JDBC Adapter: Using WebSphere Business Monitor to monitor a database

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Chapter 1. Introduction

To help you understand how to monitor operations in business applications using WebSphere adapters, this sample provides a monitor model that is generated from a Service Component Architecture (SCA) interface operation and mediation flow, and is then completed in the Monitor development tooling. The sample showcases an SCA entry event with payload coming from a source WebSphere adapter.

Printable version of this tutorial

For this sample, an inbound interface operation and mediation flow for a Java Database Connectivity (JDBC) adapter is created in IBM® WebSphere® Integration Developer v6.1. A monitor model is generated from this operation and mediation flow. This monitor model is augmented to calculate metrics, and is then deployed.

The module used in this sample is the MonitorAdapter module. All project interchange (PI) files are available in a .zip file called MonitorAdapter.zip. You can import the MonitorAdapter.zip file into WebSphere Integration Developer and review the module, the generated events, and the augmented monitor model. You can then test the monitor model using db2 commands. This sample describes the steps necessary to implement the solution, the PI file is not required unless you want to skip the implementation of the solution (see Appendix A for instructions on how to import the completed solution provided by the PI file).

This sample uses the WebSphere Integration Developer test environment to test the adapter/mediation flow and the monitor model. Both the adapter / mediation application and the monitor model application are deployed to the WebSphere Business Monitor v6.1 Server for WebSphere Enterprise Service Bus test server. The WebSphere Business Monitor test server could also be based on WebSphere Process Server.

You must have the following software to run this sample:

- WebSphere Integration Developer v6.1—the runtime test environment for WebSphere Enterprise Service Bus or WebSphere Process Server must be installed.
- WebSphere Business Monitor v6.1—toolkit installation including the model editing tooling and the Monitor server based on WebSphere Enterprise Service Bus or WebSphere Process Server. This sample assumes the use of a Monitor server on WebSphere Enterprise Service Bus.
- DB2 Enterprise Server Edition—This sample was tested using DB2 Enterprise Server Edition 8.2.6.

This documentation has five sections:

- Introduction—this section.
- Overview—Explains the scenario used in this sample, the Data Model, Human tasks and some installation tips.
- Build It Yourself—Step by step instructions to build the sample from scratch.
- Run the Sample— Run the downloaded artifacts, or the artifacts built in the Build It Yourself section.
- Download the Sample—Explains how to install the downloaded prebuilt solutions for this sample.

Chapter 2. Overview

This sample explains the major steps required to build the MonitorAdapter module, generate the monitor model, augment the monitor model, deploy the monitor model, run test data through the adapter to be consumed by the monitor model, and show monitoring results on a dashboard.

Here is a summary of the scenario used in this sample. When a new customer record is added to a database table, a JDBC adapter becomes aware of it and sends customer information to a mediation flow to process. In the monitor model, you define metrics to be set from the data issued by the JDBC adapter, and key performance indicators (KPIs) to be set using metric data. You then build a monitor dashboard to display the metrics and KPIs calculated by the monitor model processing.

- The MonitorAdapter module has two components: JDBCInboundInterface and MediationFlow. After a customer record is added to the database table, the JDBC inbound interface operation is activated to invoke the mediation flow with the payload.
- Based on the SCA operation and mediation flow, a monitor model is generated. In the Monitor Model Editor, you will add metrics to the generated monitor model to monitor the data from the adapter and mediation flow.
- To see the resulting metrics and KPIs, use the Instances view and the Dimensional view in the dashboard.

In this lab, you will create a J2EE application using WebSphere Integration Developer. In the application, the JDBC adapter acts as an event resource to fetch data from a database and then send that data to the mediation flow which emits CBEs containing the business data from the database.

Then you will create a monitor model and define the metrics.

After that you will deploy the application and monitor model to WebSphere Business Monitor test environment server.

You will then use db2 commands to trigger the monitored application to submit events.

Finally, you will configure dashboards in the WebSphere Integration Developer test environment and view the monitored data in several different views.

Chapter 3. Build it yourself

Build the sample, and then test it.

Prerequisite: Ensure that you have installed all the products listed in the Overview section.

Start building the Adapter sample by creating the DB2 resources, the adapter, and the mediation flow for your sample.

Create the DB2 artifacts for the sample

Before creating the module, you must created the DB2 artifacts for the adapter.

Create the DB2 artifacts that you will use for the sample by performing the following steps:

1. Open the DB2 Control Center and right click on **All Databases** and select **Create Database → Standard**.
2. Type ADAPTER for the database name and click **Finish**.
3. Wait for the database to be created the click **No**.
4. Open a DB2 command window and run the following commands:

   ```
   db2 connect to ADAPTER user db2admin using <db2 password>

   db2 -tvf c:\<path>\MonitorAdapter_db2.sql

   db2 disconnect ADAPTER
   ```

   The MonitorAdapter_db2.sql file contains the following information:

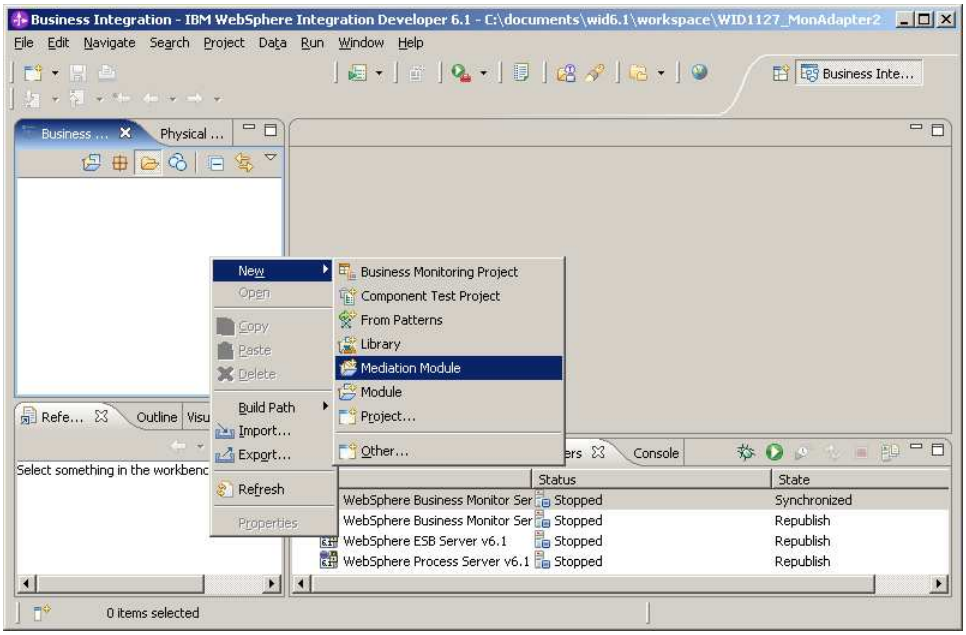
   ```
   CREATE TABLE customer
   (
    pkey  VARCHAR(10) NOT NULL PRIMARY KEY,
    fname  VARCHAR(20),
    lname  VARCHAR(20),
    ccode  VARCHAR(10)
   );

   CREATE TABLE WBIA_JDBC_EventStore
   (
    event_id      INTEGER NOT NULL GENERATED ALWAYS AS IDENTITY (START WITH 1, INCREMENT
    xid    VARCHAR(200),
    object_key     VARCHAR(80)  NOT NULL,
    object_name   VARCHAR(40)  NOT NULL,
    object_function   VARCHAR(40)  NOT NULL,
    event_priority      INTEGER   NOT NULL,
    event_time    TIMESTAMP  default CURRENT TIMESTAMP NOT NULL,
    event_status    INTEGER   NOT NULL,
    event_comment  VARCHAR(100)
   );

   CREATE TRIGGER event_create
   AFTER INSERT ON CUSTOMER REFERENCING NEW AS N
   ```

```
FOR EACH ROW MODE DB2SQL
INSERT INTO wbia_jdbc_eventstore (object_key, object_name, object_function, event_prior
```

Create a new Mediation module for the JDBC adapter

To skip the steps for creating this module, you can import the supplied project interchange file (MonitorAdapter.zip) into WebSphere Integration Developer. Refer to Downloading, then go to Test.

1. Start WebSphere Integration Developer and change the current perspective to Business Integration.
   a. Click **Window** → **Open Perspective** → **Other**.
   b. Select **Business Integration** (default), and click **OK**.
2. Right-click in the Business Integration view, then click **New** → **Mediation Module**.

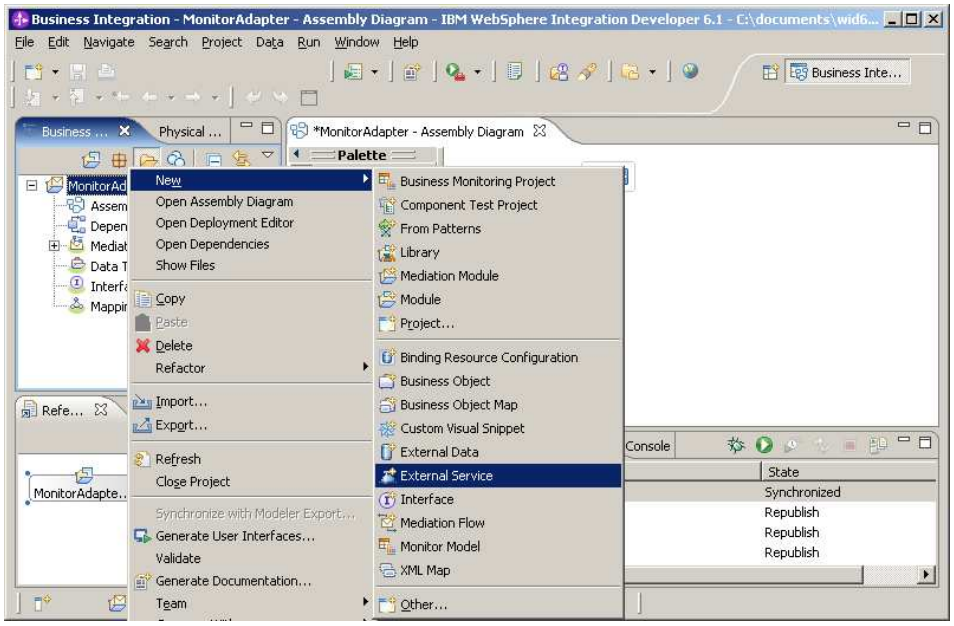


3. Type `MonitorAdapter` for the name of the new mediation module and select **WebSphere ESB Server 6.1** as the target runtime.
4. Click **Finish** to create the new module.

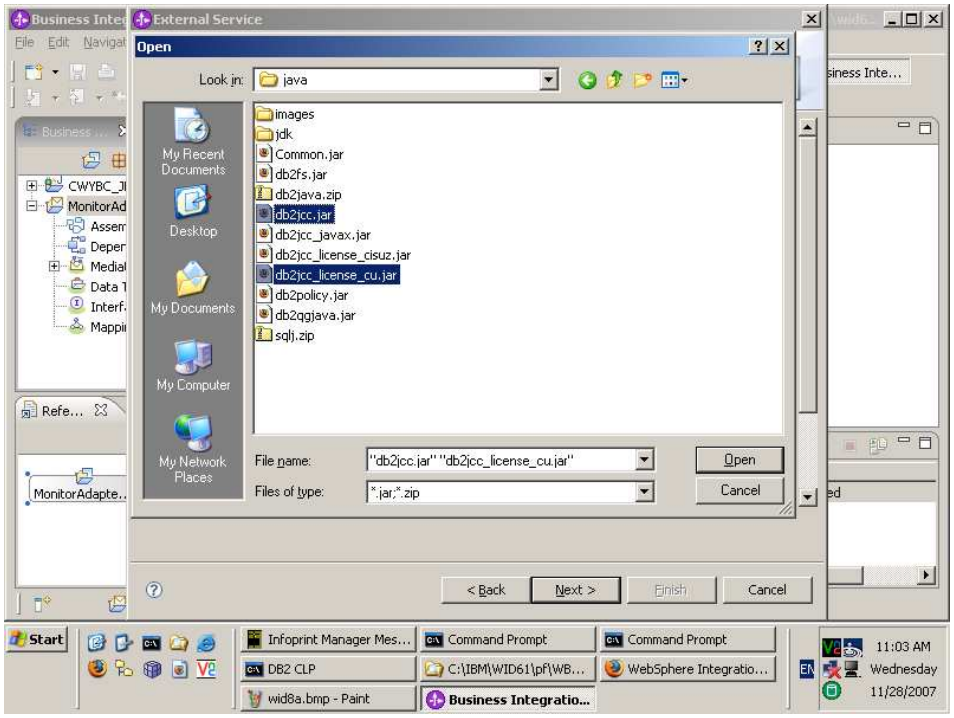
Add the JDBC adapter

Add a JDBC Adapter external service to the mediation module and deploy the mediation module.

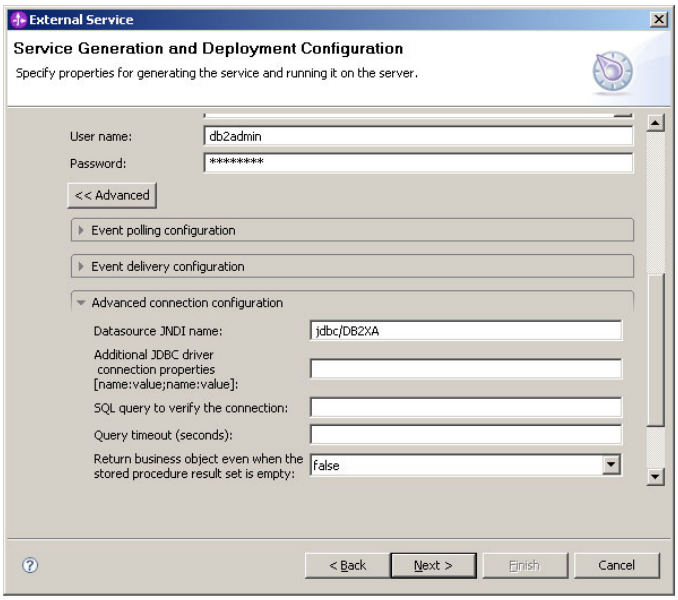
1. Right click **MonitorAdapter** and select **New → External Service**.



2. Select **Adapters** and click **Next**.
3. Select **IBM WebSphere Adapter for JDBC** and click **Next**.
4. Select **WebSphere ESB Server v6.1** for the Target runtime and click **Next**.
5. Click **Add**, locate and select the db2jcc.jar and db2jcc_licence_cu .jar files in the DB2 installation directory and click **Open** to add the JDBC driver jar files and click **Next**.



6. Select **Inbound** and click **Next**.
7. Select **DB2 UDB → V8.2** from the database list and type `ADAPTER` for the database, type the DB2 admin user name and password.
8. Click **Next**, then click **Run Query** to find the table lists. Select **DB2ADMIN → Tables → CUSTOMER** and click **>** to add CUSTOMER to the Selected objects list. Click **Next**.
9. Click **Next**.
10. In the Service Generation and Deployment Configuration window, enter the following values:
    a. For **J2C Authentication Data Entry**, type `<NodeName>/JDBCAdapter/inbound`, where <*NodeName*> is the node name of the WebSphere Application Server that will run the MonitorAdapter module. The node name for the Monitor Server on WebSphere ESB defaults to WBMonSrv_esb_Node.
    b. Enter the password for the DB2 Admin User name.
    c. Click **Advanced** and expand **Advanced connection configuration** and type `jdbc/DB2XA` as the Datasource JNDI name. You will create this datasource later.

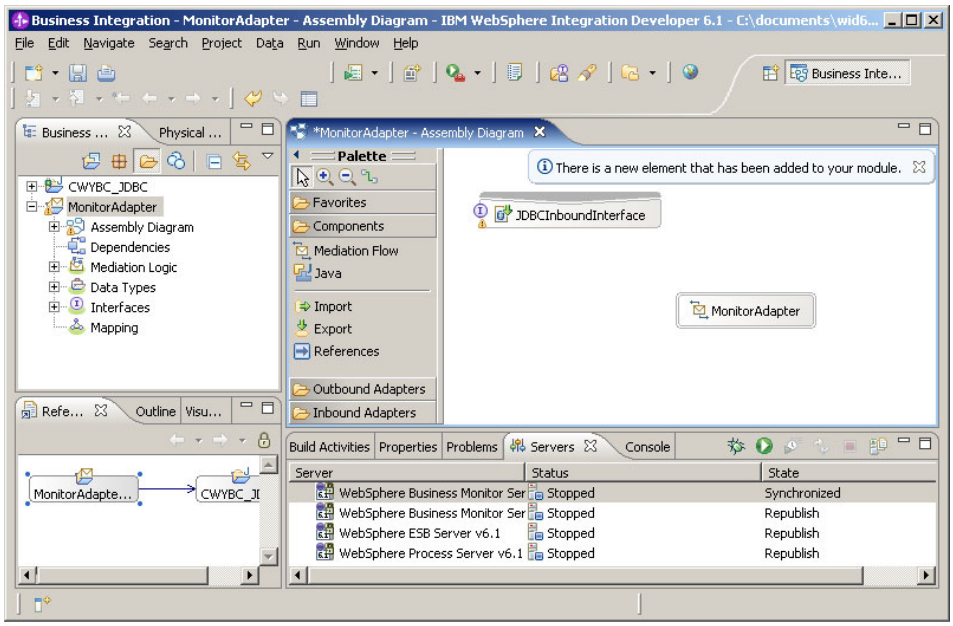


11. Click **Next** and then click **Finish**.

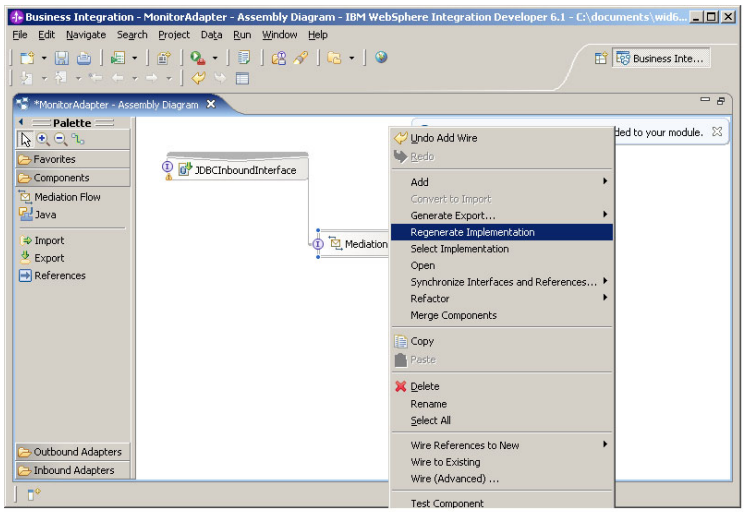
Create the mediation flow

Now create the mediation flow.

1. The Assembly Diagram editor is open. There are two elements: JDBCInboundInterface, which was created when you added the adapter, and MonitorAdapter, which was created when the module was initially created.

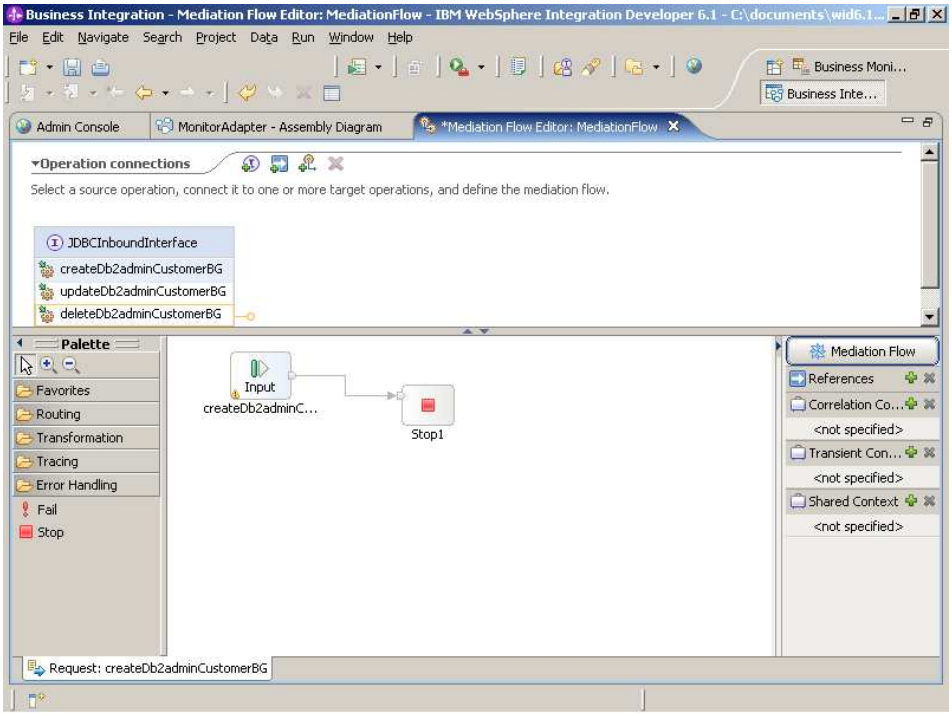


2. Right-click **MonitorAdapter** and select **Rename**. Type `MediationFlow` and press Enter.
3. In the diagram, link **JDBCInboundInterface** to **MediationFlow** using the Wire tool. In response to the prompt, click **OK**.
4. Change back to the Selection tool on the Palette and then right-click **MediationFlow** and select **Regenerate Implementation**.

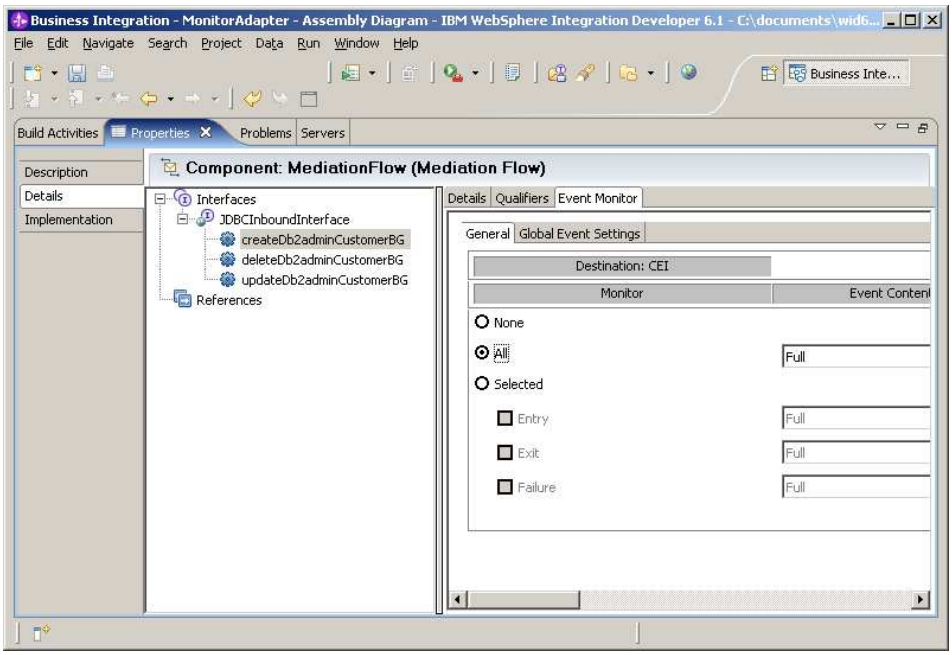


5. Click **OK** at the prompt.

6. In the Mediation Flow Editor window, click **createDb2adminCustomerBG** and you see a source operation for createDb2adminCustomerBG.
7. In the flow, right-click and select **Add** → **Stop** .
8. Connect the out terminal of **createDb2adminCustomerBG** to the input terminal of **Stop1**.



9. Save the Mediation and then click **MonitorAdapter:Assembly Diagram**.
10. Click **MediationFlow** and in the **Properties** tab select **Details**. Go to**Interfaces** → **JDBCInboundInterface** → **createDb2adminCustomerBG** and click the **Event Monitor** tab. Select **All for Monitor** and select **Full for Event Content**.

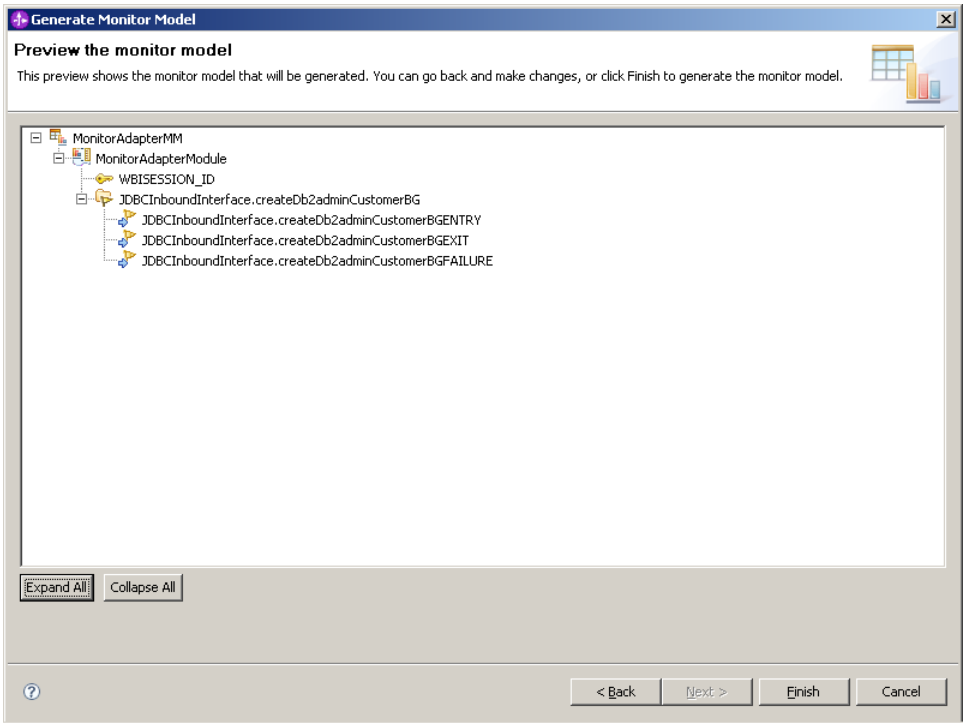


11. Click the **Global Event Setting** tab. The default event format is WebSphere Business Monitor 6.1 format.
12. Save the assembly diagram.

Generate a monitor model from the MonitorAdapter module

You will use the WebSphere Business Monitor tooling in WebSphere Integration Developer to generate a starter monitor model from the MonitorAdapter module and then you will use the Monitor Model Editor in WebSphere Integration Developer to enhance the monitor model.

1. Right-click **MonitorAdapter** and select **Monitor Tools → Generate Monitor Model**.
2. Click **New project**.
3. For the name of the new business monitoring project, type `MonitorAdapterBM`. Click **Finish**.
4. For the name of the monitor model name, type `MonitorAdapterMM`. Click **Next**.
5. Select **JDBCInboundInterface.createDb2adminCustomerBG** and click **Emitted Events**.
6. Click **Select All** and then click **Next**. Click **Next** again.
7. Click **Expand All** to see the elements of the Monitor model. Click **Finish**.

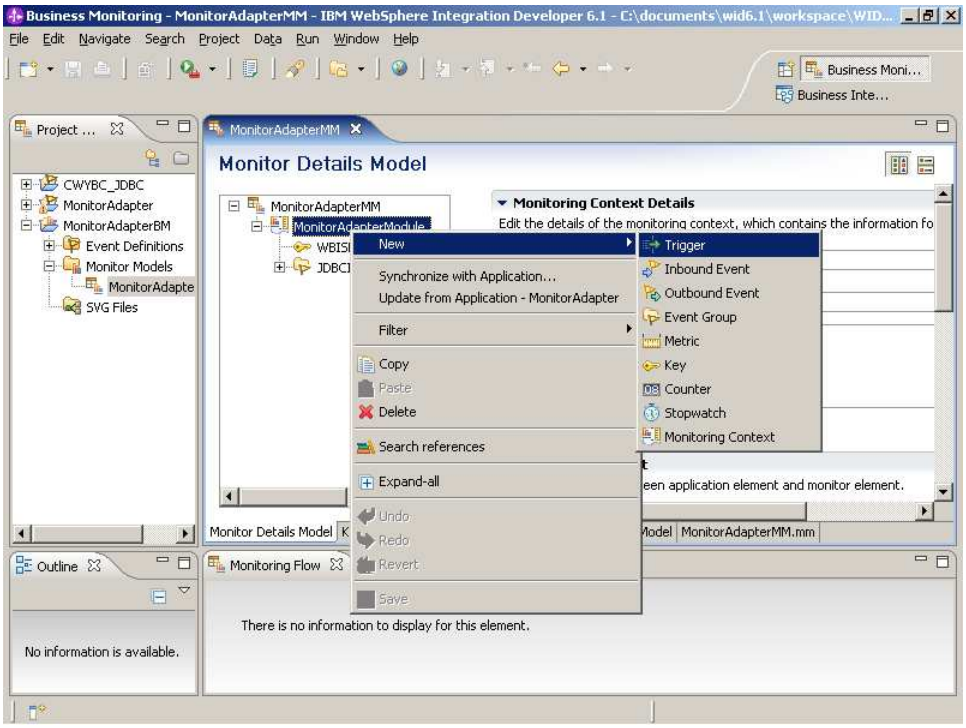


8. Click **Yes** to go to the Business Monitoring perspective.
9. For this sample, click **No** for the getting started information.

Add trigger and metrics to the monitor model

Add a trigger and metrics to the model so that it can be tested later.

1. Right-click **MonitorAdapterModule** and select **New → Trigger.**



2. For Name, type `JDBCInbound Entry Trigger` and then click **OK**.
3. On the right panel, click **Add**. Select **JDBCInboundInterface.createDb2adminCustomerBGEntry** and then click **OK**.
4. Add the FName metric using the following steps:
   a. Right-click **MonitorAdapterModule** and select **New-> → Metric**.
   b. For the Name, type `FName Metric`. Click **OK**.
   c. On the right panel, click **Add** under Metric Value Expressions.
   d. Click in the space under Trigger. Click **...** and select **JDBCInbound Entry Trigger**. Then click **OK**.
   e. Click in the space under Expression and press **Ctrl+Spacebar** to use the content assist function. Go to **MonitorAdapterMMMonitorAdapterModuleJDBCInboundInterface.createDb2adminCustor Db2adminCustomer:Db2adminCustomer**.
   f. Double click **fname**. The FName Metric is finished and will be assigned the fname from the service data object received from the adapter.
5. Add the LName Metric with JDBCInbound Entry Trigger and expression using the same process.`JDBCInboundInterface.createDb2adminCustomerBGENTRY.createDb2AdminCustomerInput:D`
6. Add CCode Metric with JDBCInbound Entry Trigger and expression `JDBCInboundInterface.createDb2adminCustomerBGENTRY.createDb2AdminCustomerInput:Db2Admin` Select **A value is required for this metric** and type `'notspecified'` for the Default Value.
7. Add Is Gold Customer Metric. Set the type to Boolean with the trigger JDBCInbound Entry Trigger and the following expression:

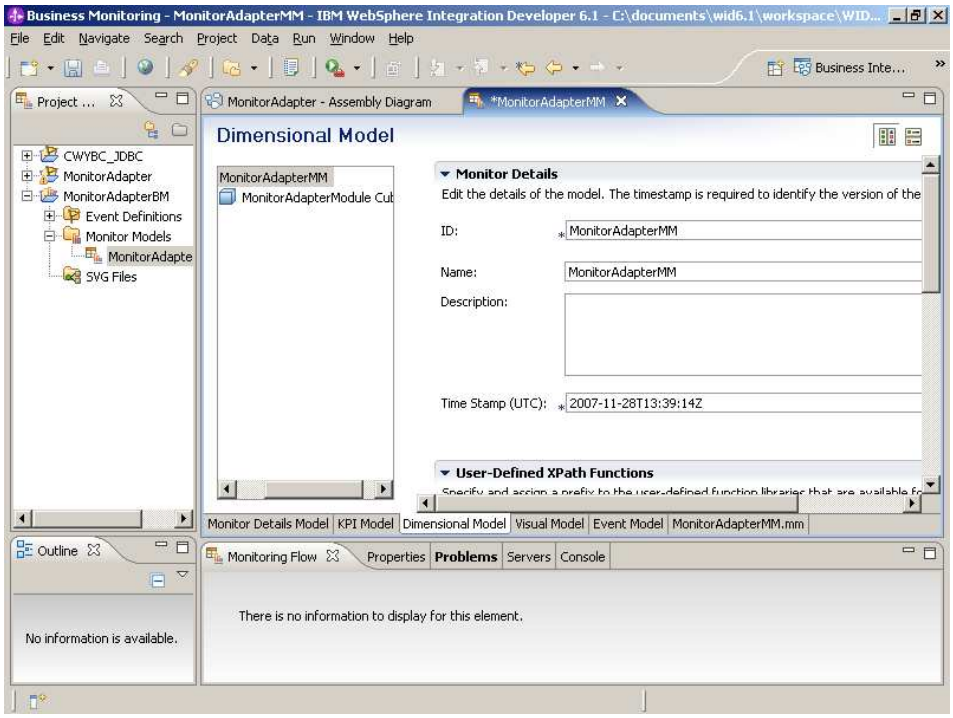
```
if (JDBCInboundInterface.createDb2adminCustomerBGENTRY/
createDb2adminCustomerBGInput/Db2adminCustomer eq 'Gold')thentrue()else
false()
```

8. Save the monitor model.

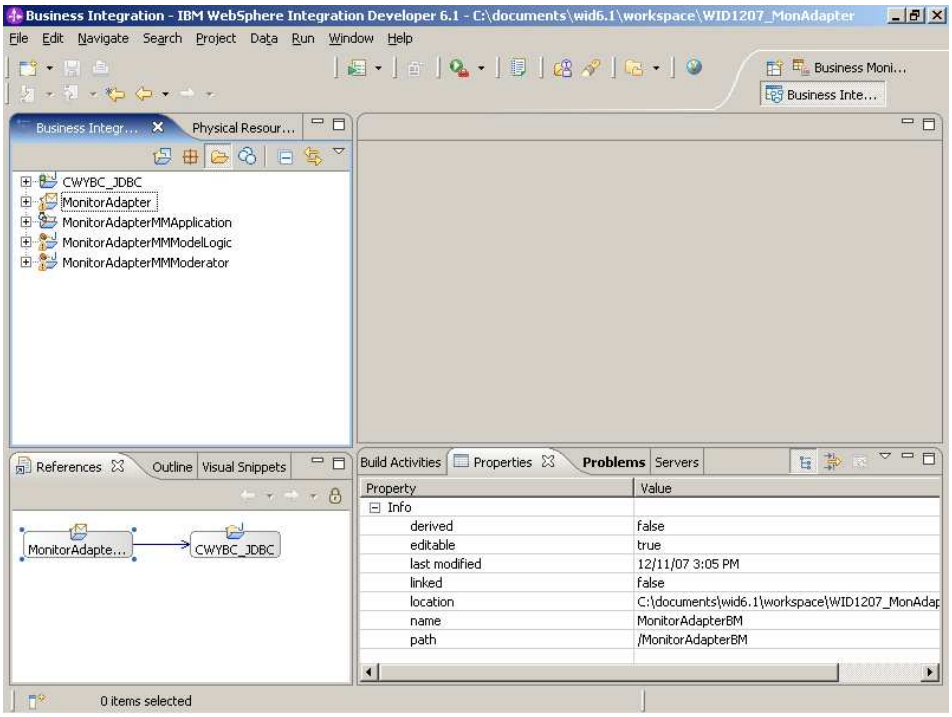
Add Dimension

Add a dimension to the monitor model.

1. Switch to the Dimensional panel by clicking **Dimensional Model** in the bottom of MonitorAdapterMM view.



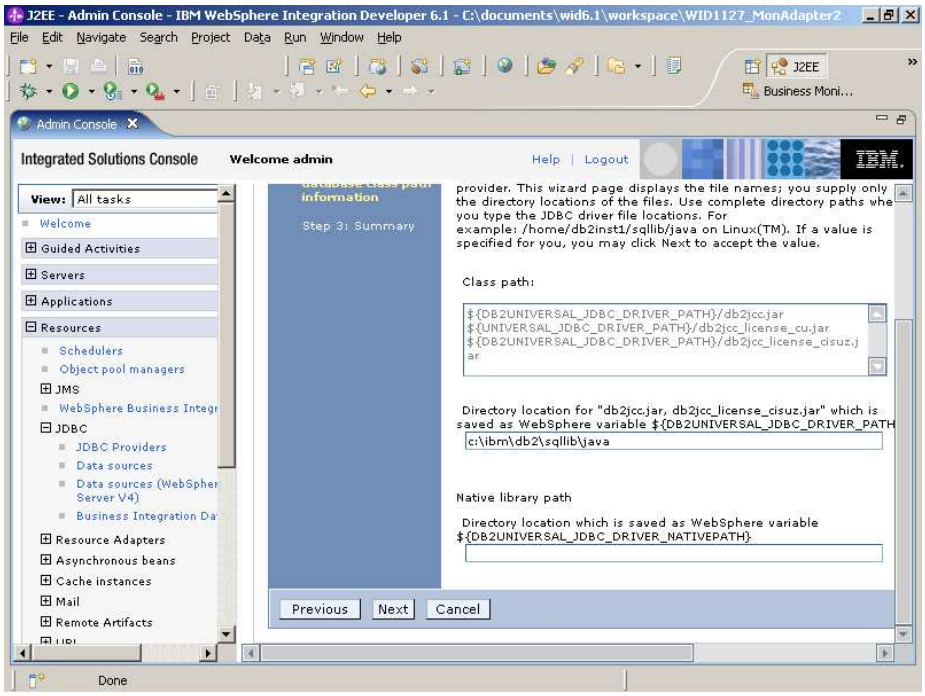
2. Right click **MonitorAdapterModelCube** in the Dimensions panel. Select **New -> Dimension** and type `CCode Dimension` as the name. Click **OK**.
3. Right click **CCode Dimension**, select **New → Dimension Level**, type `CCode Dimension Level` and select **CCode Metric** as the metric
4. Click **OK**.
5. Right click **MonitorAdapterModule Cube**, select **New → Measure**and type `FName Count Measure` for the Name. Select `Fname Metric` as the Source Metric
6. Click **OK**.
7. Press **Ctrl+S** to save the monitor model.
8. Right-click **MonitorAdapterMM.mm** on the Project Explorer. Select **Generate Monitor J2EE projects**.
9. Click **OK** and then **Finish**.
10. Go to the Business Integration view, you can see that several projects have been generated.



Configure the integrated test environment server

In this section you will configure the test environment server on which you will test the adapter/mediation flow and the monitor model.

1. In the Servers view, right-click **WebSphere Business Monitor Server v6.1 for WebSphere ESB server** and select **Start**.
2. Right-click on the started **WebSphere Monitor Server for WebSphere ESB** and select **Run administrative console**.
3. Type in the user ID `admin` and password `admin`, and click **Log In**.
4. Create a J2C Authentication Alias.
   a. In the left hand window, expand **Security** and click **Secure administration, application infrastructure**. Expand **Java Authentication and Authorization Service** in the right window.
   b. Click **J2C authentication data**.
   c. Click **New**. Type `DB2` for Alias and your DB2 userid and password.
   d. Click **OK**.
   e. Click **Save** to save the changes directly to the master configuration.
5. Repeat steps 4a through 4e for J2C authentication alias JDBCAdapter/inbound. Scroll down to verify the new entries you added.
6. Create a JDBC Provider for DB2.
   a. Expand Resources on the left hand window.
   b. Expand JDBC. Click **JDBC Providers**.
   c. Set the scope to **Node=WBMonSrv_esb_Node**.
   d. Click **New**. For Database type, select **DB2**, for Provider type select, **DB2 Universal JDBC Driver Provider**, and for Implementation type, select **XA data source**.
   e. Click **Next**. Type the directory location for the indicated jar files.



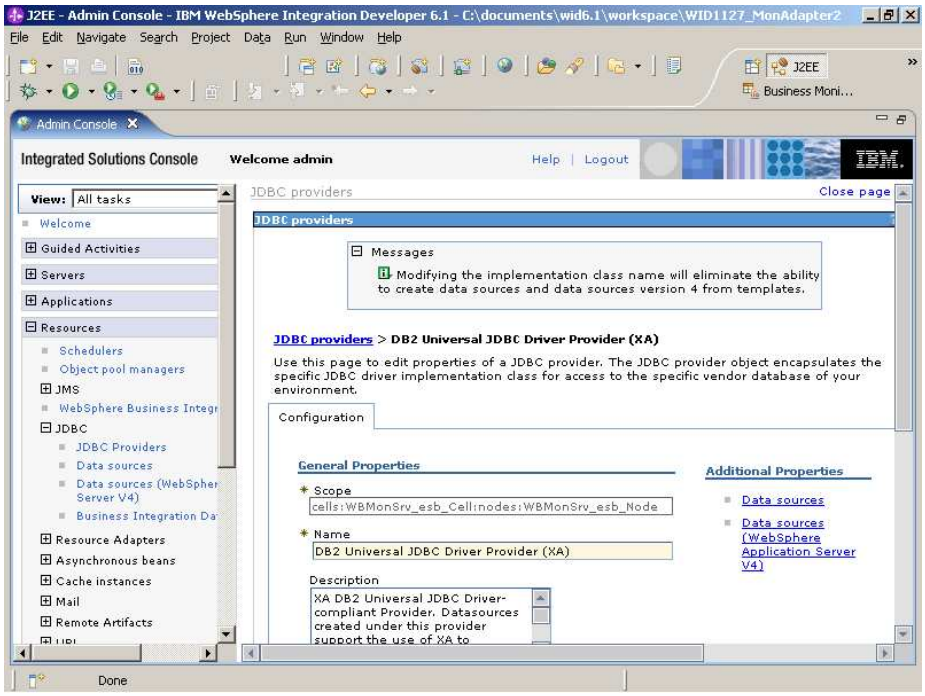
f. Click **Next**.

g. Click **Finish**.

h. Click **Save** to save the changes directly to the master configuration.

7. Create a data source for the provider just created.

a. Click the **DB2 Universal JDB Driver Provider (XA)**.



b. Click **Data sources**.

c. Click **New**.

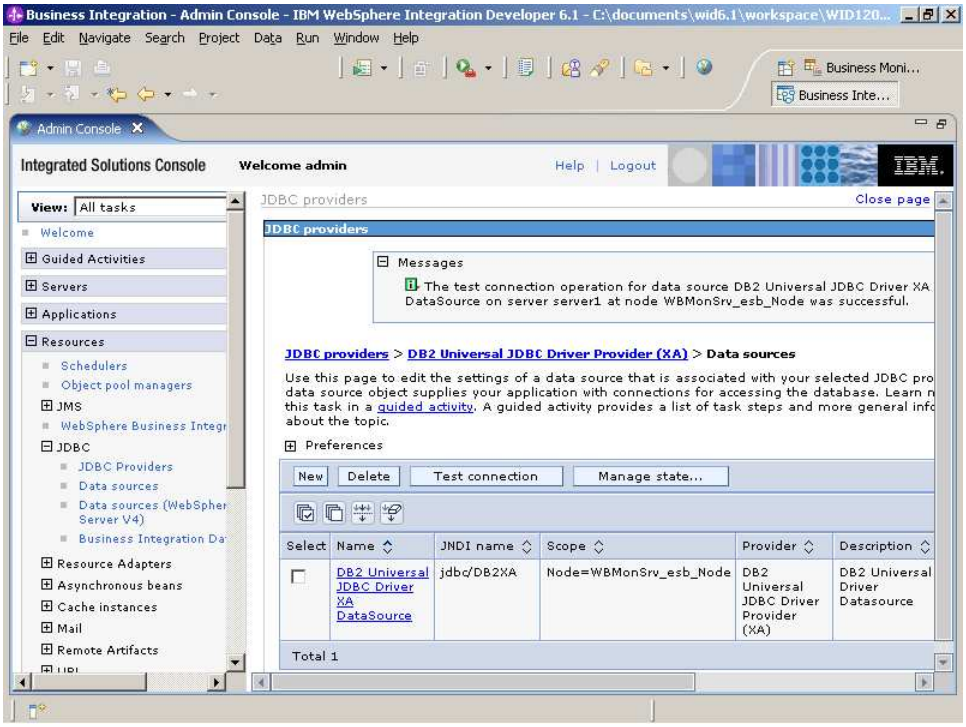
d. Type `jdbc/DB2XA` for JNDI name. This matches the JNDI name you used when configuring the JDBC adapter. Select **WBMonSrv_esb_Node/DB2** as the authentication alias and then click **Next**.

e. Type `ADAPTER` for Database name and `localhost` for Server name.

f. Click **Next** and then click **Finish**.

g. Click **Save** to save the changes directly to the master configuration.

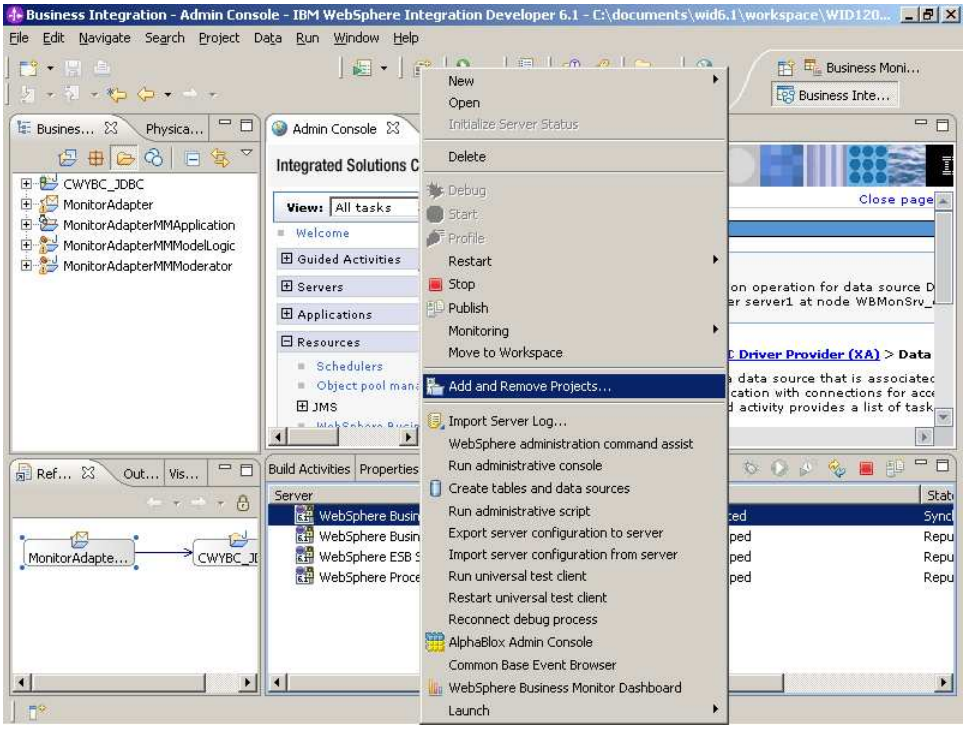
8. Select the box under **Select** and click **Test connection**. Ensure that the test connection is successful.



9. Restart the **WebSphere Business Monitor Server v6.1 on WebSphere ESB** server.

Chapter 4. Deploy the Adapter/mediation application to the test environment server

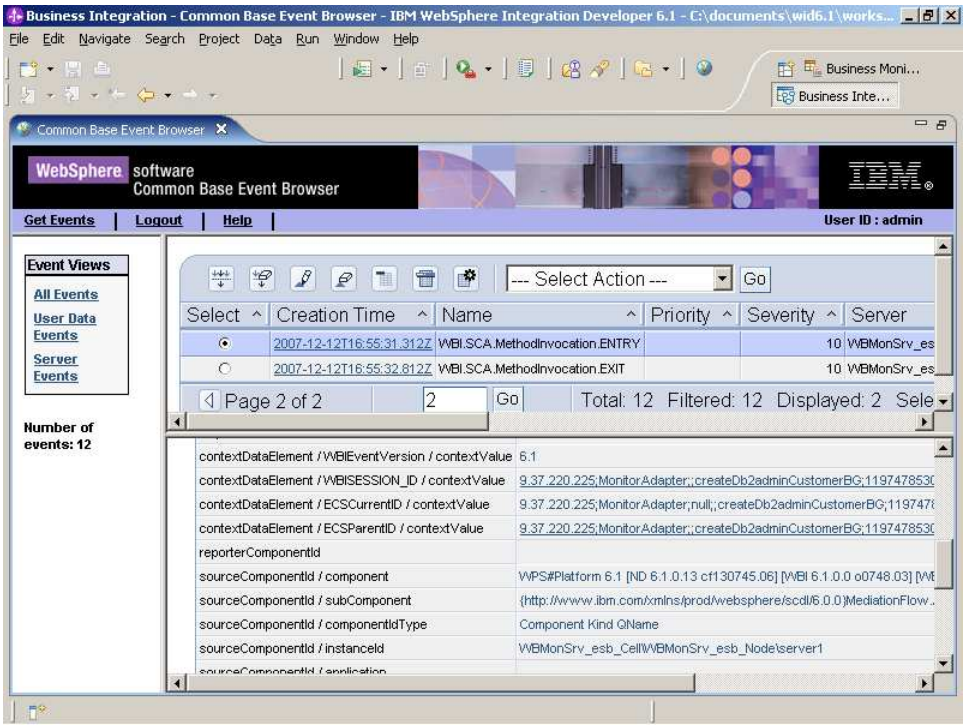
1. Right-click on the **Monitor server on WebSphere ESB** and select **Add and Remove Projects**.



2. Select **MonitorAdapterApplication** and click **Add** to add the application to Configured projects.
3. Click **Finish**. The project is deployed to the server and started. Ensure there are no error messages in the console.
4. To verify that the mediation module and adapter application works correctly, open a DB2 command window and run the following commands:

   ```
   db2 connect to ADAPTER user db2admin using <db2admin password>

   db2 insert into customer values ('1', 'Yi', 'Che', 'Regular')
   ```

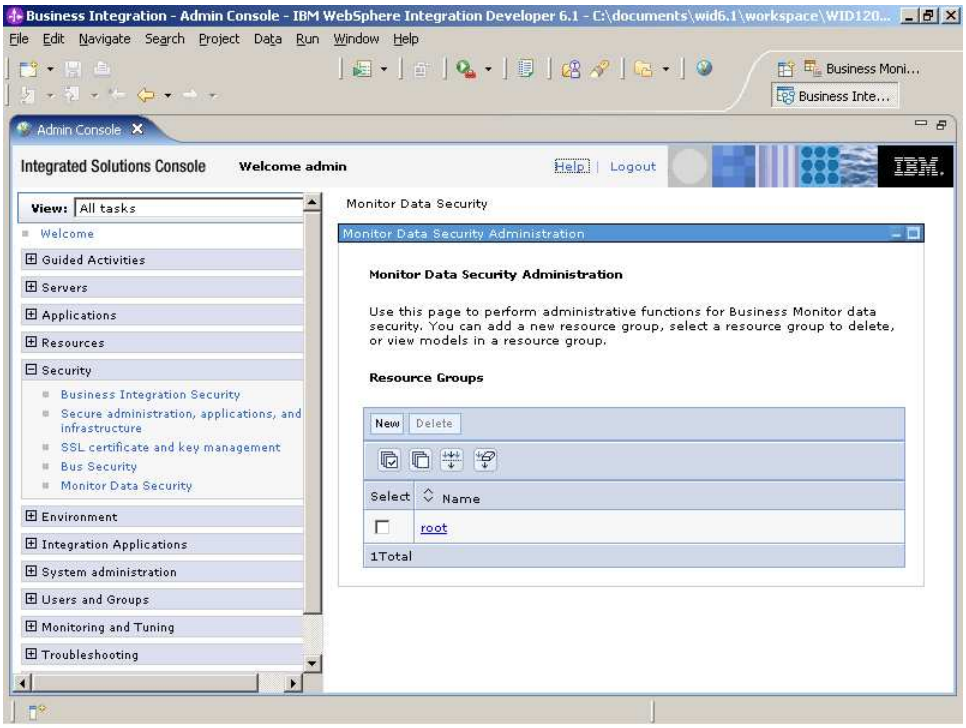
   Note: If you see general errors in the console, try removing the MonitorAdapterApp project from the server, then do **Project** → **Clean** → **Clean all projects**, then add the project to the server and retry. If you see UNAUTHENTICATED errors in the console. Follow the steps in "Add admin user to Monitor Data Security root group" on page 18 and the retry to clean the projects.
5. Right-click the **WebSphere Business Monitor Server v6.1 on WebSphere ESB server** and select **Common Base Event Browser**.
6. From the left menu of the Common Base Event browser, click **All Events**. The list should include the events related to the record that you just inserted.



Add admin user to Monitor Data Security root group

If you receive UNAUTHENTICATED errors in the console when you have selected the Clean All Projects option, you must add the admin user to the Monitor Data Security root group.

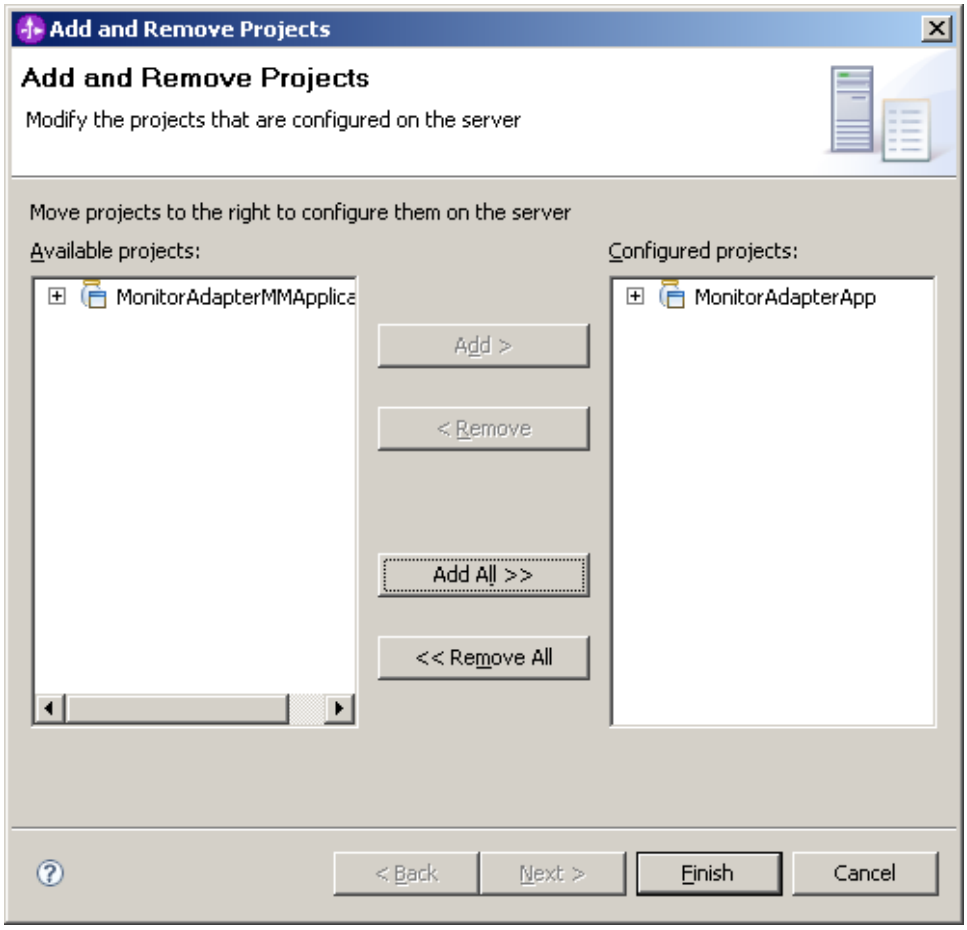
1. Right-click on the **Monitor server on WebSphere ESB** and select **Run administrative console**. Type in your user ID and password and then click **Log in**.
2. Expand **Security** and select **Monitor Data Security**.



3. Click **Root** and then click **Users**.
4. Click **OK** and then click **OK** again.
5. Right-click on the **Monitor server on WebSphere ESB** and select **Restart** → **Start**.

Chapter 5. Deploy the monitor model application to the test environment server

1. Right-click on the **Monitor server on WebSphere ESB** and select **Add and Remove Projects**.
2. Select **MonitorAdapterMMApp** and click **Add** to add the application to Configured projects.



3. Click **Finish**. The project is deployed to the server and started. Ensure you see no error messages in the console.

Chapter 6. Process events to exercise the model

After deploying the monitor model, you can run some events to verify that the monitor model works correctly.

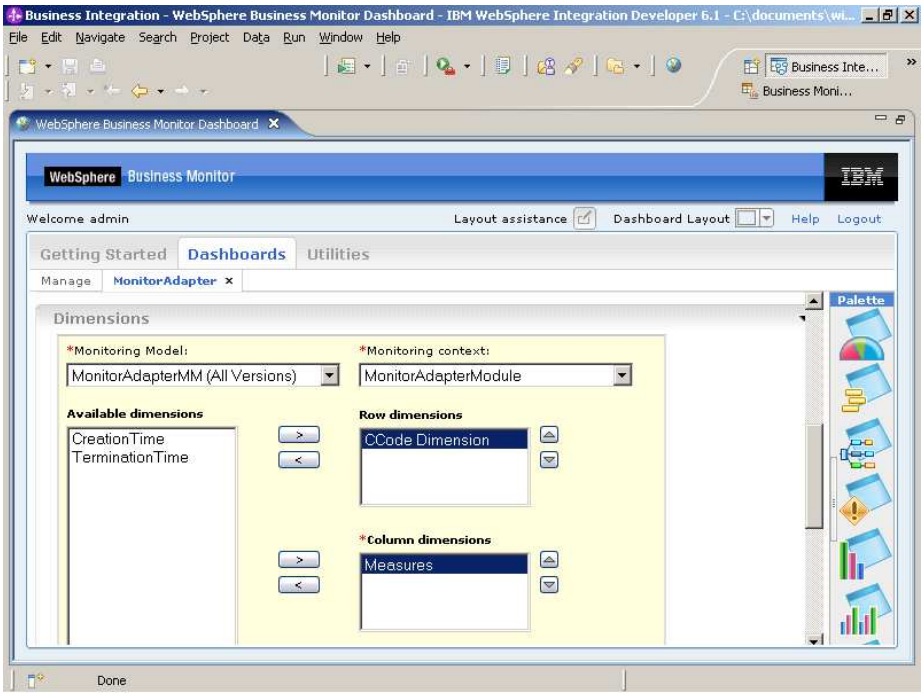
1. Open a DB2 command window. Then run the following commands:

```
db2 connect to ADAPTER user db2admin using <db2admin password>

db2 insert into customer values ('3', 'Michael', 'Davis', 'Regular')

db2 insert into customer values ('4', 'Paul', 'Smith', 'Silver')

db2 insert into customer values ('5', 'Joe', 'Williams', 'Gold')

db2 insert into customer values ('6', 'Daniel', 'Johnson', 'Regular')

db2 insert into customer values ('7', 'Tim', 'Ross', 'Gold')

db2 disconnect ADAPTER
```

2. Wait briefly so that the monitor model can process the generated events.

View the calculated information on a Monitor dashboard in the test environment

1. Right click on the **Monitor Server on WebSphere ESB** and select **WebSphere Business Monitor dashboard**.
2. Type `admin` for the user ID and `admin` for the password and click **Login**.
3. Click **Dashboards** and click **New**.
4. Type `MonitorAdapter` for the name and then click **OK**.
5. Add and configure and Instance items.
   a. Drag the 2nd palette icon (**Instances**) to **Add to Dashboard**.
   b. Click **Personalize** and move some available items to the **Selected** window and then click **OK**.
6. Add and configure Dimensions item.
   a. Drag the 6th palette icon (**Dimensions**) to **Add to Dashboard**.
   b. Click **Personalize**.
   c. In Available dimensions, select **Measures** and move it to **Column** dimensions.
   d. In Available dimensions, select **CCode Dimension** and move it to **Row** dimensions.
   e. Confirm that the window looks like the following example.



f. Click **OK**.

7. Double click **All CCode Dimension**.

Chapter 7. Download the sample

Completed samples are available so that you can start at any stage of this tutorial. This section shows you how to import the solutions. After you import the model, you can proceed to the relevant section in the Build It Yourself section to continue development.

You can download the following files.

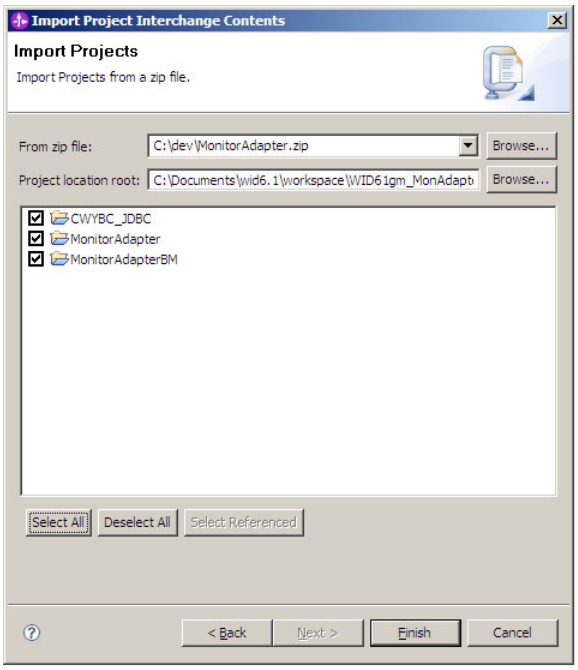
- MonitorAdapter_db2.sql
- JDBCAdapter_PI.zip

Use the following section to import the model using WebSphere® Integration Developer.

Import the J2EE application solution into WebSphere Integration Developer

A solution has been provided so that you do not have to build the J2EE application from scratch. This section shows you how to import the application into WebSphere Integration Developer and generate J2EE projects for deployment.

1. Start WebSphere Integration Developer and set up the environment.
   a. Start WebSphere Integration Developer V 6.1, and when prompted, point to a new workspace, such as C:\workspaces\MonitorAdapter.
   b. Close the **Welcome** tab.
2. Select **File** → **Import**, then select **Other** → **Project Interchange** and click **Next**.
3. Click **Browse**. Locate and select the project interchange file named MonitorAdapter.zip.
4. Click **Select All** and then click **Finish**. Wait for the projects to be built.



5. In the Business Monitoring perspective, right-click the **MonitorAdapterMM.mm** and select **Monitor Tools → Generate Monitor J2EE Projects**.
6. Click **Finish**.