




Slide 1

 WebSphere Education

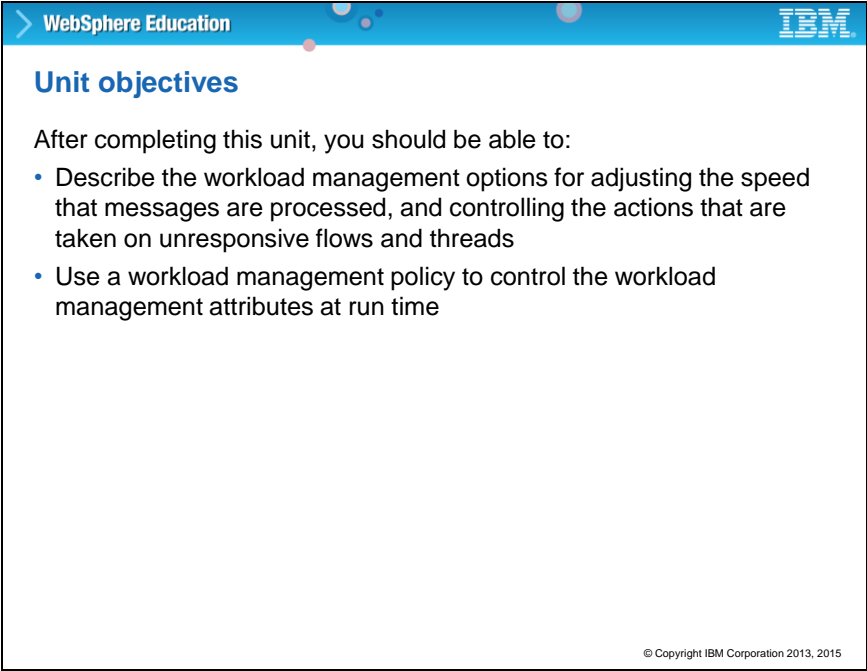


Managing the workload




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The slide features a blue header bar with the text 'WebSphere Education' on the left and the IBM logo on the right. The main content area is white with a blue title 'Unit objectives'. Below the title, it states 'After completing this unit, you should be able to:' followed by a bulleted list of two objectives. At the bottom right, there is a small copyright notice: '© Copyright IBM Corporation 2013, 2015'.

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Unit objectives

After completing this unit, you should be able to:

- Describe the workload management options for adjusting the speed that messages are processed, and controlling the actions that are taken on unresponsive flows and threads
- Use a workload management policy to control the workload management attributes at run time



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Unit objectives

Workload management allows system administrators to monitor and adjust the speed that messages are processed, and control the actions that are taken on unresponsive flows and threads. A workload management policy defines properties on the message flow in the Integration Registry so that message flows can refer to the policy to find properties at run time. This unit describes workload management and using workload management policies to specify goals for the processing rate of a message flow.

After completing this unit, you should be able to:

- Describe the workload management options for adjusting the speed that messages are processed, and controlling the actions that are taken on unresponsive flows and threads
- Use a workload management policy to control the workload management attributes at run time

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Control the processing speed in Integration Bus

- Message flow processing rate control provides intelligent mechanisms to increase and decrease processing speed
- Policy specifies goals for the processing rate of a message flow
- Allow more diverse workload management:
 - Apply policy to different Integration Bus artifacts such as applications, services, and individual nodes
 - Schedule policy application
- Allow workload management to be defined in a policy separate from the message flow
 - Define policy in the BAR file, on the message flow, or in the Integration Registry
 - Use common repository to store policies in the integration node or somewhere else
 - Policy can be changed and used in integration node independently of where it is stored
- Requires that event publication is enabled and that a publish/subscriber broker is configured

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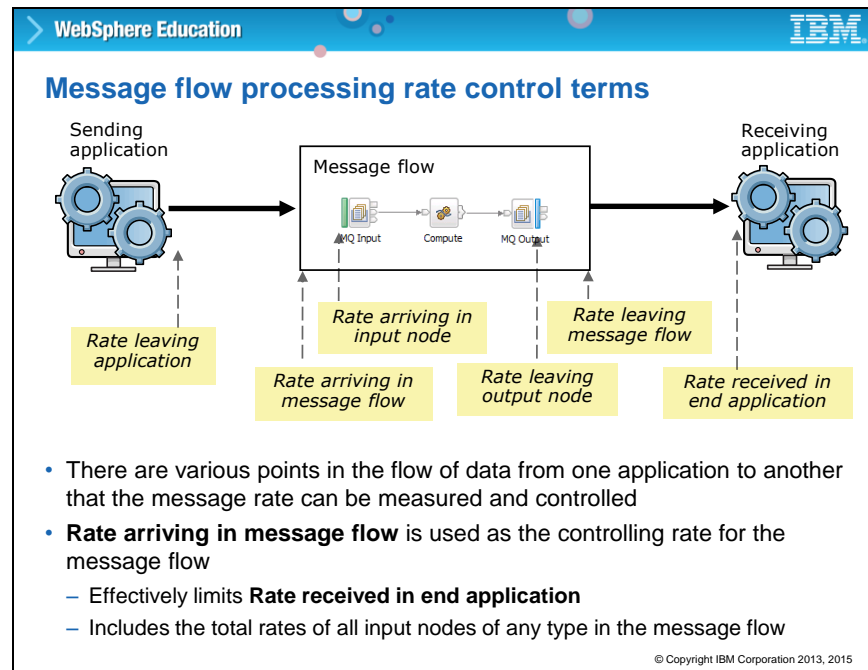
Control the processing speed in Integration Bus

Workload management allows system administrators to monitor and adjust the speed at which messages are processed. It also controls the actions that are taken on unresponsive flows and threads.

The system administrator can specify the workload management properties within a policy in an integration node's Integration Registry or by using the BAR file editor in the Integration Toolkit.

A workload management policy encompasses all of the properties that are available under workload management in one place. It allows for easier tuning of message flow performance. If you use this method, you can change the values of attributes for a policy on the integration node, which then affects the behavior of a message flow without the need for redeployment.

Workload management relies on the operational events that the integration node publishes when a publish/subscribe broker is enabled. The default configuration upon installation publishes operational events to the embedded MQTT server.



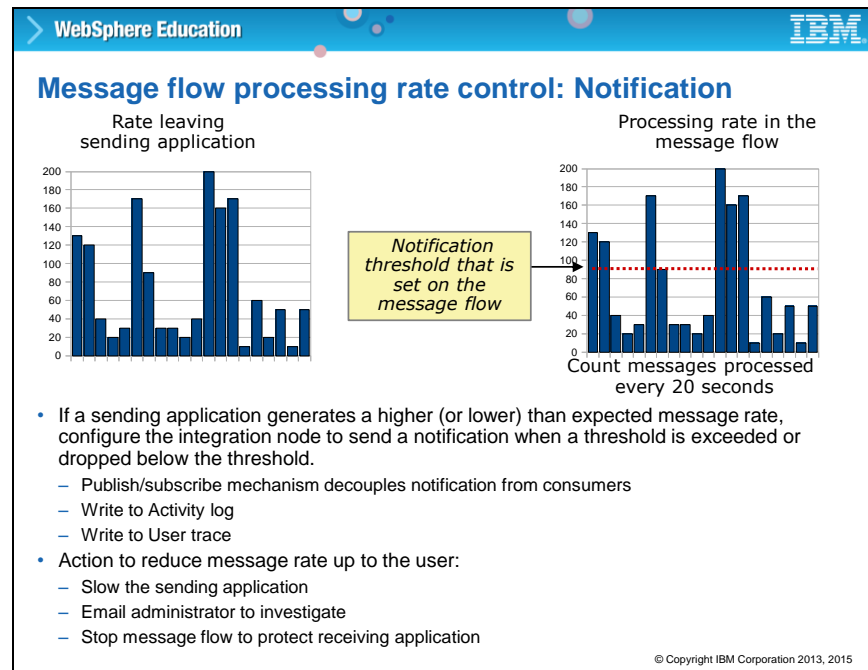
Message flow processing rate control terms

The aim of message management is to maintain a constant flow of data that does not overwhelm or “starve” the applications and to minimize bursts of data.

This slide shows all the points where the rate of message processing can be measured and controlled.

The Integration Bus system administrator can set the maximum rate that an individual message flow can run at. The maximum rate is specified as the total number of input messages processed every second. When set, the numbers of input messages that are processed across the flow are measured. This measure is irrespective of the number of extra instances in use, the number of input nodes in the message flow, or the number of errors that occur.

If necessary, a processing delay is introduced to keep the input message processing rate under the maximum flow rate setting.

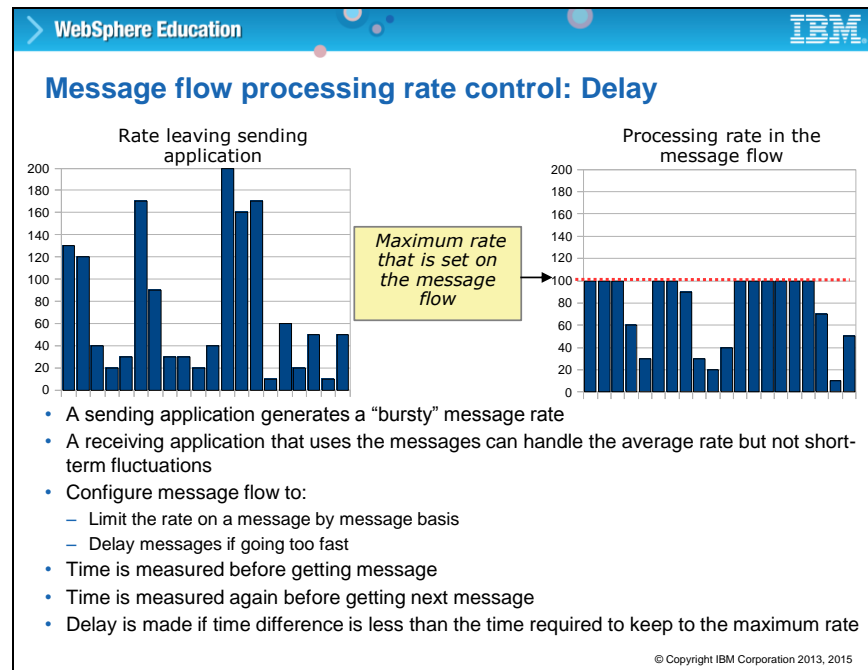


Message flow processing rate control: Notification

A common requirement is to monitor the speed at which Integration Bus processes messages so that when a sending application generates a message rate that is higher or lower than expected, the administrator receives a notification.

By configuring the workload management options in Integration Bus, you can express a notification threshold for individual message flows. If the notification threshold is exceeded, an “out of range” notification message is produced. If the notification threshold later drops back into range, a “back in range” notification message is produced. These notification messages use the Integration Bus publish/subscribe mechanism for publishing the notifications to known topics, to the Activity Log, and to a user trace, when one is enabled.

The action that is taken when the threshold is exceeded is up to the administrator and the owners of the sending and receiving applications. Options include slowing the sending application, sending you an email so that you can investigate the problem, or stopping the message flow to protect the receiving application.



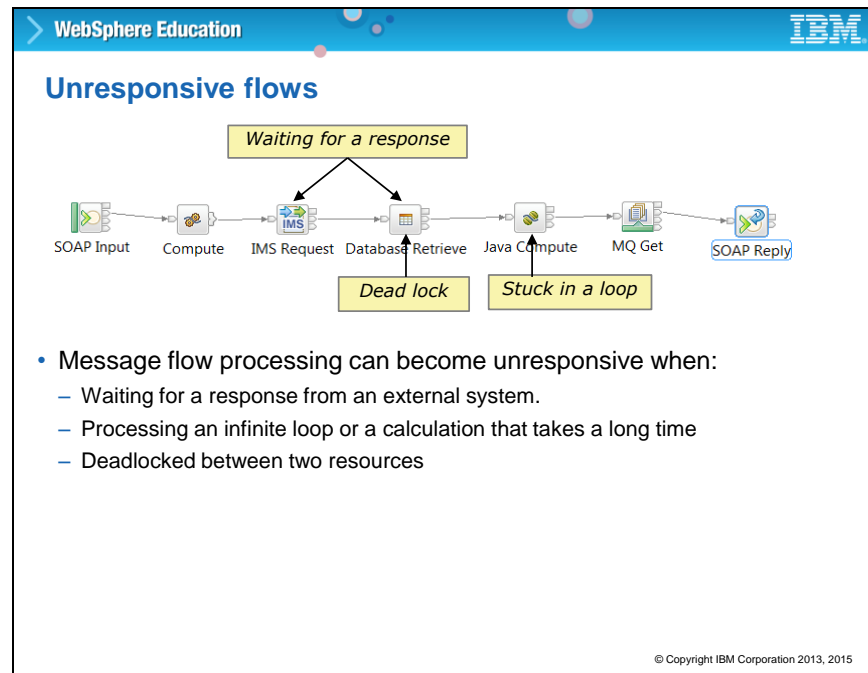
Message flow processing rate control: Delay

Some applications might send data into an Integration Bus application in bursts, which causes problems when the receiving application cannot process the “bursty” data. If you see this problem in your implementations, you can set the maximum rate that an individual message flow can run at by setting the maximum rate property.

The maximum rate is specified as the total number of input messages processed every second. The maximum rate value is divided equally among all threads that are running in the message flow irrespective of the number of input nodes within the flow.

To calculate the number of threads within a specific message flow, count the number of input nodes within the flow and then add the number of extra instances that are specified for each input node.

If any thread exceeds its maximum rate allocation, a processing delay is introduced on that thread. The processing delay keeps the processing rate under the assigned maximum rate allocation.





Unresponsive flows

Under certain conditions, message flow processing can become unresponsive. Reasons for an unresponsive flow include:

- Waiting for a response from an external system
- Processing a loop or a calculation that takes a long time
- A deadlock between two resources

If a message flow is “stuck”, you must decide whether to stop the message flow. With the Integration Bus workload management options, you can monitor a message flow to see whether it was requested to stop and to take the required action.

The next slide describes the options for handling unresponsive flows.

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Handling unresponsive flows

- Programmatically check from within a message flow if it was requested to stop
- Manually force a message flow to stop from a command with a forced restart of the integration server (execution group)
Example:

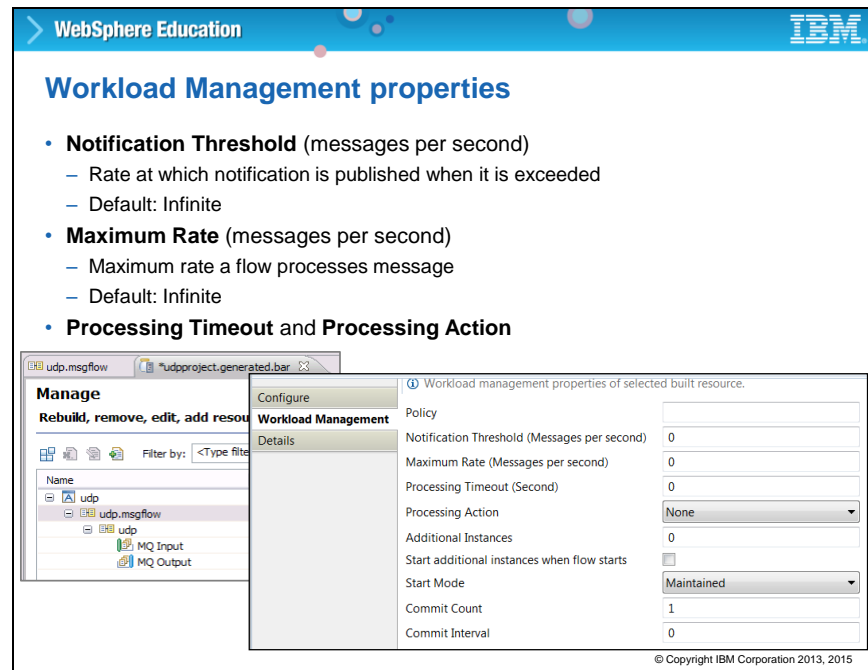
```
mqsistopmsgflow IBNODE -e is1 -m mf1 -w 30 -f restartExecutionGroup
```
- Automatically force a message flow to stop by setting message flow properties in BAR file or Workload Management policy:
 - **Processing Timeout:** Maximum time in seconds that a message flow can process a message before acting.
 - **Processing Action:** The action to take when the **Processing Timeout** is exceeded. Values are **None** or **Restart execution group** (integration server)

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Handling unresponsive flows

Integration Bus supports three primary methods for handling unresponsive flows: programmatically, manually, or automatically.

- With the programmatic method, you use the ESQL, Java, or .NET programming APIs to programmatically check whether a message flow was requested to stop. If the flow is requested to stop, you can use a function in the programming API to check from within a message flow. If a request is made to stop the message flow, the function in all three APIs returns a Boolean value of true.
- With the manual method, the system administrator manually forces a message flow to stop by running the `mqsistopmsgflow` command with the force parameter.
- With the automatic method, the integration node automatically forces a message flow to stop based on the **Processing Timeout** and **Processing Action** properties in the BAR file or the workload management policy.





Workload Management properties

Workload management properties can be configured on the BAR file by using the BAR File editor in the Integration Toolkit or through the `mqsiapplybaroverride` command. The figure shows the properties in the BAR File editor.

- **Notification Threshold** is the rate that must be exceeded before a threshold notification is generated.
- **Maximum Rate** is the maximum rate of input messages processed every second that must be exceeded before a processing delay is introduced on that thread. The processing delay keeps the processing rate under the assigned maximum.
- **Processing Timeout** is the maximum time a message flow can process a message before running the action specified in Processing Action.
- **Processing Action** is the action to take when the **Processing Timeout** is exceeded. Currently, this property is restricted to **None** or **Restart integration server**.

If one is available, you also have the option of specifying a Workload Management policy. The policy values override the property values that are set in the BAR file.



Processing Timeout notification topics

- Integration Bus publishes messages for:
 - *Processing timeout* alerts when the message flow processing timeout period is exceeded
 - *Processing finished* alerts when message flow processing is complete and **Processing Action** is set to **None**.
- Before you can use workload management functions:
 - Ensure that the publication of events is enabled
 - Ensure a publish/subscribe broker is configured

Examples:

- View the *Processing timeout* message that is published to IBM MQ by subscribing to the topic:
`$SYS/Broker/IntNode/WorkloadManagement/ProcessingTimeout/IntServer/application/messageFlow`
- View the *Processing finished* message that is published to IBM MQ by subscribing to the topic:
`$SYS/Broker/IntNode/WorkloadManagement/ProcessingFinished/IntServer/application/messageFlow`

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Processing Timeout notification topics


Assuming that the integration node is configured to publish operational events, Integration Bus publishes messages on known topics for various workload conditions.

Processing Timeout alerts are published when the message flow processing timeout period is exceeded.

Processing Finished alerts are published when message flow processing is complete and no timeout action is specified.

An application or administrator can subscribe to the topics to receive the alerts. You can define subscriptions with MQ Explorer. Alternatively you can write your own applications to subscribe to the publications for the integration servers, applications, and message flows that interest you.

This slide shows you examples of the topic strings that the integration node publishes for processing alerts.

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Processing Timeout alert example

```

<wmb:event xmlns:wmb="http://www.ibm.com/xmlns/prod/websphere/messageb
<wmb:eventPointData>
  <wmb:eventData wmb:productversion="9000" wmb:eventScenari
    <wmb:eventIdentity wmb:eventName="ProcessingTimeout"/>
  </wmb:eventData>
  <wmb:eventCorrelation/>
</wmb:eventPointData>
<wmb:messageFlowData>
  <wmb:broker wmb:name="IB9NODE" wmb:UUID="ad17dcd9-fd1f-4821-9818-86
  <wmb:executionGroup wmb:name="WorkloadManagement" wmb:UUID="f9cae71
  <wmb:messageFlow wmb:uniqueFlowName="IB9NODE.WorkloadManagement.WLM
</wmb:messageFlowData>
</wmb:eventPointData>
<wmb:applicationData xmlns="">
  <wmb:simpleContent wmb:name="processingTimeout" wmb:value="15" wmb:d
  <wmb:simpleContent wmb:name="processingTimeoutAction" wmb:value="res
  <wmb:simpleContent wmb:name="timeTaken" wmb:value="15" wmb:dataType=
  <wmb:simpleContent wmb:name="threadId" wmb:value="4940" wmb:dataType
  <wmb:simpleContent wmb:name="nodeTrail" wmb:value="[MQ Input]-out->i
</wmb:applicationData>
</wmb:event>
  
```

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Processing Timeout alert example

This slide shows an example of the XML message for a Processing Timeout event.

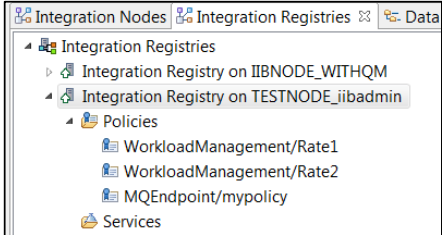
The XML message identifies the integration server and message flow. The message also contains the processing timeout value for the message flow and the processing timeout action. It also reports the time that is taken, thread ID, and the node trail.

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Workload Management policies in the Integration Registry

- Registry local to integration node
- Allows the registry to be come part of the integration solution
- Use IBM Integration web interface to manage policies and services
- Use IBM Integration Toolkit to view
- Based on standards such as Open Services for Lifecycle Collaboration (OSLC) and linked data to make it flexible



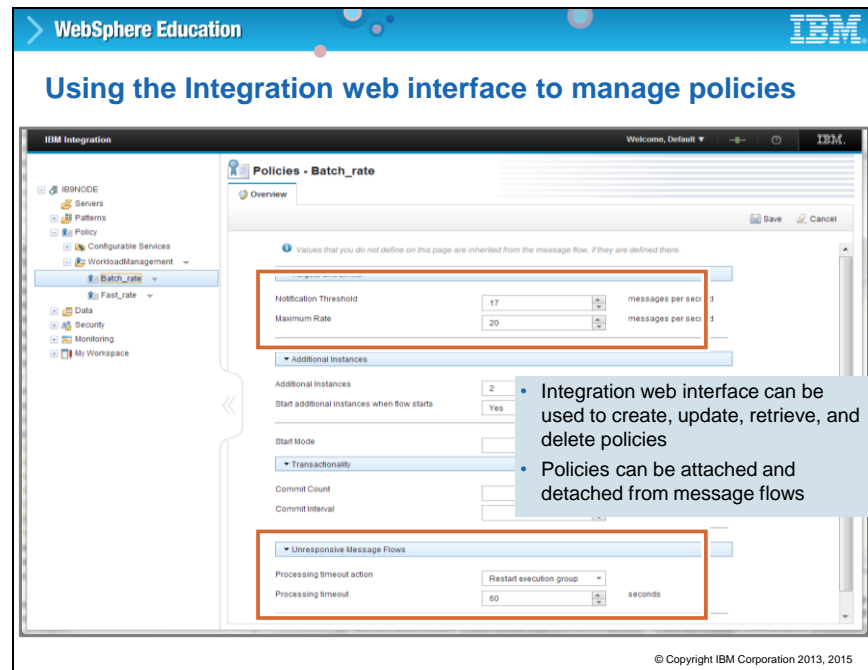
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Workload Management policies in the Integration Registry

Instead of defining Workload Management properties on the BAR file, you can create policies so administrators can control the properties at run time.

Workload management policies can be stored in the integration node's Integration Registry. You learned about the Integration Registry in the prerequisite course ZM666, *IBM Integration Bus V10 Application Development I*.

Workload Management policies are defined in the IBM Integration web user interface but can be accessed in the Integration Toolkit **Integration Registries** view.



Using the Integration web interface to manage policies

The Workload Management policy encompasses all of the properties available under workload management in one place. These properties include the notification threshold and maximum rate, which allows for the easier tuning of message flow performance.

You can create, modify, and associate a policy with a message flow in the Integration web interface.

With Workload Management policies, you can change the policy to modify the behavior of message flow without the need for redeployment.

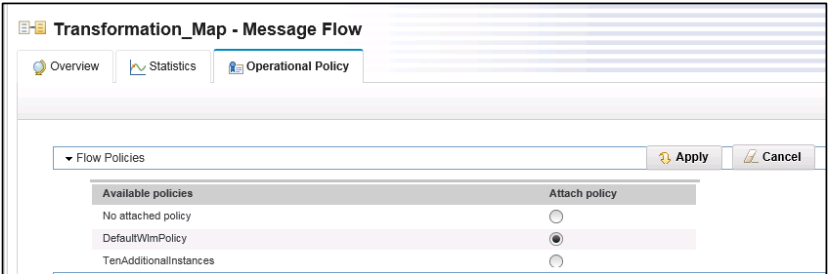
Properties that are set in the policy take precedence over properties that are set as BAR file properties. If a property is not set in the policy, the equivalent property that is set on the BAR file takes effect.

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Using the Integration web interface to attach a policy

1. In the Integration web interface, click the down arrow on right side of the application or message flow, and then click **Attach Policy**
2. On the **Operational Policy** tab, click **Attach policy** for the workload management policy
3. Click **Apply**



Available policies	Attach policy
No attached policy	<input type="radio"/>
DefaultWlmPolicy	<input checked="" type="radio"/>
TenAdditionalInstances	<input type="radio"/>

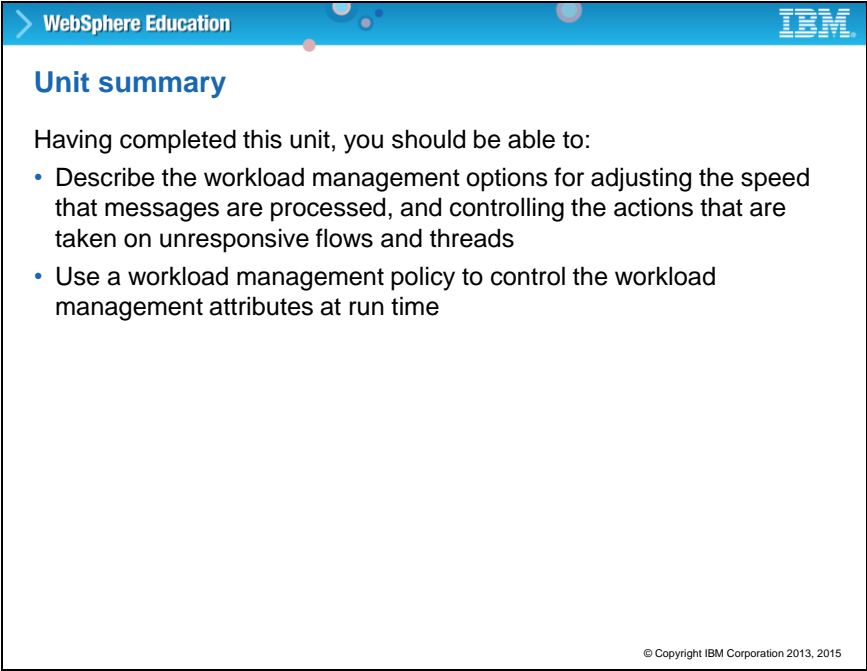
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Using the Integration web interface to attach a policy


You can attach or detach a workload management policy to a message flow or application in the Integration web interface.

The **Operational Policy** tab at the top of the message flow pane contains a list of available workload management policies in the **Flow Policies** section.

Use the radio buttons to attach or detach workload management policies. Select **No attached policy** to detach all policies from the message flow.



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Unit summary

Having completed this unit, you should be able to:

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- Use a workload management policy to control the workload management attributes at run time

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Unit summary

Workload management allows system administrators to monitor and adjust the speed that messages are processed, and control the actions that are taken on unresponsive flows and threads. A workload management policy defines properties on the message flow in the Integration Registry so that message flows can refer to the policy to find properties at run time. This unit described workload management and using workload management policies to specify goals for the processing rate of a message flow.

Having completed this unit, you should be able to:

- Describe the workload management options for adjusting the speed that messages are processed, and controlling the actions that are taken on unresponsive flows and threads
- Use a workload management policy to control the workload management attributes at run time