

IBM Integration Designer
Version 7 Release 5

Stock Quote Sample



Note

Before using this information and the product it supports, read the information in "Notices" on page 41.

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Chapter 1. Introduction

The Stock Quote sample demonstrates how you can easily integrate different services and manipulate messages at runtime without affecting the client applications. This integration is achieved through the Service Component Architecture and mediation functionality provided by the WebSphere Enterprise Service Bus. The StockQuote mediation service is built with the business integration tools for building mediations: the assembly editor and the mediation flow editor. Mediation flows intercept and modify messages that are passed between existing services (providers) and clients (requesters) that want to use those services.

Prerequisites

IBM® Integration Designer 7.5.1, with a Unit Test Environment of either IBM Process Server 7.5, or WebSphere Enterprise Service Bus 7.5.1.

This sample runs on WebSphere Enterprise Service Bus 7.5.1 or IBM Process Server 7.5.

If you want to learn more about the WebSphere Enterprise Service Bus, see the documentation in the information center for <http://publib.boulder.ibm.com/infocenter/esbsoa/wesbv7r5/index.jsp>

Learning objectives

This sample shows you how to do the following:

- Build the Stock Quote application using web services and mediation flows
- Test and debug the application using a provided client and back-end
- Redirect a service request from the administrative console while the application is running
- Run the application in the unit test environment

This sample should take approximately 60 minutes to build and run.

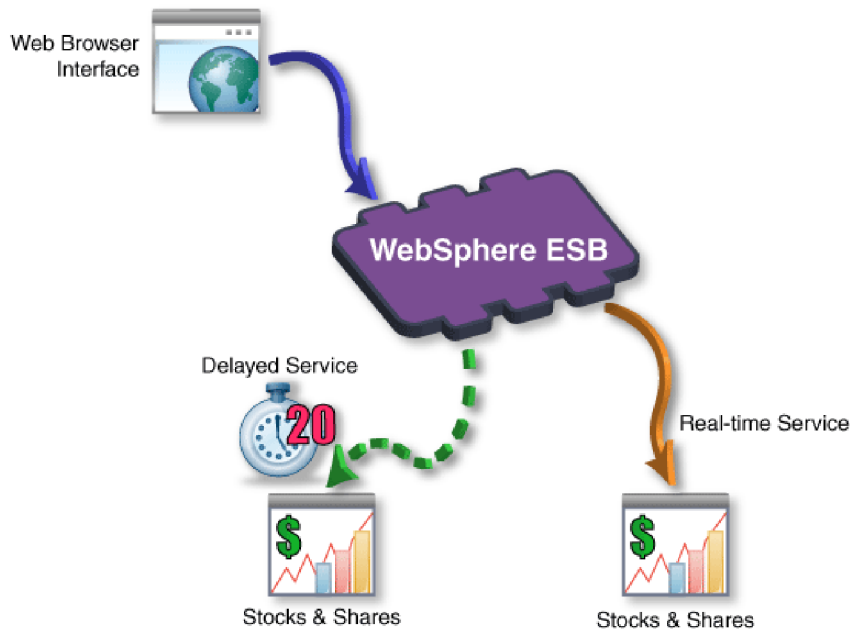
Chapter 2. Overview

This Stock Quote sample addresses the business need of a financial services company that provides an interactive Web-based stock market service to its customers.

The company wants to differentiate itself from its competition by offering tiered levels of service. The company's goal is to offer delayed stock quotes to their *standard* customers and real-time quotes to their *premium* customers, that is, customers who pay a subscription.

The company wants to:

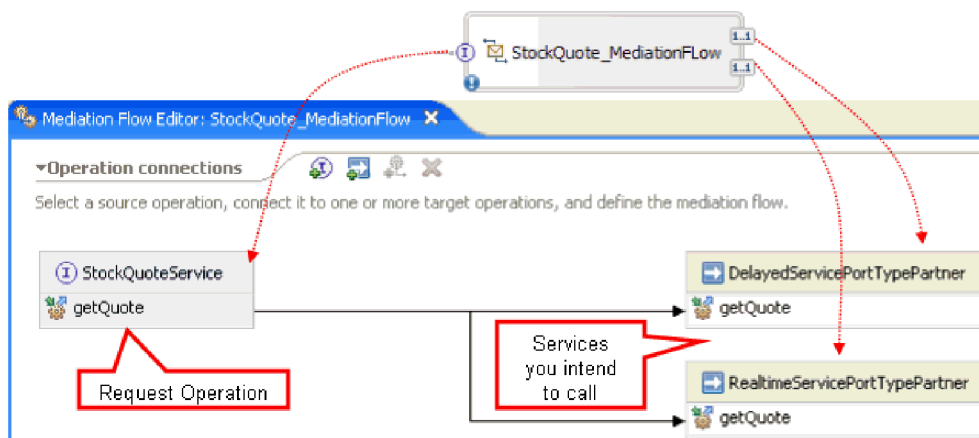
- Offer the delayed and real-time stock quote services as a single service, which dynamically determines which external service to invoke based on the customer's subscription level.
- If the real-time service is unavailable, route requests to the delayed service without affecting the running application.
- Log all requests to the service to satisfy audit requirements.



Chapter 3. Mediation design

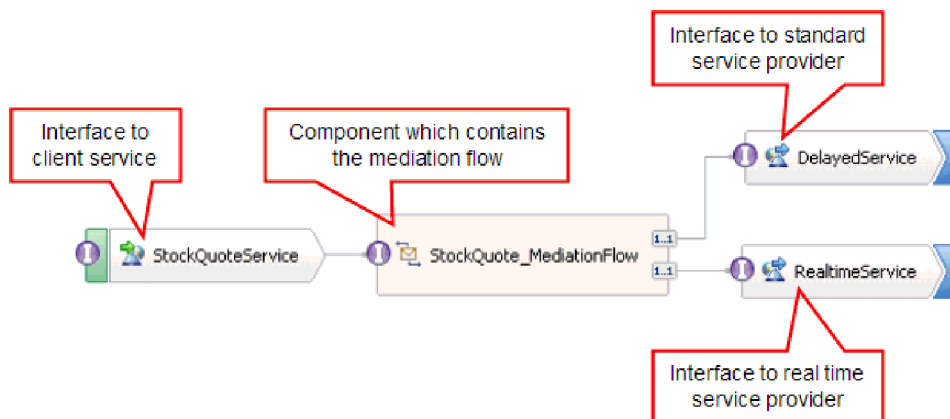
The mediation service that runs on the WebSphere ESB or IBM Process Server is contained in a single *mediation module* called StockQuote. The mediation module consists of: an *export* which provides an interface to enable the service to be called, *imports* that provide interfaces to the external web service providers, and a *mediation flow component* that defines the mediation implementation.

The mediation module, StockQuote, is built in the assembly editor, and the mediation flow component, StockQuote_MediationFlow, is created in the mediation flow editor. The following figure shows the relationship between the interfaces and references in the assembly editor and the mediation flow editor.



StockQuote mediation module

The following diagram shows the assembled StockQuote mediation module:



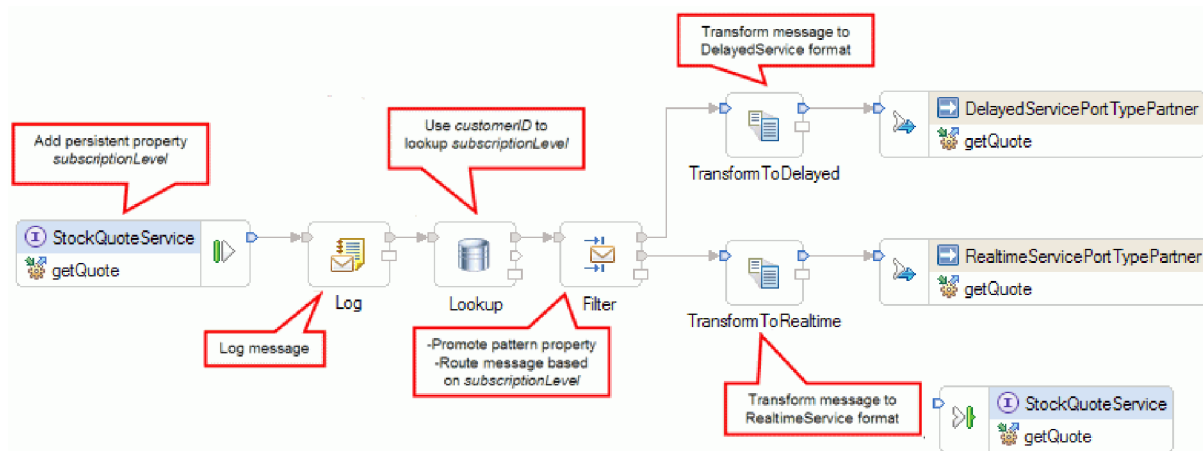
The StockQuote mediation module consists of the following elements:

- **StockQuoteService** has a WSDL interface, called StockQuoteService, and uses SOAP/JMS web service binding so that the servlet front end can connect to the mediation module by using JAX-RPC. In this sample, you will create the StockQuoteService interface and generate the WSDL file.
- **StockQuote_MediationFlow** contains the mediation flow. In this sample, you will create and implement the StockQuote_MediationFlow component.

- **RealtimeService** has a web service binding and an interface that matches the real-time (premium) service. In this sample, you will import the WSDL file RealtimeService.wsdl.
- **DelayedService** has a web service binding and an interface that matches the delayed (standard) service. In this sample, you will import the WSDL file DelayedService.wsdl.

StockQuote_MediationFlow

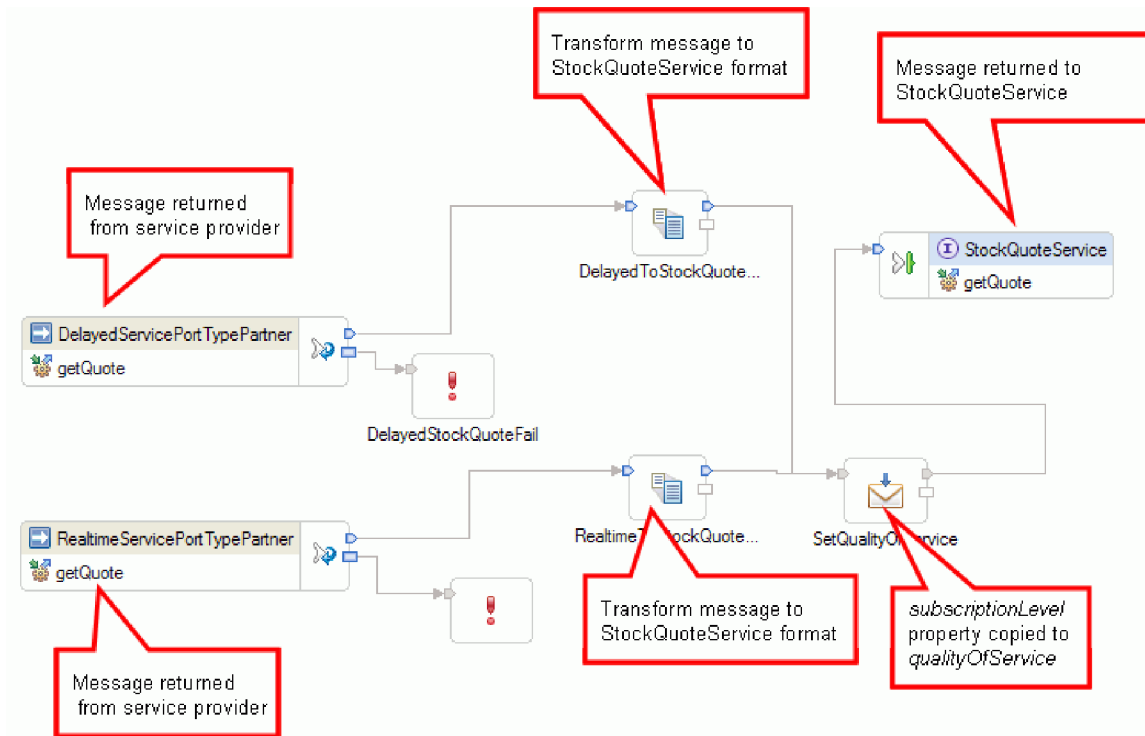
The diagram below shows the request flow that defines the mediation logic applied to the message as it flows through the StockQuote_MediationFlow component to the target service providers.



The request flow is executed from left to right, in the following order:

1. The property `subscriptionLevel` is set in the correlation context of the message so that it will be available later in the response flow.
2. The request is logged using the Message Logger mediation primitive named Log.
3. A Database Lookup mediation primitive named Lookup uses the `customerID` element in the message body to determine whether the customer is entitled to the premium or standard service by looking this information up in the supplied CustomerDatabase. This information is added to the `subscriptionLevel` property in the correlation context of the message, for use later.
4. The request is routed by a Message Filter called Filter, based on the `subscriptionLevel` information in the correlation context, to either the real-time or delayed stock quote service. The Filter's pattern property is promoted so that it can be changed at runtime to redirect the stock quote request to the delayed service if the premium service is unavailable.
5. The message is transformed on the way to either service by XSLT primitives TransformToDelayed and TransformToRealtime so that it matches what the service expects.
6. The response from each service is passed through an XSLT mediation primitive (DelayedToStockQuoteService & RealtimeToStockQuoteService) to match the format that is required by StockQuoteService.

The diagram below shows the response flow that defines the mediation logic applied to the returning message as it flows through the StockQuote_MediationFlow component from the target service provider to the client. A Message Element Setter is used to copy the value of `subscriptionLevel` from the correlation context to the property `qualityOfService` in the message. The `qualityOfService` text indicates "Premium" to a response that is returned from the real-time service, and "Standard" to a response that is returned from the delayed service. The `qualityOfService` text is displayed in the client to indicate the service provider that was used.



Chapter 4. Build it yourself

Build the sample, and then test it.

Start building the Stock Quote sample by creating the resources library and mediation module for your sample. Resources such as interfaces and business objects can be contained in libraries so that they can be easily shared by modules. Mediation modules contain mediation flow and Java components, exports to allow the target service in the mediation module to be called by other modules or clients, and imports which allow services external to the module to be invoked. The assembly diagram of the mediation module is used to wire the exports, components, and imports together to form the integrated service application.

Create and assemble the library and mediation module in the following order:

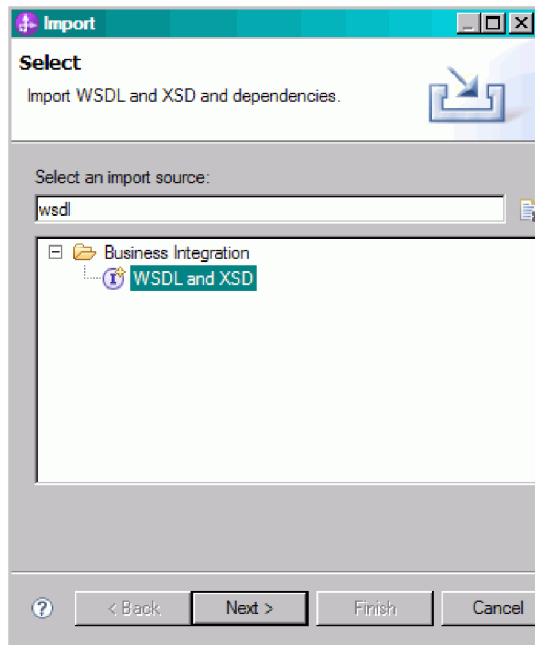
1. Create a resource library, and import the service providers' WSDL files into it.
2. Create an interface in the resources library. This interface allows the client to access the mediation flow component.
3. Create a mediation module.
4. Assemble the mediation module.
5. Implement this mediation flow component.

Import resources

Create a library, and import the ready-made WSDL files into it. These files are the web service interfaces that you will use to connect to the delayed and real-time services.

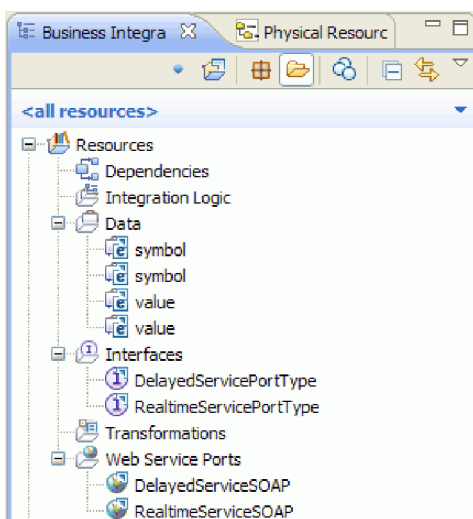
To create the **Resources** library and import the ready-made WSDL files into it, complete the following steps.

1. In the Business Integration view, under Projects click **New...** Select **Library** as the type of project and click **Next**. For the Library name specify Resources. Click **Finish**. If you already have projects in the Business Integration view, then right-click a project and select **New > Project > Library**. Name it Resources. Click **Finish**.
2. Right-click the **Resources** project and select **Import**. In the Select an import source text box, type *wSDL* and select **WSDL and XSD**. Click **Next**.



3. Choose the option to import the wsdl locally and click **Next**.
4. In the source directory field, browse to the directory where you installed shared resources (the default directory is Shared_Resources). Navigate to *Installed_Shared_Resources_Directory/plugins/com.ibm.wbit.samples.content_qualifier/artifacts/stockquote/wsdl* (where *qualifier* is a string that is appended to the plugin name and indicates the version number and time stamp, for example, 7.0.0.v20091113_0200). Click **OK**.
5. In the Import wizard, select both WSDL files: **DelayedService.wsdl** and **RealtimeService.wsdl**.
6. The target module is **Resources**.
7. Click **Finish** to import the WSDL files.

The available port types and ports based on the imported WSDL files are created under the Interfaces and the Web Service Ports categories in the navigation tree respectively.





Create the StockQuoteService interface

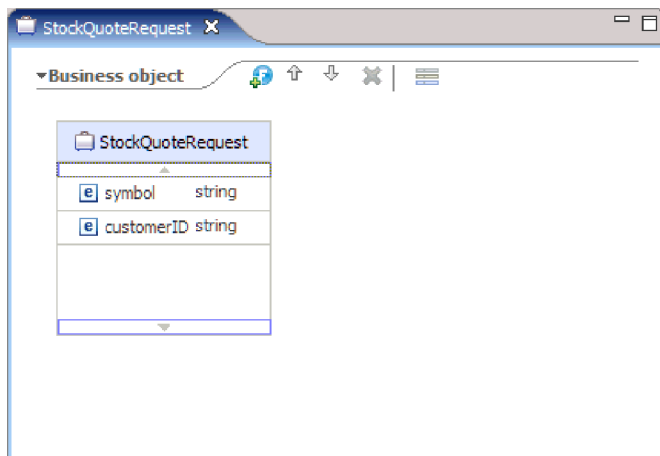
Create the StockQuoteService interface. This is the interface that you can use to connect your web client to the mediation module.


The StockQuoteService interface will have a getQuote operation. The data that is sent and received by the getQuote operation will be contained in business objects. We will create the interface and business objects in the resources library, so that they can be used by other modules in the future.

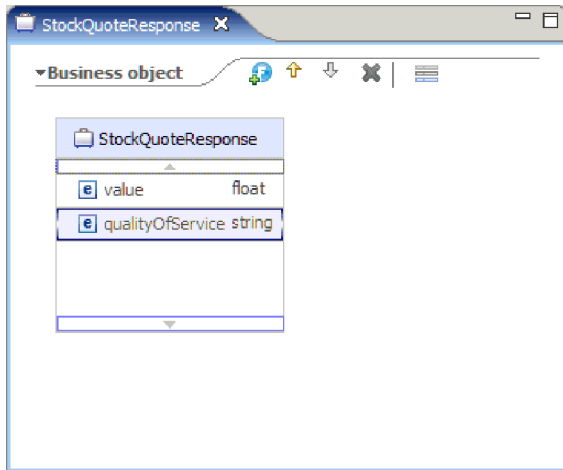
The getQuote operation will be used to send the request for a stock quote. The operation will send the request data as a business object named StockQuoteRequest that contains the fields symbol and customerID. The operation will receive the response data as business object named StockQuoteResponse that contains the fields value and qualityOfService.

Follow these instructions to first create the business objects, and then the service interface:

1. In the Business Integration view, select **Resources**, right-click and choose **New > Business Object**.
2. In the New Business Object wizard, type StockQuoteRequest in the **Name** field. Click **Finish**.
3. In the Business Object Editor that is now opened, click the **Add a field to a business object** button . A field named *field1* is created.
4. Rename field1 to symbol by clicking on the name to enter input mode.
5. Click the **Add a field to a business object** button  to add another field. Rename the field to customerID. Save the new business object.

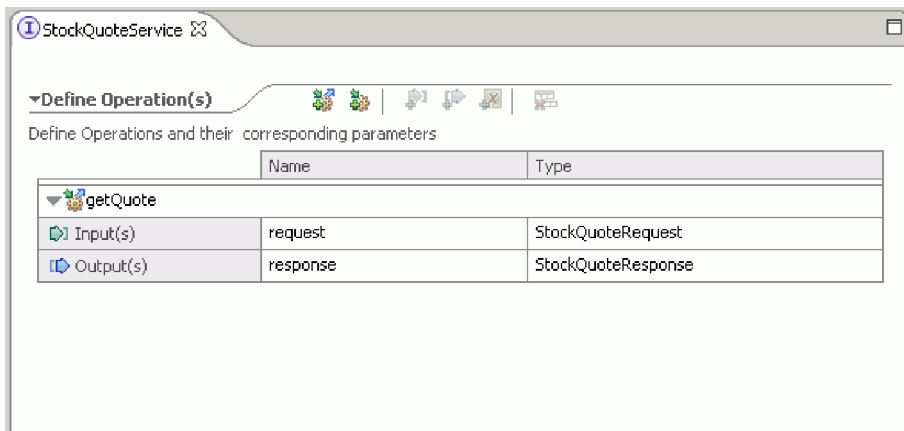


6. Right-click **Data**, and choose **New > Business Object** to create another business object.
7. In the New Business Object Wizard, type StockQuoteResponse. Click **Finish**.
8. In the Business Object Editor, click the **Add a field to a business object** button . An attribute named *field1* is created. Rename field1 to value. Click string and select float from the data type list.
9. Add another field. Rename the field to qualityOfService. Save the new business object.



10. In the Business Integration view, select **Resources**, right-click and choose **New > Interface**.
11. In the New Interface wizard, type StockQuoteService in the **Name** field. Click **Finish**.
12. In the Interface Editor that is now opened, click the **Add Request Response Operation** icon. An operation named *operation1* is created, with an input and an output. Rename operation1 to getQuote.
13. Rename input1 to request. Click input1, select it, and type request.
14. Click on the request input's type ("string") and in the resulting Data Type selection dialog, select **Browse**. Select **StockQuoteRequest** as the type and click **OK**.
15. Rename output1 to response. Click output1, select it, and type response.
16. Change the output's type to **StockQuoteResponse** . Save the interface.

This is what the interface that you created should look like in the interface editor.




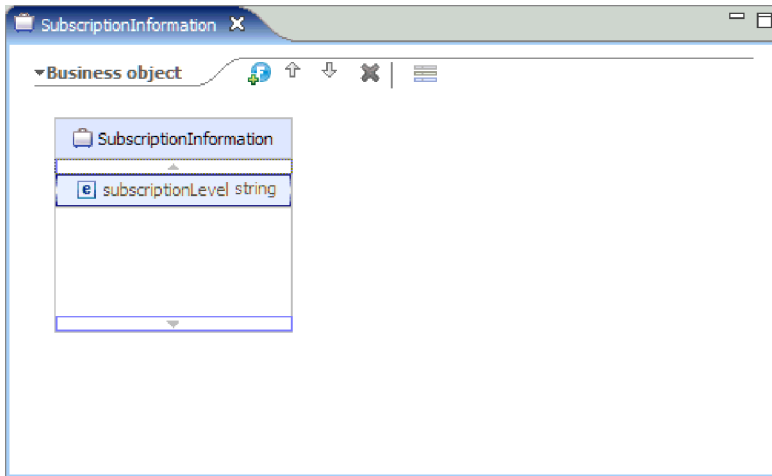
Set up a business object for temporary data

The request message is routed based on the value of the subscription level. This value needs to be passed with the message from one primitive to another. We will create a business object to contain the subscription level, and we will set the value of the subscription level when we build the request flow.

The SubscriptionInformation business object will contain a subscriptionLevel field. To create the business object, complete the following steps:

1. In the Business Integration view, select Resources. Right click and choose **New > Business Object**. Type SubscriptionInformation in the Name field, and click **Finish**.

2. In the Business Object Editor, click the **Add a field to a business object** button . An attribute named field1 of type string is created.
3. Rename field1 to subscriptionLevel and keep the type of string.



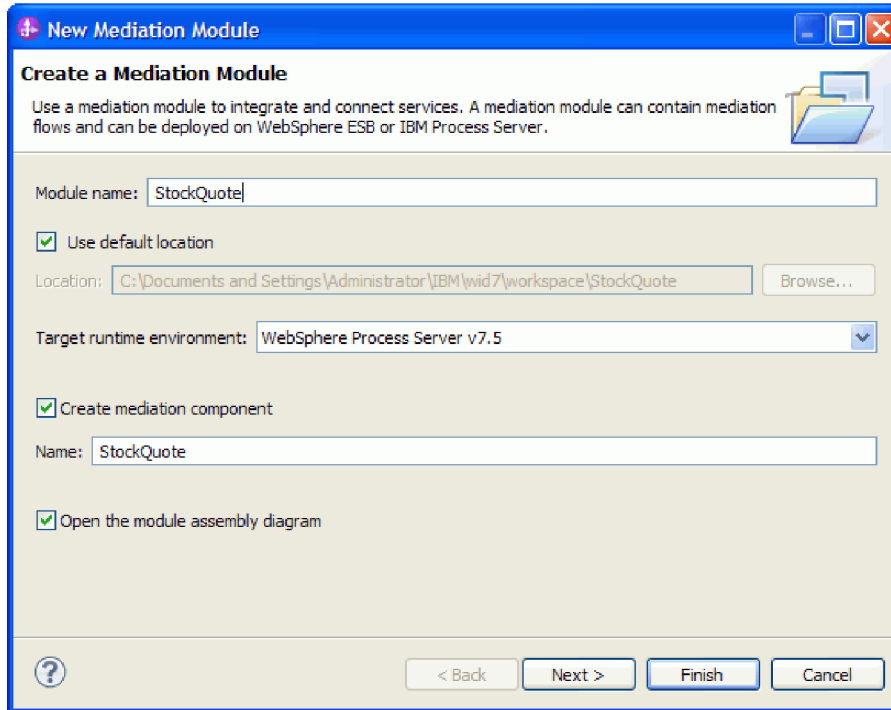
When you build your request flow, you will add this business object to the input node so that the subscriptionLevel property is available throughout the request and response flows. Close all open editors.

Create the mediation module

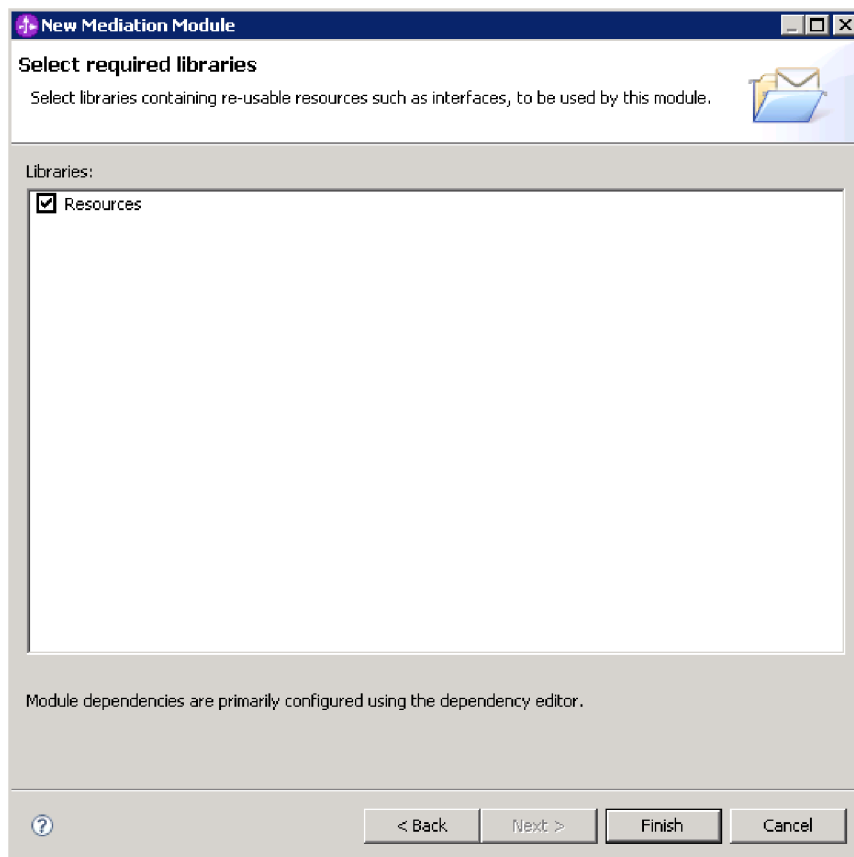
Create the mediation module named StockQuote that will contain your export, imports and mediation flow component.

To create the mediation module, complete the following steps:

1. In the Business Integration view, right-click to see the context menu and select **New > Project > Mediation Module**. The New Mediation Module window opens.
2. In the **Module Name** field, type StockQuote.
3. Depending on which server profile is installed, keep the default target runtime WebSphere ESB Server v 7.5, or change it to IBM Process Server v 7.5.
4. Keep the **Create mediation component** box checked.



5. Click **Next**.
6. In the **Select Required Libraries** wizard, select the **Resources** library and click **Finish**. This will allow the artifacts in the library to be used by the mediation module.

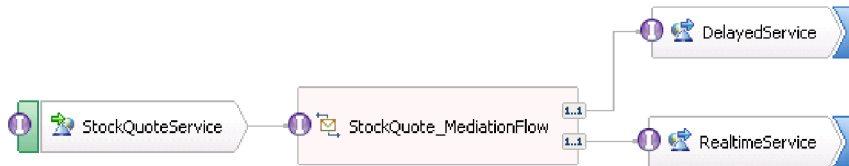


A mediation module called StockQuote is created, with a dependency on the Resources library. A mediation flow component called StockQuote is created in the module's assembly diagram.

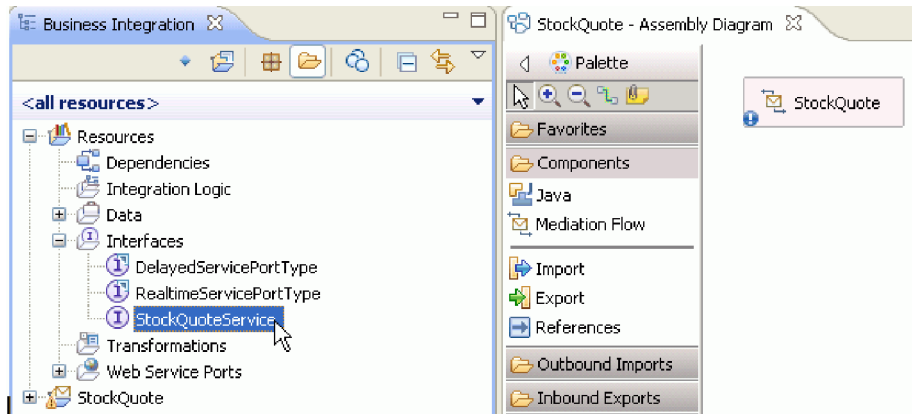
Assemble the mediation module

Assemble the client and provider services of the StockQuote sample and wire them to the mediation flow component.

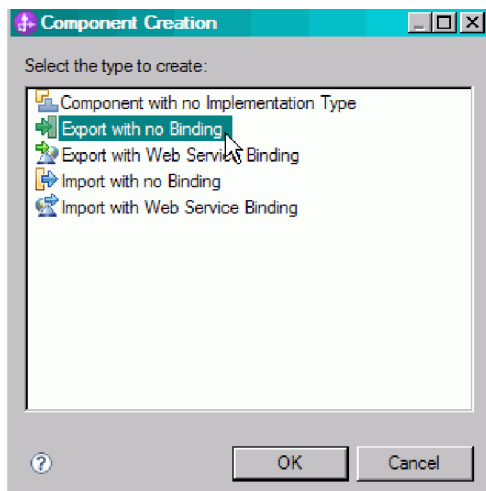
To build the StockQuote mediation module assembly diagram, as shown in the following diagram, complete the following steps:



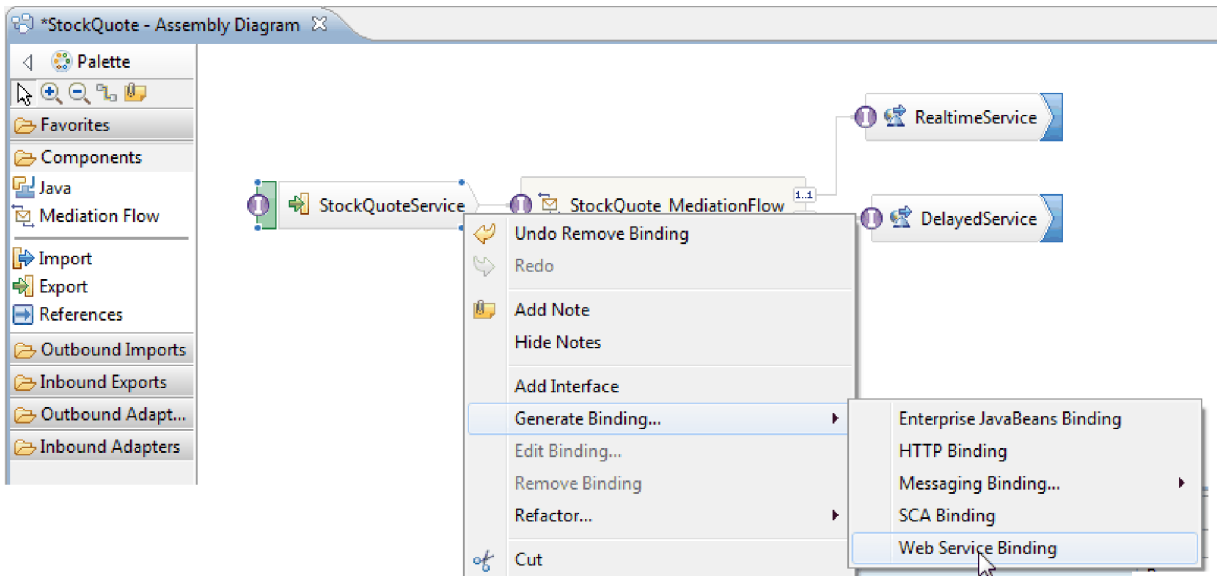
1. In the Business Integration view, expand the **StockQuote** module.
2. To open the Assembly Editor, double-click **Assembly Diagram**. The assembly editor opens showing mediation flow component named StockQuote.
3. In the **Resources** library's Interfaces category, select **StockQuoteService** and drag it on to the assembly editor canvas.



4. In the Component Creation dialog that pops up, choose to create an **Export with no Binding**.

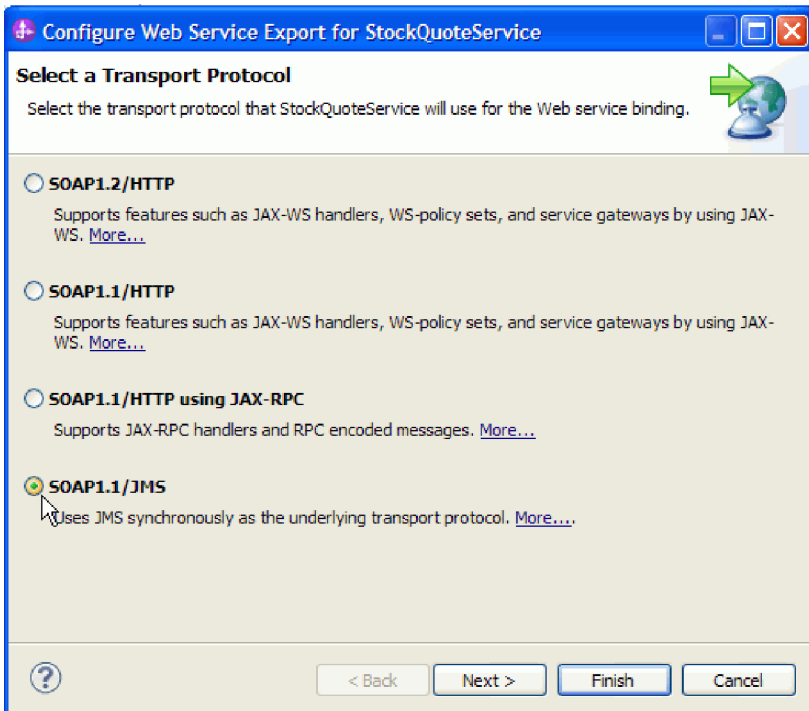


- Click **StockQuoteServiceExport1** in the Assembly Editor to highlight its name. Type **StockQuoteService** to rename the export. Notice that the name change is reflected in the Description tab in the export icon's Properties view.
- Right-click **StockQuoteService** and choose **Generate Binding... > Web Service Binding**.



You are generating a binding of type web service, using soap/jms as the transport protocol.

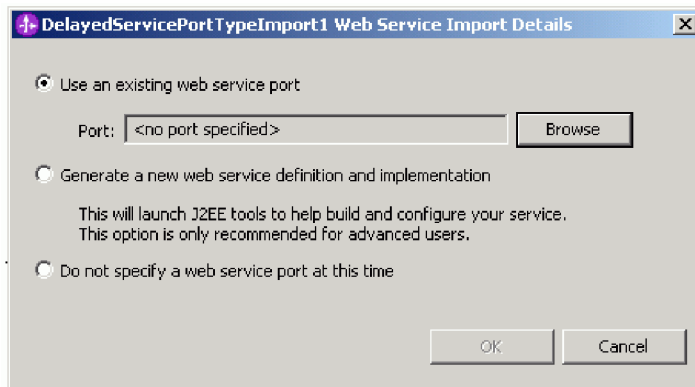
- Select **SOAP1.1/JMS** as the transport, and click **Finish**.



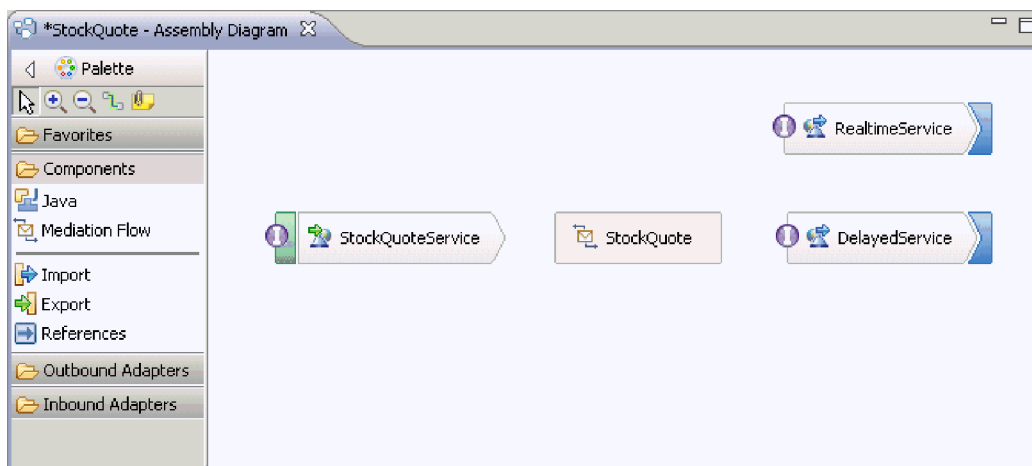
Look under the resource library's **Web Service Ports** category for the generated wsdl port, **StockQuoteService_StockQuoteServiceJms Port**.

- In the **Resources** library's Interfaces category select **DelayedServicePortType** and drag it onto the Assembly Editor canvas. In the **Component Creation** dialog choose to create an **Import with Web Service Binding** and click **OK**.

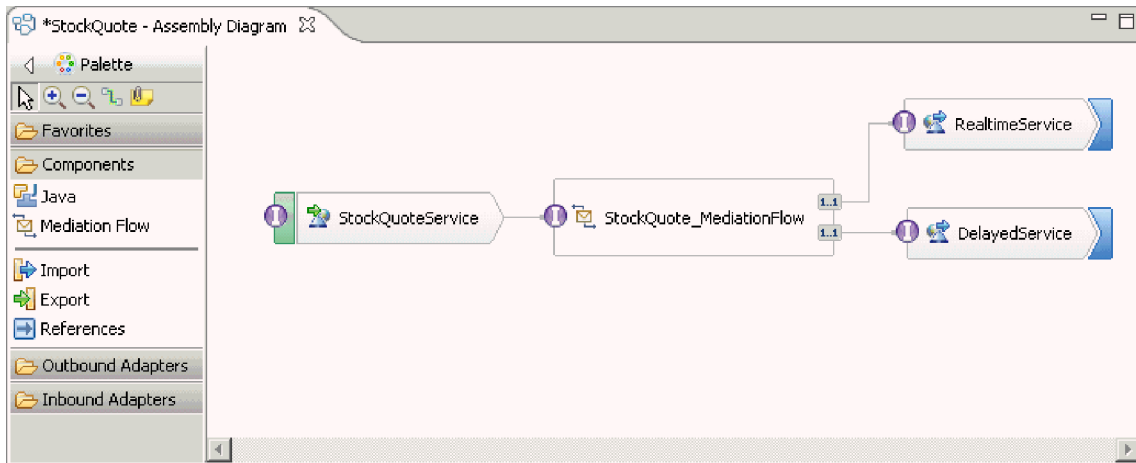
- In the details dialog that pops up, keep the default setting to use an existing web service port. Click **Browse**.



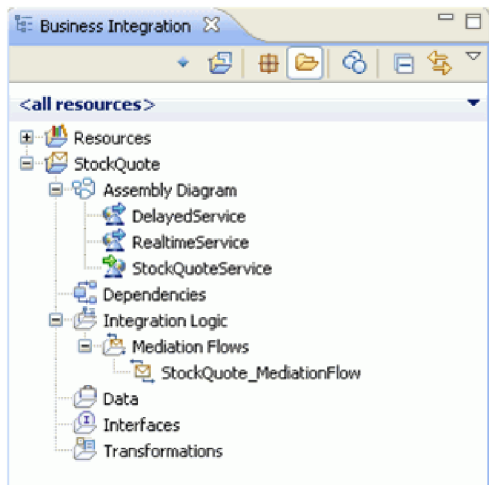
- In the selection wizard, click **DelayedServiceSOAP**. Click **OK**.
- In the transport selection window, keep the default transport, SOAP 1.1/HTTP and click **Finish**.
- Click **OK** in the details dialog.
- Select the import and rename it to **DelayedService**. Click the **Binding** tab in the Properties view to see the binding information.
- Drag **RealtimeServicePortType** onto the Assembly Editor canvas, and create an **Import with Web Service Binding**.
- Specify **RealtimeServiceSOAP** as the port, and keep the default transport protocol.
- Rename the import to **RealtimeService**.



- Click **StockQuote**, the mediation flow component that was created with the mediation module. Rename it to **StockQuote_MediationFlow**.
- Hover your mouse over **StockQuoteService**. An orange handle appears. This is the wire's source node.
- Drag the wire to the target node, **StockQuote_MediationFlow**, and release.
- Click **OK** on the Add Wire dialog. The source node's interface, **StockQuoteService**, is added to the target and the wire is created.
- Create a wire from source **StockQuote_MediationFlow** to target **RealtimeService**, and click **OK**. A matching reference, **RealtimeServicePortTypePartner**, is created on the source and the wire is created.
- Create a wire from source **StockQuote_MediationFlow** to target **DelayedService**, and click **OK**. A matching reference, **DelayedServicePortTypePartner**, is created on the source and the wire is created.



23. Generate the implementation for StockQuote_MediationFlow. In the assembly editor, select the component, right click, and select **Generate Implementation**. Select the StockQuote folder, and click OK. The mediation flow editor opens, showing the source interface and target references.
24. Click the **StockQuote - Assembly Diagram** tab to switch back to the assembly editor.
25. Since the initial mediation component was created without references or an interface attached to it, they have to be synchronized. To do this, right click **StockQuote_MediationFlow**, select **Synchronize Interfaces and References... > to Implementation**. Click **Yes**.
26. Save the assembly diagram. Expand the StockQuote assembly under the module in the Business Integration view to see the artifacts created.



Implement the mediation

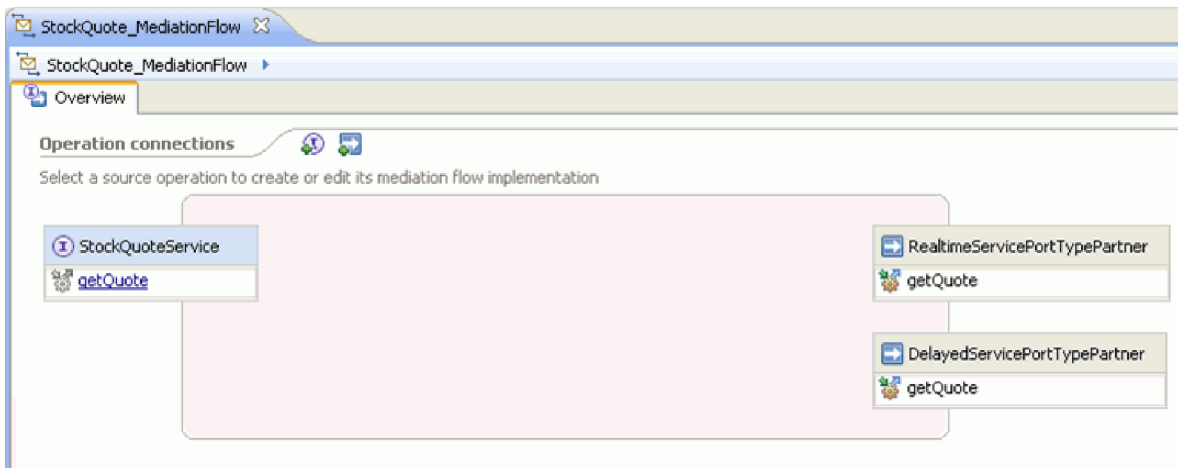
Select the sending and receiving operations. These will be end points of the mediation flow. Next, add mediation primitives between the end points to log the message, retrieve the customer's subscription level from a database, conditionally route the message based on the value retrieved, and transform the message to match the format of the receiving operation.

Follow the instructions in these topics to build your mediation flow.

Define the end points of the mediation

Follow these steps to define the end points of the mediation flow.

1. Double-click the mediation flow component to open the Mediation Flow Editor.

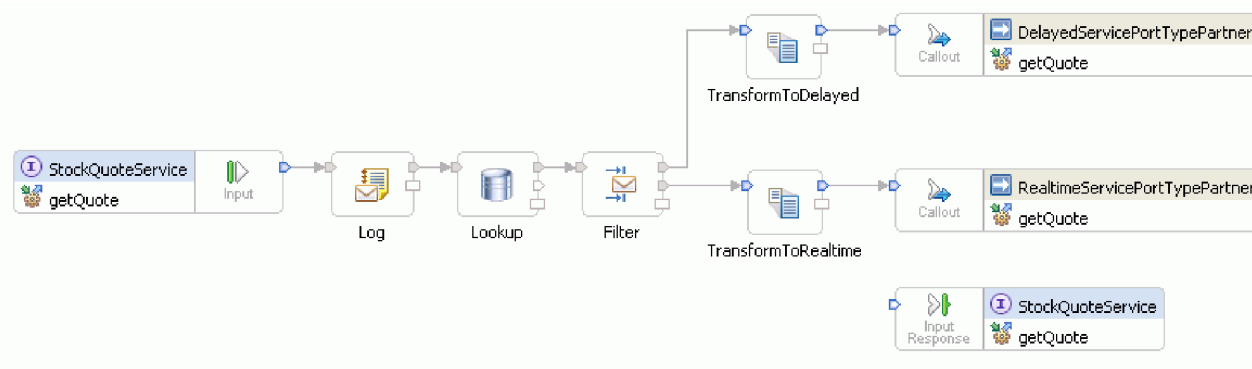


2. In the Operation connections section, click the getQuote operation of the StockQuoteService interface.
3. In the template selection dialog, choose the service integration template.
4. In the service selection dialog, choose the target operations that you want to invoke. Click **Add**.
5. Select **DelayedServicePortTypePartner**, and select the **getQuote** operation.
6. Similarly, add the **getQuote** operation of the **RealtimeServicePortTypePartner**.
7. Keep the default setting to create a separate response flow.
8. Click OK. The mediation flow editor opens. You can now proceed to build the request flow.

Build the request flow

Build the request flow for the getQuote operation: create the mediation primitives, set their properties, and wire the flow.

In the mediation flow editor, the request flow is represented from left to right. You will see an input node on the left. This is where the request message enters the flow. On the right are two callout nodes, one for each target operation. You will also see an Input Response. This node is used when a message is to be returned to the client after the flow is executed. We will not use this node in our sample. You will add mediation primitives between the input and callout nodes and wire the flow. The completed request flow is shown below:



To build the request flow, complete the following steps:

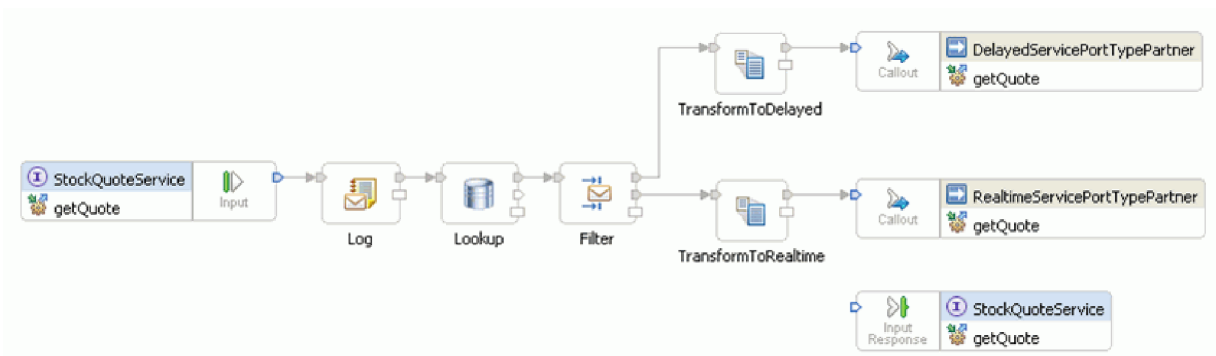
1. When the mediation flow opens, you will see a tip explaining how to invoke a service. Since you have already added a callout to the target service using the Service Integration template, you can close the tip.
2. Click the Tracing palette category to expand the group.

- Click the **Message Logger** primitive and drop it onto the request flow canvas, and rename the primitive Log.

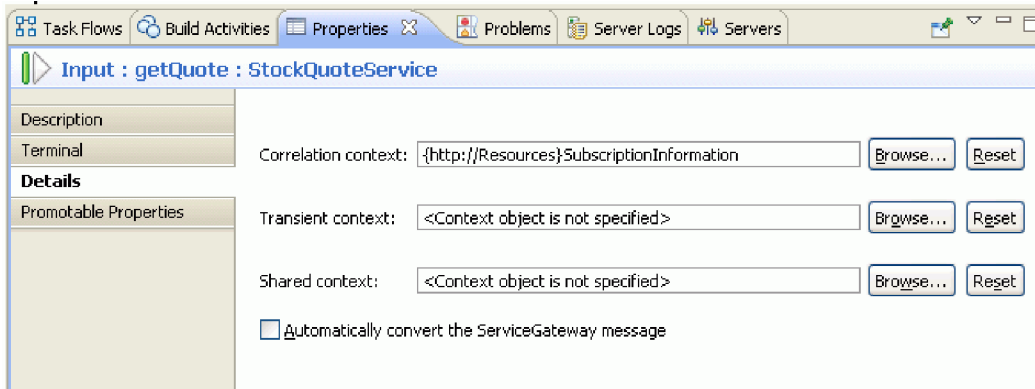


- Select a **Database Lookup** primitive from the Transformation folder in the palette, drop it onto the request flow canvas, and name it Lookup.
- Select a **Message Filter** primitive from the Routing folder, drop it onto the request flow canvas, and name it Filter.
- Select an **XSL Transformation** primitive from the Transformation folder, drop it onto the request flow canvas, and name it TransformToDelayed.
- Select another **XSL Transformation** primitive, drop it onto the request flow canvas, and name it TransformToRealtime.
- Before you proceed to wire the primitives, right click the canvas and make sure that the **Automatic Layout** option is on.
- In the request flow canvas, wire the primitives:
 - The output terminal of **getQuote : StockQuoteService** to the input terminal of **Log**
 - The output terminal of **Log** to the input terminal of **Lookup**
 - The output terminal of **Lookup** to the input terminal of **Filter**
 - The default terminal of **Filter** to the input terminal of **TransformToDelayed**
 - The match1 terminal of **Filter** to the input terminal of **TransformToRealtime**
 - The output terminal of **TransformToDelayed** to the input terminal of **getQuote : DelayedServicePortTypePartner**
 - The output terminal of **TransformToRealtime** to the input terminal of **getQuote : RealttimeServicePortTypePartner**

The wired request flow should look like this:



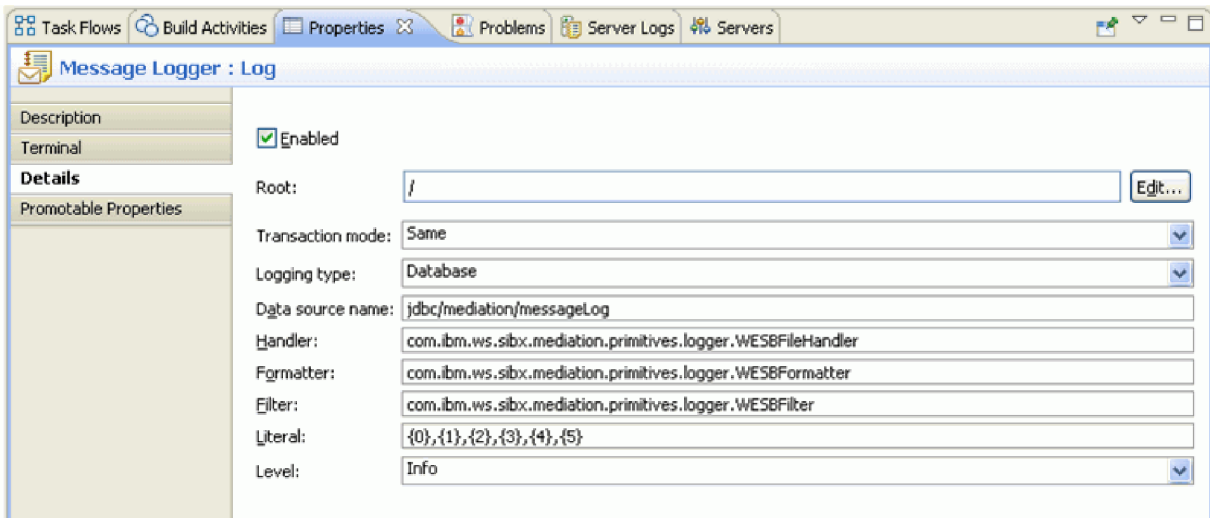
- We will now add the business object that was created earlier to the correlation context of the input node `getQuote : StockQuoteService`. This will allow the property `subscriptionLevel` to persist in the message flow. Click `getQuote : StockQuoteService` input node and switch to the Details tab in the Properties view. In the **Correlation context** field, click **Browse**. Select `SubscriptionInformation` under matching data types, and click **OK**. `{http://Resources}SubscriptionInformation` now appears in the **Correlation context**.



- Click **Log** in the request flow canvas to see the primitive's properties in the Properties view. Click the Details tab to view the properties. Use the default database to log the message. Ensure that these properties are set:

Table 1. Message Logger properties

Property	Value
Data source name	jdbc/mediation/messageLog
Root	/
Transaction mode	Same



Root specifies the part of the message to be logged. '/' logs the complete message while '/body' logs only the body of the message.

- Click **Lookup** in the request flow canvas, and enter these property values in the Details tab:

Table 2. Database Lookup properties

Property	Value
Data source name	jdbc/sample/CustomerDatabase

Table 2. Database Lookup properties (continued)

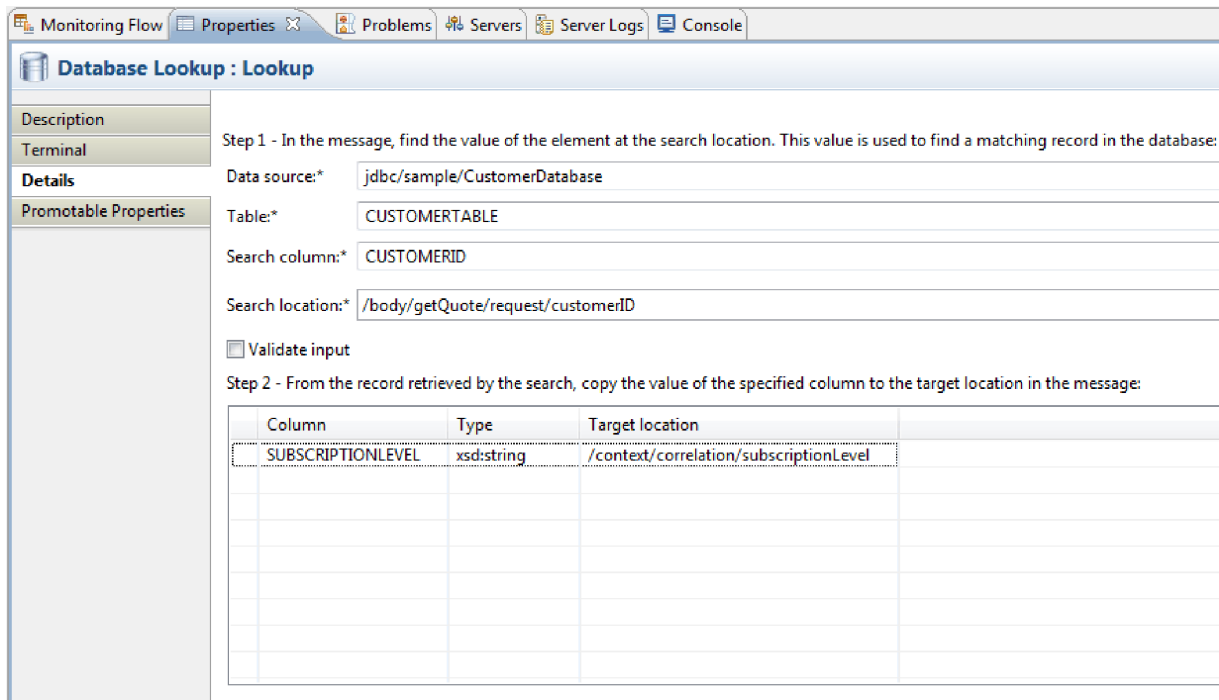
Property	Value
Table	CUSTOMERTABLE
Search column	CUSTOMERID
Search location	Click Edit... In the XPath Expression Builder, type the following XPath Expression or build it using the Simple XPath Builder: /body/getQuote/request/customerID Click OK .

In the Step 2 table, click **Add...** and enter the following values:

Table 3. Database Lookup Table properties

Column	Value
Column	SUBSCRIPTIONLEVEL
Type	{http://www.w3.org/2001/XMLSchema}string
Target location	/context/correlation/subscriptionLevel

Leave **Validate input** unchecked.



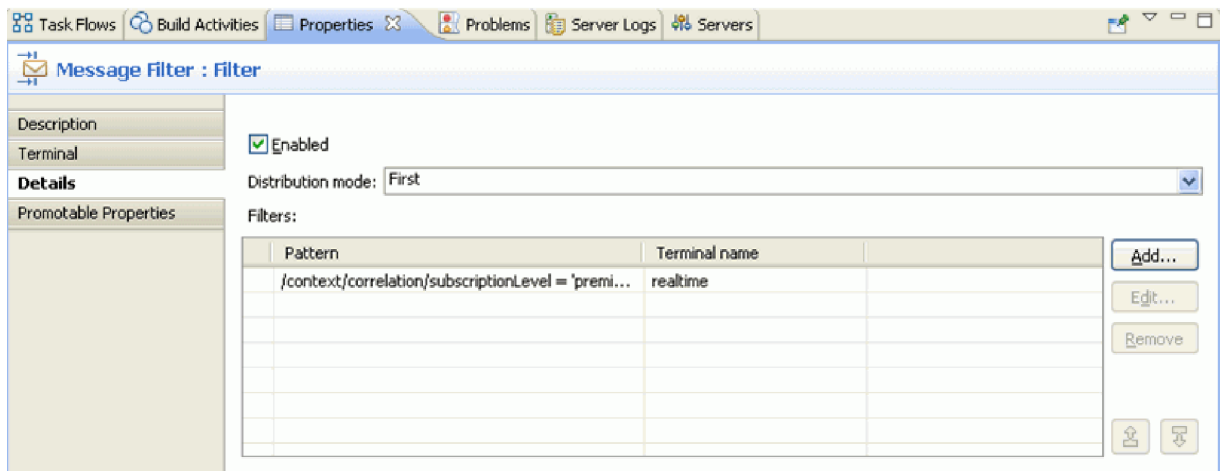
13. Click **Filter** in the request flow canvas. Select the Terminal view:
 - a. Click **match1** in the **Output terminal** list. The properties of the match1 terminal appear on the right.
 - b. In the **Terminal name** field, change the name to **realtime**.
14. By default, the message is sent to the TransformToDelayed primitive. You need to set the pattern for mapping to TransformToRealtime. Select the Details tab. In the Filter table, click **Add...** and enter the following values:

Table 4. Filter table properties

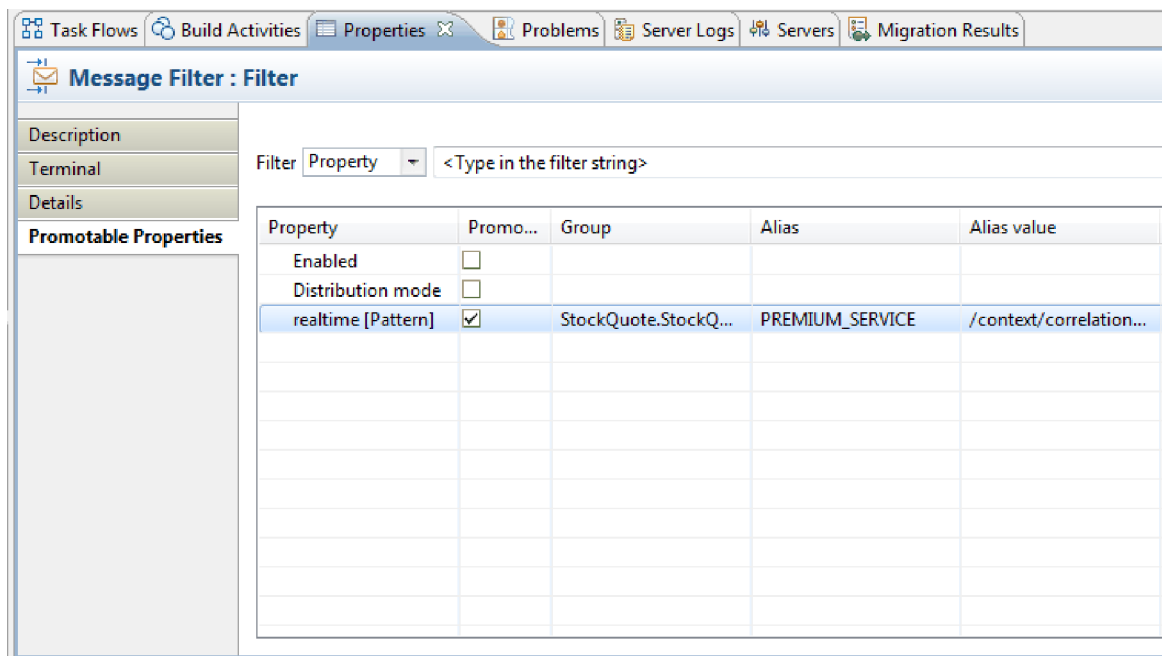
Column	Value
Pattern	/context/correlation/subscriptionLevel = 'premium'

Table 4. Filter table properties (continued)

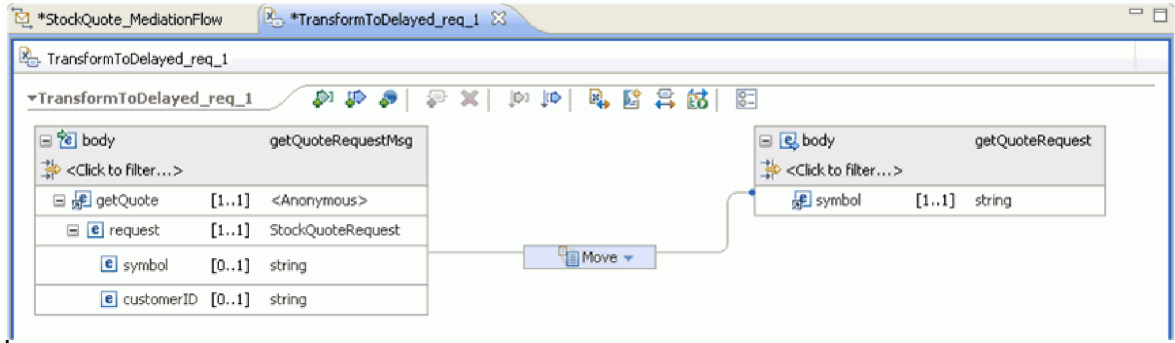
Column	Value
Terminal name	realtime



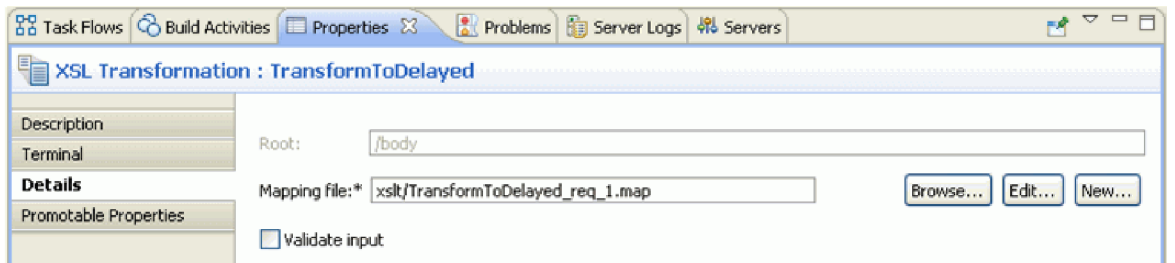
15. A promoted property can be changed by an administrator at runtime. The pattern property can be changed at runtime to change the quality of service. To promote the pattern property:
 - a. Click the Promotable properties tab.
 - b. Click the promoted check box of the realtime [Pattern] property.
 - c. Click the alias Filter.filters. Type PREMIUM_SERVICE to rename the alias.



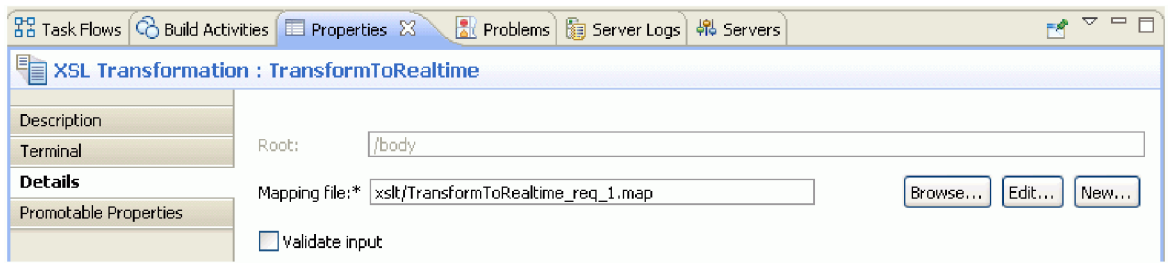
16. Set the properties for the XSL Transformation primitive TransformToDelayed:
 - a. Select the **TransformToDelayed** primitive in the request flow canvas and double-click it.
 - b. Click **Next** to see the root, input, and output message types that will be mapped. Click **Finish** to accept the defaults. This launches the map editor.
 - c. On the left side, the Input object side, expand **body** > **getQuote** > **request**. In the Output object side, the right side, expand **body**. Click symbol on the left side and drag it to symbol on the right side to wire them together and create the mapping.



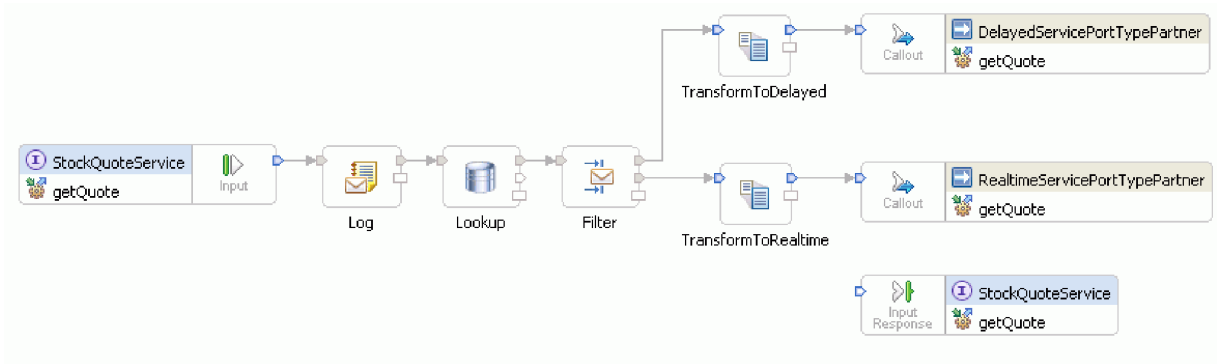
- d. Save your changes and close the map editor. The mapping file is displayed in the Details tab of the Properties view.



17. Similarly, set the properties for the XSL Transformation primitive **TransformToRealtime**:
 - a. Select the **TransformToRealtime** primitive in the request flow canvas and double-click it.
 - b. The New XML Mapping wizard opens. Click **Next** to see the root, input, and output message types that will be mapped. Click **Finish** to accept the defaults, this opens the map editor.
 - c. On the left side, expand **body > getQuote > request**. On the right side, expand **body**. Click *symbol* on the left side and drag it to *symbol* on the right side to create the mapping.
 - d. Save your changes and close the map editor. The mapping file is displayed in the Details tab of the Properties view.



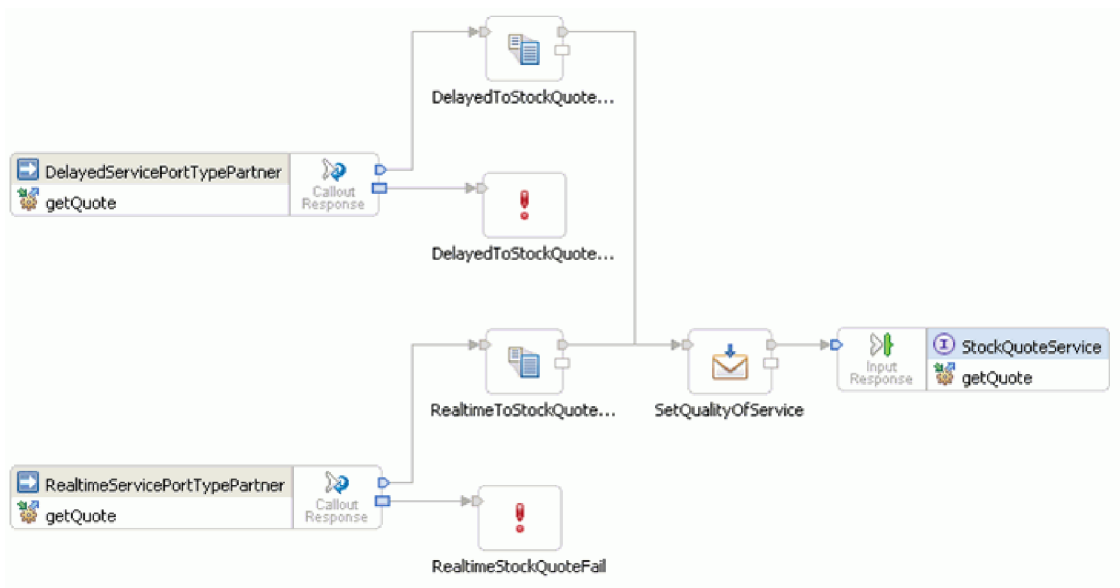
18. Save the request flow.



Build the response flow

Build the response flow for the `getQuote` operation: create the mediation primitives, set their properties, and wire the flow.

Response flows are represented from left to right in the editor. On the left are the callout response nodes, one for each target operation; this is where the returning message enters the response flow. On the right is an input response node, which represents the message returning to the source operation. You will add mediation primitives between the nodes and wire the flow. The completed response flow is shown below:

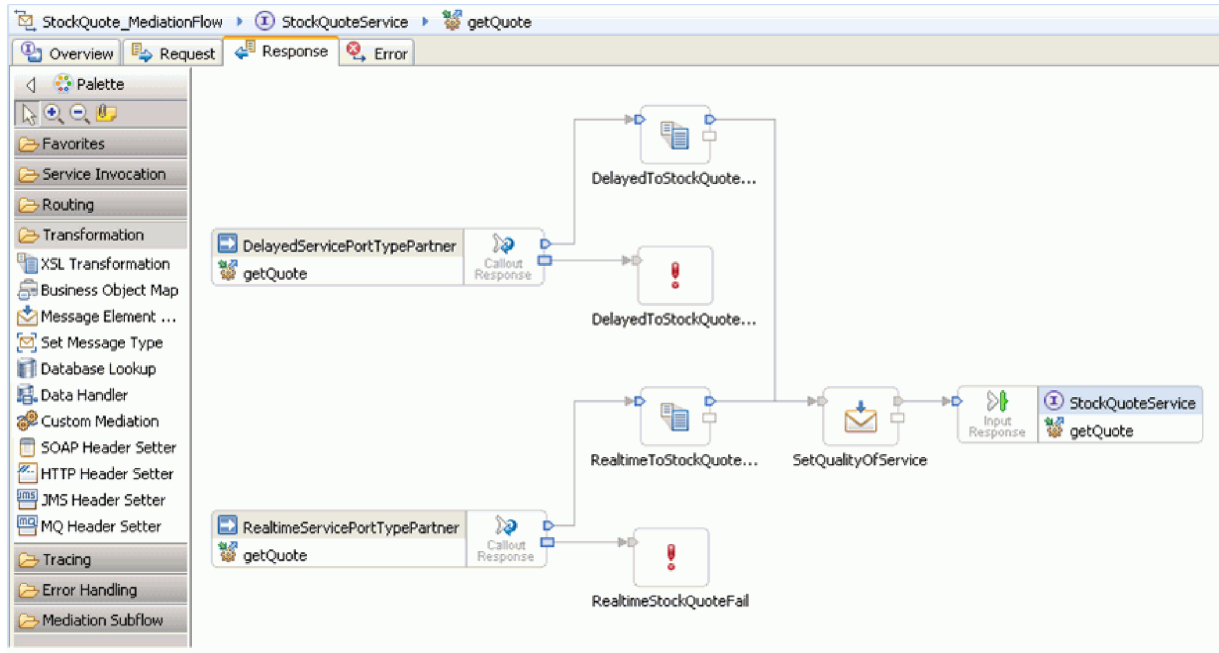


To build the response flow, complete the following steps:

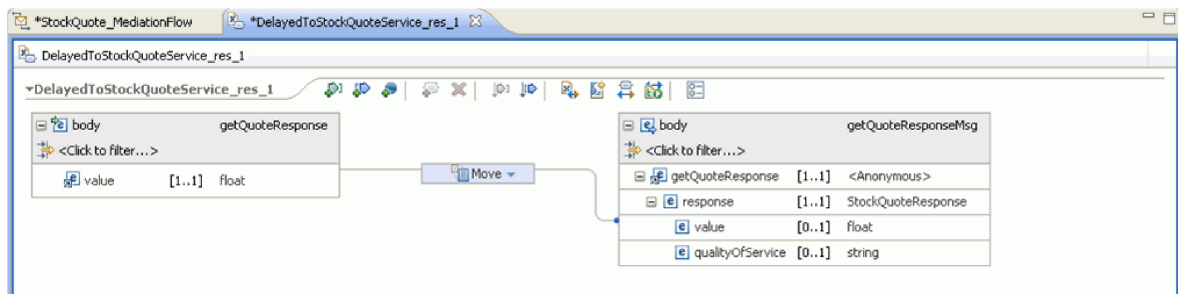
1. Click the **Response** tab to view the response flow.
2. Select an **XSL Transformation** primitive from the Transformation folder in the palette, drop it onto the response flow canvas, and rename it `DelayedToStockQuoteService`.
3. Select another **XSL Transformation** primitive, drop it onto the response flow canvas, and rename it `RealtimeToStockQuoteService`.
4. Select a **Message Element Setter** primitive from the Transformation folder, drop it onto the canvas, and rename it `SetQualityOfService`.
5. Select a **Fail** primitive from the Error Handling folder, drop it onto the canvas and rename it `DelayedStockQuoteFail`. Add another **Fail** primitive to the canvas and rename it `RealtimeStockQuoteFail`.
6. Before you proceed to wire the primitives, right click the canvas and make sure that the **Automatic Layout** option is on.
7. Wire the primitives:
 - The output terminal of `getQuote : DelayedServicePortTypePartner` to the input terminal of `DelayedToStockQuoteService`
 - The output terminal of `getQuote : RealtimeServicePortTypePartner` to the input terminal of `RealtimeToStockQuoteService`
 - The output terminal of `DelayedToStockQuoteService` to the input terminal of `SetQualityOfService`
 - The output terminal of `RealtimeToStockQuoteService` to the input terminal of `SetQualityOfService`
 - The output terminal of `SetQualityOfService` to the input terminal of `getQuote : StockQuoteService`

- The fail terminal of **getQuote : DelayedServicePortTypePartner** to the input terminal of **DelayedStockQuoteFail**
- The fail terminal of **getQuote : RealtimeServicePortTypePartner** to the input terminal of **RealtimeStockQuoteFail**

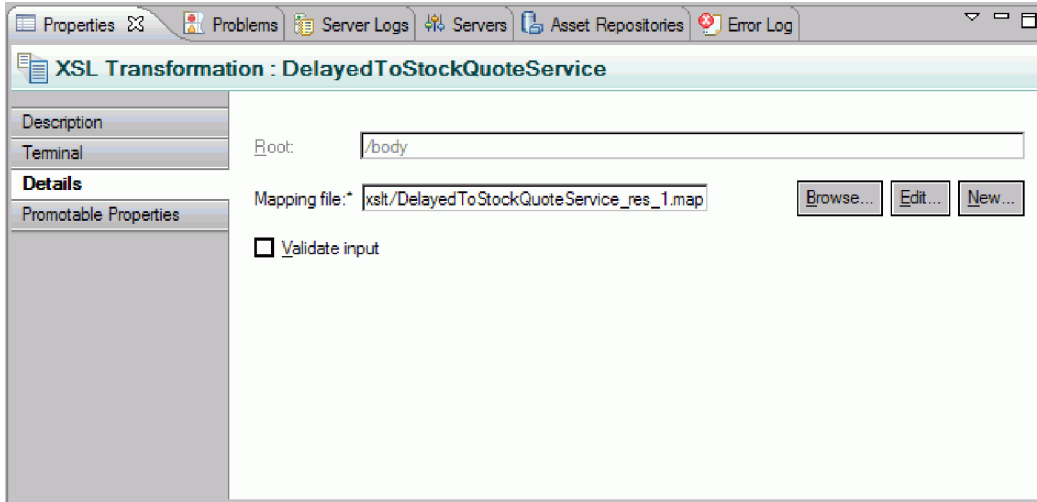
The wired response flow should look like this:



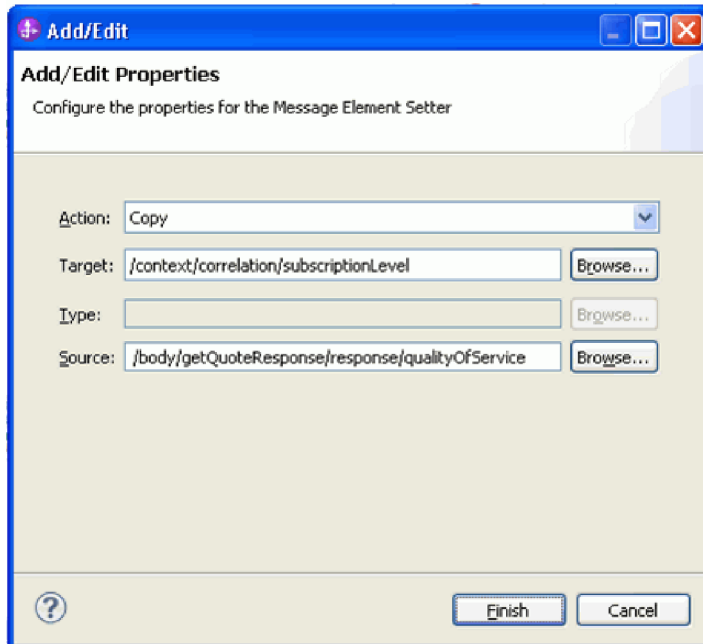
8. Set the properties for the XSLT primitive **DelayedToStockQuoteService**:
 - a. Select the **DelayedToStockQuoteService** primitive in the response flow canvas and double-click it.
 - b. The New XML Mapping wizard opens. Click **Next** to see the root, input, and output message types that will be mapped. Accept the defaults and click **Finish**.
 - c. In the input object section (left side) of the map editor, expand **body**. In the output object section (right side), expand **body** > **getQuoteResponse** > **response**.
 - d. Click value on the left side and drag it to value on the right side to wire them and create the mapping.
 - e. Save your changes and close the map editor.



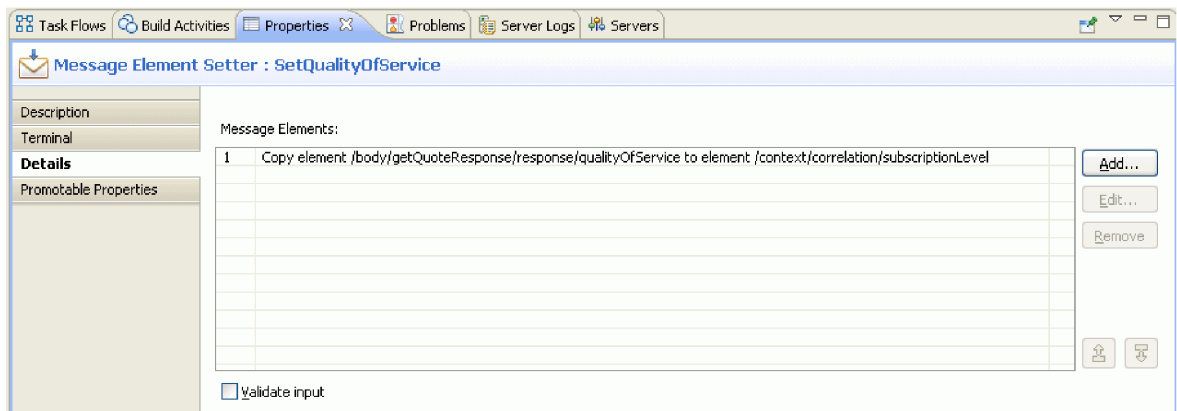
The mapping file is displayed in the Details tab of the Properties view.



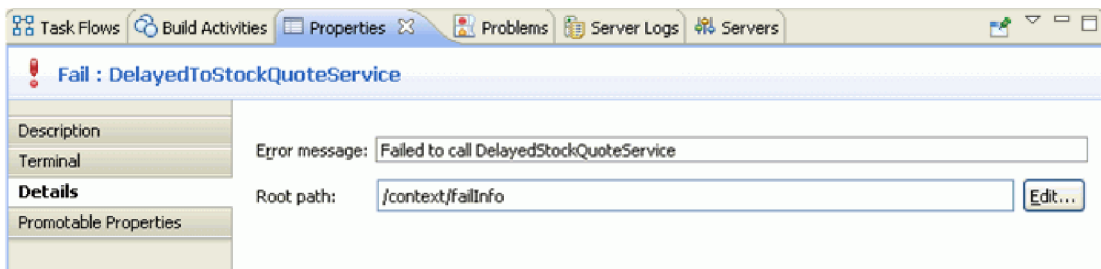
9. Similarly, set the properties for the XSLT primitive `RealtimeToStockQuoteService`:
 - a. Select the `RealtimeToStockQuoteService` primitive in the response flow canvas and double-click it.
 - b. The New XML Mapping wizard opens. Click **Next** to see the root, input, and output message types that will be mapped. Accept the defaults and click **Finish**.
 - c. In the input object section (left side) of the map editor, expand **body**. In the output object section (right side), expand **body > getQuoteResponse > response**.
 - d. Click value on the left side and drag it to value on the right side to wire them and create the mapping.
 - e. Save your changes and close the map editor. The mapping file and associated XSL style sheet are displayed in the Details tab of the Properties view.
10. Set the properties for the Message Element Setter primitive `SetQualityOfService`:
 - a. Select the `SetQualityOfService` primitive in the response flow canvas. Switch to the **Details** tab in the Properties view.
 - b. Click **Add...** to start the Add/Edit Properties wizard.
 - c. From the Action dropdown select **Copy**. For Target select **Browse**, which will bring up the XPath Expression Builder.
 - d. In the Data Types Viewer, expand **ServiceMessageObject > body > getQuoteResponse > response : StockQuoteResponse**, and select **qualityOfService**. The XPath expression is shown in the expression field. Click **OK**.
 - e. For the Source field select **Browse**. In the Data Types Viewer, expand **ServiceMessageObject > context > correlation** and select **subscriptionLevel**. The XPath expression is shown in the expression field. Click **OK**. In the Add/Edit window, click **Finish**.



The target, type and value columns of the table are populated in the first row as shown. To edit them later, select the row and click **Edit...**



11. For the two Fail primitives:
 - a. Right click **DelayedStockQuoteFail** and select **Show in Properties**. Click **Details** and in the Error message field enter Failed to call DelayedStockQuoteService.



- b. For **RealtimeStockQuoteFail** enter Failed to call RealtimeStockQuoteService in the Error message field.

12. Save the flow by pressing **Ctrl-S**.

Chapter 5. Run the sample

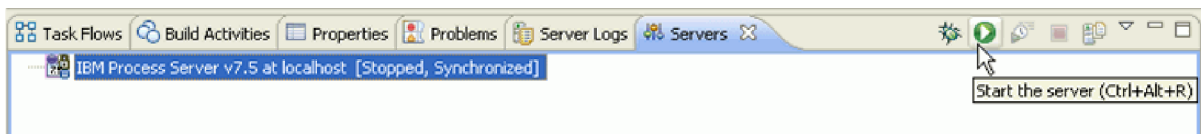
After you build or import the sample, you can test the StockQuote application in the integrated test client or the debugger.

The Stock Quote sample includes some runtime components; a real-time Web service and a delayed Web service that generate quotes randomly for the symbol specified in the test client, and a Derby database that has preloaded customer data. Before you test the sample, you must run scripts to install the runtime components; You only need to run the scripts once. Then, to run the sample, add the StockQuoteApp project to the server and launch the test client.

Install the runtime components

To run the script that installs the customer database and back-end on the server, complete the following steps:

1. Switch to the Server view. If only one server profile is installed (IBM Process Server or WebSphere ESB Server), right-click on the server and select **Start** to start the server. If both server profiles are installed, choose one of them.



- Note:** If you do not see a server in the Server view, it is likely that you did not install the WebSphere Test Environment. Run the product launchpad to install the WebSphere Test Environment.
2. You will now install the runtime components used in this sample. When the server has started successfully, open a command prompt and switch to *Install Shared Resources Directory*/plugins/com.ibm.wbit.samples.content/artifacts/stockquote/bin/. **Note:** You may find multiple versions of the com.ibm.wbit.samples.content in your install. Always choose the one with the highest version number since it will be the latest one.
 3. Run one of the following commands:
 - If you started IBM Process Server: *Installation Directory*/runtimes/bi_version_number/bin/wsadmin -f wid-install.jacl -profileName *wps_profile_name* -username *username* -password *password*
 - If you started WebSphere ESB Server: *Installation Directory*/runtimes/bi_version_number/bin/wsadmin -f wid-install.jacl -profileName *esb_profile_name* -username *username* -password *password*

Keep the command prompt open as you will need it again.

Trouble shooting tips

- If your installation directory has a space in it, you will see an error when you run the command. For example, if your installation directory is d:\Program Files, you will see this error:
'D:\Program' is not recognized as an internal or external command, operable program or batch file.

Put double quotes around the command, as follows:

```
"D:\Program Files\IBM\WID7_WTE\runtimes\bi_v7\bin/wsadmin"
-f wid-install.jacl -profileName qwps -username admin -password admin
```

- The default user is "admin" and the default password is "admin".
- The default IBM Process Server profile name is qwps.
- The default WebSphere ESB server profile name is qesb.

- To see the profile name of your server in IBM Integration Designer, switch to the servers view, right click the server and select **Manage Server Profiles**.
4. When the script has finished successfully it will display the port number of the server on which it was installed. The port number should be 9080 as shown in the following image.

```

G:\ Command Prompt
erver repository.
ADMA5053I: The library references for the installed optional package are created
.
ADMA5005I: The application $QSample is configured in the WebSphere Application S
erver repository.
ADMA5001I: The application binaries are saved in D:\Program Files\IBM\WID61\pf\w
ps\wstemp\Script11851898e2b\workspace\cells\widCell\applications\QSample.ear\SQ
Sample.ear
ADMA5005I: The application $QSample is configured in the WebSphere Application S
erver repository.
SECJ0400I: Successfully updated the application $QSample with the appContextIDFor
Security information.
ADMA5011I: The cleanup of the temp directory for application $QSample is complet
e.
ADMA5013I: Application $QSample installed successfully.

SAMP INFO: The install command for ESBSample completed successfully.

-----
Save
-----

-----
Summary
-----

+++++
Port number is 9080.
+++++

The install command succeeded for the following Samples:

    ESBSample

All commands ran successfully.

```

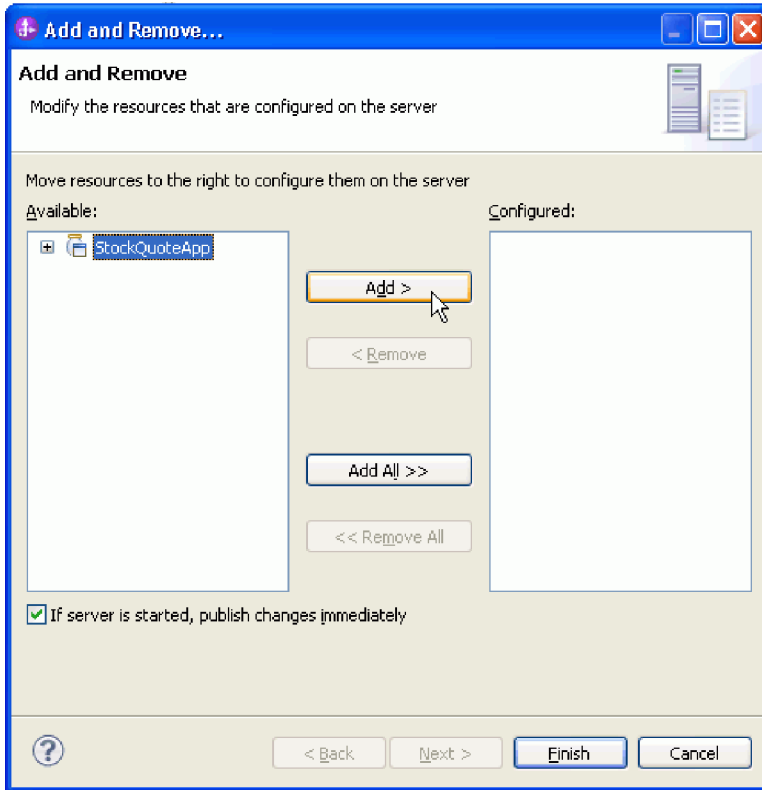
If the port number is 9080 as shown, you can skip the following steps.

5. If the port is different from 9080 we have to ensure that the Stock Quote application looks for the database on the correct port. This will affect the imports. To change the port:
 - a. Open the Assembly Diagram of the Stock Quote module.
 - b. Select the DelayedService import and in the Properties view, click **Binding**.
 - c. The Address text box will contain something similar to **http://localhost:9080/DelayedService/services/DelayedServiceSOAP**.
 - d. Overwrite "9080" with the port number displayed when you ran the script.
 - e. Follow the previous steps for the RealtimeService import and then save your module.
6. Restart the server after the script has been installed successfully by right-clicking it, selecting **Restart**.

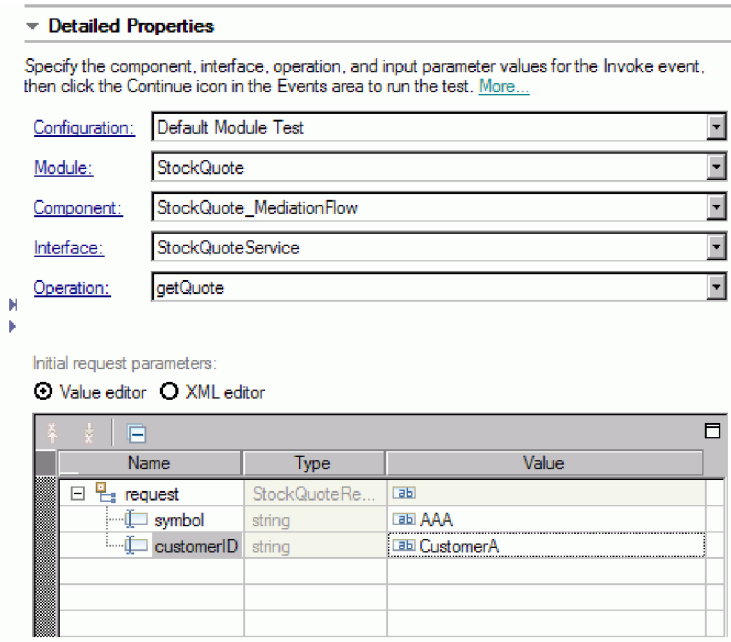
Test the mediation flow


After running the script, you have to add the StockQuoteApp to the running server. Then, you can test your mediation flow in the test client.

1. To add the StockQuoteApp project to the server, right-click on the server and select **Add and remove project...** Select the StockQuoteApp project from the Available projects list and click **Add >** to add it to the Configured projects list. Click **Finish** and wait for the server to finish publishing.



2. Open the Assembly Diagram of the StockQuote mediation module. Then right-click on the StockQuote_MediationFlow component and select **Test Component**. The Events page of the integrated test client opens.
3. In the Events page, you can select the modules, components, interfaces and operations you wish to test. For this sample, ensure the Detailed Properties are:
 - Configuration: **Default Module Test**
 - Module: **StockQuote**
 - Component: **StockQuote_MediationFlow**
 - Interface: **StockQuoteService**
 - Operation: **getQuote**
4. In the Initial request parameters table, you enter information by double clicking the cell in the value column. Double-click the value cell in the **symbol** row and enter **AAA**. In the same manner, enter **CustomerA** for the customerID.



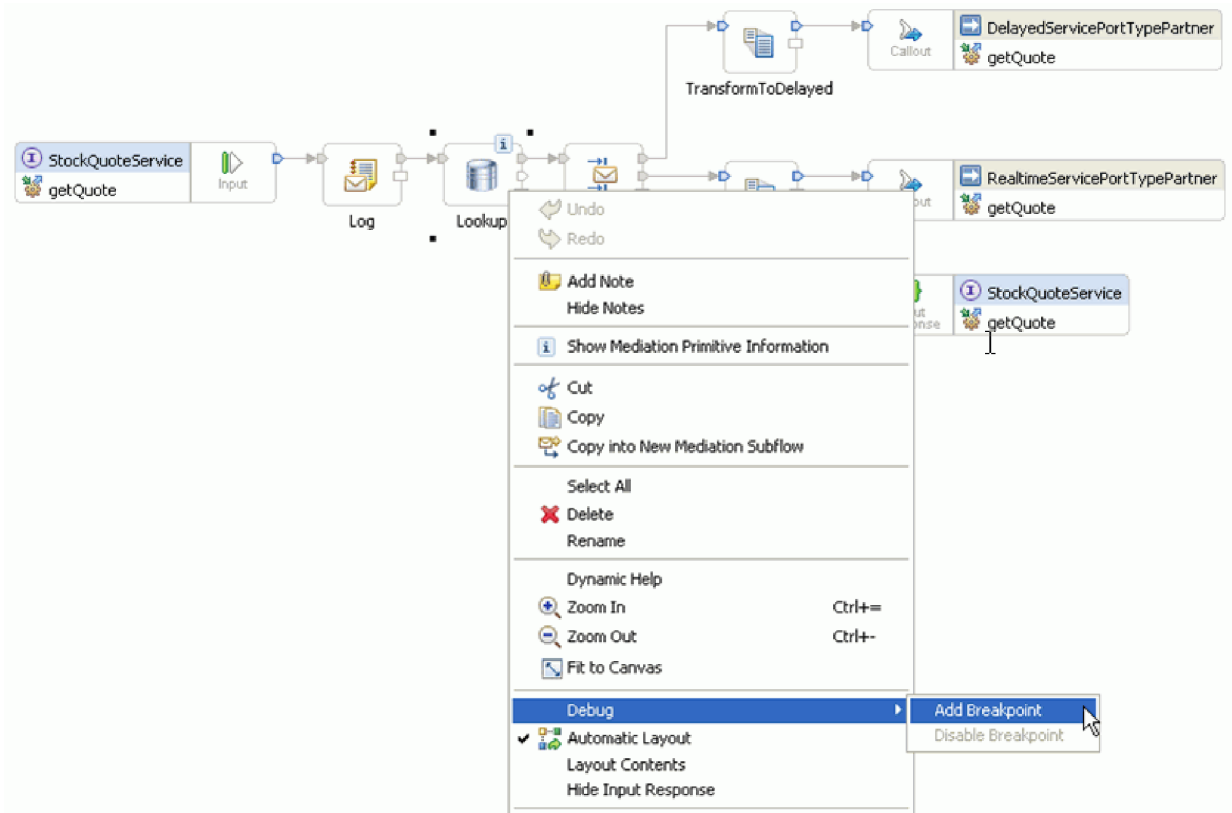
5. Next, push the **Continue** button  to invoke the getQuote operation. The Deployment Location dialog opens.
6. Select a server and click **Finish**. You can run mediation flows on either IBM Process Server or WebSphere Enterprise Service Bus. Enter the User ID and password for your server. The default is admin/admin.
7. You will see the resulting values for qualityOfService and value in the return parameters.
8. If the application does not run successfully, try the following:
 - If you see a service runtime exception, check that the web service application is started. In the Servers view, select the server, right click and select **Run Administration Console** and log in. In the list of running applications under **Applications > Enterprise Applications**, check the status of the SQSample application and start the application if necessary.
 - If you see an error indicating that the module StockQuote cannot be found, make sure the StockQuoteApp application is running, by following the instructions provided above.

Debug the mediation flow

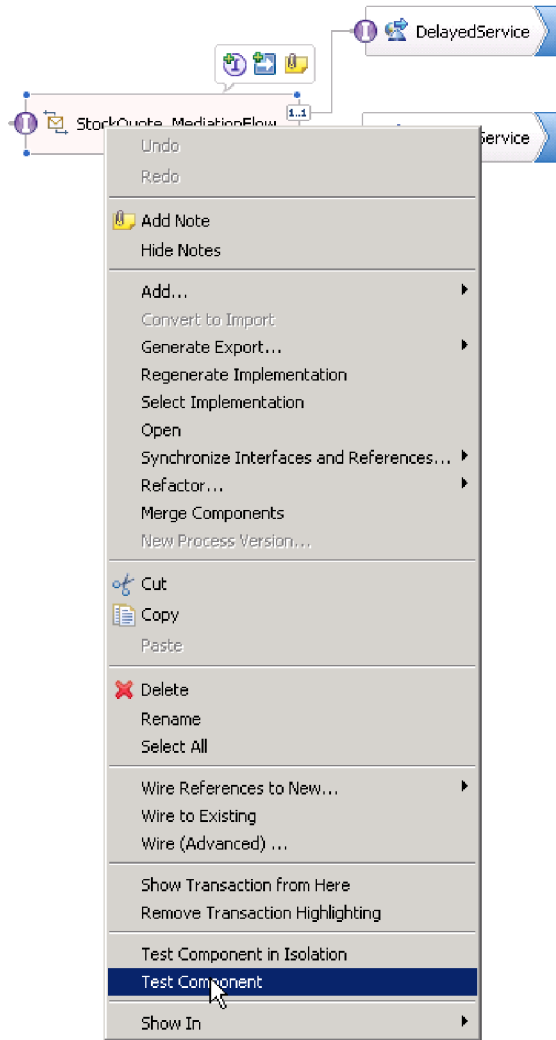
Debug the StockQuote_MediationFlow component in the unit test environment by using the integration debugger.

The Instructions below assume that the runtime components have ready been installed. See “Install the runtime components” on page 29 for information on how to install these components.

1. To add a breakpoint to a mediation primitive, right-click on the primitive node in the request or response flow canvas, and select **Debug > Add Breakpoint**. Notice that a small blue icon is added to the top left-hand corner of the node, indicating that a breakpoint has been added to it.

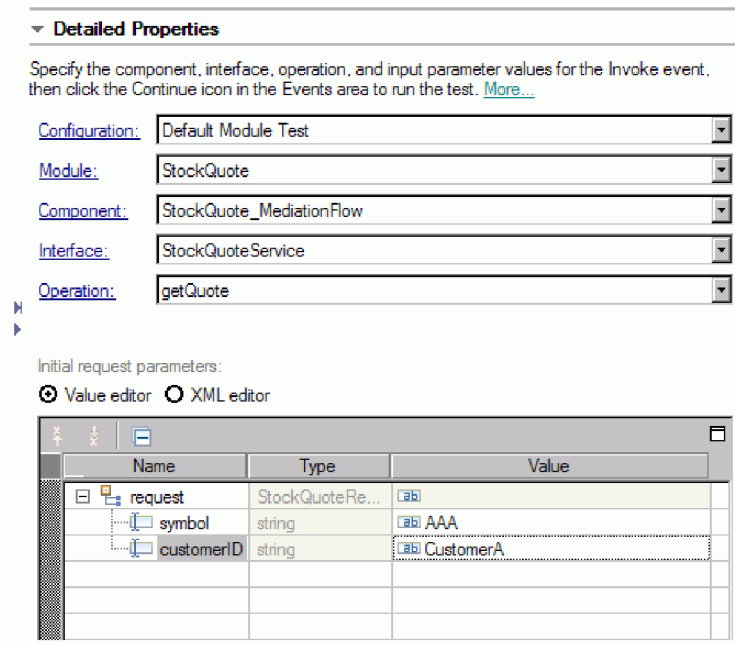




2. Select a server, right-click and click on it and select **Restart in Debug** to restart the server in Debug mode. Note that if the server is already started, you must stop and start the server again in Debug mode.
3. When the server has started, open the Assembly Diagram of the StockQuote mediation module. Then right-click on the StockQuote_MediationFlow component and select **Test Component**.



The Unit Test Environment opens.

4. In the Unit Test Environment you can select the modules, components, interfaces and operations you wish to test. For this sample, ensure the Detailed Properties are:
 - a. Configuration: **Default Module Test**
 - b. Module: **StockQuote**
 - c. Component: **StockQuote_MediationFlow**
 - d. Interface: **StockQuoteService**
 - e. Operation: **getQuote**
5. In the Initial request parameters table, you enter information by double clicking the cell in the value column. Double-click the value cell in the **symbol** row and enter **AAA**. In the same manner, enter **CustomerA** for the customerID.



6. Next, push the **Continue** button . The Deployment Location dialog opens.
7. Select the server you started in Debug mode earlier and click **Finish**. Enter the User ID and password for your server. The default is admin/admin. When the flow reaches a breakpoint, you are prompted to open the Debug perspective. Click **Yes** to open the perspective.
8. You can view the values of message elements, paths taken and breakpoints reached in this view. To continue the flow through to the end or to the next breakpoint click the **Resume** button .

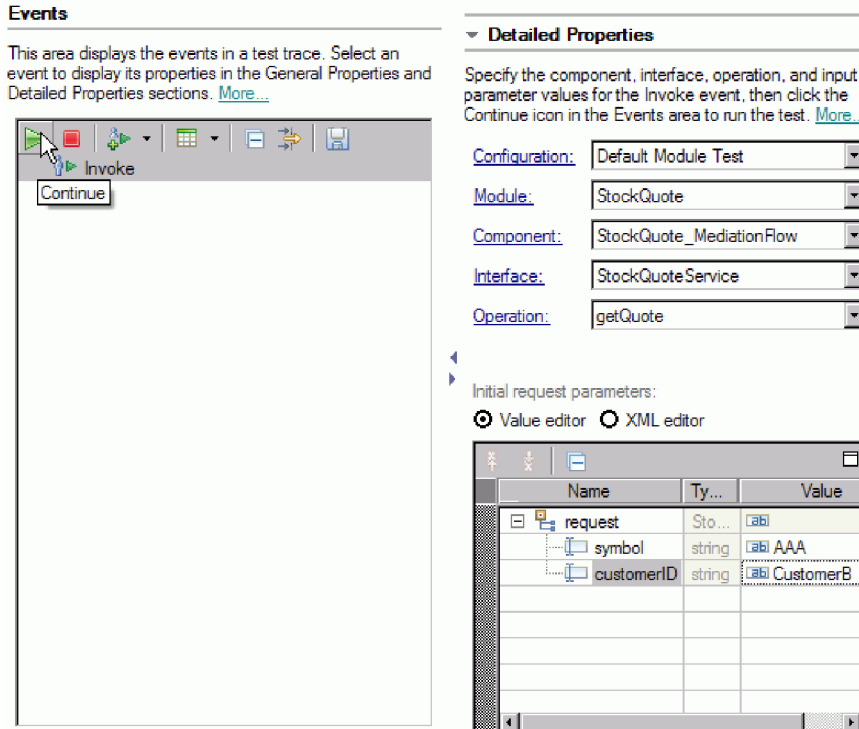
Change the quality of service at runtime

When we built the sample, we promoted the Filter pattern property, to allow us to change the value of the property at runtime. Now, we will change the value of the Filter pattern property in the unit test environment's administrative console, which will cause the request to be sent to a different service. We will view the result in the test client emulator.

To perform the actions described in this task, the server scripts must be run to install the runtime components. For instructions, see “Install the runtime components” on page 29.

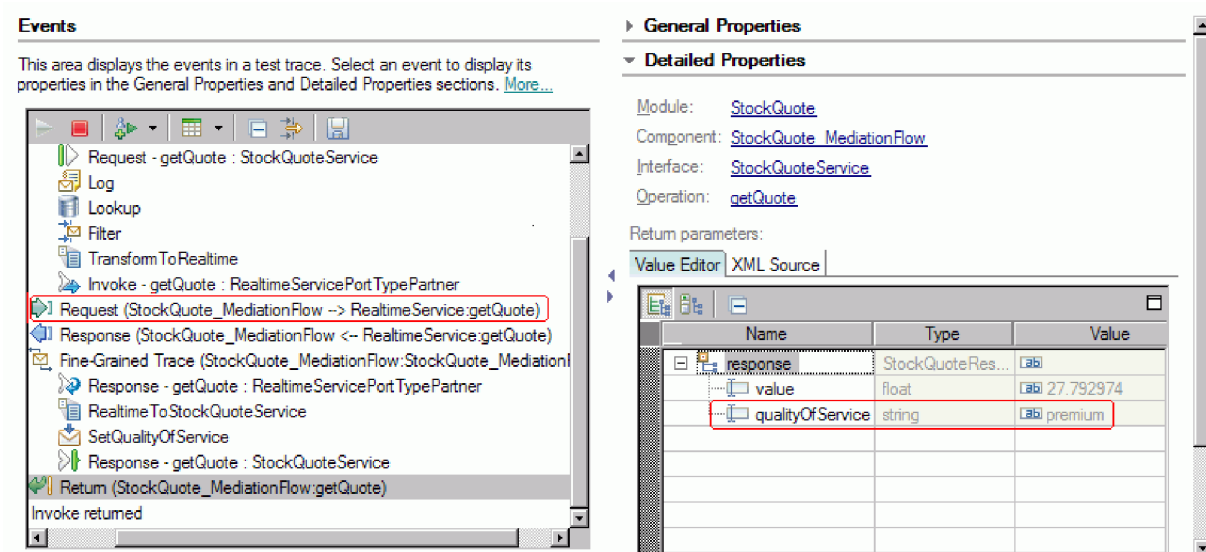
Open the StockQuote assembly diagram, and follow these steps to test the promoted property of the Filter primitive:

1. Right-click StockQuote_MediationFlow and select **Test Component**.
2. In the Events page, enter these initial request parameters, and click **Continue**.
 - For symbol, enter AAA.
 - For customerID, enter CustomerB.



3. Select the server for the unit test environment. Click **Finish** and enter the username and password to login to the server. The default is admin\admin.

The results in the emulator show that the service invoked is RealtimeService. You can also see the value of the qualityOfService string which tells you that this customer's service level is premium.



4. Switch to the Servers view. Right-click the server, and select **Administration > Run administrative console**. In the log in window, enter your userid and password (the default is admin/admin). Click **Log in**.
5. In the administrative console, expand **Applications** and click **SCA modules**.
6. In the list of applications, click **StockQuote**.

Integrated Solutions Console Welcome admin Help | Logout

View: All tasks

SCA modules

SCA modules

This page shows all installed Service Component Architecture (SCA) modules and their associated applications. SCA modules encapsulate services, so you can make changes to services without affecting users of the service. To use the SCA module services you start the associated application.

Preferences

Start Stop

Select	Module	Application	Status
<input type="checkbox"/>	BFMIF_widNode_server1	BPEContainer_widNode_server1	➔
<input type="checkbox"/>	HTMIF_widNode_server1	TaskContainer_widNode_server1	➔
<input type="checkbox"/>	StockQuote	StockQuoteApp	➔

Total 3

7. Click **Module Properties**.

Integrated Solutions Console Welcome admin Help | Logout

View: All tasks

SCA modules

SCA modules > StockQuote

Use this page to configure the details of an SCA module. A SCA module is connected to service requesters through exports and to service providers through imports. Both imports and exports have interfaces, which are abstract definitions defining access points.

Configuration

General Properties

Module:

Application name:

Description:

Module components

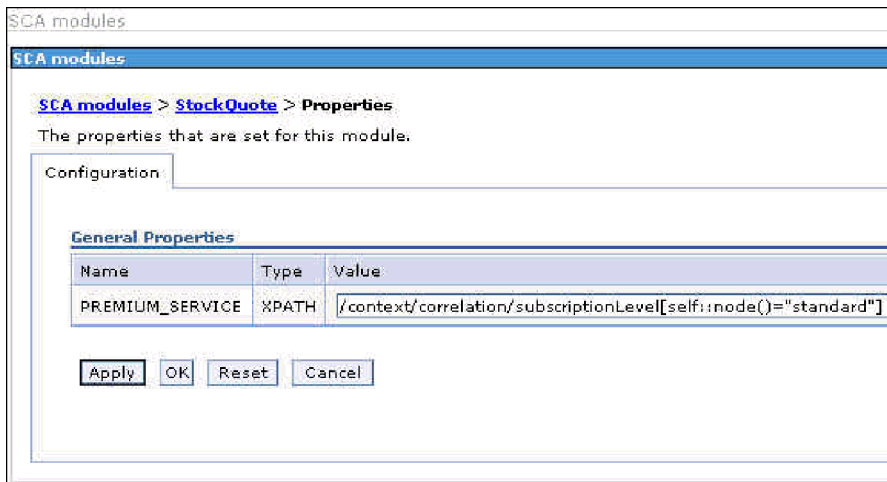
Imports

Exports

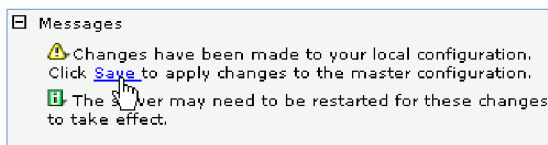
Additional Properties

- [Business processes](#)
- [Module properties](#)
- [Human tasks](#)

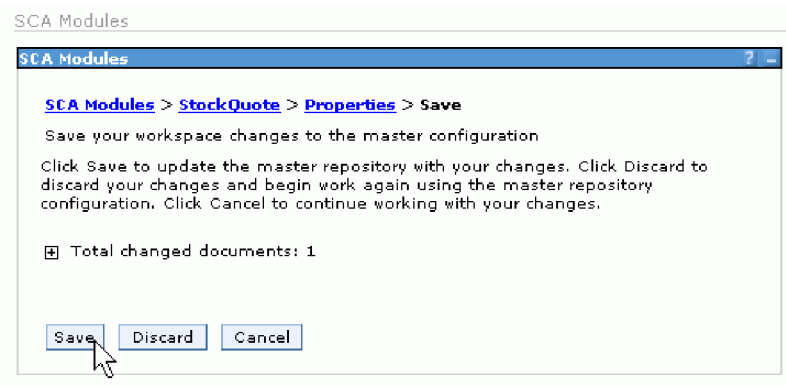
8. The property that we promoted earlier is displayed, showing the alias PREMIUM_SERVICE. Click the value field of PREMIUM_SERVICE, and change "premium" to "standard". Click **Apply**.



9. In the messages window, click **Save**.



10. In the SCA Modules window, click the **Save** button.



11. Switch to the Events page of the test client. Click Invoke  on the upper left side of the page.

12. Keep AAA as the symbol value, and enter CustomerB, the premium service customer, as the customerID value. Click **Continue**

The results in the Events area show DelayedService as the invoked service.

Events

The Events window displays a tree view of events for the 'getQuote' operation. The events are as follows:

- Invoke (StockQuote_MediationFlow:getQuote)
 - Invoke started
 - Invoke returned
- Invoke (StockQuote_MediationFlow:getQuote)
 - Invoke started
 - Invoke (StockQuote_MediationFlow:getQuote)
 - Request (StockQuote_MediationFlow --> DelayedService:getQuo) - **Highlighted with a red box**
 - Response (StockQuote_MediationFlow <-- DelayedService:getQuo)
 - Return (StockQuote_MediationFlow:getQuote)
 - Invoke returned

General Properties

Detailed Properties

Module: [StockQuote](#)
Component: [StockQuote_MediationFlow](#)
Interface: [StockQuoteService](#)
Operation: [getQuote](#)

Return parameters:

Name	T...	Value
response	Stoc...	✓
value	float	✓ 30.64931
qualityOfService	string	✓ premium

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