block. For further information on this SWIFT message block, see Appendix D, SWIFT Message Structure, and *All Things SWIFT: the SWIFT User Handbook*. Specify type `String` for each named attribute. Note that the application-specific information for the components of this business object are SWIFT tags.

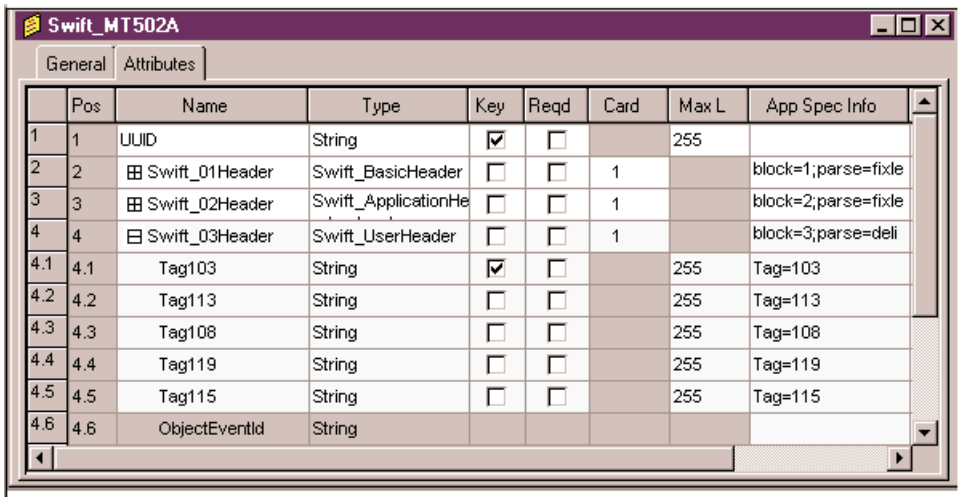


Figure 3-5 Block 3 Business Object Definition

Note: To create a block 3 business object definition for a SWIFT message, start Business Object Designer and then enter values for the attributes shown in "Sample Block 3 Business Object Definition," on page 57.

Sample Block 3 Business Object Definition

This section presents a sample definition of a block 3 business object for a SWIFT message of type MT502—an order to buy or sell.

```
[BusinessObjectDefinition]
Name = Swift_UserHeader
```

```
Version = 1.1.0

[Attribute]
Name = Tag103
Type = String
Cardinality = 1
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Tag=103
IsRequiredServerBound = false
[End]
[Attribute]
Name = Tag113
Type = String
Cardinality = 1
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Tag=113
IsRequiredServerBound = false
[End]
[Attribute]
Name = Tag108
Type = String
Cardinality = 1
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Tag=108
IsRequiredServerBound = false
[End]
[Attribute]
Name = Tag119
Type = String
Cardinality = 1
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Tag=119
IsRequiredServerBound = false
[End]
[Attribute]
Name = Tag115
Type = String
Cardinality = 1
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Tag=115
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
```

```
Type = String
Cardinality = 1
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]
```

Block 4 Business Object Structure

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

Every tag and sequence in a SWIFT message is modeled as a child business object of the MsgData BO. Accordingly, a MsgData BO has child objects of two types: field business objects (MsgField BO) and sequence business objects (MsgSeq BO). These business objects reflect how the SWIFT data is formatted in block 4. More specifically, attributes in these business objects model the content (message tags and their content) and order (sequence) that is specified in a SWIFT message format specification. The sequence of the message tags is crucial if the business object definition is to faithfully represent the SWIFT message. For further information on MsgField BOs and MsgSeq BOs, see "Sequence and Field Business Objects," on page 64.

Figure 3-6 shows a portion of the format specification from the *SWIFT Standards Release Guide* for MT502, an order to buy or sell.

MT 502 Format Specifications

MT 502 Order to Buy or Sell

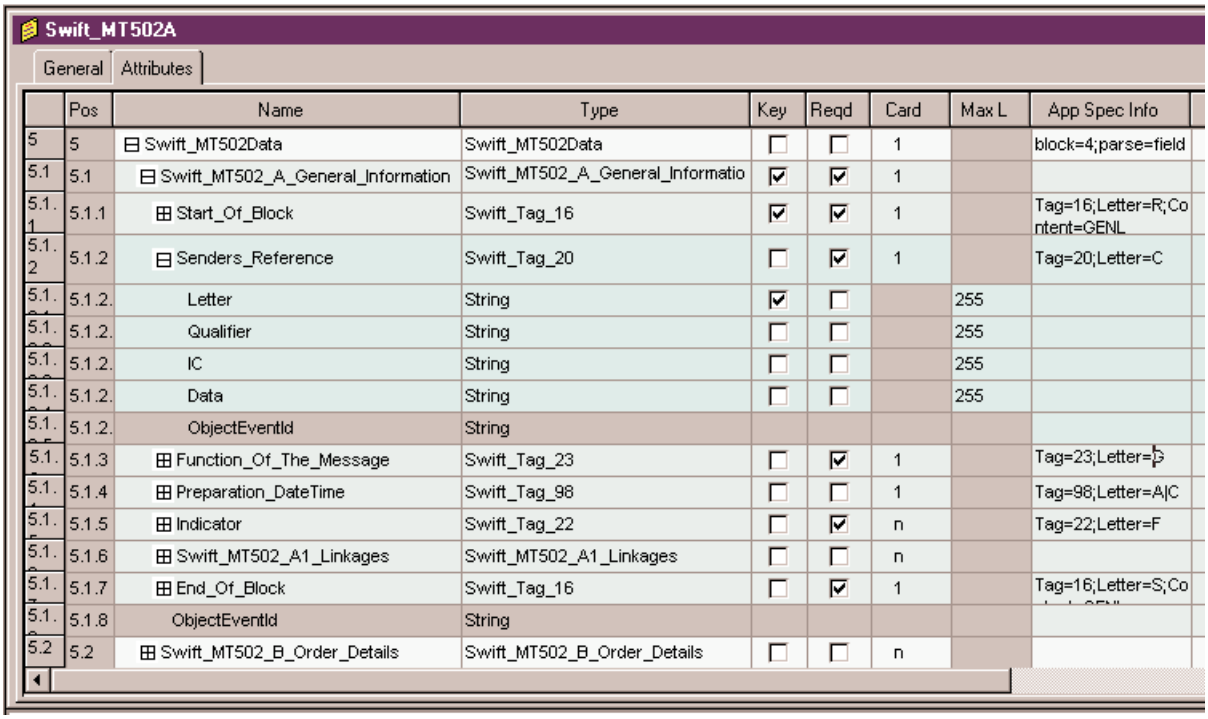
Status	Tag	Qualifier	Generic Field Name	Detailed Field Name	Content/Options	*No.*
Mandatory Sequence A General Information						
M	16R			Start of Block	GENL	*1*
M	20C	SEME	Reference	Sender's Reference	:4!c//16x	*2*
M	23G			Function of the Message	4!c[/4!c]	*3*
O	98a	PREP	Date/Time	Preparation Date/Time	A or C	*4*
----->						
M	22F	4!c	Indicator	(see qualifier description)	:4!c/[8c]/4!c	*5*
-----|						
-----> **Repetitive Optional Subsequence A1 Linkages**						
M	16R			Start of Block	LINK	*6*
O	22F	LINK	Indicator	Linkage Type Indicator	:4!c/[8c]/4!c	*7*
O	13A	LINK	Number Identification	Linked Transaction	:4!c//3!c	*8*
M	20C	4!c	Reference	(see qualifier description)	:4!c//16x	*9*
M	16S			End of Block	LINK	*10*

Figure 3-6 SWIFT Message Type 502 Format Specification

Figure 3-7 shows the corresponding portion of a business object definition, which reflects the structure of the message tags and sequences in the SWIFT message:

- The Status—M (mandatory) or O (optional)—field in the SWIFT message is mapped to the Required property in the business object definition. For example, the status of SWIFT Tag 98a (shown in Figure 3-6) is O or optional; Figure 3-7 shows the corresponding business object attribute, Preparation_DateTime (of type `Swift_Tag_98`), for which the Required property is not checked.
- The Tag, Qualifier, and Content / Options fields from the SWIFT message are mapped as attribute application-specific text in the business object definition. For example, in the SWIFT message shown in Figure 3-6, Start of Block is Tag16R with Content of GENL. The corresponding entry shown in Figure 3-7 is the attribute `Start_Of_Block` of type `Swift_Tag_16` with application-specific information property parameters that identify the Tag, the Tag's letter, and Content (`Tag=16;Letter=R;Content=GENL`).
- Data formats are often indicated in the Content / Options field in a SWIFT message. For example, Figure 3-6 shows the sender's reference for "Mandatory Sequence A General Information" as Tag20C, with a SEME qualifier and Content consisting of data format instructions (`:4!c[/4!c]`). Figure 3-7 shows the corresponding attribute application-specific text: only the Tag and Letter are shown in the AppSpecInfo field (`Tag=20;Letter=C`). The SWIFT data handler also parses the field's data content—the formatting information (`:4!c[/4!c]`) is included in the business object definition in ways that support mapping between ISO 7775 and ISO 15022 message formats.
- Repeating sequences in SWIFT messages are indicated by "---->" in the SWIFT Format Specifications as shown in Figure 3-6. Nonrepeating sequences are marked "-----|" . In the business object definition, a repeating sequence is

assigned cardinality n. For example, the repeating sequence Tag22F shown in Figure 3-6 is mapped to the attribute Indicator of type `Swift_Tag_22` with a cardinality property of n.



Swift_MT502A

General | Attributes

	Pos	Name	Type	Key	Reqd	Card	Max L	App Spec Info
5	5	⊟ Swift_MT502Data	Swift_MT502Data	☐	☐	1		block=4;parse=field
5.1	5.1	⊟ Swift_MT502_A_General_Information	Swift_MT502_A_General_Informatio	☑	☑	1		
5.1.1	5.1.1	⊞ Start_Of_Block	Swift_Tag_16	☑	☑	1		Tag=16;Letter=R;Content=GENL
5.1.2	5.1.2	⊟ Senders_Reference	Swift_Tag_20	☐	☑	1		Tag=20;Letter=C
5.1.	5.1.2.	Letter	String	☑	☐		255	
5.1.	5.1.2.	Qualifier	String	☐	☐		255	
5.1.	5.1.2.	IC	String	☐	☐		255	
5.1.	5.1.2.	Data	String	☐	☐		255	
5.1.	5.1.2.	ObjectEventId	String					
5.1.	5.1.3	⊞ Function_Of_The_Message	Swift_Tag_23	☐	☑	1		Tag=23;Letter=B
5.1.	5.1.4	⊞ Preparation_DateTime	Swift_Tag_98	☐	☐	1		Tag=98;Letter=A|C
5.1.	5.1.5	⊞ Indicator	Swift_Tag_22	☐	☑	n		Tag=22;Letter=F
5.1.	5.1.6	⊞ Swift_MT502_A1_Linkages	Swift_MT502_A1_Linkages	☐	☐	n		
5.1.	5.1.7	⊞ End_Of_Block	Swift_Tag_16	☐	☑	1		Tag=16;Letter=S;Co
5.1.	5.1.8	ObjectEventId	String					
5.2	5.2	⊞ Swift_MT502_B_Order_Details	Swift_MT502_B_Order_Details	☐	☐	n		

Figure 3-7 Partial Block 4 Business Object Definition

MsgData BO Format

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

MsgData BO Name

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

`Swift_MT<message_type>Data`

For example:

```
Name = Swift_MT502Data
```

MsgData BO Attribute Names

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

- a MsgSeq BO
- a MsgField BO

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

`Swift_<tag_number>_<position_in_the_SWIFT_message>`

For example:

```
Name = Swift_94_1
```

The naming convention for MsgSeq BO attributes is as follows:

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

For example:

```
Name = Swift_MT502_B
```

For further information see "Sequence Business Object Structure," on page 65 and "Field Business Object Definitions," on page 68.

MsgData BO Attribute Types

The type for MsgData attributes is as follows:

For MsgField BO attributes:

```
Swift_Tag_<tag_number>
```

For example:

```
Type = Swift_Tag_94
```

For MsgSeq BO attributes:

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

For example:

```
Type = Swift_MT502_B
```

MsgData BO Attribute ContainedObjectVersion

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

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

...

ContainedObjectVersion = 1.1.0

...

[End]
```

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

MsgData BO Attribute Relationship

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

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

...

Relationship = Containment

...

[End]
```

MsgData BO Attribute Cardinality

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

```
[Attribute]
Name = Swift_16_1
Type = Swift_Tag_16
...
Cardinality = n
...
[End]
```

MsgData BO Attribute IsKey

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

For example:

```
[Attribute]
Name = Swift_16.1
Type = Swift_Tag_16
...
Cardinality = 1
IsKey = true
[End]
```

MsgData BO Attribute AppSpecificInfo

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

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

where *nn* is the SWIFT tag number of the field, *xx* is one or a list of supported letter options for the tag, and *string* is the value of the qualifier for a non-generic field as described in Table 3-1, on page 43. For example:

```
[Attribute]
Name = Swift_16_22
Type = Swift_Tag_16
...
AppSpecificInfo = Tag=16;Letter=S;Content=OTHRPRTY
...
[End]
```

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

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

The MsgField child object—a TagUnion business object and its child objects, TagLetterOption objects—will be populated instead of the DataField attribute. For information on TagUnion business objects, see "Field Business Object Definitions," on page 68.

Sequence and Field Business Objects

As noted above, the connector models sequences and tags in SWIFT messages as sequence business objects (MsgSeq BO) and field business objects (MsgField BO), respectively. Figure 3-8 illustrates the hierarchical relationship of these business objects.

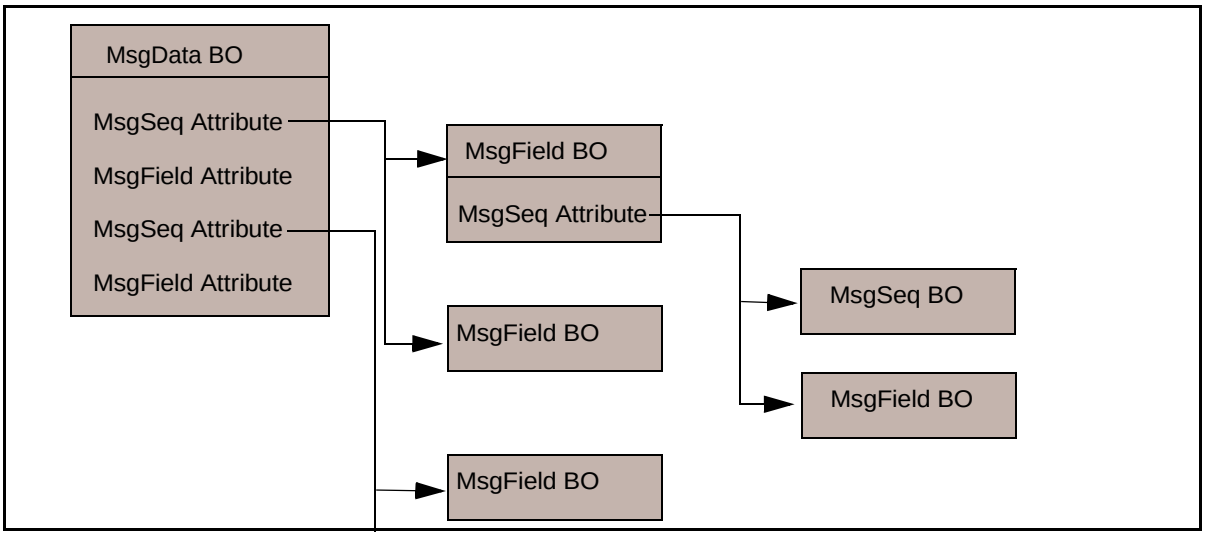


Figure 3-8 Field and Sequence Business Objects in the (Block 4) MsgData BO

Figure 3-9 shows part of a definition for a SWIFT message (MT502) that illustrates a sequence containing field and sequence attributes. The sequence attribute `Swift_MT02_B_Order_Details` not only includes several attributes of type Tag (for example, `Swift_Tag_16`, `Swift_Tag_94`), but also the subsequence `Swift_MT502_B1_Price`. This subsequence is a repeating optional sequence, and its properties reflect this (`Required= no`; `Cardinality=n`). Note that the sequences contain no application-specific information.

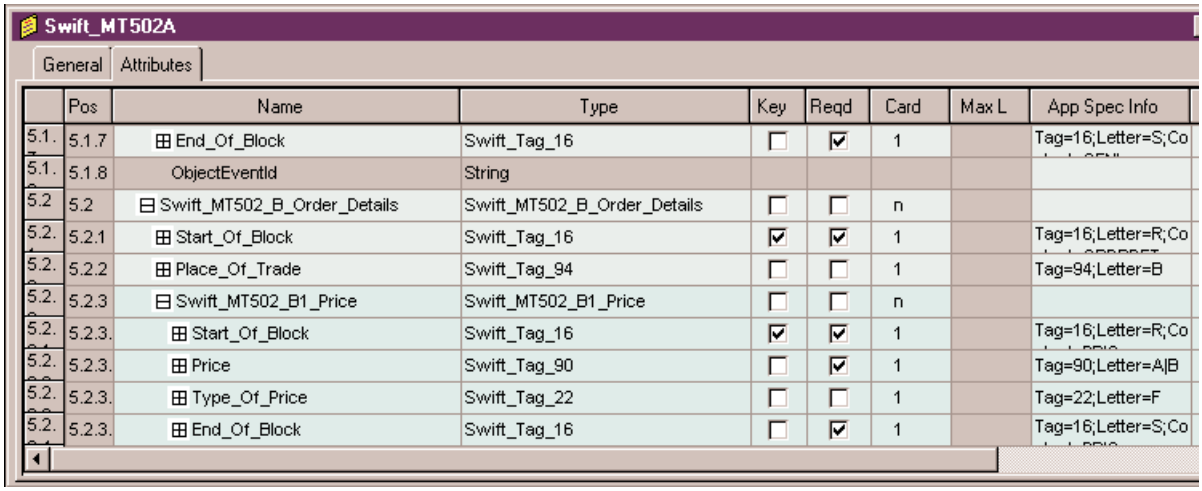


Figure 3-9 A Sequence Containing Tag and Subsequence Attributes

Sequence Business Object Structure

As shown in Figure 3-10, each sequence business object (MsgSeq BO) attribute indicates one of the following:

- another MsgSeq BO, or subsequence
- a MsgField BO

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

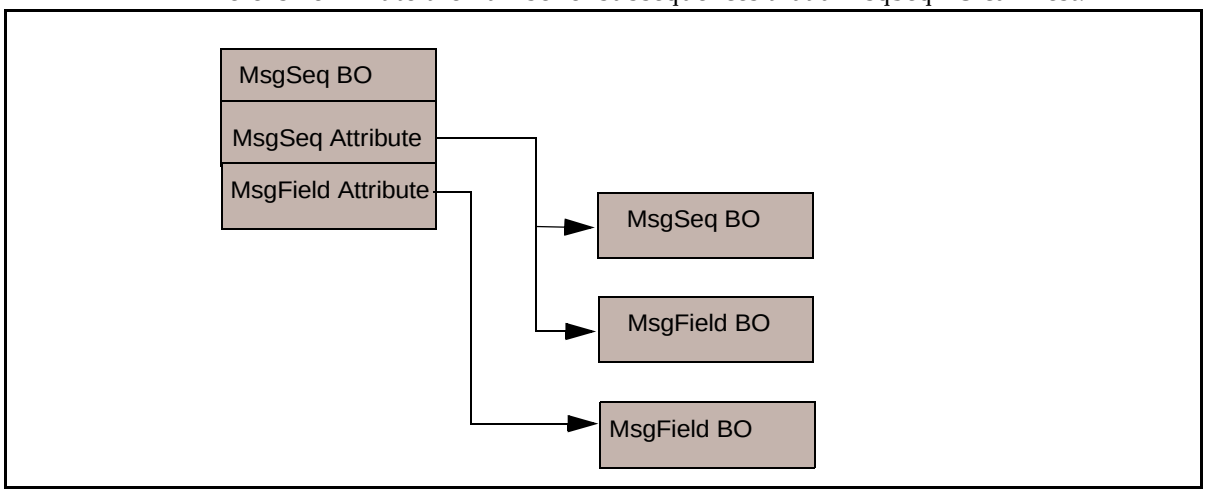
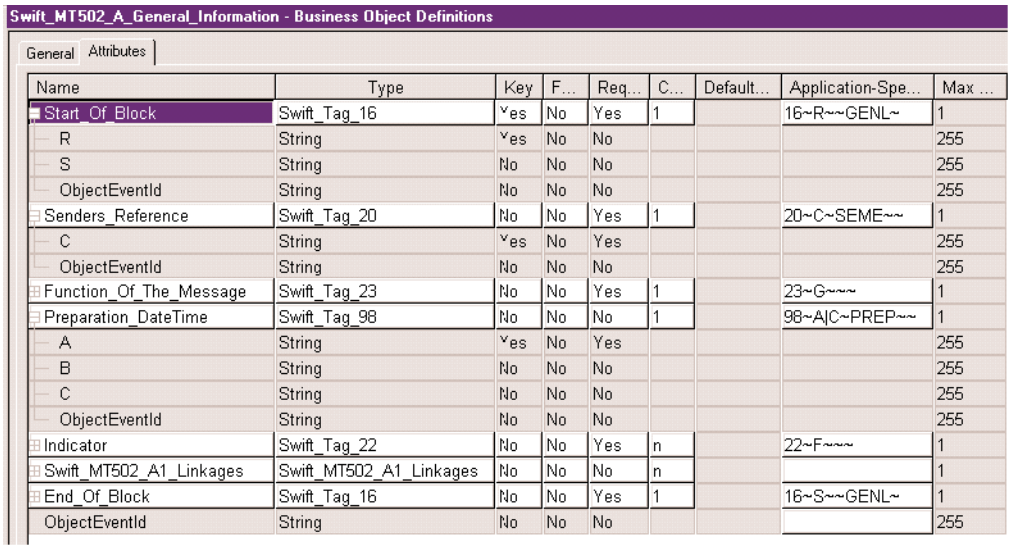


Figure 3-10 Field and Subsequence Business Objects in the MsgSeq BO

Figure 3-11 shows another excerpt of a MsgSeq BO. In this excerpt, the `Swift_Tag_` attributes represent MsgField BOs. The `Swift_MT502_A1_Linkages` attribute is for a child object that is a subsequence MsgSeq BO.



Swift_MT502_A_General_Information - Business Object Definitions

General | Attributes

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

Figure 3-11 Excerpt from a Sequence Business Object (MsgSeq BO)

The following rules apply to sequence business objects:

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

For a sample sequence business object, see "Sample Sequence Business Object Definition," on page 66.

MsgSeq BO Format

Like a MsgData BO, a MsgSeq BO consists of attributes that are either MsgSeq BOs or MsgField BOs. For information on the format of these attributes, see "MsgData BO Format," on page 61.

Sample Sequence Business Object Definition

This section presents a sample definition of a MsgSeq BO for a SWIFT message of type MT502—an order to buy or sell. The definition is of a Mandatory Sequence A Order to Buy or Sell.

```
[BusinessObjectDefinition]
Name = Swift_MT502_A_General_Information
Version = 1.0.0

[Attribute]
Name = Start_Of_Block
Type = Swift_Tag_16
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
```

```
MaxLength = 1
IsKey = true
IsForeignKey = false
IsRequired = true
AppSpecificInfo = Tag=16;Letter=R;Content=GENL
IsRequiredServerBound = false
[End]
[Attribute]
Name = Senders_Reference
Type = Swift_Tag_20
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
AppSpecificInfo = Tag=20;Letter=C
IsRequiredServerBound = false
[End]
[Attribute]
Name = Function_Of_The_Message
Type = Swift_Tag_23
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
AppSpecificInfo = Tag=23;Letter=G
IsRequiredServerBound = false
[End]
[Attribute]
Name = Preparation_DateTime
Type = Swift_Tag_98
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Tag=98;Letter=A|C
IsRequiredServerBound = false
[End]
[Attribute]
Name = Indicator
Type = Swift_Tag_22
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = n
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
AppSpecificInfo = Tag=22;Letter=F
IsRequiredServerBound = false
[End]
```

```
[Attribute]
Name = Swift_MT502_A1_Linkages
Type = Swift_MT502_A1_Linkages
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = n
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]
[Attribute]
Name = End_Of_Block
Type = Swift_Tag_16
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 1
IsKey = false
IsForeignKey = false
IsRequired = true
AppSpecificInfo = Tag=16;Letter=S;Content=GENL
IsRequiredServerBound = false
[End]
[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]
```

Field Business Object Definitions

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

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

MsgField BO Format

As shown in Figure 3-12, each MsgField BO contains five attributes, including one and only one TagUnion BO, with the data type shown in parentheses () below:

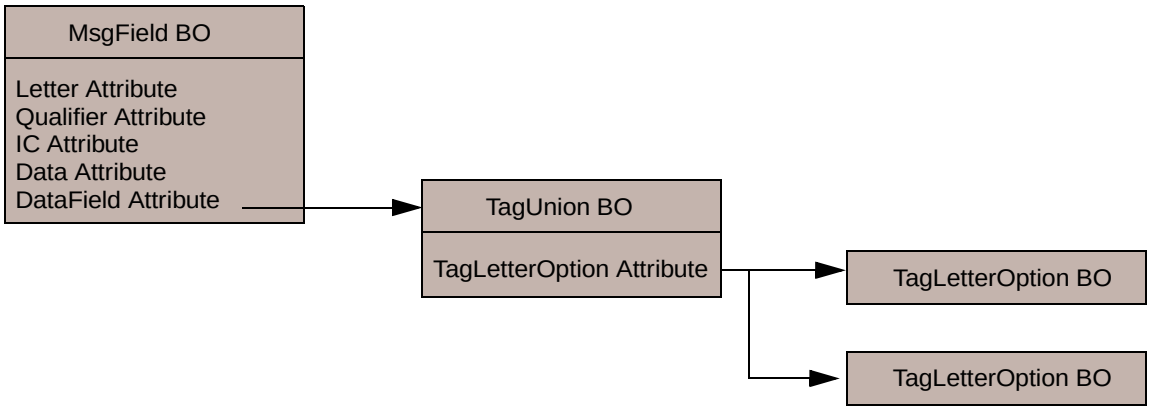


Figure 3-12 Attributes and Business Objects in the MsgField BO

The content and order of all subfields other than the SWIFT Qualifier and Issuer Code (IC) are captured in the child object of DataField, which is the TagUnion BO and its child objects, TagLetterOption BOs. The attributes and business objects shown in Figure 3-12 are discussed in the section below.

MsgField BO, TagUnion BO, and TagLetterOption BO Names

The naming convention for a MsgField BO is as follows:

`Swift_Tag_<N>`

where N stands for the message number. For example:

`Name = Swift_Tag_22`

The naming convention for a TagUnion BO is as follows:

`Swift_Tag_Union_<tag_number>`

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

`Name = Swift_Tag_Union_20`

The naming convention for a TagLetterOption BO is as follows:

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

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

`Name = Swift_Tag_Union_20_Opt_C`

MsgField BO, TagUnion BO, and TagLetter BO Attribute Names

The names of the five attributes in a MsgField BO are as follows:

- `Letter`
- `Qualifier`

- IC
- Data
- DataField

The names of attributes in TagUnion BOs are as follows:

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

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

```
Swift_20_C
```

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

```
Name = ProprietaryCode
```

MsgField BO, TagUnion BO, and TagLetterOption BO Attribute Types
The type for MsgField attributes is as follows:

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

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

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

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

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

The type for attributes in TagLetterOption BOs is always `String`.

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

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

```
[Attribute]
Name = Swift_20_C
Type = Swift_Tag_Union_20_Opt_C
...
ContainedObjectVersion = 1.1.0
...
[End]
```

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

MsgField BO, TagUnion BO, and TagLetterOption BO Attribute Cardinality

The cardinality of attributes in TagUnion BOs and TagLetterOption BOs is always set to `1`. For example:

```
[Attribute]
Name = Swift_20_C
Type = Swift_Tag_Union_20_Opt_C
...
Cardinality = 1
...
[End]
```

MsgField BO, TagUnion BO, and TagLetterOption BO Attribute IsKey

In each MsgField BO, the attribute `Letter` must be defined as the key attribute.

For example:

```
[Attribute]
Name = Letter
Type = String
IsKey = true
...
[End]
```

The first attribute of a TagUnionBO is defined as key.

The first attribute of TagLetterOption BO is defined as key.

TagLetterOption BO Attribute AppSpecificInfo

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

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

where

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

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

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

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

```
[Attribute]
Name = CountryCode
Type = String
...
AppSpecificInfo = Format=2!a;Delim=/
...
[End]
```

For a sample object and attribute definitions, see "Sample MsgField BO, TagUnion BO, and TagLetterOption BO Definitions," on page 72.

Sample MsgField BO, TagUnion BO, and TagLetterOption BO Definitions

This section presents a sample definition of a MsgField BO definition that illustrates TagUnion and TagLetterOption attributes and objects.

The sample MsgField BO, `Swift_Tag_21`, is as follows:

```
[BusinessObjectDefinition]
Name = Swift_Tag_21
Version = 3.0.0

[Attribute]
Name = Letter
Type = String
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Qualifier
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = IC
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
```

```
Name = Data
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = DataField
Type = Swift_Tag_Union_21
ContainedObjectVersion = 3.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Delete
[End]

[Verb]
Name = Retrieve
[End]

[Verb]
Name = Update
[End]
[End]
```

Note that the `DataField` attribute indicates a TagUnion BO, whose name is defined by the `Type` attribute, `Swift_Tag_Union_21`. Here is that TagUnion BO, which lists as attributes all the letter options for `Swift_Tag_21`.

```
[BusinessObjectDefinition]
Name = Swift_Tag_Union_21
Version = 1.1.0

[Attribute]
Name = Swift_21
Type = Swift_Tag_Union_21_Opt
```

```
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = true
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_A
Type = Swift_Tag_Union_21_Opt_A
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_B
Type = Swift_Tag_Union_21_Opt_B
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_C
Type = Swift_Tag_Union_21_Opt_C
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_D
Type = Swift_Tag_Union_21_Opt_D
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
```

```
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_E
Type = Swift_Tag_Union_21_Opt_E
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_F
Type = Swift_Tag_Union_21_Opt_F
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_G
Type = Swift_Tag_Union_21_Opt_G
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_N
Type = Swift_Tag_Union_21_Opt_N
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_P
Type = Swift_Tag_Union_21_Opt_P
ContainedObjectVersion = 1.0.0
```

```
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = Swift_21_R
Type = Swift_Tag_Union_21_Opt_R
ContainedObjectVersion = 1.0.0
Relationship = Containment
Cardinality = 1
MaxLength = 0
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]

[End]
```

Note that `IsKey = true` for the first attribute in the TagUnion BO above, `Swift_21`.

The attribute `Swift_21_A` indicates a child object TagLetterOption BO. This child object's name is defined by the attribute's `Type` attribute, `Swift_Tag_Union_21_Opt_A`. Here is that TagLetterOption BO:

```
[BusinessObjectDefinition]
Name = Swift_Tag_Union_21_Opt_A
Version = 1.0.0

[Attribute]
Name = ReferenceOfTheIndividualAllocation
Type = String
MaxLength = 255
IsKey = true
IsForeignKey = false
```

```
IsRequired = false
AppSpecificInfo = Format=16x
IsRequiredServerBound = false
[End]

[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]
```

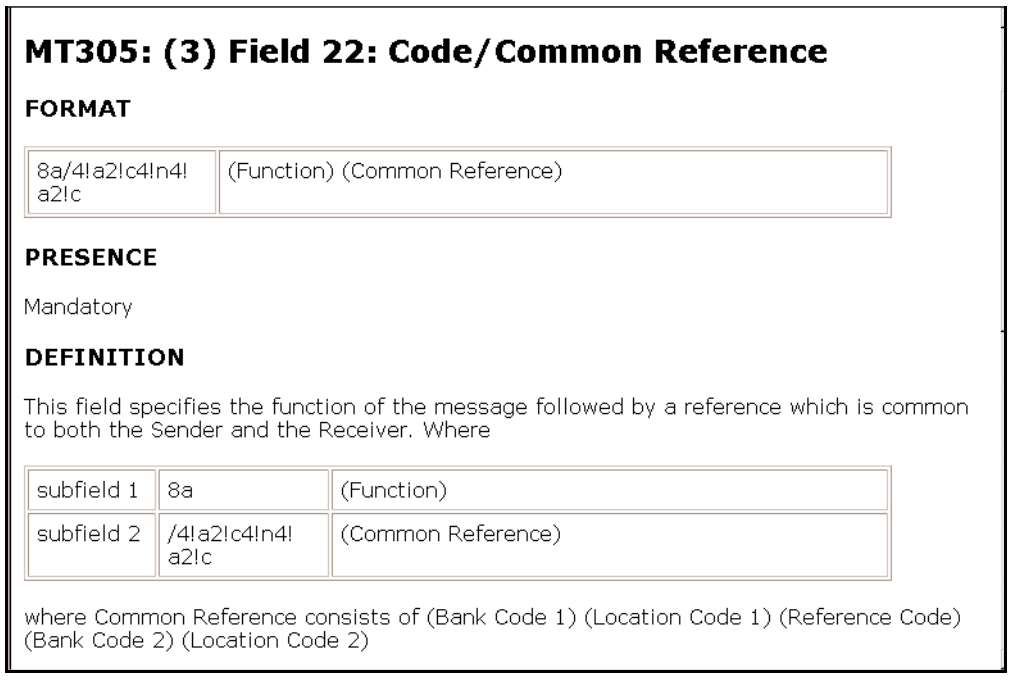
Note that the only attribute of this TagLetterOption BO, `ReferenceOfTheIndividualAllocation`, is a concatenation of the corresponding SWIFT subfield name for this tag option, with the first letter of each word in uppercase. The Qualifier and Issuer Code subfields are excluded from the attribute of the TagLetterOption BOs. The `IsKey` property is also `true` for this attribute.

Note: A TagUnion BO contains both generic and non-generic fields. A non-generic field has no subfields.

The TagLetterOption BO can represent simple and complex SWIFT field and subfield formatting. Here is a business object definition for `Swift_Tag_Union_22_Opt`, a TagLetterOption BO whose attributes and application-specific information specify the subfield formatting for SWIFT Field 22, a function for a Common Reference between a sender and receiver. Notice that the `AppSpecificInfo` for `Function` specifies the format and the delimiter with which to parse the data in the SWIFT message. `CommonReference` is the concatenation of the subfield name. The `AppSpecificInfo` for `CommonReference` corresponds to that shown in Figure 3-13.

```
[BusinessObjectDefinition]
Name = Swift_Tag_Union_22_Opt
Version = 1.0.0

[Attribute]
Name = Function
Type = String
MaxLength = 255
IsKey = true
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Format=8a;Delim=/
IsRequiredServerBound = false
[End]

[Attribute]
Name = CommonReference
```

```
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
AppSpecificInfo = Format=4!a2!c4!n4!a2!c
IsRequiredServerBound = false
[End]

[Attribute]
Name = ObjectEventId
Type = String
MaxLength = 255
IsKey = false
IsForeignKey = false
IsRequired = false
IsRequiredServerBound = false
[End]

[Verb]
Name = Create
[End]

[Verb]
Name = Retrieve
[End]
[End]
```



MT305: (3) Field 22: Code/Common Reference

FORMAT

8a/4!a2!c4!n4!a2!c	(Function) (Common Reference)

PRESENCE

Mandatory

DEFINITION

This field specifies the function of the message followed by a reference which is common to both the Sender and the Receiver. Where

subfield 1	8a	(Function)
subfield 2	/4!a2!c4!n4!a2!c	(Common Reference)

where Common Reference consists of (Bank Code 1) (Location Code 1) (Reference Code) (Bank Code 2) (Location Code 2)

Figure 3-13 SWIFT Field Definition

CHAPTER 4

ISO 7775 to ISO 15022 Mapping

The IBM WebSphere Business Adapter for SWIFT dynamically transforms a business object representing an ISO 7775 SWIFT message into a business object representing the corresponding ISO 15022 SWIFT message and vice versa. The transformation is performed by a mapping engine. The mapping engine is governed by a production instruction meta-object (PIMO). This chapter describes PIMOs, how they map business object attributes, and how to create or modify a PIMO.

Important

The adapter supports business object ISO 7775-15022 mapping for SWIFT Category 5, Securities Markets, but only with the expanded business object definitions available with this release and described in Chapter 3, "Business Objects," and only on Solaris platforms. The mapping capability does not support transformation of business objects released with 1.2 or earlier releases of the adapter for SWIFT.

The chapter contains the following sections:

"Production Instruction Meta-Objects (PIMOs)"	page 79
"Creating PIMOs"	page 87
"Modifying PIMOs: Map Summary"	page 96

Production Instruction Meta-Objects (PIMOs)

A PIMO is a hierarchical meta-object that supports the transformation of business objects from one format to another. PIMOs specify not only the attribute-to-attribute mapping but also the computation instructions required to perform the transformation. The mapping and the computation instructions constitute meta-data that is used by the mapping engine.

`Map_objects.txt` contains 20 PIMOs in their entirety. Each PIMO contains all of the meta-data required to transform a business object representing an ISO 7775- or 15022-formatted SWIFT message to a business object representing the corresponding ISO 15022- or 7775-formatted SWIFT message. For more on these PIMOs and how to create or modify them, see "Creating PIMOs," on page 87.

PIMO Structure and Syntax

As Figure 4-1 shows, a simple PIMO has two mandatory child objects, Port and Action, and an optional child object, Declaration.

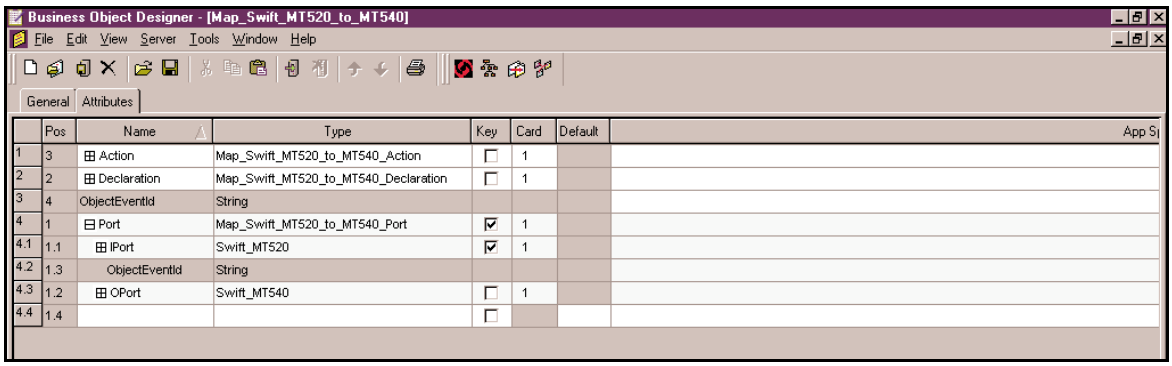


Figure 4-1 Simple PIMO

The attribute structure is as follows:

Port This child object always contains an input port and output port.

- **IPort** The input port
- **OPort** The output port

Declaration This optional child object contains attributes that name local variables.

Action This attribute describes objects that contain compute instructions. The instructions, which reside in the attribute's application-specific information, are used to process Declaration variables and Port objects. Action child objects represent computational sub-tasks listed in the order of execution:

- Action1
- Action2
- ...
- Action*n*

In fact, as shown in Figure 4-2, the PIMOs that are used to map SWIFT business objects are hierarchical objects that contain many nested levels of PIMOs, each with their own Port, Action, and Declaration objects as well as discrete mapping and computing instructions. At every level, however, the Port, Action and Declaration attributes exhibit the same syntax, structure, and function, which are described in the sections below.

Note: A simple PIMO can have multiple nested levels of Port, Declaration, and Action objects. A complex PIMO has more than one Port object on the same level. The PIMOs available with this release are simple PIMOs.

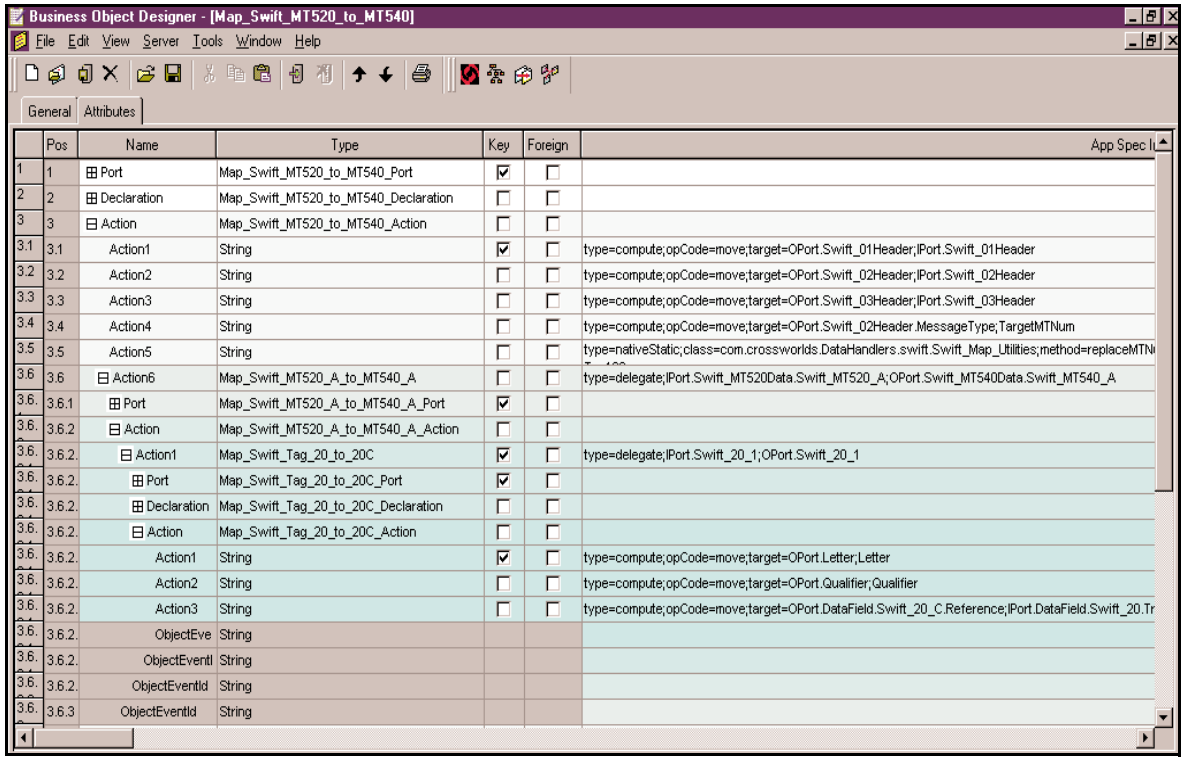


Figure 4-2 Excerpt of Expanded PIMO

Port

The Port object type describes the specific transformation the mapping engine undertakes and has the following naming syntax:

PimoName>_Port

In Figure 4-1, for example, the Port is of type `Map_Swift_MT520_to_MT540_Port`, which names the transformation of a business object representing an ISO 7775 SWIFT message to an object representing an ISO 15022 SWIFT message.

Port contains as child objects IPort (input port) and OPort (output port). The types of the IPort and OPort attributes describe the parameters to be mapped: an IPort is used to pass an input parameter (for example, `Swift_MT_520`), and an OPort is used to pass an output parameter (for example `Swift_MT_540`). The parameters are passed by way of reference to their object types.

The IPort and OPort object may be a primitive type, such as `int`, `float`, or `String`, or a business object, such as `Swift_MT520`. The computation instructions contained in an Action child object refer to, and act on, these IPort and OPort object types.

Note: IPort and OPort cannot specify a meta-object as a type.

By convention, the Port and IPort attributes are marked as key (`IsKey = true`).

Declaration

The Declaration object type describes the objects to be transformed and has the following naming syntax:

*PimoName*_Declaration

The attributes in Declaration child objects specify local variables for the computing instructions that are detailed in Action objects for the Port. The attribute type declares the type of variable.

Variables can be constant or variable. The keyword `final` in a Declaration object's `AppSpecificInfo` designates a constant variable. If a Declaration object's `AppSpecificInfo` is blank, the variable is not constant. In the PIMO excerpt shown in Figure 4-3, for example, `Qualifier` and `Letter` are declared constant variables; `Var Boolean` and the `Map_Swift_Tag35E_to_70E_Declaration` itself are variable.

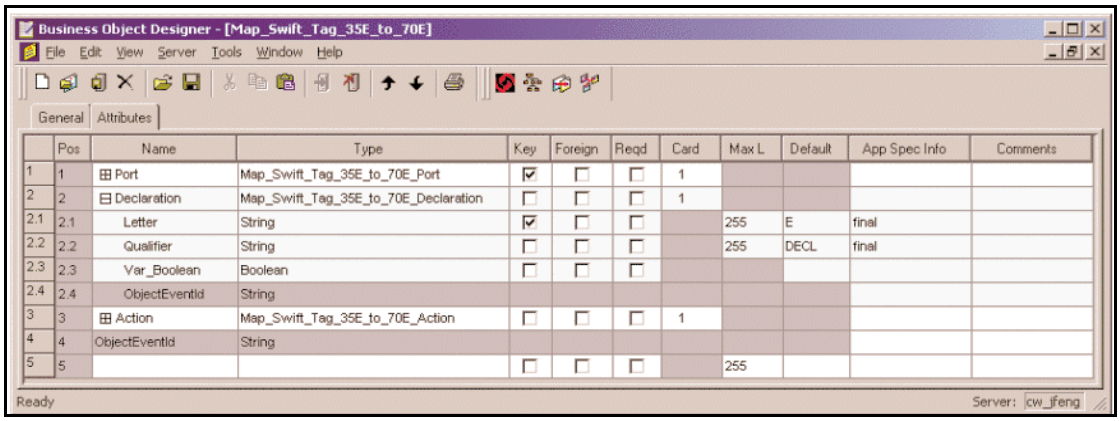


Figure 4-3 Declarations in a PIMO

By convention, the first variable in the Declaration object is marked as key (`IsKey = true`).

Note: A Declaration object is optional; when Action objects require no local variable, the Declaration attribute can be omitted. The data type of the Declaration child object cannot be a meta-object.

Action

The Action object describes the computing instructions that the mapping engine performs. The top-level Action object has the following naming syntax:

*PimoName*_Action

The computing instructions specified in Action objects act on the IPort and OPort objects and use the variables specified in Declaration objects. For each Port and Declaration, the Action objects aggregate, in sequential order, all of the computing instructions for the map engine. No space or period is allowed in the Action type names.

Actions can be one of the following types:

- Compute
- Delegate
- Native
- Scenario

Compute Action

A Compute type indicates that the Action can be performed by a simple operation. All compute type Actions use the keyword `opCode` to specify the name of operation. The keyword `Target` designates the receiving party of the operation. The syntax for a compute type Action is specified in its `AppSpecificInfo` and is as follows:

`opCode=<`*`opCode`*`>;target=<`*`variable`*`>;<`*`parameters`*`>`

where *`opCode`*, *`variable`*, and *`parameters`* are described in Table 4-1.

Table 4-1 Compute Action opCodes

opCode	Example	Description
+	`type=compute;opCode=+;target=Var_B;Var_1;Var_2`	Addition. `Var_2` is added to `Var_1` and the sum assigned to the target, `Var_B`; applies to string and numeric type variables.
-	`type=compute;opCode=-;target=Var_B;Var_1;Var_2`	Subtraction. `Var_2` is subtracted from `Var1` and the difference is assigned to the target, `Var_B`. Applies to numeric type variables.
move	`type=compute;opCode=move;target=OPort;Var_1`	Copy the value of `Var_1` to the target, `OPort`. Applies to all variable types.
index	`type=compute;opCode=index;target=var_4;Var_1;Var_2;Var_3`	Looks for first occurrence of string `Var_2` in the string `Var_1`, starting at the position `Var_3`. Returns `Var_4` to the target, `OPort`. `Var_4` can be `–1` if `Var_2` is not found. Applies to string variables only.
substring	`type=compute;opCode=substring;target=result;sourceString;index1;index2`	Assign target the result of the sub-string of `sourceString` from `index1` to `index2`. When `index2` exceeds the string length of `sourceString`, `index2` is deemed the same length as that of `sourceString`.
append	`type=compute;opCode=append;target=result;source1String;index;source2String`	Append `source2String` to `source1String` at `index`. The result is assigned to the target, `result`.

Table 4-1 Compute Action opCodes (Continued)

opCode	Example	Description
size	type=compute;opCode= size;target=OPort;Var;	Assign target the length of variable Var when Var is of type String. When Var is of type containment, assign target the number of instances of Var.

Delegate Action

Delegate Action is specified when more than one Compute Action is required. A Delegate Action relies on nested PIMOs to complete the Action, and in this sense is analogous to a function call. The syntax of a Delegate Action object is specified in its AppSpecificInfo and is as follows:

type=delegate;<*var1*>;<*var2*>

where type indicates the Delegate Action type and *var1* is passed to the IPort of a child PIMO, and *var2* is passed to the OPort of the child PIMO. The relative position of the variables corresponds to the sequence of Ports in the invoked PIMO. (The invoked PIMO is the PIMO to which Action is delegated.) Looping occurs if one or both of the IPort and OPort objects in the invoked PIMO is of cardinality n. The loop syntax of the delegation is as follows:

- If both the IPort and OPort objects in the invoked PIMO have cardinality n, then for each instance of these Port objects, an object is created and passed on to the invoked PIMO's IPort and OPort. Looping occurs as many times as the number of object instances, and delegation is passed by reference along with each instance.
- If the IPort object in the invoked PIMO has cardinality n and the OPort object does not have cardinality n, then for each instance of the IPort object, an object is created and passed on to the IPort of the invoked PIMO along with a reference to the type of the OPort object. Looping occurs as many times as the number of IPort object instances, and delegation is passed by reference along with each instance.

For example, in Figure 4-4, Action6 is of type Delegate. The computing tasks for this action are too complex for specification using Compute Action. In fact, the computing tasks require two levels of Delegate Action. The first Delegate Action is to a nested PIMO, Map_Swift_MT520_A_to_MT540_A_Port. The Action of this Port is also of type Delegate, with its variables passed to the IPort and OPort of

`Map_Swift_Tag_20_to_20C_Port`. The Action of this nested PIMO is of the compute type, and the results are passed back up to the invoking PIMOs, just like a function call.

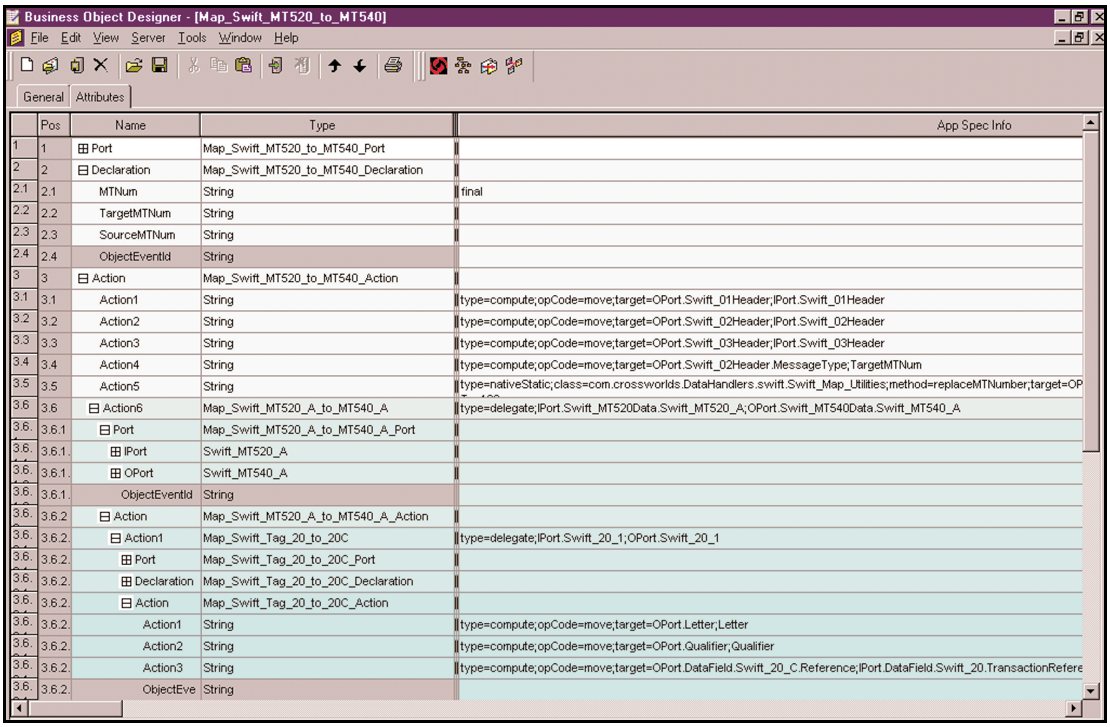


Figure 4-4 Delegate Action in a PIMO

Native Action

Native Action is used to invoke components implemented in Java. In particular, a Native Action object supports calls to the public static method of a Java class, which allows you to develop more complicated processing functions in Java. The syntax of a Native Action object is specified in its `AppSpecificInfo` and is as follows:

`type=nativeStatic;class=<`*`className`*`>;method=<`*`methodName`*`>;`
`target=return;`*`var1`*`;`*`var2`*`,`*`varn`*

where `type` indicates the Native Action type, *`className`* indicates the name of a Java class, *`methodName`* indicates the name of the static Java method that provides the functionality for the action, and the return value of the function call is passed to the target variables as follows: *`var1`* is passed to the first variable of the method, and *`var2`* will be passed to the second variable of the method, and so on.

Note: The order and type of variables in the method call must match the that of the parameters in the method.

Scenario Action

A Scenario Action is a construct that makes possible conditional computing and branching in PIMOs.

A Scenario Action is a child object that consists of two to three attributes:

Scenario (Action Object)

- Scenario (attribute)
- TrueAction (attribute)

- FalseAction (attribute)

The Scenario attribute is always a boolean expression, and the TrueAction or FalseAction (or both) attributes contain conditional computing instructions that are processed after the boolean expression is evaluated.

The syntax of a Scenario Action object is specified in its `AppSpecificInfo` and is as follows:

```
type=scenario
```

The syntax of a Scenario attribute is specified in its `AppSpecificInfo` and is as follows:

`Boolean_Expression`

where *`Boolean_Expression`* corresponds to one of the entries in Table 4-2.

Table 4-2 Scenario Attribute Boolean Expressions

Boolean Symbol	Example	Description
==	`IPort==LetterA`	Equal. When applied to string type variables, equality means that the lexical content of the two strings is the same.
>	`Var_A>Var_B`	Greater than. When applied to `String` type variables, string length is compared.
>=	`Var_A>=Var_B`	Greater than or equal to. When applied to `String` type variables, string length is compared.
&&	`(IPort==LetterA)&& (IPort==LetterC)`	And
||	`(IPort==LetterA)|| (IPort==LetterC)`	Or
<		Less than. When applied to `String` type variables, string length is compared.
<=		Less than or equal to. When applied to `String` type variables, string length is compared.

Note: PIMOs support parentheses in the Boolean expression.

A TrueAction attribute indicates the computing instruction that the map engine will process if the Boolean expression (in the Scenario attribute) evaluates to true; likewise, a FalseAction attribute indicates the action if the Boolean expression evaluates to

false. Actions specified in the TrueAction and FalseAction can be Compute, Delegate and Native types, and follow the syntax of the Compute, Delegate and Native type Actions, respectively.

For example, Figure 4-5 shows the attributes of a Scenario Action. If the IPort Object is equal to `Code_AVAL`, then the computing instruction `type=compute;opCode=move;target=OPort;Qualifier_TAV1` will be processed by the map engine.

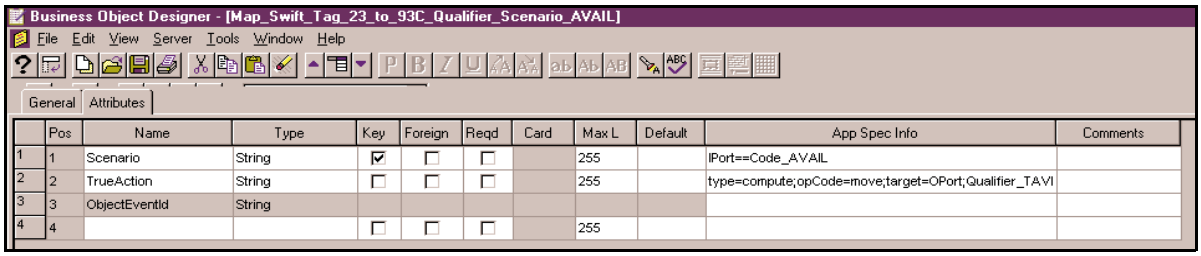


Figure 4-5 Scenario Action in a PIMO

Object References in Actions

Actions make reference to other PIMO objects, whether Port or Declaration objects. By convention, the application-specific information of Action objects follows the path name convention that uses a period to denote the attribute names at different levels in the hierarchy of the PIMO.

For example, consider an IPort of type `Swift_Tag_20` (the type shown in parentheses), which has the following hierarchy:

```
IPort (Swift_Tag_20)
```

- `Letter (String)`
- `Qualifier (String)`
- `IC (String)`
- `Data (String)`
- `DataField (Swift_Tag_Union_20)`
  - `Swift_20 (Swift_Tag_Union_20_Opt)`
    `Subfield (String)`
  - `Swift_20_C (Swift_Tag_Union_20_Opt_C)`
    `Reference (String)`

Then the reference to the `Swift_20_C` attribute is `IPort.DataField.Swift_20_C.`

Creating PIMOs

This section describes how to create a PIMO using Business Object Designer. Before proceeding, review the previous sections of this chapter, and make sure you have access to the *Swift User HandBook* and Business Object Designer, with which you should be familiar. For more information, see the *Business Object Development Guide*. You should also have access to `Map_Objects.txt`, which contains the PIMOs shipped with this release as well as thousands of sub-maps and objects that may be of use.

Note: The example used to illustrate the process of creating PIMOs is a sample PIMO residing in `Map_Objects.txt`. For a closer look at any of the screenshots presented below, launch Business Object Designer and open `Map_Swift_MT520_to_MT540` from your repository.

Getting Started

1. Launch Business Object Designer.
2. Choose **Server>Connect** and login to your server.

   This provides access to your repository. To load the repository, see Chapter 2, "Configuring the Connector," and the system installation guide for your operating environment.
3. Choose **File>New**.

   This displays the New Business Object Dialog.
4. Enter the Business Object name as follows:

`Map_Swift_MT<`*`SourceNN`*`>_to_MT<`*`DestinationNN`*`>`

where *`SourceNN`* is the SWIFT message type number that corresponds to the business object you want to transform and *`DestinationNN`* is the SWIFT message type number that corresponds to the destination business object. This is the name of a new PIMO representing the mapping between the source message type and the destination message type as shown in Figure 4-6.

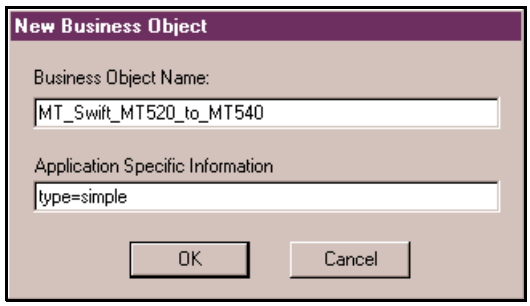


Figure 4-6 Naming a New PIMO

5. Enter `type=simple` in the Application Specific Information field.

Defining Port

1. Enter **Port** in the Attribute Name field as shown in Figure 4-7.

Figure 4-7 Specifying a Port Object

2. Right-click the Type field, and from the pop-up menu choose from available port objects in your repository.

   The type syntax for the Port is as follows:

   `PimoName``_Port`

In the example shown in Figure 4-7, the type is as follows:

`Map_Swift_MT520_to_MT540_Port`

3 In the Port attribute row, check the Key property and enter **1** in the Cardinality field as shown in Figure 4-7.

Defining Port Child Objects

The Port object must have two child objects, IPort and OPort, which correspond to the business objects representing the source and destination SWIFT messages.

1 Select ObjectEventId under Port and, from the Edit menu, choose **Insert Above**.

2 Enter **IPort** and **OPort** as names of new attributes under the Port object.

3 Right click the IPort Type field, and from the pop-up menu choose the object from those available in your repository.

The type syntax for the IPort is as follows:

`Swift_<IPortSourceNN>`

In the example shown in Figure 4-8 the IPort type is `Swift_MT520`.

4 Right click the OPort Type field, and from the pop-up menu choose the object from those available in your repository.

In the example shown in Figure 4-8 the OPort type is `Swift_MT540`.

5 In the IPort attribute row, check the Key property and enter **1** in the Cardinality field for both IPort and OPort as shown in Figure 4-8.

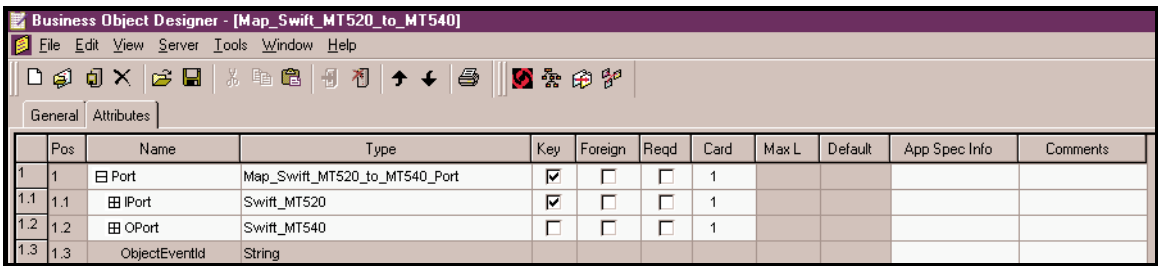


Figure 4-8 Specifying IPort and OPort Objects

Defining Declaration

A Declaration object at the top-level of a PIMO specifies high-level variables as required by Action objects at this level. As shown in Figure 4-9, the Declaration variable applies to the top-level Action object discussed below in "Defining Action," on page 90. Following the naming convention for a Declaration object, the type of this variable is `Map_Swift_MT520_to_MT540_Declaration`.

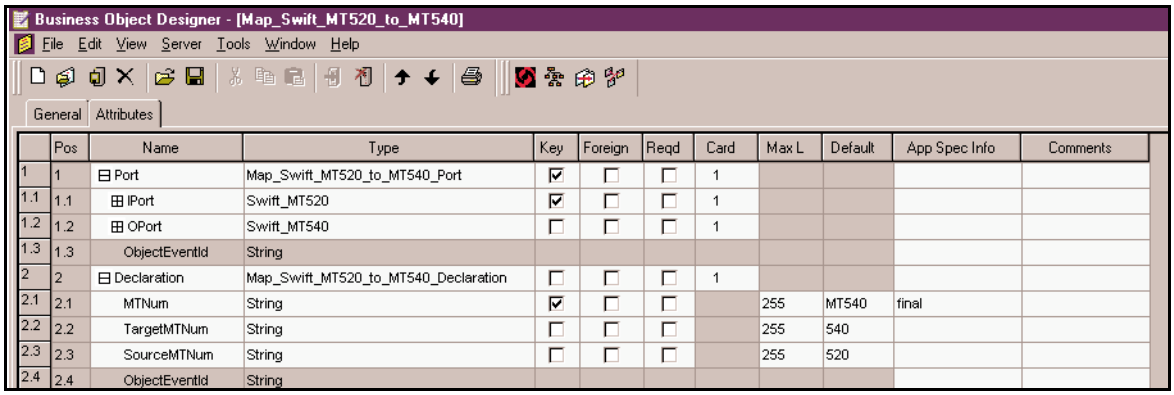
1 Enter **Declaration** in the Name field under ObjectEventId.

2 Enter *PimoName*`_Declaration` in the Type field.

In the example, the Declaration type is `Map_Swift_MT520_to_MT540_Declaration`

3 Enter three attributes of type `String` with specifications as follows:

- **MTNum** A constant (enter `final` in the App Spec Info field) with the Key property checked and a Default value of **MT**<*DestinationNN*>. In the example, the default is the destination SWIFT message type, **MT540**.
- **TargetMTNum** A variable whose default value is the *DestinationNN*. In the example, the default value is 540.
- **SourceMTNum** A variable whose default value is the *SourceNN*. In the example, the default value is 520.



	Pos	Name	Type	Key	Foreign	Reqd	Card	Max L	Default	App Spec Info	Comments
1	1	⊟ Port	Map_Swift_MT520_to_MT540_Port	☑	☐	☐	1				
1.1	1.1	⊞ IPort	Swift_MT520	☑	☐	☐	1				
1.2	1.2	⊞ OPort	Swift_MT540	☐	☐	☐	1				
1.3	1.3	ObjectEventId	String								
2	2	⊟ Declaration	Map_Swift_MT520_to_MT540_Declaration	☐	☐	☐	1				
2.1	2.1	MTNum	String	☑	☐	☐		255	MT540	final	
2.2	2.2	TargetMTNum	String	☐	☐	☐		255	540		
2.3	2.3	SourceMTNum	String	☐	☐	☐		255	520		
2.4	2.4	ObjectEventId	String								

Figure 4-9 Specifying a Declaration for a Top-Level PIMO

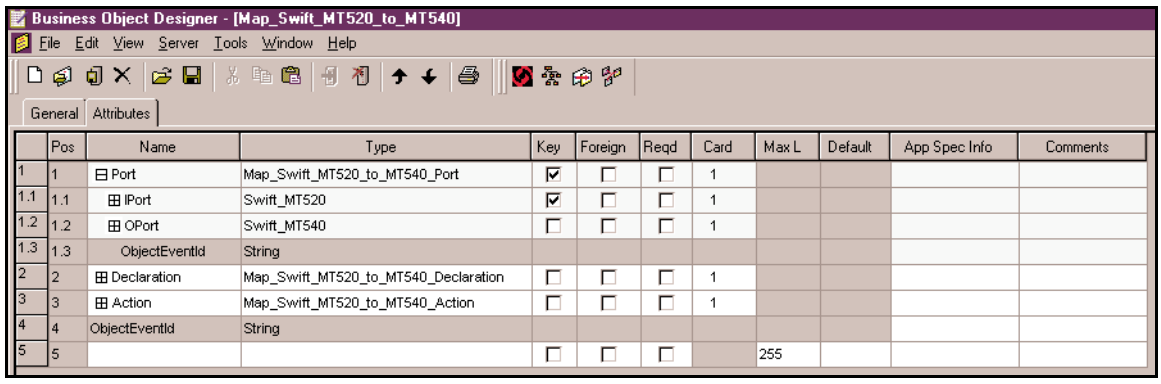
For examples of sequence- and field-level Declarations, see "Representing Sequence Objects," on page 91 and "Representing Field Objects," on page 93.

Defining Action

To define the top-level Action Object for the PIMO:

1. Enter Action in the Name field under ObjectEventId.
2. Enter `Map_Swift_MT`<*SourceNN*>`_to_MT`<*DestinationNN*>`Action` in the Type field.

   In the example, the Action type is `Map_Swift_MT520_to_MT540_Action`, as shown in Figure 4-10.



	Pos	Name	Type	Key	Foreign	Reqd	Card	Max L	Default	App Spec Info	Comments
1	1	⊟ Port	Map_Swift_MT520_to_MT540_Port	☑	☐	☐	1				
1.1	1.1	⊞ IPort	Swift_MT520	☑	☐	☐	1				
1.2	1.2	⊞ OPort	Swift_MT540	☐	☐	☐	1				
1.3	1.3	ObjectEventId	String								
2	2	⊞ Declaration	Map_Swift_MT520_to_MT540_Declaration	☐	☐	☐	1				
3	3	⊞ Action	Map_Swift_MT520_to_MT540_Action	☐	☐	☐	1				
4	4	ObjectEventId	String								
5	5			☐	☐	☐		255			

Figure 4-10 Specifying an Action for a Top-Level PIMO

To create all other Action objects for a PIMO mapping SWIFT MT520 to MT 540, you must become familiar with the actual tag- and field-level maps for these messages. This information is available in the *SWIFT User Handbook, Category 5, Securities Markets Message Usage Guidelines*. Figure 4-11 shows a page from Appendix B of this book, which illustrates the tag and field maps that the PIMO will model.

The following tables show the mapping of the Settlement and Reconciliation (S&R) messages. The mapping for S&R covers eleven message types: MTs 520, 521, 530, 531, 534, 570, 571, 572, 573, 580 and 583.

B.1 MT 520 Receive Free → MT 540 Receive Free

	MT 520		MT 540			
Data Elements	**Seq**	**Field Tag**	**Seq**	**Field Tag**	**Qualifier**	**Comments**
Delivery Date	A	30	B	98a	SETT	
TRN	A	20	A	20C	SEME	
Related Refrence	A	21	A1	20C	RELA	
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	
Identification of Securities	A	35B	B	35B		
Next Coupon	A	35a	B1 B1	98A 13a	COUP COUP	
Book Value	A	33V	B1	90a	MRKT	
Instructing Party	A	82a	E1 E1	95a 97a	See field specs SAFE	Please refer to Settlement Chain section
Quantity of Securities	B	35A	C	36B	SETT	
Safekeeping Account	B	83a	C	97a	SAFE	
Certificate Numbers	B	35E	C	13B	CERT	
Deliverer of Securities	C	87a	E1 E1	95a 97a	DEAG SAFE	Please refer to Settlement Chain section
Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	Please refer to Settlement Chain section
Deliverer's Instructing Party	C	85a	E1 E1	95a 97a	SELL SAFE	Please refer to Settlement Chain section
Registration Details	C	77D	E1	70a	REGI	

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Figure 4-11 Excerpt from SWIFT User Handbook showing ISO 7775-15022 Field and Tag Mapping

The sections below describe how to extract this information and create Action objects that represent SWIFT sequences and fields.

Representing Sequence Objects

Review the maps in the *SWIFT User Handbook, Category 5, Securities Markets Message Usage Guidelines* Appendix for SWIFT MT520 to MT 540 and identify the following:

- The number of sequences in the source message type (MT520)
- The number of sequences in the destination message type (MT 540)

Use the following naming convention for representing a sequence in a PIMO:

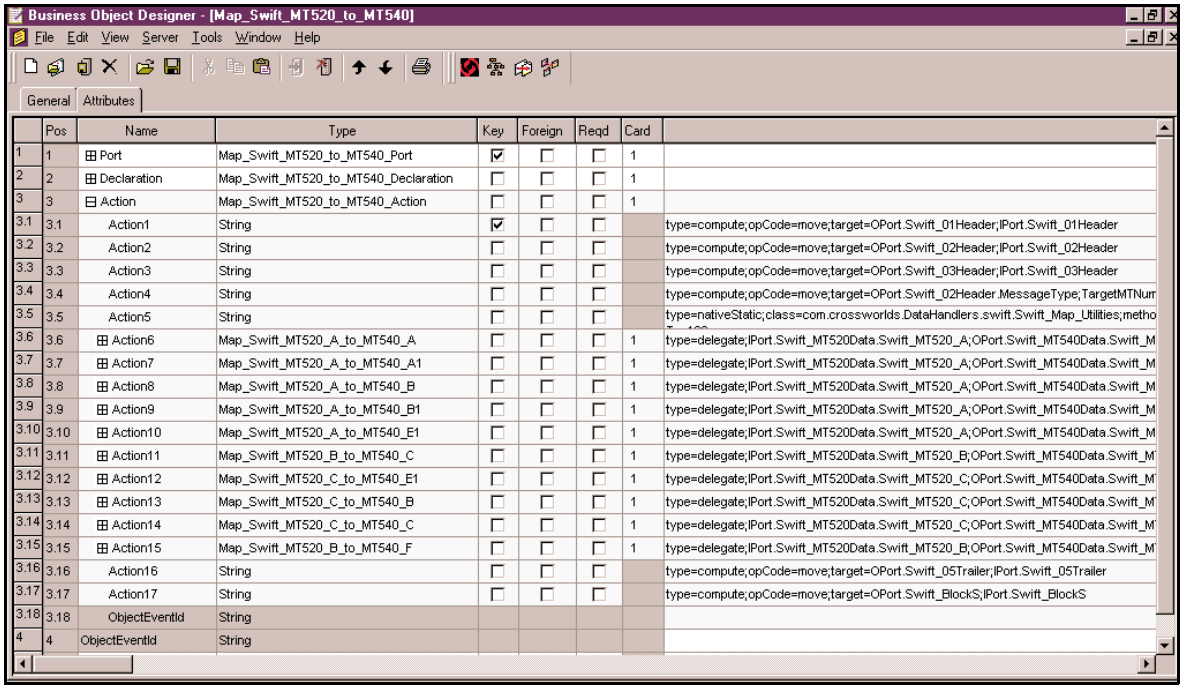
`Map_Swift_MT<SourceNN>_<X>_to_MT<DestinationNN>_<X>`

where *X* stands for the sequence letter and is always in uppercase.

Note: PIMO sequence object names can also reflect two special cases:

- The source message tag has a sequence but the destination does not:
  - Map_Swift_MT<*SourceNN*>_<*X*>_*to*_MT<*DestinationNN*>
- The destination message tag has a sequence but the source does not:
  - Map_Swift_MT<*SourceNN*>_*to*_MT<*DestinationNN*>_<*X*>

As shown in Figure 4-12, the child objects representing some of the sequences make use of Delegate Action because the mapping requires multiple Compute Action objects.



	Pos	Name	Type	Key	Foreign	Reqd	Card	
1	1	⊞ Port	Map_Swift_MT520_to_MT540_Port	☑	☐	☐	1	
2	2	⊞ Declaration	Map_Swift_MT520_to_MT540_Declaration	☐	☐	☐	1	
3	3	⊟ Action	Map_Swift_MT520_to_MT540_Action	☐	☐	☐	1	
3.1	3.1	Action1	String	☑	☐	☐		type=compute;opCode=move;target=OPort.Swift_01Header;IPort.Swift_01Header
3.2	3.2	Action2	String	☐	☐	☐		type=compute;opCode=move;target=OPort.Swift_02Header;IPort.Swift_02Header
3.3	3.3	Action3	String	☐	☐	☐		type=compute;opCode=move;target=OPort.Swift_03Header;IPort.Swift_03Header
3.4	3.4	Action4	String	☐	☐	☐		type=compute;opCode=move;target=OPort.Swift_02Header.MessageType;TargetMTNum
3.5	3.5	Action5	String	☐	☐	☐		type=nativeStatic;class=com.crossworlds.DataHandlers.swift.Swift_Map_Utilities;metho
3.6	3.6	⊞ Action6	Map_Swift_MT520_A_to_MT540_A	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540Data.Swift_M
3.7	3.7	⊞ Action7	Map_Swift_MT520_A_to_MT540_A1	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540Data.Swift_M
3.8	3.8	⊞ Action8	Map_Swift_MT520_A_to_MT540_B	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540Data.Swift_M
3.9	3.9	⊞ Action9	Map_Swift_MT520_A_to_MT540_B1	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540Data.Swift_M
3.10	3.10	⊞ Action10	Map_Swift_MT520_A_to_MT540_E1	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540Data.Swift_M
3.11	3.11	⊞ Action11	Map_Swift_MT520_B_to_MT540_C	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_B;OPort.Swift_MT540Data.Swift_M
3.12	3.12	⊞ Action12	Map_Swift_MT520_C_to_MT540_E1	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_C;OPort.Swift_MT540Data.Swift_M
3.13	3.13	⊞ Action13	Map_Swift_MT520_C_to_MT540_B	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_C;OPort.Swift_MT540Data.Swift_M
3.14	3.14	⊞ Action14	Map_Swift_MT520_C_to_MT540_C	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_C;OPort.Swift_MT540Data.Swift_M
3.15	3.15	⊞ Action15	Map_Swift_MT520_B_to_MT540_F	☐	☐	☐	1	type=delegate;IPort.Swift_MT520Data.Swift_MT520_B;OPort.Swift_MT540Data.Swift_M
3.16	3.16	Action16	String	☐	☐	☐		type=compute;opCode=move;target=OPort.Swift_05Trailer;IPort.Swift_05Trailer
3.17	3.17	Action17	String	☐	☐	☐		type=compute;opCode=move;target=OPort.Swift_BlockS;IPort.Swift_BlockS
3.18	3.18	ObjectEventId	String					
4	4	ObjectEventId	String					

Figure 4-12 Specifying Sequence Objects with Delegate Action

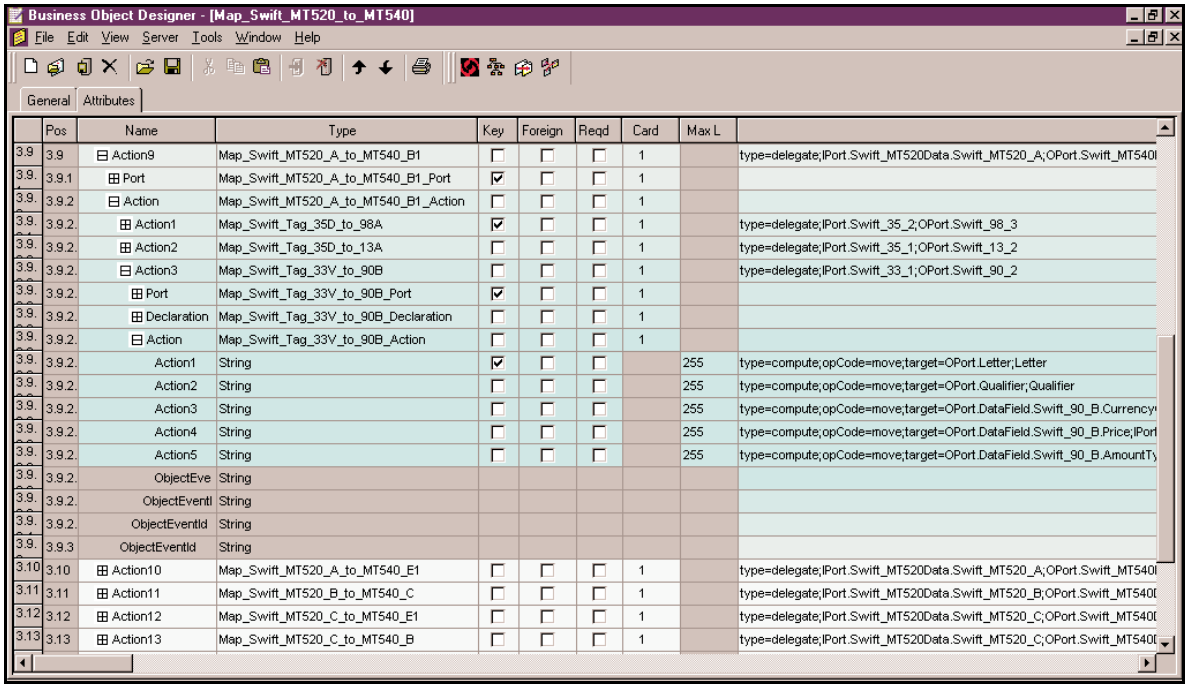
When using Delegate Action, you must pass the IPort and OPort object paths. For example, Figure 4-12 shows that mapping computations from Swift_MT520_A (the child object of Swift_MT_520Data) to Swift_MT540_A (the child object of Swift_MT_540Data). Accordingly, the naming convention is as follows:

```
IPort.<Source_Object_Path>
OPort.<Destination_Object_Path>
```

In the example, the corresponding entries are:

```
IPort.Swift_MT520Data.Swift_MT520_A
OPort.Swift_MT540Data.Swift_MT540_A
```

For each delegated sequence shown in Figure 4-12, you must define the Port, Declaration, and Action objects for the parent. Declaration is mandatory at the level of any Compute Action that refers to variables. Figure 4-13 shows how some of the Action and sub-Action objects are defined.



	Pos	Name	Type	Key	Foreign	Reqd	Card	Max L	
3.9	3.9	⊟ Action9	Map_Swift_MT520_A_to_MT540_B1	☐	☐	☐	1		type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540
3.9.	3.9.1	⊞ Port	Map_Swift_MT520_A_to_MT540_B1_Port	☑	☐	☐	1		
3.9.	3.9.2	⊟ Action	Map_Swift_MT520_A_to_MT540_B1_Action	☐	☐	☐	1		
3.9.	3.9.2.	⊞ Action1	Map_Swift_Tag_35D_to_98A	☑	☐	☐	1		type=delegate;IPort.Swift_35_2;OPort.Swift_98_3
3.9.	3.9.2.	⊞ Action2	Map_Swift_Tag_35D_to_13A	☐	☐	☐	1		type=delegate;IPort.Swift_35_1;OPort.Swift_13_2
3.9.	3.9.2.	⊟ Action3	Map_Swift_Tag_33V_to_90B	☐	☐	☐	1		type=delegate;IPort.Swift_33_1;OPort.Swift_90_2
3.9.	3.9.2.	⊞ Port	Map_Swift_Tag_33V_to_90B_Port	☑	☐	☐	1		
3.9.	3.9.2.	⊞ Declaration	Map_Swift_Tag_33V_to_90B_Declaration	☐	☐	☐	1		
3.9.	3.9.2.	⊟ Action	Map_Swift_Tag_33V_to_90B_Action	☐	☐	☐	1		
3.9.	3.9.2.	Action1	String	☑	☐	☐		255	type=compute;opCode=move;target=OPort.Letter;Letter
3.9.	3.9.2.	Action2	String	☐	☐	☐		255	type=compute;opCode=move;target=OPort.Qualifier;Qualifier
3.9.	3.9.2.	Action3	String	☐	☐	☐		255	type=compute;opCode=move;target=OPort.DataField.Swift_90_B.Currency
3.9.	3.9.2.	Action4	String	☐	☐	☐		255	type=compute;opCode=move;target=OPort.DataField.Swift_90_B.Price;IPort
3.9.	3.9.2.	Action5	String	☐	☐	☐		255	type=compute;opCode=move;target=OPort.DataField.Swift_90_B.AmountTy
3.9.	3.9.2.	ObjectEve	String						
3.9.	3.9.2.	ObjectEventI	String						
3.9.	3.9.2.	ObjectEventId	String						
3.9.	3.9.3	ObjectEventId	String						
3.10	3.10	⊞ Action10	Map_Swift_MT520_A_to_MT540_E1	☐	☐	☐	1		type=delegate;IPort.Swift_MT520Data.Swift_MT520_A;OPort.Swift_MT540
3.11	3.11	⊞ Action11	Map_Swift_MT520_B_to_MT540_C	☐	☐	☐	1		type=delegate;IPort.Swift_MT520Data.Swift_MT520_B;OPort.Swift_MT540
3.12	3.12	⊞ Action12	Map_Swift_MT520_C_to_MT540_E1	☐	☐	☐	1		type=delegate;IPort.Swift_MT520Data.Swift_MT520_C;OPort.Swift_MT540
3.13	3.13	⊞ Action13	Map_Swift_MT520_C_to_MT540_B	☐	☐	☐	1		type=delegate;IPort.Swift_MT520Data.Swift_MT520_C;OPort.Swift_MT540

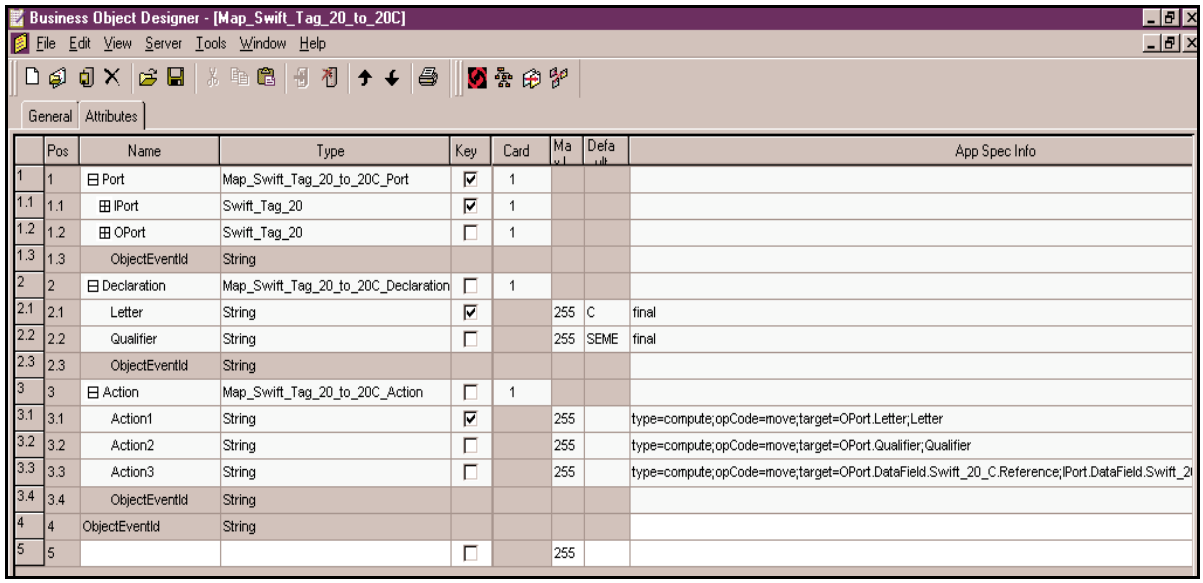
Figure 4-13 Sub-Action Objects for a Sequence Object

Representing Field Objects

Just as SWIFT sequences can contain other sequences as well as field tags, sequence objects in PIMOs make reference to sequence and field objects. Field objects are child objects of sequence Action objects. This section describes how to create field objects that map to other field objects via parent sequence Action objects.

The previous section showed how to define sequence objects, including `Map_Swift_20_to_20C`. Figure 4-14 shows how to create the PIMO entries that correspond to the field and sub-field mapping for this sequence.

Note: The *SWIFT User Handbook* shows that no Code Words are required for the `Map_Swift_20_to_20C` mapping.



	Pos	Name	Type	Key	Card	Ma	Defa	App Spec Info
1	1	⊟ Port	Map_Swift_Tag_20_to_20C_Port	☑	1			
1.1	1.1	⊞ IPort	Swift_Tag_20	☑	1			
1.2	1.2	⊞ OPort	Swift_Tag_20	☐	1			
1.3	1.3	ObjectEventId	String					
2	2	⊟ Declaration	Map_Swift_Tag_20_to_20C_Declaration	☐	1			
2.1	2.1	Letter	String	☑		255	C	final
2.2	2.2	Qualifier	String	☐		255	SEME	final
2.3	2.3	ObjectEventId	String					
3	3	⊟ Action	Map_Swift_Tag_20_to_20C_Action	☐	1			
3.1	3.1	Action1	String	☑		255		type=compute;opCode=move;target=OPort.Letter;Letter
3.2	3.2	Action2	String	☐		255		type=compute;opCode=move;target=OPort.Qualifier;Qualifier
3.3	3.3	Action3	String	☐		255		type=compute;opCode=move;target=OPort.DataField.Swift_20_C.Reference;IPort.DataField.Swift_2
3.4	3.4	ObjectEventId	String					
4	4	ObjectEventId	String					
5	5			☐		255		

Figure 4-14 Field Action Objects for a Sequence

As shown in Figure 4-14, you must specify Port (IPort and OPort) objects, Declaration variables, and Actions for Field objects:

Port The type for IPort and OPort is the source and destination tag, stripped of tag letters. In this case, they are the same, `Swift_Tag_20`. IPort, by convention is Key (`IsKey = true`).

Declaration The tag letter variable is specified as Letter. In this example, the default value is `C`. The keyword `final` designates this variable as a constant, and, by convention, the first variable is Key (`IsKey = true`). Qual_<*QUALIFIER*> represents the qualifier. (The qualifier is always in uppercase.) In the example the default value is `SEME`.

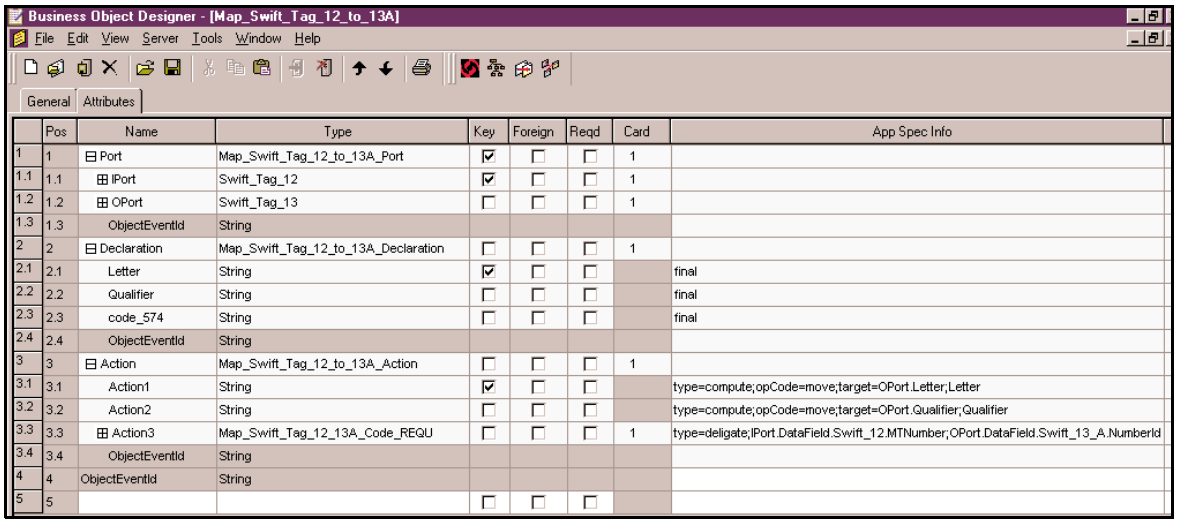
Action The sub-Action objects are as follows:

Action1 `type=compute;opCode=move;target=OPort.Letter;Letter` The value of the Letter variable is moved to the Letter attribute of OPort (which is Swift_Tag_20)

Action2
`type=compute;opCode=move;target=OPort.Qualifier;Qualifier` The value of the Qualifier variable is moved to the Qualifier attribute of OPort (which is Swift_Tag_20).

Action3
`type=compute;opCode=move;target=OPort.DataField.Swift_20_C.Reference;IPort.DataField.Swift_20.TransactionReferenceNumber` The value of `IPort.DataField.Swift_20.TransactionReferenceNumber` is moved to `OPort.DataField.Swift_20_C.Reference`.

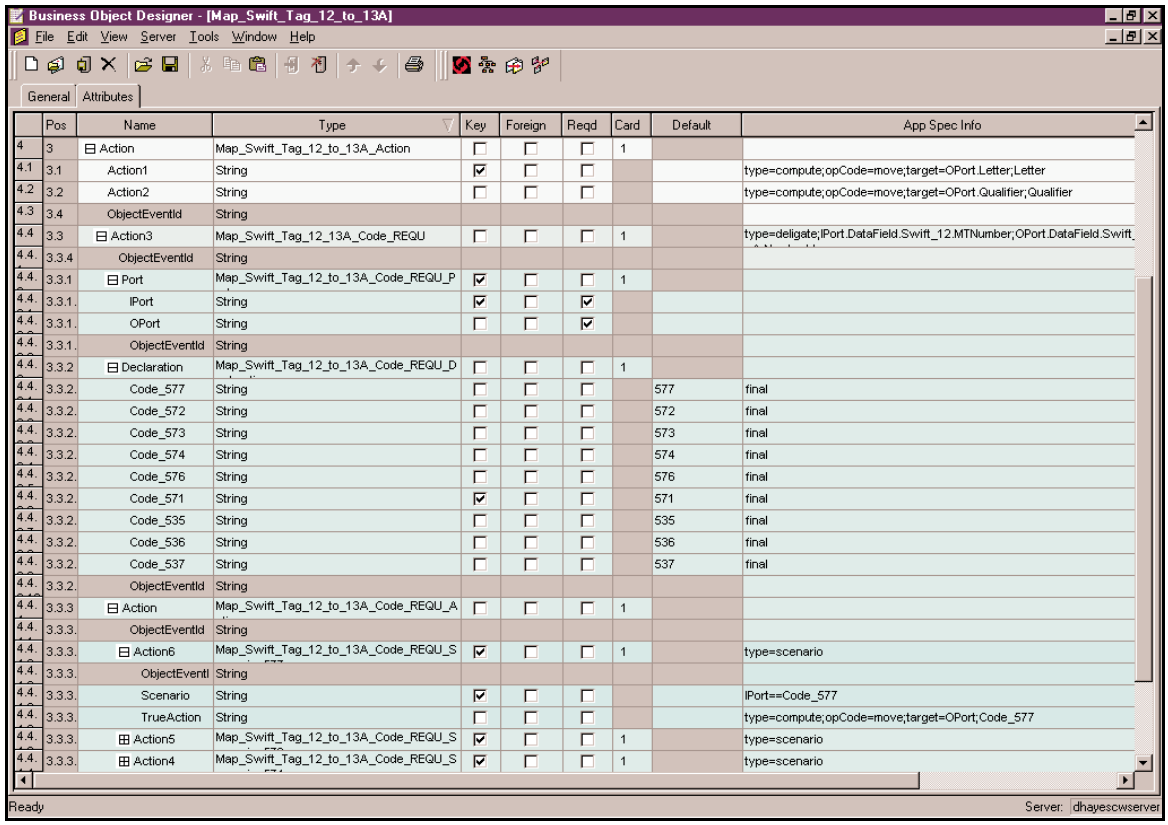
Figure 4-15 shows a field map that involves code word mapping and a Delegate Action.



	Pos	Name	Type	Key	Foreign	Reqd	Card	App Spec Info
1	1	⊟ Port	Map_Swift_Tag_12_to_13A_Port	☑	☐	☐	1	
1.1	1.1	⊞ IPort	Swift_Tag_12	☑	☐	☐	1	
1.2	1.2	⊞ OPort	Swift_Tag_13	☐	☐	☐	1	
1.3	1.3	ObjectEventId	String					
2	2	⊟ Declaration	Map_Swift_Tag_12_to_13A_Declaration	☐	☐	☐	1	
2.1	2.1	Letter	String	☑	☐	☐		final
2.2	2.2	Qualifier	String	☐	☐	☐		final
2.3	2.3	code_574	String	☐	☐	☐		final
2.4	2.4	ObjectEventId	String					
3	3	⊟ Action	Map_Swift_Tag_12_to_13A_Action	☐	☐	☐	1	
3.1	3.1	Action1	String	☑	☐	☐		type=compute;opCode=move;target=OPort.Letter;Letter
3.2	3.2	Action2	String	☐	☐	☐		type=compute;opCode=move;target=OPort.Qualifier;Qualifier
3.3	3.3	⊞ Action3	Map_Swift_Tag_12_13A_Code_REQU	☐	☐	☐	1	type=deligate;IPort.DataField.Swift_12.MTNumber;OPort.DataField.Swift_13_A.NumberId
3.4	3.4	ObjectEventId	String					
4	4	ObjectEventId	String					
5	5			☐	☐	☐		

Figure 4-15 Field Mapping with Code Words

For Action3, the Delegate Action, you must define the Port (IPort and OPort) Declaration, and sub-Action objects as shown in Figure 4-16.



	Pos	Name	Type	Key	Foreign	Reqd	Card	Default	App Spec Info
4	3	⊟ Action	Map_Swift_Tag_12_to_13A_Action	☐	☐	☐	1		
4.1	3.1	Action1	String	☑	☐	☐			type=compute;opCode=move;target=OPort.Letter;Letter
4.2	3.2	Action2	String	☐	☐	☐			type=compute;opCode=move;target=OPort.Qualifier;Qualifier
4.3	3.4	ObjectEventId	String						
4.4	3.3	⊟ Action3	Map_Swift_Tag_12_13A_Code_REQU	☐	☐	☐	1		type=deligate;IPort.DataField.Swift_12.MTNumber;OPort.DataField.Swift_
4.4.	3.3.4	ObjectEventId	String						
4.4.	3.3.1	⊟ Port	Map_Swift_Tag_12_to_13A_Code_REQU_P	☑	☐	☐	1		
4.4.	3.3.1.	IPort	String	☑	☐	☑			
4.4.	3.3.1.	OPort	String	☐	☐	☑			
4.4.	3.3.1.	ObjectEventId	String						
4.4.	3.3.2	⊟ Declaration	Map_Swift_Tag_12_to_13A_Code_REQU_D	☐	☐	☐	1		
4.4.	3.3.2.	Code_577	String	☐	☐	☐		577	final
4.4.	3.3.2.	Code_572	String	☐	☐	☐		572	final
4.4.	3.3.2.	Code_573	String	☐	☐	☐		573	final
4.4.	3.3.2.	Code_574	String	☐	☐	☐		574	final
4.4.	3.3.2.	Code_576	String	☐	☐	☐		576	final
4.4.	3.3.2.	Code_571	String	☑	☐	☐		571	final
4.4.	3.3.2.	Code_535	String	☐	☐	☐		535	final
4.4.	3.3.2.	Code_536	String	☐	☐	☐		536	final
4.4.	3.3.2.	Code_537	String	☐	☐	☐		537	final
4.4.	3.3.2.	ObjectEventId	String						
4.4.	3.3.3	⊟ Action	Map_Swift_Tag_12_to_13A_Code_REQU_A	☐	☐	☐	1		
4.4.	3.3.3.	ObjectEventId	String						
4.4.	3.3.3.	⊟ Action6	Map_Swift_Tag_12_to_13A_Code_REQU_S	☑	☐	☐	1		type=scenario
4.4.	3.3.3.	ObjectEventI	String						
4.4.	3.3.3.	Scenario	String	☑	☐	☐			IPort==Code_577
4.4.	3.3.3.	TrueAction	String	☐	☐	☐			type=compute;opCode=move;target=OPort;Code_577
4.4.	3.3.3.	⊞ Action5	Map_Swift_Tag_12_to_13A_Code_REQU_S	☑	☐	☐	1		type=scenario
4.4.	3.3.3.	⊞ Action4	Map_Swift_Tag_12_to_13A_Code_REQU_S	☑	☐	☐	1		type=scenario

Figure 4-16 Code Word Declaration for a Field Map

The code words are declared and assigned constant default values. A Scenario Action (Action6) specifies an equality boolean expression and a contingent Compute Action to execute if the expression evaluates to false.

Modifying PIMOs: Map Summary

The file `Map_Objects.txt` contains PIMOs for maps as follows:

From ISO 7775 to ISO 15022

- MT520 to MT540 Receive Free
- MT521 to MT541 Receive Payment Against
- MT522 to MT542 Deliver Free
- MT523 to MT543 Deliver Against Payment
- MT530 to MT544 Receive Free Confirmation
- MT531 to MT 545 Receive Against Payment Confirmation
- MT532 to MT546 Deliver Free Confirmation
- MT533 to MT547 Deliver Against Payment Confirmation
- MT571 to MT535 Statement of Holdings
- MT573 to MT537 Statement of Pending Transactions

From ISO 15022 to ISO 7775

- MT536 to MT572 Statement of Transactions
- MT540 to MT520 Receive Free
- MT541 to MT521 Receive Payment Against
- MT542 to MT522 Deliver Free
- MT543 to MT523 Deliver Against Payment
- MT544 to MT530 Receive Free Confirmation
- MT545 to MT 531 Receive Against Payment Confirmation
- MT546 to MT532 Deliver Free Confirmation
- MT547 to MT533 Deliver Against Payment Confirmation
- MT548 to MT534 Settlement Status and Processing Advice

If you need to modify one or more of these PIMOs:

- Review "Production Instruction Meta-Objects (PIMOs)," on page 79 and "Creating PIMOs," on page 87
- Find the PIMO you want to modify in the tables below, which summarize the default values and mapping relationships for each PIMO

  Note: Each table below shows the mapping relationships and default values for the ISO 7775-to-15022 direction and for the reverse (ISO 15022-to-7775) direction.
- Launch Business Object Designer and open the PIMO you wish to modify, saving a backup copy of the unmodified original copy.

MT520 to MT540 Receive Free

Table 4-3 MT520 to MT540 Receive Free

	MT520		MT540			
Data Elements	**Seq**	**Field Tag**	**Seq**	**Field Tag**	**Qualifier**	**Comments**
Delivery Date	A	30	B	98a	SETT	MT540 default values: 98A
TRN	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	MT540 default values: 98A
Identification of Securities	A	35B	B	35B		
Next Coupon	A	35a	B1 B1	98A 13a	COUP COUP	MT520 default values: 35D MT540 default values: 13A
Book Value	A	33V	B1	90a	MRKT	MT540 default values: 90B
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs SAFE	MT520 default values: 82D MT540 default values: 95Q REAG, 97A
Quantity of Securities	B	35A	C	36B	SETT	
Safekeeping Account	B	83a	C	97a	SAFE	MT520 default values: 83D MT540 default values: 97A
Certificate Numbers	B	35E	C	13B	CERT	MT520 default values: 35E->70E (F)
Deliverer of Securities	C	87a	E1 E1	95a 97a	DEAG SAFE	MT520 default values: 87D MT540 default values: 95Q, 97A

Table 4-3 MT520 to MT540 Receive Free (Continued)

Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT520 default values: 88D MT540 default values: 95Q, 97A
Deliverer's Instructing Party	C	85a	E1 E1	95a 97a	SELL SAFE	MT520 default values: 85D MT540 default values: 95Q, 97A
Registration Details	C	77D	E1	70a	REGI	MT540 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT540 default values: 70E
Sender to Receiver Information	C	72	B C	70E 13B	SPRO CERT	

Table 4-4 MT520 to MT540 Code Word Mapping

MT520	**MT540**
Tag 72 (C)	Tag 13B (C)
MSG579	CERT
Tag 35A	Tag 36B
FMT	FAMT
BON	UNIT
CER	
CPN	
MSC	
OPC	
OPS	
PRC	
PRS	
RTE	
SHS	
UNT	
WTS	

MT521 to MT541 Receive Payment Against

Table 4-5 MT521 to MT541 Receive Payment Against

	MT521		MT541			
Data Elements	**Seq**	**Field Tag**	**Seq**	**Field Tag**	**Qualifier**	**Comments**
Settlement Date	A	30	B	98a	SETT	MT541 default values: 98A
TRN	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	MT541 default values: 98A
Identification of Securities	A	35B	B	35B		
Next Coupon	A	35a	B1 B1	98A 13a	COUP COUP	MT521 default values: 35D MT541 default values: 13C
Book Value	A	33V	B1	90a	MRKT	
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs SAFE	MT521 default values: 82D MT541 default values: 95Q REAG, 97A
Quantity of Securities	B	35A	C	36B	SETT	
Safekeeping Account	B	83a	C	97a	SAFE	MT521 default values: 83D MT541 default values: 97A
Certificate Numbers	B	35E	C	13B	CERT	521.B.35E is mapped to 541.F.70E (with DECL as qualifier) instead of to 541.C.13B
Deliverer of Securities	C	87a	E1 E1	95a 97a	See Field Specs SAFE	MT521 default values: 87D MT541 default values: 95Q DEAG, 97A

Table 4-5 MT521 to MT541 Receive Payment Against (Continued)

Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT521 default values: 88D MT541 default values: 95Q, 97A
Deliverer's Instructing Party	C	85a	E1 E1	95a 97a	SELL SAFE	MT521 default values: 85D MT541 default values: 95Q, 97A
Registration Details	C	77D	E1	70a	REGI	MT541 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT541 default values: 70E
Account for Payment	C	53a	C	97a	CASH	MT521 default values: 53C MT541 default values: 97A
Account with Institution	C	57a	E2 E2	95a 97A	ACCW CASH	MT521 default values: 57D MT541 default values: 95Q
Beneficiary of Money	C	58a	E2 E2	95a 97A	BENM CASH	MT521 default values: 58D MT541 default values: 95Q
Deal Price	C	33T	B	90a	DEAL	MT541 default values: 90B
Deal Amount	C	32M	E3	19A	DEAL	
Accrued Interest	C	34a	E3	19A	ACRU	MT521 default values: 34G
Taxes Added	C	71E	E3	19A	See Field Specs	MT 541 default values: TRAX
Broker's Commission	C	71F	E3	19A	See Field Specs	MT 541 default values: LOCO
Other Charges or Fees	C	71G	E3	19A	See Field Specs	MT 541 default values: CHAR
Settlement Amount	C	32B	C E3	19A 19A	SETT SETT	
Account(s) for Charges	C	71D	E2	97A 70E	CHAR DECL	

Table 4-5 MT521 to MT541 Receive Payment Against (Continued)

Sender to Receiver Information	C	72	B C	70E 13B	SPRO CERT	13B CERT: Not Implemented

Table 4-6 MT521 to MT541 Code Mapping

MT521	**MT541**
Old Tag: 72 (C)	New Tag: 13B (C)
Old Code	Qualifier
MSG579	CERT
Old Tag: 35A	New Tag: 36B
Old Code	Qualifier
FMT	FAMT
BON	UNIT
CER	
CPN	
MSC	
OPC	
OPS	
PRC	
PRS	
RTE	
RTS	
SHS	
UNT	
WTS	

MT522 to MT542 Deliver Free

Table 4-7 MT522 to MT542 Deliver Free

Data Element	MT522		MT542			
	Seq	**Field Tag**	**Seq**	**Field Tag**	**Qualifier**	**Comments**
Delivery Date	A	30	B	98a	SETT	
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	MT542 default values: 98A
Identification of Securities	A	35B	B	35B	-	
Next Coupon	A	35a	B1 B1	98A 13a	COUP COUP	MT522 default values: 35D, 35C MT542 default values: 98A, 13A
Book Value	A	33V	B1	90a	MRKT	
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs	MT522 default values: 82D MT542 default values: 95Q DEAG, 97A SAFE
Quantity of Securities	B	35A	C	36B	SETT	
Safekeeping Account	B	83a	C	97a	SAFE	MT522 default values: 83D Default values for MT542: 97A
Certificate Numbers	B	35E	C	13B	CERT	
Receiver of Securities	C	87a	E1 E1	95a 97a	REAG SAFE	MT522 default values: 87D MT542 default values: 95Q, 97A
Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT522 default values: 88D MT542 default values: 95Q, 97A

Table 4-7 MT522 to MT542 Deliver Free (Continued)

Registration Details	C	77D	E1	70a	REGI	MT542 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT542 default values: 70E
Sender to Receiver Information	C	72	B C	70E 13B	SPRO CERT	13B CERT: not implemented

Table 4-8 MT 522 to MT 542 Code Mapping

MT522	**MT542**
Old Tag: 72 (C)	**New Tag: 13B (C)**
MSG579	CERT
Old Tag: 35A	**New Tag: 36B**
FMT	FAMT
BON	UNIT
CER	
CPN	
MSC	
OPC	
OPS	
PRC	
PRS	
RTE	
RTS	
SHS	
UNT	
WTS	

MT523 to MT543 Deliver Against Payment

Table 4-9 MT523 to MT543 Deliver Against Payment

Data Element	MT523		MT543			
	Seq	Field Tag	Seq	Field Tag	Qualifier	Comments
Settlement Date	A	30	B	98a	SETT	
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	MT543 default values: 98A
Identification of Securities	A	35B	B	35B	-	
Next Coupon	A	35a	B1 B1	98A 13a	COUP COUP	MT523 default values: 35D, 35C MT543 default values:13A
Book Value	A	33V	B1	90a	MRKT	MT543 default values: 90B
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs SAFE	MT523 default values: 82D MT543 default values: 95Q DEAG, 97A
Quantity of Securities	B	35A	C	36B	SETT	
Safekeeping Account	B	83a	C	97a	SAFE	MT523 default values: 83D MT543 default values: 97A
Certificate Numbers	B	35E	C	13B	CERT	
Receiver of Securities	C	87a	E1 E1	95a 97a	REAG SAFE	MT523 default values: 95Q MT543 default values: 97A
Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT523 default values: 88D; MT543 default values: 95Q, 97A

Table 4-9 MT523 to MT543 Deliver Against Payment (Continued)

Registration Details	C	77D	E1	70a	REGI	MT543 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT543 default values: 70E
Account for Payment	C	53a	C	97a	CASH	MT523 default values: 53D MT543 default values: 97A
Account With Institution	C	57a	E2 E2	95a 97a	ACCW CASH	MT523 default values: 57D MT543 default values: 95Q, 97R
Beneficiary of Money	C	58a	E2 E2	95a 97a	BENM CASH	MT523 default values: 58D MT543 default values: 95Q, 97A
Deal Price	C	33T	B	90a	DEAL	MT543 default values: 90B
Deal Amount	C	32M	E3	19A	DEAL	
Accrued Interest	C	34a	E3	19A	ACRU	
Taxes Deducted	C	71E	E3	19A	See Field Specs	MT543 default values: TRAX
Broker's Commission	C	71F	E3	19A	See Field Specs	MT543 default values: LOCO
Other Charges or Fees	C	71G	E3	19A	See Field Specs	MT543 default values: CHAR
Settlement Amount	C	32B	C E3	19A 19A	SETT SETT	
Account(s) For Changes	C	71D	E2	70E	DECL	
Sender to Receiver Information	C	72	B C	70E 13B	SPRO CERT	

Table 4-10 MT523 to MT543 Code Word Mapping

MT523	**MT543**
Old Tag: 72 (C)	**New Tag: 13B (C)**

Table 4-10 MT523 to MT543 Code Word Mapping (Continued)

MSG579	CERT
Old Tag: 35A	**New Tag: 36B**
FMT	FAMT
BON	UNIT
CER	
CPN	
MSC	
OPC	
OPS	
PRC	
PRS	
RTE	
SHS	
UNT	
WTS	

MT530 to MT544 Receive Free Confirmation

Table 4-11 MT530 to MT544 Receive Free Confirmation

Data Elements	MT530		MT544			
	Seq	**Field Tag**	**Seq**	**Field Tag**	**Qualifier**	**Comments**
TRN	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Delivery Date	A	30	B	98a	ESET	
Identification of Securities	A	35B	B	35B		
Next Coupon	A	35a 35C	B1 B1	98A 13a	COUP COUP	MT530 default values: 35D MT544 default values: 13A
Book Value	A	33V	B1	90a	MRKT	SWIFT documentation erroneously lists 35V as MT530 tag.
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs SAFE	MT530 default values: 82D MT544 default values: 95Q, 97A
Quantity of Securities	B	35A	C	36B	ESTT	
Safekeeping Account	B	83a	C	97a	SAFE	MT530 default values: 83D MT544 default values: 97A
Certificate Numbers	B	35E	C	13B	CERT	
Deliverer of Securities	C	87a	E1 E1	95a 97a	DEAG SAFE	MT530 default values: 87D MT544 default values: 95Q 97A
Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT530 default values: 88D MT544 default values: 95Q, 97A

Table 4-11 MT530 to MT544 Receive Free Confirmation (Continued)

Deliverer's Instructing Party	C	85a	E1 E1	95a 97a	SELL SAFE	MT530 default values: 85D MT544 default values: 95Q, 97A
Registration Details	C	77D	E1	70a	REGI	MT544 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT544 default values: 70E
Other Charges	C	71C	E3	19A	See Field Specs	MT544 default values: CHAR
Own Charges	C	71B	E3	19A	See Field Specs	MT544 default values: CHAR
Sender to Receiver Information	C	72	B C1	70E 13B	SPRO CERT	

Table 4-12 MT530 to MT544 Code Word Mapping

MT530	**MT544**
Old Tag: 72 (C)	New Tag: 23G (A)
REVERSAL	RVSL
Old Tag: 72 (C)	**New Tag: 22a (A) Qualifier PARS**
PARTIAL	PAIN
COMPLETE	PARC
Old Tag: 72 (C)	**New Tag: 13B (C)**
MSG579	CERT
REGOPEN	-

MT531 to MT 545 Receive Against Payment Confirmation

Table 4-13 MT531 to MT 545 Confirmation of Receive Against Payment

Data Elements	MT531		MT545			
	Seq	**Field Tag**	**Seq**	**Field Tag**	**Qualifier**	**Comments**
TRN	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Settlement Date	A	30	B	98a	ESET	MT545 default values: 98A
Identification of Securities	A	35B	B	35B		
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	MT545 default values: 98A
Next Coupon	A	35a 35C	B1 B1	98A 13a	COUP COUP	MT531 default values: 35D, 35C MT545 default values: 13A
Book Value	A	33V	B1	90a	MRKT	SWIFT documentation erroneously lists 35V as MT531 tag.
Instructing Party	A	82a	E1 E1	95a 97a	REAG SAFE	MT531 default values: 82D MT545 default values: 95Q, 97A
Quantity of Securities	B	35A	C	36B	ESTT	
Safekeeping Account	B	83a	C	97a	SAFE	
Certificate Numbers	B	35E	C	13B	CERT	
Deliverer of Securities	C	87a	E1 E1	95a 97a	DEAG SAFE	MT531 default values: 87D MT545 default values: 95Q, 97A
Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT531 default values: 88D MT545 default values: 95Q, 97A

Table 4-13 MT531 to MT 545 Confirmation of Receive Against Payment (Continued)

Deliverer's Instructing Party	C	85a	E1 E1	95a 97a	SELL SAFE	MT531 default values: 85D MT545 default values: 95Q, 97A
Registration Details	C	77D	E1	70a	REGI	MT545 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT545 default values: 70E
Account for Payment	C	53a	C	97a	CASH	MT531 default values: 53C MT545 default values: 97A
Account with Institution	C	57a	E2 E2	95a 97A	ACCW CASH	MT531 default values: 57D MT545 default values: 95Q
Beneficiary of Money	C	58a	E2 E2	95a 97A	BENM CASH	MT531 default values: 58D MT545 default values: 95Q
Special Concessions	C	33S	E3	19A	SPCN	
Deal Price	C	33T	B	90a	DEAL	MT545 default values: 90B
Deal Amount	C	32M	E3	19A	DEAL	
Accrued Interest	C	34a	E3	19A	ACRU	MT531 default values: 34G
Settlement Amount	C	32B	C E3	19A 19A	ESTT ESTT	
Other Charges	C	71C	E3	19A	CHAR	
Own Charges	C	71B	E3	19A	CHAR	
Exchange Rate	C	36	E3	92B	EXCH	
Net Proceeds	C	34A	E3	19A	POST	
Sender to Receiver Information	C	72	B C1	70E 13B	SPRO CERT	

Mapping of Code Words (MT 531 ·> MT 545):

Table 4-14 MT531 to MT545 Code Word Mapping

MT531	**MT545**
Old Tag: 72 (C)	**New Tag: 23G (A)**
REVERSAL	RVSL
Old Tag: 72 (C)	**New Tag: 22a (A) Qualifier PARS**
PARTIAL	PAIN
COMPLETE	PARC
Old Tag: 72 (C)	**New Tag: 13B (C)**
MSG579	CERT
REGOPEN	-

MT532 to MT 546 Deliver Free Confirmation

Table 4-15 MT532 to MT 546 Deliver Free Confirmation

Data Element	MT532		MT546			
	Seq	Field Tag	Seq	Field Tag	Qualifier	Comments
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Delivery Date	A	30	B	98a	ESET	MT546 default values: 98A
Identification of Securities	A	35B	B	35B	-	
Next Coupon	A	35a	B1 B1	98A 13a	COUP COUP	
Book Value	A	33V	B1	90a	MRKT	
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs	MT532 default values: 82D MT546 default values: 95Q DEAG, 97A SAFE
Quantity of Securities	B	35A	C	36B	ESTT	
Safekeeping Account	B	83a	C	97a	SAFE	MT532 default values: 83D MT546 default values: 97A
Certificate Numbers	B	35E	C	13B	CERT	
Receiver of Securities	C	87a	E1 E1	95a 97a	REAG SAFE	MT532 default values: 87D MT546 default values: 95Q, 97A
Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT532 default values: 88D MT546 default values: 95Q, 97A
Registration Details	C	77D	E1	70a	REGI	MT546 default values: 70D
Declaration Details	C	77R	E1	70a	DECL	MT546 default values: 70E

Table 4-15 MT532 to MT 546 Deliver Free Confirmation (Continued)

Other Charges	C	71C	E3	19A	See Field Specs	MT546 default values: CHAR
Own Charges	C	71B	E3	19A	See Field Specs	MT546 default values: CHAR
Sender to Receiver Information	C	72	B C	70E 13B	SPRO CERT	

Table 4-16 MT532 to MT546 Code Word Mapping

MT 532	**MT546**
Old Tag: 72 (C)	New Tag: 13B (C)
MSG579	CERT
Old Tag: 35A	**New Tag: 36B**
FMT	FAMT
BON	UNIT
CER	
CPN	
MSC	
OPC	
OPS	
PRC	
PRS	
RTE	
RTS	
SHS	
UNT	
WTS	

MT533 to MT547 Deliver Against Payment Confirmation

Table 4-17 MT533 to MT547 Deliver Against Payment Confirmation

Data Element	MT533		MT547			
	Seq	Field Tag	Seq	Field Tag	Qualifier	Comments
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Settlement Date	A	30	B	98a	ESET	MT547 default values: 98A
Date and Place of Trade	A	31P	B B	98a 94B	TRAD TRAD	
Identification of Securities	A	35B	B	35B	-	
Next Coupon	A	35a 35C	B1 B1	98A 13a	COUP COUP	MT533 default values: 35D, 35C MT547 default values: 98A, 13A
Book Value	A	33V	B1	90a	MRKT	
Instructing Party	A	82a	E1 E1	95a 97a	See Field Specs	MT533 default values: 82D MT547 default values: 95Q DEAG, 97A SAFE
Quantity of Securities	B	35A	C	36B	ESTT	
Safekeeping Account	B	83a	C	97a	SAFE	MT533 default values: 83D MT547 default values: 97A
Certificate Numbers	B	35E	C	13B	CERT	Note the Code level mapping
Receiver of Securities	C	87a	E1 E1	95a 97a	REAG SAFE	MT533 default values: 87D MT547 default values: 95Q, 97A

Table 4-17 MT533 to MT547 Deliver Against Payment Confirmation (Continued)

Beneficiary of Securities	C	88a	E1 E1	95a 97a	BUYR SAFE	MT533 default values: 88D MT547 default values: 95Q, 97A
Registration Details	C	77D	E1	70a	REGI	
Declaration Details	C	77R	E1	70a	DECL	
Account for Payment	C	53a	C	97a	CASH	MT533 default values: 53D MT547 default values: 97A
Account With Institution	C	57a	E2 E2	95a 97a	ACCW CASH	MT533 default values: 57D MT547 default values: 95Q, 97A
Beneficiary of Money	C	58a	E2 E2	95a 97a	BENM CASH	MT533 default values: 58D MT547 default values: 95Q, 97A
Special Concessions	C	33S	E3	19A	SPCN	
Deal Price	C	33T	B	90a	DEAL	MT547 default values: 90B
Deal Amount	C	32M	E3	19A	DEAL	
Accrued Interest	C	34a	E3	19A	ACRU	MT533 default values: 34G
Settlement Amount	C	32B	C E3	19A 19A	ESTT ESTT	
Other Charge(s)	C	71C	E3	19A	See Field Specs	MT547 default values: CHAR
Own Charge(s)	C	71B	E3	19A	See Field Specs	MT547 default values: CHAR
Exchange Rate	C	36	E3	92B	EXCH	
Net Proceeds	C	34A	E	19A	ANTO	
Sender to Receiver Information	C	72	B C	70E 13B	SPRO CERT	

Table 4-18 MT533 to MT547 Code Word Mapping

MT533	**MT547**

Table 4-18 MT533 to MT547 Code Word Mapping

Old Tag: 72 (C)	**New Tag: 13B (C)**
MSG579	CERT
Old Tag: 35A	**New Tag: 36B**
FMT	FAMT
BON	UNIT
CER	
CPN	
MSC	
OPC	
OPS	
PRC	
PRS	
RTE	
RTS	
SHS	
UNT	
WTS	

MT534 to MT548 Settlement Status and Processing Advice

Table 4-19 MT534 to MT548 Settlement Status and Processing Advice

Data Elements	MT534		MT548			
	Seq.	**Field Tag**	**Seq.**	**Field Tag**	**Qualifier**	**Comments**
Transaction Reference Number	----	20	A	20C	SEME	
Related Reference	----	21	A1	20C	RELA	
MT and Date of Original Instruction	----	11a	A1	13A	LINK	Date of original instruction can not be specified anymore.
Settlement Date	----	30	B	98a	SETT	
Date Problem Occurred	----	31S	----	----		
Further Identification	----	23	A2	25D	See Field Specs	MT548 default values: SETT
			A2a	24B	See Field Specs	MT548 default values: PEND
			B	22H	REDE	
Safekeeping Account	----	83a	B	97a	SAFE	MT534 default values: 83D MT548 default values: 97A
Quantity of Securities	----	35A	B	36B	SETT	
Identification of Securities	----	35B	B	35B		
Receiver / Deliverer of Securities	----	87a	B1	95a	REAG or DEAG	MT534 default values: 87D MT548 default values: 96A
			B1	97a	SAFE	MT548 default values: 97A

Table 4-19 MT534 to MT548 Settlement Status and Processing Advice (Continued)

Receiver / Deliverer's Instructing Party	----	82a	B1	95a	See Field Specs	MT534 default values: 8D MT548 default values: 95A
			B1	97a	SAFE	MT548 default values: 97A
Narrative	----	79	B	70E	SPRO	
Sender to Receiver Information	----	72	B	70E	SPRO	

Table 4-20 MT534 to MT548 Code Word Mapping

MT534	**MT548**
Old Tag: 23	**New Tag: 24B (A2a) Qualifier: PEND**
COLLATER	COLL
CPFUTURE	CFUT
CPLACK	CLAC
CPMONEY	CMON
FUTURE	FUTU
LACK	LACK
MONEY	MONY
REGOPEN	REGO
MONSE	LACK and MONY
NODEL	NDEL
REFUS	REFS
INCAD	INCA

MT571 to MT535 Statement of Holdings

Table 4-21 MT571 to MT535 Statement of Holdings

Data Elements	MT571		MT535			
	Seq	Field Tag	Seq	Field Tag	Qualifier	Comments
Page Number/ Continuation Indicator	A	28	A	28E		
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Safekeeping Account	A	83a	A	97a	SAFE	MT571 default values: 83D MT535 default values: 97A
Statement Period	A	67A	A	98a	STAT	MT535 default values: 98A
Date Prepared	A	30	A	98a	PREP	MT535 default values: 98C
Statement Basis	A	26F	A	22F	STBA	
Quantity of Securities	B	35H	B	93B	AGGR	
Quantity of Securities	B1	60B	B1	93C	See Field Specs	MT535 default values: BORR
Further Identification	B1	23	B1 B1	93C 70C	BORR SUBB	The qualifier of the balance field will specify the status or characteristic Additional information can be given in the narrative
Sender to Receiver Information	B1	72	B1a	70C	SUBB	
Identification of Securities	B	35B	B	35B		
Price per Unit	B	33B	B	90a	See Field Specs	MT535 default values: 90B MRKT
Accrued Interest	B	34a	B B	99A 19A	DAAC ACRU	
Exchange Rate	B	36	B	92B	EXCH	

Table 4-21 MT571 to MT535 Statement of Holdings (Continued)

Value	B	32H		19A	HOLD	
Sender to Receiver Information	B	72	B	70E	HOLD	
Number of Repetitive Parts	C	18A	----	----		
Final Value	C	34E	C	19A	HOLP	
Sender to Receiver Information	B	72	B1 B1 B1	90a 98a 94B	See Field Specs PRIC PRIC	MT535 default values: 90A MRKT, 98A

Table 4-22 MT571 to MT535 Code Word Mapping

Old Tag: 26F (A)	**New Tag: 22F (A) Qualifier: STBA**
ACTUA	SETT
TRADE	TRAD
CONTR	----
BOOKD	----
Old Tag: 23 (B1)	**New Tag: 93C (B1) All Qualifiers**
NA	NAVL
AD	AVAL
Old Tag: 23 (B1)	**New Tag: 93C (B1)**
REGIS	REGO
DEPRJ	----
REGRJ	----
DENOM	REGO
PLEDG	COLI or COLO
MARGE	COLI or COLO
COLLA	COLI or COLO
LOAND	LOAN
BORRO	BORR
TRNSH	TRAN
REINV	PECA

Table 4-22 MT571 to MT535 Code Word Mapping (Continued)

DIVID	PECA
SPLIT	PECA
TENDE	PECA
REDEM	PECA
EXCHS	PECA
AVAIL	TAVI
MERGE	PECA
LIQUI	PECA
BANKR	PECA
PENDD	PEND
PENDR	PENR
SEE72	----
Old Tag: 72 (C)	**New Tag: 90a (B) All Qualifiers**
DISCOUNT	DISC
PREMIUM	PREM
Old Tag: 72 (C)	**New Tag: 98a (B)**
VALUDATE (date)	PRIC
Old Tag: 72 (C)	**New Tag: 94B (B)**
VALUDATE (source)	PRIC

MT572 to MT536 Statement of Transactions

Table 4-23 MT572 to MT536 Statement of Transactions

Data Elements	MT572		MT536			
	Seq.	**Field Tag**	**Seq.**	**Field Tag**	**Qualifier**	**Comments**
Page Number / Continuation Indicator	A	28	A	28E		
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA	
Safekeeping Account	A	83a	A	97a	SAFE	MT572 default values: 83D MT536 default values: 97A
Statement Period	A	67A	A	69a	STAT	MT536 default values: 69A
Date Prepared	A	30	A	98a	PREP	MT536 default values: 98A
Identification of Securities	B	35B	B1	35B		
Opening Balance	B	60A	B1	93B	FIOP	
Safekeeping Account	B	83a	----	----		The functionality of the new message does not allow you to specify more than one safekeeping account per message (which is specified in sequence A)
Opening Balance	B	60B	----	----		
Quantity of Securities	B	35A	B1, A2	36B	PSTA	
Transaction Details	B1a	66A	B1b B1b B1b B1b B1a2	98a 22H 22F 22F 25D	ESET REDE TRAN CAEV and SETR MOVE	MT536 default values: 98A High level transaction type Detailed transaction type

Table 4-23 MT572 to MT536 Statement of Transactions (Continued)

Transaction Details	B1a	66A	B1a1 B1a	20C 20C	RELA PREV	Account Owner's Reference Sender's Reference
Counterparty	B1a	87a	B1a2a B1b1	95a 97a	DEAG and REAG SAFE	MT572 default values: 87D MT536 default values: 97A
Settlement Date	B1a	30	B2a	98a	SETT	MT536 default values: 98A
Price Per Unit	B1a	33B	B1	90a	MRKT	MT536 default values: 90B
Accrued Interest	B	34a	B1a2 Blb	99A 19A	DAAC ACRU	MT572 default values: 34G
Amount	B	34a	B1b	19A	PSTA	MT572 default values: 34G
Sender to Receiver Information	B1a	72	B1a2 B1a2 B1 B1	70E 22a 98a 94B	TRDE TRAN PRIC PRIC	
Closing Balance	B	62B	----	----		
Closing Balance	B	62A	B1	93B	FICL	
Number of Repetitive Parts	C	18A	----	----		
Sender to Receiver Information	C	72	A B1a2 B1 B1	17B 22a 98a 94B	ACTI TRAN PRIC PRIC	

Table 4-24 MT572 to MT536 Code Word Mapping

MT572	**MT536**
Old Tag: 66A (B)	**New Tag: 22H (B1b) Qualifier: REDE**
N	RECE
T	DELI
Old Tag: 66A (B)	**New Tag: 22F (B1b) Qualifier: SETR**
10 (correction)	----
11 (receipt for deposit)	TRAD (trade)

Table 4-24 MT572 to MT536 Code Word Mapping (Continued)

12 (regular trade)	TRAD (trade)
13 (forward trade)	----
14 (new issue)	----
16 (delivery)	TRAD (trade)
27 (depository transfer)	OWNE (external own account transfer)
28 (deposit transfer)	OWNI (internal own account transfer)
29 (opening buy)	----
30 (opening sell)	----
31 (closing buy)	----
32 (closing sell)	----
34 (assigned)	----
Old Tag: 66A (B)	**New Tag: 22F (B1b1) Qualifier: CAEV**
17 (bonus securities)	BONU (bonus issue)
18 (stock dividends)	DVSE (stock dividend)
19 (split)	SPLF (stock split)
20 (reverse split)	SPLR (reverse stock split)
21 (exchange)	EXOF (exchange offer) MRGR (merger)
22 (conversion)	CONV (conversion)
	EXWA (warrant exercise)
23 (redemption)	BPUT (put redemption)
24 (new issue for conversion of maturing debentures)	REDM (redemption
25 (drawing by lot)	DRAW (drawing)
26 (modification of identification of security)	----
33 (exercise)	EXWA (warrant exercise)
Old Tag: 66A (B)	**New Tag: 22F (B1b) Qualifier: MOVE**
35 (reversal)	REVE
Old Tag: 66A (B)	**New Tag: 22F (B1b) All Qualifiers**
72 (see field 72)	All other codes

Table 4-24 MT572 to MT536 Code Word Mapping (Continued)

Old Tag: 72 (B,C)	**New Tag: 22F (B1b) Qualifier: TRAN**
LOANDOUT	BOLE
BORROWED	BOLE
COLLATER	COLL
Old Tag: 72 (B,C)	**New Tag: 98a (B)**
VALUDATE (date)	PRIC
Old Tag: 72 (B)	**New Tag: 94B (B)**
VALUDATE (source)	PRIC
Old Tag: 72 (C)	**New Tag: 17B (A) Qualifier: ACTI**
NOTRANS	N

MT573 to MT537 Statement of Pending Transactions

Table 4-25 MT573 to MT537 Statement of Pending Transactions

Data Elements	MT573		MT537			
	Seq.	**Field Tag**	**Seq.**	**Field Tag**	**Qualifier**	**Comments**
Page Number/ Continuation Indicator	A	28	A	28E		
Transaction Reference Number	A	20	A	20C	SEME	
Related Reference	A	21	A1	20C	RELA PREV	
Safekeeping Account	A	83a	A	97a	SAFE	MT573 default values: 83A MT537 default values: 97A
Statement Period	A	67A	A	98a	STAT	MT537 default values: 98A
Date Prepared	A	30	A	98a	PREP	MT537 default values: 98C
Identification of Securities	B,C	35B	B2b	35B		
Safekeeping Account	B,C	83a	----	----		The functionality of the new message does not allow you to specify more than one safekeeping account per message (which is specified in sequence A)
Transaction Reference Number	B,C	20	B2a	20C	RELA	
Further Identification	B,C	23	B B1	25D 24B	SETT See field specs	MT537 default values: 24B PEND

Table 4-25 MT573 to MT537 Statement of Pending Transactions

MT and Date of the Original Instruction	B,C	11a	B1	13A	LINK	MT573 default values: 11R
Related Reference	B,C	21	B2a	20C	RELA	
Quantity of Securities	B,C	35A	B2b	36B	PSTA	
Settlement Date	B,C	30	B2b	98a	SETT	
Settlement Amount	B,C	32B	B2b	19A	PSTA	
Counterparty	B,C	87a	B2b1 B2b1	95a 97a	REAG or DEAG SAFE	MT573 default values: 87D MT537 default values: 95Q, 97A
Sender to Receiver Information	B,C	72	B2b	70E	TRDE	
Sender to Receiver Information	D	72	A	17B	ACTI	

Table 4-26 MT573 to MT537 Code Word Mapping

MT573	**MT537**
Old Tag: 23 (B,C)	**New Tag: 24B (B1) Qualifier: PEND**
COLLATER	COLL
CPFUTURE	CFUT
CPLACK	CLAC
CPMONEY	CMON
FUTURE	FUTU
INCAD	INCA
LACK	LACK
MONEY	MONY
MONSE	LACK and MONY
NODEL	NDEL
REFUS	REFS

Table 4-26 MT573 to MT537 Code Word Mapping (Continued)

REGOPEN	REGO
SEE72	----
Old Tag: 23 (B,C)	**New Tag: 24B (B1) Qualifier: PENF**
CERTD	REGO
COLLATER	COLL
CPLACK	CLAC
CPMONEY	CMON
FAIL	---- (see other codes)
INCAD	INCA
LACK	LACK
MONEY	MONY
REGOPEN	REGO
MONSE	LACK and MONY
NODEL	NDEL
REFUS	REFS
Old Tag: 23 (B,C)	**New Message Type: MT 548** **New Tag: 24B (A2a) Qualifier: REJT**
LATEI	LATE
CPLAT	LATE
MDATE	MDAT
Old Tag: 23 (B,C)	**New Tag: 24B (B1), Qualifier: NMAT**
CUNMATCH	NMAT
UNMATCH	CMIS
DSECU	DSEC
DDATE	DDAT
DTRAN	DTRA
DMONE	DMON
DQUAN	DQUA
Old Tag: 72 (D)	**New Tag: 17B (A)**
Old Code	Qualifier: ACTI
NOPENDGS	N

CHAPTER 5

SWIFT Data Handler

The SWIFT data handler is a data-conversion module whose primary roles are to convert business objects into SWIFT messages and SWIFT messages into business objects. The SWIFT data handler's primary roles are to:

- convert incoming SWIFT messages to business objects and vice versa
- pass business objects to the mapping engine for transformation from formats representing ISO 7775 to formats representing ISO 15022 and vice versa

Both default top-level data-handler meta-objects (connector and server) support the `swift` MIME type and therefore support use of the SWIFT data handler.

This chapter describes how the SWIFT data handler processes SWIFT messages. It also discusses how to configure the SWIFT data handler. The chapter contains the following sections:

"Configuring the SWIFT Data Handler"	page 129
"Business Object Requirements"	page 130
"Converting Business Objects to SWIFT Messages"	page 131
"Converting SWIFT Messages to Business Objects"	page 131

Configuring the SWIFT Data Handler

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

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

Note: For the SWIFT data handler to function properly, you must also create or modify business object definitions so that they support the data handler. For more information, see "Connector Business Object Requirements," on page 40.

Configuring the Connector Meta-Object

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

You must set the value of this property before running the connector. Doing so will enable the connector to access the SWIFT data handler when converting SWIFT messages to business objects and vice versa. For further information, see "Connector-Specific Properties," on page 21.

Configuring the Data Handler Child Meta-Object

For the SWIFT data handler, WebSphere delivers the default meta-object `MO_DataHandler_Default`. This meta-object specifies a child attribute of type `MO_DataHandler_Swift`. Table 5-1 describes the attributes in the child meta-object, `MO_DataHandler_SWIFT`.

Table 5-1 Child Meta-Object Attributes for the SWIFT Data Handler

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

The Delivered Default Value column in Table 5-1 lists the value that WebSphere provides for the default value of the associated meta-object attribute. You must ensure that all attributes in this child meta-object have a default value that is appropriate for your system and your SWIFT message type. Also, make sure that at least the `ClassName` and `BOPrefix` attributes have default values.

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

Business Object Requirements

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

Converting Business Objects to SWIFT Messages

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

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

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

- `parse=no;`
  The attribute MUST be of type `String` and is formatted as
  {*block number*`:`*attribute value*}
  The *block number* is the value of the `block=`*block value* application-specific text property.
- `parse=fixlen;`
  The attribute must be a single cardinality container. It is formatted as
  {*block number*:*attr0 value* a*ttr1 value*….*attrn value*}
  where *attrn value* is the attribute value of the *n*th attribute. All CxIgnore and CxBlank attributes are IGNORED.
- `parse=delim;`
  The attribute must be a single cardinality container. It is formatted as
  {*block number*`:[`*Tag*`:`*attr1 data*`]…[`*Tag*`:`*attr1 data*`]`}
  where: *Tag* is the value of the Tag property of attribute application-specific text
  attrn data is the value of the attribute. All CxIgnore and CxBlank attributes are IGNORED.
- `parse=field;`
  This setting can be used only on Block 4 messages. Fields are printed out in loop through non-CxIgnore and non-CxBlank attributes of the business object.
  - If `appText == NULL` and the attribute is a container, call `printBO(childBO)`. Handle multiple cardinality if required.
  - If `appText != NULL`, call `printFieldObj()`, which handles multiple cardinality and calls `printFieldBO()` to write out a tag.
- All fields are formatted as generic or non-generic fields. The tag number is determined by the value of the Tag business object attribute. All non-CxIgnore attributes of the tag business object are printed out. For more on generic or non-generic fields, see Appendix D, SWIFT Message Structure.

Converting SWIFT Messages to Business Objects

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

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

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

Mapping Engine

The SWIFT data handler uses a mapping engine to perform transformations between business objects representing ISO 7775 and ISO 15022 SWIFT messages. For each transformation, a Production Instruction Meta Object (PIMO) serves as a map. PIMOs specify the attribute-to-attribute mapping and the computation instructions required to perform the transformation. The attribute mapping and the computation instructions constitute meta-data that is used by the mapping engine.

If specified in the map subscription meta-object for a business object representing an ISO 7775 format, the data handler passes the ISO 7775 object definition to the mapping engine. There, using a production instruction meta-object (PIMO), the

mapping engine transforms the ISO 7775 object into an ISO 15022 business object definition and passes it to the data handler. It is likewise in the other direction. Using the map subscription meta-object, the connector determines whether the business object representing an ISO 15022 message type is supported and, if supported, requires transformation into an ISO 7775 business object. If so, the connector passes the message to the SWIFT data handler. The data handler passes the ISO 15022 business object definition to the mapping engine. Using a PIMO, the mapping engine processes the sub-fields of business object data, creating an ISO 7775-compliant business object.

CHAPTER 6

Troubleshooting

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

Startup Problems

Problem	Potential Solution / Explanation
The connector shuts down unexpectedly during initialization and the following message is reported: `Exception in thread "main" java.lang.NoClassDefFoundError: javax/jms/JMSException`...	Connector cannot find file `jms.jar` from the IBM MQSeries Java client libraries. Ensure that variable `MQSERIES_JAVA_LIB` in `start_connector.bat` points to the IBM MQSeries Java client library folder.
The connector shuts down unexpectedly during initialization and the following message is reported: `Exception in thread "main" java.lang.NoClassDefFoundError: com/ibm/mq/jms/ MQConnectionFactory...`	Connector cannot find file `com.ibm.mqjms.jar` in the IBM MQSeries Java client libraries. Ensure that variable `MQSERIES_JAVA_LIB` in `start_connector.bat` points to the IBM MQSeries Java client library folder.
The connector shuts down unexpectedly during initialization and the following message is reported: `Exception in thread "main" java.lang.NoClassDefFoundError: javax/naming/Referenceable...`	Connector cannot find file `jndi.jar` from the IBM MQSeries Java client libraries. Ensure that variable `MQSERIES_JAVA_LIB` in `start_connector.bat` points to the IBM MQSeries Java client library folder.

The connector shuts down unexpectedly during initialization and the following exception is reported: `java.lang.UnsatisfiedLinkError: no mqjbnd01 in shared library path`	Connector cannot find a required runtime library (`mqjbnd01.dll` [NT] or `libmqjbnd01.so` [Solaris]) from the IBM MQSeries Java client libraries. Ensure that your path includes the IBM MQSeries Java client library folder.
The connector reports `MQJMS2005: failed to create MQQueueManager for ':'`	Explicitly set values for the following properties: `HostName`, `Channel`, and `Port`.

Event Processing

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

APPENDIX A

Standard Configuration Properties for Connectors

Connectors have two types of configuration properties:

- Standard configuration properties
- Connector-specific configuration properties

This chapter describes standard configuration properties, applicable to all connectors. For information about properties specific to the connector, see the installing and configuring chapter of its adapter guide.

The connector uses the following order to determine a property's value (where the highest numbers override the value of those that precede):

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

The chapter contains the following sections:

"Configuring Standard Connector Properties for IBM CrossWorlds InterChange Server"	page 137
"Configuring Standard Connector Properties for WebSphere MQ Integrator"	page 148

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

Configuring Standard Connector Properties for IBM CrossWorlds InterChange Server

This section describes standard configuration properties applicable to connectors whose integration broker is IBM CrossWorlds InterChange Server (ICS). Standard configuration properties provide information that is used by a configurable

component of InterChange Server called the **connector controller**. Like the connector framework, the code for the connector controller is common to all connectors. However, you configure a separate instance of the controller for each connector.

A connector, which consists of the connector framework and the application-specific component, has been referred to historically as the **connector agent**. When a standard configuration property refers to the agent, it is referring to both the connector framework and the application-specific component.

For more information on configuring connectors that work on InterChange Server, refer to information on the connector controller in:

- *Technical Introduction to IBM CrossWorlds*
- *System Administration Guide*
- *System Implementation Guide*

Important

Not all properties are applicable to all connectors that use InterChange Server. For information specific to an connector, see its adapter guide.

You configure connector properties from Connector Designer, which you access from IBM CrossWorlds System Manager.

Note: Connector Designer and CrossWorlds System Manager run only on the Windows system. Even if you are running the connector on a UNIX system, you must still have a Windows machine with these tools installed. Therefore, to set connector properties for a connector that runs on UNIX, you must start up CrossWorlds System Manager on the Windows machine, connect to the UNIX InterChange Server, and bring up Connector Designer for the connector.

A connector obtains its configuration values at startup. If you change the value of one or more connector properties during a runtime session, the property's update semantics determine how and when the change takes effect. There are four different types of update semantics for standard connector properties:

- Dynamic—The change takes effect immediately after it is saved.
- Component restart—The change takes effect only after the connector is stopped and then restarted in CrossWorlds System Manager. This does not require stopping and restarting the application-specific component or InterChange Server.
- Server restart—The change takes effect only after you stop and restart the application-specific component and InterChange Server.
- Agent restart—The change takes effect only after you stop and restart the application-specific component.

To determine the update semantics for a specific property, refer to the Update Method column in the Connector Designer window, or see the Update Method column of Table A-1.

Table A-1 provides a quick reference to the standard connector configuration properties. You must set the values of some of these properties before running the connector. See the sections that follow for explanations of the properties.

Table A-1 Quick Reference for Standard Connector Properties

Property Name	Possible Values	Default Value	Update Method	Notes
"AgentConnections"	`1-4`	`1`	server restart	multi-threaded connector only
"AgentTraceLevel"	`0-5`	`0`	dynamic	
"Agent URL"	*URL for connector agent gateway*		server restart	HTTP transport only
"ApplicationName"	*application name*	*the value that is specified for the connector name*	component restart	value required
"Anonymous Connections"	`true` or `false`	`false`	server restart	HTTPS transport only
"CA Certificate Location"	*path/filename*		server restart	HTTPS transport only
"CharacterEncoding"	`ascii7`or `ascii8`	`ascii7`	component restart	HTTPS transport only
"ConcurrentEventTriggeredFlows"	`1` to `32,767`	`1`	server restart	
"ContainerManagedEvents"	`JMS` or `None`	`JMS`		guaranteed event delivery
"ControllerStoreAndForwardMode"	`true` or `false`	`true`	dynamic	
"ControllerTraceLevel"	`0-5`	`0`	dynamic	
"DeliveryTransport"	`MQ, IDL, JMS,` or `HTTP`	`MQ`	system restart	
"GW Name"	*gateway name*		server restart	HTTP transport only

Table A-1 Quick Reference for Standard Connector Properties (Continued)

Property Name	Possible Values	Default Value	Update Method	Notes
"jms.BrokerName"	If FactoryClassName is `IBM`, use `crossworlds.queue.manager`. If FactoryClassName is `Sonic`, use `localhost:2506`.	`crossworlds.queue.manager`	server restart	JMS transport only

"jms.FactoryClassName"	`CxCommon.Messaging.jms.IBMMQSeriesFactory`
	`CxCommon.Messaging.jms.SonicMQFactory`
	Any Java class name
		`CxCommon.Messaging.jms.IBMMQSeriesFactory`	server restart	JMS transport only

"jms.Password"	Any valid password		server restart	JMS transport only
"jms.UserName"	Any valid name		server restart	JMS transport only
"Listener Port"	*port number*	`80` for HTTP `443` for HTTPS	server restart	HTTP transport only
"LogAtInterchangeEnd"	`true` or `false`	`false`	component restart	
"LogFileName"	*filename* or `STDOUT`	`C:\CrossWorlds\InterChangeSystem.log`	component restart	
"MessageFileName"	*path/filename*	*`ConnectorName`*`Connector.txt` or `InterchangeSystem.txt`	component restart	
"OADAutoRestartAgent"	`true` or `false`	`false`	dynamic	
"OADMaxNumRetry"	*a positive number*	`1000`	dynamic	

Table A-1 Quick Reference for Standard Connector Properties (Continued)

Property Name	Possible Values	Default Value	Update Method	Notes
"OADRetryTimeInterval"	*a positive number in minutes*	`10`	dynamic	
"PollEndTime"	*`HH:MM`*	`HH:MM`	component restart	
"PollFrequency"	`-1` *to 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	
"PollStartTime"	*`HH:MM`* *(HH is 0-23, MM is 0-59)*	`HH:MM`	component restart	
"RestartRetryCount"	`0-99`	`3`	dynamic	
"RestartRetryInterval"	*a sensible positive value in minutes*	`1`	dynamic	
"SourceQueue"	`SourceQueue` or `None`	`SourceQueue`		designates event source queue in support of guaranteed event delivery
"TraceFileName"	*path/filename*	`STDOUT`	component restart	

AgentConnections

The AgentConnections property controls the number of IIOP connections opened for request transport between an application-specific component and its connector controller. By default, the value of this property is set to 1, which causes InterChange Server to open a single IIOP connection.

This property enhances performance for a multi-threaded connector by allowing multiple connections between the connector controller and application-specific component. When there is a large request/response workload for a particular connection, the IBM WebSphere administrator can increase this value to enhance performance. Recommended values are in the range of 2 to 4. Increasing the value of

this property increases the scalability of the Visigenic software, which establishes the IIOP connections. You must restart the application-specific component and the server for a change in property value to take effect.

Important

If a connector is single-threaded, it cannot take advantage of the multiple connections. Increasing the value of this property causes the request transport to bottleneck at the application-specific component. To determine whether a specific connector is single- or multi-threaded, see the installing and configuring chapter of its adapter guide.

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.

Agent URL

Used when HTTP or HTTPS is the delivery transport, specifies the URL of the application-specific component's gateway. You set this value on the controller to allow it to connect to its application-specific component's gateway by providing that gateway's URL and the port number on which that gateway listens for communications from the controller.

Use the format *Protocol*`://`*host_name*`:`*port_number*. For example, `http://www.`*`othercompany`*`.com:80`. Specify `https` protocol for secure transport. If you set the protocol to `https`, two additional properties, "Anonymous Connections" and "CA Certificate Location", display in the Connector Designer. These properties are required for HTTPS.

The default port is `80` for HTTP, and `443` for HTTPS. If you do not specify a port in the `Agent URL` property, the controller uses the default port for the selected protocol. However, it is recommended that you explicitly state the port number on both the controller and application-specific component side, even if you use the default port.

The port number you specify in this property's value must match the port number configured for the application-specific component's gateway. That port number is set for the application-specific component in the connector's configuration file. Note that you can change only controller configuration properties using the Connector Definitions screen. To change application-specific component properties, you must directly edit the connector's configuration file.

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.

Anonymous Connections

Used when HTTPS is the delivery transport, determines whether the controller allows data exchange in the event that the application-specific component gateway cannot be validated. Failure to validate may occur for a number of reasons. For example, if certification authority (CA) certificates are missing at the controller end, or identity certificates or private key stores are missing at the application-specific component

gateway end, the server may not be able to validate the gateway. Data exchange is secure in an anonymous connection. However, without validating the application-specific component, the system is vulnerable to unauthenticated access.

The default value is `false`.

CA Certificate Location

Used when HTTPS is the delivery transport, specifies the directory path where certification authority (CA) certificates are stored. When the application-specific component gateway presents its identity certificates, the connector controller authenticates them with the CA certificates stored in this directory. If the connector controller cannot authenticate the identity certificates, it either terminates the connection or sets up an anonymous connection, depending on the value of the "Anonymous Connections" property.

CharacterEncoding

Set to `ascii7` if the connector handles data containing the standard ASCII character set. Set to `ascii8` if the connector handles data containing extended ASCII characters. The default is `ascii7`.

Note: Not all connectors use this property. To determine whether a specific connector does, see the installing and configuring chapter of its adapter guide.

ConcurrentEventTriggeredFlows

Determines how many business objects can be concurrently processed by the connector controller 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 controller for a source application to simultaneously map multiple event business objects, and to simultaneously deliver them to multiple collaboration instances. Setting this property to enable concurrent mapping of multiple business objects can speed delivery of business objects to a collaboration, particularly if the business objects use complex maps. Increasing the arrival rate of business objects to collaborations can improve overall performance in the system.

Note: To implement concurrent processing for an entire flow (from a source application to a destination application) also requires that the collaboration be configured to use multiple threads and that the destination application's application-specific component be able to process requests concurrently. To configure the collaboration, set its `Maximum number of concurrent events` property high enough to use multiple threads. For an application-specific component to process requests concurrently, it must be either multi-threaded, or be capable of using Connector Agent Parallelism and be configured for multiple processes (setting the `Parallel Process Degree` configuration property greater than `1`). For information on setting these properties and resources, see the *System Administration Guide*.

Important

To determine whether a specific connector is single- or multi-threaded, see the installing and configuring chapter of its adapter guide.

The `ConcurrentEventTriggeredFlows` property has no effect on connector polling, which is single-threaded and performed serially. For more information about using concurrent flow processing, see the *System Administration Guide*.

ContainerManagedEvents

Setting this property to `JMS` enables the connector to remove a message from the source queue and place it on the destination queue as a single transaction. This property can also be set to `None`.

Default = `JMS`

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

PollQuantity = `1`
SourceQueue = `SOURCEQUEUE`

Note, too, that 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 InterChange Server, the connector controller blocks the request to the application-specific component. When the application-specific component becomes operational, the controller forward the request to it.

Important

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`.

DeliveryTransport

Specifies the transport mechanism for the delivery of events. Possible values are `MQ` for MQSeries, `IDL` for CORBA IIOP, `JMS` for Java Messaging Service, and `HTTP`. The default is `MQ`.

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

MQSeries and IDL

It is recommended using MQSeries rather than IDL for event delivery transport, unless you have compelling reasons not to license and maintain two separate products. MQSeries offers the following advantages over IDL:

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

JMS

Enables communication between the connector controller and application-specific component using JMS.

If you select JMS as the delivery transport, four additional properties, "jms.BrokerName", "jms.FactoryClassName", "jms.Password",and "jms.UserName", display in Connector Designer. The first two of these properties are required for this transport.

HTTP

Enables HTTP communication between the connector controller and application-specific component through the WebSphere business integration system web gateway. HTTP allows communication between InterChange Server and an application-specific component residing on a remote machine across the Internet or an intranet. If you set the DeliveryTransport property to `HTTP`, the "Agent URL", "GW Name", and "Listener Port" properties are required.

GW Name

Used when HTTP or HTTPS is the delivery transport, specifies the CORBA object name of the controller gateway for InterChange Server. The gateway name must be unique among all other gateways on the local network.

jms.BrokerName

Specifies the broker name to use for the JMS provider.

The default is `crossworlds.queue.manager`.

jms.FactoryClassName

Specifies the class name to instantiate for a JMS provider.

The default is CxCommon.Messaging.jms.IBMMQSeriesFactory.

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.

Listener Port

Used when HTTP or HTTPS is the delivery transport, this property specifies the port number on which the controller gateway listens on behalf of the connector controller. If you do not specify a port number, the controller gateway listens on the default port for the selected protocol. The default port is 80 for HTTP, and 443 for HTTPS. If a number other than the default is used, the Remote URL property in the connector configuration file must reflect this.

LogAtInterchangeEnd

Specifies whether to log errors to InterChange Server's log destination, in addition to logging locally. Logging to the server's log destination also turns on email notification, which generates email messages for the MESSAGE_RECIPIENT specified in the InterchangeSystem.cfg file when errors or fatal errors occur. As an example, when a connector loses its connection to its application, if LogAtInterchangeEnd is set to true, an email message is sent to the specified message recipient. The default is false.

LogFileName

The name of the file where the application-specific component logs messages. Specify the file name in an absolute path. The default is C:\CrossWorlds\InterChangeSystem.log. To log to the command prompt window that opens when the application-specific component starts, change the value of this property to STDOUT. To log to a file of your choosing, specify the full path of that file.

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.

Important

To determine whether a specific connector has its own message file, see the installing and configuring chapter of its adapter guide.

OADAutoRestartAgent

Specifies whether the Object Activation Daemon (OAD) automatically attempts to restart the application-specific component after an abnormal shutdown. If you set this property to `true`, two additional properties, "OADMaxNumRetry" and "OADRetryTimeInterval", display in Connector Designer. This property is required for automatic restart. For more information, see the *System Administration Guide*.

The default is `false`.

OADMaxNumRetry

Specifies the maximum number of times that the OAD automatically attempts to restart the application-specific component after an abnormal shutdown. For more information, see the *System Administration Guide*.

The default is `1000`.

OADRetryTimeInterval

Specifies the number of minutes of the retry time interval that the OAD automatically attempts to restart the application-specific component after an abnormal shutdown. If the application-specific component does not start within the specified interval, the OAD repeats the attempt as many times as specified in "OADMaxNumRetry". For more information, see the *System Administration Guide*.

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.

PollFrequency

The amount of time between polling actions. Set the 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.

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.

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. For more information, see the *System Administration Guide*.

The default is `3`.

RestartRetryInterval

Specifies the interval 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. For more information, see the *System Administration Guide*.

The default is `1`.

SourceQueue

Designates the source queue for the connector framework in support of guaranteed event delivery. For further information, see "ContainerManagedEvents," on page 144.

Default = `SourceQueue`

TraceFileName

The name of the file where the application-specific component writes trace messages. Specify the filename in an absolute path. The default is `STDOUT`.

Configuring Standard Connector Properties for WebSphere MQ Integrator

This section describes standard configuration properties applicable to adapters whose integration broker is WebSphere MQ Integrator (WMQI). For information on using WMQI, see the *WebSphere Business Integration Adapters Implementation Guide for MQ Integrator*.

Important

Not all properties are applicable to all connectors that use WMQI. For information specific to a connector, see its adapter guide.

You configure connector properties from Connector Configurator.

Note: Connector Configurator runs only on the Windows system. Even if you are running the connector on a UNIX system, you must still have a Windows machine with this tool installed. Therefore, to set connector properties for a connector that runs on UNIX, you must execute Connector Configurator on the Windows computer and copy the configuration files to the UNIX computer using FTP or some other file transfer mechanism. For more information about Connector Configurator, see Appendix B, "Connector Configurator."

A connector obtains its configuration values at startup. If you change the value of one or more connector properties during a runtime session, you must restart the connector. Standard configuration properties provide information that is used by the adapter framework and connector framework, and is common to all connectors.

Standard Connector Properties

Table A-1 provides a quick reference for standard connector configuration properties. See the sections that follow for explanations of the properties.

Table A-2 Quick Reference for Standard Connector Properties for WMQI

Name	Possible Values	Default Value
"AdminInQueue"	*valid MQSeries queue name*	ADMININQUEUE
"AdminOutQueue"	*valid MQSeries queue name*	ADMINOUTQUEUE
"AgentTraceLevel"	0-5	0
"ApplicationName"	*application name*	*AppName*Connector
"BrokerType"	WMQI	WMQI
"CharacterEncoding"	ascii7 or ascii8	ascii7
"ContainerManagedEvents"	JMS or None	JMS
"ConcurrentRequests"	1-10	10
"DeliveryQueue"	*valid MQSeries queue name*	DELIVERYQUEUE
"DeliveryTransport"	WMQI-JMS	WMQI-JMS
"FaultQueue"	*valid MQSeries queue name*	FAULTQUEUE
"MessageFileName"	*path/filename*	*InterchangeSystem .txt*
"PollEndTime"	*HH:MM*	HH:MM
"PollFrequency"	*milliseconds*/ key/no	10000
"PollStartTime"	*HH:MM*	HH:MM
"QueueManager"	*valid MQSeries queue manager name*	crossworlds.queue .manager
"QueueManagerLogin"	*user name for MQSeries queue manager*	crossworlds

Table A-2 Quick Reference for Standard Connector Properties for WMQI

Name	Possible Values	Default Value
"QueueManagerPassword"	*password for MQSeries queue manager user name*	`WMQI`
"RepositoryDirectory"	*path/directory name*	`C:\crossworlds\Repository`
"RequestQueue"	*valid MQSeries queue name*	`REQUESTQUEUE`
"RestartRetryCount"	`0-99`	`3`
"RestartRetryInterval"	*an appropriate integer indicating the number of minutes between restart attempts*	`1`
"SourceQueue"	`SourceQueue` or `None`	`SourceQueue`
"SynchronousRequestQueue"	*valid MQSeries queue name*	
"SynchronousResponseQueue"	*valid MQSeries queue name*	
"Timeout"	*an appropriate integer indicating the number of minutes the connector waits for a response to a synchronous request*	`0`
"WireFormat"	*path/filename*	`CwXML`

AdminInQueue

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

AdminOutQueue

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

AgentTraceLevel

Level of trace messages for the connector's 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 connection to the application. This name is used by the system administrator to monitor the connector's environment. When you create a new connector definition, this property defaults to the name of the connector. When you work with the definition for an IBM WebSphere-delivered connector, the property is also likely to be set to the name of the connector. Set the property to a value that suggests the program with which the connector is interfacing, such as the name of an application, or something that identifies a file system or website in the case of technology connectors.

BrokerType

This property is set to the value `WMQI` for connectors that are configured to use WebSphere MQSeries Integrator as the integration broker.

CharacterEncoding

Set to `ascii7` if the connector handles data containing the standard ASCII character set. Set to `ascii8` if the connector handles data containing extended ASCII characters. The default is `ascii7`.

Note: Not all connectors use this property. To determine whether a specific connector does, see the installing and configuring chapter of its adapter guide.

ConcurrentRequests

ConcurrentRequests is 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.

ContainerManagedEvents

Setting this property to `JMS` enables the connector to remove a message from the source queue and place it on the destination queue as a single transaction. This property can also be set to `None`.

Default = `JMS`

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

PollQuantity = `1`
SourceQueue = `SOURCEQUEUE`

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

DeliveryQueue

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

DeliveryTransport

Specifies the transport mechanism for the delivery of events. The property defaults to the value `WMQI-JMS`, indicating that the Java Messaging Service is used for communication with WebSphere MQ Integrator. Although the list of possible values in the drop-down menu also includes `MQ`, `IDL`, `JMS`, and `HTTP`, this property must be set to `WMQI-JMS` when WMQI is the integration broker or the connector cannot start.

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.

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. This property defaults to the value `InterchangeSystem.txt` for new connector definitions and should be changed to the name of the message file for the specific connector.

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.

PollFrequency

The amount of time between polling actions. Set the 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.

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.

QueueManager

The queue manager that controls the various queues used for communication between the connector and the integration broker.

QueueManagerLogin

A valid user name to log in to the MQSeries queue manager specified for the "QueueManager" property.

If local binding is being used to connect to the queue manager, then this property is not necessary. If client mode is being used to connect to the queue manager over TCP/IP, however, then this property must be set to a valid queue manager user name. For more information on local binding and client mode communication, see the *WebSphere Business Integration Adapters Implementation Guide for MQ Integrator*.

QueueManagerPassword

The password for the MQSeries queue manager user name specified for the "QueueManagerLogin" property.

If local binding is being used to connect to the queue manager, then this property is not necessary. If client mode is being used to connect to the queue manager over TCP/IP, however, then this property must be set to the proper password. For more information on local binding and client mode communication, see the *WebSphere Business Integration Adapters Implementation Guide for MQ Integrator*.

RepositoryDirectory

The path and name of the directory from which the connector reads the XML schema documents that store the meta-data of business object definitions.

RequestQueue

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

RestartRetryCount

Specifies the number of times the connector attempts to restart itself. The default value is `3`, indicating that the connector tries to restart 3 times. For instance, if a connector is unable to log in to an application it fails to start, but with this property set to the value 3 the connector tries a total of three times to start. When used in conjunction with the "RestartRetryInterval" property, this behavior enables a connector to make several attempts at communicating with an application that might not reliably have a connection available all the time.

RestartRetryInterval

Specifies the interval in minutes at which the connector attempts to restart itself. The default value is `1`, indicating that the connector waits 1 minute in between its restart attempts.

SourceQueue

Designates the source queue for the connector framework in support of guaranteed event delivery. For further information, see "ContainerManagedEvents," on page 151.

Default = `SourceQueue`

SynchronousRequestQueue

Delivers request messages that require a synchronous response from the connector framework to WMQI. 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 WMQI on the SynchronousResponseQueue. The response message sent to the connector bears a correlation ID that matches the ID of the original message.

SynchronousResponseQueue

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

Timeout

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.

WireFormat

The data format for messages exchanged by the connector. The default value `CwXML` is the only valid value, and directs the connector to compose the messages in XML.

APPENDIX B

Connector Configurator

Before you can start and use a connector, you must create or modify a connector configuration file (*.cfg file) that sets the properties for the connector, designates the business objects and any meta objects that it supports, and sets logging and tracing values that the connector will use at runtime.

Use Connector Configurator to create and modify the configuration file for your connector.

Note: Connector Configurator runs only in a Windows environment. If you are running the connector itself in a UNIX environment, use Connector Configurator in a Windows environment, as described in these instructions, to create the connector configuration file. Then copy the file to your UNIX environment. Some properties in the connector configuration file use directory paths, which are defaulted to the path convention for the Windows environment. If you use the connector configuration file in a UNIX environment, be sure to revise any directory path constructs in the configuration properties to match the UNIX convention for directory paths.

Using Connector Configurator

If a configuration file has previously been created for your connector, you can use Connector Configurator to open the file and modify its settings. If no configuration file has yet been created for your connector, you can use Connector Configurator to both create the file and set its properties. This appendix describes how to use Connector Configurator to

- Create a New Configuration File
- Set Properties in a New or Existing Configuration File
- Complete the Connector Configurator Tasks for Your Connector

Note: The Server menu selection of the Connector Configurator screen is not used for configuring connectors for use with MQ Integrator as the broker; it is reserved for use with IBM CrossWorlds InterChange Server. If you are using MQ Integrator as the broker, do not attempt to connect to InterChange Server.

Creating a New Configuration File

You can create a connector configuration (*.cfg) file in either of the following ways:

- Create a completely new connector configuration file from within Connector Configurator
- Load a file that contains preliminary settings for your connector (referred to as a connector definitions file) and save it as a connector configuration file

Creating a File from within Configurator

1. Choose File -> New.
2. The New Connector dialog appears, with the following fields:
   - Name

     Enter the name of the connector. Names are case-sensitive. The name you enter must be unique, must end with the word “connector” and must be consistent with the file name for a connector that you have installed on the system; for example, enter `ClarifyConnector` if the connector file name is `Clarify.dll`.

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

     Choose WMQI connectivity.
3. The configuration screen displays, showing the broker that you are using and the name that you have given to the connector. You can fill in all the field values to complete the definition now (see "Setting the Configuration File Properties"), or you can save the file and complete the fields later.
4. To save the file, choose File -> Save->To File. The Save File Connector dialog displays. Choose *.cfg as the file type, verify in the File Name field that you have the correct spelling and casing for the connector, navigate to the directory where you want to locate the file, and choose Save. The status display in the lower panel of Connector Configurator indicates that the configuration file was successfully created.

   Note: The directory path and name that you establish here must match the connector configuration file path and name that you supply in the startup file for the connector.
5. To complete the connector definition, enter values in the fields for each of the tabs of the Connector Configurator window, as described under "Setting the Configuration File Properties".

Loading Settings from a Connector Definitions File

A connector definitions file 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 (such a file typically has the extension *.txt; for example, CN_XML.txt for the XML connector).

In addition, if you have previously used an IBM CrossWorlds connector in an ICS environment, the definitions for that connector may be available to you in a repository file that was used in the IBM CrossWorlds configuration of that connector. Such a file would typically have the extension *.in or *.out.

However, that definition is not complete until you designate the supported business objects and meta objects, set values for the use of trace and log files, and set appropriate values for your connector under the Standard and Application Config Properties tabs. Although some of these values are preset in the connector definition file, you may wish to change their values. In addition, a connector definition may have some required Standard or Application Config properties that have no pre-filled value, and you may need to set such values in Connector Configurator in order to complete the definition. For some connectors, you may need to use the Application Config Properties tab to both add an application-specific property and set its value.

To use a connector definitions file to configure a connector, you must open the definitions file in Connector Configurator, revise the configuration, and then save the file as a configuration file (*.cfg file). To do this, follow these steps:

1. In Connector Configurator, choose File>Open>From File.
2. In the Open File Connector dialog, choose one of the following:
   - ICS Repository (*.in, *.out)

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

     Choose this if you have available a *.txt file that was delivered in the package for this connector, or if you have a definitions file available under another extension.
3. In the directory display, navigate to the appropriate connector definitions file, select it, and choose Open.
4. The Connector Configurator window displays the configuration screen, prefilled with the attributes and values that Connector Configurator found in the connector definitions file.

   The title of the configuration screen displays the type of the broker and the name of the connector as specified in the connector definition file. If you are using a connector definition file or repository file that still has its original values, the title on the configuration screen may show that the broker type value for the connector definition is “ICS.” You must change this value before you can configure the connector for use with MQ Integrator as the broker. To do so:

   a. Under the Standard Properties tab, select the value field for the Delivery Transport property. In the drop-down menu, select the value WMQI-JMS.

   b. The Standard Properties tab will refresh to show a new property, BrokerType, with WMQI as the prefilled value. This means that MQ Integrator has now been selected as the broker type. When you save the file, this broker selection will be retained. You can save the file now, or proceed to complete the remaining configuration fields, as described in "Setting the Configuration File Properties".

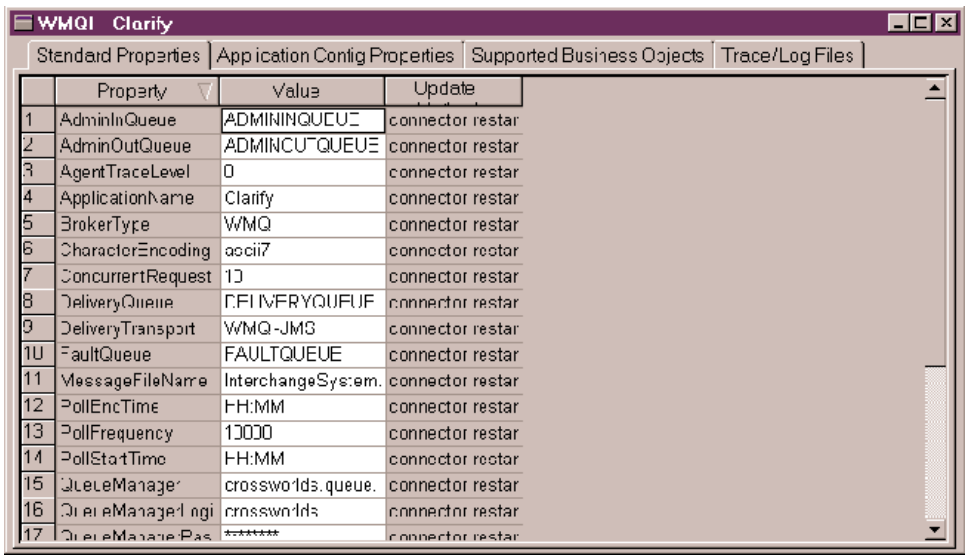
5 When you have finished making entries in the configuration fields, choose File->Save->To File, choose *.cfg as the extension, choose the correct location for the file in the directory structure, and choose Save. (If you have multiple connector configurations open, as you might if you have opened a repository file, choose Save All if you want to save all of the configurations.)

Before it saves the file, Connector Configurator validates to make sure that you have set values for all the required Standard properties. If you omit a required Standard property, Connector Configurator displays a message that tells you that the validation failed. You must supply a value for the property in order to save the configuration file.

Connector Configurator saves the configuration file to the location and file name that you specified. Keep in mind that to start your connector, the name and final location of your configuration file must match exactly (including casing) the name and path specified in your startup file.

Setting the Configuration File Properties

When you create and name a new connector configuration file, or when you open an existing connector configuration file, Connector Configurator displays a configuration screen with tabs for the different categories of configuration values that you must set. When you select a tab, you display the fields for that category. In the following diagram, the Standard Properties tab has been selected:



The configuration values that you need to set in Connector Configurator are:

1 Standard Properties

2 Application Config Properties

3 Supported Business Object Definitions and meta objects

4 Trace / Log File values

Note: Configurable values in the Connector Configurator screen can use either the English character set or non-English character sets. However, the names of both standard and application config properties, and the names of supported business objects, must use the English character set only.

Standard properties are differentiated from Application Config Properties as follows:

- Standard properties of a connector are shared by both the applications-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 your connector guide. You can change some but not all of these values.
- Application Config (application-specific) properties apply only to the connector component that interacts directly with an application. Each connector has application-specific properties that are unique to the connector's application. Some of these properties have changeable default values; others you must set explicitly. The installation and configuration chapters of your connector guide describe the application-specific properties and recommended values for that connector.

The fields for Standard Properties and Application Config Properties are color-coded to show which are configurable:

- Properties in grey background are standard properties for connectors. Their values can be changed, but their names cannot be changed or removed.
- Properties in white background vary depending on the connector development code. These properties can be deleted and their values can be changed.
- Value fields are configurable.
- The Update Method field is not configurable. It tells you the action you will need to perform to activate a changed property.

Setting Standard Connector Properties

For standard properties, you can configure values, but you cannot change the names of the properties or their update method.

To change a value:

1. Click in the field whose value you want to set.
2. Either enter a value, or choose from the drop-down menu if one appears.
3. After entering all the intended Standard Property values, you can do either of the following:
   - To discard the changes, preserve the original values, and exit the Connector Configurator, choose File>Exit (or close the window), and choose No when prompted to save changes.
   - To enter values for other categories in Connector Configurator, choose 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 will be prompted to either save or discard the values that you entered in all of the categories as a whole.
   - To save the revised values, choose File->Exit (or close the window) and choose Yes when prompted to save changes. Alternatively, choose Save->To File from either the File menu or the toolbar.

Setting Application Config Properties

For application-specific configuration properties, you can add or change property names, configure values, and choose whether to Encrypt the property:

1 Click in the field whose name or value you want to set.

2 Enter a name or value.

3 To encrypt a property, click the Encrypt box.

4 Choose to save or discard changes, as described for Setting Standard Connector Properties.

Note the Update Method shown for each of the changed properties to determine if either a component or server restart is necessary.

Attention

Changing a pre-set 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 clicking the Encrypt checkbox in the Edit Property window. To decrypt a value, uncheck the Encrypt checkbox, enter the correct value in the Verification dialog box, and choose OK. If the entered value is correct, the Value is decrypted and displays. Your connector guide contains a list and description of each property and its default value.

Update Method

When MQ Integrator is used as the broker, connector properties are static. The Update Method is Connector Restart, meaning that for changes to take effect, you must restart the connector after saving the revised connector configuration file.

Specifying Supported Business Object Definitions

The steps described in this chapter presume that you have already created business object definitions, and that you have created MQ message set files (*.set files), which contain message set IDs that Connector Configurator requires for designating the business objects supported by the connector. See the *WebSphere Business Integration Adapters Implementation Guide for MQ Integrator* for information about creating the MQ message set files.

Each time that you add business object definitions to your system, you must use Connector Configurator to designate those business objects as supported by the connector.

Important

If your connector requires meta objects, you must create message set files for them and load them into Connector Configurator, in the same manner as for business objects.

To specify supported business objects:

1 Select the Supported Business Objects tab and choose Load. The Open Message Set ID File(s) dialog displays.

2 Navigate to the directory where you have placed your message set file for the connector and select the appropriate message set file (*.set) or files.

3 Choose Open. The Business Object Name field is filled with the business object names contained in the *.set file, and the numeric message set ID for each business object is listed in its corresponding Message Set ID field. Do not change the message set IDs. These names and numeric IDs will be saved when you save the configuration file.

4 Whenever you add business objects to your configuration, you must load their message set files. If you attempt to load a message set that contains a business object name that already exists in your configuration, or if you attempt to load a message set file that contains a duplicate business object name, Connector Configurator will detect the duplicate and display the Load Results dialog. The dialog shows the business object name or names for which there are duplicates. For each duplicate name shown, click in the Message Set ID field, and choose the Message Set ID that you wish to use.

Setting Trace/Log File Values

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

To change the logging and tracing values:

1 Choose 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.
- To File: Writes logging or tracing messages to a file that you specify. To specify the file, choose the directory button (ellipsis), navigate to the preferred location, provide a file name, and choose Save. Logging or tracing files will be written to the file and location that you specify.

  Note: Both logging and tracing files are simple text files, and 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 .trc, to avoid confusion with other files that might reside on your system. For logging files, either .log or .txt are typical file extensions.

Completing the Configuration

After you have created a configuration file for a connector and modified it with any necessary changes, 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.

APPENDIX C

Connector Feature List

This appendix details the features supported by the connector. For descriptions of these features, see “Appendix A: Connector Feature Checklist” in the *Connector Development Guide*. The chapter contains the following sections:

"Business Object Request Handling Features"	page 163
"Event Notification Features"	page 165
"General Features"	page 166

Business Object Request Handling Features

Table 6-1 details the business object request handling features supported by the connector.

Table 6-1 Business Object Request Handling Features

Category	Feature	Support	Notes
Create	Create verb	N / A	Support is entirely dependent on application receiving connector request.
Delete	Delete verb	N / A	Support is entirely dependent on application receiving connector request.
	Logical delete	N / A	Support is entirely dependent on application receiving connector request.
Exist	Exist verb	N / A	Support is entirely dependent on application receiving connector request.
Misc	Attribute names	Full	

Table 6-1 Business Object Request Handling Features (Continued)

Category	Feature	Support	Notes
	Business object names	Full	
Retrieve	Ignore missing child object	N / A	Support is entirely dependent on application receiving connector request.
RetrieveByContent	Ignore missing child object	N / A	Support is entirely dependent on application receiving connector request.
	Multiple results	N / A	Support is entirely dependent on application receiving connector request.
	RetrieveByContent verb	N / A	The connector supports RetrieveByContent verb in full when using synchronous request / response.
Update	After-image support	N / A	Support is entirely dependent on application receiving connector request.
	Delta support	N / A	Support is entirely dependent on application receiving connector request.
	KeepRelations	N / A	Support is entirely dependent on application receiving connector request.
Verbs	Retrieve verb	N / A	Support is entirely dependent on application receiving connector request.
	Subverb support	Partial	Depends on data handler chosen for the connector.
	Verb stability	Full	

Event Notification Features

Table 6-2 details the event notification features supported by the connector.

Table 6-2 Event Notification Features

Category	Feature	Support	Notes
Connector Properties	Event distribution	No	
	PollQuantity	Full	
Event Table	Event status values	N / A	
	Object key	N / A	
	Object name	N / A	
	Priority	Full	Connector retrieves messages based on the priority specified in their message header (range 0-9). See MQSeries documentation for more information.
Misc.	Archiving	Full	Connector can deliver copies of messages to different queues depending on whether the message was unsubscribed, was successfully processed, or resulted in errors.
	CDK method gotApplEvent	Full	
	Delta event notification	No	
	Event sequence	Full	
	Future event processing	No	
	In-Progress event recovery	Full	
	Physical delete event	N / A	Support is entirely dependent on application receiving connector request.
	RetrieveAll	N / A	Support is entirely dependent on application receiving connector request.
	Smart filtering	No	
	Verb stability	N / A	

General Features

Table 6-3 details the general features supported by the connector.

Table 6-3 General Features

Category	Feature	Support	Notes
Business Object Attributes	Foreign key	No	
	Foreign Key attribute property	N / A	Support is entirely dependent on application receiving connector request.
	Key	No	
	Max Length	Partial	May be used by the data handler chosen for the connector.
	Meta-data-driven design	Full	
	Required	No	
Connection Lost	Connection lost on poll	Full	
	Connection lost on request processing	Full	
	Connection lost while idle	No	
Connector Properties	ApplicationPassword	Full	
	ApplicationUserName	Full	
	UseDefaults	Partial	Depends on the data handler established for the connector.
Message Tracing	General messaging	Full	
	generateMsg()	Full	
	Trace level 0	Full	
	Trace level 1	Full	
	Trace level 2	Full	
	Trace level 3	Full	
	Trace level 4	Full	
	Trace level 5	Full	
Misc.	CDK method LogMsg	Full	
	Java Package Names	Full	

Table 6-3 General Features (Continued)

Category	Feature	Support	Notes
	Logging messages	Full	
	NT service compliance	Full	
	Transaction support	Full	
Special Value	CxBlank processing	Partial	Depends on the data handler chosen for the connector
	CxIgnore processing	N / A	Support is entirely dependent on application receiving connector request.

APPENDIX D

SWIFT Message Structure

This appendix describes SWIFT message structure and includes the following sections:

"SWIFT Message Types"	page 169
"SWIFT Field Structure"	page 170
"SWIFT Message Block Structure"	page 171

SWIFT Message Types

SWIFT messages consist of five blocks of data including three headers, message content, and a trailer. Message types are crucial to identifying content.

All SWIFT messages include the literal “MT” (Message Type). This is followed by a 3-digit number that denotes the message type, category, and group. Consider the following example, which is an order to buy or sell via a third party:

`MT502`

The first digit (`5`) represents the category. A category denotes messages that relate to particular financial instruments or services such as Precious Metals, Syndications, or Travelers Checks. The category denoted by `5` is Securities Markets.

The second digit (`0`) represents a group of related parts in a transaction life cycle. The group indicated by `0` is a Financial Institution Transfer.

The third digit (`2`) is the type that denotes the specific message. There are several hundred message types across the categories. The type represented by `2` is a Third-Party Transfer.

Each message is assigned unique identifiers. A 4-digit session number is assigned each time the user logs in. Each message is then assigned a 6-digit sequence number. These are then combined to form an ISN (Input Sequence Number) from the user’s

computer to SWIFT or an OSN (Output Sequence Number) from SWIFT to the user's computer. It is important to remember that terminology is always from the perspective of SWIFT and not the user.

The Logical Terminal Address (12 character BIC), Day, Session and Sequence numbers combine to form the MIR (Message Input Reference) and MOR (Message Output Reference), respectively.

For a full list of SWIFT message types, see *All Things SWIFT: the SWIFT User Handbook*.

SWIFT Field Structure

This section discusses the SWIFT field structure. A field is a logical subdivision of a message block A, which consists of a sequence of components with a starting field tag and delimiters.

A field is always prefaced by a field tag that consists of two digits followed, optionally, by an alphabetic character. The alphabetic character is referred to as an option. For example, `16R` is a tag (`16`) with an option (`R`) that indicates the start of a block; `16S` is a tag (`16`) with an option (`S`) that indicates the end of a block. A field is always terminated by a field delimiter. The delimiter depends on the type of field used in a message block.

There are two types of fields used in SWIFT messages: generic and non-generic. The type of field used in a SWIFT message block is determined by the Message Type. What follows is a discussion of these SWIFT field structures. For more on generic and non-generic fields and how to distinguish between them, see Part III, Chapter 3 of the *SWIFT User Handbook*

Note: The symbol `CRLF` shown below is a control character and represents carriage return / line feed (0D0A in ASCII hex, 0D25 in EBCDIC hex).

Non-Generic Fields

The structure of non-generic fields in SWIFT message blocks is as follows:

`:2!n[1a]:` *data content*`<CRLF>`

where:

`:` = mandatory colon

`2!n` = numeric character, fixed length

`[1a]` = one optional alphabetic character, letter option

`:` = mandatory colon

data content = the data content, which is defined separately for every tag

<CRLF> = field delimiter

The following is an example of a non-generic field:

```
:20:1234<CRLF>
:32A:...<CRLF>
```

Note: In some cases (such as with the tag `15A`...*n*), the data content is optional.

Generic Fields

The structure of generic fields in SWIFT messages is as follows:

`:2!n1a::4!c//[8c]//`*data content*

where

`:2!n1a:` = same format as non-generic fields, except that `1a` is mandatory

`:` = mandatory second colon (required in all generic fields)

`4!c` = qualifier

`//` = first delimiter

`[8c]` = issuer code or Data Source Scheme (DSS)

`//` = second delimiter

data content = See Part III, Chapter 3 of the *SWIFT User Handbook* for the format definition

Note: Non-generic fields and generic fields cannot share the same field tag letter option letter. In order to distinguish between them easily, a colon is defined as the first character of the column Component Sequence. Generic fields are defined in the same section (Part III, Chapter 3 of the *SWIFT User Handbook*) as the non-generic fields.

The following character restrictions apply to generic field data content:

- Second and subsequent lines within the data content must start with the delimiter CRLF.
- Second and subsequent lines within the data content must never start with a colon (:) or a hyphen (-).
- The data content must end with the delimiter CRLF.

SWIFT Message Block Structure

The connector supports SWIFT Financial Application (FIN) messages. They have the following structure:

{1: *Basic Header Block*}
{2: *Application Header Block*}
{3: *User Header Block*}
{4: *Text Block or body*}
{5: *Trailer Block*}

These five SWIFT message blocks include header information, the body of the message, and a trailer. All blocks have the same basic format:

{*n*:...}

The curly braces ({}) indicate the beginning and end of a block. *n* is the block identifier, in this case a single integer between 1 and 5. Each block identifier is associated with a particular part of the message. There is no carriage return or line feed (CRLF) between blocks.

Blocks 3, 4, and 5 may contain sub-blocks or fields delimited by field tags. Block 3 is optional. Many applications, however, populate block 3 with a reference number so that when SWIFT returns the acknowledgement, it can be used for reconciliation purposes.

Note: For further information on SWIFT message blocks, see Chapter 2 of the *SWIFT User Handbook FIN System Messages Document*.

{1: Basic Header Block}

The basic header block is fixed-length and continuous with no field delimiters. It has the following format:

{1: F 01 BANKBEBB 2222 123456}

(a) (b) (c) (d) (e) (f)

a) 1: = Block ID (always 1)

b) Application ID as follows:

– F = FIN (financial application)

– A = GPA (general purpose application)

– L = GPA (for logins, and so on)

c) Service ID as follows:

– 01 = FIN / GPA

– 21 = ACK / NAK

d) BANKBEBB = Logical terminal (LT) address. It is fixed at 12 characters; it must not have X in position 9.

e) 2222 = Session number. It is generated by the user's computer and is padded with zeros.

f) 123456 = Sequence number that is generated by the user's computer. It is padded with zeros.

{2: Application Header Block}

There are two types of application headers: Input and Output. Both are fixed-length and continuous with no field delimiters.

The input (to SWIFT) structure is as follows:

{2: I 100 BANKDEFFXXXX U 3 003}

(a) (b) (c) (d) (e) (f) (g)

a) 2: = Block ID (always 2)

b) I = Input

c) 100 = Message type

d) BANKDEFFXXXX = Receiver's address with X in position 9/ It is padded with Xs if no branch is required.

e) U = the message priority as follows:

– S = System

– N = Normal

– U = Urgent

f) 3 = Delivery monitoring field is as follows:

– 1 = Non delivery warning (MT010)

– 2 = Delivery notification (MT011)

– 3 = Both valid = U1 or U3, N2 or N

g) 003 = Obsolescence period. It specifies when a non-delivery notification is generated as follows:

– Valid for U = 003 (15 minutes)

– Valid for N = 020 (100 minutes)

The output (from SWIFT) structure is as follows:

```
{2:   O      100   1200   970103BANKBEBBAXXX2222123456   970103  1201   N}
(a)   (b)    (c)   (d)    (e)                            (f)     (g)    (h)
```

a) 2: = Block ID (always 2)

b) O = Output

c) 100 = Message type

d) 1200 = Input time with respect to the sender

e) The Message Input Reference (MIR), including input date, with Sender's address

f) 970103 = Output date with respect to Receiver

g) 1201 = Output time with respect to Receiver

h) N = Message priority as follows:

– S = System

– N = Normal

– U = Urgent

{3: User Header Block}

This is an optional block and has the following structure:

```
{3:  {113:xxxx}  {108:abcdefgh12345678}     }
(a)     (b)              ( c)
```

a) 3: = Block ID (always 3)

b) 113:xxxx = Optional banking priority code

c) This is the Message User Reference (MUR) used by applications for reconciliation with ACK.

Note: Other tags exist for this block. They include tags (such as 119, which can contain the code ISITC on an MT521) that may force additional code word and formatting rules to validate the body of the message as laid down by ISITC (Industry Standardization for Institutional Trade Communication). For further information, see *All Things SWIFT: the SWIFT User Handbook*.

{4: Text Block or body}

This block is where the actual message content is specified and is what most users see. Generally the other blocks are stripped off before presentation. The format, which is variable length and requires use of CRLF as a field delimiter, is as follows:

```
{4:CRLF

:20:PAYREFTB54302 CRLF

:32A:970103BEF1000000,CRLF

:50:CUSTOMER NAME CRLF

AND ADDRESS CRLF

:59:/123-456-789 CRLF

BENEFICIARY NAME CRLF

AND ADDRESS CRLF

-}
```

The symbol CRLF is a mandatory delimiter in block 4.

The example above is of type MT100 (Customer Transfer) with only the mandatory fields completed. It is an example of the format of an ISO7775 message structure. Block 4 fields must be in the order specified for the message type in the appropriate volume of the *SWIFT User Handbook*.

Note: The ISO7775 message standard is gradually being replaced by the newer data dictionary standard ISO15022. Among other things, the new message standard makes possible generic fields for block 4 of a SWIFT message structure. For further information, see "SWIFT Field Structure," on page 170.

The content of the text block is a collection of fields. For more on SWIFT fields, see "SWIFT Field Structure," on page 170. Sometimes, the fields are logically grouped into sequences. Sequences can be mandatory or optional, and can repeat. Sequences also can be divided into subsequences. In addition, single fields and groups of consecutive fields can repeat. For example, sequences such as those in the SWIFT Tags 16R and 16S may have beginning and ending fields. Other sequences, such as Tag 15, have only a beginning field. In yet other message types, no specific tags mark the start or end of a field sequence.

The format of block 4 field tags is:

:*nn*a:

nn = Numbers

a = Optional letter, which may be present on selected tags

For example:

:20: = Transaction reference number

`:58A:` = Beneficiary bank

The length of a field is as follows:

nn = Maximum length

nn`!` = Fixed-length

nn`-`*nn* = Minimum and maximum length

nn `*` *nn* = Maimum number of lines times maximum line length

The format of the data is as follows:

n = Digits

d = Digits with decimal comma

h = Uppercase hexadecimal

a = Uppercase letters

c = Uppercase alphanumeric

e = Space

x = SWIFT character set

y = Uppercase level A ISO 9735 characters

z = SWIFT extended character set

Some fields are defined as optional. If optional fields are not required in a specific message, do not include them because blank fields are not allowed in the message.

`/,word` = Characters “as is”

`[...]` = Brackets indicate an optional element

For example:

`4!c[/30x]`	This is a fixed 4 uppercase alphanumeric, optionally followed by a slash and up to 30 SWIFT characters.
`ISIN1!e12!c`	This is a code word followed by a space and a 12 fixed uppercase alphanumeric.

Note: In some message types, certain fields are defined as conditional. For example, when a certain field is present, another field may change from optional to mandatory or forbidden. Certain fields may contain sub-fields, in which case there is no `CRLF` between them. Validation is not supported.

Certain fields have different formats that depend on the option that is chosen. The option is designated by a letter after the tag number, for example:

:32A:000718GBP1000000,00 Value Date, ISO Currency, and Amount

:32B:GBP1000000,00 ISO Currency and Amount

Note: The SWIFT standards for amount formats are: no thousand separators are allowed (10,000 is not allowed, but 10000 is allowed); use a comma (not a decimal point) for a decimal separator (1000,45 = one thousand and forty-five hundredths).

`:58A:NWBKGB2L`	Beneficiary SWIFT address
`:58D:NatWest Bank`	Beneficiary full name and address

```
Head Office

London
```

{5: Trailer Block}

A message always ends in a trailer with the following format:

```
{5: {MAC:12345678}{CHK:123456789ABC}
```

This block is for SWIFT system use and contains a number of fields that are denoted by keywords such as the following:

MAC	Message Authentication Code calculated based on the entire contents of the message using a key that has been exchanged with the destination and a secret algorithm. Found on message categories 1,2,4,5,7,8, most 6s and 304.
CHK	Checksum calculated for all message types.
PDE	Possible Duplicate Emission added if user thinks the same message was sent previously
DLM	Added by SWIFT if an urgent message (U) has not been delivered within 15 minutes, or a normal message (N) within 100 minutes.