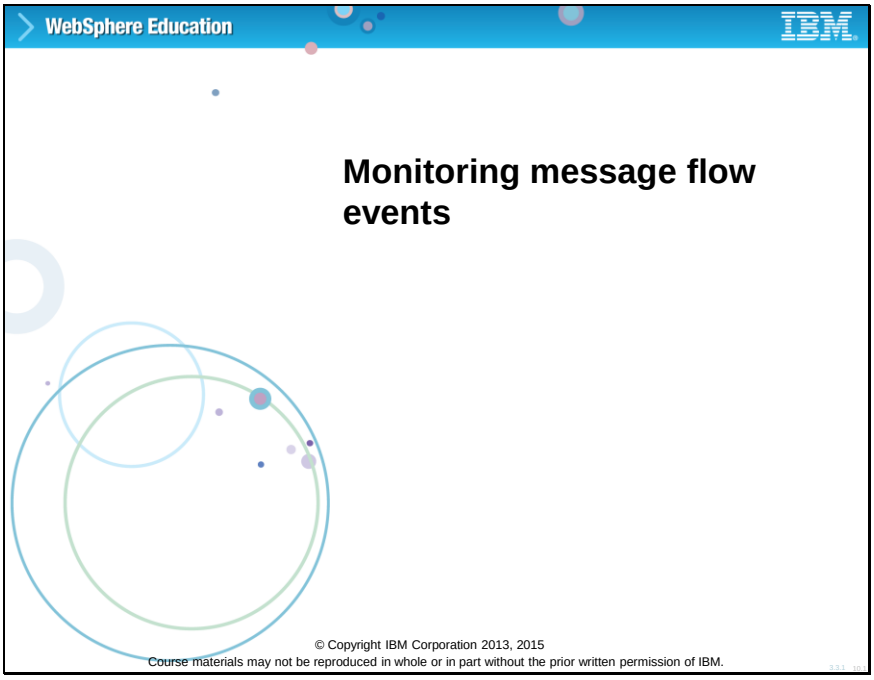
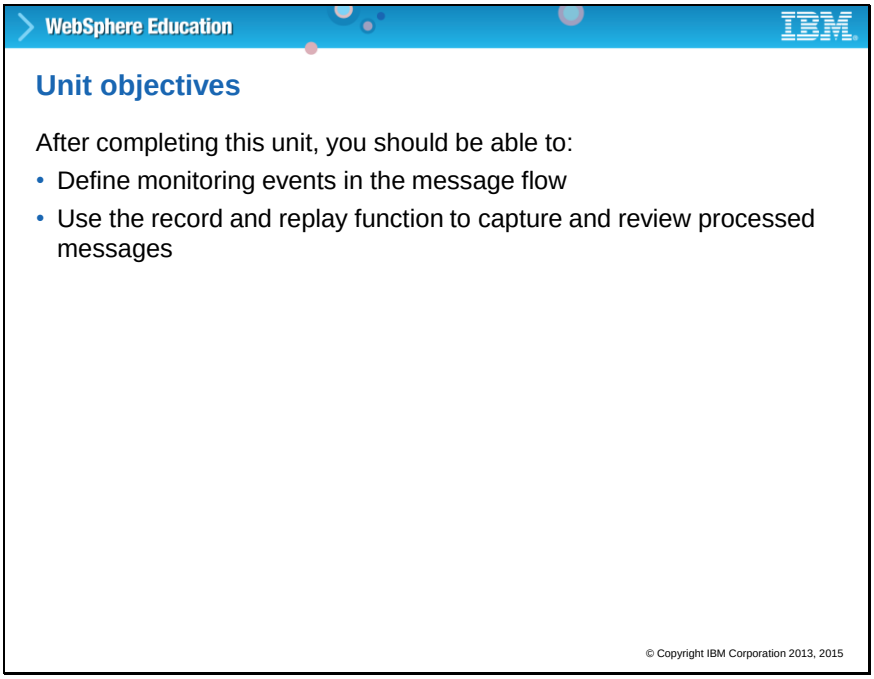
Slide 1


WebSphere Education
IBM
Monitoring message flow events
© Copyright IBM Corporation 2013, 2015
Course materials may not be reproduced in whole or in part without the prior written permission of IBM.

Slide 2

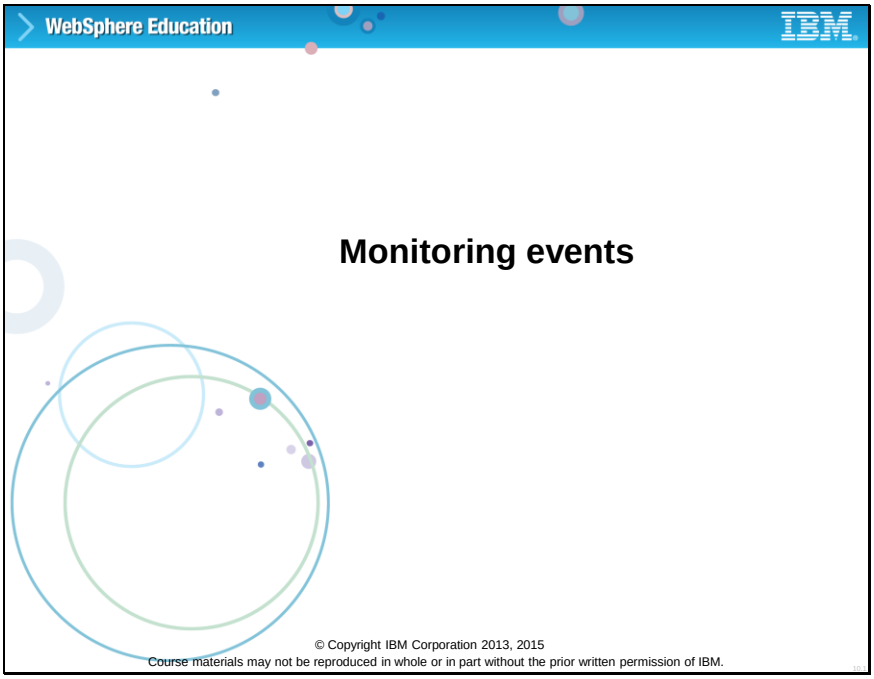


Unit objectives

Integration nodes use a publish/subscribe broker to publish events in response to changes in configuration, state, or operational status. You can monitor these events by subscribing to the topics. For audit or problem determination purposes, you can record data to a database, then view it, and replay it. This unit describes the IBM Integration Bus tools that are available for monitoring message flow events and analyzing message data.

After completing this unit, you should be able to:
- Define monitoring events in the message flow
- Use the record and replay function to capture and review processed messages

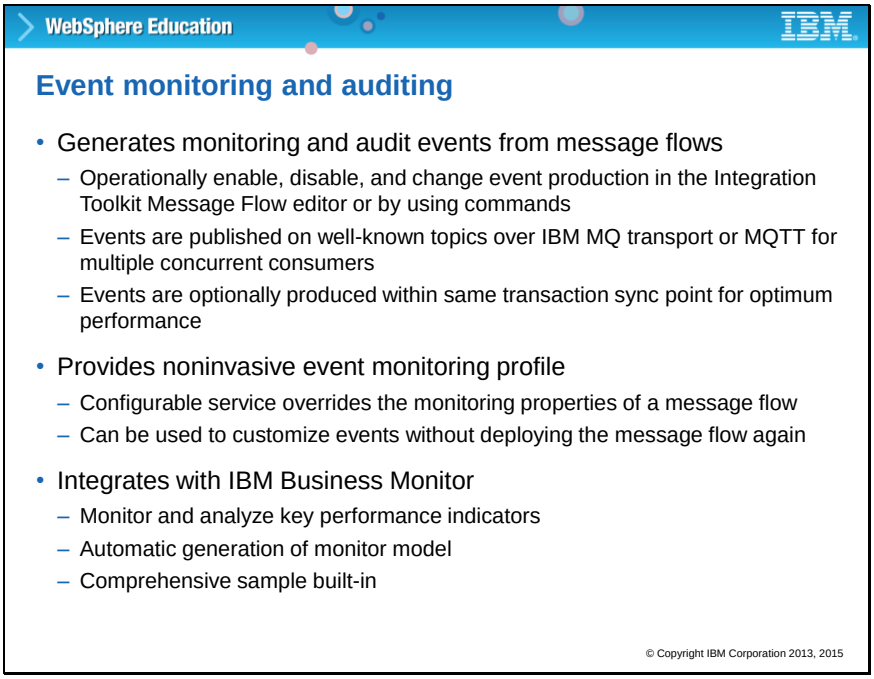
Slide 3



Topic 1: Monitoring events

Message flows can be configured to emit events. The events can be read and used by other applications for transaction monitoring and auditing, and business process monitoring. This topic introduces event monitoring.

Slide 4



Event monitoring and auditing

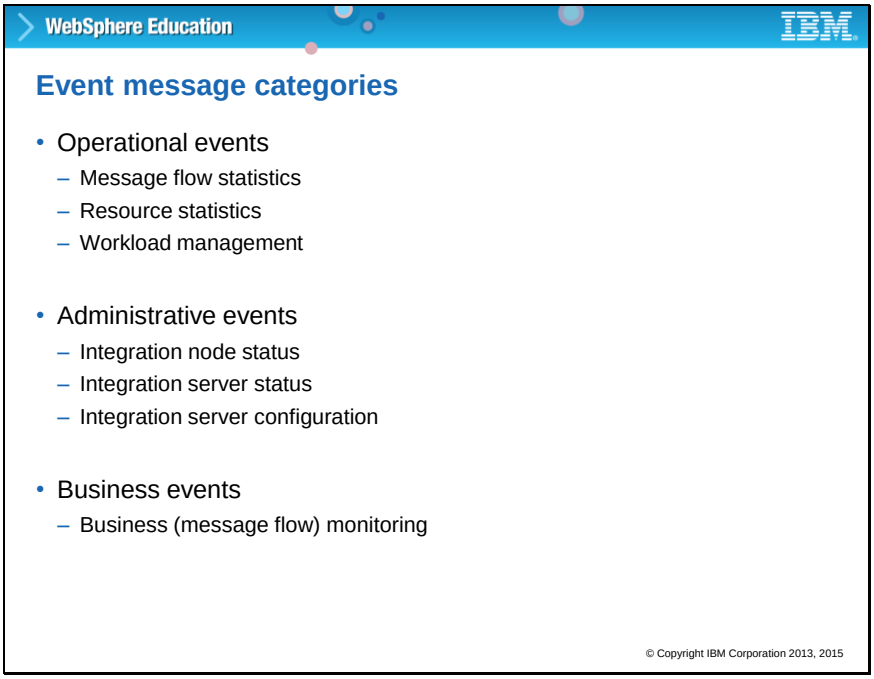
Message flows can be configured to emit events. Other applications can read and use these events for transaction monitoring, auditing, and business process monitoring. For example, it might be necessary to capture the first three fields of an input message at a certain point in the flow. Event generation can be configured by using the Integration Toolkit and commands.

Events are published over a publish/subscribe network as a well-defined topic. You can also generate an event at design-time or operationally at any point throughout the flow, containing the entire payload or any piece of it.

A monitoring profile configurable service can be used to customize events after a message flow is deployed, but without redeploying the flow.

You can also monitor message flows by using IBM Business Monitor. IBM Business Monitor is business activity monitoring software that provides a real-time view of your business processes and operations. It contains personalized business dashboards that calculate and display key performance indicators and metrics that are derived from business processes, business activity data, and business events. IBM Business Monitor can be used to trend the data, for example, analyzing the volume of changes, or breaking out the information by geographical area.

Slide 5

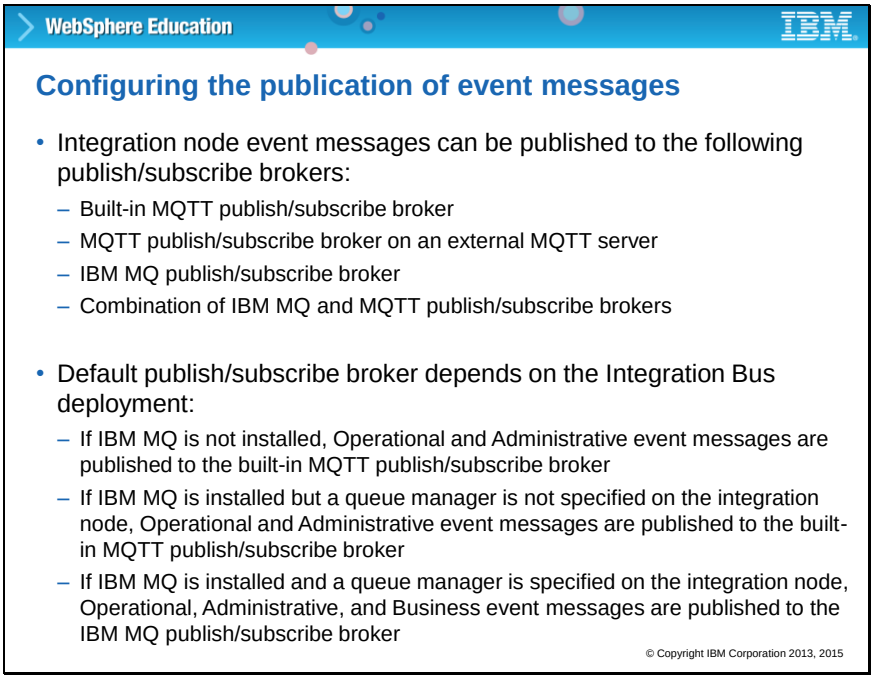


Event message categories

Integration Bus event messages are categorized as operational events, administrative events, and business events. This unit focuses on the business events that a message flow can generate.

If you want to receive event messages for any of these events (which include viewing statistics in the IBM Integration web user interface), you must ensure that event publication is enabled. You also must ensure that either an MQTT or MQ publish/subscribe broker is configured.

Slide 6



Configuring the publication of event messages

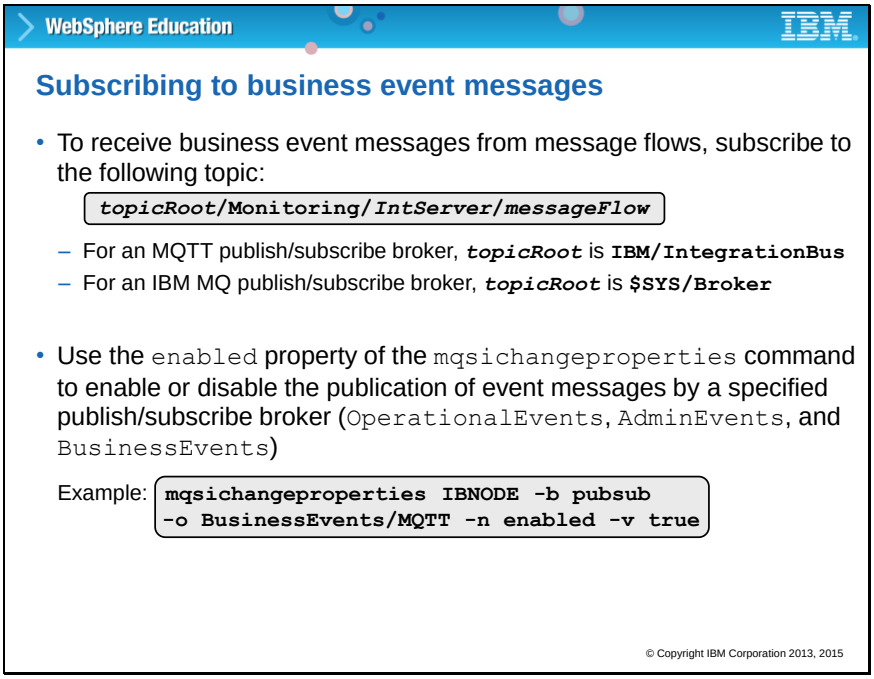
Integration Bus publishes operational, administration, and business events on known topics.

Integration node event messages can be published to the following publish/subscribe brokers:

- The built-in MQTT publish/subscribe broker
- An MQTT publish/subscribe broker on an external MQTT server
- An MQ publish/subscribe broker
- A combination of IBM MQ and MQTT publish/subscribe brokers

By default, operational events and administration events are published to the built-in MQTT publish/subscribe broker and business events are published to MQ. If you want to publish Business events to MQTT, you must enable the publication of the BusinessEvents group to the built-in MQTT publish/subscribe broker.

Slide 7



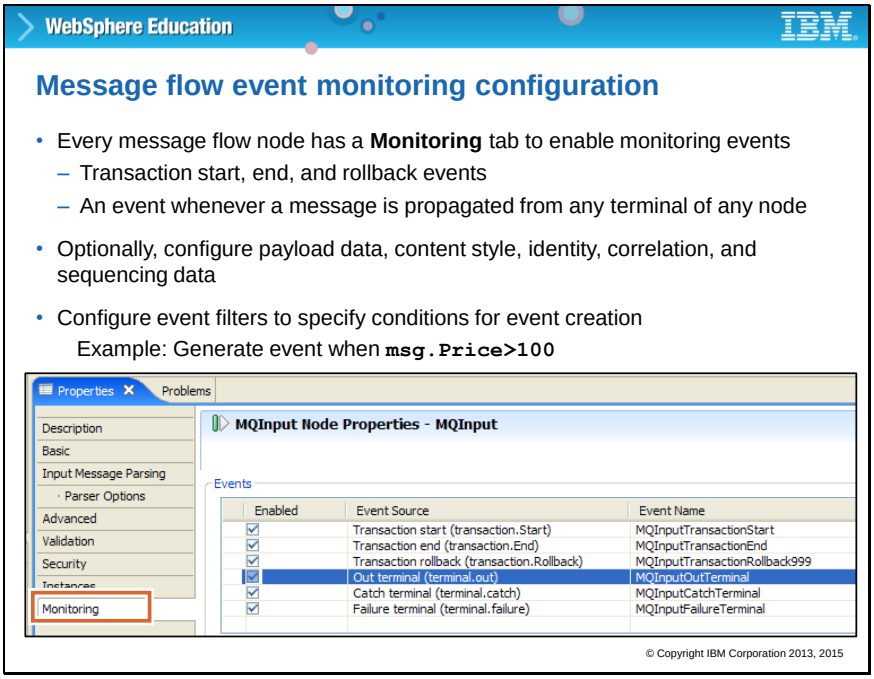
Subscribing to business event messages

An application can subscribe to topics that return messages about the configuration, state, or operational status of your integration node, integration server, or message flows.

You can configure your message flow to emit event messages that can be used to support transaction monitoring and auditing, and business process monitoring.

When you use the built-in MQTT publish/subscribe broker, business monitoring events are not published by default. This example shows you how to use the mqsichangeproperties command to enable business event publication on the internal MQTT broker.

Slide 8



Message flow event monitoring configuration

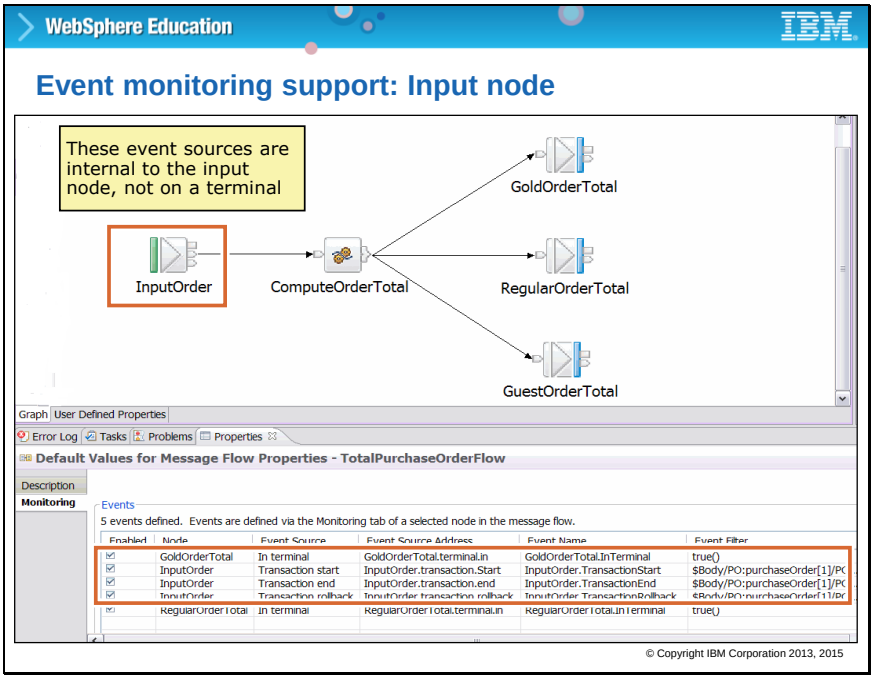
In a development environment, the monitoring requirements are defined in the Integration Toolkit. Every message processing node contains **Monitoring** properties that identify the event to generate and any additional information that the event message provides.

Developers can use the **Monitoring** properties to declare the event to see from a node, such as an input event, by checking the box next to the event. In the example, the MQ Input node has monitoring enabled at all points for a transaction: transaction start, transaction end, and transaction rollback.

It is also possible to declare sequencing information, correlating information, what the payload looks like, certain fields, and other information.

Event filters can be defined to generate events only when a certain condition applies, such as when a field in the message exceeds a specified value.

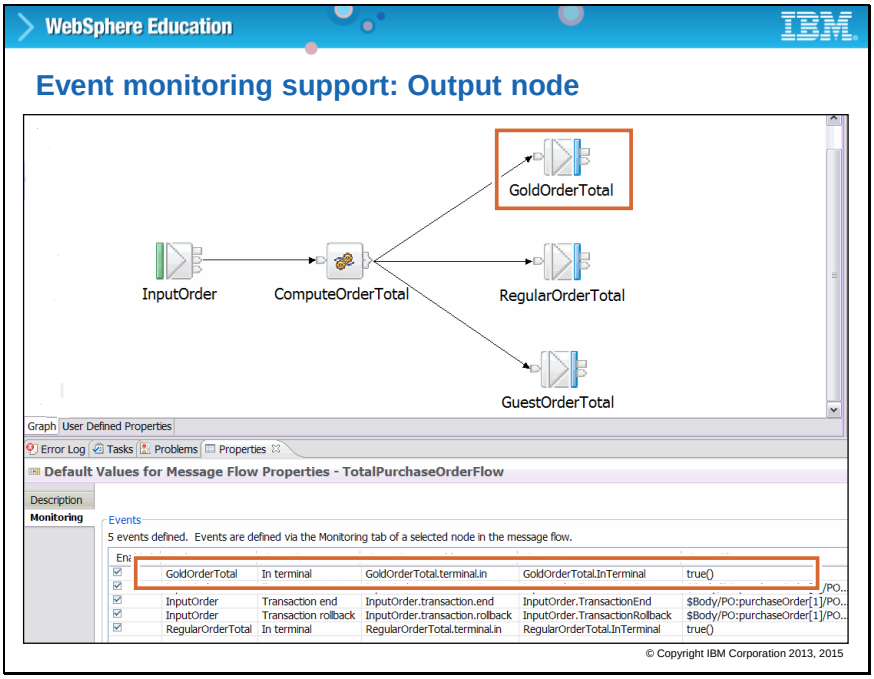
Slide 9



Event monitoring support: Input node

This slide highlights the event definitions for the MQ Input node that is named **InputOrder**: transaction start, transaction end, and transaction rollback.

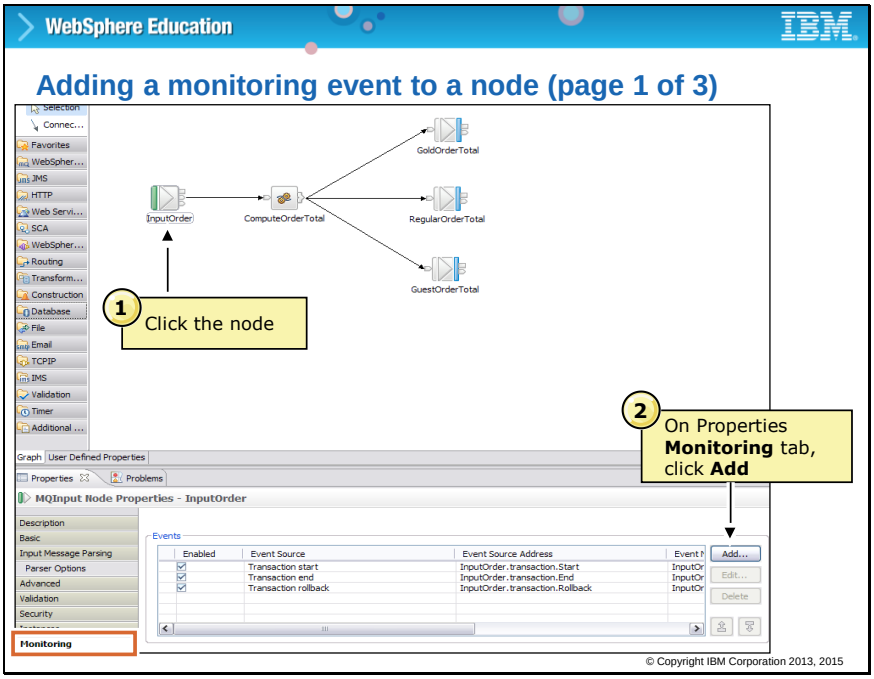
Slide 10



Event monitoring support: Output node

This slide highlights the event that is defined for the MQ Output node that is named **GoldOrderTotal**. The only event that is defined in the node is the **In** terminal, which means that an event is emitted when the message reaches the **In** terminal of the node.

Slide 11



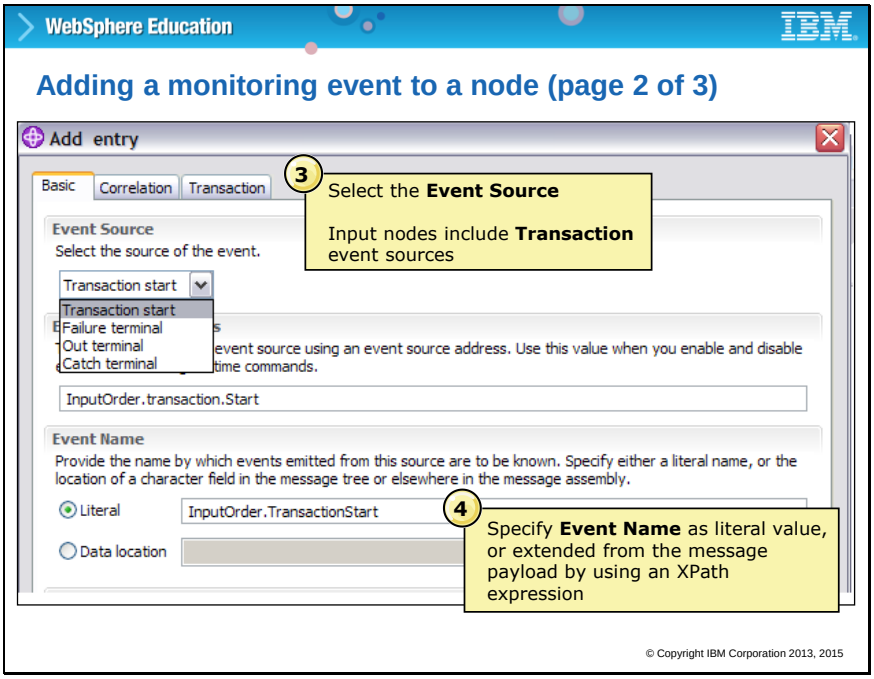
Adding a monitoring event to a node (1 of 3)

This slide and the next series of slides show how to configure events in the Integration Toolkit.

1. To add, edit, or delete an event for a node, click the node in the flow that generates the events, such as an input node. Click the **Monitoring** tab in the **Properties** view to show the event summary window.
2. To add an event, click **Add**.

You can also select any event in the summary and then click **Delete** to delete the event, or click **Edit**, to modify the event configuration.

Slide 12

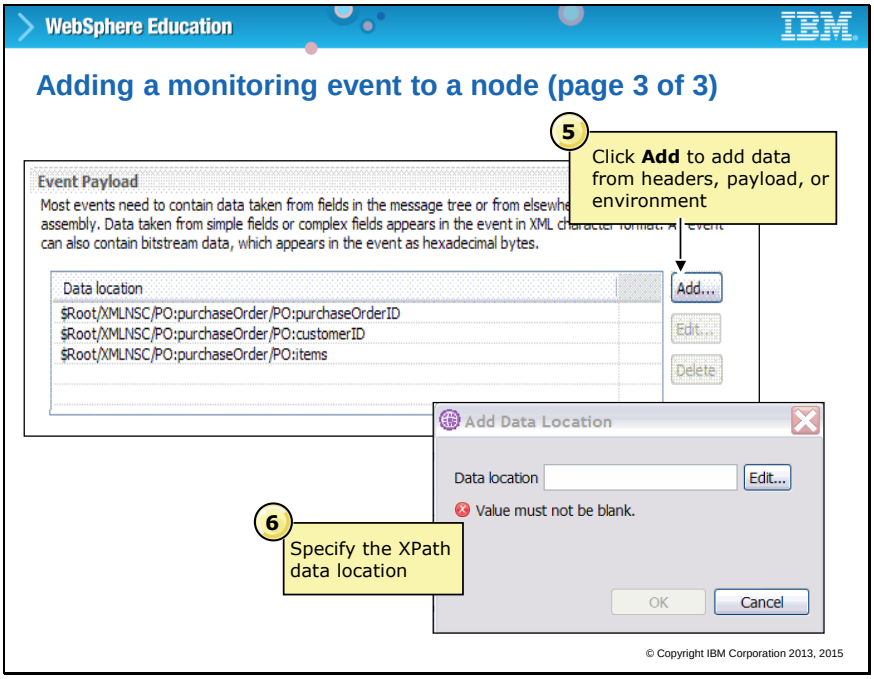


Adding a monitoring event to a node (1 of 3)

3. Select the event source from the **Event Source** list. The event source options depend on the node type and terminals. In the example that is shown here, the node that was selected was an input node with **Failure**, **Out**, and **Catch** terminals. The list contains an event for each output terminal. The list also contains an event for transaction start because the node is an input node.

4. The Integration Toolkit provides an event source literal name, also referred to as the event source address. It is the concatenation of the node name and the event. In this example, the node name is **InputOrder**. The event that is selected in the previous step was transaction start so the event source literal name is **InputOrder.TransactionStart**. The event source literal name is the name that is used to reference this event from a command. You have the option of overriding the Event Name with a literal value or an XPath expression that references an element in the message payload.

Slide 13



Adding a monitoring event to a node (3 of 3)

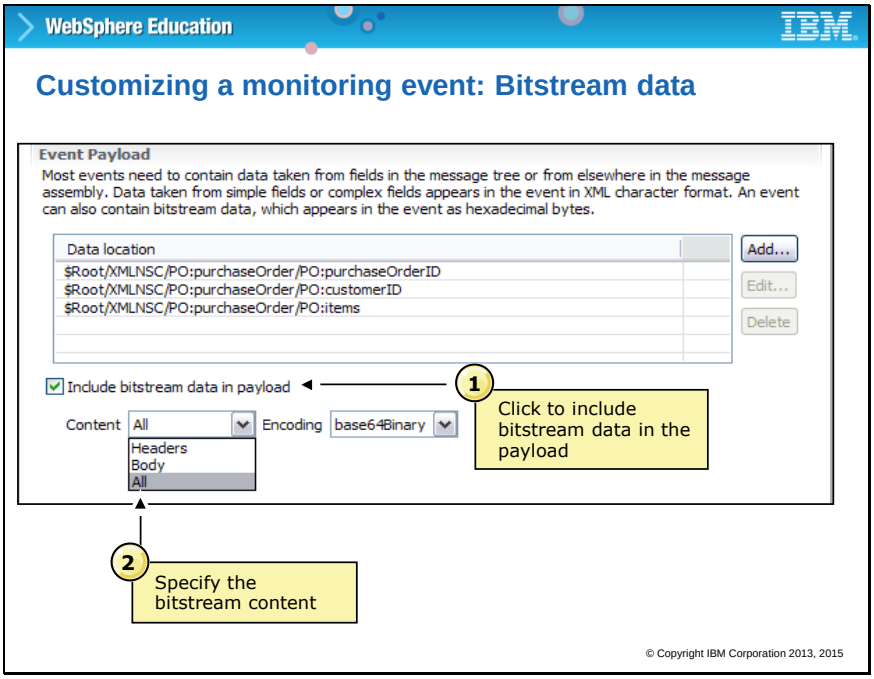
The next steps are optional.

5. The **Event Payload** section identifies the payload information to include in the event message. If you want to include the message data with the event message, click **Add**, and then provide the XPath or ESQL path of the payload object in the **Add Data Location** window.

6. If you click **Edit** in **Add Data Location** window, the XPath builder opens with the message structure to assist with creating the XPath for the data.

Multiple XPath queries can be specified by repeating these steps.

Slide 14

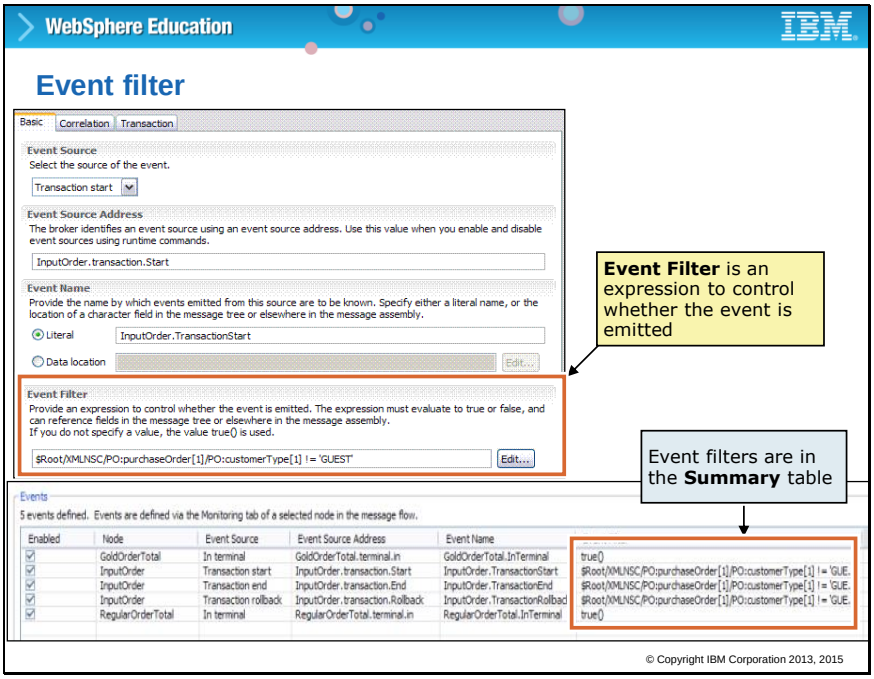


Customizing a monitoring event: Bitstream data

If you want an event to include the payload in the event message, click the **Include bitstream data in payload** check box in the **Event Payload** section. After the check box is selected, you can select the bitstream content as **headers only**, **body only**, or *all*. You can also select the encoding as **Cdata**, **base64 binary**, or **hex64 binary**.

Do not select **CData** for bitstream encoding when **Content** is set to **Headers** or **All** because headers can contain binary data. If you select **CData** for **Encoding**, set **Content** to **Body**.

Slide 15



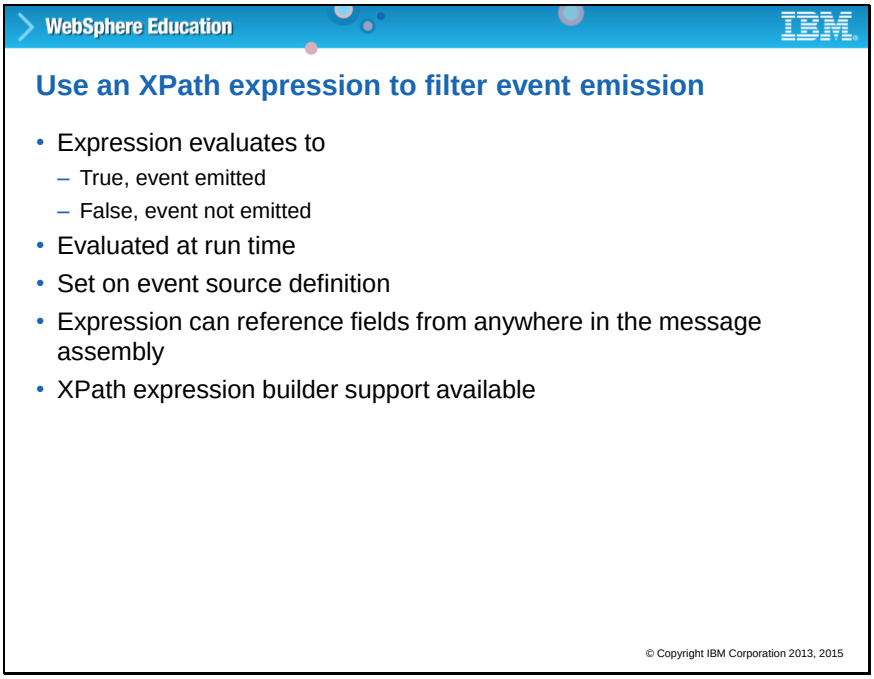
Event filter

Integration Bus event filters can filter out events that do not match a business rule. So Integration Bus can filter events rather than emitting them to IBM Business Monitor, for example, and filtering them there. This process improves performance by eliminating an unnecessary event.

The event filter can be set to a number, Boolean, or string XPath expression that evaluates to a Boolean “true” or “false”. If the expression evaluates to “true”, then events are emitted. If the expression evaluates to “false”, then events are not emitted. The default setting is “true”.

As shown in the example, event filters are configured in the **Event Filters** section that is displayed when you add or edit events in the Integration Toolkit. When you define a filter, you can click **Edit** in the **Event Filter** section to start the XPath expression builder. The event filters for each event are shown on the **Monitoring** tab **Summary** table. In the example, the event filter for the node **GoldOrderTotal In** terminal event source is set to “true”. This value is the default, which causes an event to always be emitted.

Slide 16

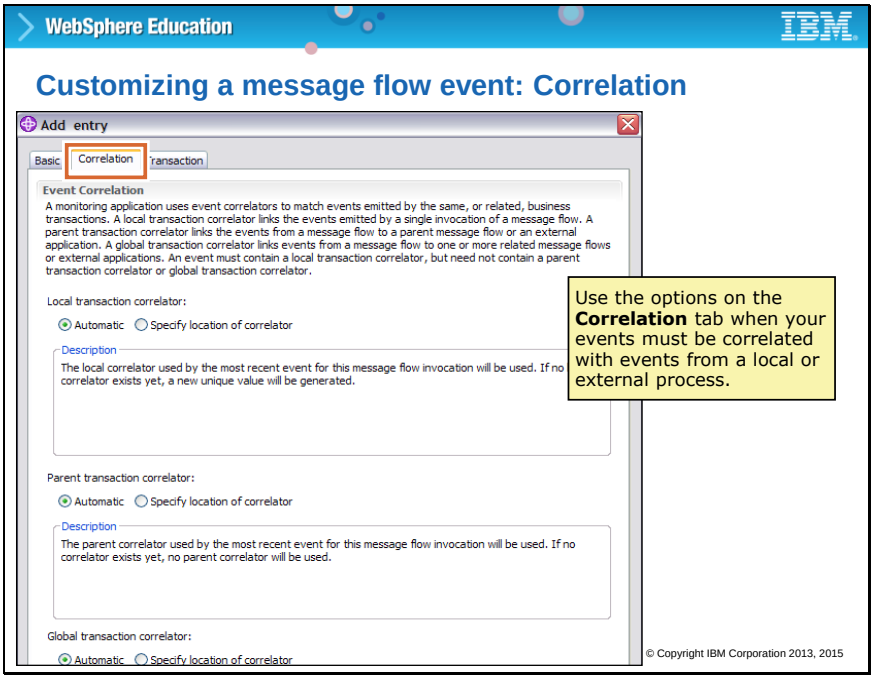


Use an XPath expression to filter event emission

With Integration Bus filters, you can specify an XPath or ESQL query that is evaluated at run time to control whether the event should be produced.

Filters can be configured in the Integration Toolkit or in the exported XML file that contains event information.

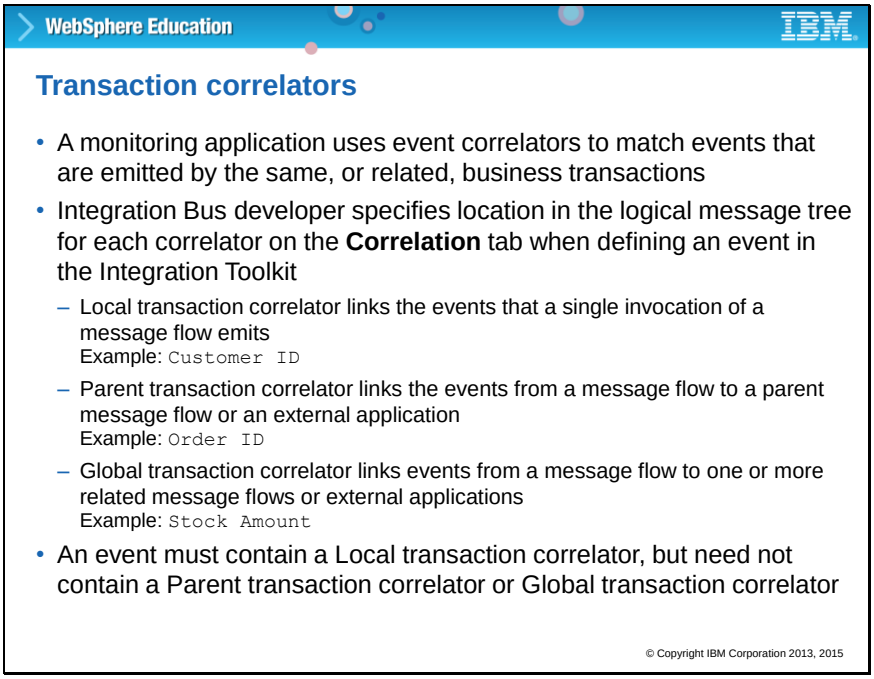
Slide 17



Customizing a message flow event: Correlation

Event configuration includes a **Correlation** tab. This option is used to associate events. Correlation provides three levels of transaction correlator: local, parent, and global.

Slide 18

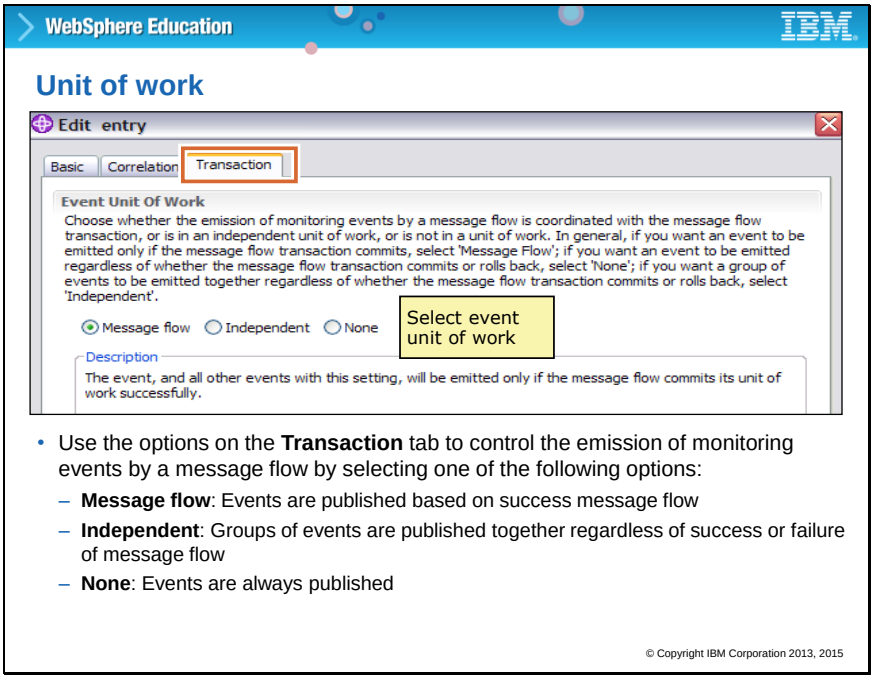


Transaction correlators

Local transaction correlator groups all monitoring events that are related to a specific message. You can select Automatic to automatically generate a correlation ID, or you can specify an ID. If you select Automatic, Integration Bus reuses the query results from the first evaluation of the XPath query.

Parent transaction correlator and Global transaction correlator are business-related and correlate events between different messages. For example, if you are processing invoice line items as a transaction, you can correlate to get the invoice number in the parent, then get the individual line item events. Using the same example, you can use global to identify the purchase order number and pick up the invoice events from all invoices that reference the purchase order.

Slide 19



Unit of work

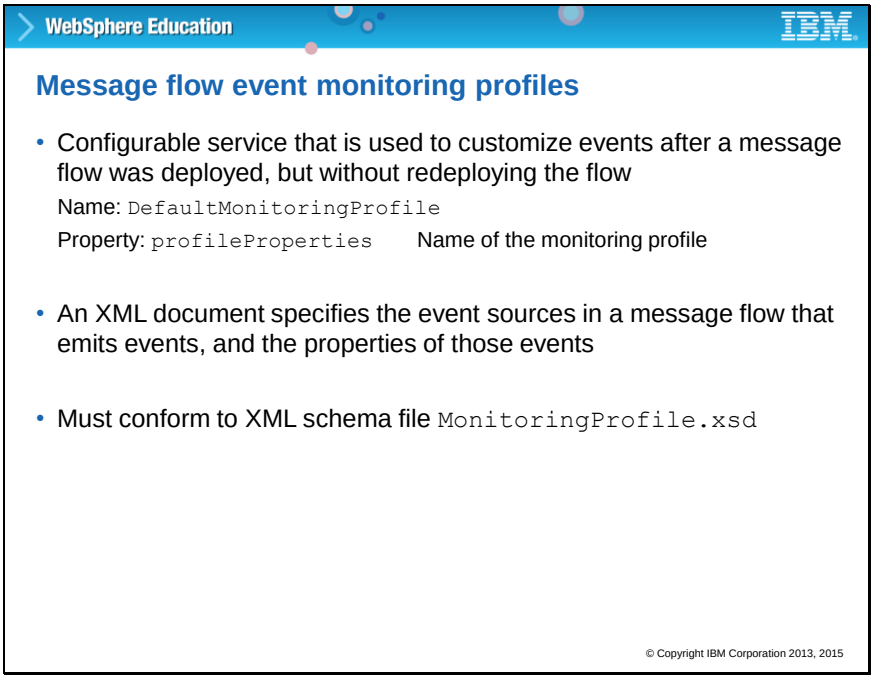
In Integration Bus, you can choose how event emission is coordinated by specifying a unit of work on the event monitoring **Transaction** tab.

When a message is processed, the updates are included in a unit of work that is referred to as the **Message flow** unit of work. It is committed if the message processing is successful, and it is rolled back if it fails.

The **Independent** unit of work is a separate unit of work that is created and committed regardless of whether the message is processed successfully or not. Use this option for events, such as those related to error paths, that must be published even if the flow fails.

If you do not want a monitoring event to be included in any unit of work, choose the **None** option.

Slide 20



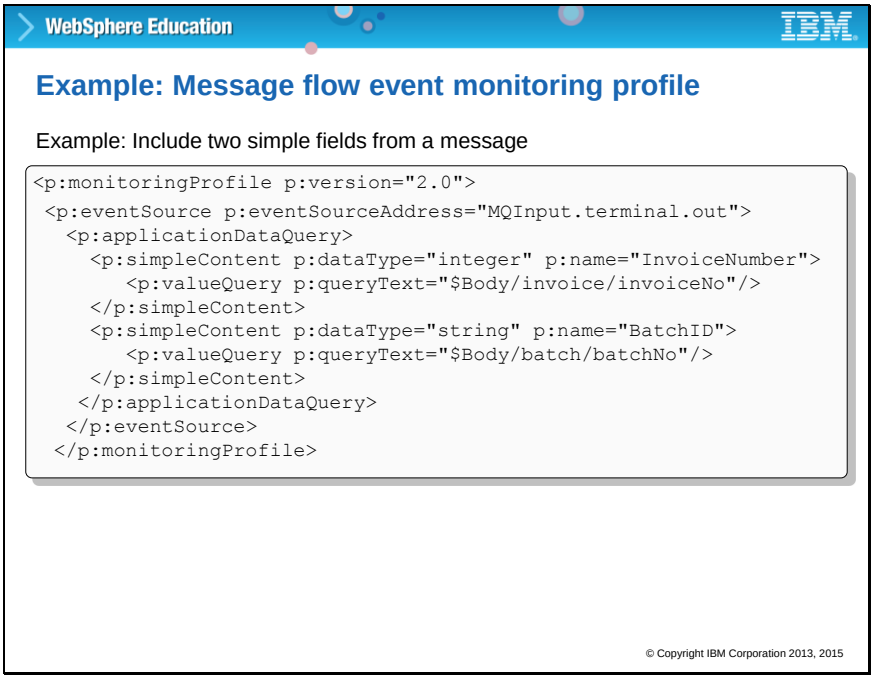
Message flow event monitoring profiles

You or an administrator can use a monitoring profile configurable service to customize events after a message flow is deployed without redeploying the flow.

A monitoring profile is an XML file that lists the event sources in the message flow, and defines the properties of each event. A monitoring profile also gives an administrator the ability to change monitoring events that were configured in the message flow node Monitoring properties without changing or redeploying the message flow.

If the deployed message flow has event monitoring properties that are configured by using the Integration Toolkit, use the mqsireportflowmonitoring command to create the equivalent monitoring profile XML file for the message flow. Use this profile as a starting point for creating other monitoring profiles.

Slide 21

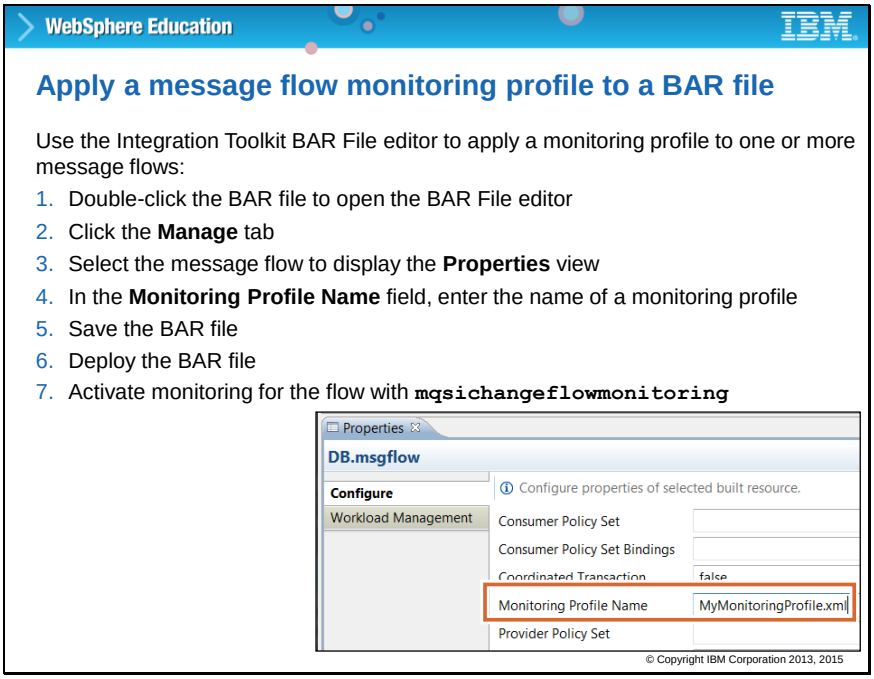


Example: Message flow event monitoring profile

This slide contains an example of an event monitoring profile XML file.

The profile in the example captures the invoice number and batch ID from the body of the logical message. The message is captured at the MQ Input node Out terminal (the event source).

Slide 22



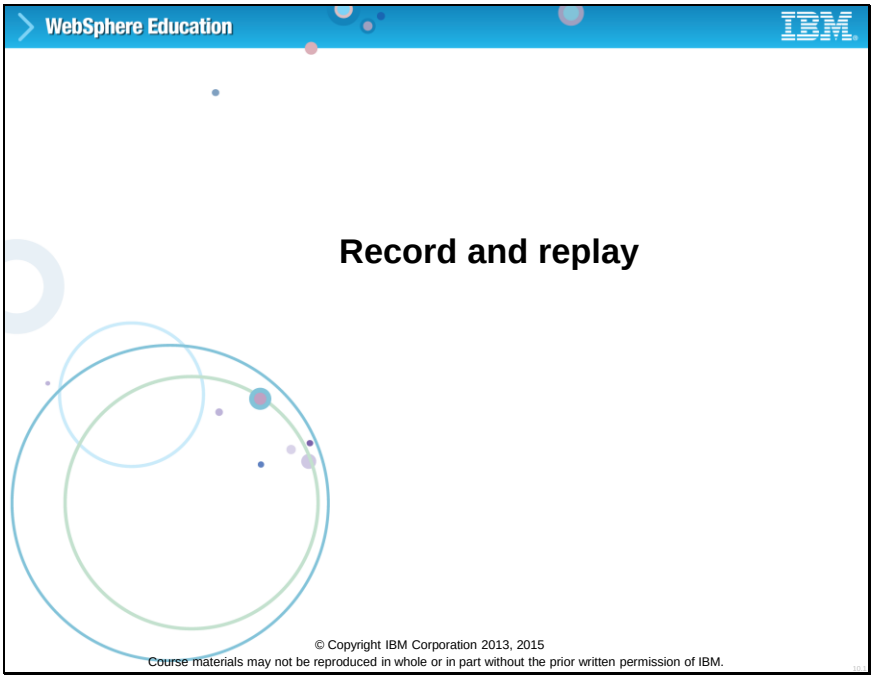
Apply a message flow monitoring profile to a BAR file

A monitoring profile can be applied by modifying the BAR file in the Integration Toolkit BAR file editor.

To apply a monitoring profile to a message flow in the BAR file editor, open the BAR file and go to the **Manage** tab. Select the message flow to display the message flow properties. In the **Monitoring Profile Name** field, enter the name of a monitoring profile.

After you save and deploy the BAR file, you must activate monitoring for the flow by using the mqsichangeflowmonitoring command.

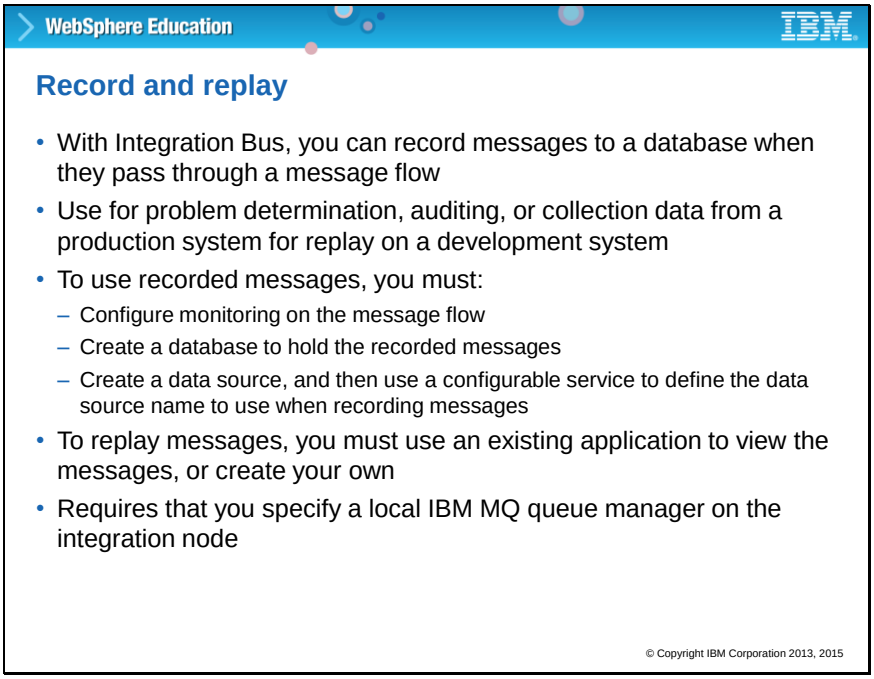
Slide 23



Topic 2: Record and replay

If you configured your message flow to emit event messages, you can record and replay in-flight data. This topic describes how to set up the Integration Bus environment for record and replay.

Slide 24



Record and replay

While monitoring and auditing is restricted to capturing data at specific endpoints only, record and replay captures and manages message data as it is processed. The record and replay function gives you the ability to capture data that contains errors, correct it, and then resubmit it for processing.

At a high level, the following operations are the primary operations that are involved in record and replay:

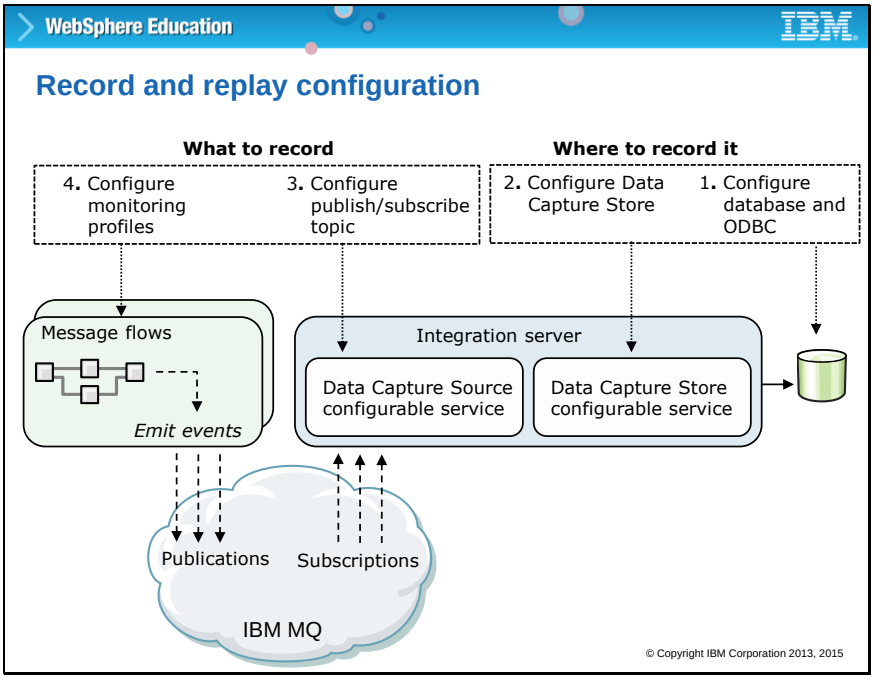
- Some type of trigger event occurs that causes message details to be enqueued. For example, some type of processing error occurs in a message flow.
- The integration node records the message in a DB2, Oracle, or Microsoft SQL Server database.
- Using Integration Bus and the Integration web user interface, you can query saved messages.

If authorized, you can replay messages to the same or a different source. For example, you can resubmit the corrected message to MQ for reprocessing.

If you want to control users' ability to record, view, and replay data, you must enable integration node administration security and also configure security for data capture.

Record and replay use MQ publish/subscribe, which requires that the integration node is associated with an MQ queue manager.

Slide 25



Record and replay configuration

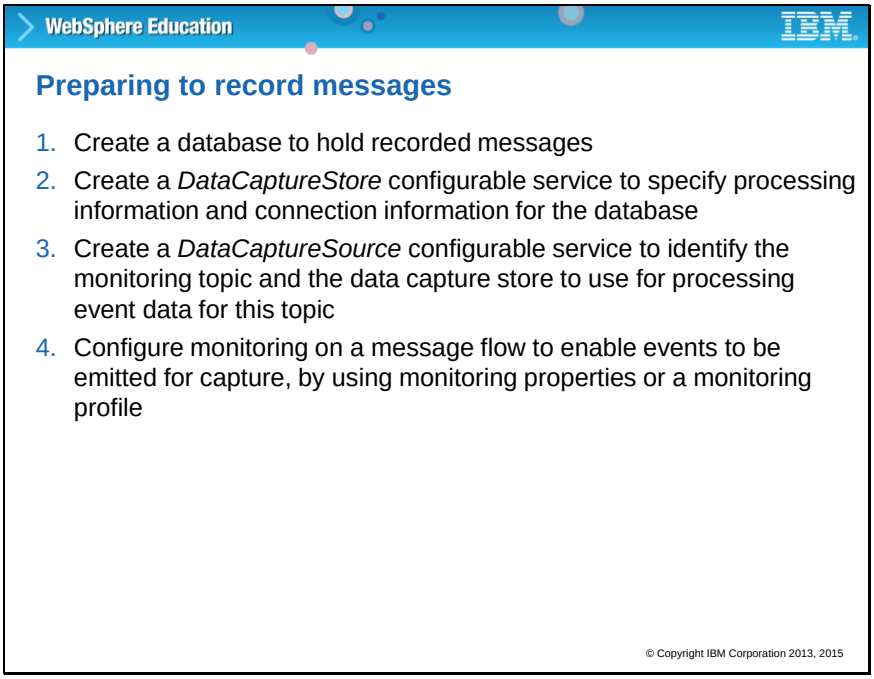
This slide summarizes the configuration requirements for record and replay.

Record and replay require an external database to store the transactions in a Data Capture Store. So the first steps are to define the database table, and the connection to the database from Integration Bus.

Record and replay also use the MQ publish/subscribe broker to subscribe to the event monitoring topics and capture the event messages. To identify the source of the data, create a DataCaptureSource configurable service.

These steps are described in detail next.

Slide 26



Preparing to record messages

The slide lists the steps that must be completed before Integration Bus can record messages.

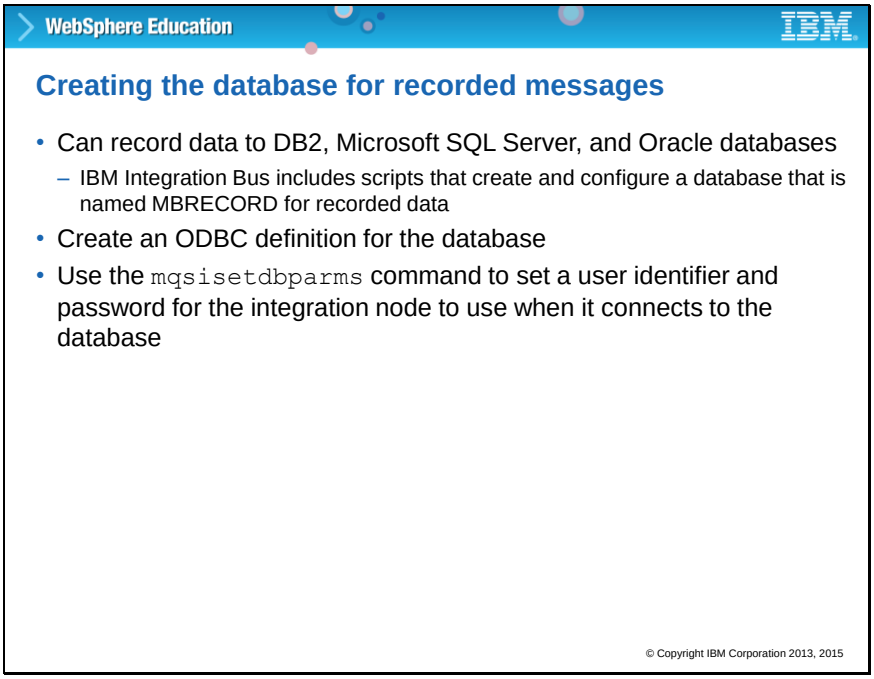
First, you must specify the database and create the database table to hold the recorded messages. You must also create an ODBC connection for the database.

Next, create a DataCaptureStore configurable service that identifies the database that holds the messages.

Then, create a DataCaptureSource configurable service to specify the monitoring topic that identifies the messages flows from which your data comes. The DataCaptureSource configurable service identifies the monitoring topics and data capture store. Multiple instances of the DataCaptureSource configurable service can use the same DataCaptureStore configurable service.

Finally, ensure that event monitoring is configured and enabled for the message flow.

Slide 27

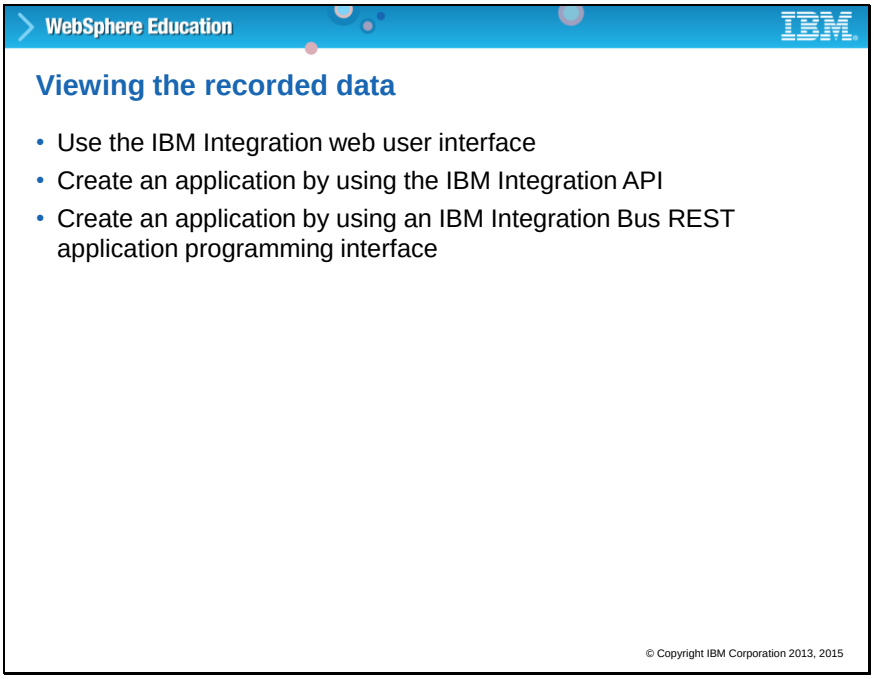


Creating the database for recorded messages

You can record event messages to DB2, Microsoft SQL Server, and Oracle databases.

A script is provided with Integration Bus that you can use to create the database and database tables. The script creates a database that is called MBRECORD with a default schema. You can run this script unmodified, or you can customize it.

Slide 28

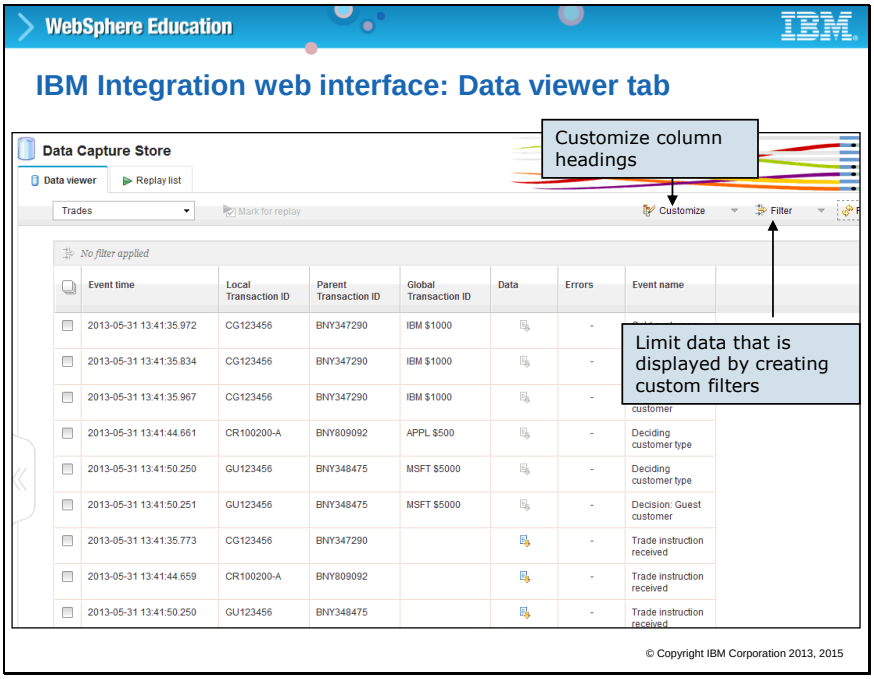


Viewing the recorded data

You can use the Integration web user interface to review the recorded data, update, and requeue the message, or delete the message.

You can also use the IBM Integration API or the IBM Integration REST API to write your own message viewer application to fit your requirements.

Slide 29



IBM Integration web interface: Data viewer tab

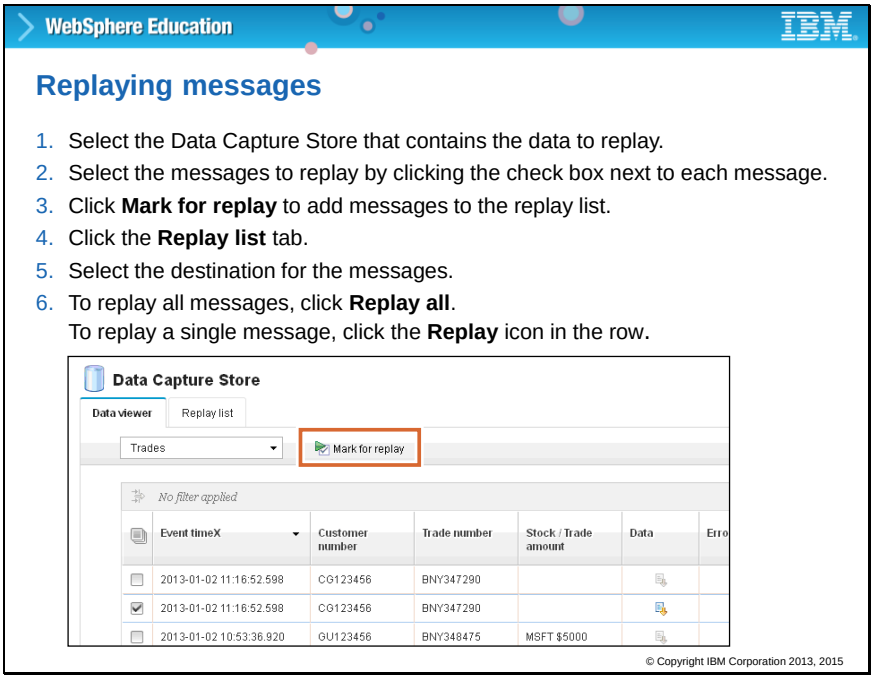
This slide shows an example of the record and replay Data viewer in the Integration web interface.

The Data viewer table contains the transactions and monitoring events. You can customize the table headings so that they are more descriptive and relevant to a business analyst that might be viewing this data.

To change the name of each column, double-click the column name, and then enter another name. These changes are stored in the Integration Registry, and are retained uniquely for each data capture store.

You can also limit the data that is displayed in the Data viewer by using the Filter function.

Slide 30



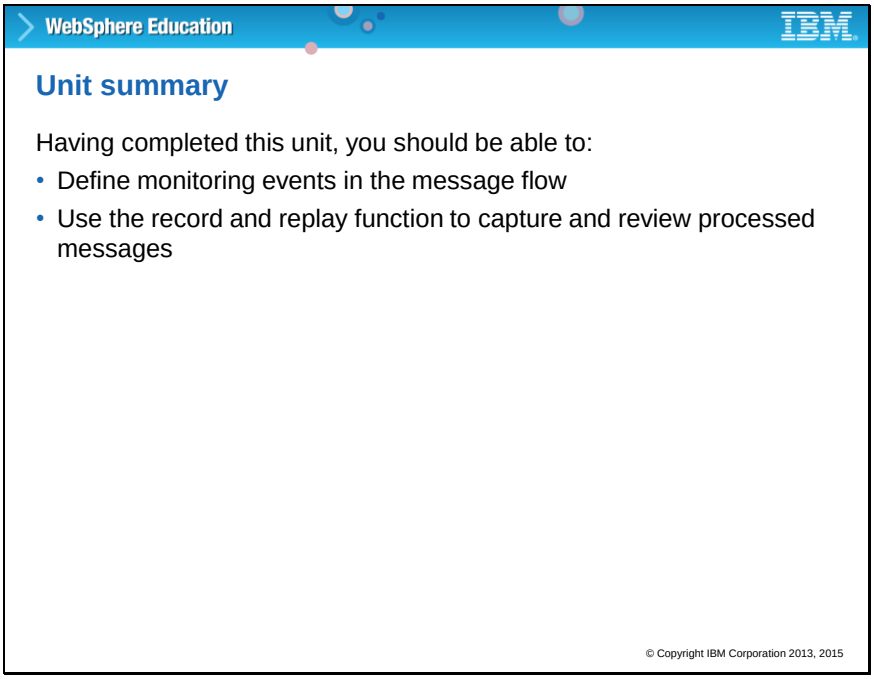
Replaying messages

The slide lists the steps for replaying messages by using the Integration web user interface.

Each row that is displayed represents a recorded message. To sort these rows into a particular order, click a column heading.

You can also use a filter to help find rows in which you are interested. Filtering is case-sensitive and allows the use of wildcards. To search for an exact match, enclose the search string in quotation marks. You can also search for a substring, and you can use an asterisk to match zero or more characters.

Slide 31



Unit summary

Integration nodes use a publish/subscribe broker to publish business events. For audit or problem determination purposes, you can record events to a database, view them, and replay them. This unit described the IBM Integration Bus tools that are available for monitoring message flow events and analyzing message data.

Having completed this unit, you should be able to:
- Define monitoring events in the message flow
- Use the record and replay function to capture and review processed messages