

3 Implementation

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3.1 Introduction

Note: The solution for this chapter can be found in `c:\bpm\solutions\03-implementation.zip`

In the first exercise, you built a basic process with roles, activities, and transitions. In this lesson, you will further enhance the process by creating data types, variables, Task Services, Rule Services, and Adapter Services and binding them to the process activities.

Objectives

After completing this lesson, you will know how to:

- Implement Process Activities and create Task, Rule and Adapter Services
- Define the different kinds of Data Objects (variables)
- Define Data Inputs and Data Outputs (arguments)
- Map arguments to instance variables

The tasks you will complete in this lesson are:

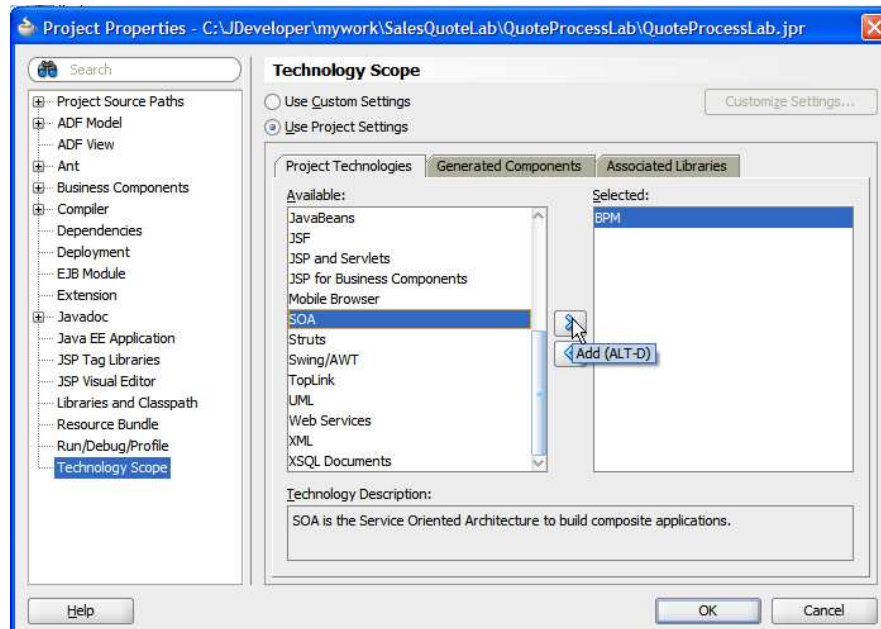
- Understanding of Business Catalog
- Define Task Services and map to Interactive Tasks
- Define Rule Services and map to Rule Task

- Define Adapter Services and map to Service Task.
- Create Business Objects (data types)
- Create Data Inputs (input arguments) and Data Outputs (output arguments) for process and process steps
- Create Variables (Data Objects)
- Create Data Mappings

3.2 Launch BPM Studio

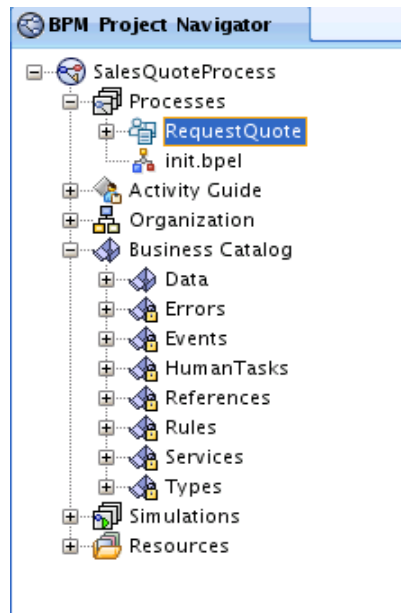
Launch **BPM Studio** and if prompted for the developer type, select **Default**.

Note: If you are not sure you have selected the correct developer type go to **Applications Navigator**, highlight your **BPM Project – QuoteProcessLab** – and right-click on **Properties**. Go to **Technology Scope** and see that both **BPM** and **SOA** are in the **Selected Technologies** pane on the right. If necessary, you can add the technology to the pane as shown in the figure below.



3.3 Business Catalog

The **Business Catalog** holds the different types of Services (System, BPEL processes, Task Services, Rule Services) as well as Business Objects (Data). There are different folders for holding different types of BPM artifacts. Some folders have a lock to indicate that the artifacts inside them cannot be deleted.



3.4 Creating a Business Object

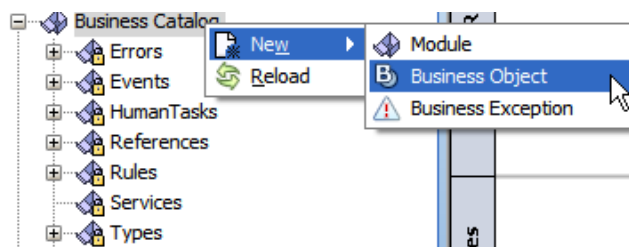
Complex types are referred to as **Business Objects** in **BPM Studio** and represented by **XML Schema**. **Business Objects** are stored under the **Business Catalog** folder.

There are 2 ways to create a **Business Object**

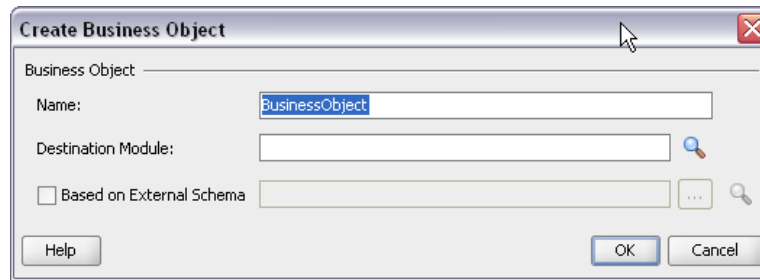
- Create from scratch
- Browse an external schema definition and create **Business Objects** from it.

In this example, you create a **Business Object** named **Quote** defined by the **QuoteRequest** element in the **Quote.xsd** file. Perform the following steps to create this Business Object.

1. In the **BPM Project Navigator**, right-click on **Business Catalog**, select **New** and then select **Business Object**.



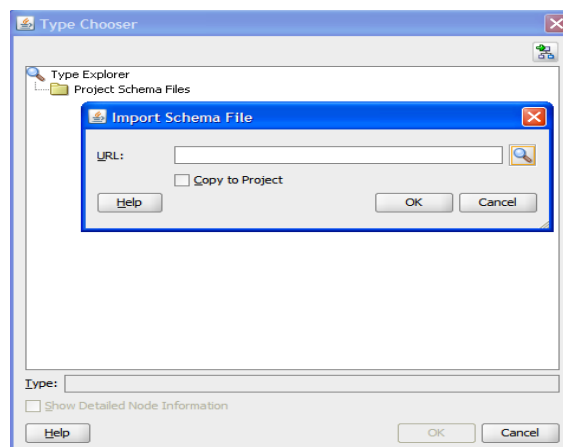
This brings up the **Business Object** dialog.



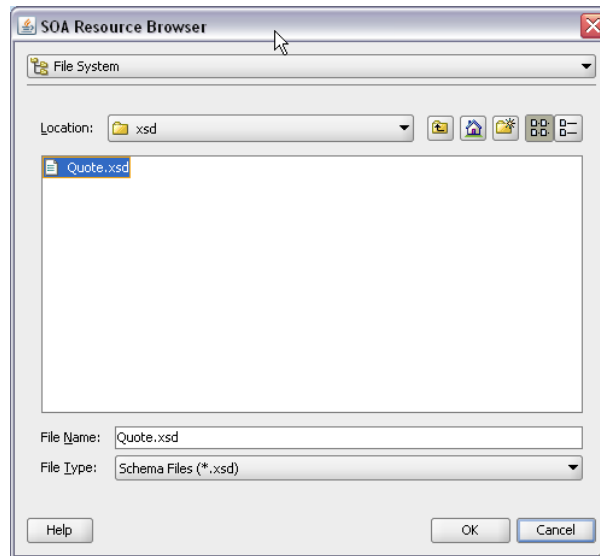
2. Type in *Quote* in the **Name** field.
3. Click on the browse button next to the **Destination Module**. This brings up the **Module List** dialog. Click on the **New** symbol to add a module under **Business Catalog** with the name *Data*.



4. Click **OK**
5. Select the **Based on External Schema** option and click the **Schema Browser** icon. This brings up the **Type Chooser** dialog. Click on the **Import Schema Files** icon on the top right corner to import an XSD file into your BPM Project.
6. Select the **Copy to Project** option in the **Import Schema File** dialog and select the **Browse Resources...** icon



7. This brings up the **SOA Resource Browser** window. Locate and select the **Quote.xsd** file in the lab materials xsd folder.



8. Click **OK** to close the **SOA Resource Browser** and click **OK** again on the **Localize Files** dialog.
9. Expand the **Project Schema Files** folder in the **Type Chooser** and expand **Quote.xsd** and select the **QuoteRequest** element. Click **OK** and click **OK** again.
10. The **Quote Business Object** opens. You can add description and documentation details here as desired. When finished, close the **Quote** window.

This completes the creation of the **Quote Business Object**.

3.5 Data Inputs and Data Outputs

Data Input refers to the information required to start the **Activity** (Task, Sub-process) or **Process**. It is the input argument. A collection of **Data Inputs** is referred to as an **Input Set**.

Data Output refers to the data that is returned from the **Activity** or **Process**. It is the output argument. A collection of **Data Outputs** is referred to as an **Output Set**.

The **Start Event** has only **Output Set**. The **End Event** has only **Input Set**. Other activities can have both **Input** and **Output Sets**.

The **Output Set** of the **Start Event** and the **Input Set** of the **End Event** determine the arguments of the Process.



Note: As you will see in later section, the input and output arguments of the process step is the same as the inputs and outputs of the Service (Task, Rules, or System) that it is bound to.

3.6 Creating Data Objects

Data Objects represent variables. **Data Objects** can be one of:

- **Process Level** (process variables) – Visible throughout the process and persisted through the life time of the process instance.
- **Activity Level** (local variables) – Visible within a particular scope of the process. The lifetime of the **Data Object** is limited to the lifetime of the scope.
- **Project Level** (BPM project variables) – Visible across processes within a particular BPM Project.

A **Data Object** has a **Type**. The type can be scalar or native type: **String**, **Integer**, **Decimal**, **Boolean**, **Array**, or it can be a complex type defined by a Business Object.

In this lab, you create 3 **String** variables for the outcomes of **Business Practices Review**, **Approve Deal** and **Approve Terms** activities.

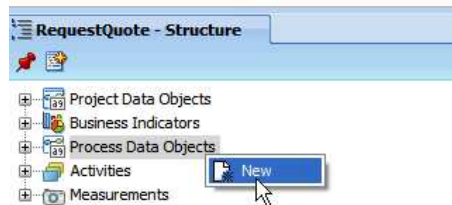
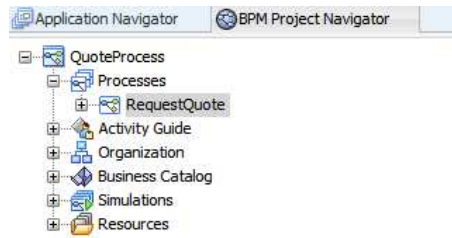
In addition, you create a **Boolean** variable used to determine if the **Business Practices Review** step is required or not.

You also create a complex variable of the **QuoteRequest** type in **Quote.xsd** using the Business Object you created for QuoteRequest.

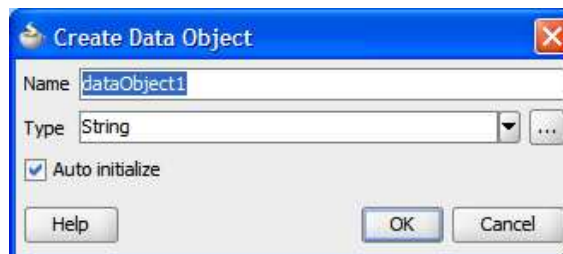
Using the steps outlined below create the Data Objects listed in this table.

Process Data Object	Type
approveDealOutcome	String
approveTermsOutcome	String
businessPracticesOutcome	String
businessPracticesReviewRequired	Boolean
quote	QuoteRequest in Quote.xsd (using the Quote Business Object you already created)

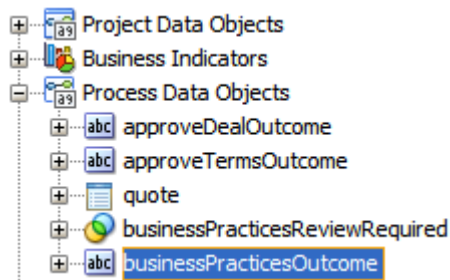
1. In the **BPM Project Navigator**, highlight your *RequestQuoteLab* process to view the **Structure** pane in the lower left of the screen. If the **Structure** pane is not visible, select **View→Structure** and be sure you have your process selected in the **BPM Project Navigator**.



2. Right click on the **Process Data Objects** folder and select **New** to launch the **Create Data Object** window.
3. Enter a value for the **Name** field and select the appropriate scalar type.

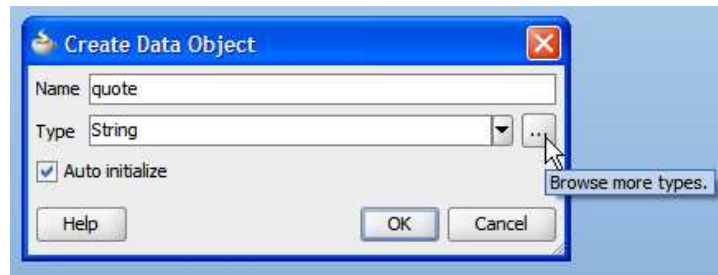


4. Create the four scalar type data objects listed in the table above.

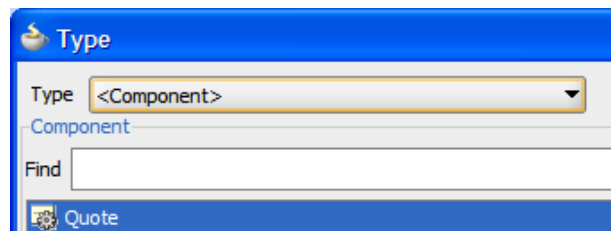


Now create a **Data Object** of type **Quote Business Object**.

5. Right-click on **Process Data Objects** in the **Structure Pane** and select **New**. This brings up the **Create Data Object** dialog. Type in "quote" for the **Name** of the **Data Object**.



6. To set the **quote** to the type **Quote Business Object**, select the “...” option. This brings up the **Type Chooser** window.
7. Select **Component** from the list of types and then choose the **Quote** from the list of **Business Objects**



Click **OK** and click **OK** again

3.7 Implementing Enter Quote Details

3.7.1 Defining the Task Service

In the first exercise, you defined the outline of the process and specified only the **Name** and **Description** for the activities. Now, in order to execute the process, you need to implement the process activities. Every **Interactive Task** has to be bound to a **Task Service**. You can either browse for existing **Task Services** or create one on the fly. Multiple **Interactive Tasks** can share the same **Task Service**.

In this exercise, you create a new **Task Service**.

8. Right click on the **Enter Quote Details** user activity and select **Properties**
9. In the **Properties** dialog, click the **Implementation** tab
10. Click the green + next to **Human Task**

Basic Implementation

Implementation Type: User task

Human Task:

Human Task Attributes

Title: Plain Text

Priority: 3 (normal)

☐ Re initiate

Advanced

Data Associations

☐ Use Associations Type: Simple

☐ Use Transformations

Help OK Cancel

11. In the **Create Human Task** dialog Enter the name, *EnterQuoteDetails*
Select **Initiator** for **Pattern**. This automatically sets the outcome to **SUBMIT**.
12. Type in *Enter Quote* for the title.
13. Click on the **green +** next to **Parameters** to launch the **Data Object** dialog
14. Drag **quote** from the **Data Object Navigator** window to the **Parameters** section.
15. Set the parameter to **Editable**.
16. Click **OK** and the task definition gets created.

Properties - Enter Quote Details

Basic Implementation

Create Human Task

General

Name: EnterQuoteDetails Priority: 3 (normal)

Pattern: Initiator

Title: Enter Quote

Outcomes: SUBMIT

Parameters

Parameter	Name	Type	Editable

Outcome target:

Help OK Cancel

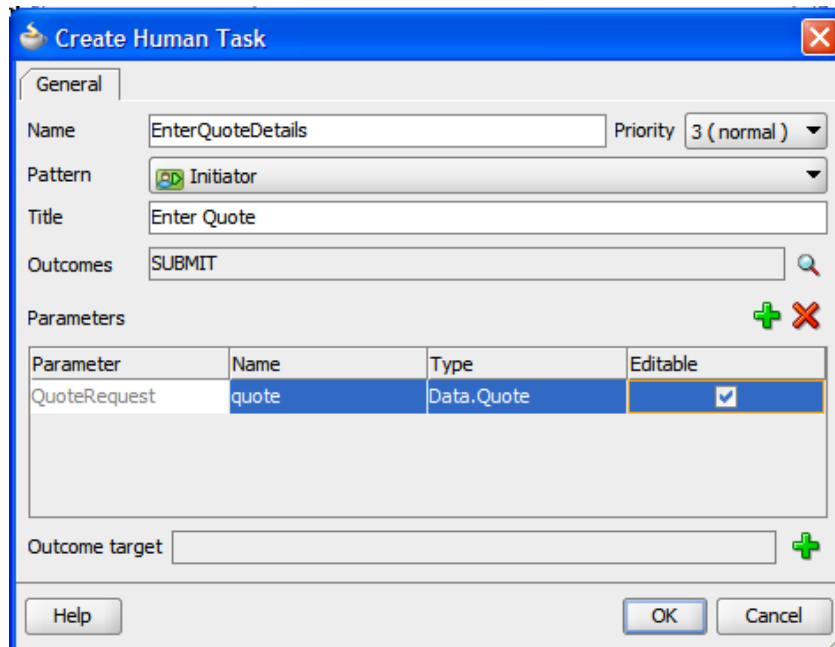
Data Object

Drag Data Objects to Parameters table and Outcome Target field.

- Enter Quote Details
 - RequestQuoteLab
 - approveDealOutcome
 - approveTermsOutcome
 - businessPracticesOutcome
 - businessPracticesReviewRequired
 - quote
 - QuoteProcessLab

Help Close

17. click OK again.



Create Human Task

General

Name: EnterQuoteDetails Priority: 3 (normal)

Pattern: Initiator

Title: Enter Quote

Outcomes: SUBMIT

Parameters

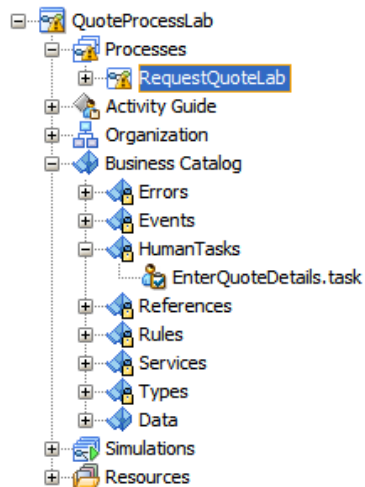
Parameter	Name	Type	Editable
QuoteRequest	quote	Data.Quote	<input checked="" type="checkbox"/>

Outcome target:

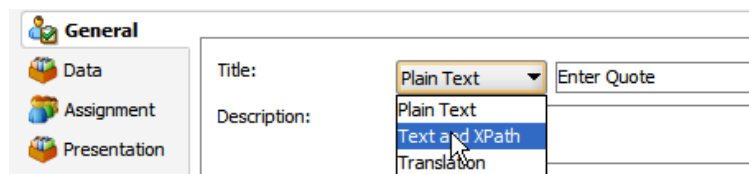
Help OK Cancel

This completes the creation of the **EnterQuoteDetails Task Service**.

18. Expand the **Business Catalog > HumanTasks** folder to examine the newly created **Task Service** and the **Types** folder to see the associated types.



19. Now edit the **Task Service**. Double-click the .task file to open the **Task Editor** with the **Task Service** definition.
20. Set the **Title** of the task in a dynamic fashion based on incoming payload using the **Text and XPath** option and then click the **Expression Builder** icon on the far right.



General

Data

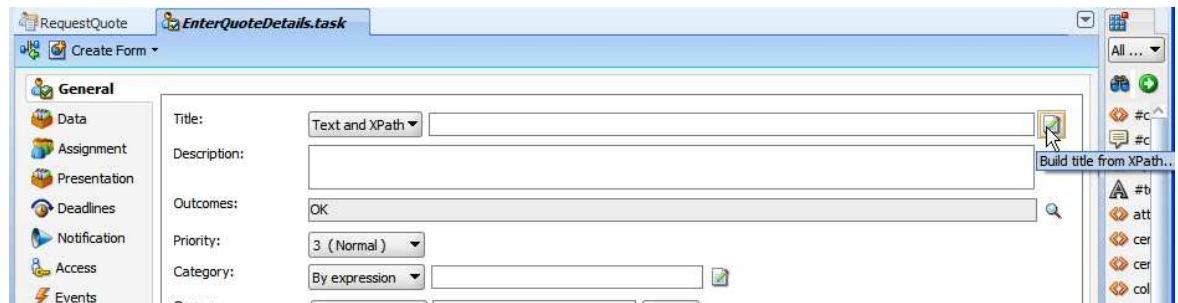
Assignment

Presentation

Title: Enter Quote

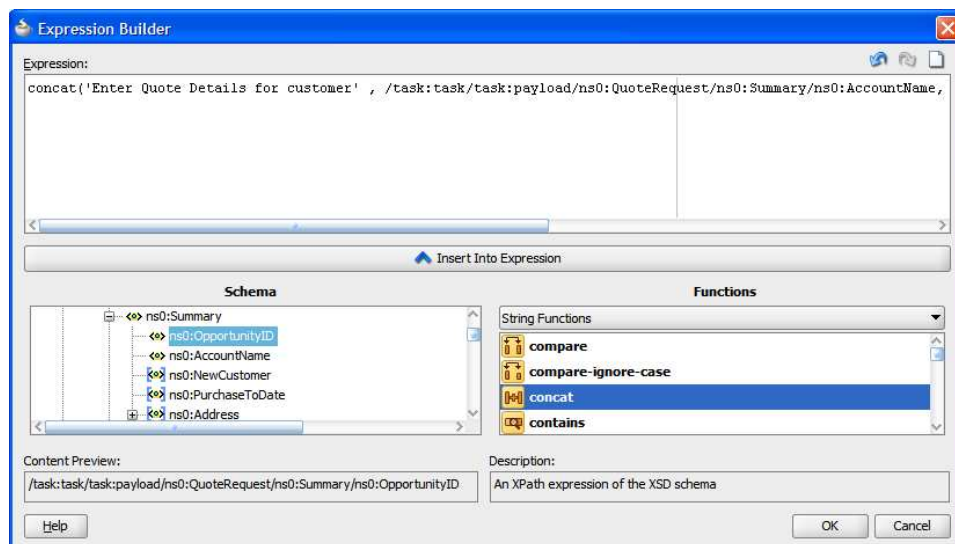
Description:

Expression Builder icon: Plain Text, Plain Text, **Text and XPath**, Translation



21. This opens up the **Expression Builder**. Create the following XPath expression:

```
concat('Enter Quote Details for customer' ,  
/task:task/task:payload/ns0:QuoteRequest/ns0:Summary/ns0:AccountName, 'Quote id = ',  
/task:task/task:payload/ns0:QuoteRequest/ns0:Summary/ns0:OpportunityID)
```



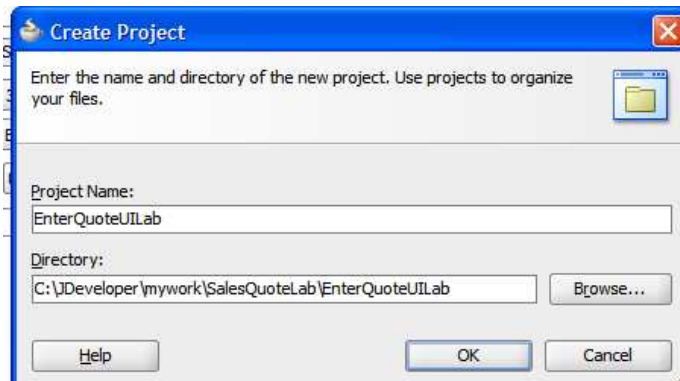
22. Click **OK**.

3.7.2 Generate Form for the Task

23. Click on the **Create Form** menu and select **Auto-Generate Task Form**



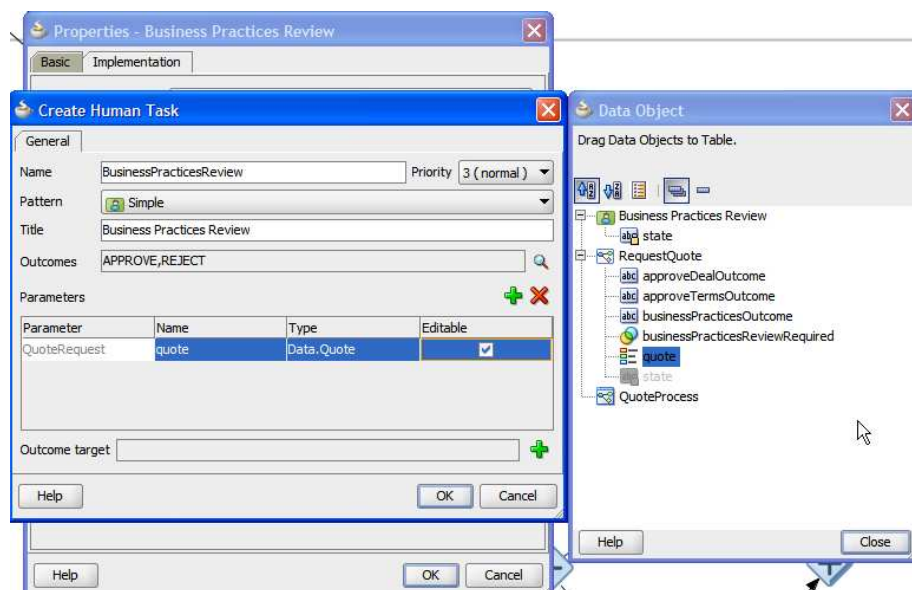
24. Enter the **Project Name** *EnterQuoteUILab* and the Directory *SalesQuoteLab\EnterQuoteUILab*. Click **OK**.



25. The user interface for the Task Service is generated automatically. A number of dialogs open to give you an opportunity to do some customization. For this exercise, simply click **OK** to all the dialogs. You will know when the form is finished when you see the taskdetails.jspx file open and displaying the form. Save the everything and close all open task windows.

Complete the **Task Service** configuration of the remaining four **Interactive Tasks** – namely **Approve Deal**, **Approve Terms**, **Finalize Contract** and **Business Practices Review** in the same manner, following the steps below

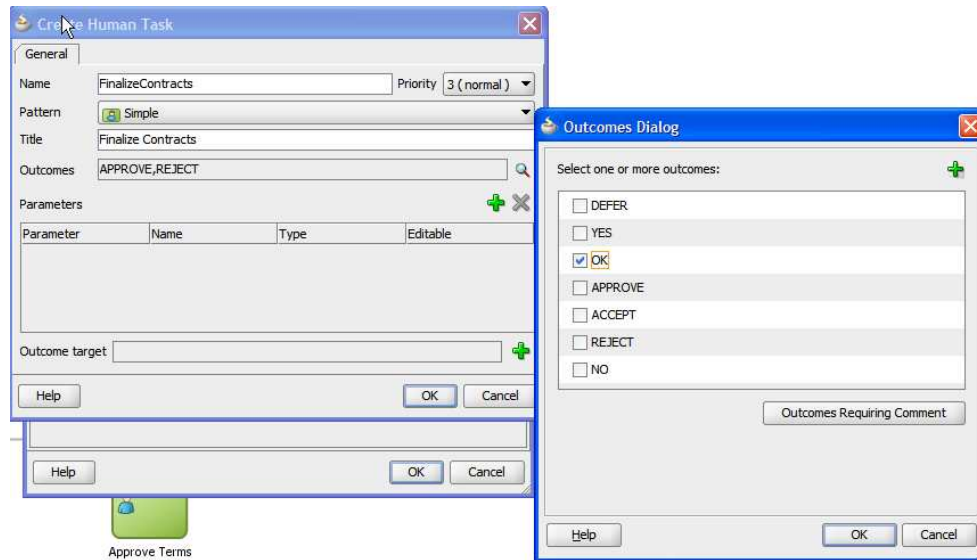
26. Right click **Business Practices Review** and select the **Properties** window and the **Implementation** tab.
27. Click the “+” symbol to create the **Task Service**.
28. Enter the **Name** as *BusinessPracticesReview*.
29. Select the **Pattern** as **Simple**.
30. Enter the **title** as *Business Practices Review*, and add the parameter, **quote** with the **Editable** checkbox checked.
31. The **Business Practices Review** properties dialog looks like the picture below.



32. Click **OK** and click **OK** again.

The configuration of **Approve Deal** and **Approve Terms** activities are the same as the configuration of **Business Practices Review** activity (they have same outcomes – **APPROVE** and **REJECT**).

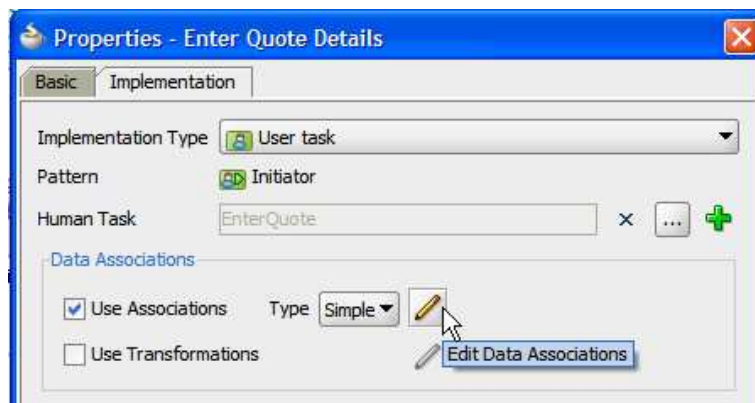
The configuration of **Finalize Contracts** activity is the same except that it has single outcome – **OK** instead of **APPROVE** and **REJECT**.



33. Now create the **Task Forms** as described for EnterQuoteUILab. Remember to include the suffix "UILab" for all the auto-generated task forms.

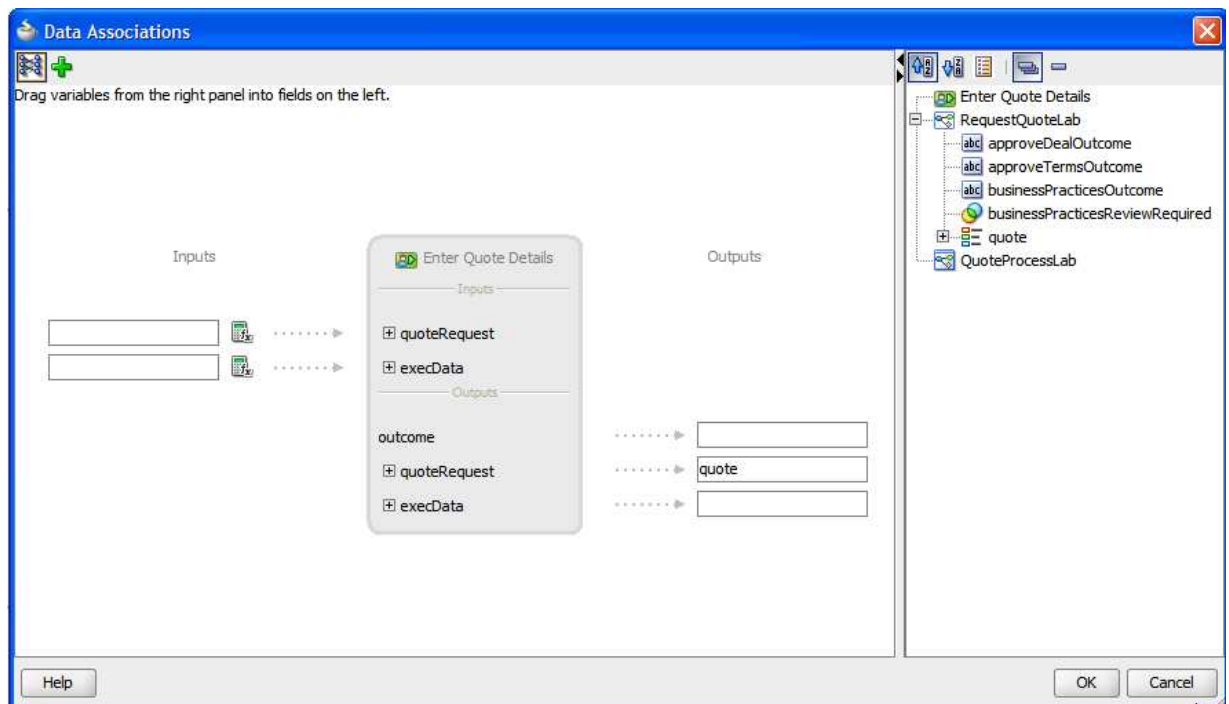
3.7.3 Task data mapping

For the **Interactive Task** activities, creating the **Task** also sets the **Input Data** and **Output Data** associations automatically for the data defined in the task when possible. To view the associations, open the **Interactive Task Properties** and in the **Implementation** tab click on the pencil icon next to it.



Note that for **Enter Quote Details**, the output association is set while the input association is empty. You manually set the input for **Enter Quote Details** towards the end of this lab.

For the other tasks, you set the appropriate output association for outcome at the end as well. It's best to do data associations in the last part of implementation after all of the different elements have been built.



3.7.4 Mapping swim lane Roles to LDAP Roles

Process Roles have to be mapped to LDAP Roles for the process to run. You use the pre-seeded roles in the LDAP of the **Oracle Weblogic Server** installed as part of this training. The user seeding is already done if you are using the vm image. You need to seed the roles manually if you installed your own server.

Seed demo users manually: do the following on your running server

- Open a new command window and unzip `demo-community.zip`
- Edit the `build.properties` with your server name and paths for your installation. Note `bea.home` is the same as `<Middleware_Home>`.
- Set `JAVA_HOME` and `PATH` to point to `jdk` that is in `<Middleware_Home>`.

Execute the ant script as follows

```
cd demo-community/  
<Middleware_Home>/modules/org.apache.ant_1.7.1/bin/ant seedDemoUsers
```

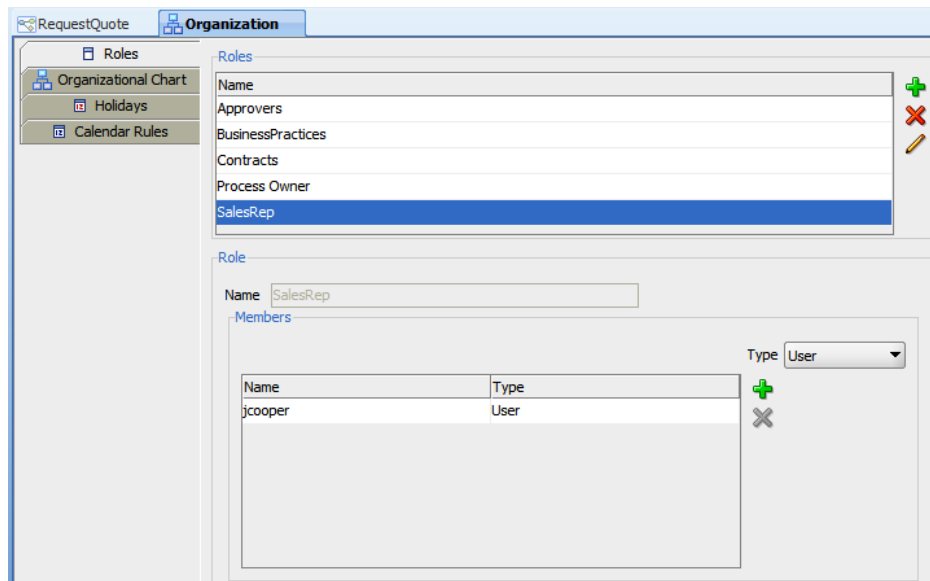
Note: The BPM engine (**Oracle Weblogic Server**) has to be running to map the Process Roles to the LDAP roles. Be sure your server is running before continuing.

34. In **BPM Studio**, navigate to **BPM Process Navigator**

35. Right click on **Organization** and select **Open**

36. In the **Organization** editor, select the **SalesRep** role from the list of **Roles**

37. Click on the green + within the **Members** sub-panel



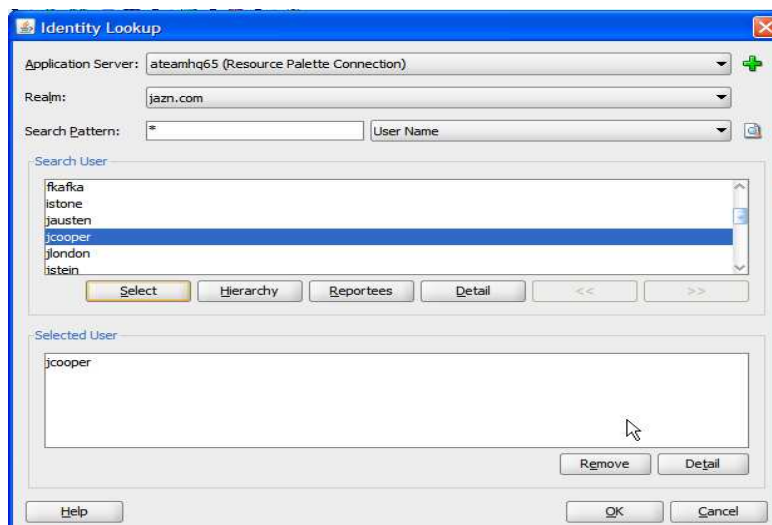
38. Choose the **Application Server connection** for your server. If there is not one already created, select the green + icon to create it.

Note the following if you need to create a connection. The training configurations usually use user weblogic and password welcome1. The port is "7001" if you are using a single server configuration and "8001" if you are using an Admin server with a SOA managed server configuration. The domain name is "domain1" on most training machine installations. When you test the connection, you only need to have the HTTP protocol test successfully. The 8001 port connection will fail for most of the other protocols but don't worry; you don't need them for LDAP!

39. Check the **Realm** selection and change it if necessary for your installation.

40. Click the **Lookup** icon to search for users.

41. Select user "jcooper" and click the **Select** button.



In a similar manner, perform role mapping as shown in the table below for the remaining Process Roles:

Approvers	cdickens
Business Practices	jstein
Contracts	wfaulk
Process Owner	jstein

You will need to remember which user is assigned to which role later when you run the process. Write them down or keep this table handy.

3.8 Configuration of the Service Task

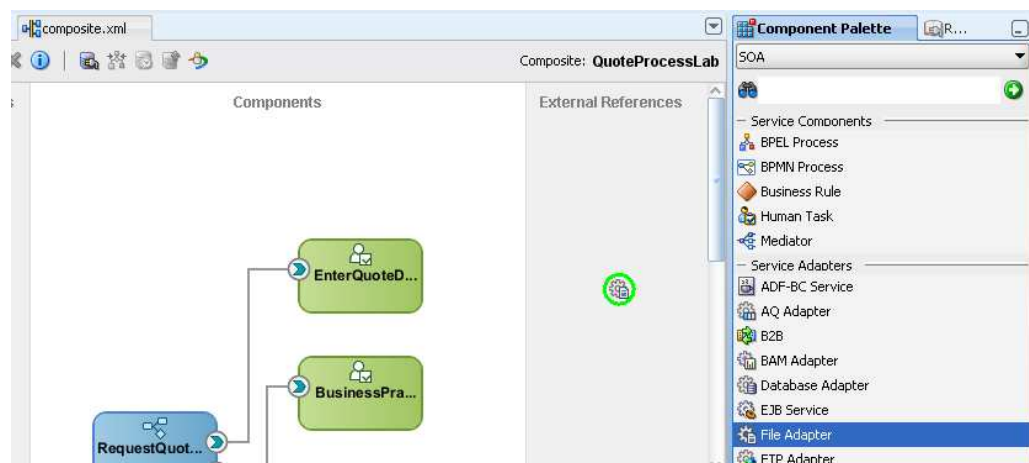
Now complete the following to add a service to your application which implements the SaveQuote **Service Task**. First you create the service by adding a **Service Reference** to the application using the composite editor. Then, you go back to the BPM process and bind the service to the SaveQuote **Service Task**.

42. Navigate to the composite editor by clicking the Go To Composite Editor button at the top of your BPM process.



43. Drag-and-drop the **File Adapter** from the **Component Palette** to the right hand **External References** pane in the composite editor.

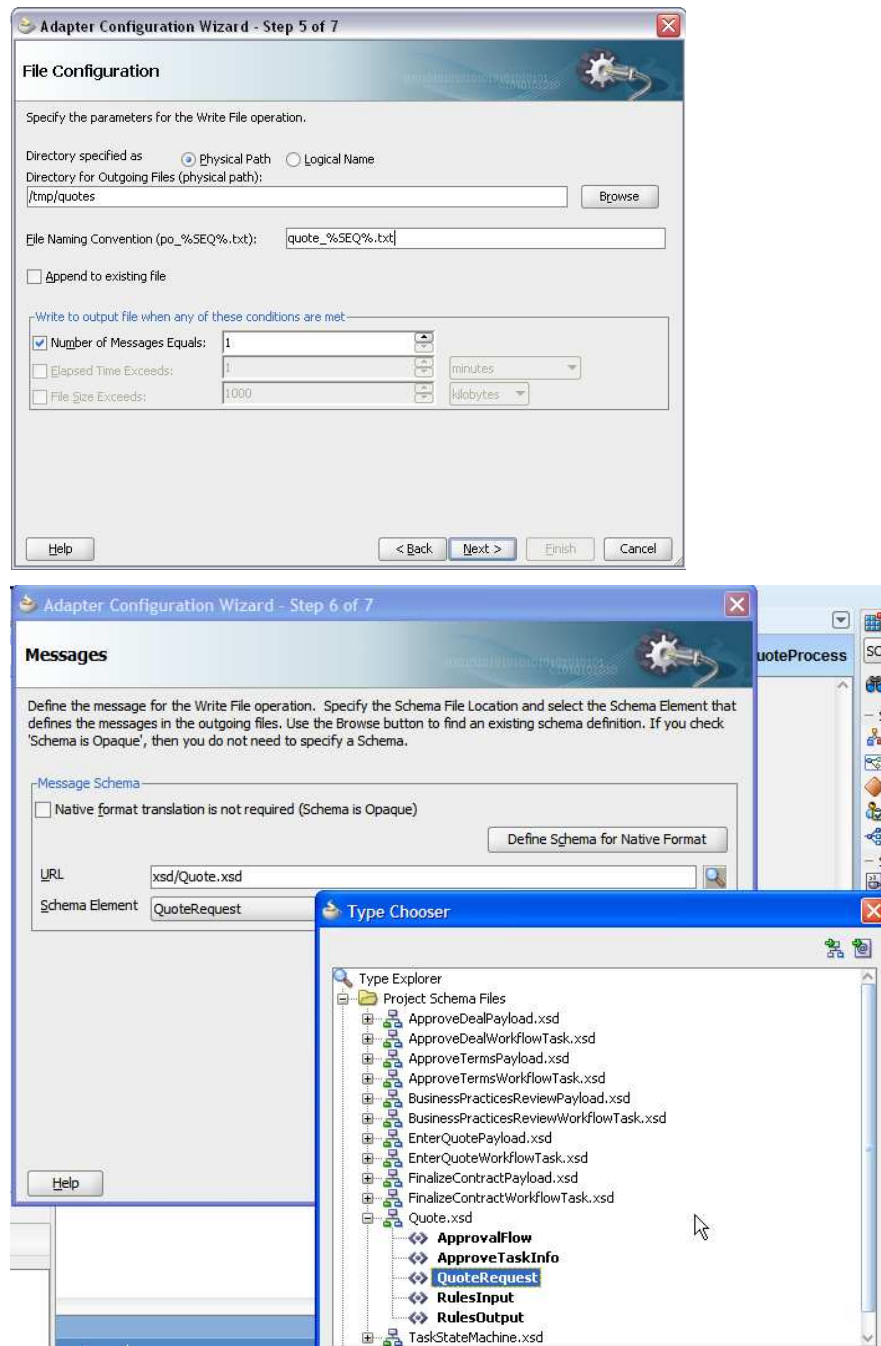
Note that with the composite editor, you must drag the **File Adapter** and drop it on the **External References** pane. You do not use the click-and-drop method that you can use in the BPM process editor.



44. Walk through steps in the **File Adapter** wizard and create a service called **SaveQuote** to write to a file. The following screens show you the steps: choose the write operation, specify the destination file name and directory – it must be a directory accessible to your server such as `c:\temp`. Do not select the **Native Format Translation Required** option, and for the schema choose the **QuoteRequest** schema from the `Quote.xsd` file you used earlier.

The image displays three sequential screenshots of the 'Adapter Configuration Wizard'.

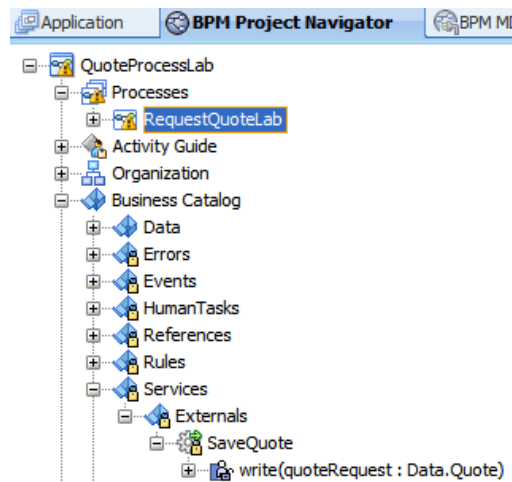
- Step 2 of 7: Service Name**
The title bar reads 'Adapter Configuration Wizard - Step 2 of 7'. The main heading is 'Service Name'. A message states: 'The Service Name cannot be modified.' Below this, 'Service Type: File Adapter' is shown. The 'Service Name' field contains the text 'SaveQuote'.
- Step 3 of 7: Adapter Interface**
The title bar reads 'Adapter Configuration Wizard - Step 3 of 7'. The main heading is 'Adapter Interface'. A descriptive text explains that the adapter interface is defined by a WSDL generated using the operation name and schema. Below, the 'Interface' section has two radio buttons: 'Define from operation and schema (specified later)' (which is selected) and 'Import an existing WSDL'.
- Step 4 of 7: Operation**
The title bar reads 'Adapter Configuration Wizard - Step 4 of 7'. The main heading is 'Operation'. A descriptive text explains the four supported operations: Read File, Write File, Synchronous Read File, and List Files. Below, the 'Operation Type' section has four radio buttons: 'Read File', 'Write File' (which is selected), 'Synchronous Read File', and 'List Files'. The 'Operation Name' field at the bottom contains the text 'Write'.



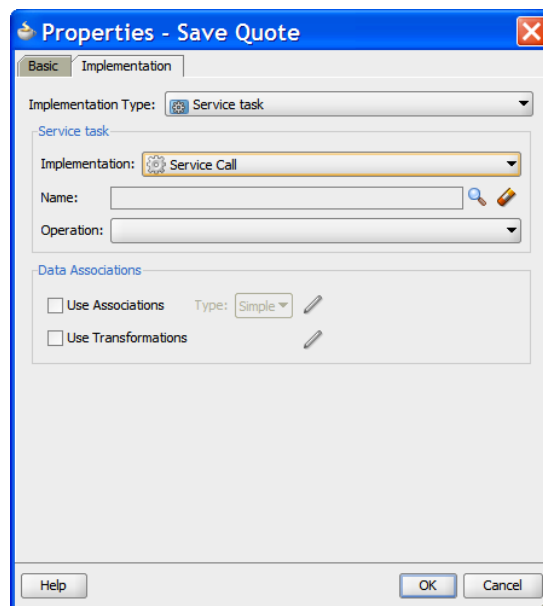
Bind Service Activity to Service

The File Adapter service that you just created in the composite application gets promoted to the **Business Catalog** in the **BPM Project Navigator** automatically.

45. Navigate to **BPM Project Navigator**
46. Go to **Business Catalog/Services/Externals** folder and expand it. Verify that the **SaveQuote** service is present.

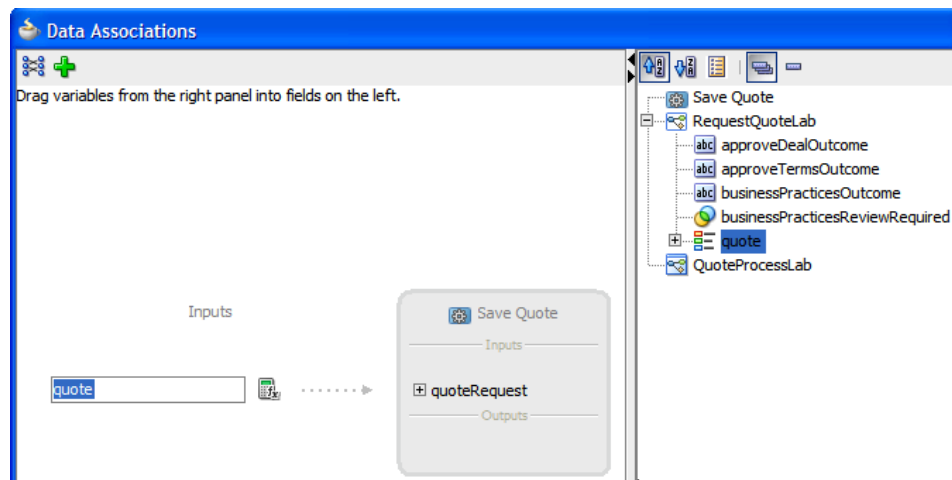


47. Open **RequestQuoteLab** BPMN process.
48. Right click on **Save Quote Service Activity**, select **Properties** and click **Implementation** tab
49. Select **Service** in the drop down menu within **Service Task**
50. Click on the magnifying glass next to **Name** to search for available services and select the service **SaveQuote**. Click **OK** to select the service but don't click **OK** on the Properties dialog yet!



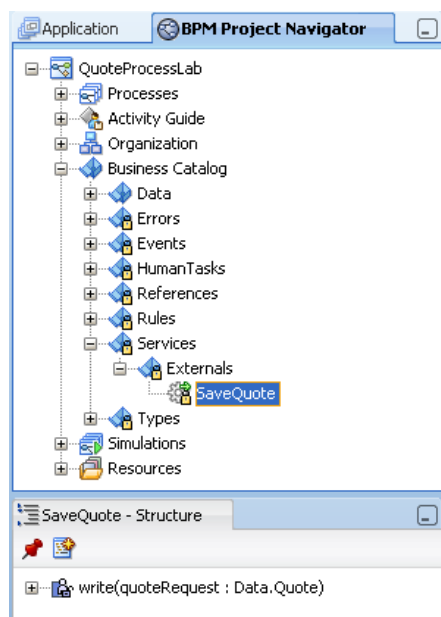
Pass Data to Service

51. Select **Use Associations** within **Data Associations** section and select type **Simple**.
52. Drag-and-drop the quote data object from the right hand panel to the **Inputs** area



53. Now click **OK** and click **OK** again. The **Save Quote Service Task** is complete.

Warning: There is an intermittent issue with the setting of the **Service** activity data. To verify it is set properly, select the **SaveQuote** service in the **Business Catalog**. The structure pane shows the service signature. The parameter name must be **quoteRequest**. If it shows as **quote**, save everything, exit JDeveloper and start it again. When you see **quoteRequest** in the service signature, you can continue.

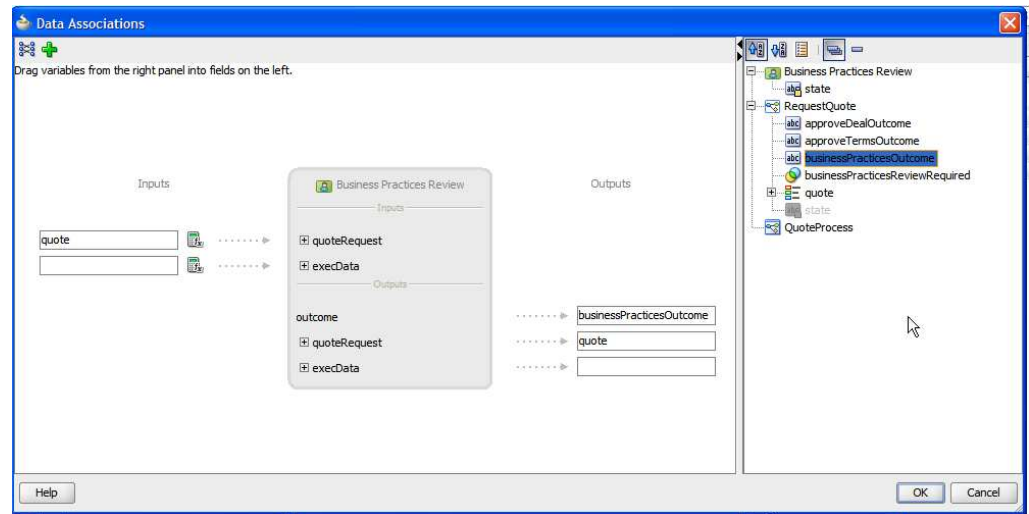


3.9 Data Association configuration for conditional flows

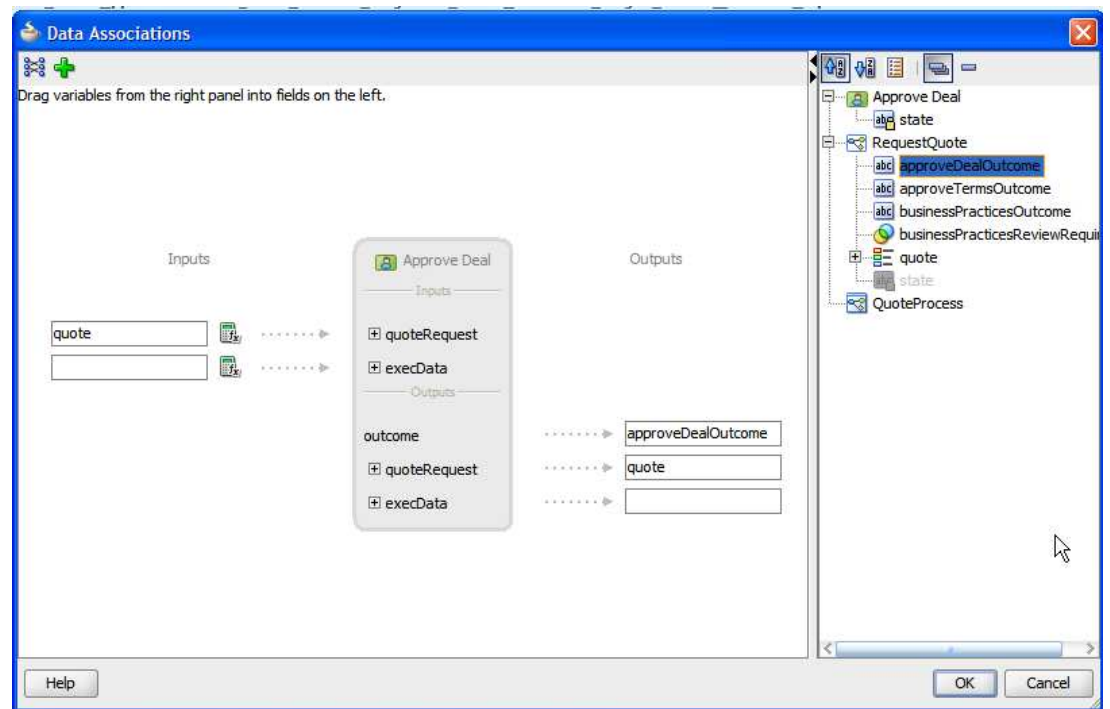
The outcomes of the Business Practices Review, Approve Deal and Approve Terms Interactive tasks have to be evaluated for conditional branching. The task outcome of these tasks is a string value of "APPROVE" or "REJECT". You set these outcomes when you defined the task. The outcomes get mapped to the Data Objects so you can then use the Data Objects in the conditional expressions used for branching.

54. Open the **Implementation** tab for the **Business Practices Review** properties and map the task outcome as shown in the figure below. You need to drag and drop the

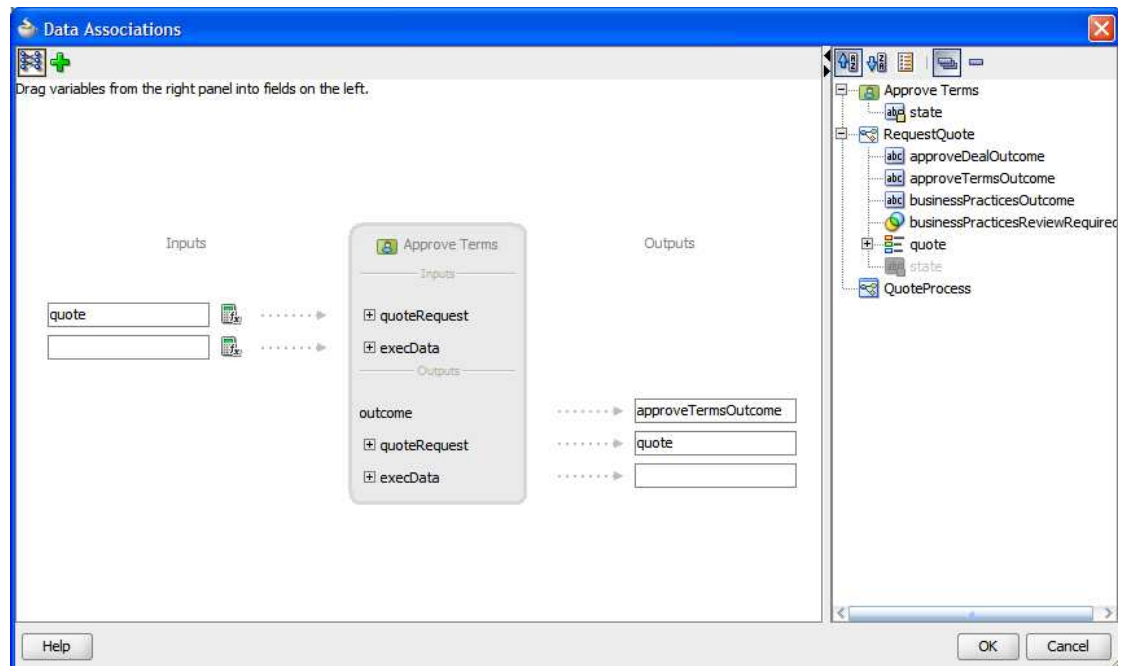
businessPracticesOutcome data object into the field next to the **outcome** output argument. Click **OK** and click **OK** again.



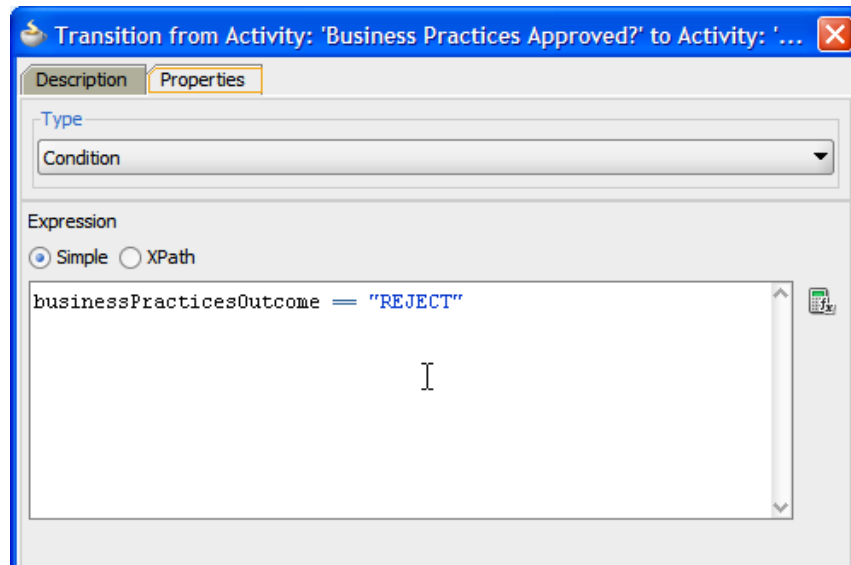
55. Map the outcome of the **Approve Deal** step as shown in the figure below:



56. Map the outcome of the Approve Terms step as shown in the figure below:



57. Now, specify the data object based conditional expression for the **Business Practices Reject** and **Deal or Terms Rejected** paths as shown in the figures below.



Transition from Activity: 'Approved?' to Activity: 'Enter Quote Details'

Description Properties

Type

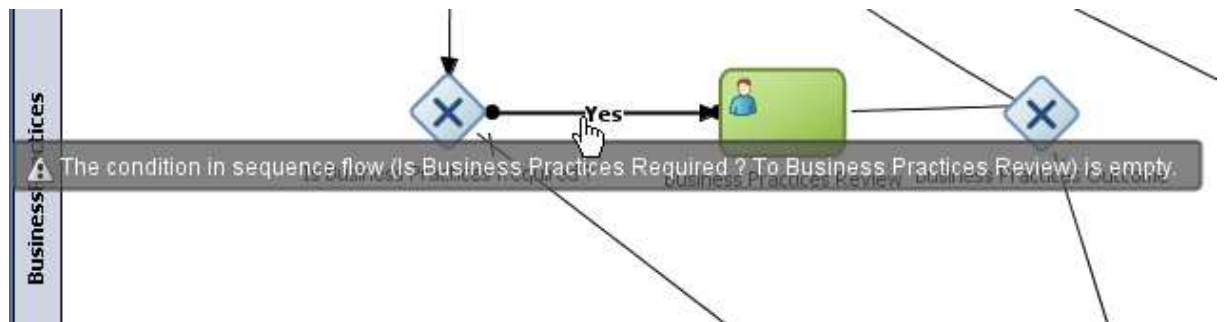
Condition

Expression

☒ Simple ☐ XPath

```
approveDealOutcome = "REJECT" or approveTermsOutcome = "REJECT"
```

58. Add the condition for the **Yes** path for **Is Business Practices Review Required?** Gateway.



Transition from Activity: 'Is Business Practices Required ?' to Activity...

Description Properties

Type

Condition

Expression

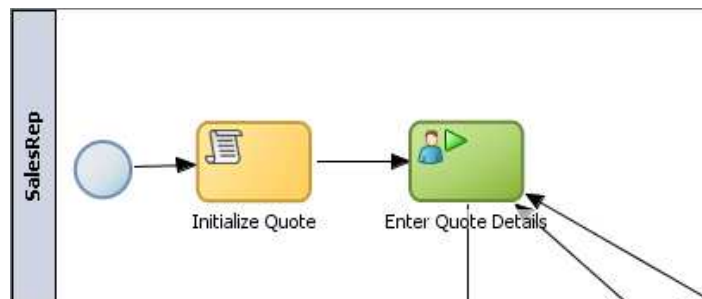
☒ Simple ☐ XPath

```
businessPracticesReviewRequired = true
```

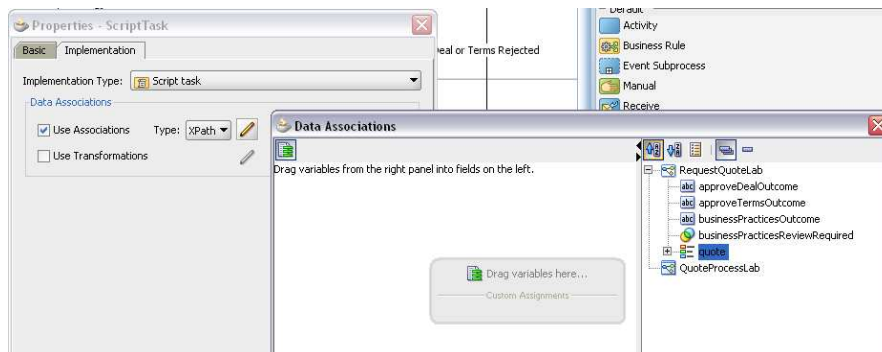
3.10 Configuration of Script Tasks

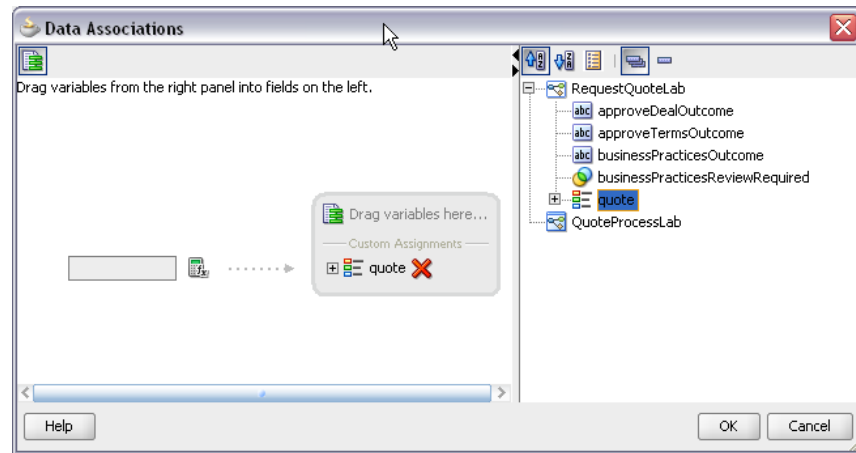
Finally, you need to add a **Script Task** to set the payload (the input data) for the **Enter Quote Details** task and to determine whether the **Business Practices Review** activity is required or not. The script goes right before **Enter Quote Details**. Using a script to set the input data makes testing this process easier but when running such a process for real, the user who initiates the task would enter the input data.

59. Click and drop a **Script Task** from the **BPMN Component Palette** and place it between the **Start** and **Enter Quote Details** steps. Name it *Initialize Quote*.



60. Click the **Implementation** tab and select **Use Associations**.
61. Select the **XPath** option and click the pencil icon to edit.
62. Drag the quote Data Object into the Custom Assignments area

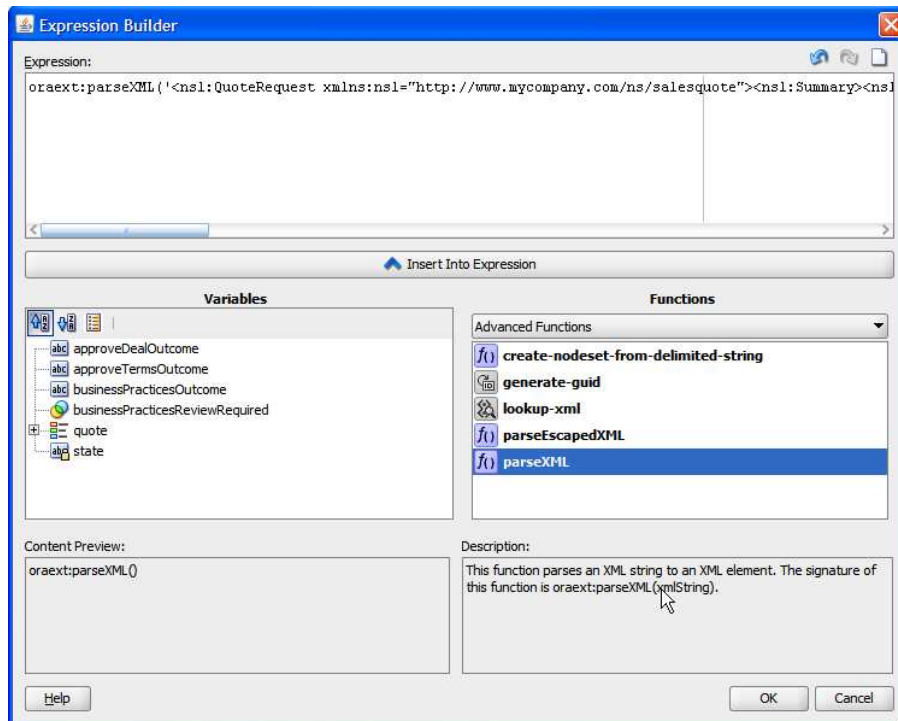




The XPath expression for the left hand side is shown below. The XML is also available in the c:\bpm\input\testData.xml file.

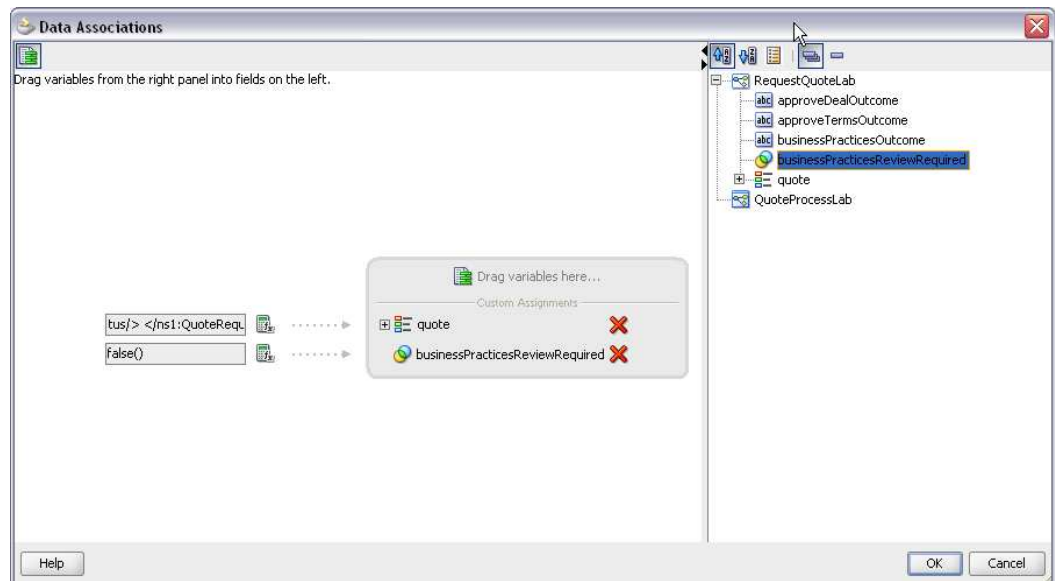
```
oraext:parseXML( ' <ns1:QuoteRequest
xmlns:ns1="http://www.mycompany.com/ns/salesquote">
  <ns1:Summary>
    <ns1:OpportunityID>zzzz2</ns1:OpportunityID>
    <ns1:AccountName>Acme New</ns1:AccountName>
    <ns1:Address>
      <ns1:Street>Demo Way</ns1:Street>
      <ns1:City>Redwood Shores</ns1:City>
      <ns1:State>CA</ns1:State>
      <ns1:Zip>94065</ns1:Zip>
      <ns1:Country>USA</ns1:Country>
    </ns1:Address>
    <ns1:SalesRepId>jcooper</ns1:SalesRepId>
    <ns1:SalesRepName>James Cooper</ns1:SalesRepName>
    <ns1:ValidUntil>2010-05-30</ns1:ValidUntil>
    <ns1:EffectiveDiscount>0.0</ns1:EffectiveDiscount>
  </ns1:Summary>
  <ns1:QuoteRequestStatus/>
</ns1:QuoteRequest>' )
```

63. Click the Expression Builder icon to open the Expression Builder and enter the XML string. Be sure to use the oraext:parseXML function and enter single quotes around the XML string inside the ().

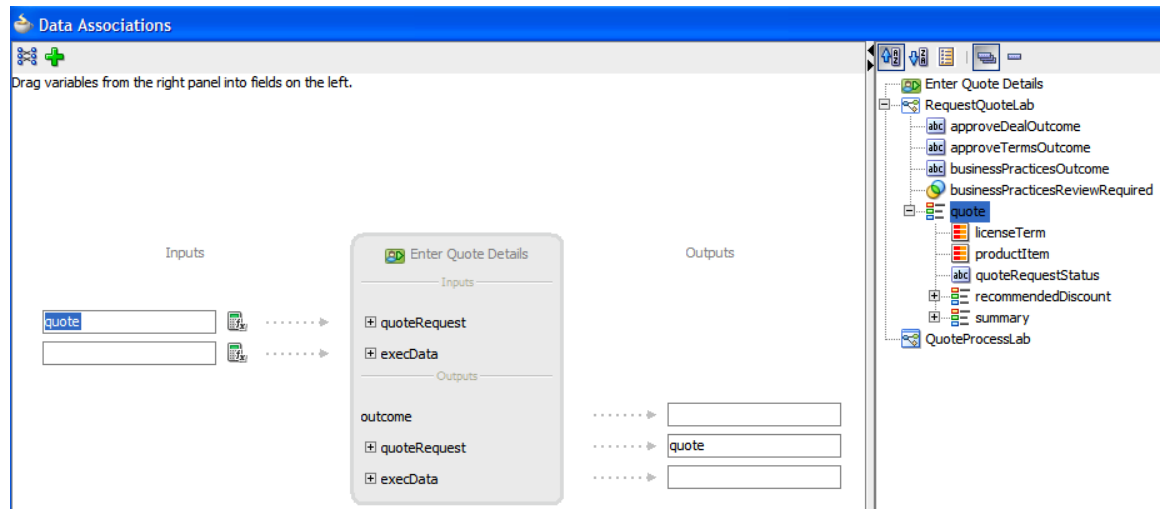


The quote **Data Object** is now initialized to the data in testData.xml.

64. Add another custom data mapping by dragging **businessPracticesReviewRequired** into the Custom Assignments area.
65. Set the **businessPracticesReviewRequired** to false() by either typing it into the Expression Builder or selecting it from the list of Logical Functions.

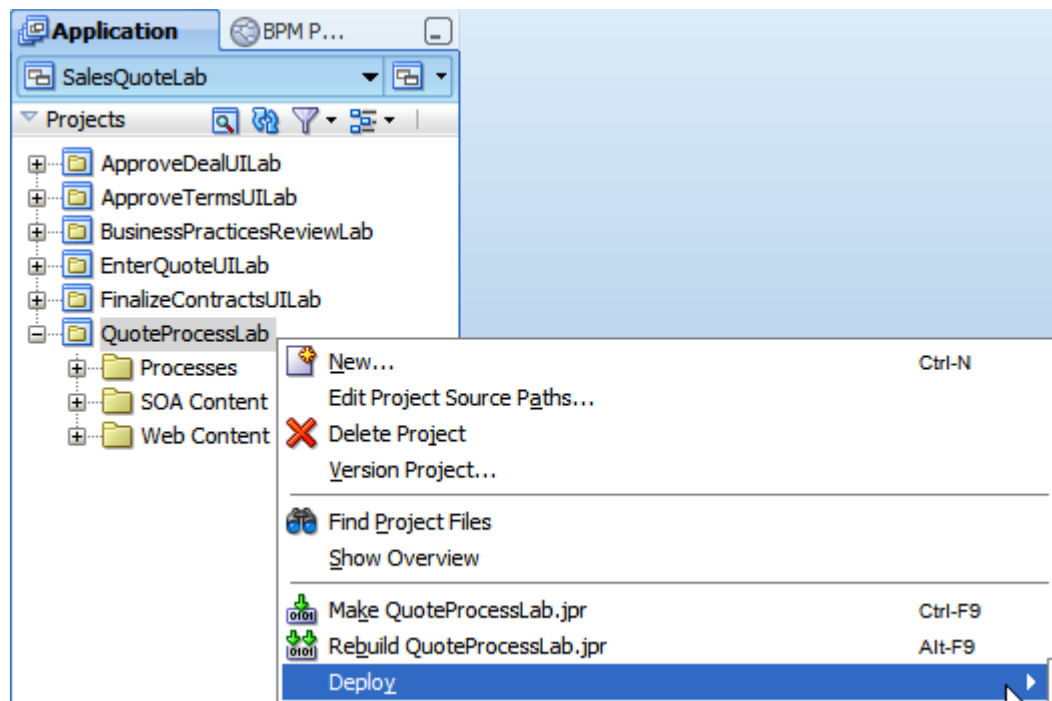


66. Go back to **Enter Quote Details** and set the input mapping to the quote **Data Object** as shown in the figure below. There is no need to set the outcome output data because this task has only a SUBMIT outcome.



67. This completes the implementation of the process.

3.11 Deploying the process

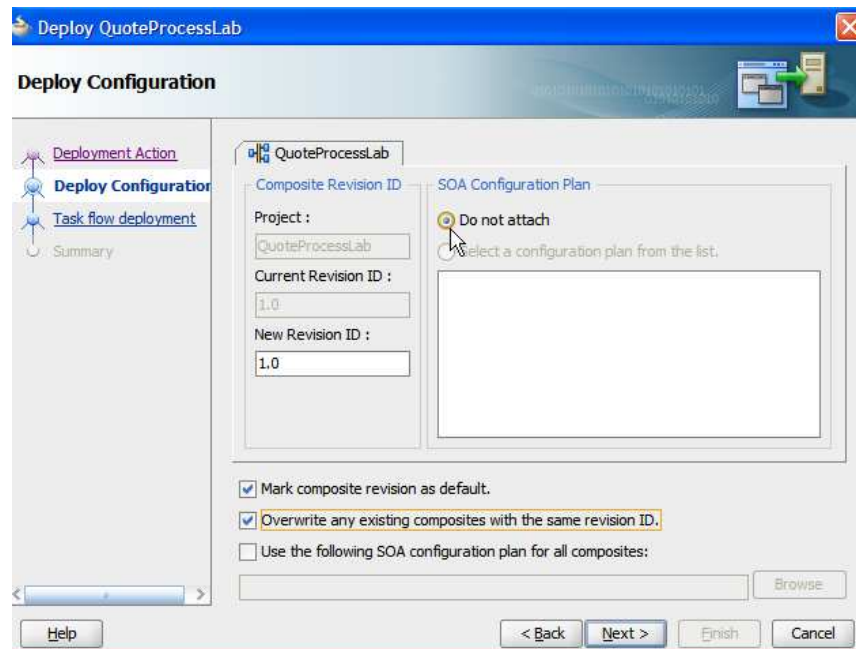
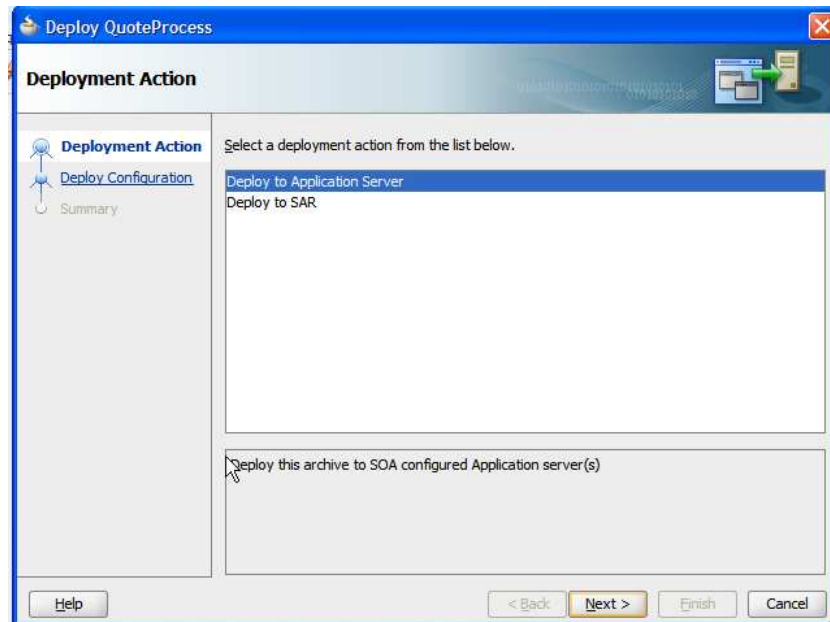


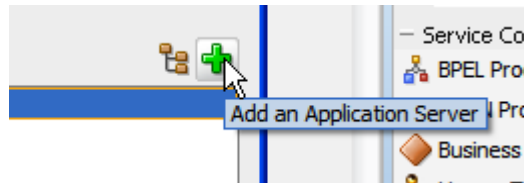
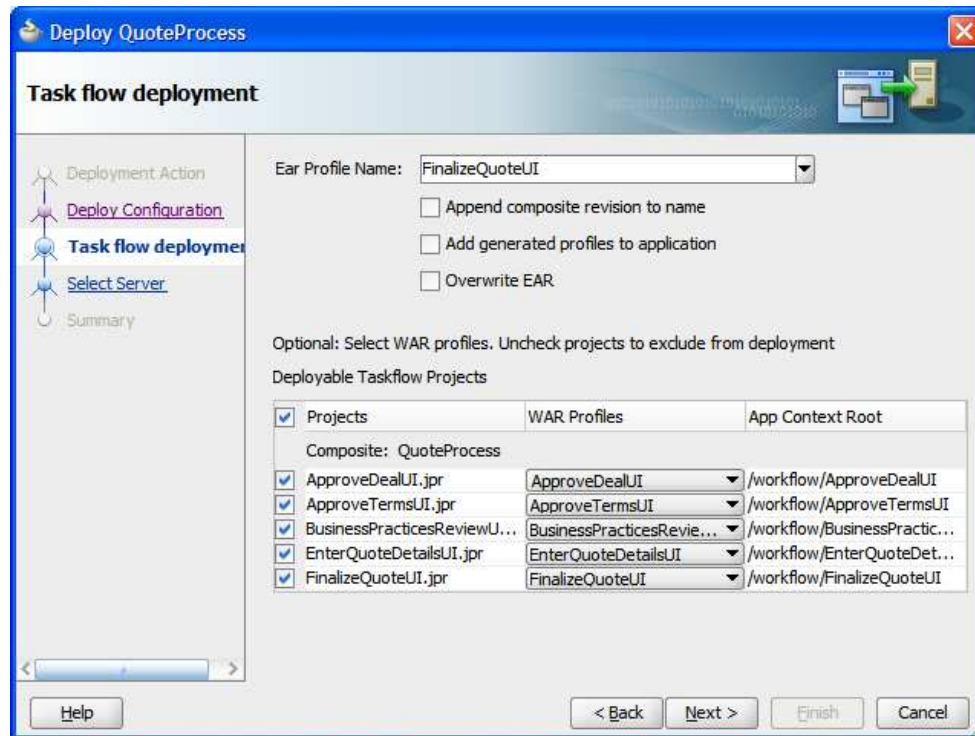
68. Go to **Applications Navigator**.

69. Highlight the **BPM Project QuoteProcessLab** and select **Deploy**.

70. Follow the steps as shown in the screen shot below.

Note: You will need to configure a connection to the BPM run-time engine along the way. Earlier, you set up a connection for LDAP access. If you have a managed server configuration, the LDAP connection used the 8001 port and will not work for deployment. The training configurations usually use user weblogic and password welcome1. For deployment, most training configurations use 7001 for the port and domain1 for the domain. When you test the connection, all protocols should test successfully.





Create Application Server Connection - Step 4 of 6

Configuration

Usage
Name and Type
Authentication
Configuration
Test
Finish

WebLogic Server connections use a host name and port to establish a connection. The Domain of the target will be verified

Weblogic Hostname (Administration Server):
bpm-server

Port: 7001 SSL Port: 7002

☐ Always use SSL

Weblogic Domain:
domain1

Deploy QuoteProcess

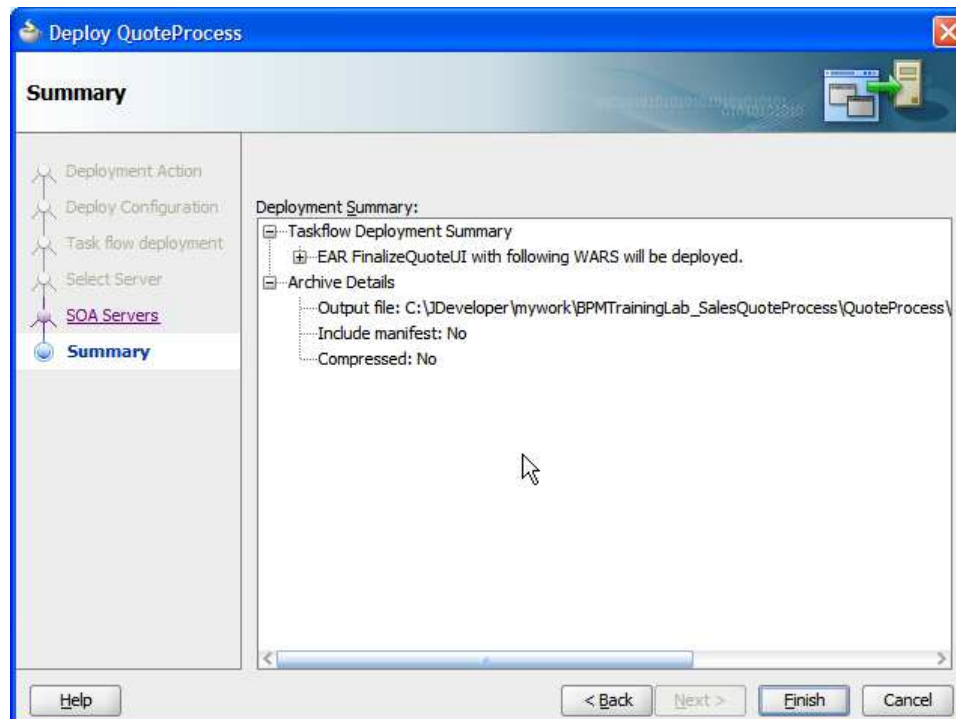
SOA Servers

Deployment Action
Deploy Configuration
Task flow deployment
Select Server
SOA Servers
Summary

Choose the target SOA server(s) to which you want to deploy this archive.

☒ soa_server1

Help < Back Next > Finish Cancel



This completes deployment of the process. You are now ready to run the process. Go to the next chapter for instructions on running and testing the process.