Oracle® Fusion Middleware

Using the SAP R/3 Integration Adapter for Oracle WebLogic Server

12c Release (12.2.1.4.0)

E97289-02

May 2023

Provides information on how to integrate with SAP R/3 systems and develop applications.

ORACLE

Oracle® Fusion Middleware Using the SAP R/3 Integration Adapter for Oracle WebLogic Server, 12c Release (12.2.1.4)

E97289-02

Primary Author: Sunil Kumar

Contributor: Arpit Gupta, Pankaj Kumar, K Rajendra Prasad, Ashok Kumar Reddy Nekkanti, Sidhant Mahajan, Riyaz Nadimimasid, and Manisha.

Content

Content ..... **iii**

Preface ..... **ix**

Audience ..... *ix*

Documentation Accessibility ..... *ix*

Related Documents ..... *ix*

Conventions ..... *ix*

1 Understanding of the Adapter for SAP **1-1**

1.1 Overview *1-1*

1.2 Business Design Using Adapter for SAP *1-1*

1.3 Adapter Components *1-2*

1.4 Supported Versions and Platforms *1-2*

1.5 Supported SAP ABAP Technologies *1-3*

2 Working with Adapter for SAP **2-1**

2.1 Prerequisites *2-1*

2.1.1 JDeveloper 2-1
2.1.2 SAP Java Connector (JCo) 2-1
2.1.3 Verify WebLogic and SOA 2-4
2.1.4 Adapter Components 2-5
2.1.5 Update the Default JNDI with the SAP Login Parameters 2-6
2.1.6 SAP Login Parameters 2-8

2.2 SAP Connection Configuration Parameters *2-8*

2.2.1 Login Parameters 2-8
2.2.1.1 Direct Connection 2-9
2.2.1.2 Load Balanced 2-10
2.2.2 Server Parameters (for Inbound) 2-11
2.2.3 Trace Parameters 2-11
2.2.4 Connection Pool Parameters 2-11
2.2.5 SAP Connection Security Parameters (SNC) 2-13
2.2.6 Additional Connection Parameters 2-13
2.2.7 Additional JCO Connection Properties 2-14

2.3 Create a Composite in Design-time *2-15*

2.4 Setting up JNDI for Adapter for SAP at Run-time *2-18*

2.5 Deployment of the Composite on Run-time Environment *2-20*

2.5.1 Create Application Server in JDeveloper 2-20
2.5.2 How to Deploy 2-20

2.6 Testing the Deployed Projects 2-20

3 Supported SAP Interfaces 3-21

3.1 Business Application Programming Interfaces (BAPI) 3-21
3.1.1 Standard BAPI 3-21
3.1.2 Custom BAPI 3-22

3.2 Remote Enabled Function Modules (RFCs) 3-22
3.2.1 Standard RFC 3-23
3.2.2 Custom RFC 3-23

3.3 Intermediate Document (IDoc) 3-23
3.3.1 Standard IDoc 3-23
3.3.2 Custom IDoc 3-23
3.3.3 Extended IDoc 3-23

4 SAP Java Connector 3.x 4-25

4.1 Supported Systems and Platforms 4-25

4.2 Performance 4-25
4.2.1 Connection Management 4-26
4.2.2 Connection Pooling 4-26
4.2.3 Caching of Metadata 4-28

4.3 RFC Server Threads 4-28

4.4 Trace Level Parameter 4-28

4.5 JCo Supported SAP Data types 4-29

5 Oracle Adapter for SAP Features 5-31

5.1 tRFC/qRFC/bgRFC Support 5-31
5.1.1 Modeling the tRFC SAP Endpoint: 5-32
5.1.2 Testing the tRFC SAP Endpoint 5-35
5.1.3 Modeling the qRFC SAP Endpoint 5-36
5.1.4 Testing the qRFC SAP Endpoint 5-39
5.1.5 Modeling the bgRFC SAP Endpoint 5-40
5.1.6 Testing the bgRFC SAP Endpoint 5-45

5.2 Design-Time Test Functionality 5-46
5.2.1 Using the Design-Time Test Functionality 5-46

5.3 Exception Filter 5-51
5.3.1 Create an Exception Filter Project 5-51
5.3.2 Testing the Exception Filter Project 5-52

5.4 Schema Validation 5-55
5.4.1 Create a Project with Schema Validation: 5-55
5.4.2 Testing the Schema Validation Project: 5-56

5.5 AutoSYSTAT Feature for RFC 5-57
5.5.1 Creating a Project with AutoSYSTAT01 Property 5-57

5.5.2 Test the Project with AutoSystat Property....5-58

5.6 Encode IDoc....5-60
5.6.1 Create a Project for Flat File IDoc....5-60
5.6.2 Test the Flat File IDoc Project....5-61

5.7 Generic IDoc Support....5-62
5.7.1 Create Generic IDoc Inbound Endpoint....5-63
5.7.2 Test the Generic IDoc Inbound Endpoint....5-64
5.7.3 Create Generic IDoc Outbound Endpoint....5-65
5.7.4 Test the Generic IDoc Outbound Endpoint....5-66

5.8 Revision IDoc Support....5-67

5.9 Sharing Program ID Feature....5-68
5.9.1 Create a Sharing Program ID Project:....5-68

5.10 Multiple IDoc Support....5-69
5.10.1 Create a project for Multiple IDoc Support:....5-69

5.11 Credential Mapping for Oracle SOA Suite (BPEL, Mediator, BPM or OSB)....5-70
5.11.1 Setup Credential Mapping for the Adapter....5-70
5.11.2 Setup Credential Mapping for SOA....5-74
5.11.2.1 Creating SOA Project for Credential Mapping....5-74

5.12 Stateful Interaction....5-79
5.12.1 Create a Stateful BAPI project....5-80
5.12.2 Test the Stateful BAPI Project:....5-83

5.13 Error Handling....5-83

5.14 SOA Debugger Support....5-84
5.14.1 SOA Debugger for Inbound....5-84
5.14.2 SOA Debugger for Outbound....5-88

5.15 Non_Xml Characters Handling Feature....5-95

5.16 Error Document Support....5-96

5.17 Payload Threshold Support....5-99
5.17.1 Inbound Project with payloadSizeThreshold support....5-99
5.17.2 Outbound Project with payloadSizeThreshold Support....5-101

5.18 TID Backstore Support....5-104

5.19 Large payload support-AsAttachment....5-106

5.20 Resiliency Support....5-111
5.20.1 Inbound Project with Resilience support....5-111

5.21 Segment Release Design Time and Runtime Support....5-115

5.22 Special Character Support for Inbound IDoc....5-116

5.23 Dynamic RFC Cache Update....5-116

6 Complete Walkthrough of the Adapter Configuration Wizard....6-118

6.1 Overview....6-118

6.2 The Adapter Wizard in JDeveloper....6-118

6.3 Specifying the Service Name 6-119

6.4 Connecting to SAP 6-119
6.4.1 Define a Connection Name 6-121
6.4.2 Define the Connection Parameters to the Connection Name 6-121
6.4.3 Connect to a Defined SAP connection 6-124

6.5 Select SAP Objects from Objects Selection 6-135
6.5.1 Object Panel 6-136
6.5.2 Selected BAPI /RFC functions or IDoc messages panel 6-141
6.5.3 Definition panel 6-142

6.6 JCA Properties Page 6-143
6.6.1 Interaction of JCA Properties (Outbound to the Adapter) 6-144
6.6.2 Activation of JCA Properties (Inbound to the Adapter) ControlCharacter 6-146
6.6.3 Generation of Corresponding (JCA) Artifacts (WSDL/XML Schemas) 6-147

6.7 Finishing with Adapter Configuration Wizard 6-147

7 Configuring the Adapter Run-Time Parameters on the WebLogic Server 7-149

7.1 Adapter Integration with Oracle WebLogic Server 7-149
7.1.1 Configure Run-time Parameters for the Adapter for SAP 7-149

8 Integration Scenarios in Oracle SOA Suite 8-154

8.1 Integration Overview 8-154

8.2 The Adapter Integration With SOA Service Components 8-154
8.2.1 Create a New Application Server Connection 8-154
8.2.2 Create an Empty Composite for SOA 8-160
8.2.3 Design an Outbound BPEL Process for BAPI/RFC/IDOC 8-164
8.2.4 Design an Inbound BPEL Process for BAPI/RFC/IDoc 8-184
8.2.5 Deploy the Composite with Inbound BPEL Process 8-197
8.2.6 Generate an Event in SAP R/3 and Process It by the SOA Composite 8-197
8.2.7 Define an Outbound Mediator Process 8-198
8.2.8 Define an Inbound Mediator Process 8-208
8.2.9 Deployment of Inbound Mediator Process 8-221
8.2.10 Generate an Event in SAP R/3 for Testing Mediator Inbound and Outbound Process 8-221

8.3 The Adapter Integration with BPM Service Components 8-221
8.3.1 Deployment of Adapter 8-221
8.3.2 Create an Empty Composite for BPM 8-222
8.3.3 Define a BPM Outbound Process 8-224
8.3.4 Design a BPM Inbound Process 8-243

8.4 The Adapter Integration with Oracle Service Bus (OSB) 8-254
8.4.1 Create an Empty Composite for OSB 8-254
8.4.2 Define an OSB Outbound Process 8-257
8.4.3 Define an OSB Inbound Process 8-275

8.5 Deploy the Defined Process 8-292

8.6 Test the Deployed Process 8-298
8.6.1 Test the Outbound Process 8-298
8.6.1.1 Invoking the Input XML Document in the Oracle Enterprise Manager Console 8-299

8.6.2 Test the Inbound Process....8-304
8.6.2.1 Generate an Event in SAP R/3....8-305

9 Adapter for SAP Performance Tuning....9-1

9.1 Tuning and Performance....9-1
9.1.1 Tuning Parameters....9-1
9.1.1.1 SAP JCo Parameter Tuning....9-1
9.1.1.2 BPEL Infrastructure Tuning Parameters (These are provided at Enterprise Management (EM) level): 9-1
9.1.2 System Configuration....9-3
9.1.2.1 Oracle Linux Server....9-3
9.1.2.2 Hardware....9-3
9.1.3 Outbound Performance....9-4
9.1.3.1 Performance Summary....9-4
9.1.3.2 Enhanced Performance....9-5

9.2 Inbound Performance....9-5
9.2.1 Performance Summary....9-6

10 SOA Reports Integration....10-8

10.1 Adapter Health Report....10-8
10.1.1 Configuration Report....10-9
10.1.1.1 EIS Connectivity....10-10
10.1.2 Monitoring reports....10-11
10.1.3 Snapshot Reports....10-11

11 Troubleshooting and Error Messages....11-13

11.1 Log file Information....11-13

11.2 Oracle Adapter for SAP Design-Time JDeveloper....11-14

11.3 Oracle Adapter for SAP Run-Time....11-15

11.4 SAP R/3....11-17

11.5 Known Issues....11-18

12 Migration Support....12-19

12.1 Migration of SAP Endpoints in SOA Projects....12-19

12.2 Migration of SAP Endpoints in OSB Projects....12-22

12.3 Deploying the Adapter Migrated Project....12-28

12.4 Updating JCA file in Migrated Projects....12-28

12.5 Execution Steps for Deployed Migrated Projects....12-28
12.5.1 Inbound Project....12-28
12.5.2 Outbound Project....12-28

A SAP System Configurations for Remote Processing....1

A.1 Roles and Authorizations....1

A.2 RFC Authorization Object....1

A.3 SAP Inbound Communication *2*
A.3.1 Configure a Logical System 3
A.3.2 Configure a Partner Profile 6
A.3.3 Configure Inbound Process Code 7
A.3.4 Configure a Distribution Model 8
A.4 SAP Outbound Communication *10*
A.4.1 Configure RFC Destination and Program ID 10
A.4.2 Configure a Port 12
A.4.3 Configure a Logical System 14
A.4.4 Configure a Distribution Model 14
A.4.5 Configure Partner Profile 14
A.5 SAP User Authorizations for Adapter *16*
A.6 SAP BGRFC Configuration *17*
Glossary **20**
Index **21**

Preface

- Audience
- Documentation Accessibility
- Related Documents
- Conventions

Audience

Using the SAP R/3 Integration Adapter for Oracle WebLogic Server is intended for anyone who is interested in using these adapters.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc`.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info` or visit `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs` if you are hearing impaired.

Related Documents

For more information, see the Oracle Fusion Middleware 12c Release (12.2.1.4) documentation on the Oracle Help Center.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	

monospace	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values. Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1 Understanding the Adapter for SAP

This chapter provides an introduction to the Oracle Integration Adapter for SAP R/3. It contains the following topics:

- Section 1.1, "Overview"
- Section 1.2, "Business Design Using Adapter for SAP"
- Section 1.3, "Adapter Components"
- Section 1.4, "Supported Versions and Platforms"
- Section 1.5, "Supported SAP ABAP Technologies"

1.1 Overview

The Adapter for SAP is used for the integration of Oracle products with SAP Enterprise to exchange the real-time data. It is developed in the Oracle JCA framework. It is based on the SAP Java Connector 3.0 (SAP JCo) and is used for the inbound and outbound interaction with SAP using message types RFC/BAPI/IDOC.

- **Outbound interaction:** When an application uses the Adapter for SAP to invoke an SAP R/3 business object or business operation, the interaction is termed as Outbound interaction.
- **Inbound interaction:** When an SAP R/3 system triggers an event and the event is listened by an application using Adapter for SAP as a result of which the application receives SAP R/3 data, the interaction is termed as Inbound interaction.

Adapter for SAP allows different types of connection methods including secure connection and message server communication method, with both Unicode and Non-unicode SAP systems.

It offers organizations a service-oriented approach to unlock the information assets that have evolved in most IT environments. It provides tighter integration with both the design-time and run-time components of SOA suite and also with other Oracle products which helps customer for better business data integration.

1.2 Business Design Using Adapter for SAP

Adapter for SAP provides seamless integration between SAP R/3 systems and non-SAP systems. It supports xml communication as standard business message format which is useful in integrating different platforms. Adapter run-time provides access to an SAP System and control secure communication, connection management and function execution. Adapter design-time module comes as an integral part of Oracle SOA Suite and OSB products. This helps you to design business integration scenarios with SAP R/3 systems.

Adapter for SAP run-time supports bi-directional communication to an SAP system. You can add, update or receive business data to and from SAP. The Adapter for SAP supports multiple

SAP interfaces like BAPI/RFC/IDoc to perform such operations. As an end user, you only need to know which RFC/IDoc/BAPI of SAP system would be used and which type of communication would be required in the business use case. Security and connection management is handled by the adapter itself. Before starting integration with Adapter for SAP, you should have SAP user credentials for communication. The SAP user should have minimum required permissions to execute BAPI/RFC/IDOC. To receive any data from SAP system, you should take help of SAP admin to define logical systems in SAP side.

Adapter for SAP encapsulates most of the complex data types supported by SAP R/3 systems in the form of xml standard type which ease the integration for end user by avoiding the complexity of data mapping at the time of process design.

1.3 Adapter Components

Components of Adapter for SAP are defined in two parts:

1. Design-time Component (JDeveloper extension)
2. Run-time Component (WebLogic application)

Design-time component for Adapter comes with Oracle JDeveloper as a part of SOA, OSB, and BPM Oracle integration products. Adapter design-time provides wizard based design flow which contains pages categorized to support step-by-step procedure to create an SAP reference/service in the SOA/OSB composites. JCA artifacts are created as a result of the Adapter design.

The Adapter Run-time component comes with Oracle SOA/OSB release as a JCA connector. This component is implemented using j2EE Connector Architecture Framework. Adapter run-time must be deployed to the WebLogic Server as a resource adapter before deploying any SOA/OSB projects using Adapter for SAP. This adapter component executes a native call to SAP and sends back result as an xml in case of outbound execution. It takes care of the native call to SAP and creates abstraction of SAP related execution complexities from the user.

1.4 Supported Versions and Platforms

Oracle Integration Adapter for SAP R/3 supports the below mentioned versions of the interacting/underlying systems:

Operating System (OS) Versions:

Oracle Integration Adapter for SAP R/3 supports all the versions of operating systems that are supported by SAP JCo 3.0. Below is the list of the OS platforms.

For more information about the versions supported by SAP JCo 3.x, refer to SAP Note #1077727 in the SAP service Market Place.

- Windows (2008 R2)
- Linux (Oracle Linux 6 and Redhat Linux 6)

SAP Versions:

- SAP R/3 4.7
- SAP ECC 5.0
- SAP ECC 6.0

- SAP ECC 6.0 EhP 6
- SAP ECC 6.0 EhP 7

JAVA Versions:

- Oracle Integration Adapter for SAP R/3 supports all java version supported by SAP JCo 3 API

JCo Versions:

- SAP JCo 3.X

Oracle SOA Versions:

- Oracle Fusion Middleware 12.2.1

For more information on the Oracle Fusion Middleware Certification Matrix, refer to:

http://www.oracle.com/technetwork/middleware/fusion-middleware/documentation/fmw-122120-certmatrix-3254735.xlsx

1.5 Supported SAP ABAP Technologies

Oracle Integration Adapter for SAP R/3 provides access to the following SAP ABAP interfaces:

1. RFC (Remote Function Call)
2. BAPI (Business Application Programming Interface)
3. IDocs (Intermediate Documents)

Remote Function Call (RFC) is a standard SAP interface for communication within SAP systems and with external non-SAP systems. RFC calls a function to be executed in a remote system.

Business Application Programming Interfaces (BAPIs) are defined as API methods of SAP business object types. A BAPI is implemented as a function module that is stored and described in the Function Builder. BAPIs are remotely enabled functions which mean that these can be invoked from remote programs like standalone Java programs or Web services. This attribute of the BAPIs help to facilitate the integration of third-party systems with the SAP proprietary R/3 products. BAPI is usually a self-contained business function.

Intermediate Document (IDoc) is an SAP document format for business transaction data transfers. As the name suggests, these documents act as intermediate storage of information, which can be sent bi-directionally for exchange of data between SAP R/3 and non-R/3 systems.

An IDoc is made up of the following parts:

- **Control record:** This section contains control information regarding the IDoc. Its constituents are Sender's name, Receiver name, Message type, and IDoc type. The format of the control record is similar for all the IDoc types.
- **Data records:** It consists of a header that contains the identity of the IDoc. Its constituents include a sequential segment number, a segment type description, and field containing the actual data of the segment.

- **Status records:** The status record shows the information regarding already processed stages and remaining processing stages of the IDoc. It has an identical format for each IDoc type.

2

Working with Adapter for SAP

This section provides a quick start guide to use the Oracle Integration Adapter for SAP R/3. This chapter contains the following topics:

- Section 2.1, "Prerequisites"
- Section 2.2, "SAP Connection Configuration Parameters"
- Section 2.3, "Additional JCO Connection Properties
- The user can increase the cpi max jco parameter by adding the below parameter in the startManagedweblogic.sh file of all managed servers, changes will affect after the managed server restart.

JAVA_OPTIONS="-Djco.cpic_maxconv=300 ${JAVA_OPTIONS}"
Export JAVA_OPTIONS

Figure 2-8 startManagedweblogic.sh file

startManagedWebLogic.sh

```
WLS_USER=""
export WLS_USER

WLS_PW=""
export WLS_PW

#  Set JAVA_OPTIONS to the java flags you want to pass to the vm. i.e.:

#  set JAVA_OPTIONS=-Dweblogic.attribute=value -Djava.attribute=value -
DCPIC_MAX_CONV=500

JAVA_OPTIONS="-Dweblogic.security.SSL.trustedCAKeyStore="/oracle/GA12.2.1/
Middleware/wlserver/server/lib/cacerts" ${JAVA_OPTIONS}"
JAVA_OPTIONS="-Djco.cpic_maxconv=300 ${JAVA_OPTIONS}"
export JAVA_OPTIONS
```

- Create a Composite in Design-time"
- Section 2.4, "Setting up JNDI for Adapter for SAP at Run-time"
- Section 2.5, "Deployment of the Composite on Run-time Environment"
- Section 2.6, "Testing the Deployed Projects"

2.1 Prerequisites

This section lists the prerequisites for using Adapter for SAP in design-time and run-time environment.

2.1.1 JDeveloper

Installation of the appropriate version of JDeveloper is required for developing the components at design-time. For more information on installation steps of JDeveloper, refer to *Oracle Fusion Middleware Installation Guide for Oracle JDeveloper*.

2.1.2 SAP Java Connector (JCo)

SAP JCo is a middleware component which is used for communication between the Adapter and the SAP system. This component has to be installed in both design-time and run-time environments of Adapter for SAP. Below are the details which will help you to install and validate the SAP JCo.

1. JCo version supports SAP Java Connector 3.x. The latest version available is SAP JCo 3.0.13. More details on the supported operating systems and platforms, is provided in chapter SAP Java Connector 3.x". The Adapter does not support the platforms which are not supported by the SAP JCo 3.x.

2. **JCo Files:** Below are the required SAP JCo installation files:

   i. Microsoft Windows

      a. sapjco3.jar
      b. sapjco3.dll
      c. sapidoc3.jar

   ii. Linux

      a. sapjco3.jar
      b. libsapjco3.so
      c. sapidoc3.jar

3. Source for SAP JCo files:

   These files are provided by SAP administrator or you can download the installation files from SAP service market place under `service.sap.com/connectors`.

   Verify Path and ClassPath for SAPJCo files :

   For Windows :

   1. SAPJCo3 library should be in CLASSPATH and PATH variable .
   2. Extract SAPJCO zip in a folder location and now this folder should contain sapjco3.jar,sapjco3.dll and sapidoc3.jar
   3. Provide this folder location in to the PATH
   4. Provide location of sapjco3 and sapidoc3 jars in to CLASSPATH

For Linux :

1. SAPJCo3 library should be in CLASSPATH and PATH variable
2. Extract SAPJCO in a folder location like /oracle/SAPJCo3 and now this folder should contain sapjco3.jar, libsapjco3.so and sapidoc3.jar
3. Keep libsapjco3.so file in to LD_LIBRARY_PATH or make sure libsapjco3.jar is installed as system library
4. LD_LIBRARY_PATH can be set using following command
   Export LD_LIBRARY_PATH=/oracle/SAPJCo3

4. Check for the compatibility:

After downloading the SAP JCo files, place it in the directory of the system where these libraries need to be validated. Perform the following steps to validate SAP JCo:

i. Navigate to the directory where the *sapjco3.jar* file is located.

a. On Windows:

- Right-click the **sapjco3.jar** file.
- Select **Open with** and then click Java 2 Platform Standard Edition binary.
  Or
  Run sapjco3.jar file from command prompt, as shown in Figure 2-1.

Figure 2-1 Run Command Screen

b. On Linux:

- Execute the command from the command prompt
  `java -jar sapjco3.jar`

ii. Execute the above command in respective OS. A popup window appears, as shown in Figure 2-2. If the popup opens successfully, it implies that JCo installation is successful.

Figure 2-2 Popup window of OS

iii. Another way of validation is to check the path of JCo library and path of JCo archive property in screen. If they are showing correct library and archive (jar) file, it means that JCo library is correct for your Operating System.

5. JCo file location for the Adapter for SAP.

- In Design-time environment, place the files at below path:
  <ORACLE_HOME>/soa/plugins/jdeveloper/integration\adapters/lib
- In Run-time environment, place the files at below path:
  <ORACLE_HOME>/user_projects/domains/soa_domain/lib

6. Update the Global variables:

We need to update the path of the JCo library installed in the PATH of the Global variables.

i. Windows:

In the Windows Operating systems, the environment variables have to be updated as mentioned in the below steps.

a. Go to **My Computer** properties.
b. Navigate to Advanced Properties -> Environment variables, and update the PATH and CLASSPATH variables as below:

- *PATH=$PATH;*
  <ORACLE_HOME>\soa\plugins\jdeveloper\integration\adapters\lib

ii. Linux:

In the Linux Operating systems, the environment variables have to be updated as mentioned in the below steps.

a. Navigate to the Bash profile with the below command, using the same SOA Installation.
```
vi ~/.bash_profile
```
b. Press "**i**" for insertion and add the below entries in the bash_profile file

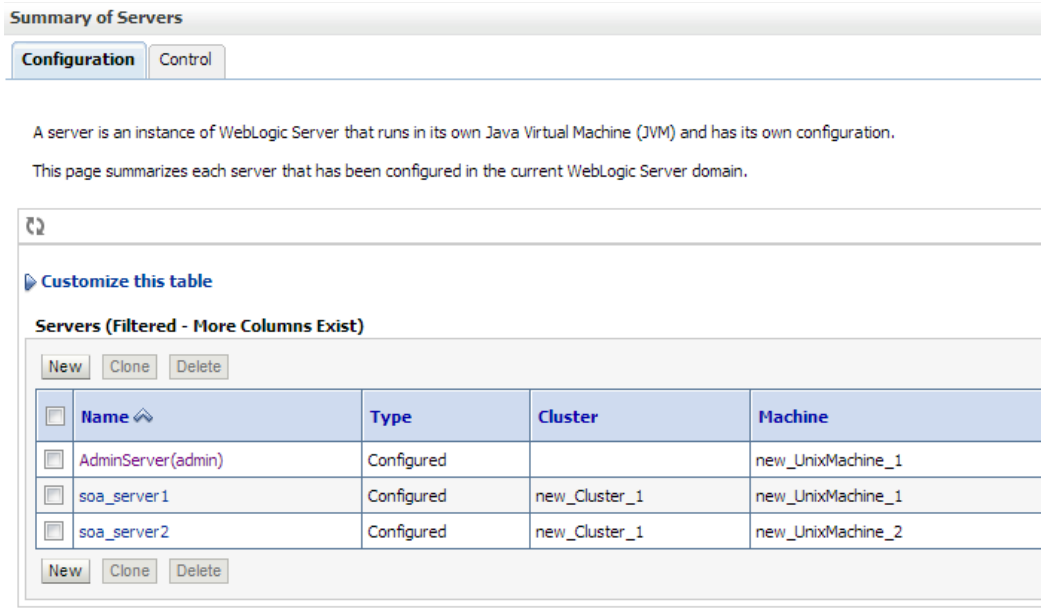
- ```
  PATH=$PATH;
  <ORACLE_HOME>\soa\plugins\jdeveloper\integrati
  on\adapters\lib
  ```

c. Press <Esc> and then press <Ctrl+Shft+x> to save.

2.1.3 Verify WebLogic and SOA

After installation of WebLogic and SOA, verify that the servers are in the **Running** state and **Health** is **OK** as shown in Figure 2-3.

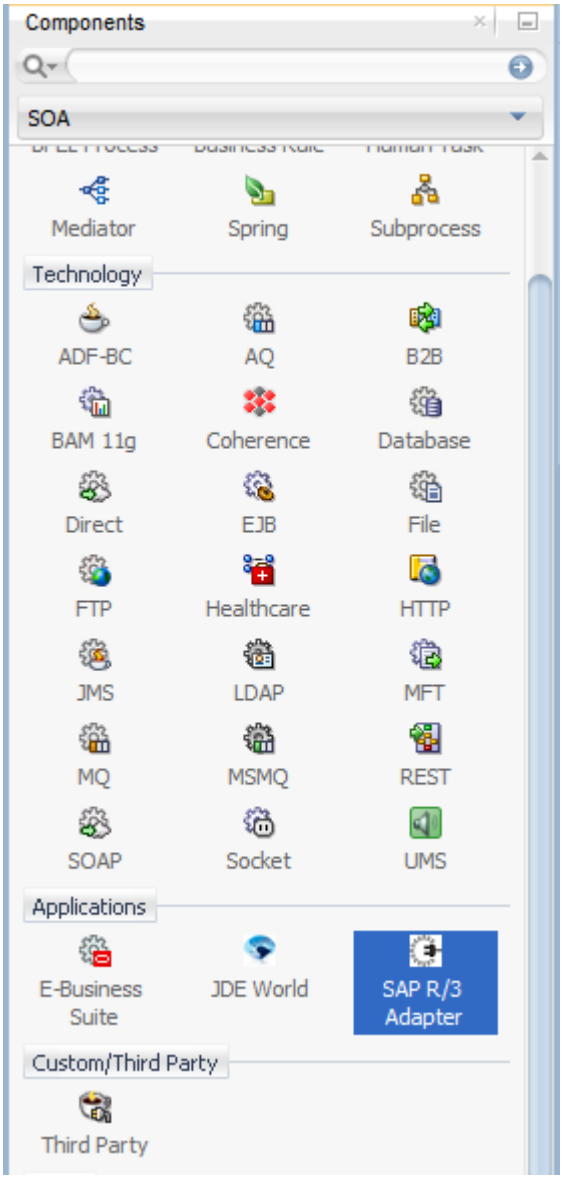
Figure 2-3 Summary of Servers



2.1.4 Adapter Components

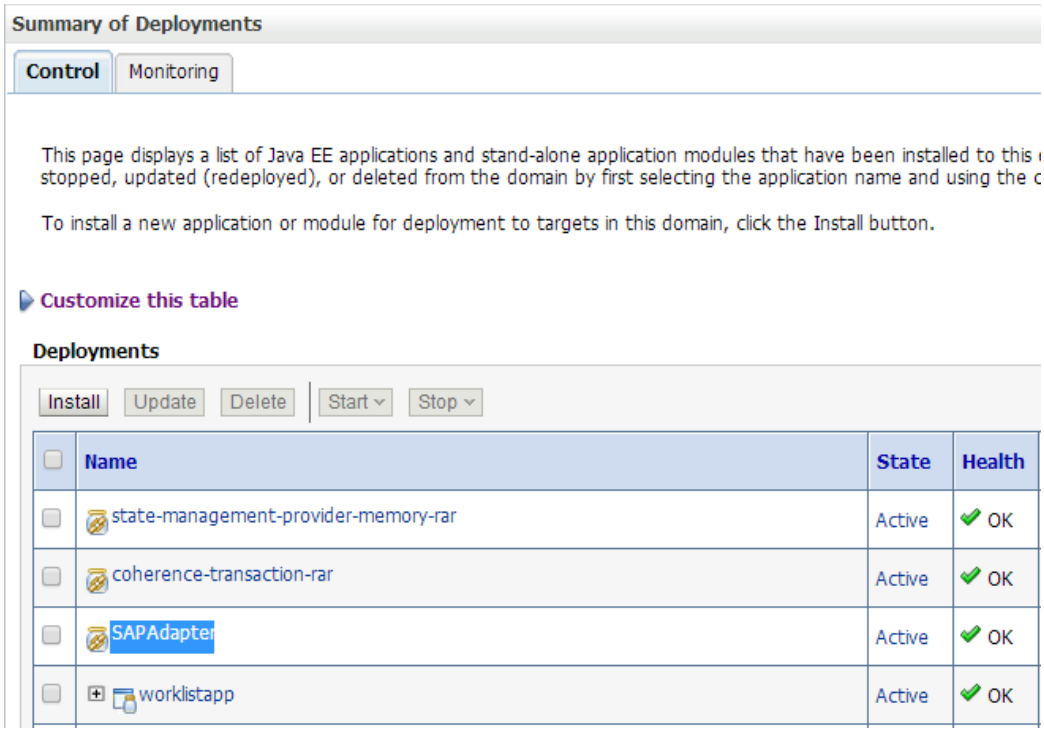
1. **Design-time:** After installing the Adapter for SAP in design-time of the build provided, create or open an existing SOA project in JDeveloper and check for the Adapter icon in the Component palette of JDeveloper, as shown in the Figure 2-4.
  ```

Figure 2-4 Adapter Icon in the Component Palette of JDeveloper



2. **Run-Time:** After installation of Adapter run-time in the WebLogic console, verify the status of the Adapter to be **Active** and checked **OK**, as shown in Figure 2-5.

Figure 2-5 Summary of Deployments

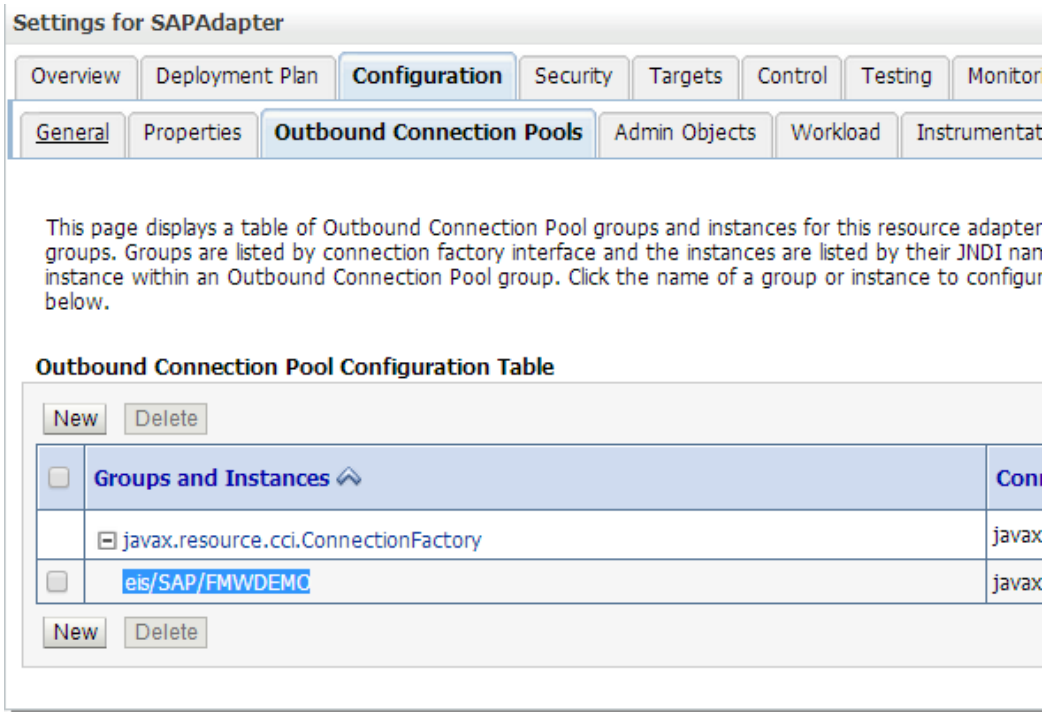


2.1.5 Update the Default JNDI with the SAP Login Parameters

Update the default JNDI with the SAP Login parameters in the below path of console.

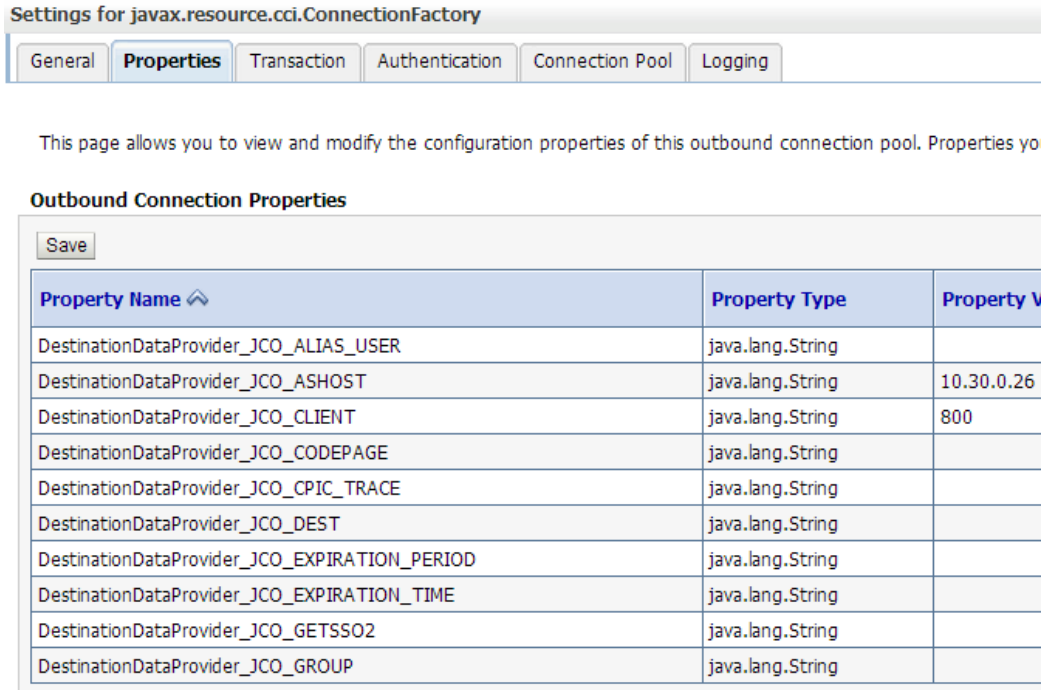
1. Home →Summary of Servers →Summary of Deployments →Adapter for SAP, as shown in Figure 2-6.

Figure 2-6 Setting for Adapter for SAP



2. Click on **eis/SAP/FMWDEMO.** The **Outbound Connection Properties** page is displayed, as shown in Figure 2-7.

Figure 2-7 Properties Tab



2.1.6 SAP Login Parameters

You need to have SAP R/3 logon parameters for making the connection to the SAP system from DT wizard or RT (JNDI). These are provided by the SAP System Administrator. Below ia the list of mandatory connection parameters which are required for making a simple outbound connection to the SAP system.

1. **Client:** This is the client number of the SAP system. This is a 3 digit numeric character. For example, Client = 100.
2. **User name:** This is the SAP user. Dialog or Communication type of SAP user can be used here.
3. **Password:** Password of SAP user.
4. **Language:** SAP Logon language. The language provided here should be one of the installed languages provided by the SAP administrator. In case of language dependent data, the response data text is returned based on the language passed in this parameter. This is a 2 digit character. For example, 'EN', 'DE'.
5. **Application Server:** A fully qualified domain name or IP of the SAP Application Server.
6. **System Number:** Instance number of the Application Server.

There are various other SAP Connection Parameters which are part of connection configuration and used for the inbound and outbound connection to SAP. Below is the list of different type of parameters. For more information, refer to the section "SAP Connection Configuration Parameters".

1. Direct Application Server Connection parameters.
2. Message Server Connection parameters.
3. Server parameters for inbound.
4. Tracing parameters.
5. Connection pool parameters.
6. SAP secured connection parameters.
7. Additional connection parameters.

2.2 SAP Connection Configuration Parameters

This section contains the SAP R/3 logon parameters, which are used to configure a connection to SAP R/3 using the Oracle Application Adapter.

2.2.1 Login Parameters

Table 2-1 lists and describes user login parameters

`

Table 2-1 Login Parameters

Parameter	Description	Example	Comment
Client (DestinationDataProvider_JCO_CLIENT)	Identifies the SAP client.	800	In organizational, commercial, and technical terms, a self-contained unit in an SAP system with separate master records and its own set of tables. It is a mandatory parameter.
User name (DestinationDataProvider_JCO_USER)	SAP login ID.	JCA_DEV	User type for dialog-free communication between systems. It is a mandatory parameter.
Password (DestinationDataProvider_JCO_PASSWD)	Confidential authentication information	JCA_111@D	Password for logging in to the SAP system. This is a protected word or string of characters that identifies or authenticates a user for access to an SAP system. It is a mandatory parameter.
Language (DestinationDataProvider_JCO_LANG)	A language key. EN (English) is the default.	EN	The current logon language of SAP. It is a mandatory parameter.
alias_user (DestinationDataProvider_JCO_ALIAS_USER)	Logon user alias	JCA_ALIAS	Specifies the alias user name for the SAP user login. It is an optional parameter.
mysapsso2 (DestinationDataProvider_JCO_MYSAPSSO2)	Indicates whether or not to use the specified SAP Cookie Version 2 as the login ticket instead of user ID and password.		Login with single sign-on is based on secure network connection (SNC) encryption and can only be used in combination with an SNC. It is an optional parameter.
x509cert (DestinationDataProvider_JCO_X509CERT)	Indicates whether or not to use the specified X509 certificate as the login certificate instead of user ID and password.		Login with X509 is based on Secure Network Connection (SNC) encryption and can only be used in combination with an SNC. It is an optional parameter.

2.2.1.1 *Direct Connection*

Table 2-2 lists and describes Direct Connection parameters.

Table 2-2 Direct Connection parameters

Parameter	Description	Example	Comment
Application Server (DestinationDataProvider_JCO_ASHOST)	Connects to an ABAP application server.	10.30.XX.XX	To obtain meta data information, a connection to a single application server is required. Application programs in an R/3 System are run on application servers.
System Number (DestinationDataProvider_JCO_SYSNR)	Identifies a unique instance on the application server.	00	An application server may have different system numbers.

2.2.1.2 *Load Balanced*

Table 2-3 lists and describes Load Balanced Connection parameters

Table 2-3 Load Balanced Connection Parameters

Parameter	Description	Example	Comment
Message Server (DestinationDataProvider_JCO_MSSERV)	Connects to an ABAP message server.		Application servers from one SAP system are usually configured in logon groups (For load balancing purposes), where each group serves a particular kind of user. The message server is responsible for communication between the application servers. It passes requests from one application server to another within the system. It also contains information about application server groups and the current load balancing within them. It uses this information to choose an appropriate server when a user logs onto the system.
Message Host (DestinationDataProvider_JCO_MSHOST)	Connects to an ABAP message Host.		The IP of message server host.
R/3 Name (DestinationDataProvider_JCO_R3NAME)	Identifies a unique instance on the application server.		Symbolic SAP system name used to identify the system.
Server Group (DestinationDataProvider_JCO_GROUP)	Identifies the logon group.	PUBLIC	Logon group that the user ID belongs with.
Router (DestinationDataProvider_JCO_SAPROUTER)	SAP Route String describes a connection required between two hosts		To be able to connect to an SAP server from the internet, one uses SAP router as a proxy between the SAP GUI and the SAP server. **Note:** Program ID having special characters is not getting handled as of now.

2.2.2 Server Parameters (for Inbound)

Table 2-4 lists and describes SAP Gateway Server parameters.

Table 2-4 SAP Gateway Server Parameters

Parameter	Description	Example	Comment
SAP Gateway Host (ServerDataProvider_JCO_GWHOST)	Enter the name of an SAP Gateway server.	"isdsrv2"	The SAP Gateway carries out CPI-C services within the SAP world, which are based on TCP/IP. These services enable SAP Systems and external programs to communicate with one another.
SAP Gateway Service (ServerDataProvider_JCO_GWSERV)	Enter the service name (usually a compound of the service name and system number).	Sapgw00	Service name on the gateway host.
Program ID (ServerDataProvider_JCO_PROGID)	A program identifier that has been specified on the SAP Gateway Server (case sensitive).	"S1PROG"	Program ID is a unique identifier for your communication session specified by your system administrator. The value entered in this field must match the one exposed on the gateway.

2.2.3 Trace Parameters

Table 2-5 lists and describes Trace parameters.

Table 2-5 Trace Parameters

Parameter	Description	Example	Comment
SAP trace (DestinationDataProvider_JCO_TRACE)	Enables the SAP Java connectors trace behaviour.	0 / 1	Off default - only hard errors are recorded in a trace file (dev rfc.trc) in append mode. ON - individual rfc*.trc and JCO*.trc are written for each request. Useful in finding errors, not recommended in a productive system.
Trace level (DestinationDataProvider_JCO_CPIC_TRACE)	Indicates the level of detail in the SAP traces.	03	Select a value that ranges from 0 through 10 from the list.

2.2.4 Connection Pool Parameters

Table 2-6 lists and describes Connection Pooling parameters.

Table 2-6 Connection Pooling Parameters

Parameter	Description	Example	Comment
Pool Capacity (DestinationDataProvider_JCO_POOL_CAPACITY)	Maximum number of connections which will be kept open by the pool for possible reuse. These connections will be automatically closed if they cannot be reused for more than the **Connection Timeout** period. A value of 0 has the effect that there is no connection pooling, i.e. connections will be closed after each request.	3	3 Connections will be kept open by the pool for reuse.
Peak Limit (DestinationDataProvider_JCO_PEAK_LIMIT)	Maximum number of connections which can be allocated from the pool. This enables the user to create more connections as specified by the **Peak limit** parameter, for example for temporary peak usage times. If the value for **Maximum connections** is less than the value of the parameter **Peak limit**, the parameter will automatically be reset to the value of **Peak limit**. All allocated connections exceeding the **Peak limit** will be closed immediately, if they are released from the application to the pool again.	10	Maximum 10 connections can be allocated from the pool.
Max Wait (DestinationDataProvider_JCO_MAX_GET_TIME)	Defines the maximum time to wait to obtain a requested connection. If the connection pool is exhausted (that means that the Maximum Connections limit is reached) and another thread is requesting an additional connection, this is the time that is being waited for some connection to be released by another thread so that that one can be handed out to the waiting thread.	30 s	The default value for the Maximum Waiting time is 30 seconds.
Expiration Time (DestinationDataProvider_JCO_EXPIRATION_TIME)	Time in ms after which the connections held by the internal pool can be closed.	10,000	The connections will be closed after 10 seconds.
Expiration Period (DestinationDataProvider_JCO_EXPIRATION_PERIOD)	This is interval in ms with which the timeout checker thread checks the connections in the pool for expiration.	5,000	The timeout checker will check the connections every 5 seconds.

For more information on parameters, see Table 4-1.

2.2.5 SAP Connection Security Parameters (SNC)

Table 2-7 lists and describes SNC parameters.

Table 2-7 SNC Parameters

Parameter	Description	Example	Comment
SNC mode (DestinationDataProvider_JCO_SNC_MODE)	Flag for activating SNC .	1 (on)	This is a required parameter.
SNC Partner (DestinationDataProvider_JCO_SNC_PARTNERNAME)	Specifies the application server's SNC name	p:CN=ABC, O=MyCompany C=US	User can find the application server's SNC name in the profile parameter snc/identity/as.
SNC level (DestinationDataProvider_JCO_SNC_QOP)	Specifies the level of protection to use for the connection.	Selection, see the next column.	1: Authentication only 2: Integrity protection 3: Privacy protection (default) 8: Use the value from snc/data protection/use on the application server 9: Use the value from snc/data_protection/max on the application server Default value = 3
SNC Name (DestinationDataProvider_JCO_SNC_MYNAME)	Specifies SNC name.	p:CN=SAP J2EE O=MyCompany, C=US	This parameter is optional, but set it to ensure that the correct SNC name is used for the connection. **Note**: This is an optional field, but it is recommended to be passed for security purpose.
SNC library Path (DestinationDataProvider_JCO_SNC_LIBRARY)	Specifies the path and file name of the external library.	C:\SAP J2EE_Engine\SAPCryptolib\sapcrypto.dll	The default is the system-defined library as defined in the environment variable SNC LIB.

2.2.6 Additional Connection Parameters

Table 2-8 lists and describes Additional Connection parameters.

Table 2-8 Additional Connection Parameters

Parameter	Description	Example	Comment
Type (DestinationDataProvider_JCO_TYPE)	Type of remote host	2 = R/2, 3 = R/3, E = External	Remote host used to connect to RFC Destination.
CodePage (DestinationDataProvider_JCO_CODEPAGE)	Initial codepage in SAP notation	8400	Uniquely identifying the logon language and Extracts the text data according to the logon language.

Parameter	Description	Example	Comment
Repository_destination (DestinationDataProvider_JCO_DEST)	Specifies which destination should be used as repository.	10.32.32.XX	SAP Repository destination to connect.
Repository User (DestinationDataProvider_JCO_REPOSITORY_USER)	If repository destination is not set, and this property is set, it will be used as user for repository calls. This allows using a different user for repository lookups.	MYSAPREPO	Repository user having only access to connect to specified SAP Repository only.
Repository Password (DestinationDataProvider_JCO_REPOSITORY_PASSWD)	The password for a repository user. Mandatory, if a repository user should be used.	MYPASS	Connect to the destination successfully with valid repository user and Repository Password .

Note: If the user is a Repository user and has no authorization on particular RFC/BAPI/IDoc. The returned error message will not be Repository specific.

2.2.7 Additional JCO Connection Properties

The user can increase the cpi max jco parameter by adding the below parameter in the startManagedweblogic.sh file of all managed servers, changes will affect after the managed server restart.

```
JAVA_OPTIONS="-Djco.cpic_maxconv=300  ${JAVA_OPTIONS}"
Export JAVA_OPTIONS
```

Figure 2-8 startManagedweblogic.sh file

```
startManagedWebLogic.sh
WLS_USER=""
export WLS_USER

WLS_PW=""
export WLS_PW

#  Set JAVA_OPTIONS to the java flags you want to pass to the vm. i.e.:

#  set JAVA_OPTIONS=-Dweblogic.attribute=value -Djava.attribute=value -
DCPIC_MAX_CONV=500

JAVA_OPTIONS="-Dweblogic.security.SSL.trustedCAKeyStore="/oracle/GA12.2.1/
Middleware/wlserver/server/lib/cacerts" ${JAVA_OPTIONS}"
JAVA_OPTIONS="-Djco.cpic_maxconv=300 ${JAVA_OPTIONS}"
export JAVA_OPTIONS
```

2.3 Create a Composite in Design-time

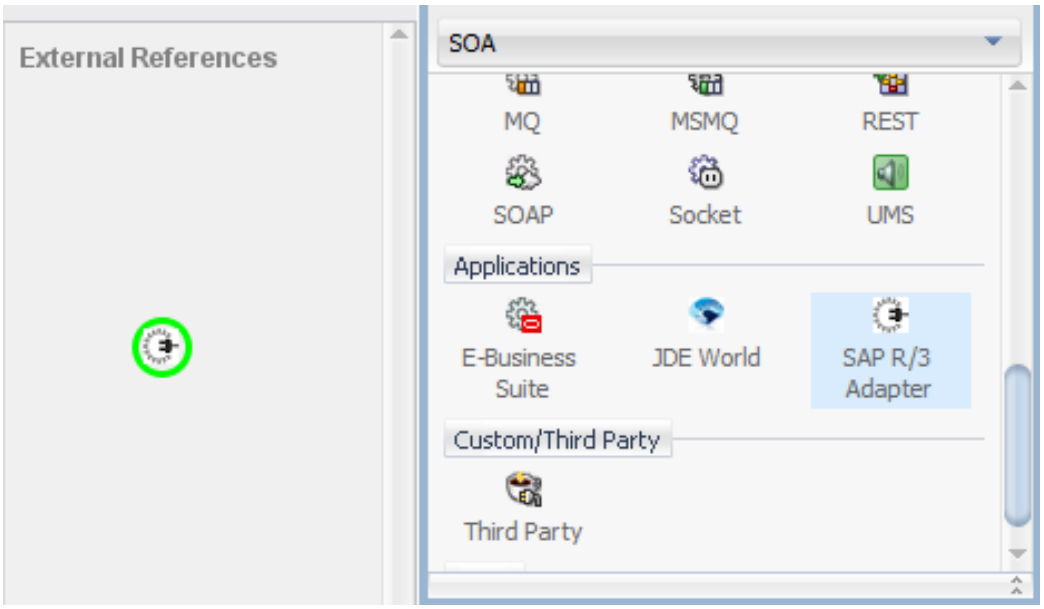
1. Open the JDeveloper installed from the below path:

   <ORACLE_HOME>/jdeveloper/jdev/bin /jdev

2. Create a new SOA application and corresponding project. For more information, refer to the section "Create an Empty Composite for SOA".

3. Drag and drop the Adapter to the External Reference, as shown in Figure 2-8.

Figure 2-9 Adapter Component



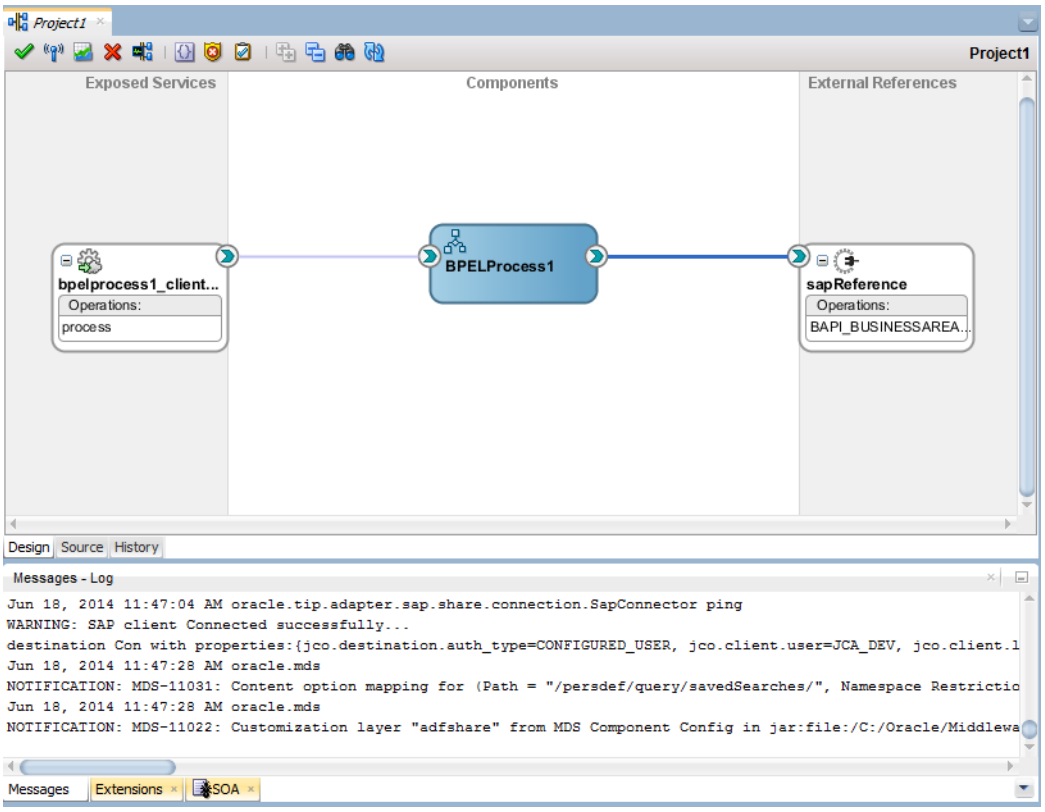
4. The configuration wizard for the Adapter appears.

5. Provide the required details in the wizard respectively. For more information, refer to the section "Adapter Wizard in JDeveloper".

6. Configure the BPEL process. For more information, refer to the section "Define an Outbound BPEL Process".

7. Outbound Composite created at the end of the process will look as shown in Figure 2-9.

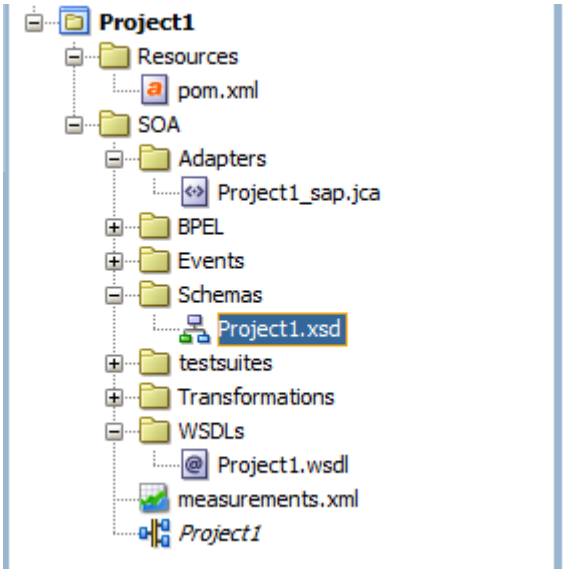
Figure 2-10 Outbound Composite



8. Below artifacts are created as a part of Adapter outbound composite creation. You can find those artifacts in the left side pane under the project node. As shown in Figure 2-10.

   - PROJECT1_sap.jca
   - PROJECT1.xsd
   - PROJECT1.wsdl
     (Where PROJECT1 is the name of the Adapter reference name provided in the adapter wizard)

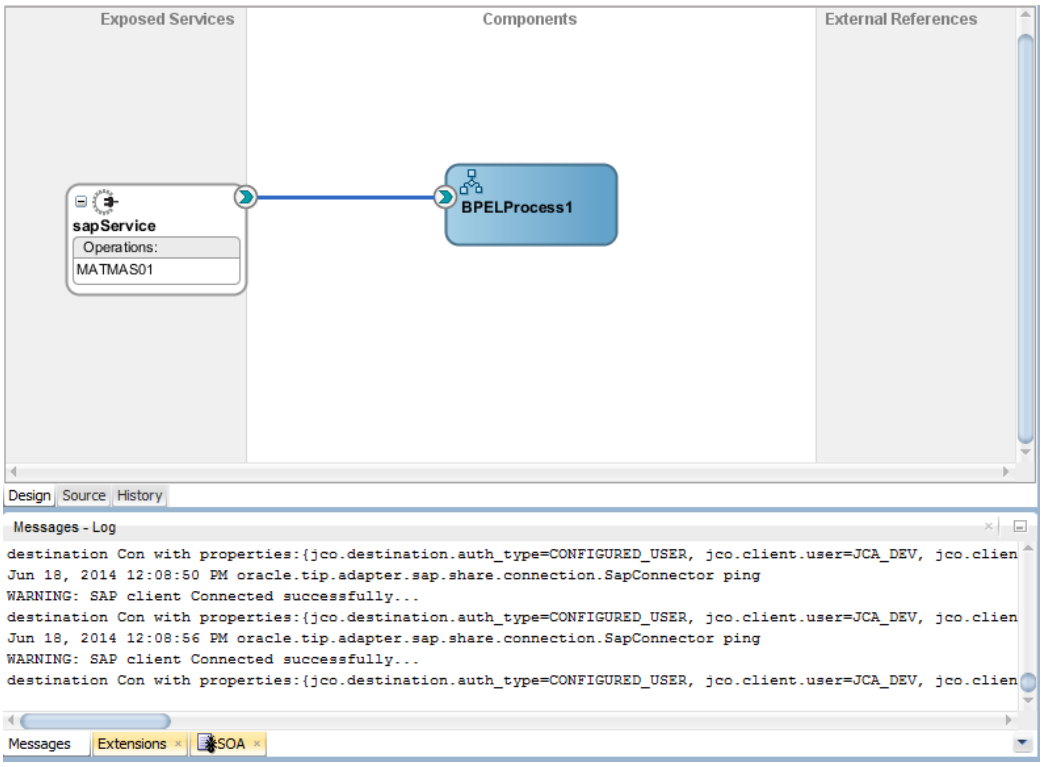
Figure 2-11 Created Artifacts as part of Adapter Outbound Composite



9. Follow the similar steps to create an inbound Adapter composite. In this case, drag the Adapter to **Exposed Services** swim lane. For more information, refer to the section "Define an Inbound BPEL Process".

10. Inbound Composite created at the end of the process will look as shown in Figure 2-11.

Figure 2-12 Created Inbound Composite



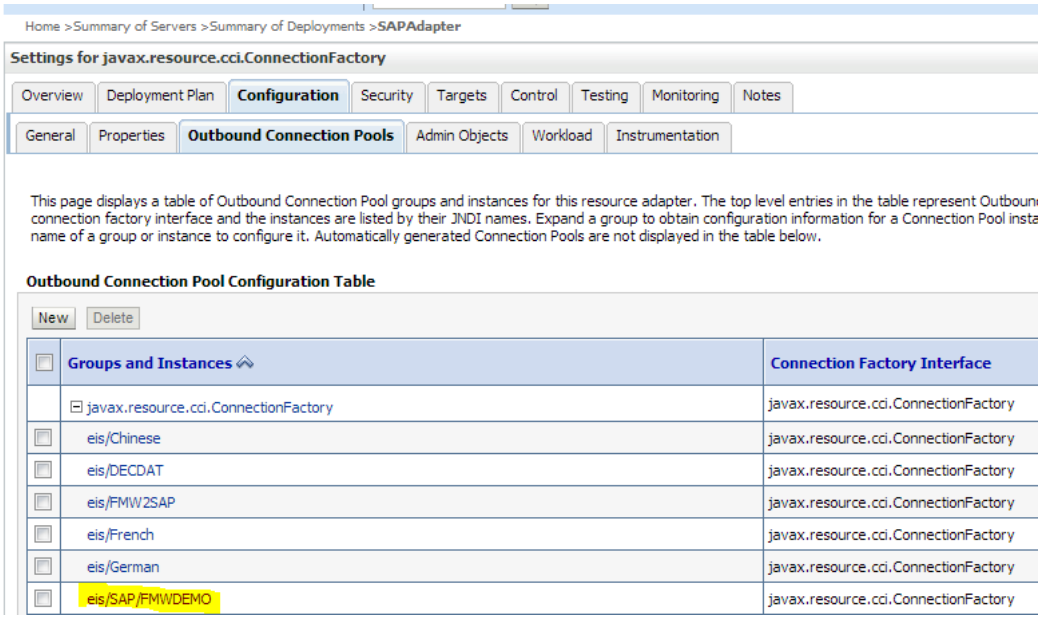
2.4 Setting up JNDI for Adapter for SAP at Run-time

This section describes how to configure JNDI connection parameters which consists of the following steps:

1. Update the default JNDI with the SAP Login parameters in the below path of console.

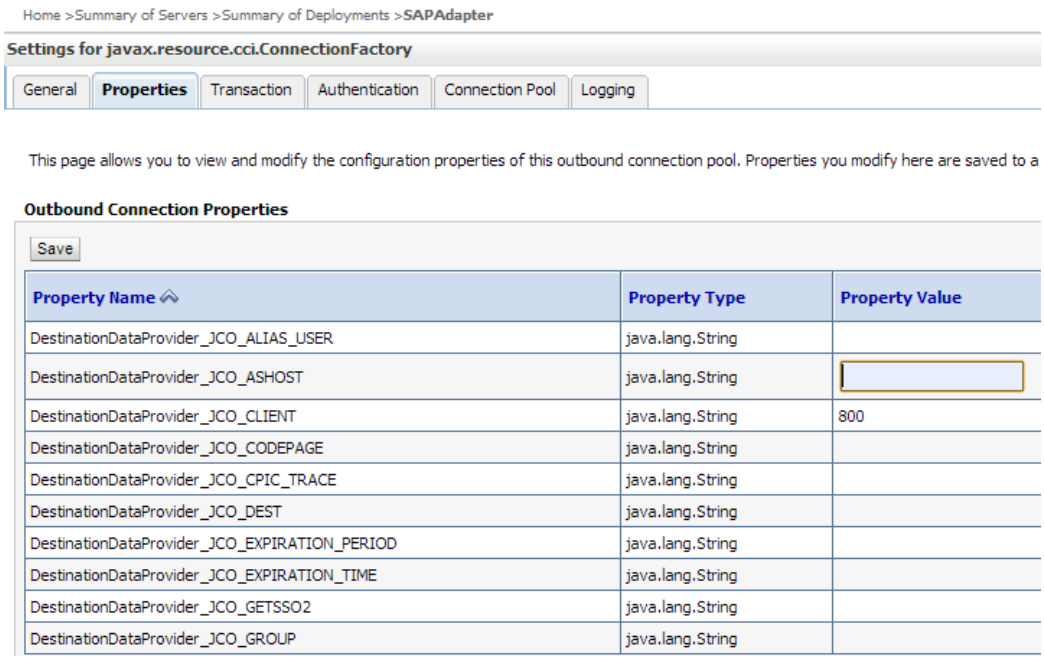
   Home →Summary of Servers →Summary of Deployments →Adapter, as shown in Figure 2-12.

Figure 2-13 Update JNDI with Connection Parameters



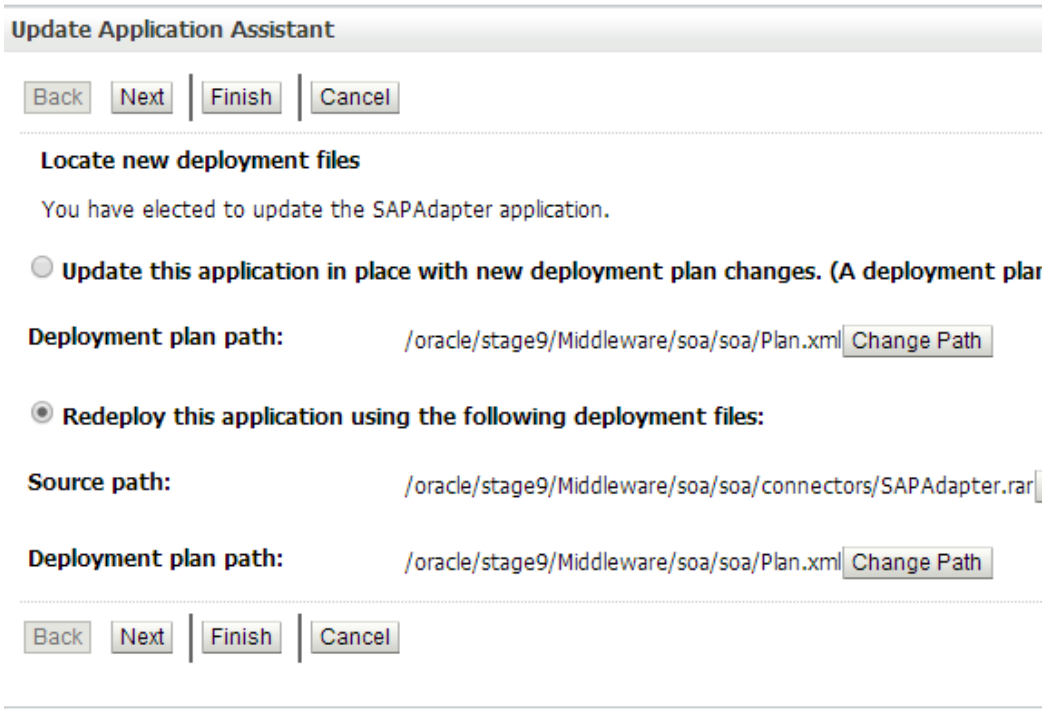
Once clicked on **eis/SAP/FMWDEMO**, below screen appears, as shown in Figure 2-13.

Figure 2-14 Outbound Connection Properties



2. Save the JNDI.
3. Select the Adapter in the summary of deployments. Click **Update** button and follow wizard, as shown in Figure 2-14, to update the connection configuration.

Figure 2-15 Update Application Assistant



4. The updated connection information will be applicable for the projects which deployed after update. Now the projects can be deployed for execution.

2.5 Deployment of the Composite on Run-time Environment

The developed Adapter project has to be deployed to the Application Server Connection which is already created in the JDeveloper. Below are the steps which include the creation and deployment of the application server.

2.5.1 Create Application Server in JDeveloper

Perform the following steps for creating the new application server:

1. Go to the **Application Server** tab and right-click on the parent node of application server.
2. Select the type of server. Standalone is the default.
3. Provide the connection name and credentials in the nextscreens respectively.
4. Test the connection and finish the wizard if it is successful.

   For more information on creation of Application Server Connection, refer to the section "Create a New Application Server Connection".

2.5.2 How to Deploy

Perform the following steps for deploying the project:

1. Select the project.
2. Right-click and select **Deploy**.
3. From the list, select the server on which you need to deploy.
4. Click on **Next** and then **Finish**.

For more information on deployment of the project, refer to the section "Deploy the Defined Process".

2.6 Testing the Deployed Projects

Refer to the section “Test the Deployed Process” for the details on how to test the Outbound and Inbound Endpoints in EM.

3

Supported SAP Interfaces

Adapter for SAP provides access to SAP R/3 interfaces such as Remote Enabled Function Modules (RFC), Business Application Programming Interfaces (BAPI) and Intermediate Documents (IDoc).

This section contains the following topics:

- Section 3.1, "Business Application Programming Interfaces (BAPI) "
- Section 3.2, "Remote Enabled Function Modules (RFCs) "
- Section 3.3, "Intermediate Document (IDoc) "

3.1 Business Application Programming Interfaces (BAPI)

BAPI's (Business Application Programming Interface) are a set of interfaces to object-oriented programming methods in SAP. They enable a programmer to integrate third-party software into the proprietary R/3 product from SAP. These interfaces can be used by external applications developed by customers and complementary software partners as well as by other SAP applications. For specific business tasks such as uploading transactional data, BAPIs are implemented and stored in the R/3 system as Remote Function Call (RFC) modules.

BAPIs provide the client with an object-oriented view of the application objects without needing to know the implementation details. BAPIs are always developed by defining scenarios which are used to map and implement system-wide business processes.

Note: Online BAPIs(which call SAP screens) were not supported by Adapter for SAP.

3.1.1 Standard BAPI

Some BAPIs and methods provide basic functions and can be used for most SAP Business Objects. Such BAPIs are known as Standardized BAPIs. For example, Some BAPIs are used for replicating business object instances: They enable specific instances of an object type to be copied to one or more different systems. These BAPIs are used mainly to transfer data between distributed systems within the context of Application Link Enabling (ALE).

A number of service BAPIs provide basic help functions. Service BAPIs provide information or services for the BAPIs from Individual Business Components. Service BAPIs are created in the Business Object Repository (BOR) under the application component hierarchy shown below:

- Cross-Application Components
- Business Framework Architecture

There are some parameters that can be created for various BAPIs because they contain the same or equivalent data in all BAPIs. Such parameters are known as "standardized parameters". They should be implemented in the same way in all BAPIs.

Return Parameters: Each BAPI must have an export return parameter for returning messages to the calling application. To provide application programmers with a consistent error handling process for BAPI calls, all Return Parameters must be implemented in the same standardized way.

Change Parameters: For the BAPIs that cause database changes (for example, Change and Create BAPIs), you must be able to distinguish between parameter fields that contain modified values and parameter fields that have not been modified. This diffrentiationis made through the use of standardized parameters.

3.1.2 Custom BAPI

Though SAP provides a bunch of ready-to-use BAPI's but you can also create your own BAPI(s) easily if required.

Custom BAPIs can be created as per the business requirement of the Customer / Project. Generally, the option of using the Standard BAPIs is explored to see if the requirement can be satisfied, otherwise Custom BAPI can be used.

Custom BAPI’s code can always be updated according to the business requirements, at any point of time, unlike Standard BAPI’s which you cannot change. Information about the updated BAPI can be retrieve by Adapter for SAP at any point of time.

3.2 Remote Enabled Function Modules (RFCs)

RFC is the protocol used by SAP for remote communication, that is, for communications between remote (independent) systems.

A Remote Function Call (RFC) is the call or remote execution of a Remote Function Module in an external system.

RFC is used for communications between two independent SAP systems, or for communications between an SAP system and a non-SAP system, such as an external application. It can also be used for communications between modules on the same system.

Using the RFC interfaces, you can extend the functionality of R/3 applications from an external program.

Compared to using the GUI interfaces, using RFC interfaces requires more knowledge of the business logic of the R/3 applications with which you are integrating the external application.

RFC is the standard SAP interface for communication between SAP systems. RFC calls a function to be executed in a remote system.

Note: The Oracle Adapter for SAP supports all datatype and parameter types including Import, Export, Table and Changing Parameter.

3.2.1 Standard RFC

SAP provides a range of ready-to-use RFCs based on different business requirements. Standard RFC can be called and executed remotely by an external system like Adapter for SAP. For example, RFC_READ_TABLE is a standard SAP function module available within R/3 SAP systems. This returns the details of the fields present within an SAP table.

3.2.2 Custom RFC

If Standard RFCs are not enough to meet business/customer requirements then Custom RFCs are created. You can later update the custom RFC according to the requirement. Adapter for SAP can then use the updated custom RFC.

3.3 Intermediate Document (IDoc)

Intermediate Document (IDoc) is a standard SAP document format. IDocs enable the connection of different application systems using a message-based interface. The use of IDocs has three main aims:

- Structured exchange and automatic posting of application documents.
- Reduction of the varying complex structures of different application systems to one simple structure. For example, the structure of an SAP application document and the structure of the corresponding Electronic Data Interchange (EDI) message according to the UN/EDIFACT standard.
- Detailed error handling before the data is posted in the application. IDocs can be regarded and defined on two levels: On a technical level and on an application level. The technical level enables the support of cross-application functions such as routing and technical error handling.

  Intermediate Documents (IDocs) are the “logical messages” that correspond to different business processes. They enable different application systems to be linked by a message-based interface. The IDoc type indicates the SAP format to use to transfer the data for a business transaction. An IDoc is a real business process in the form of an IDoc type that can transfer several message types.

3.3.1 Standard IDoc

Standard IDocs are available in SAP for meeting most of the business requirements. Standard IDocs can be used for exchanging and automatic posting of application documents. For example, MATMAS01 is a standard IDoc available in the SAP Form Material Master data.

3.3.2 Custom IDoc

Custom IDocs are created according to the special business/customer requirements for which standard IDoc is not already available. If later some changes are required in IDoc, it can be done in Custom IDocs. The Adapter for SAP will be able to use the latest updated IDoc.

3.3.3 Extended IDoc

When the Standard IDocs provided by SAP are not sufficient for a business process, you can use Extended IDoc. Extension of an IDoc can take place whenever dictionary table has a new structure appended, as required by the business process.

Extension of an IDoc takes place when extra fields are required for the business process. For instance, when you already have a predefined IDoc type say "*INVOIC02*", but the requirement is to transfer additional structure containing VBRK-KTGRD (Account assignment group for this customer) and VBRK-MANSP (Dunning block). To meet the requirement, you will have to create a segment structure by adding segment with two additional fields as an extension to the existing IDoc type '*INVOIC02*'. Thus IDoc extension is adding extra functionality to the existing message type.

4

SAP Java Connector 3.x

This chapter describes the SAP JCo 3.x library. SAP Java Connector 3.x is a standalone java library to connect with any SAP R/3 system. SAP JCo supports communication with the AS ABAP (Application server for ABAP) in both directions: Inbound (Java calls ABAP) and Outbound calls (ABAP calls Java).

You can find further information on the communication between SAP Java applications and the ABAP environment in the SAP Library: `http://help.sap.com`

The section contains the following topics:

- Section 4.1, "Supported Systems and Platforms"
- Section 4.2, "Performance"
- Section 4.3, "RFC Server Threads"
- Section 4.4, "Trace Level Parameter"
- Section 4.5, "JCo Supported SAP Data types "

4.1 Supported Systems and Platforms

SAP JCo 3.0 is supported by SAP JVM 5 and 6 versions as well as for Java 5, 6, and 7 Standard Editions of the corresponding platform vendor. You should use the SAP JVM 5 or 6, because it adds further diagnostic support features and it is also not subject to the end-of-maintenance restrictions of the JVMs of other vendors.

The JCo 3.0 release is supported for the operating systems mentioned in the following link (SAP Note #1077727) in combination with the SAP JVM 5 or Java 5 Standard Edition of the corresponding platform vendor.

SAP R/3 does not support the particular JVM if that is not included in the list of supported JVMs.

Generally a new patch level is downwards compatible to the previous patch levels of the same release. So the files of an old JCo 3.0 installation may simply be replaced with the latest ones. SAP JCo 3.0 is replacing SAP JCo 2.0 and SAP JCo 2.1 and is released for Java 5, 6, and 7 version.

SAP JCo 3 with combination of SAP JVM 5/6 or JAVA 5/6 supports 64 and 32 bit operating system. From SAP JCo 3 onwards, it does not support 32 bit UNIX system.

4.2 Performance

This section describes the Connection configuration in detail like Connection pooling and thread related management and caching of metadata for faster performance.

4.2.1 Connection Management

SAP JCo 3 initiate many useful changes in Connection Management rather than just creating direct connections to the SAP system. SAP JCo provides connection pooling and thread related management. This Pool is managed by JCo; JCo is responsible for creating and removing connections from pool. This improves JCo throughput performance.

This allows reusing of connections without having to go through the expensive logon process again. If a connection that is not part of the internal array is returned to the pool. (This is only possible if maximum connection is larger than maximum pool size).

Make connection peak limit large enough so that the limit is never reached. An exception to this would be the small pools used for individual named user. Here a small maximum connection is a suitable way to ensure that the same user does not have an inordinate number of sessions with the SAP system.

4.2.2 Connection Pooling

In SAP JCo 3.0, the connection setup is no longer implemented explicitly using a single or pooled connection, Instead the type of connection is determined only by the connection properties (properties) that define a single or pooled connection implicitly. Besides making direct connection, you can use pool connection to make it available instead of creating a connection every time. There is a limit to the maximum number of connections that can be active in pool and their timeout in JCo Destination connection parameters. Below are the parameters that are defined to configure connection pool, as shown in Figure 4-1.

Figure 4-1 Management Tab

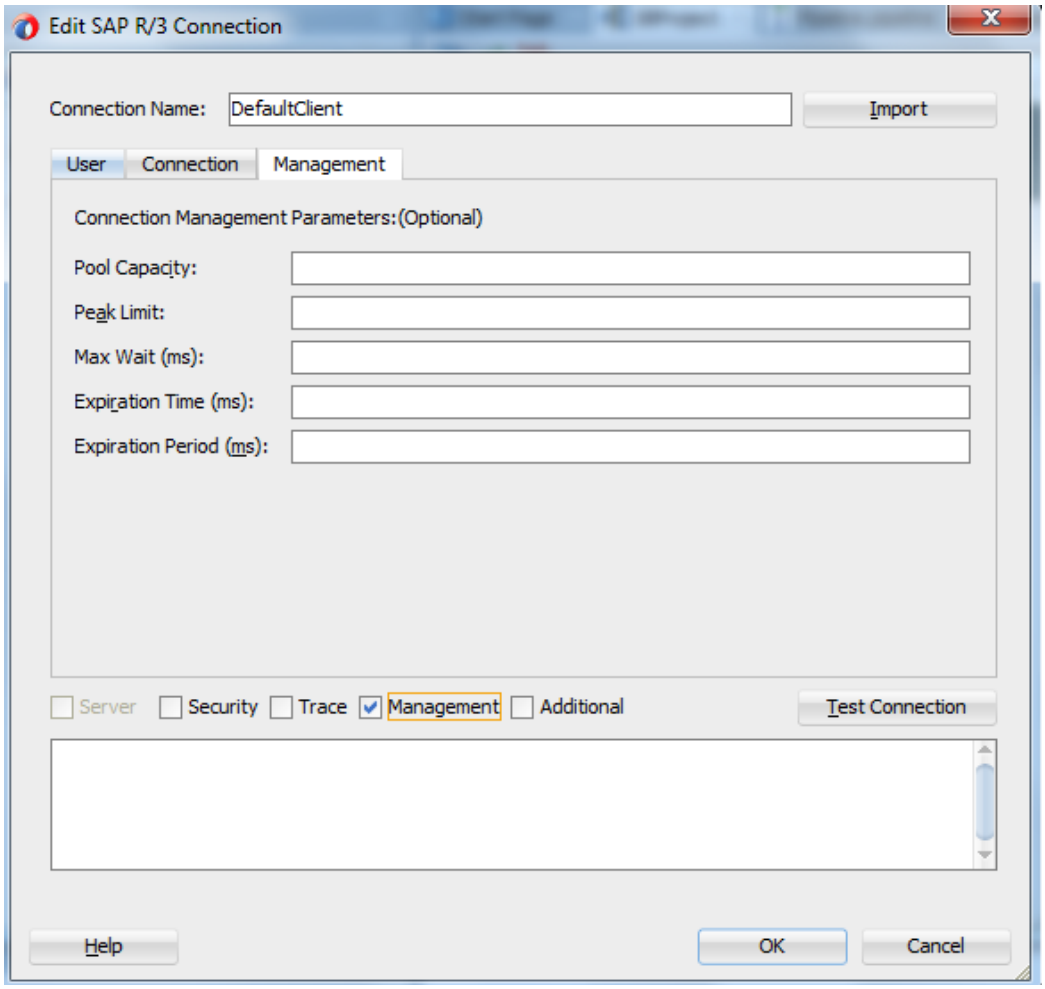


Table 4-1 lists and describes the JCo parameters used in connection management.

Table 4-1 JCo Parameters

Parameter	Description
jco.destination.peak_limit	Maximum number of active connections that can be created for a destination simultaneously.
jco.destination.pool_capacity	Maximum number of idle connections kept open by the destination. A value of 0 has the effect that there is no connection pooling that is connections will be closed after each request.
jco.destination.expiration_time	Time in milliseconds after that the connections hold by the internal pool can be closed.
jco.destination.expiration_check_period	Interval in milliseconds with which the timeout checker thread checks the connections in the pool for expiration.

jco.destination.max_get_client_ time	Maximum time in milliseconds to wait for a connection, if the maximum allowed number of connections is allocated by the application.

Note: The Management tab is not supported for the current release , it will be introduced in the future releases.nline BAPIs(which call SAP screens) were not supported by Adapter for SAP.

4.2.3 Caching of Metadata

SAP Java connector API cache repository metadata into local cache to avoid number of calls to the SAP system. This feature improves performance of SAP JCo. Metadata for functions and parameters will be fetched at the first request and will be stored in the repository cache. SAP JCo 3 handles object caching itself and hence the developers do not need to take care of that. API provides some method to clear cached metadata.

4.3 RFC Server Threads

SAP JCo 3.0 provides RFC Server module that helps to run an RFC function module on non-SAP system. The SAP ABAP program can invoke this function module. These java programs register using a program ID in SAP R/3 Gateway using server threads.

After connection, these RFC programs wait for incoming calls from the SAP system. Server threads listen for any incoming messages from the SAP system on a particular program ID. For this, the program ID should be registered with the SAP system. If RFC Connection once interrupted, JCo server automatically registers itself again with the SAP Gateway.

Configuration parameters can be used to make the throughput more efficient. This configuration can be changed in the Adapter through the WebLogic console.

If program ID with the same name is registered multiple times from different RFC servers, IDoc sent on that program ID from SAP system get transferred to one of the registered RFC server based on default **Load Balancing** scenarios. You can modify load balancing scenario based on your requirement. For modification, consult with your SAP system administrator.

4.4 Trace Level Parameter

SAP JCo 3 uses the RFC and CPIC API. Traces generated by these components include JCo API calls, RFC traces, and CPIC traces. You can trace JCo API calls by enabling the JCo traces and setting the appropriate trace level in the Adapter configuration.

The Trace level property specifies the level of detail in the traces produced by JCo. The amount of trace data increases with trace level, and each level contains all of the trace data from the lower levels. If you choose one of the higher trace levels, you need to ensure that you have enough free disk space available.

SAP JCo 3 provides trace configuration to trace information. JCo 3 defines parameters for different type of logging. *jco.client.trace* parameter is used to define logging level for RFC logs. Possible values are 0 (disable) or 1(enable). *jco.client.cpic_trace* parameter is used for CPIC trace logs. Possible values for CPIC trace is given in Table 4-2.

Table 4-2 CPIC Trace Value

Parameter	Description
-1	Take over environment value
0	No trace
1	Errors
2	Errors and warnings
3	Info messages, errors and warnings

jco.server.trace parameter is used for JCo RFC Server level logging. Possible values are 0 (enable), 1 (disable).

dev_jrfc.trc is always created when an RFC error occurs, even if traces are turned off.

JCo tracing can be turned on using *jco.trace_level* property as an environment variable. This enables logging for all API and communication happening in JCo. Possible values and their description are given in Table 4-3.

Table 4-3 JCo Trace Value

Parameter	Description
0	Nothing
1	Errors
2	Errors and warnings
3	Info messages, errors and warnings
4	Execution path, info messages, errors and warnings
5	Verbose execution path, info messages, errors and warnings
6	Verbose execution path, limited data dumps, info messages, errors and warnings
7	Full execution path, data dumps with metadata, verbose info messages, errors and warnings
8	Full execution path, full data dumps with metadata, verbose info messages, errors and warnings

Note that the trace file can be find at {jdev_home}\jdev\bin.

4.5 JCo Supported SAP Data types

The Adapter for SAP allows all JCo supported SAP data types that can be used in data exchange between SOA composites and SAP applications. Table 4-4 shows the mapping between basic ABAP data types used in SAP application and JCo java data types.

Table 4-4 Mapping between basic ABAP data types used in SAP application and JCo java data types

ABAP Type	Description	Data Type
C	Character	String
N	Numerical Character	String
X	Binary Data	Byte ()
P	Binary Coded Decimal	Big Decimal
I	4-byte Integer	Int
B	1-byte Integer	Int
S	2-byte Integer	Int
F	Float	Double
D	Date	Date
T	Time	Date
decfloat16	Decimal floating point 8 bytes (IEEE 754r)	BigDecimal
decfloat34	Decimal floating point 16 bytes (IEEE 754r)	BigDecimal
G	String (variable length)	String
Y	Raw String (variable length)	Byte ()

Additional ABAP data types are handled as follows:

- Type h (Hierarchical) – supported, as JCo tables.
- Nested – supported, record within record.
- Deep – supported, if referenced type is supported.

5

Oracle Adapter for SAP Features

The latest 12.2.1 Release provides new features for the Oracle Adapter for SAP, which is described in this chapter. This chapter contains the following sections:

- Section 5.1, "tRFC/qRFC/bgRFC Support"
- Section 5.2, "Design-Time Test Functionality"
- Section 5.3, "Exception Filter"
- Section 5.4, "Schema Validation"
- Section 5.5, "AutoSYSTAT Feature for RFC "
- Section 5.6, "Encode IDoc "
- Section 5.7, "Generic IDoc Support "
- Section 5.8, " Revision IDoc Support"
- Section 5.9, "Sharing Program ID Feature "
- Section 5.10, "Multiple IDoc Support"
- Section 5.11, "Credential Mapping for Oracle SOA Suite (BPEL, Mediator, BPM or OSB)"
- Section 5.12, "Stateful Interaction"
- Section 5.13, "Error Handling"
- Section 5.14, "SOA Debugger Support"
- Section 5.15, “Non-XML Characters Handling Support”
- Section 5.16, “Error Document Support”
- Section 5.17, “Payload Threshold Support”
- Section 5.18, “TID Backstore Support”
- Section 5.19, “Large Payload Support (AsAttachment)”
- Section 5.20, “Resiliency Support”
- Section 5.21, “Segment Release Design Time and Runtime Support”
- Section 5.22, “Special Character Support for Inbound iDoc”
- Section 5.23, “Dynamic RFC Cache Update”

5.1 tRFC/qRFC/bgRFC Support

These are the SAP communication methods which are supported by the Adapter for SAP in the outbound processing.

Transactional RFC (tRFC): This is an asynchronous communication method that manages to execute the called function in the target system only once. The listener to the port need not to be available at the time when the RFC client program SAP is executing a tRFC. The tRFC component stores the called RFC function together with the corresponding data, in the SAP database under a unique transaction ID (TID).

Queued RFC (qRFC): This is also an asynchronous communication method which guarantees that multiple requests are processed in the order, specified by the sender. tRFC can be serialized using queues (inbound and outbound queues). In simple, the tRFC requests which are serialized using the inbound/outbound queues in SAP, are called queued RFC (qRFC). qRFC is therefore an extension of tRFC. It processes and request only if it has no predecessors in the same queue. You can use qRFC if requirement is to guarantee that several requests are processed in a defined order. This section provides the details of modeling and testing of an endpoint in the tRFC/qRFC communication method as mentioned below:

- Modeling the tRFC SAP Endpoint
- Testing the tRFC SAP Endpoint
- Modeling the qRFC SAP Endpoint
- Testing the qRFC SAP Endpoint

Background RFC (bgRFC): bgRFC is an asynchronous communication method supported by SAP ERP to support recording of the transactions at called application side which can be executed later. User can submit execution of multiple function unit to SAP ERP in single transaction. However, it must be verified that those function units should be independent to each other. bgRFC Support execution in two modes:

Type t: If bgRFC with exactly once execution is required

Type q: If bgRFC with order of execution of function unit is required

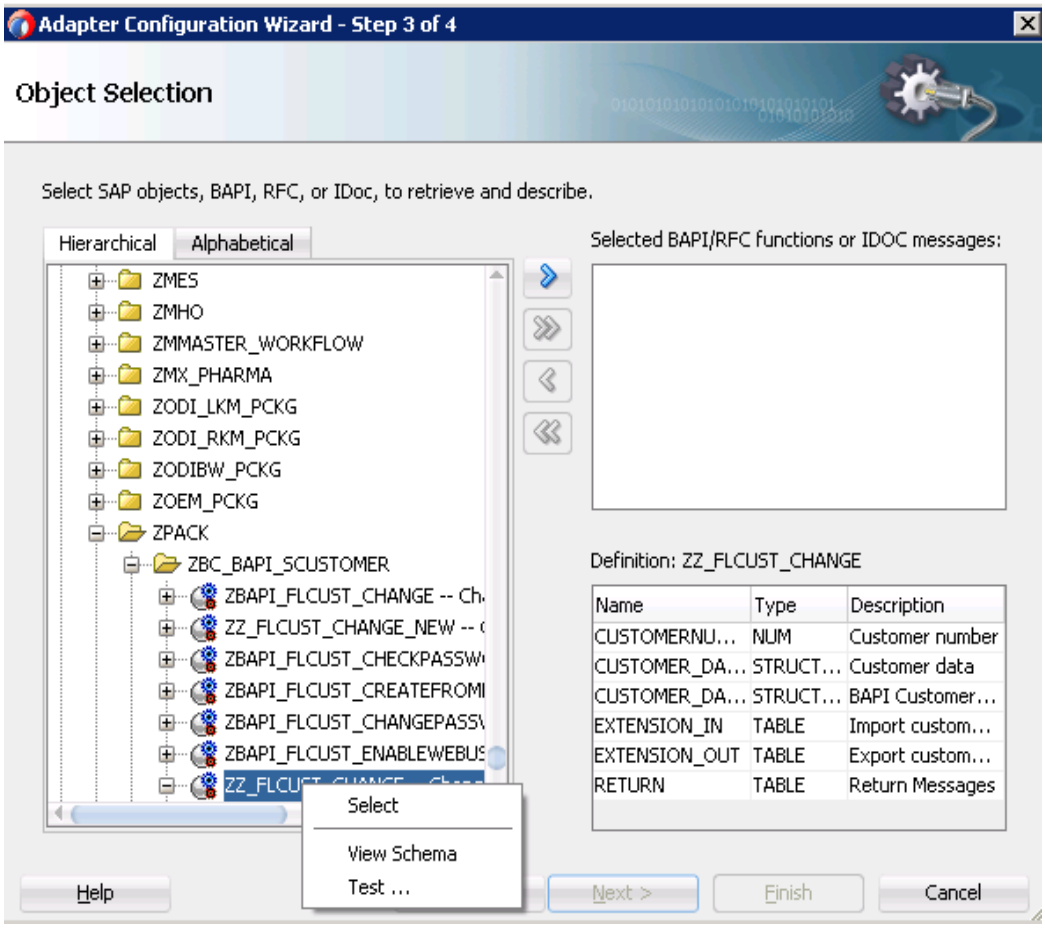
5.1.1 Modeling the tRFC SAP Endpoint:

1. To create a tRFC SAP Endpoint, create an outbound RFC project. (For more information, refer to the section "Design an Outbound BPEL Process").

2. In the **Object Selection** page, right-click on any RFC and then click on **Select**, as shown in Figure 5-1.

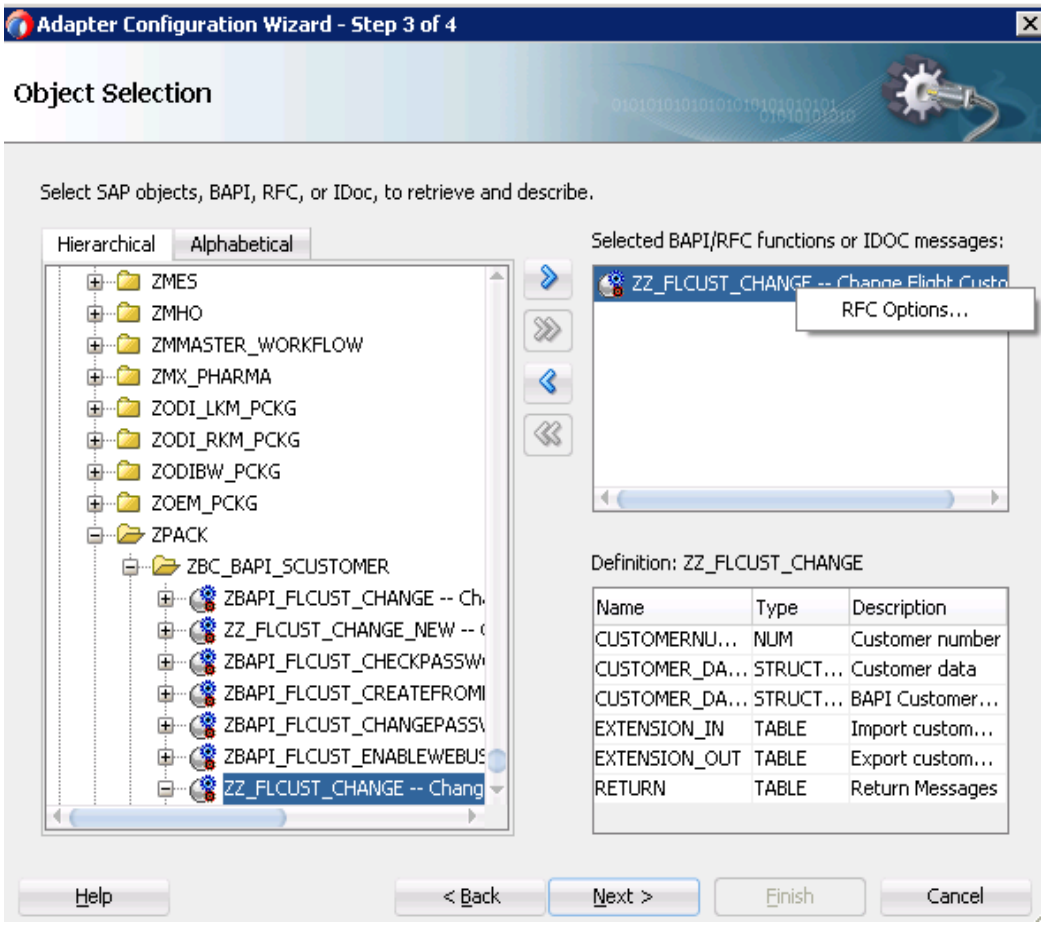
   The selected RFC appears in the **Select BAPI/RFC functions or IDOC messages** area.

Figure 5-1 Object Selection Page



3. Right-click on the selected RFC and select **RFC Options**, as shown in Figure 5-2.

Figure 5-2 Selected RFC

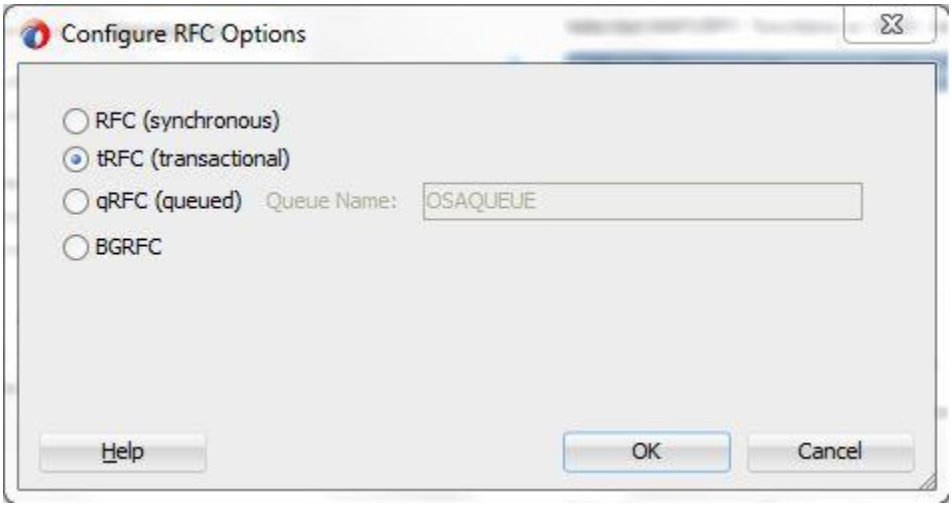


The Configure RFC Option window appears.

4. Select the **tRFC** radio button, as shown in Figure 5-3.

5. Click **OK**.

Figure 5-3 Configure RFC Option



6. Click **Finish**.

The jca file of the project looks like as shown in Figure 5-4.

Figure 5-4 JCA File

```
<adapter-config name="sapReference" adapter="sap" wsdlLocation="../WSDL

  <connection-factory location="eis/SAP/FMWDEMO" UIConnectionName="Defa
  <endpoint-interaction portType="sapReference_PT" operation="ZZ_FLCUST
    <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInt
      <property name="Interaction" value="stateless"/>
      <property name="ExceptionFilter" value="off"/>
      <property name="SchemaValidation" value="off"/>
      <property name="RFC" value="ZZ_FLCUST_CHANGE"/>
      <property name="Type" value="TRFC"/>
    </interaction-spec>
  </endpoint-interaction>

  <endpoint-interaction portType="sapReference_PT" operation="OSA_CMD_C
    <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInt
      <property name="Interaction" value="stateless"/>
      <property name="ExceptionFilter" value="off"/>
      <property name="SchemaValidation" value="off"/>
      <property name="RFC" value="OSA_CMD_CONFIRM_TID"/>
      <property name="Type" value="CMD"/>
    </interaction-spec>
  </endpoint-interaction>
```

5.1.2 Testing the tRFC SAP Endpoint

1. Deploy project. (For more information, refer to the section "Deploy the Defined Process").

2. Test deployed the project by sending the request messages while providing a TID value, as shown in Figure 5-5.

Figure 5-5 tRFC Endpoint

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/enve
   <soapenv:Header/>
   <soapenv:Body>
      <urn:ZZ_FLCUST_CHANGE tid="678hgjk">
         <!--You may enter the following 6 items in any order-->
         <urn:CUSTOMERNUMBER>00000453</urn:CUSTOMERNUMBER>
         <urn:CUSTOMER_DATA>
            <urn:CUSTNAME>xyz</urn:CUSTNAME>
```

3. Make sure the TID value provided, is unique every time a new request is sent to SAP, else the RFC execution will not happen.

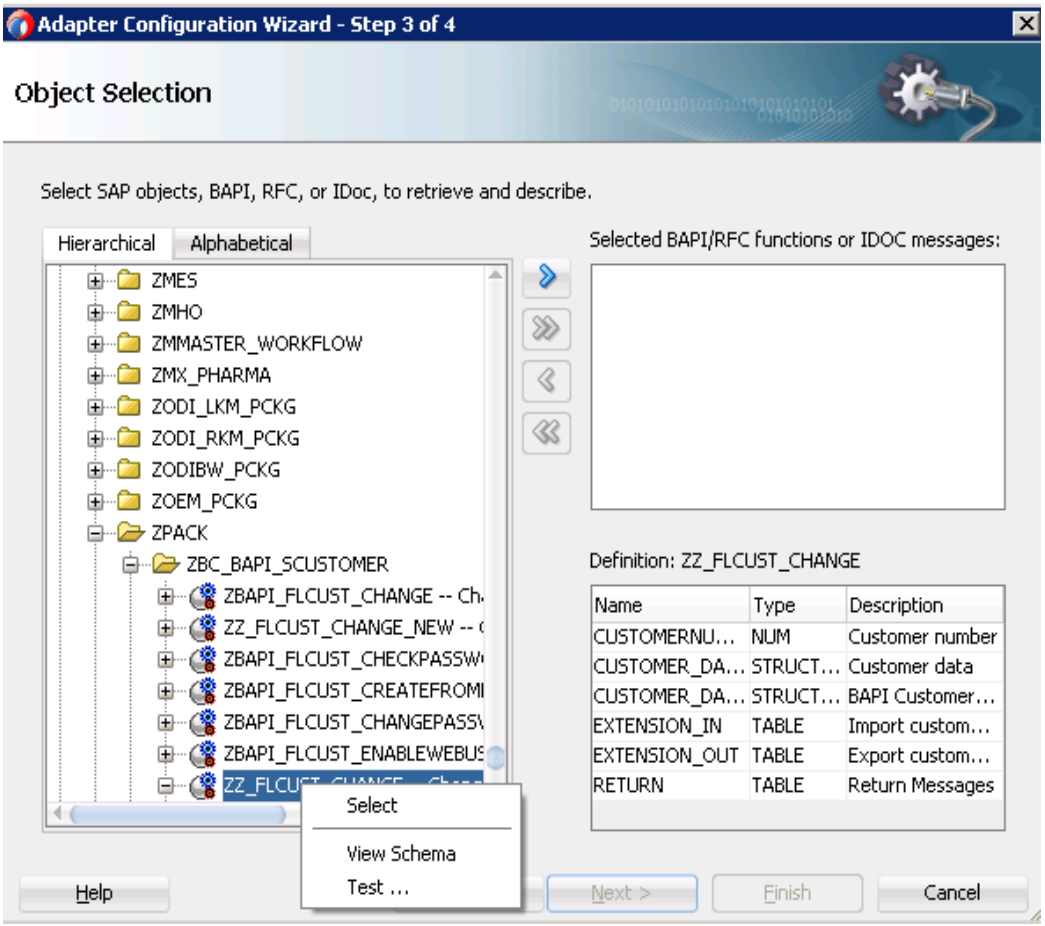
5.1.3 Modeling the qRFC SAP Endpoint

1. To create a qRFC SAP Endpoint, create an outbound RFC project. (For more information, refer to the section "Design an Outbound BPEL Process").

2. In the **Object Selection** page, right-click on any RFC and then click on **Select**, as shown in Figure 5-6.

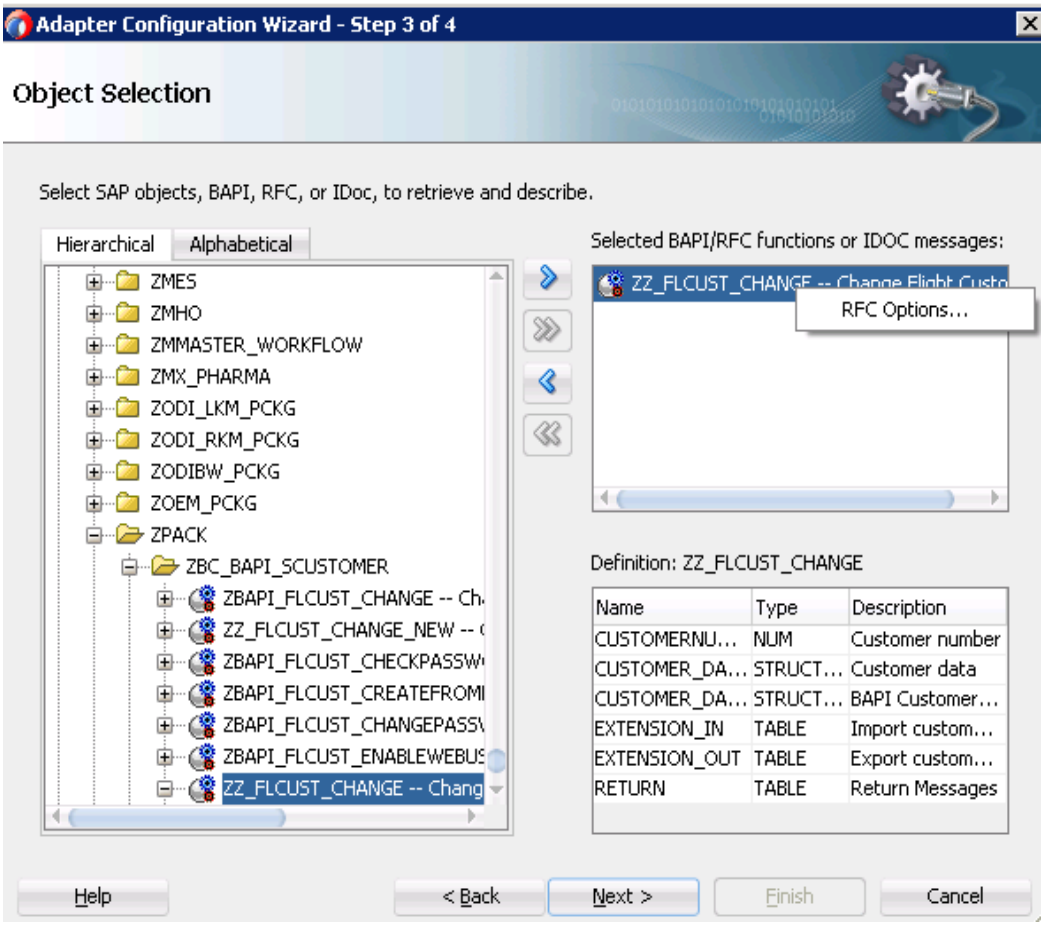
   The selected RFC appears in the **Selected BAPI/RFC functions or IDOC messages** area.

Figure 5-6 Object Selection Page



3. Right-click on the selected RFC and select **RFC Options**, as shown in Figure 5-7.

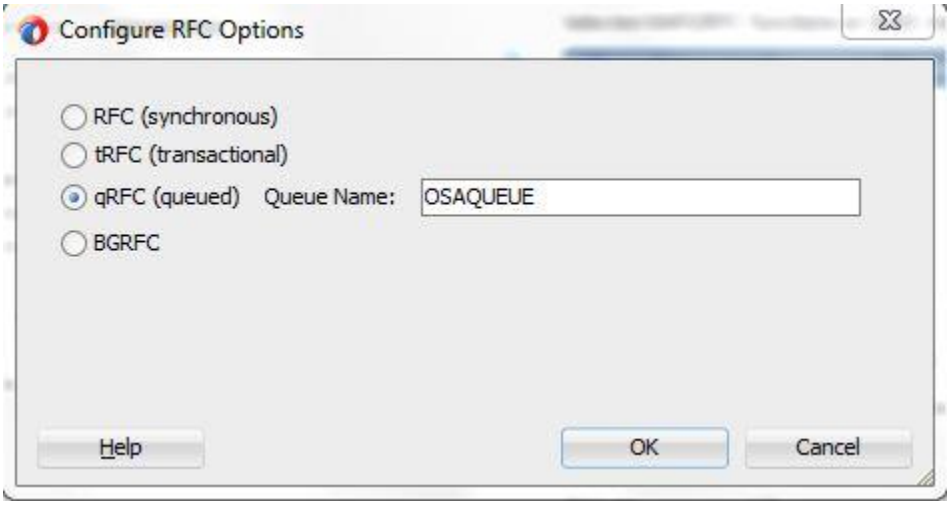
Figure 5-7 Select RFC



The Configure RFC Options window appears.

4. Select the **qRFC** radio button, as shown in Figure 5-8.
5. Enter the queue name in the **Queue Name** field. This queue should exist in the SAP system.
6. Click **OK**.

Figure 5-8 Configure RFC Option



7. Click **Finish**.

   The jca file of the project looks like as shown in Figure 5-9.

Figure 5-9 JCA File

```
<adapter-config name="sapReference" adapter="sap" wsdlLocation="../WSDLs/sapReference.wsdl
  <connection-factory location="eis/SAP/FMWDEMO" UIConnectionName="DefaultClient"/>
  <endpoint-interaction portType="sapReference_PT" operation="ZZ_FLCUST_CHANGE">
    <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
      <property name="Interaction" value="stateless"/>
      <property name="ExceptionFilter" value="off"/>
      <property name="SchemaValidation" value="off"/>
      <property name="RFC" value="ZZ_FLCUST_CHANGE"/>
      <property name="Type" value="QRFC"/>
      <property name="QueueName" value="OSAQUEUE"/>
    </interaction-spec>
  </endpoint-interaction>

  <endpoint-interaction portType="sapReference_PT" operation="OSA_CMD_CONFIRM_TID">
    <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
      <property name="Interaction" value="stateless"/>
      <property name="ExceptionFilter" value="off"/>
      <property name="SchemaValidation" value="off"/>
      <property name="RFC" value="OSA_CMD_CONFIRM_TID"/>
      <property name="Type" value="CMD"/>
    </interaction-spec>
  </endpoint-interaction>

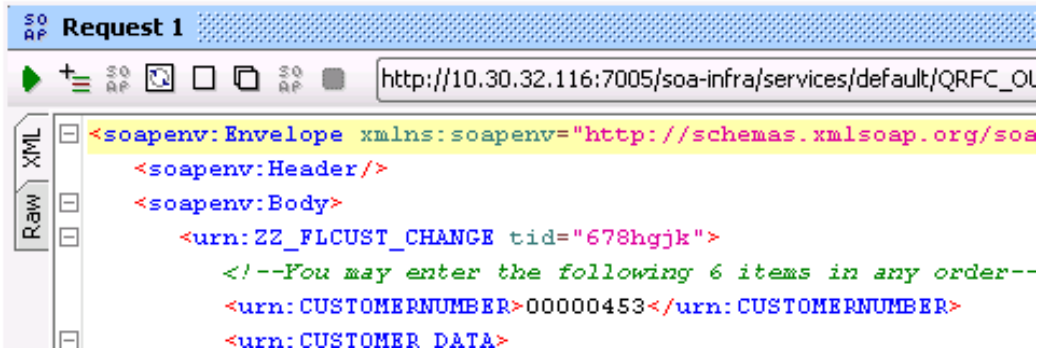
</adapter-config>
```

5.1.4 Testing the qRFC SAP Endpoint

1. Deploy project. (For more information, refer to the section “Deploy the Defined Process”).

2. Test deployed the project by sending the request messages while providing a TID value, as shown in Figure 5-10.

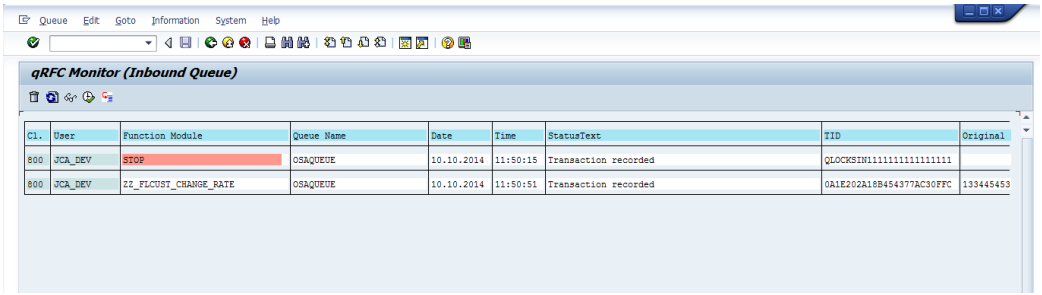
Figure 5-10 Test qRFC Endpoint



3. Make sure that the TID value provided is unique every time a new request is sent to SAP, else the RFC execution will not happen.

4. The request message can be seen in the SAP queue with SMQ2 tcode, as shown in Figure 5-11.

Figure 5-11 qRFC Monitor



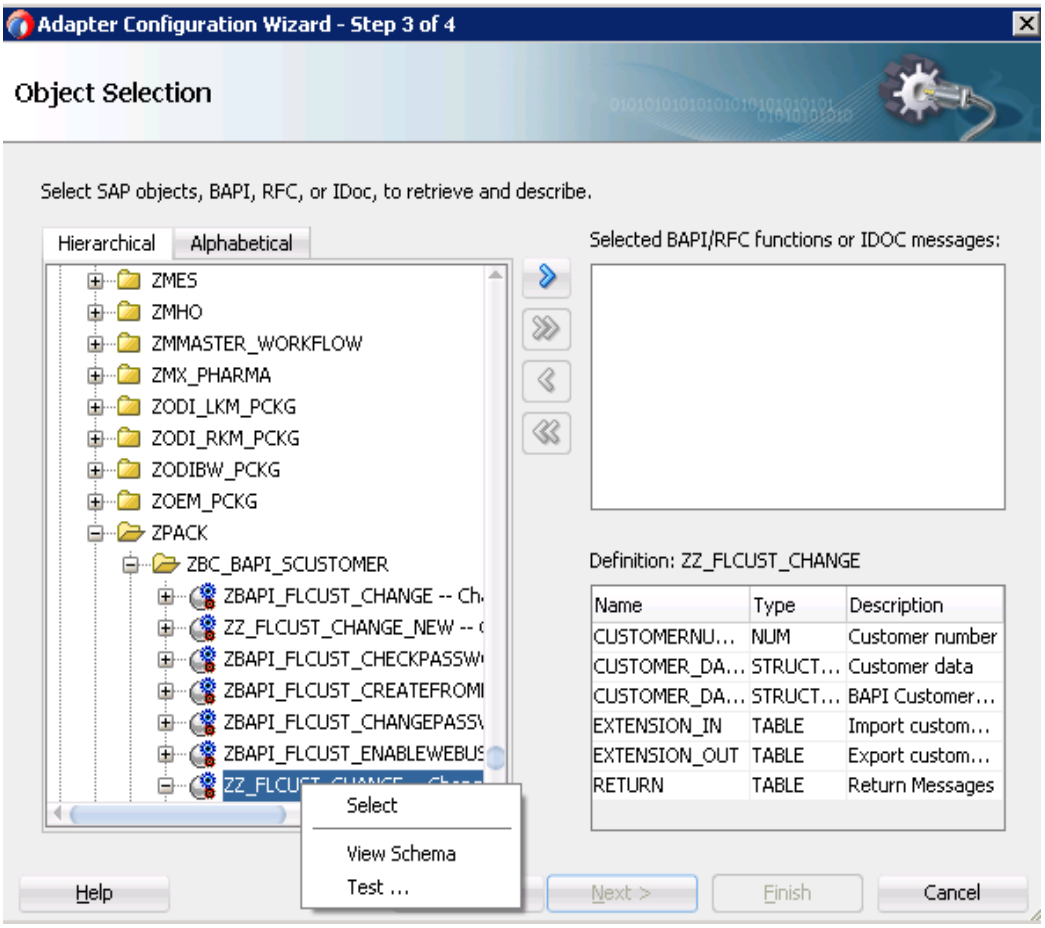
5.1.5 Modeling the bgRFC SAP Endpoint

1. To create a bgRFC SAP Endpoint, create an outbound RFC project. (For more information, refer to the section "Design an Outbound BPEL Process").

2. In the **Object Selection** page, right-click on any RFC and then click on **Select**, as shown in the Figure below.

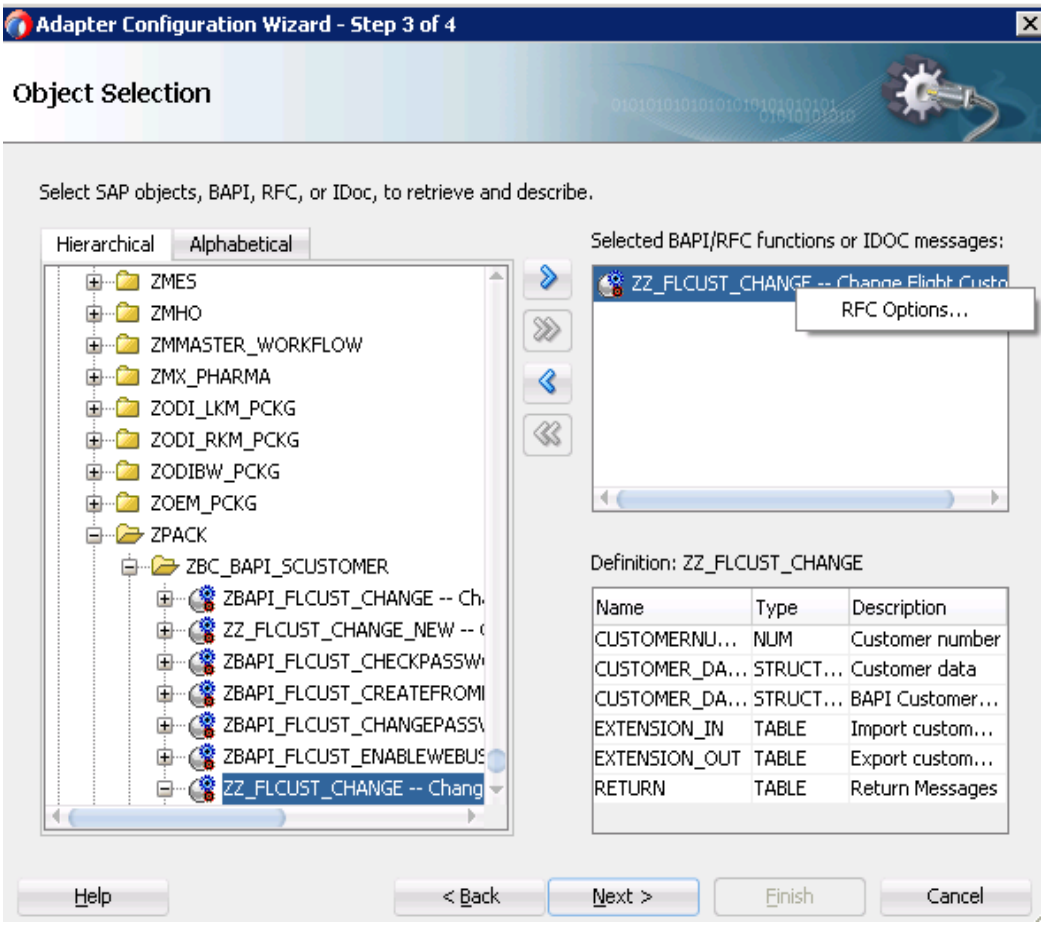
The selected RFC appears in the **Selected BAPI/RFC functions or IDOC messages** area.

Figure 5-12 Object Selection Page



3. Right-click on the selected RFC and select **RFC Options**, as shown in the Figure below.

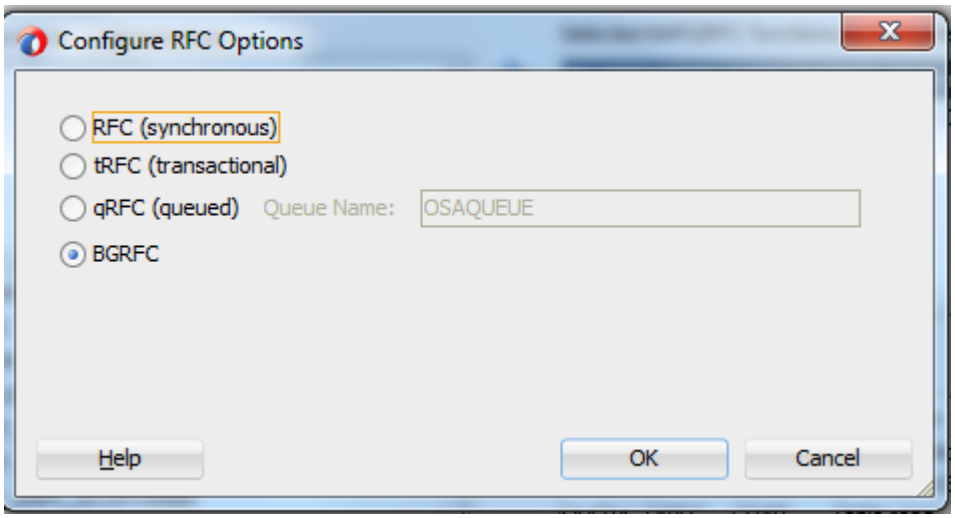
Figure 5-13 Select RFC



The Configure RFC Options window appears.

4. Select the **bgRFC** radio button, as shown in Figure 5-8.

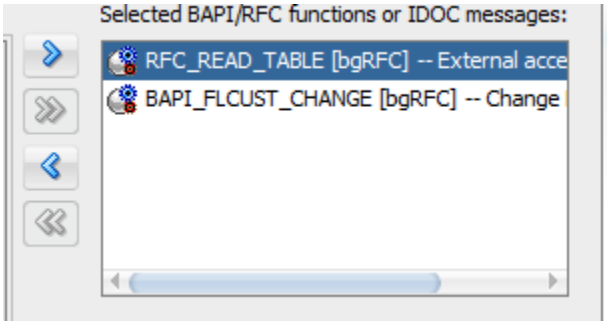
Figure 5-14 Configure RFC Option



5. Click **OK**.

6. You can set more than one RFC as an bgrfc mode as show in Figure below

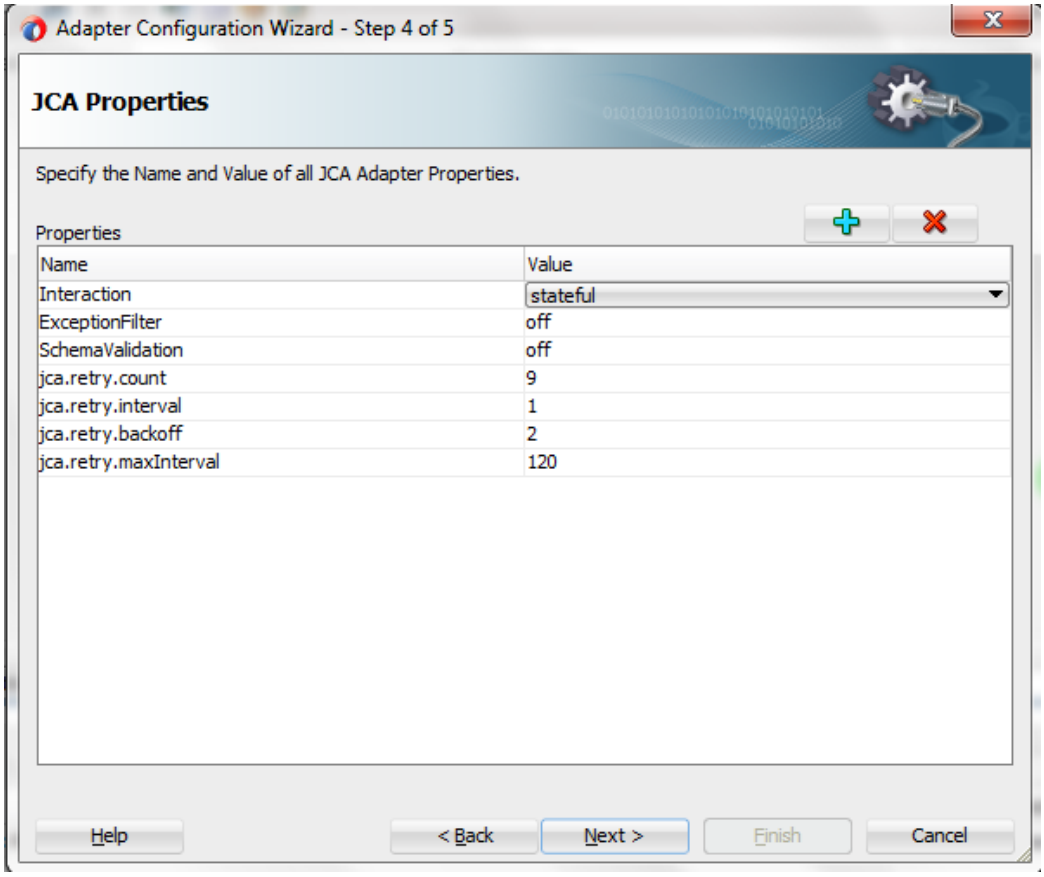
Figure 5-15 Configure RFC Option



7. Click **Next**. At Properties page you can specify the queues that you want to use in bgRFC Type q execution, you can skip this if bgRFC of Type t execution is required.

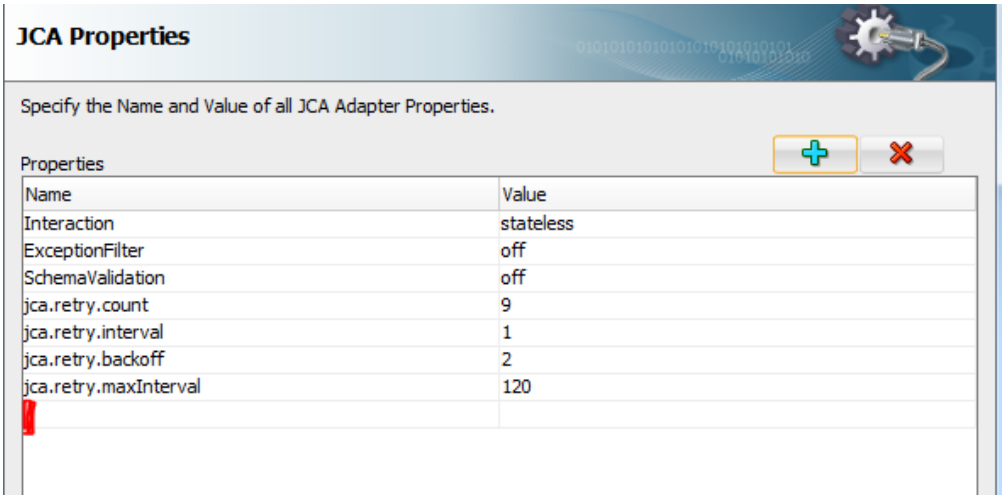
8. Click on the Add button as shown below.

Figure 5-16 Configure RFC Option



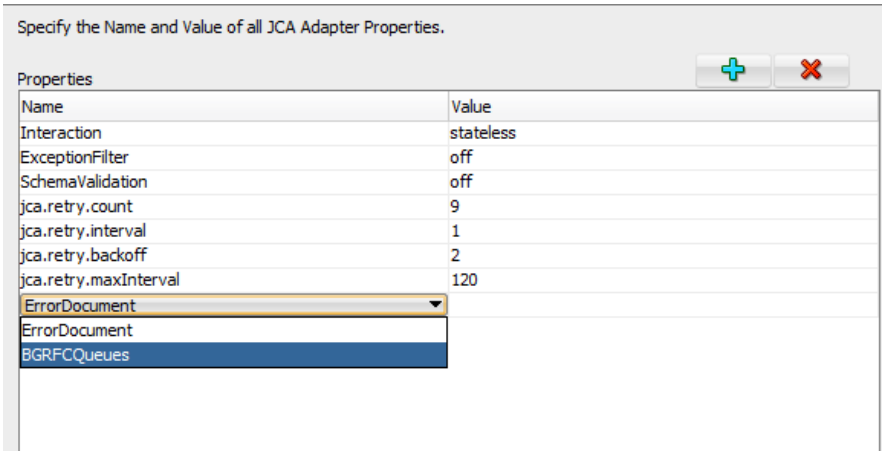
9. You can choose BGRFCQueues property from the drop-down and can choose value for that as shown in figure below

Figure 5-17 Configure RFC Option



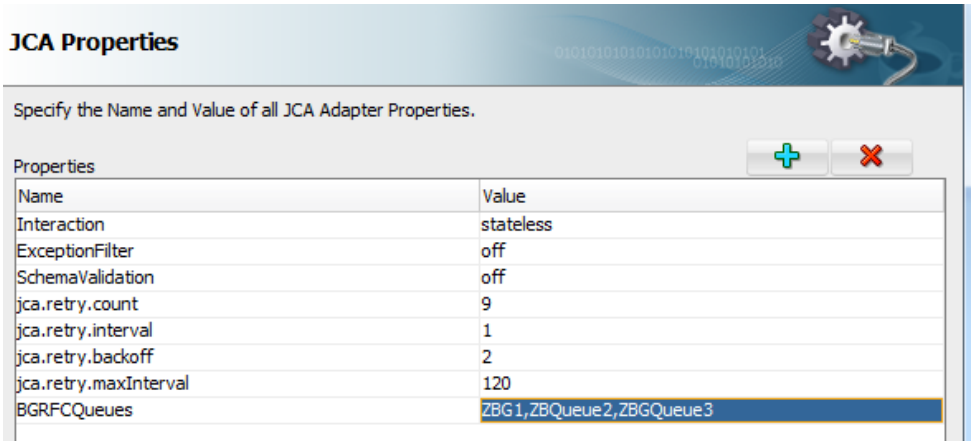
10. Click on the appeared row, a drop-down menu appears with the properties list .Select BGRFCQueues property from the option as shown in the figure below.

Figure 5-18 Configure RFC Option



11. Provide queue names in the Value columns as shown in the figure below.

Figure 5-19 Configure RFC Option



12. Click **Finish**.

The jca file of the project looks like as shown in the Figure below.

Figure 5-20 JCA File

```
<adapter-config name="sapReference_2" adapter="sap" wsdlLocation="../WSDLs/sapReference_2.w

  <connection-factory UIConnectionName="sdjb" location="eis/SAP/FMNDEMO"/>
  <endpoint-interaction portType="sapReference_2_PT" operation="BGQRFCFunction">
    <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
      <property name="BGRFCQueues" value="ZBG1,ZBQueue2,ZBGQueue3"/>
      <property name="Interaction" value="stateless"/>
      <property name="ExceptionFilter" value="off"/>
      <property name="SchemaValidation" value="off"/>
      <property name="RFC" value="RFC_READ_TABLE,BAPI_FLCUST_CHANGE,"/>
      <property name="Type" value="BGRFC"/>
    </interaction-spec>
  </endpoint-interaction>

</adapter-config>
```

5.1.6 Testing the bgRFC SAP Endpoint

1. Deploy the project. (For more information, refer to the section "Deploy the Defined Process").

2. Test the deployed project by sending the request messages, as shown in the Figure below.

Figure 5-21 Test qRFC Endpoint

```
<BGQRFCFunction xmlns="urn:sap-com:document:sap:rfc:functions">
    <BAPI_FLCUST_CHANGE xmlns="urn:sap-com:document:sap:rfc:functions">
        <CUSTOMERNUMBER>00000010</CUSTOMERNUMBER>
        <CUSTOMER_DATA>
            <CUSTNAME>cus_data2</CUSTNAME>
        </CUSTOMER_DATA>
        <CUSTOMER_DATA_X>
            <CUSTNAME>X</CUSTNAME>
        </CUSTOMER_DATA_X>
    </BAPI_FLCUST_CHANGE>
    <BAPI_FLCUST_CHANGE xmlns="urn:sap-com:document:sap:rfc:functions">
        <CUSTOMERNUMBER>00000011</CUSTOMERNUMBER>
        <CUSTOMER_DATA>
            <CUSTNAME>cus_data2</CUSTNAME>
        </CUSTOMER_DATA>
        <CUSTOMER_DATA_X>
            <CUSTNAME>X</CUSTNAME>
        </CUSTOMER_DATA_X>
    </BAPI_FLCUST_CHANGE>
</BGQRFCFunction>
```

3. You can add more data to BAPI_FLCUST_CHANGE as it is unbounded defined in the schema.

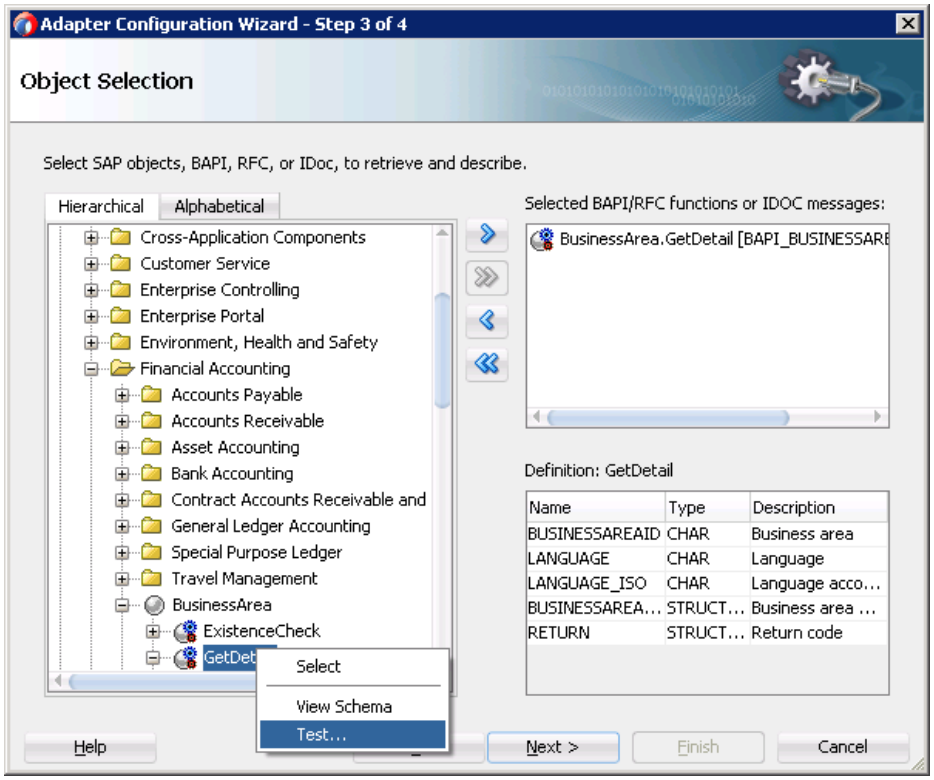
5.2 Design-Time Test Functionality

The design-time test functionality, available in Adapter, is used to test any SAP object in the design-time itself. It returns the result of the execution in the Adapter wizard. This feature is applicable only for outbound testing of RFC and BAPI objects, but not for IDocs.

5.2.1 Using the Design-Time Test Functionality

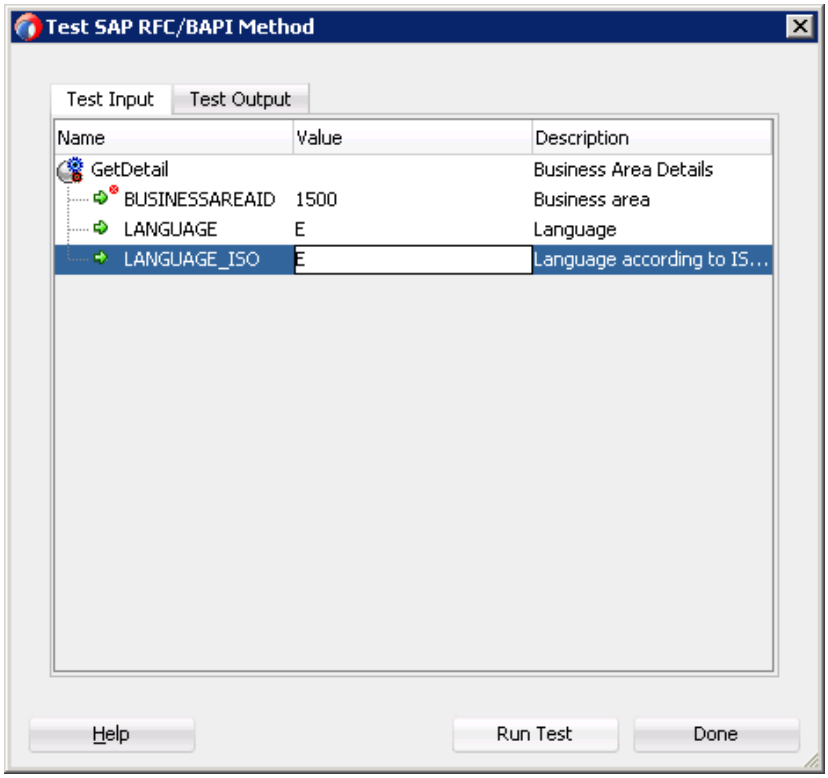
1. On **Object Selection** page in the Adapter Configuration Wizard, right-click on any objects (BAPI/RFC) and then click **Test** button, as shown in Figure 5-22.

Figure 5-22 Adapter Configuration Wizard



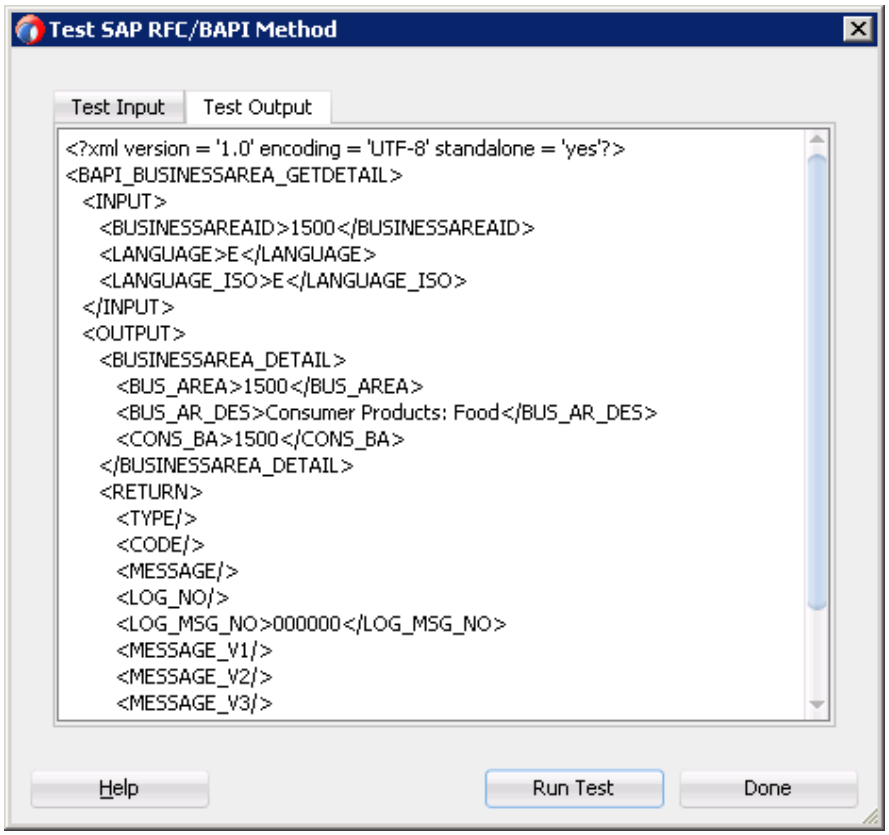
2. Provide the necessary inputs and click **Run Test** button, as shown in Figure 5-23.

Figure 5-23 Test Dialog



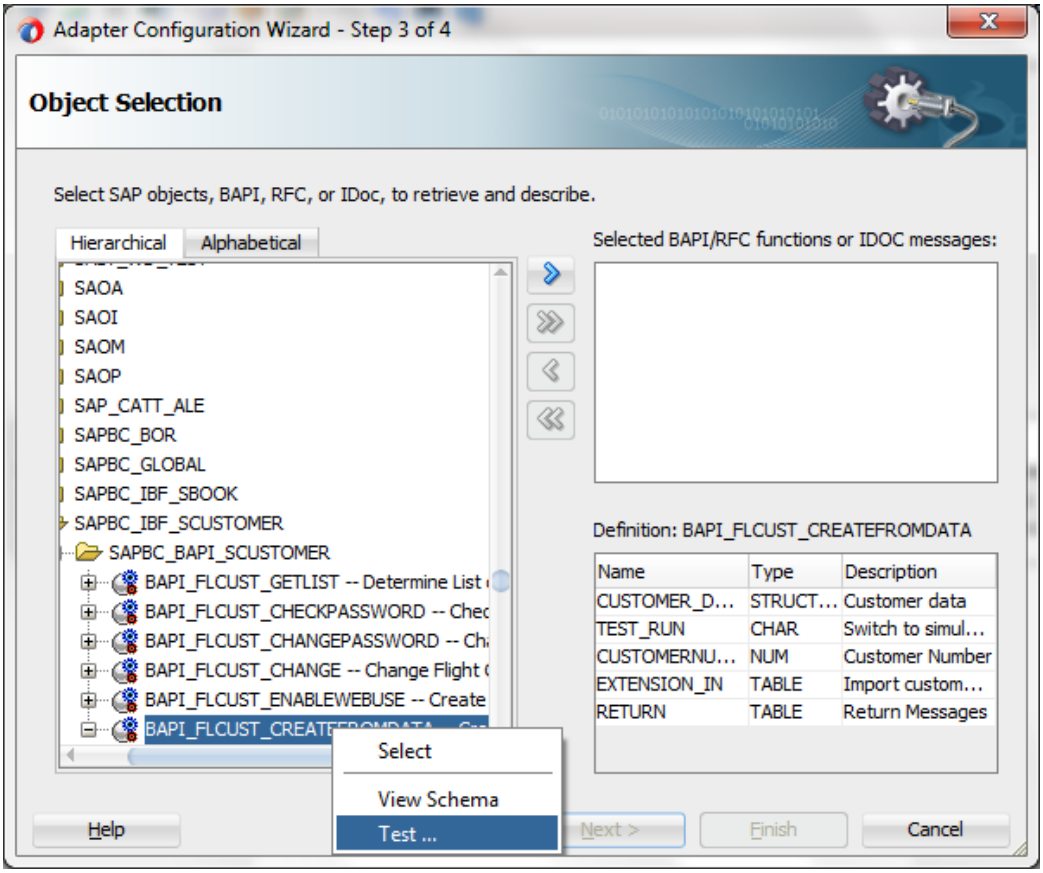
This shows result of the BAPI/RFC executed, as shown in Figure 5-24.

Figure 5-24 Test Output



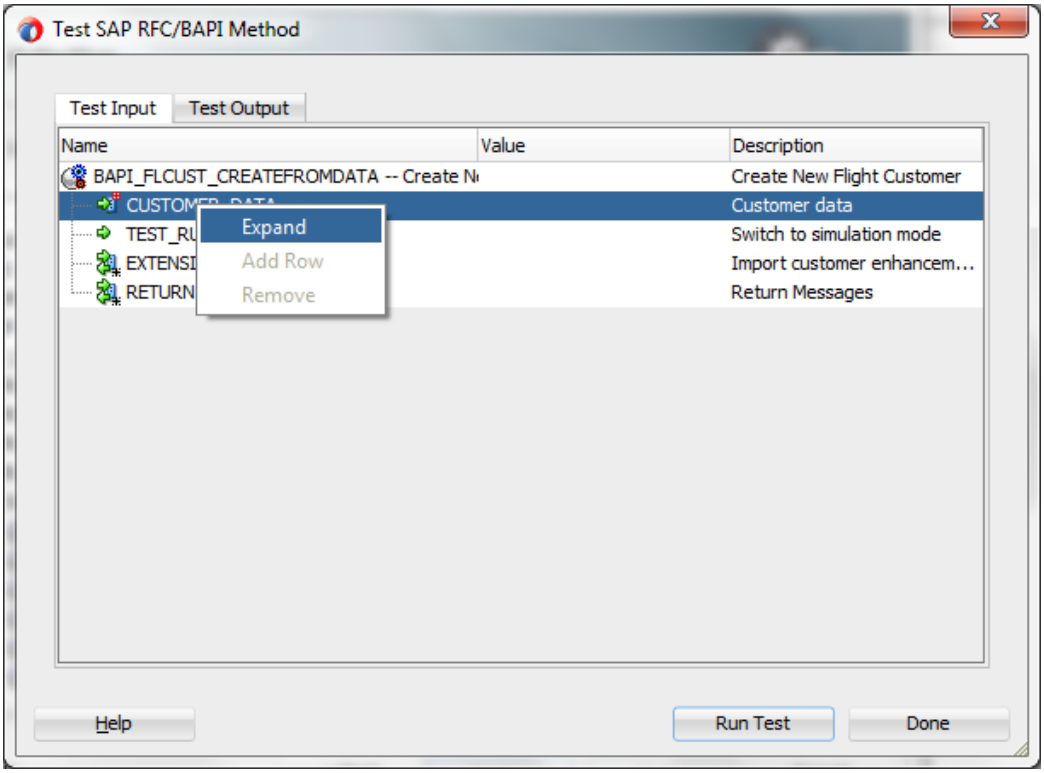
The BAPIs which takes structure or table as an input , needs to follow the below steps to run the design time functionality test.

Figure 5-25 Result Dialog



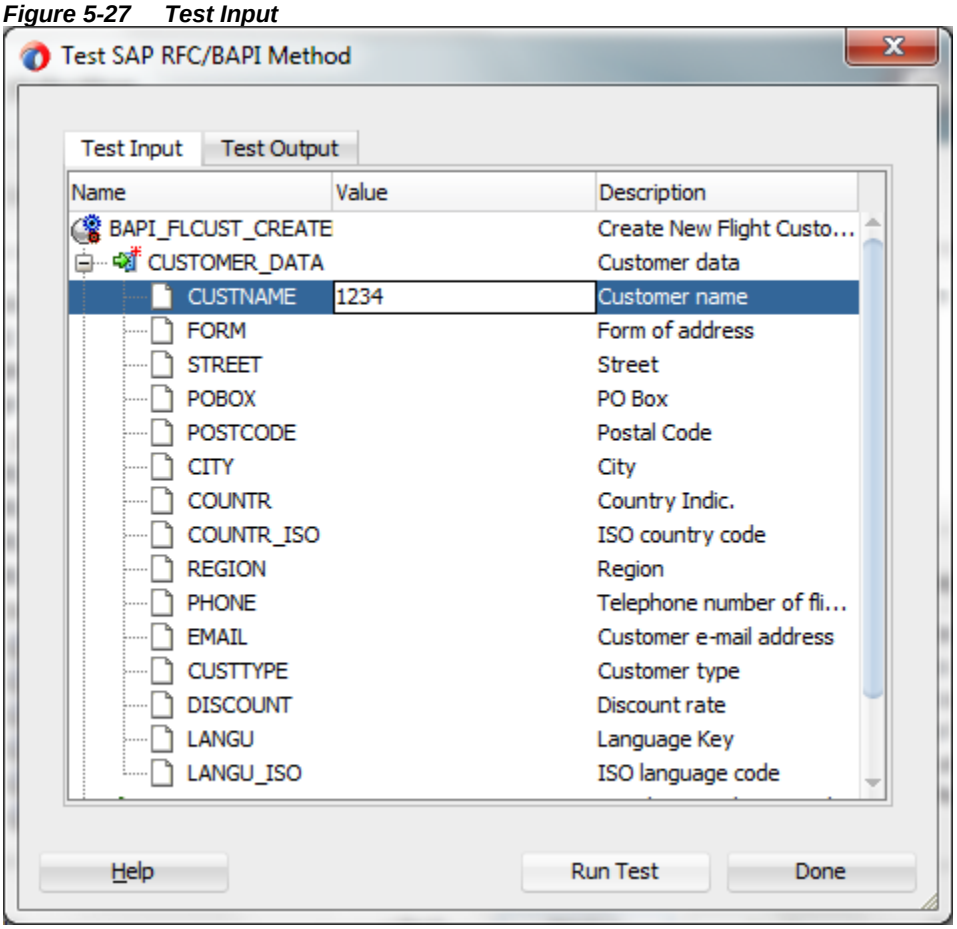
Right-click on the CUSTOMER_DATA , click on **Expand** to expand the structure.

Figure 5-26 Result Dialog



Now give the required input as mentioned below , then Click on **Run Test** button.

Figure 5-27 Test Input



5.3 Exception Filter

The Adapter for SAP provides a JCA interaction spec property, "ExceptionFilter", to enable the adapter to filter outbound exceptions using an exception filter class. A default implementation, *oracle.tip.adapter.sap.exception.SAPExceptionFilter*, is included with the Adapter for SAP. It filters the JCO exceptions into PCRetriableResourceException (a remote fault) or PCResourceException (a binding fault), supported by the Oracle Fault handling and rejection framework. The default exception filter can be replaced with a custom filter by changing the className attribute of <exception-filter> element in the generated JCA file.

5.3.1 Create an Exception Filter Project

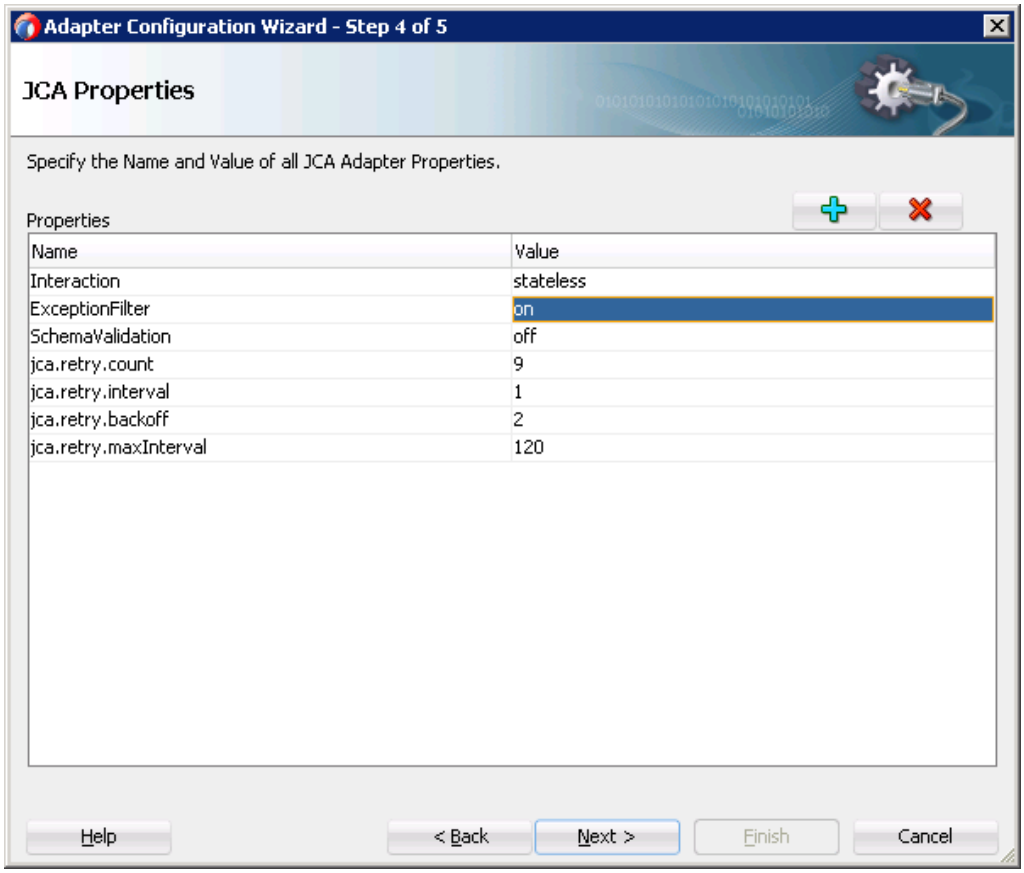
Perform the following steps to create an SAP Endpoint with Exception Filter feature:

1. Create an outbound BAPI/RFC/IDoc endpoint using the Adapter for SAP.

   (For more information, refer to the section "Configure the Adapter Component" under BPEL Outbound Process)

2. Set "ExceptionFilter" property to **on** in the JCA Properties page, as shown in Figure 5-28.

Figure 5-28 Exception Filter Property



5.3.2 Testing the Exception Filter Project

Remote Fault: PCRetriableResource Exception

To test the Exception Filter Project:

1. Deploy the project with exception filter **on**. (For more information, refer to the section "Deploy the Defined Process").
2. Simulate an exception by disconnecting the WebLogic server from SAP, for example, lock the SAP user.
3. Execute the outbound project.
4. The output fails with an error message.
5. Check the SOA server diagnostic log.

It contains an exception as given below and shown in Figure 5-29.

```
oracle.tip.adapter.sap.exception.SAPExceptionFilter@301155b3.appl
yFilter(): javax.resource.ResourceException:
com.sap.conn.jco.JCoException: (103) JCO_ERROR_LOGON_FAILURE:
User is locked. Please notify the person responsible on
```

```
10.30.32.42 sysnr 00 linked to class
com.sap.conn.jco.JCoException wrapped with
oracle.tip.adapter.api.exception.PCRetriableResourceException
```

Figure 5-29 SOA Server Diagnostic Log Screen

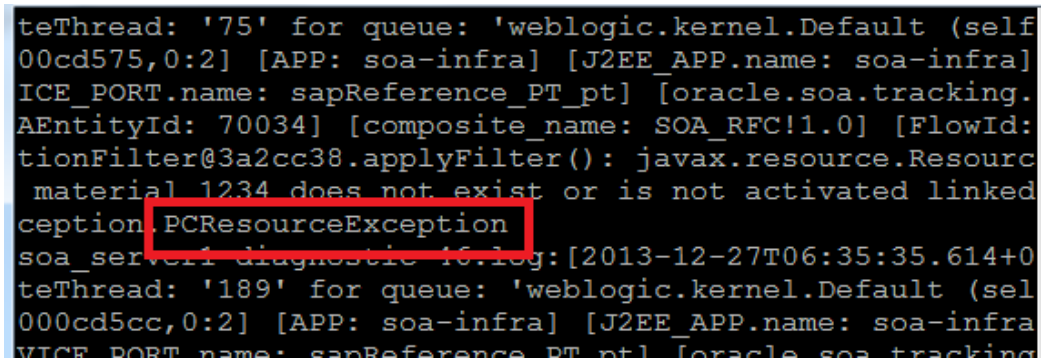
This confirms that the exception has been captured.

Binding Fault: PCResource Exception

To test the Exception Filter Project:

1. Create an outbound endpoint for the RFC object BAPI_MATERIAL_GET_DETAIL, exposed as a proxy service.
2. Deploy the project with exception filter **on**. (For more information, refer to the section "Deploy the Defined Process").
3. Execute the outbound project.
4. The output fails with an error message.
5. Check the SOA server diagnostic log, as shown in Figure 5-30.

Figure 5-30 SOA Server Diagnostic Log Screen

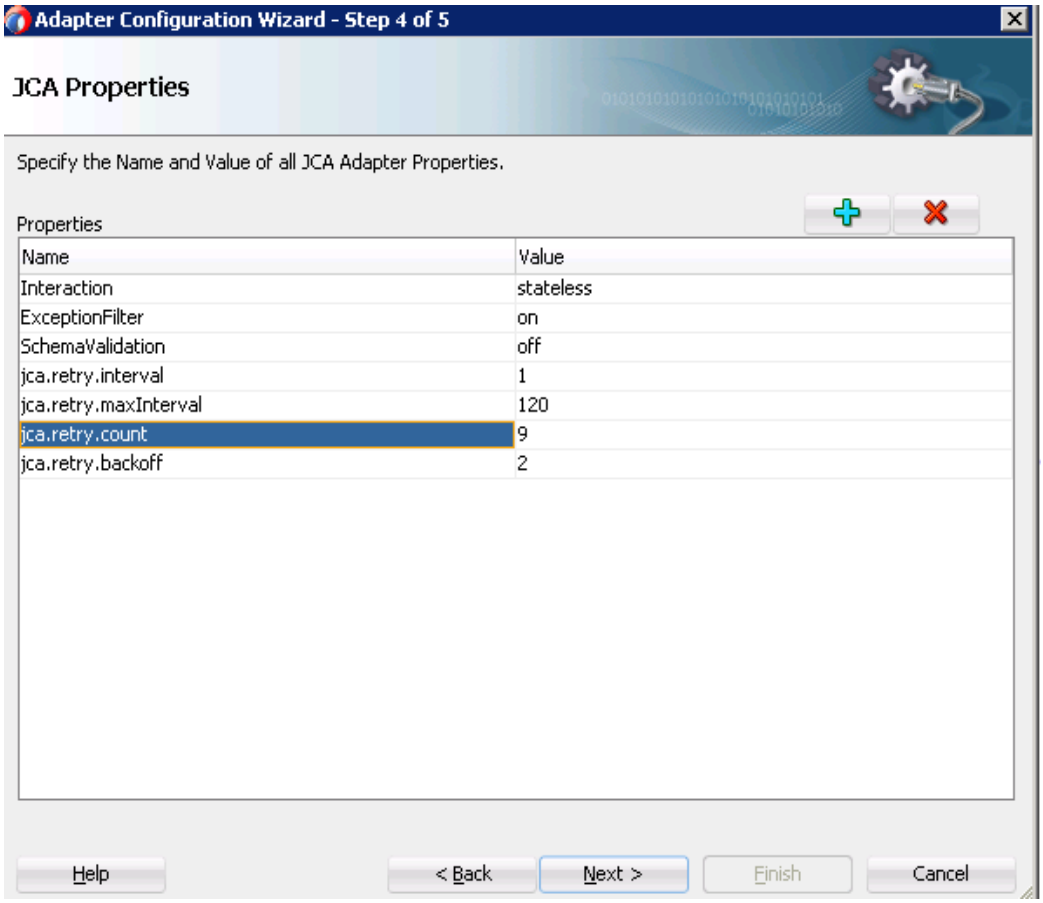


Testing RetryCount Property of the Adapter

With RetryCount property, user can set the number of times the Adapter will try to connect to SAP in case of failure in SAP connection.

1. Deploy the project with the property **jca.retry.count** in the JCA Properties page of the Adapter wizard set to the number of times you want the Adapter for SAP to try and connect to SAP. For example, jca.retry.count = 9, as shown in Figure 5-31.

Figure 5-31 JCA Properties Page



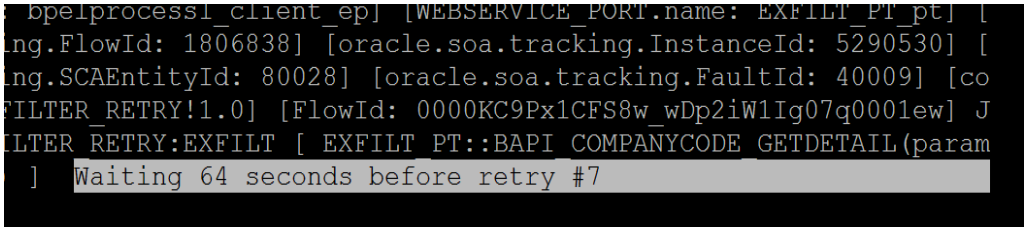
2. Simulate an exception by disconnecting the WebLogic server from the SAP, for example, lock the SAP user.
3. Execute the outbound project.
4. The output fails with an error message.
5. Check the SOA server diagnostic log.

   It will show that Adapter for SAP is retrying about 9 times as there will be entries like:

   - Waiting 1 second before retry #1
   - Waiting 1 second before retry #2
   - Waiting 4 seconds before retry #3

     And so on, as shown in Figure 5-32.

Figure 5-32 SOA Server Diagnostic Log Screen



If while retrying, the WebLogic server is connected to SAP again by unlocking the user then there will be no more retry entries in the diagnostic log and the result of the execution will be received successfully.

Note: Manual editing of JCA properties file (.jca file) to change the value of Exception Filter property from "**on**" to "**off**" or vice-versa is not supported and the changes will not be reflected.

5.4 Schema Validation

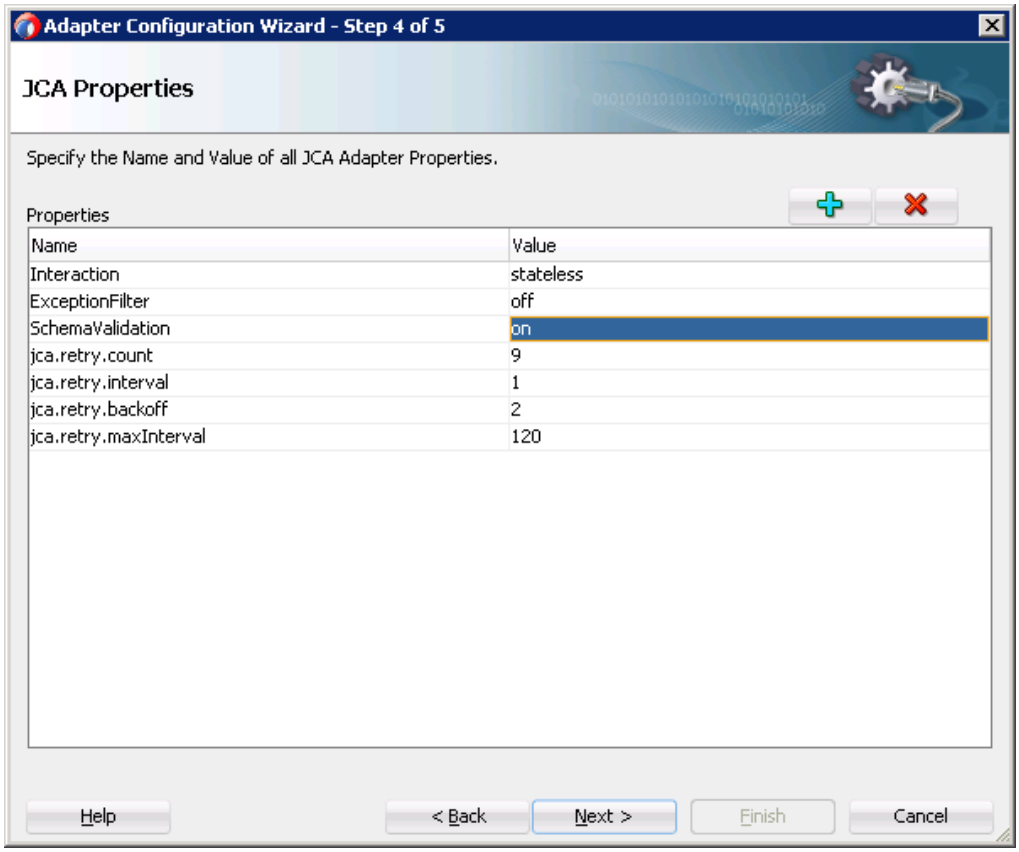
The SchemaValidation property is used to validate the input xml during run-time execution against the xsd created for the SAP Object. You need to set the property SchemaValidation in the **JCA Properties** page to "**on**", so that the input xml is validated before sending a request. If this property is not in compliance to xsd, you will get an error message.

5.4.1 Create a Project with Schema Validation:

1. Create an outbound project. (For more information, refer to the section "Configure the Adapter Component" under BPEL Outbound Process)

2. Set the SchemaValidation property in **JCA Properties** page to "**on**", as shown in Figure 5-33.

Figure 5-33 Schema Validation Property



3. Click **Next** and then **Finish**.

5.4.2 Testing the Schema Validation Project:

1. Deploy the project having schema validation on. (For more information, refer to the section "Deploy the Defined Process").

2. Enter any invalid payload input xml.

3. It will then give the error message as given below:

```
<env:Envelope
xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">

   <env:Header>

      <tracking:faultId
xmlns:tracking="http://oracle.soa.tracking.core.TrackingProperty"
>20002</tracking:faultId>

   </env:Header>

   <env:Body>

      <env:Fault>
```

```
            <faultcode>env:Server</faultcode>

            <faultstring>Exception occurred when binding was invoked.
```

Exception occurred during invocation of JCA binding: "JCA Binding execute of Reference operation 'HOLIDAY_CHECK_AND_GET_INFO' failed due to: javax.resource.ResourceException: Invalid Input XML".

The invoked JCA adapter raised a resource exception.

Please examine the above error message carefully to determine aresolution.</faultstring>

```
            <faultactor/>

            <detail>

               <exception>Invalid Input XML</exception>

            </detail>

         </env:Fault>

   </env:Body>

</env:Envelope>
```

5.5 AutoSYSTAT Feature for RFC

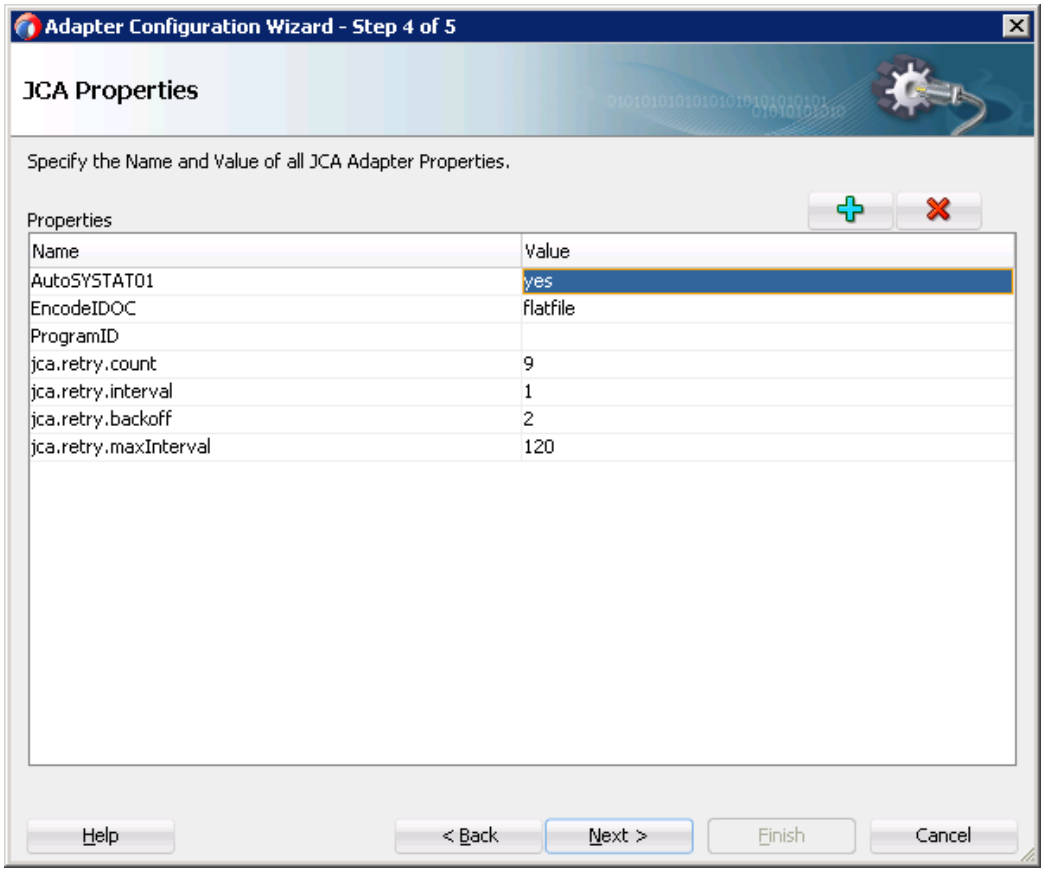
The Adapter for SAP is able to send SYSTAT01 upon a successful reception of an IDoc message. For this, the AutoSYSTAT01 property in the **JCA Properties** page must be set to "**yes**". The Adapter for SAP is able to auto return SYSTAT01, based on the successful message receiving status in SAP.

5.5.1 Creating a Project with AutoSYSTAT01 Property

1. Create Inbound Endpoint for IDOC. For more information, refer to the section "Design an Inbound BPEL Process".

2. In the **JCA Properties** page, set the **AutoSYSTAT01** property to "**yes**", as shown in Figure 5-34.

Figure 5-34 AutoSystat Property



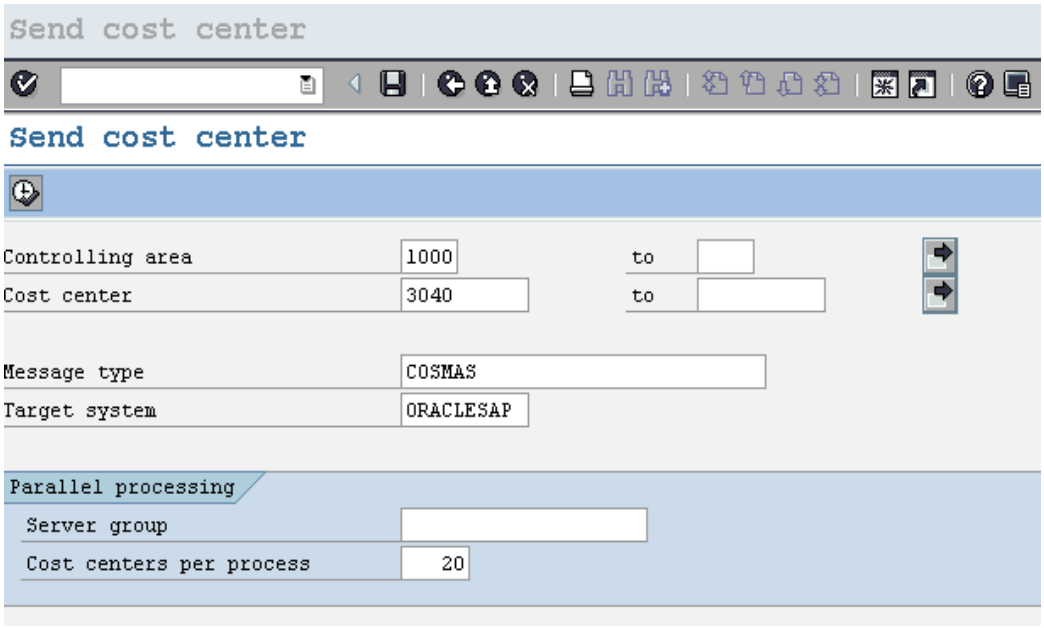
3. Complete the project.

5.5.2 Test the Project with AutoSystat Property

1. Deploy the project with AutoSystat property set to “yes”. (For more information, refer to the section “Deploy the Defined Process”).

2. Send an IDoc from SAP. For example, a COSMAS IDoc sent through BD16 tcode, as shown in Figure 5-35.

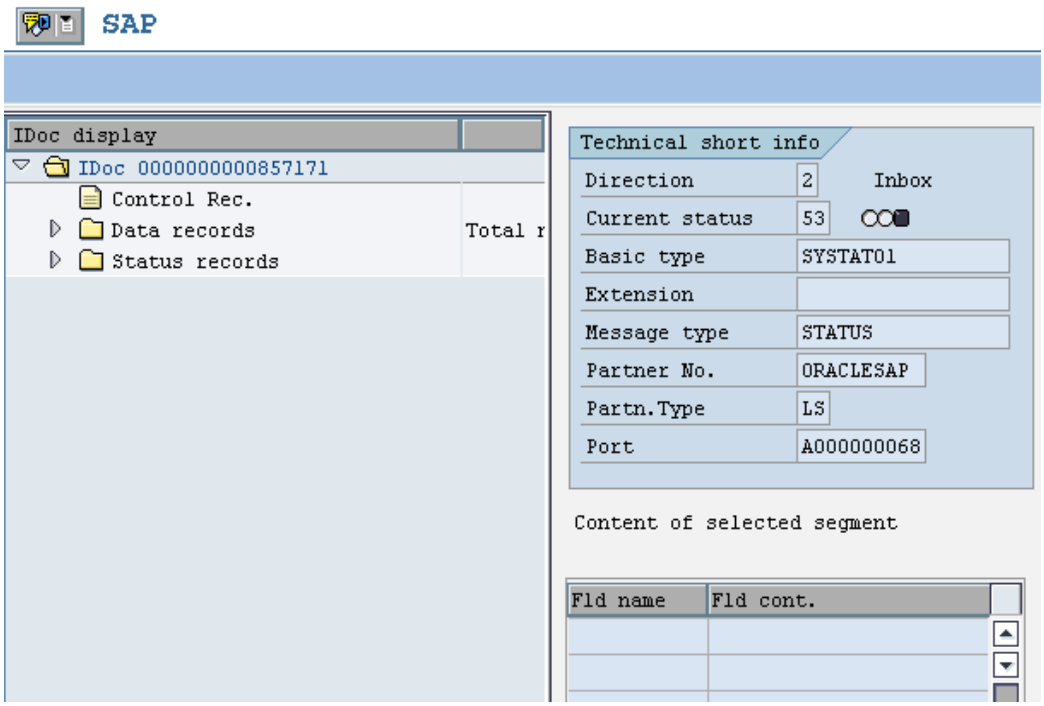
Figure 5-35 Send Cost Center



3. Navigate to tcode WE02 of SAP.

4. It will show the status IDoc coming from the Adapter as an acknowledgement of receiving the COSMAS IDoc, as shown in Figure 5-36.

Figure 5-36 SAP IDoc Display



5.6 Encode IDoc

SAP uses a non-XML text-based format, called ‘flat file IDoc format’ for serializing IDoc messages to/from the file system. In a flat-file IDoc, all IDoc records including control and data are stored in lines of text separated by a line delimiter.

In SAP, file-based RFC destinations are used to read/write flat file IDoc. Oracle Adapter for SAP provides support for accepting flat file IDoc from non-JCO based input streams, e.g., file system. This feature helps in the integration scenarios where SAP or third-party generated flat file IDoc are used for inbound/outbound data.

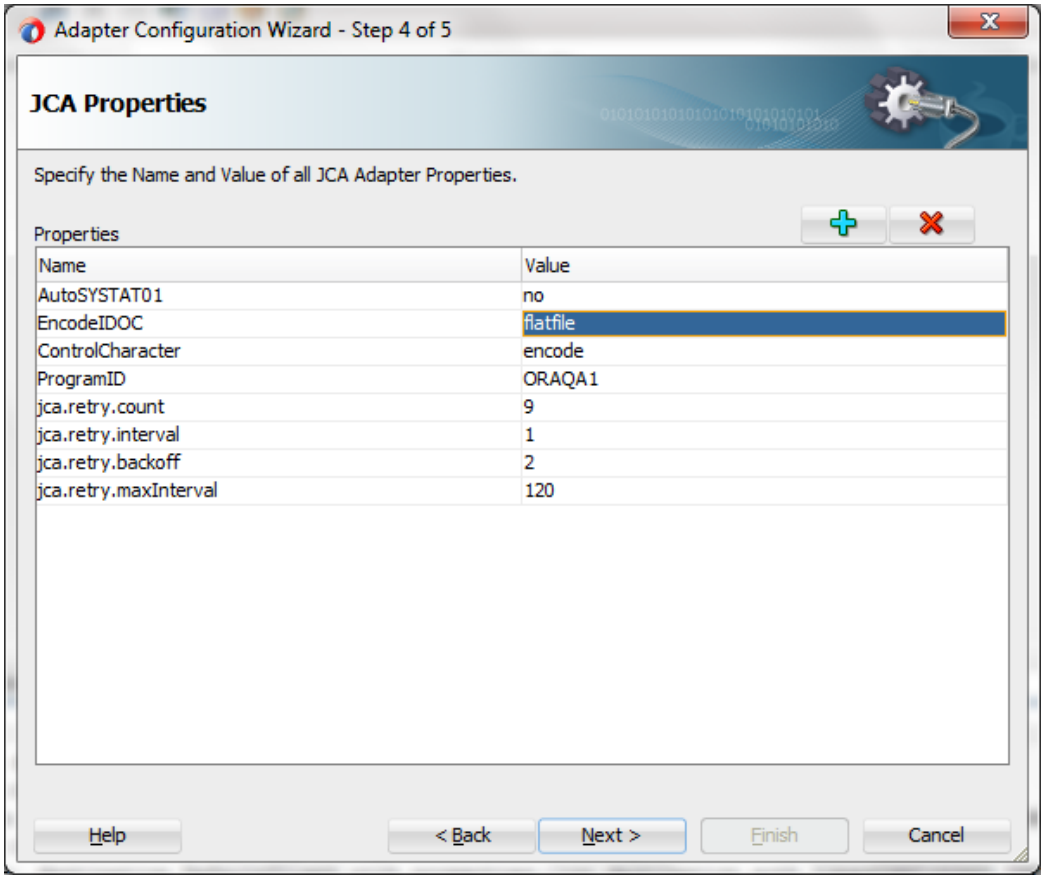
For receiving IDocs in flat file format from SAP, you have to set the **encodeIDOC** property in the **JCA Properties** page.

5.6.1 Create a Project for Flat File IDoc

1. Create an Inbound Endpoint for IDoc. For more information, refer to the section “Design an Inbound BPEL Process” A file adapter can be used to receive the IDoc in flat file format.

2. In the **JCA Properties** page set the EncodeIDOC property to **flatfile**, as shown in Figure 5-37.

Figure 5-37 Encode IDoc



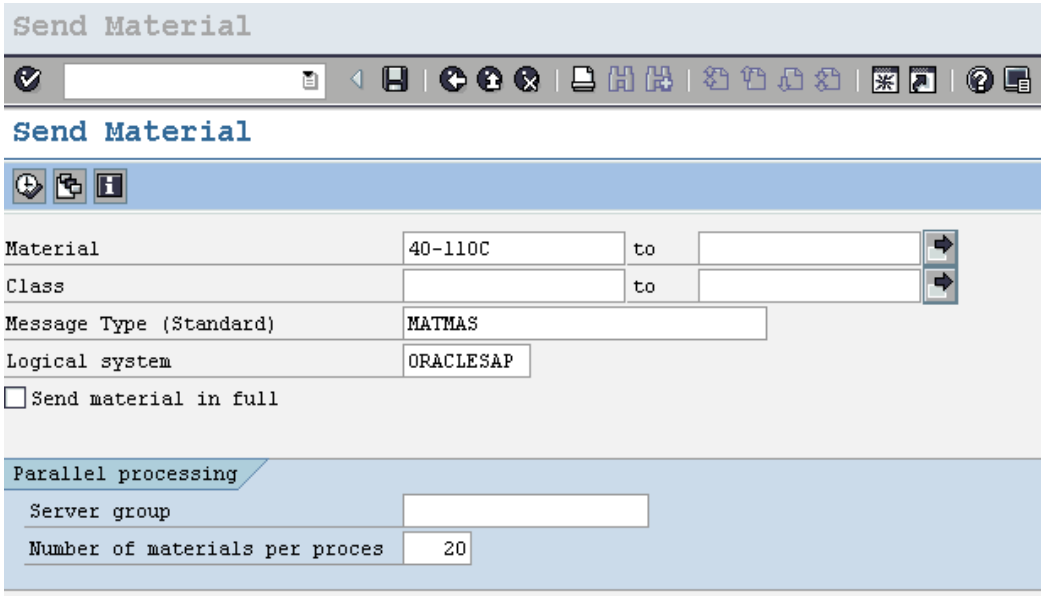
3. Click **Next** and then **Finish**.

5.6.2 Test the Flat File IDoc Project

1. Deploy the project. For more information, refer to the section "Deploy the Defined Process".

2. Test deployed project by sending an IDoc from SAP, for example, a MATMAS IDoc can be sent from BD10 tcode of SAP, as shown in Figure 5-38.

Figure 5-38 Send Material



3. Check the received file. It will be in a flatfile format instead of XML, as shown in Figure 5-39.

Figure 5-39 FlatFile Format

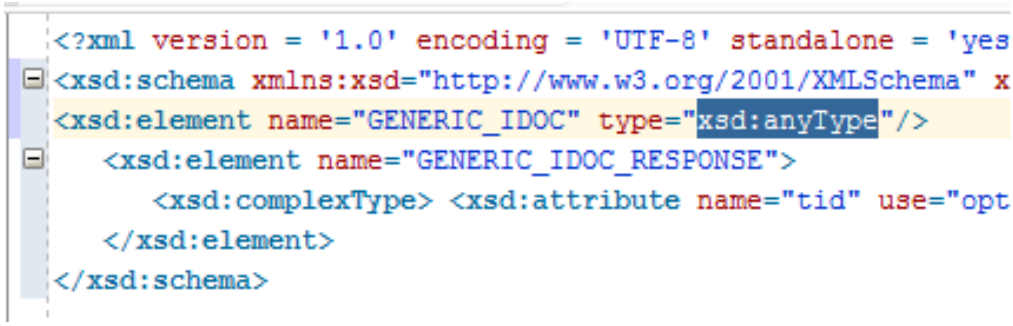
```
EDI_DC    80000000000000632750620 30MATMAS011FILEPORTJ LSORACLESAP
SAPHR9
LST90CLNT090

E2MARAM005800000000000006327500000001E2MARAM005000000020 005MB03              20031002BINS
EA                                          000
LBR1.000         FTQ      0001                 00          0.000
0.000            0.000           0.00.0       0  0                      0     0     0
0000000000000000
0.0                                                                              B
E2MAKTM001800000000000006327500000002E2MAKTM001000001030 0051ANNE KLEIN (MAXWELL) t? ZH
E2MAKTM001800000000000006327500000003E2MAKTM001000001030 0053Toothpaste (C&D)
E2MAKTM001800000000000006327500000004E2MAKTM001000001030 0056S40  (Euro)
E2MAKTM001800000000000006327500000005E2MAKTM001000001030 0057 900 MHz Wireless Telephone
E2MAKTM001800000000000006327500000006E2MAKTM001000001030 0058Watches & FJ
E2MAKTM001800000000000006327500000007E2MAKTM001000001030 0059Alarms - Argo
E2MAKTM001800000000000006327500000008E2MAKTM001000001030 005AFoodSaver Vac 1075 (Tilia)
E2MAKTM001800000000000006327500000009E2MAKTM001000001030 005BPT15   P-touch
E2MAKTM001800000000000006327500000010E2MAKTM001000001030 005DLucent Fibers  (Thor Labs)
E2MAKTM001800000000000006327500000011E2MAKTM001000001030 005EMAB Product 3
E2MAKTM001800000000000006327500000012E2MAKTM001000001030 005FDasani (Coke)
E2MAKTM001800000000000006327500000013E2MAKTM001000001030 005IPorcelain (Mannington)
E2MAKTM001800000000000006327500000014E2MAKTM001000001030 005JCore Switching (Lucent)
E2MAKTM001800000000000006327500000015E2MAKTM001000001030 005K014795 R&W BEEF NOODLE 0.25
E2MAKTM001800000000000006327500000016E2MAKTM001000001030 005NBacardi Light  750ml (charmer
E2MAKTM001800000000000006327500000017E2MAKTM001000001030 005SMediq - ACS
E2MAKTM001800000000000006327500000018E2MAKTM001000001030 005UWound Care (J&J)
E2MAKTM001800000000000006327500000019E2MAKTM001000001030 005WConsulting (Novadigm)
E2MAKTM001800000000000006327500000020E2MAKTM001000001030 005aLIds
E2MAKTM001800000000000006327500000021E2MAKTM001000001030 005bSingulair  (Merck)
E2MAKTM001800000000000006327500000022E2MAKTM001000001030 005cIndustrial (Aceto)
E2MARCM004800000000000006327500000023E2MARCM004000001030 0053000VEB                MAB
0.000         0.000         0               00000000                          0.00  0
0.0      0000000002   0.00  0.000         0.00
0               000001                                                          00000
```

5.7 Generic IDoc Support

The Adapter for SAP provides a generic IDoc message type to enables you to receive\send different native IDoc message type of SAP system by selecting single message type GENRIC_IDOC in design-time of the Adapter. For GENERIC_IDOC support, Adapter for SAP creates schema structure with element type “anyType”, as shown in Figure 5-40.

Figure 5-40 Schema Structure with Element Type



This feature enables dynamic run-time changes on the content of IDoc message type at the SAP server without requiring to re-deploy/re-configure the SOA project. The downstream processing function can cast the IDoc message and processor can route it according to the correct IDoc message type.

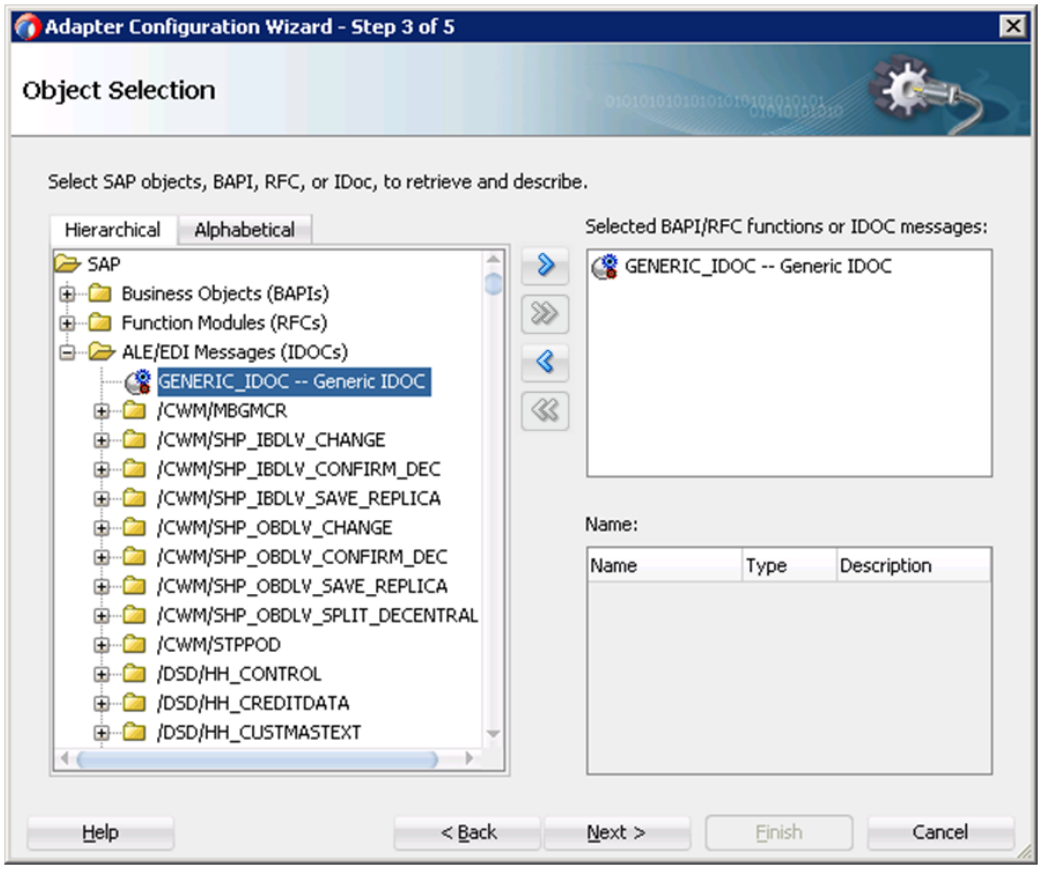
Note: In case you are directly using the standard IDOCs and not as a GENERIC IDOC message type, any structure changes to the IDOC will need a re-configure/re-deployment of the SOA project to take effect.

5.7.1 Create Generic IDoc Inbound Endpoint

1. Create Inbound Endpoint for IDoc. For more information, refer to the section "Design an Inbound BPEL Process for BAPI/RFC/ID" A file adapter can be used to receive the IDoc.

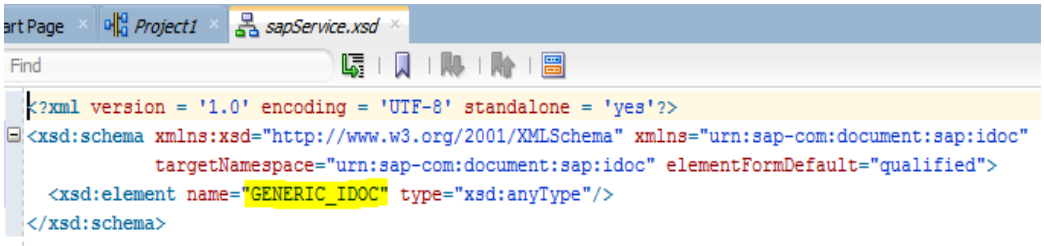
2. In the **Object Selection** page of the Adapter wizard, select **Generic IDOC**, as shown in Figure 5-41.

Figure 5-41 Generic IDoc Support



The XSD of the Generic IDoc look like as shown in Figure 5-42.

Figure 5-42 XSD of the Generic IDoc



3. Click **Next** and then **Finish** the project.

5.7.2 Test the Generic IDoc Inbound Endpoint

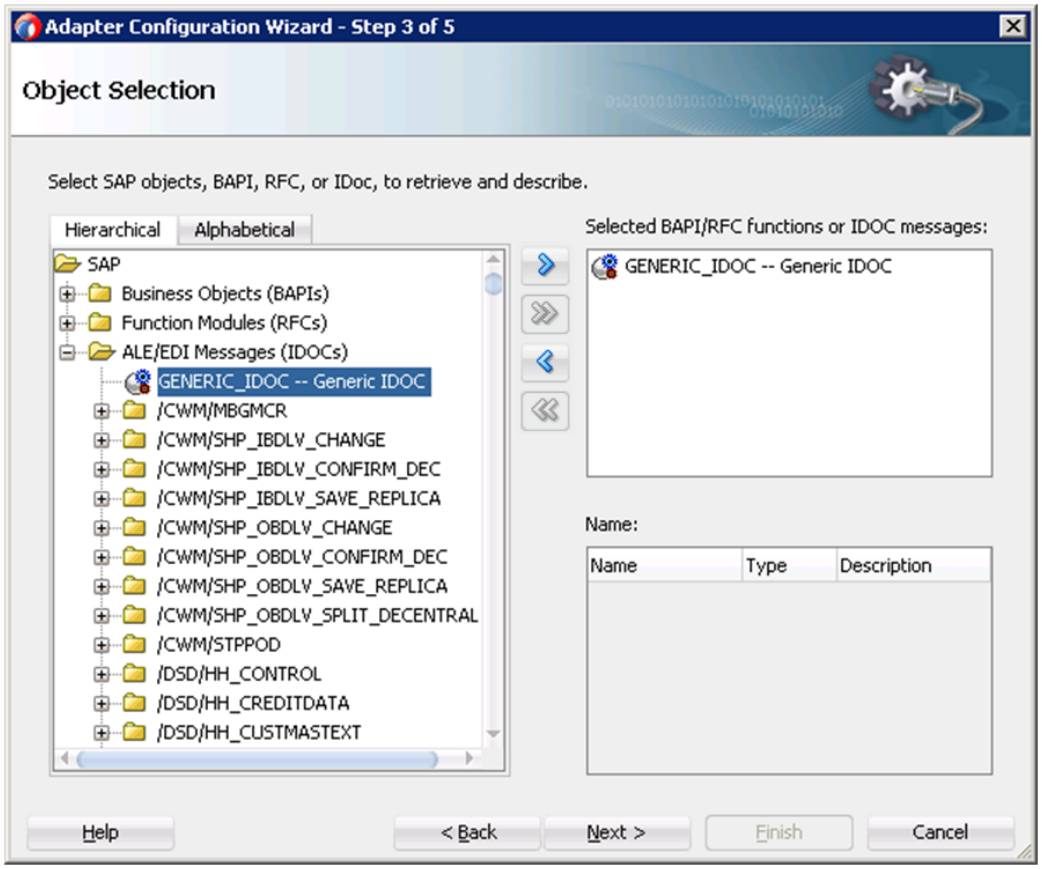
1. Deploy the project. For more information, refer to the section "Deploy the Defined Process".
2. Test deployed project by sending an IDoc from SAP. For example, a MATMAS IDoc can be sent from BD10 tcode of SAP.
3. Check the IDoc received through file adapter. The received xml will look like as shown in Figure 5-43.

Figure 5-43 XML File Format

5.7.3 Create Generic IDoc Outbound Endpoint

1. Create Outbound Endpoints for IDoc. For more information, refer to the section "Design an Outbound BPEL Process for BAPI/RFC/IDOC".
2. In the **Object Selection** page of the Adapter wizard, select **Generic IDOC** and click **Next** button, as shown in Figure 5-44.

Figure 5-44 Object Selection Page



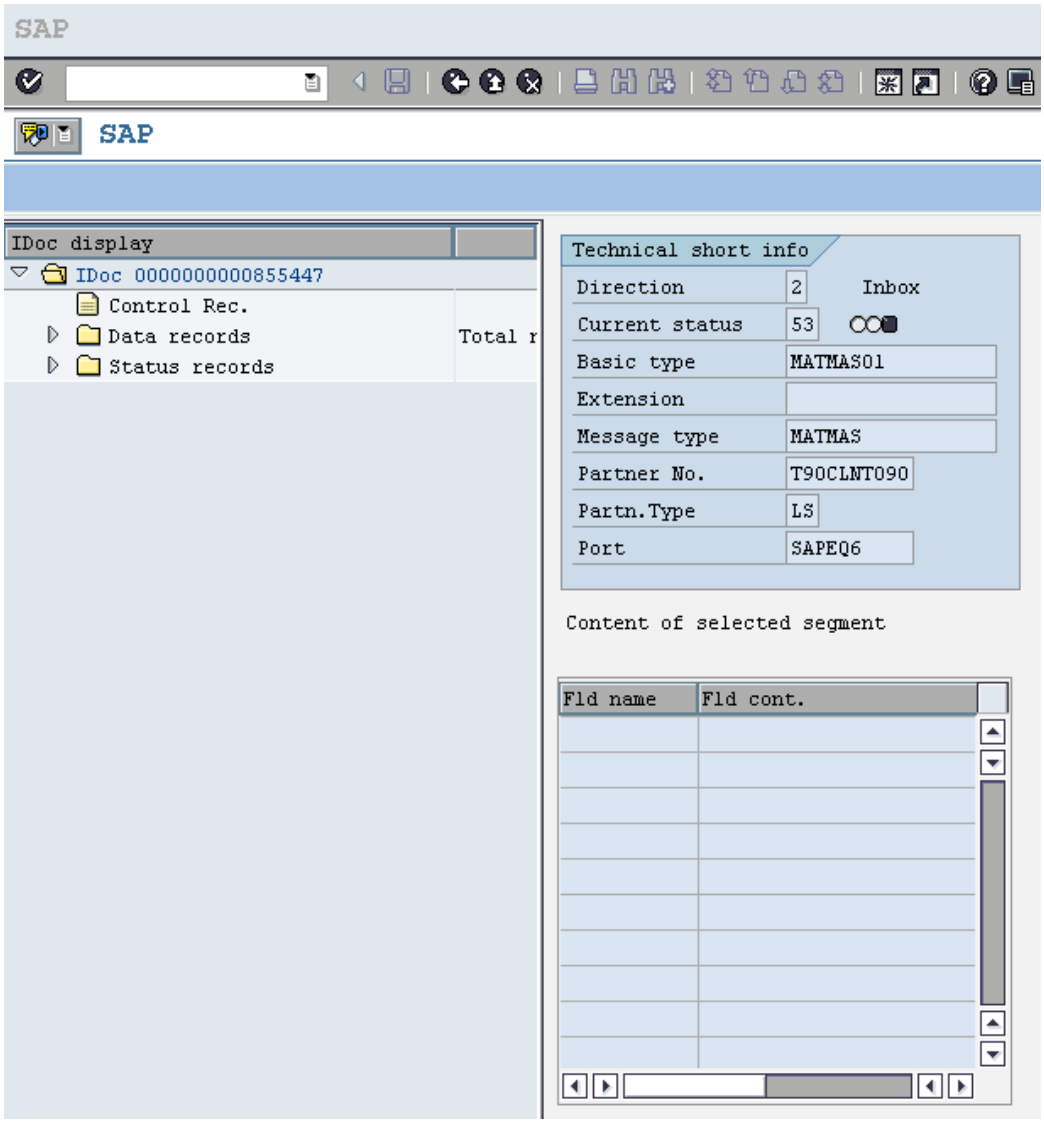
3. Click **Next , Next** and then **Finish** for the subsequest screens.

   It will create an SAP endpoint with XSD/WSDL for Generic IDoc.

5.7.4 Test the Generic IDoc Outbound Endpoint

1. Deploy the Generic IDoc project. For more information, refer to the section "Deploy the Defined Process".
2. Send a Generic IDoc (for example: matmas01) to SAP system.
3. The received IDoc status can be checked in SAP system through tcode WE02, as shown in Figure 5-45.

Figure 5-45 SAP IDoc Display



This shows the IDoc was successfully received by SAP.

5.8 Revision IDoc Support

Idoc-ecmrev01 is an IDoc type, which contains object management record for an object (material or document) which is marked by a revision level. This data is necessary in order to correctly make, change and delete a revision level within engineering change management.

IDocs of this type are automatically sent when:

- An object (material or document) is distributed which is marked by the revision level.
- Distribution starts with a change indicator for an Integrated Distributed PDM Solution (ID PDM).

Note: Adapter for SAP supports this feature dynamically with the help of Generic IDoc functionality.

5.9 Sharing Program ID Feature

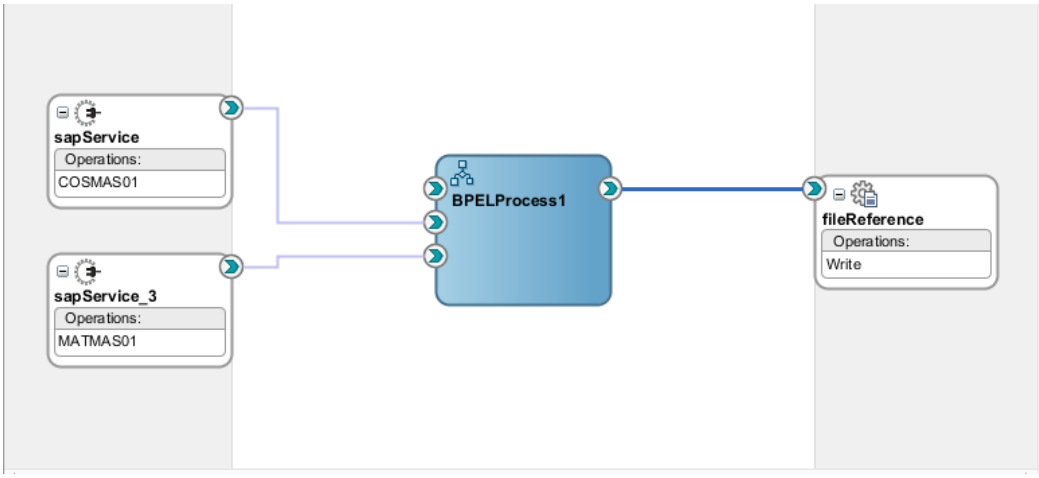
The Adapter for SAP enables multiple inbound IDoc message types to share an SAP connection using the same program ID. You can generate a WSDL port Type with multiple operations to receive individual IDoc message type.

The Adapter for SAP enables a program ID to be shared for different inbound data. For example, two or more IDoc types can be sent to the same program ID used by SOA inbound endpoints.

5.9.1 Create a Sharing Program ID Project:

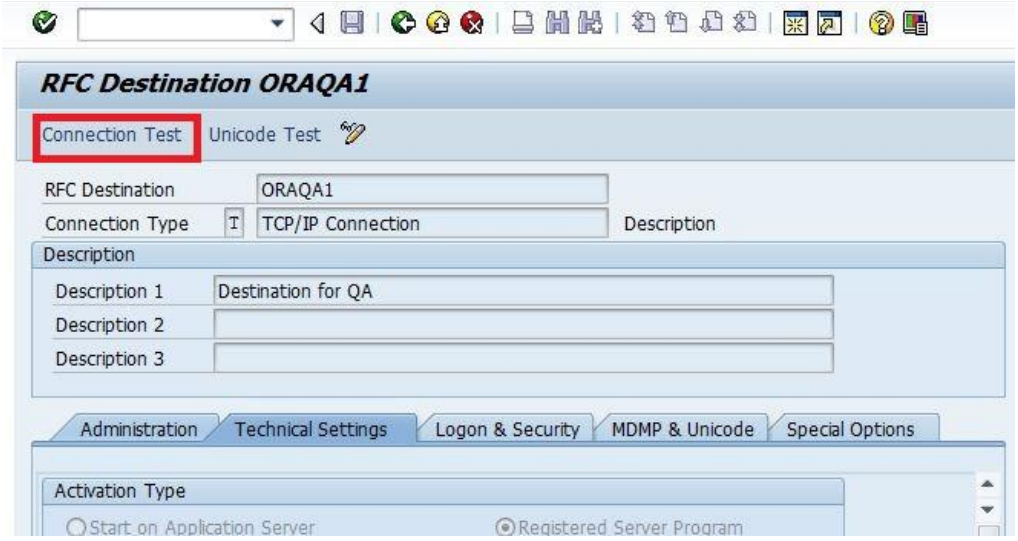
1. Create Inbound Endpoint for IDoc. For more information, refer to the section "Defining an inbound BPEL Process".
2. Create multiple Inbound endpoints for different message types, as shown in Figure 5-46.

Figure 5-46 Multiple Inbound Endpoints



3. Deploy project. For more information, refer to the section 7.6 "Deploy the Defined Process".
4. Test Program ID registration using transaction sm59 in SAP GUI, as shown in Figure 5-47.

Figure 5-47 Connection Test



5. Send IDocs that were selected in the projects from SAP.

5.10 Multiple IDoc Support

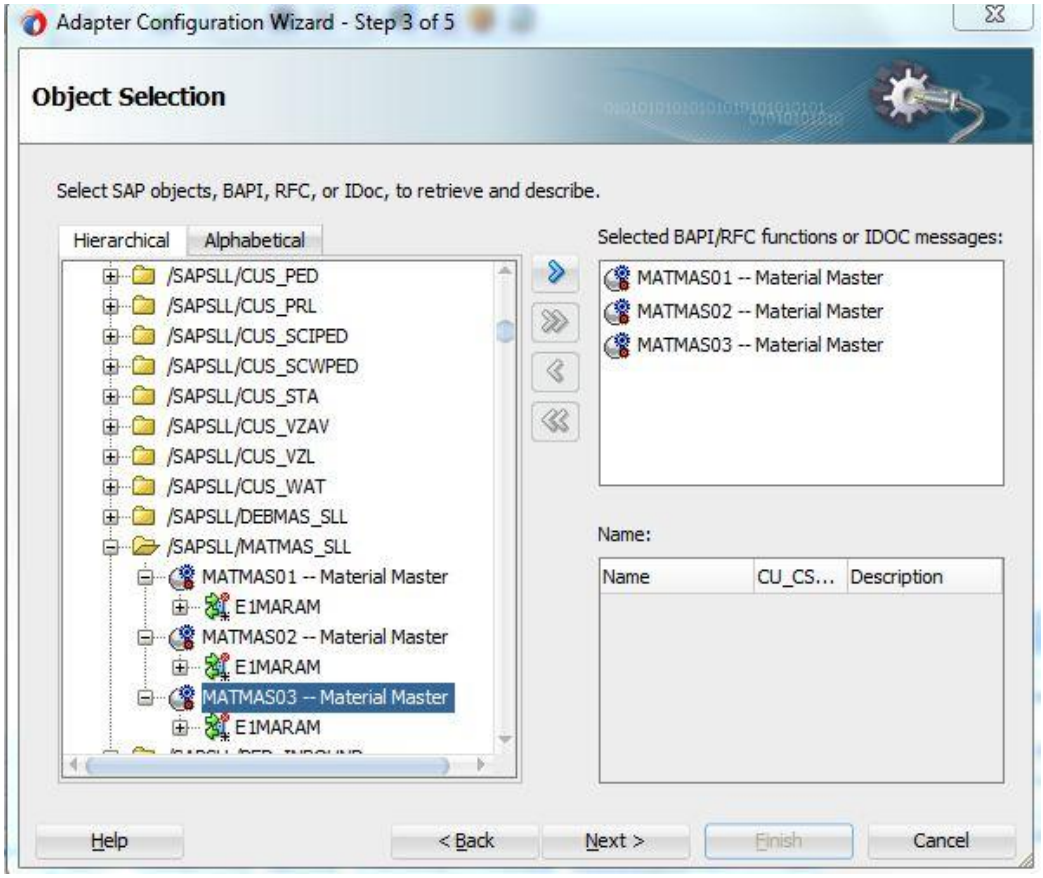
Adapter for SAP enables the selection of multiple IDocs within single inbound endpoint of the Adapter. The Adapter once creates JCA, WSDL and xsd files for all selected IDocs.

5.10.1 Create a project for Multiple IDoc Support:

1. Create inbound IDoc project. For more information, refer to the section "Defining an inbound BPEL Process".

2. Select multiple IDoc while creating the Adapter inbound endpoint, as shown in Figure 5-48.

Figure 5-48 Select Multiple IDoc



3. JCA file of the project will look like as shown in Figure 5-49.

Figure 5-49 JCA File Screen

4. Deploy project. For more information, refer to the section "Deploy the Defined Process".

5. Test deployed project by sending multiple IDocs from SAP. Adapter for SAP receives all different, selected IDocs using a single SAP endpoint.

5.11 Credential Mapping for Oracle SOA Suite (BPEL, Mediator, BPM or OSB)

Credential mapping is the process whereby a remote system's authentication and authorization mechanisms are used to obtain an appropriate set of credentials to authenticate users to a target resource. In the WebLogic Server security architecture, a Credential Mapping provider is used to provide credential mapping services and bring new types of credentials into the WebLogic Server environment. To pass user credentials to the Adapter for SAP, create a credential map from the Oracle WebLogic Server user credentials to the EIS user credentials (SAP R/3 adapter). Then associate a credential policy with a BPEL, Mediator, BPM or OSB Web service and invoke the Web service using Oracle WebLogic Server user credentials. These credentials are mapped to the EIS user credentials and then passed to the J2CA container, which uses them to connect with the EIS adapter (SAP R/3).

5.11.1 Setup Credential Mapping for the Adapter

Credential mapping consists of the following steps:

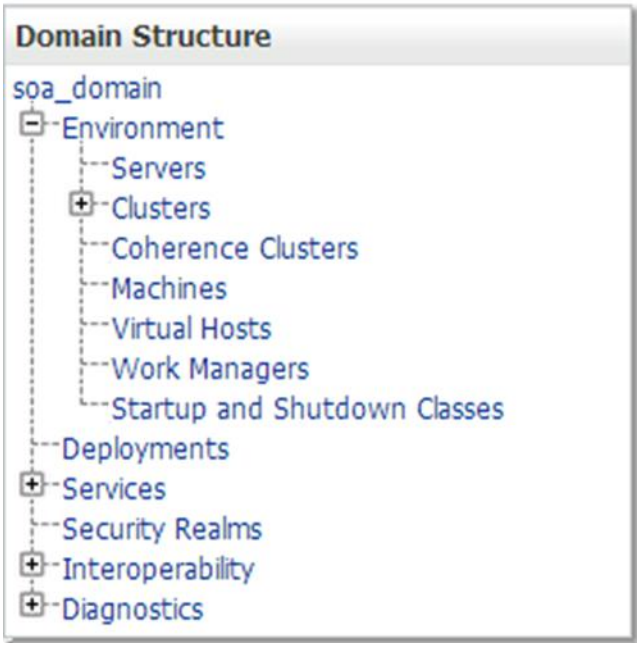
1. Install the Adapter for SAP. For more information, refer to the section Configuring the Adapter Run-Time Parameters on the WebLogic Server".

2. Create Mapping.

   In WebLogic console, you can map the credentials of WebLogic user with SAP user credentials.

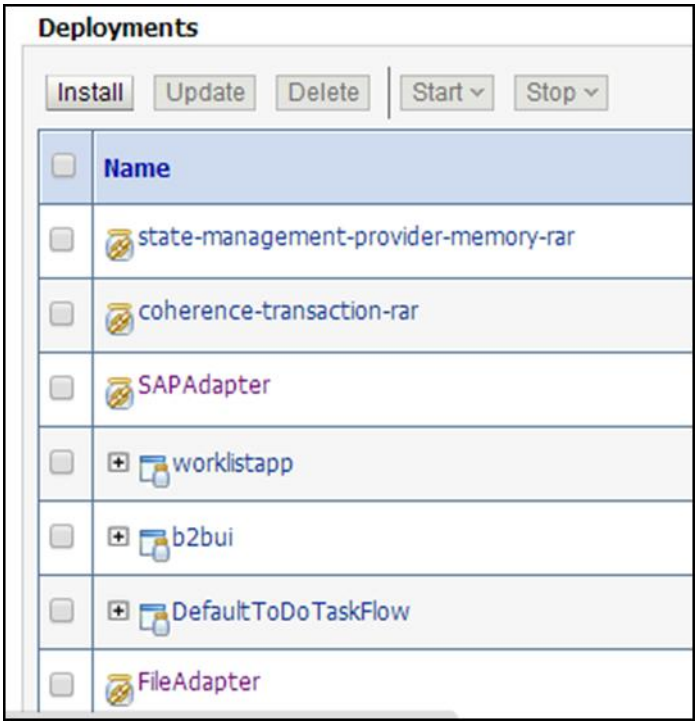
   a. In the **Domain Structure** section in the left pane, click **Deployments**. The Deployments page is displayed in Figure 5-50.

Figure 5-50 Domain Structure Section



b. Select the **Adapter** from the list, as shown in Figure 5-51.

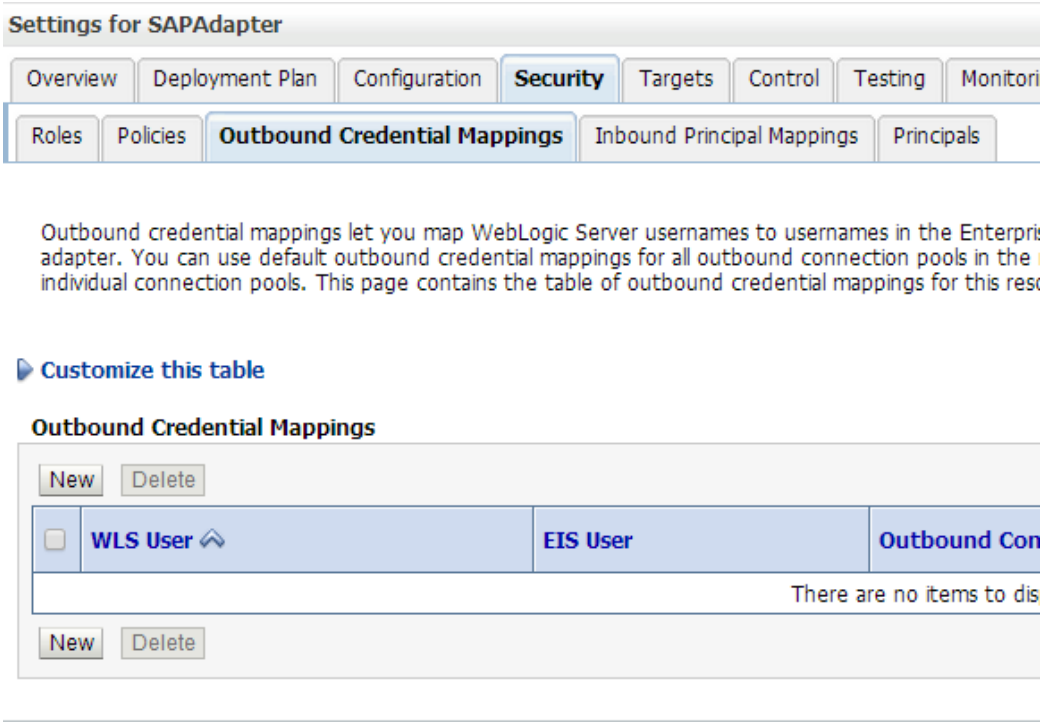
Figure 5-51 Deployments list



c. Click on **Security** tab and then click on **Outbound Credential Mapping** tab.

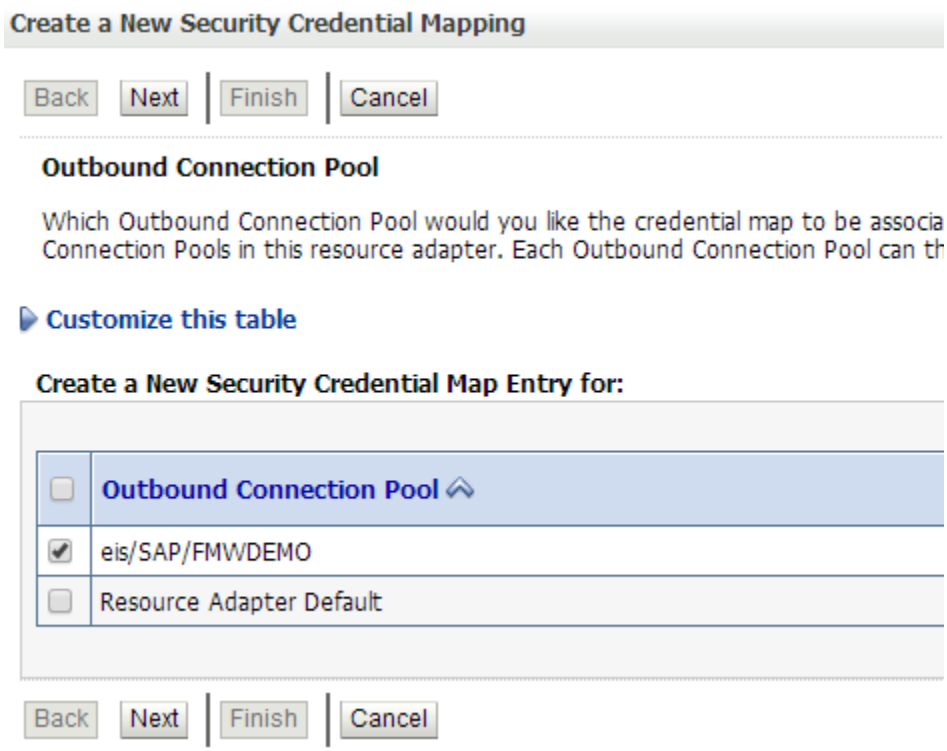
d. Click **New** button to create a new credential map, as shown in Figure 5-52.

Figure 5-52 Outbound Credential Mapping



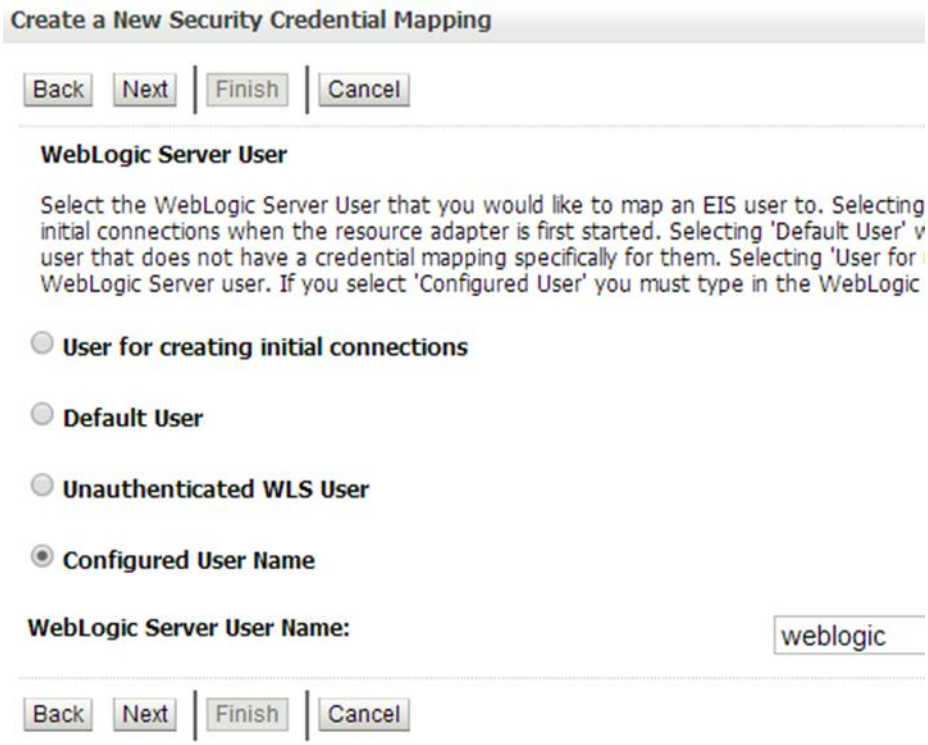
e. Select one of the Connection pool for which you are creating the credential mapping, as shown in Figure 5-53.

Figure 5-53 Create a New Security Credential Mapping



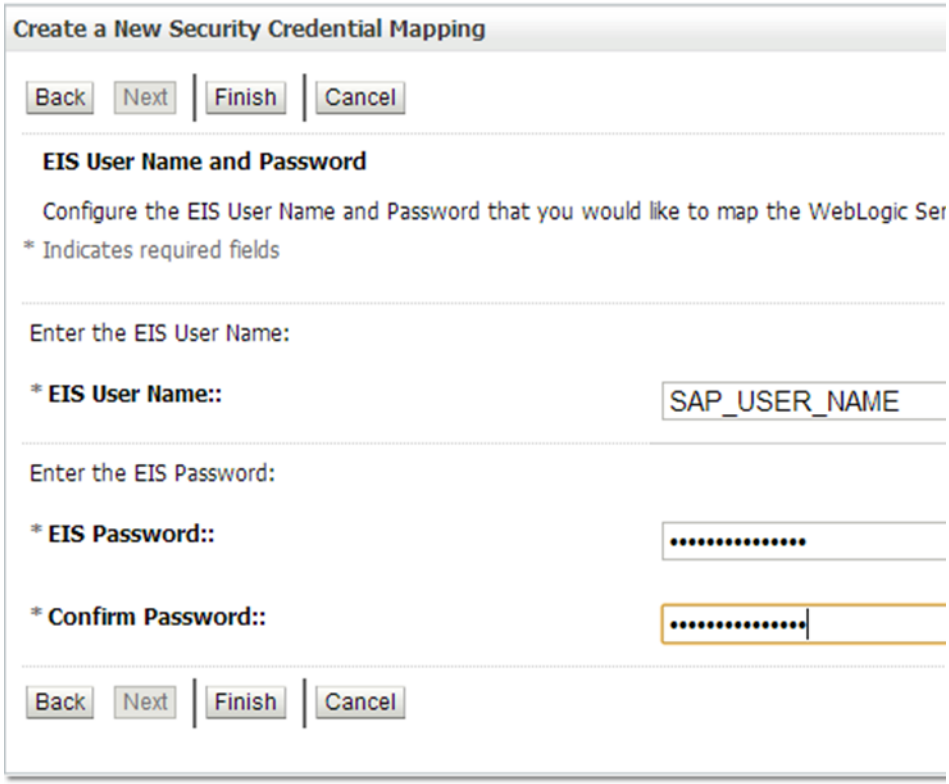
f. Select **Configured User Name** radio box and enter your WebLogic username, as shown in Figure 5-54.

Figure 5-54 Create a New Security Credential Mapping



g. Enter the SAP username and password and click **Finish**, as shown in Figure 5-55.

Figure 5-55 Create a New Security Credential Mapping



Credential mapping setup is done. Now you can use the same mapping in SAP SOA/OSB projects.

5.11.2 Setup Credential Mapping for SOA

To pass the user credentials to the SAP resource adapter, create a credential map from the Oracle WebLogic Server user credentials to the EIS user credentials (SAP R/3 adapter). For more information, refer to the section "Setup Credential Mapping for the Adapter". Now associate a credential policy with a Web service and invoke the Web service using Oracle WebLogic Server user credentials. These credentials are mapped to the EIS user credentials and then passed to the Adapter container, which uses them to connect with the EIS adapter (SAP R/3).

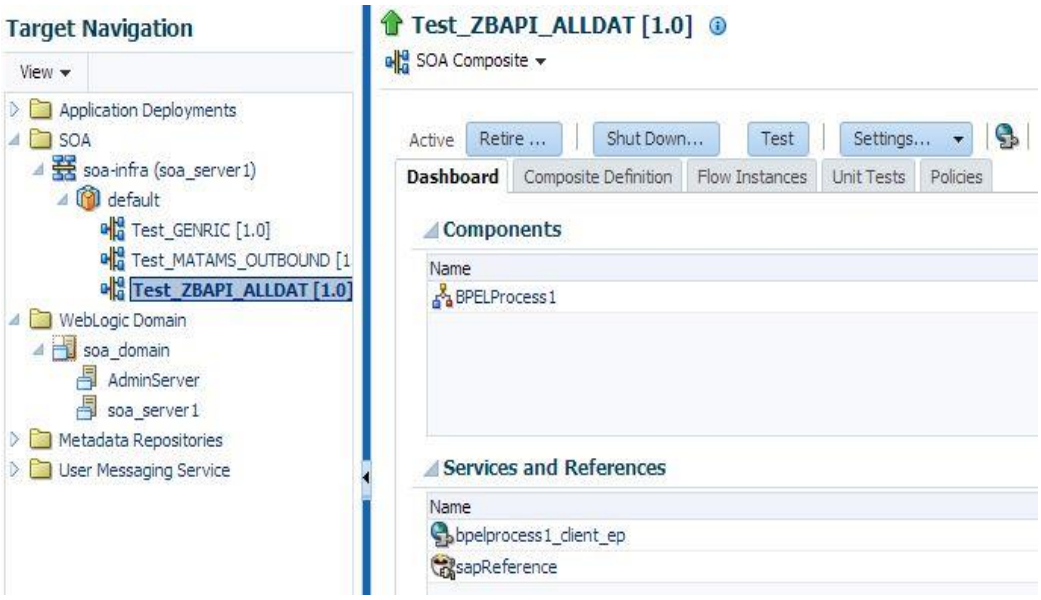
5.11.2.1 Creating SOA Project for Credential Mapping

To create SOA project for credential mapping, follow the provided steps:

1. Create the Adapter outbound endpoint. For more information, refer to the section "Design an Outbound BPEL Process".
2. Deploy the project. For more information, refer to the section "Deploy the Defined Process".
3. Attach policy with project:

a. Open EM console and navigate till your deployed project, as shown in Figure 5-56.

Figure 5-56 Target Navigation



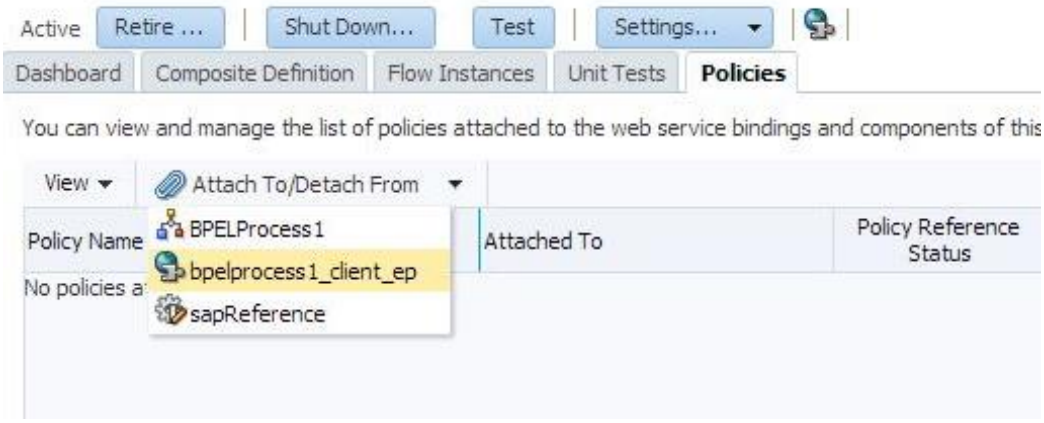
b. Click on **Policies** tab, as shown in Figure 5-57.

Figure 5-57 Policies Tab

c. Click on **Attach To/Detach From** drop-down and select **bpelprocess1_client_ep** to attach the policy.

This navigates to the policy selection page, as shown in Figure 5-58.

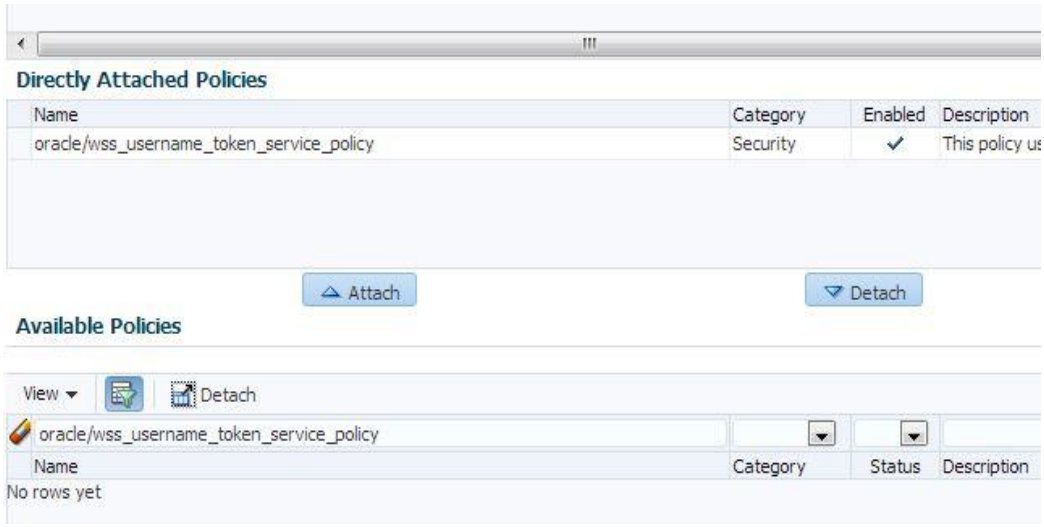
Figure 5-58 Policies Tab



d. Search policy with name **oracle/wss_username_token_service_policy** in the policy page.

   The **oracle/wss_username_token_service_policy** policy appears in the search result area, as shown in Figure 5-59.

Figure 5-59 Search Policy



e. Select the searched policy and click **Attach to** button.

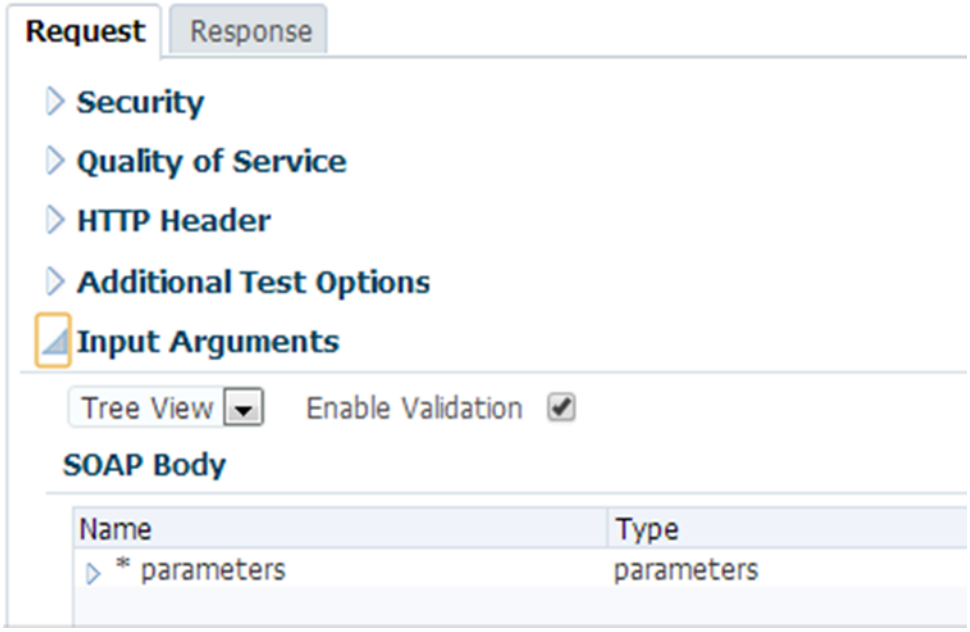
f. Click **Ok** button.

g. Click **Test** button to start testing this project, as shown in Figure 5-60.

Figure 5-60 Test Project

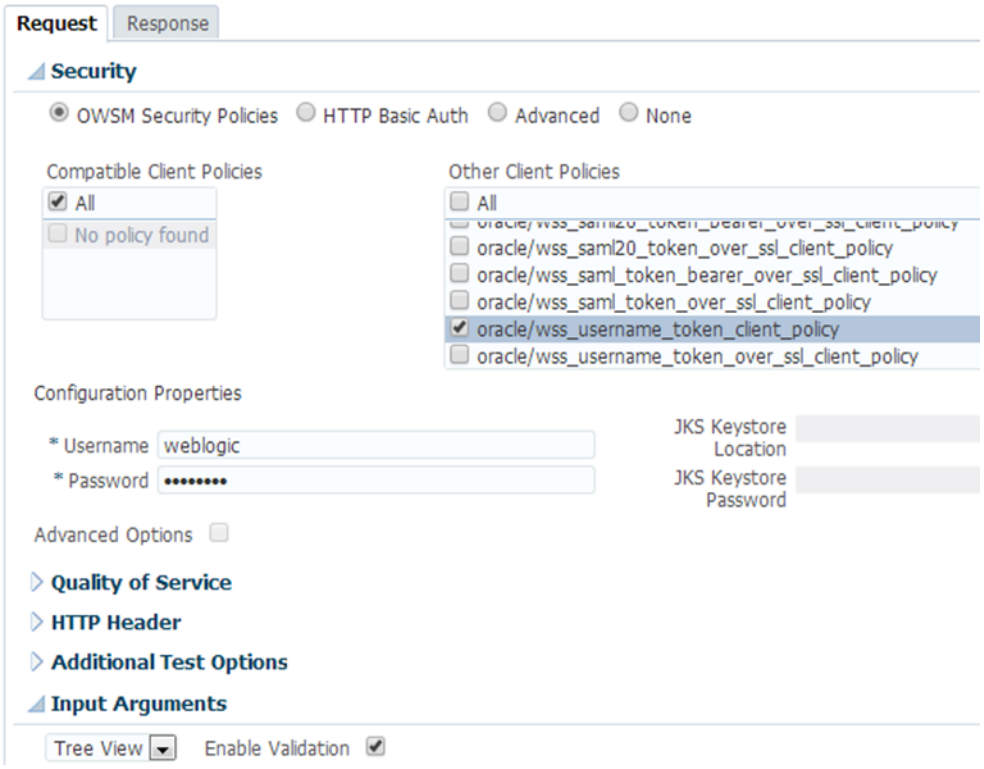
h. Click on **Request** tab and select **Security**, as shown in Figure 5-61.

Figure 5-61 Request Tab



i. Select **OWSM Security Policy** radio button and select **oracle/wss_username_token_client_policy** from **Other Client Policies** table, as shown in Figure 5-62.

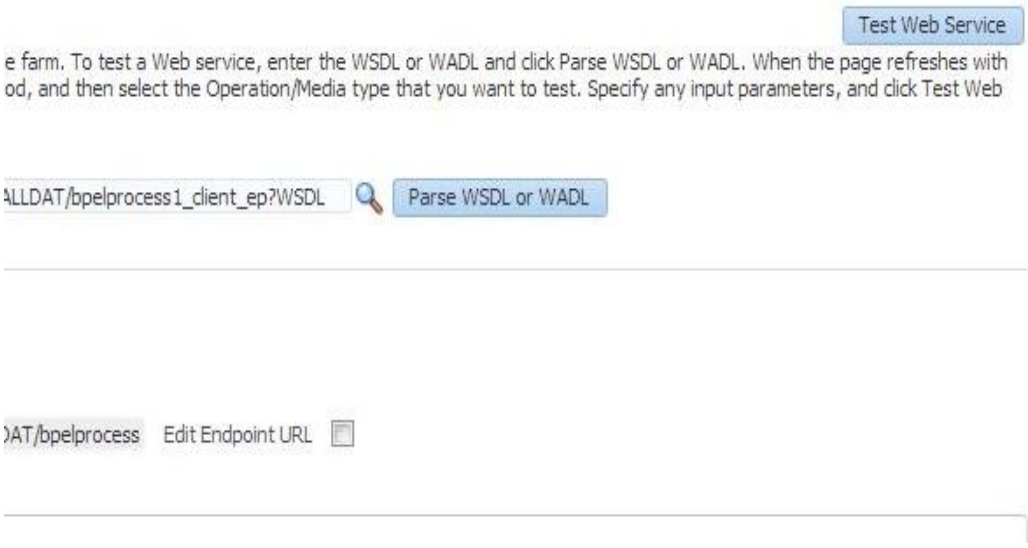
Figure 5-62 Request Tab



j. Under **Configuration Projects**, enter Username and Password (that you mapped with SAP user credential in the credential mapping).

k. Click **Test Web Service** button to test the service, as shown in Figure 5-63.

Figure 5-63 Test Web Service



5.12 Stateful Interaction

Stateless interaction

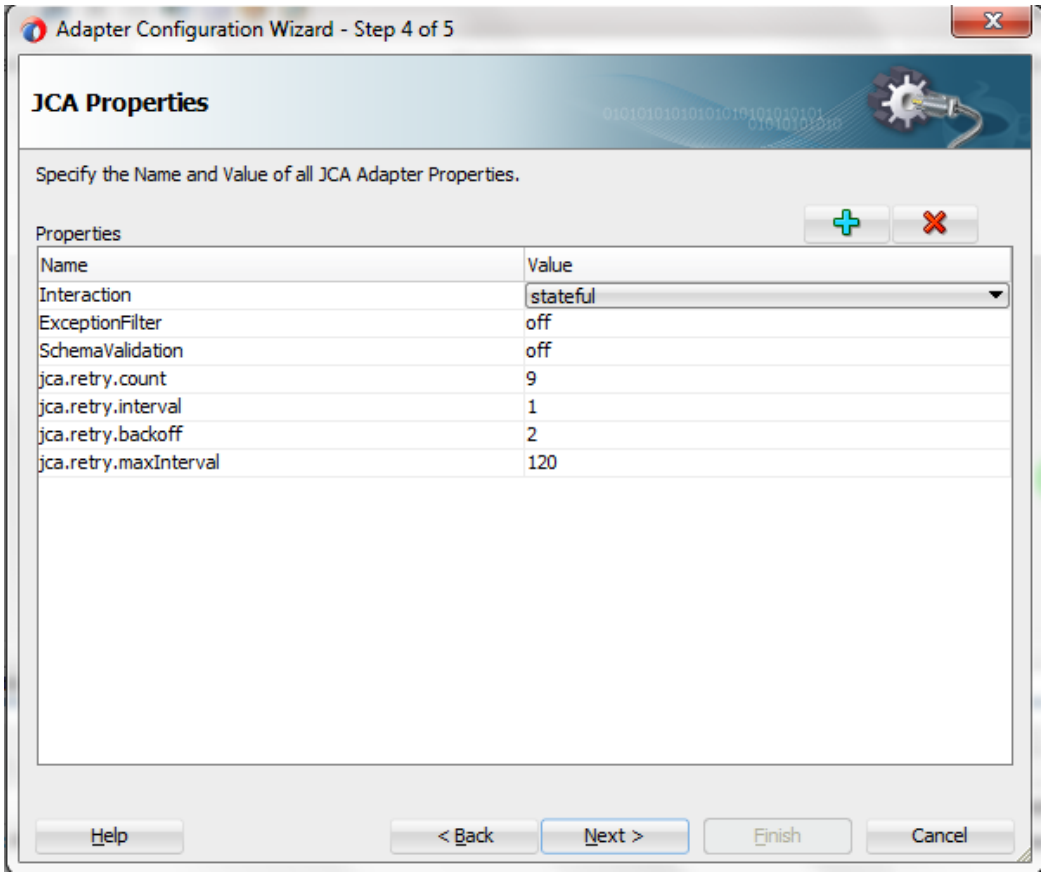
A server processes requests based solely on information provided with each request and does not rely on information from earlier requests. The server does not need to maintain state information between requests.

Stateful interaction

A server processes requests based on both the information provided with each request and information stored from earlier requests. The server needs to access and maintain state information generated during the processing of an earlier request. This is in case when update /Insertion of data needs to be done in SAP with standard BAPIs

The Adapter for SAP has a design-time property “Interaction”, stateless / stateful, as shown in Figure 5-64.

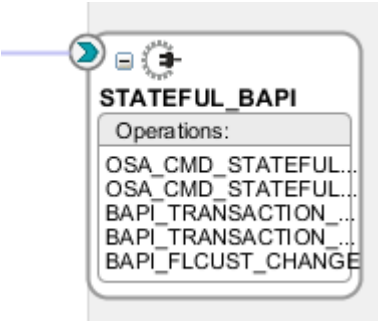
Figure 5-64 JCA Property Page



When stateful property is set in the JCA properties page of the Adapter wizard, the following operations are automatically created, as shown in Figure 5-65.

- OSA_CMD_STATEFUL_OPEN
- SELECTED_BAPI
- BAPI_TRANSACTION COMMIT
- BAPI TRANSACTION ROLLBACK
- OSA_CMD_STATEFUL_CLOSE

Figure 5-65 Stateful BAPI



This ensures when the selected BAPI is executed, upon successful execution, automatically an explicit commit is called using bapi_transaction_commit to commit the changes done to SAP database, else a transaction rollback happens using bapi_transaction_commit. The operation osa_cmd_stateful open and osa_cmd_stateful_close ensure that all the operations happen in the same session.

This feature is useful for BAPIs that do not contain an implicit commit statement which will commit the changes done to SAP database table.

All outbound Endpoints are stateless by default.

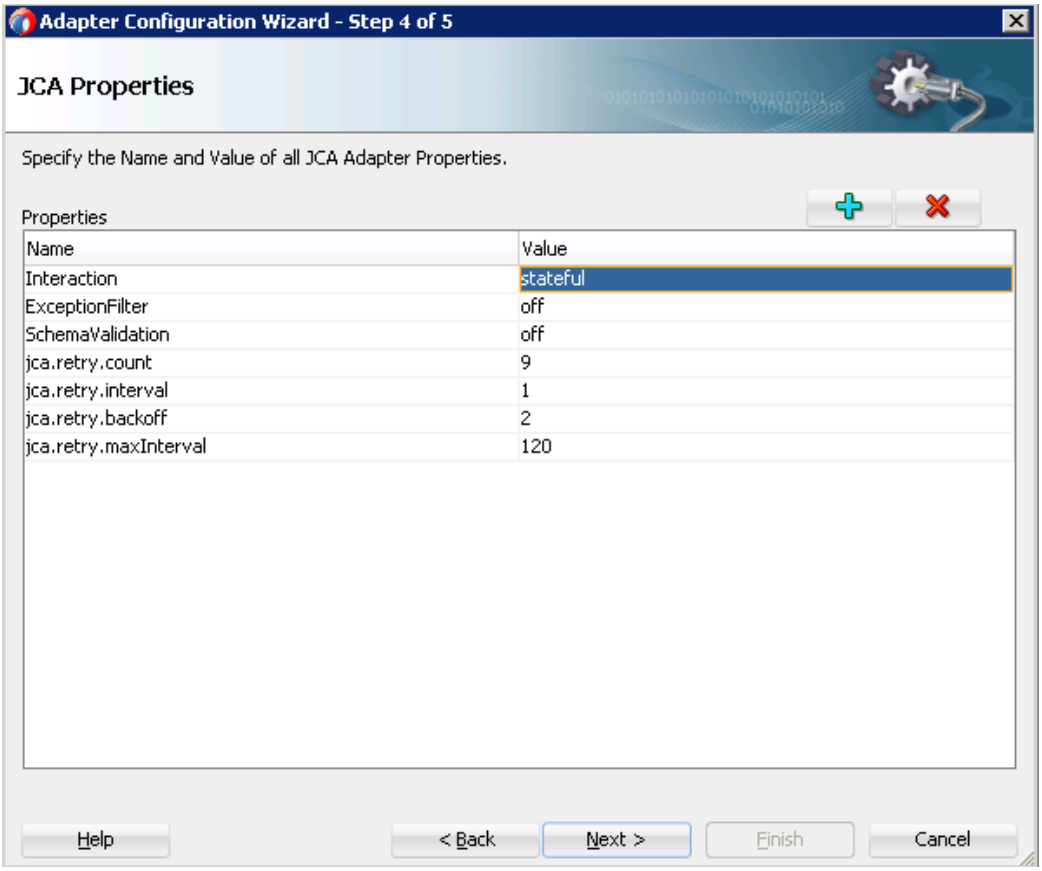
5.12.1 Create a Stateful BAPI project

1. Create an outbound endpoint. (For more information, refer to the section "Configure the Adapter Component" under BPEL Outbound Process).

2. Select a BAPI in the object selection page of the Adapter wizard, which does not have internal commit in it. For example, Flight_Customer. Change (BAPI_FLCUST_CHANGE).

3. Set the Interaction property in JCA Properties page to "stateful", as shown in Figure 5-66.

Figure 5-66 Stateful Property



4. Click **Next** and then **Finish**.

5. It creates an SAP endpoint with 5 operations, as mentioned below:

- OSA_CMD_STATEFUL_OPEN
- OSA_CMD_STATEFUL_CLOSE
- BAPI_TRANSACTION_COMMIT
- BAPI_TRANSACTION_ROLLBACK
- BAPI_FLCUST_CHANGE

6. Create a BPEL process and add:

- A receive activity for BAPI_FLCUST_CHANGE
- An invoke to invoke OSA_CMD_STATEFUL_OPEN
- Create the SID variable to store the session ID
- An assign to copy session ID (SID) from response to a SID variable
- An assign to copy SID to BAPI_FLCUST_CHANGE request
- An invoke to invoke BAPI_FLCUST_CHANGE request
- An assign to copy SID to BAPI_TRANSACTION_COMMIT request
- An invoke to invoke BAPI_TRANSACTION_COMMIT request
- An assign to copy SID to OSA_CMD_STATEFUL_CLOSE request

- An invoke to invoke OSA_CMD_STATEFUL_CLOSE request
- A reply to return BAPI_FLCUST_CHANGE response.

7. **Finish** and **save** the project.

8. The jca file of the project looks like as shown in Figure 5-67.

Figure 5-67 JCA File

```
<connection-factory location="eis/SAP/FMWDEMO" UIConnectionName="DefaultClient"/>
<endpoint-interaction portType="STATEFUL_BAPI_PT" operation="BAPI_TRANSACTION_COMMIT">
  <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
    <property name="Interaction" value="stateful"/>
    <property name="ExceptionFilter" value="off"/>
    <property name="RFC" value="BAPI_TRANSACTION_COMMIT"/>
    <property name="Type" value="RFC"/>
  </interaction-spec>
</endpoint-interaction>

<endpoint-interaction portType="STATEFUL_BAPI_PT" operation="BAPI_TRANSACTION_ROLLBACK"
  <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
    <property name="Interaction" value="stateful"/>
    <property name="ExceptionFilter" value="off"/>
    <property name="RFC" value="BAPI_TRANSACTION_ROLLBACK"/>
    <property name="Type" value="RFC"/>
  </interaction-spec>
</endpoint-interaction>

<endpoint-interaction portType="STATEFUL_BAPI_PT" operation="BAPI_FLCUST_CHANGE">
  <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
    <property name="Interaction" value="stateful"/>
    <property name="ExceptionFilter" value="off"/>
    <property name="RFC" value="BAPI_FLCUST_CHANGE"/>
    <property name="Type" value="BAPI"/>
    <property name="BAPI" value="FlightCustomer.Change"/>
  </interaction-spec>
</endpoint-interaction>

<endpoint-interaction portType="STATEFUL_BAPI_PT" operation="OSA_CMD_STATEFUL_OPEN">
  <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
    <property name="Interaction" value="stateful"/>
    <property name="ExceptionFilter" value="off"/>

     <property name="RFC" value="OSA_CMD_STATEFUL_OPEN"/>
     <property name="Type" value="CMD"/>
   </interaction-spec>
 </endpoint-interaction>

 <endpoint-interaction portType="STATEFUL_BAPI_PT" operation="OSA_CMD_STATEFUL_CLOSE">
   <interaction-spec className="oracle.tip.adapter.sap.outbound.SAPInteractionSpecImpl">
     <property name="Interaction" value="stateful"/>
     <property name="ExceptionFilter" value="off"/>
     <property name="RFC" value="OSA_CMD_STATEFUL_CLOSE"/>
     <property name="Type" value="CMD"/>
   </interaction-spec>
 </endpoint-interaction>

</adapter-config>
```

Note: In case of exception, session will not get closed automatically. In this case, User needs to implement rollback mechanism to close the session.

5.12.2 Test the Stateful BAPI Project:

1. Deploy the project having Interaction property as “stateful”.
2. Enter a value for the inputs to the BAPI, also provide a session ID variable number and execute.
3. You can see that the changes are reflected in the corresponding SAP database table. For example, the changes for BAPI “bapi_flcust_change” is reflected in SAP table ‘scustom’ in SE11 tcode.

5.13 Error Handling

When an adapter raises an exception during run-time, the SOAP agent produces a SOAP fault element in the generated SOAP response. The SOAP fault element contains fault code and fault string elements. The fault string contains the native error description from the adapter target system. Since adapters use the target system interfaces and APIs, whether an exception is raised depends on how the target systems interface or API treats the error condition. If a SOAP request message is passed to an adapter by the SOAP agent and that request is invalid based on the WSDL for that service, then the adapter may raise an exception yielding a SOAP fault.

Figure 5-68 shows the sample of SOAP Fault.

Figure 5-68 SOAP Fault

```
<env:Fault>
    <faultcode>env:Server</faultcode>
    <faultstring>
       Exception occurred when binding was invoked.
       Exception occurred during invocation of JCA
       binding: "JCA Binding execute of Reference
       operation 'BAPI_COMPANYCODE_GETDETAIL' failed
       due to: com.sap.conn.jco.JCoException: (126)
       JCO_ERROR_ABAP_EXCEPTION:
       Company code 1212 does not exist".
       The invoked JCA adapter raised a resource exception.
       Please examine the above error message carefully to
       determine a resolution.
    </faultstring>
    <faultactor/>
    <detail>
       <exception>Company code 1212 does not exist</exception>
    </detail>
</env:Fault>
```

5.14 SOA Debugger Support

You can test and debug SOA composite applications with the SOA debugger in Oracle JDeveloper. The SOA debugger reduces the development cycle for an SOA composite application by providing a troubleshooting environment within the Oracle JDeveloper. This implies that you do not need to build an SOA composite application in Oracle JDeveloper, deploy it to the SOA Infrastructure, launch a console to test or view audit trails and flow traces, and then return to Oracle JDeveloper to repeat the ercise. Instead, you can set breakpoints in Oracle JDeveloper for troubleshooting on the following components:

- Binding components and service components in SOA composite applications.
- Synchronous and asynchronous BPEL processes.
- BPM processes.

Note the following guidelines when using the SOA debugger:

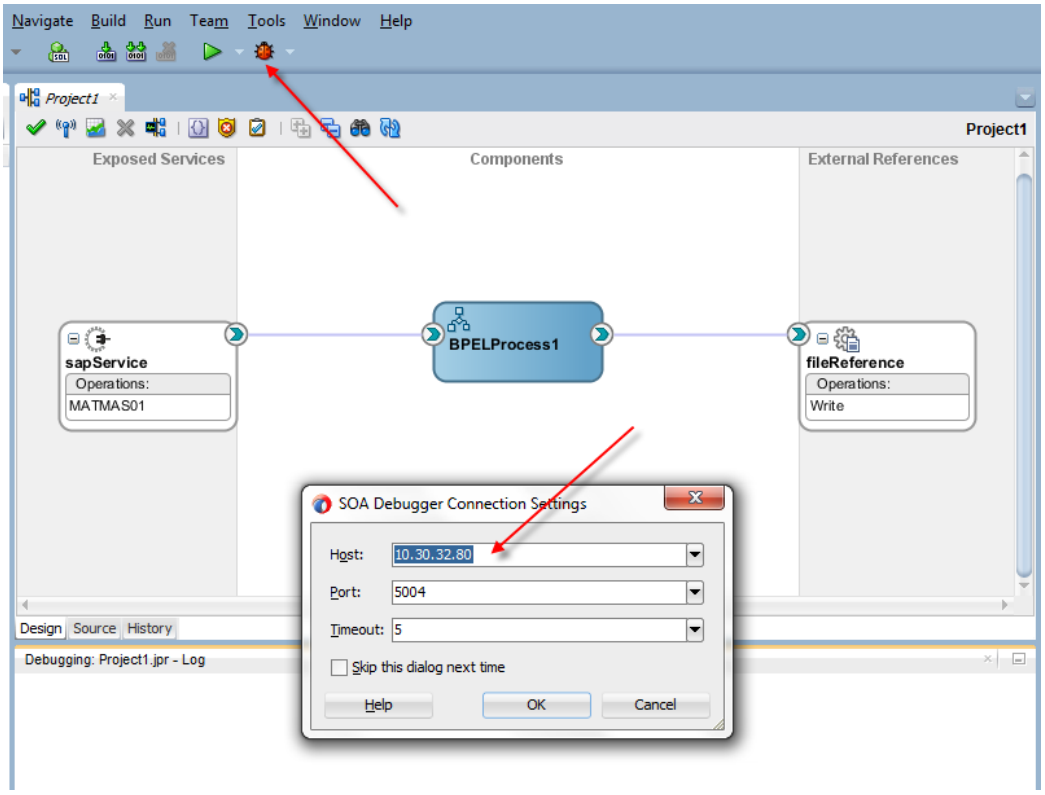
- Debugging is limited to design view in Oracle JDeveloper.
- You cannot debug cross-language features, such as a Java ec activity, XSLT and XQuery transformations, and so on.
- You can debug SOA composite applications on servers where Oracle SOA Suite is installed. For example, if Oracle SOA Suite runs on managed servers, clients must connect using the managed server host and port.
- Only one client at a time can connect to the debugger.
- Multiple instances of a SOA composite application cannot be debugged. Only a single instance can be debugged.
- Adapter endpoint errors are not displayed in the SOA debug.

5.14.1 SOA Debugger for Inbound

Perform the following steps for SOA debugger for inbound endpoint:

1. Click on the **Debug** icon on JDeveloper toolbar and use the default, as shown in Figure 5-69.

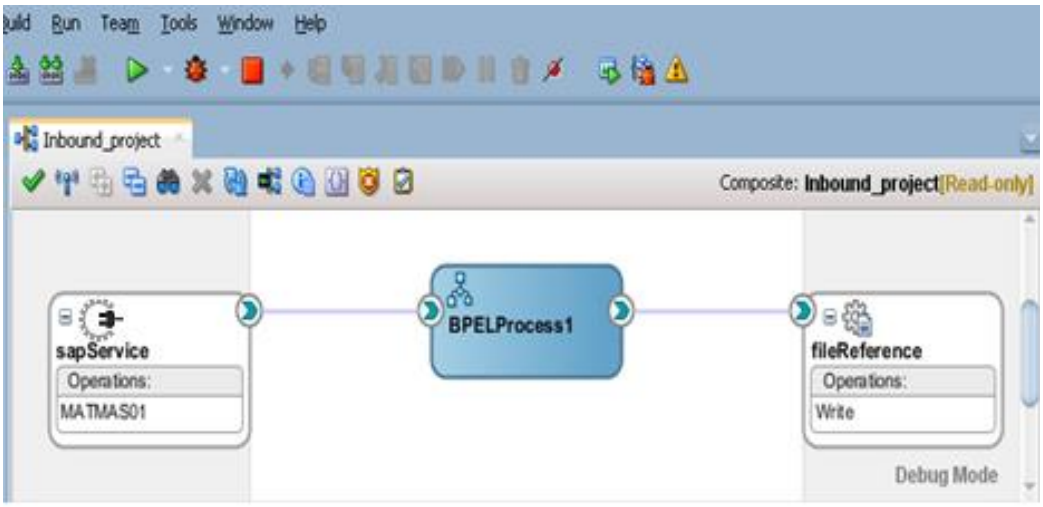
Figure 5-69 SOA Debugger for Inbound



2. Enter the **Host** IP and click **OK**.

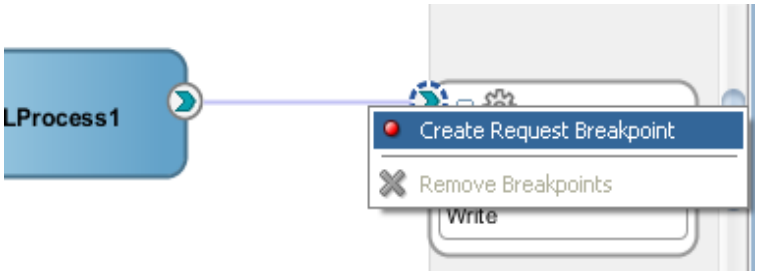
   JDeveloper deploys the SOA project for debugging, Once JDeveloper connected to SOA debugger running on SOA run-time, it shows several SOA debugger windows, as shown in Figure 5-70.

Figure 5-70 SOA Debugger Windows



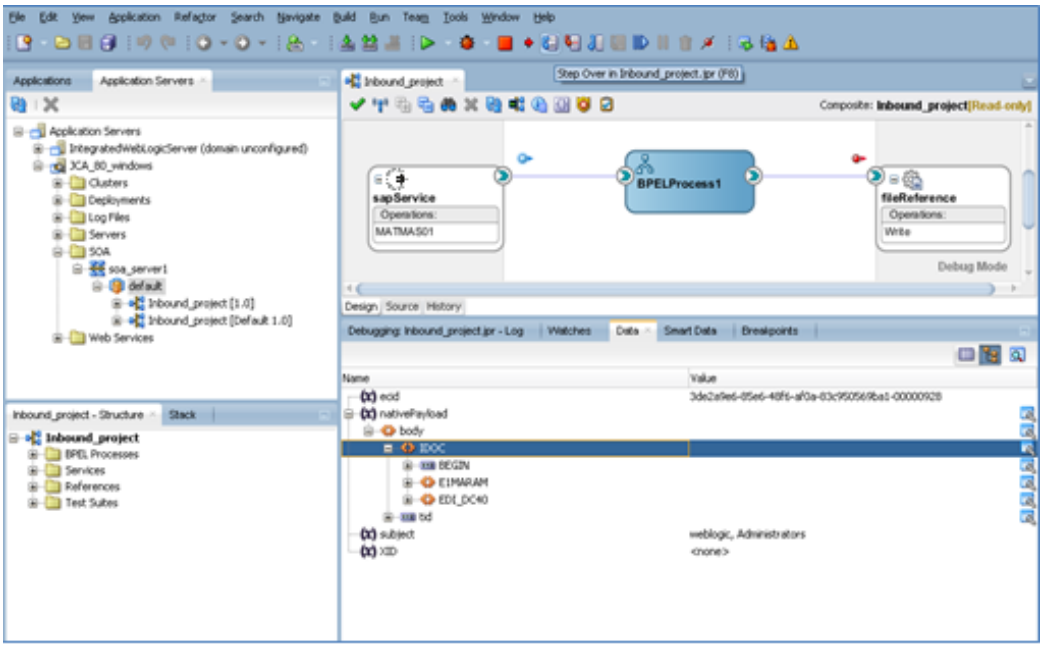
3. Right-click on the endpoint connector to show breakpoint options, once selected, breakpoint icons will be added, as shown in Figure 5-71.

Figure 5-71 Breakpoint Options



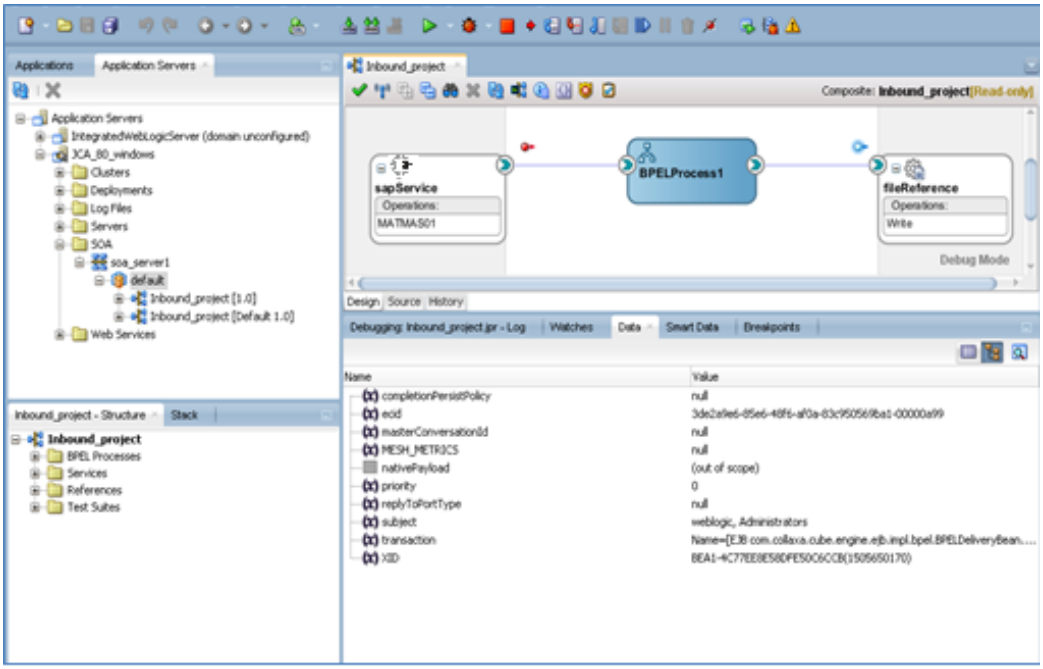
4. Trigger the inbound from SAP that hits the breakpoint. To proceed to the next breakpoint, click on the step over, as shown in Figure 5-72.

Figure 5-72 Breakpoint Options



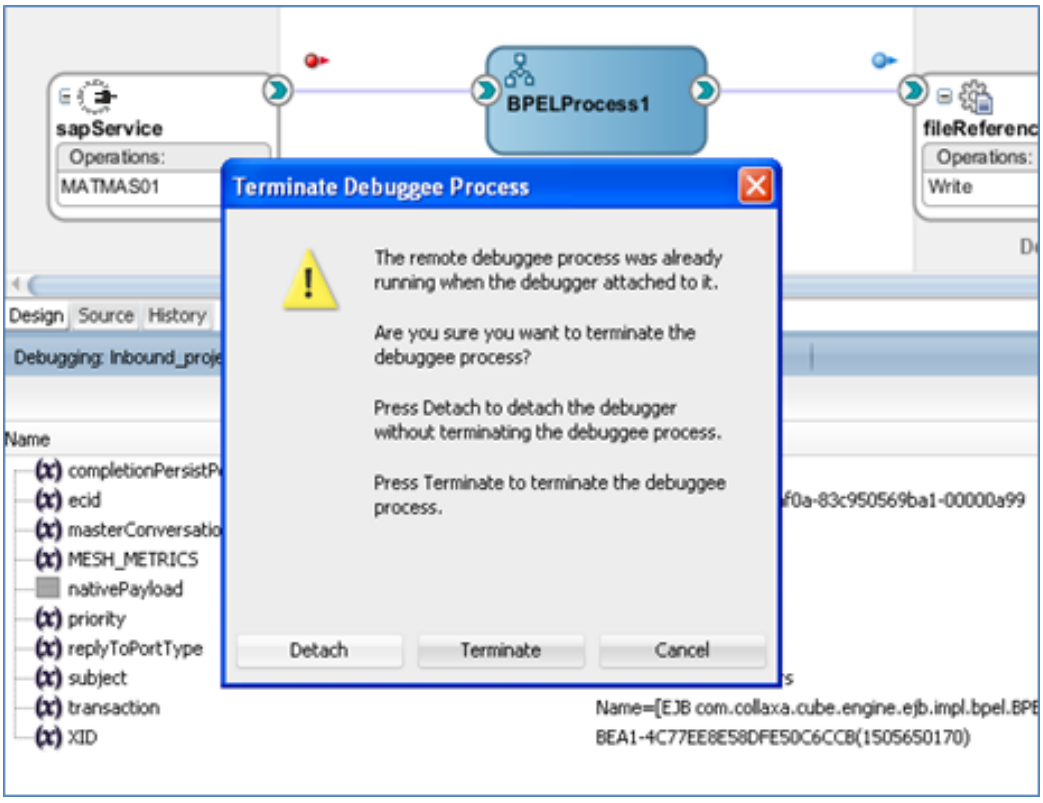
It hits the next breakpoint, as shown in Figure 5-73.

Figure 5-73 Breakpoint Options



5. Click on **Detach** button to detach the debugger, as shown in Figure 5-74.

Figure 5-74 Detach Debugger

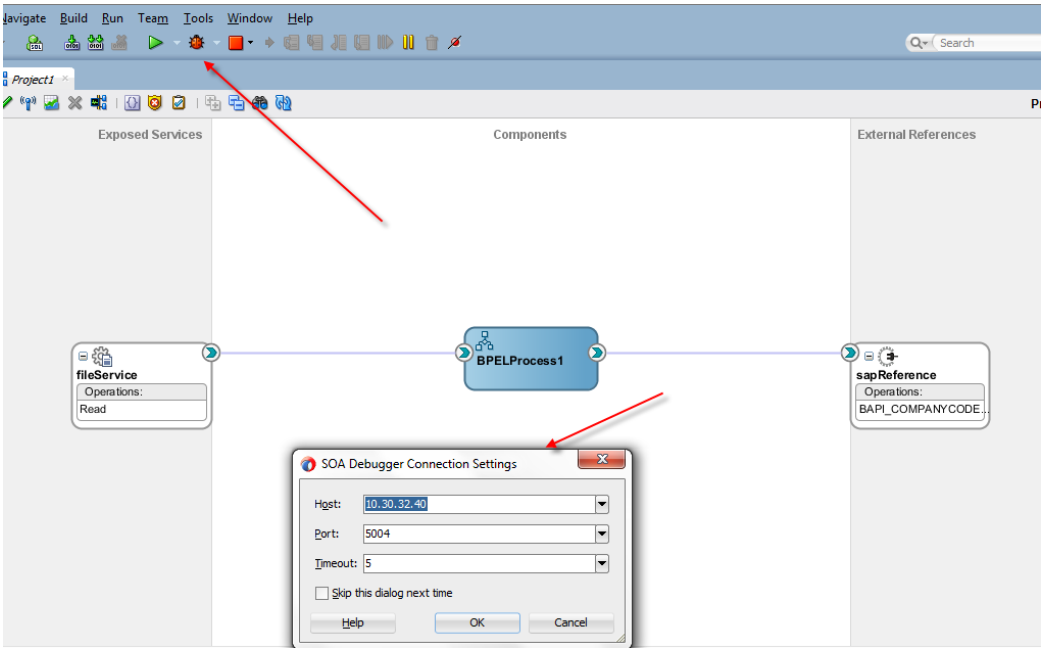


5.14.2 SOA Debugger for Outbound

Perform the following steps for SOA debugger for outbound endpoint:

1. Click on the **Debug** icon on JDeveloper toolbar and use the default, as shown in Figure 5-75.

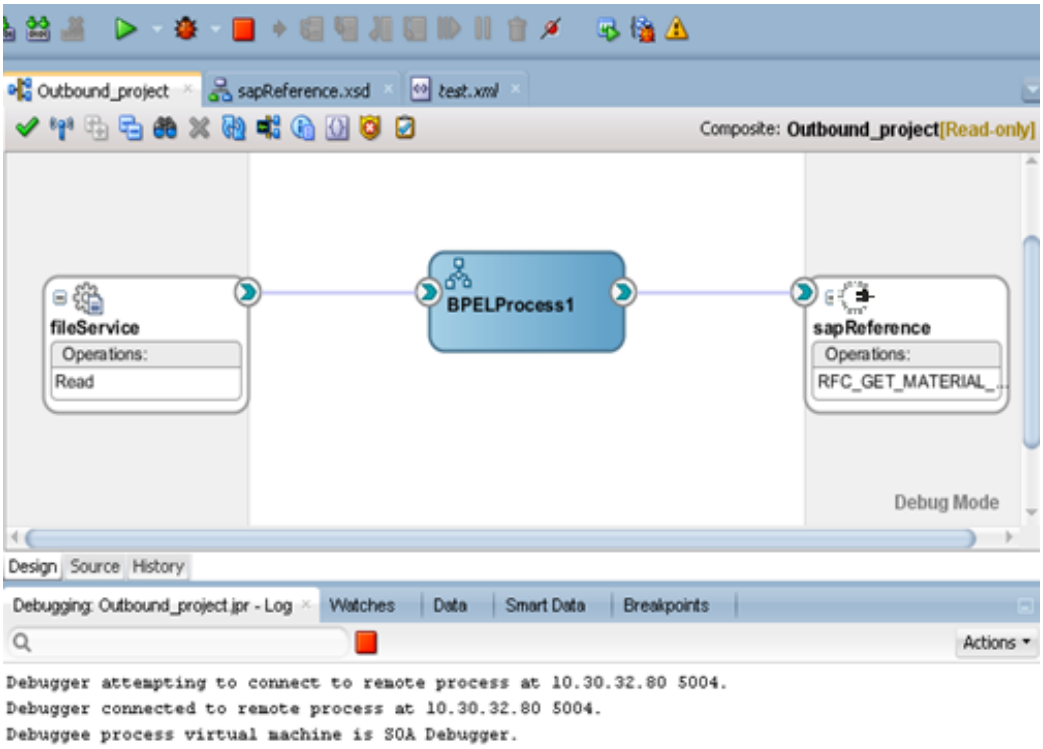
Figure 5-75 SOA Debugger for Outbound



6. Enter the **Host** IP and click **OK**.

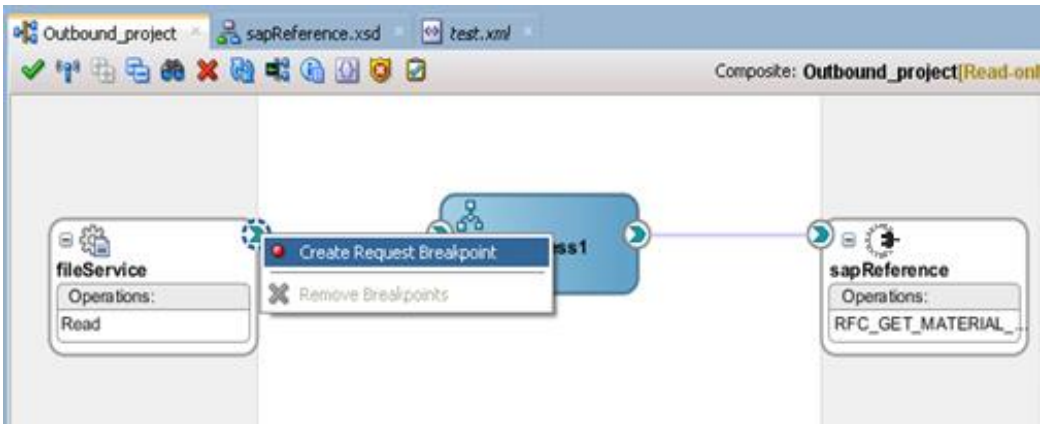
   JDeveloper deploys the SOA project for debugging.Once JDeveloper gets connected to SOA debugger running on SOA run-time, it shows several SOA debugger windows, as shown in Figure 5-76.

Figure 5-76 SOA Debugger Windows



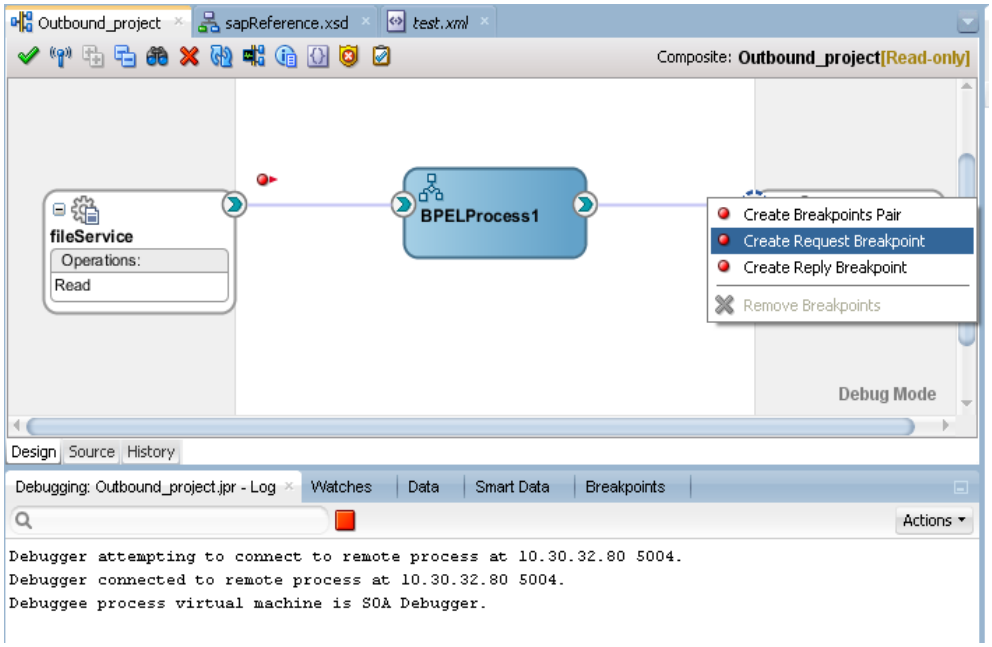
7. Right-click on the endpoint connector to see the breakpoint options, as shown in Figure 5-77.

Figure 5-77 Breakpoint Options



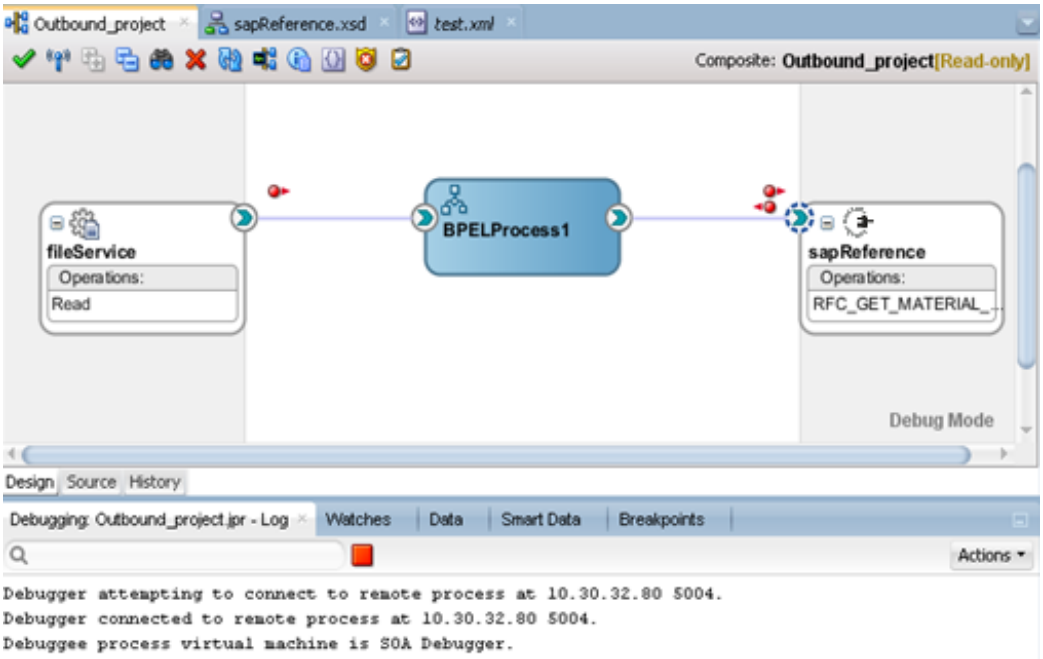
8. Right-click on the endpoint connector to see breakpoint options, as shown in Figure 5-78.

Figure 5-78 Breakpoint Options



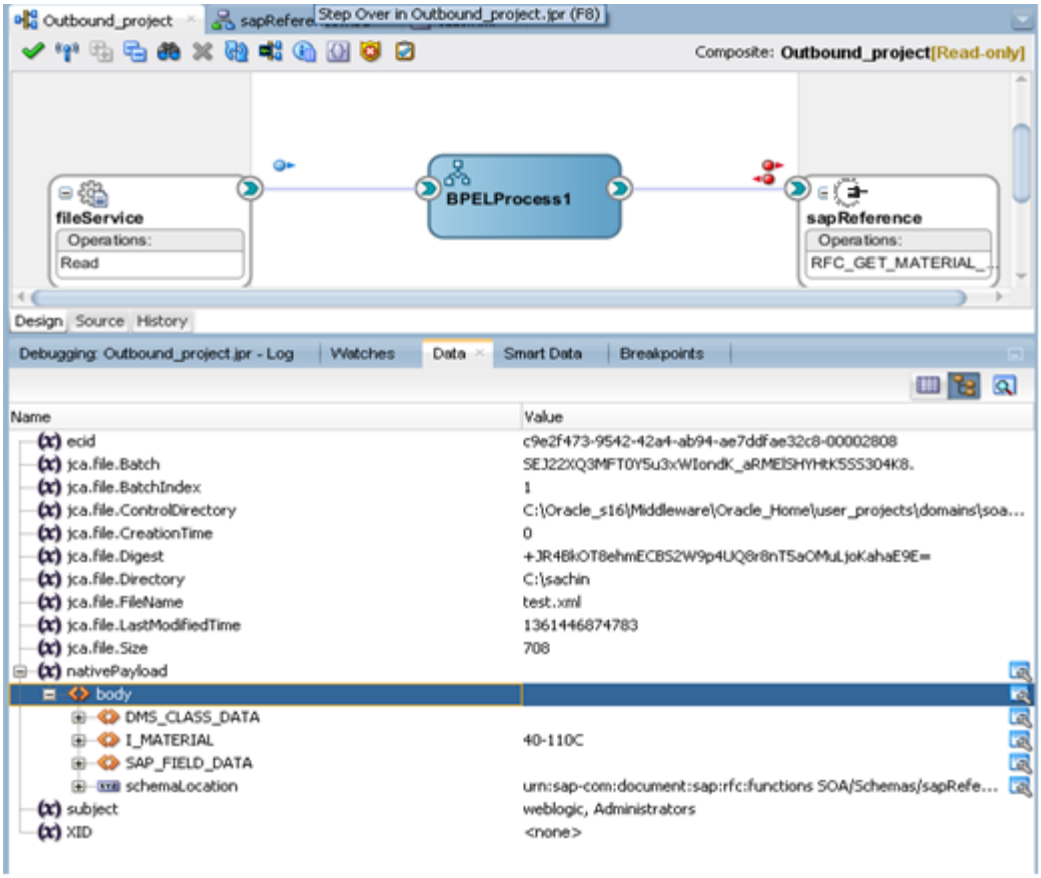
Once selected, the breakpoint icons will be added, as shown in Figure 5-79.

Figure 5-79 Breakpoint Options



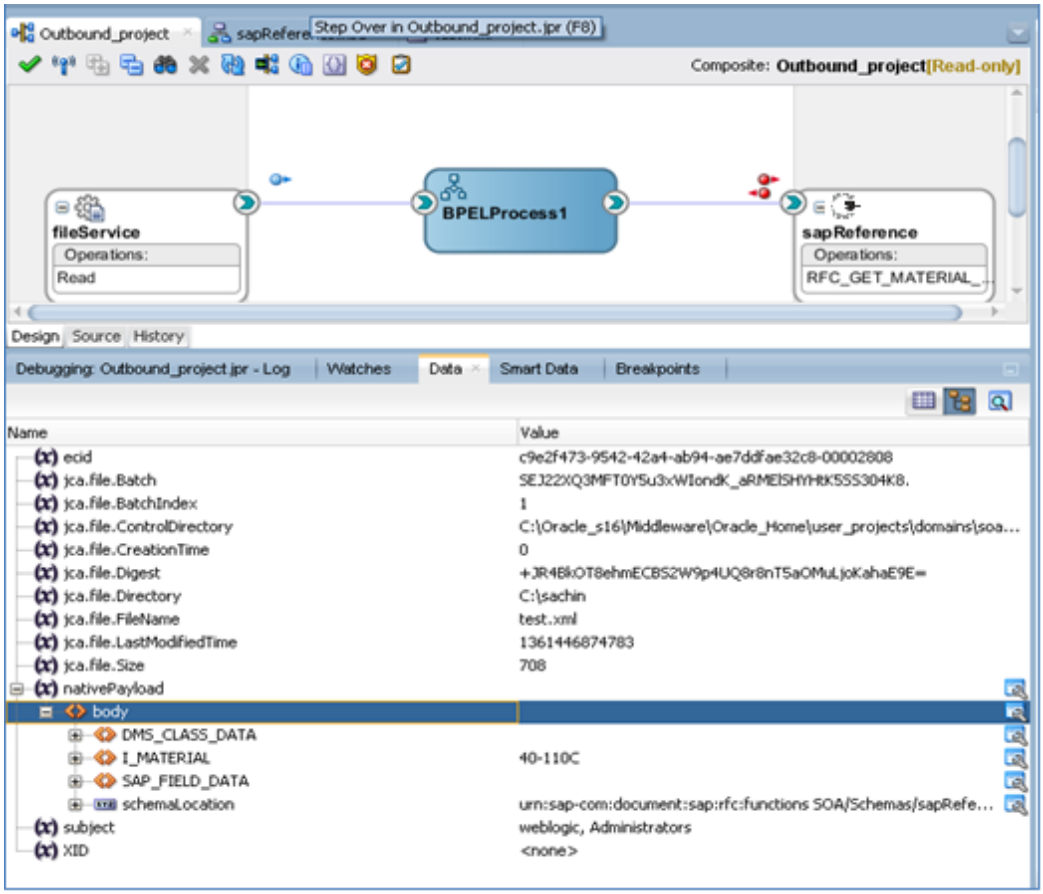
9. Send test message and the debugger will break at, e.g., the request message, as shown in Figure 5-80.

Figure 5-80 Breakpoint Options



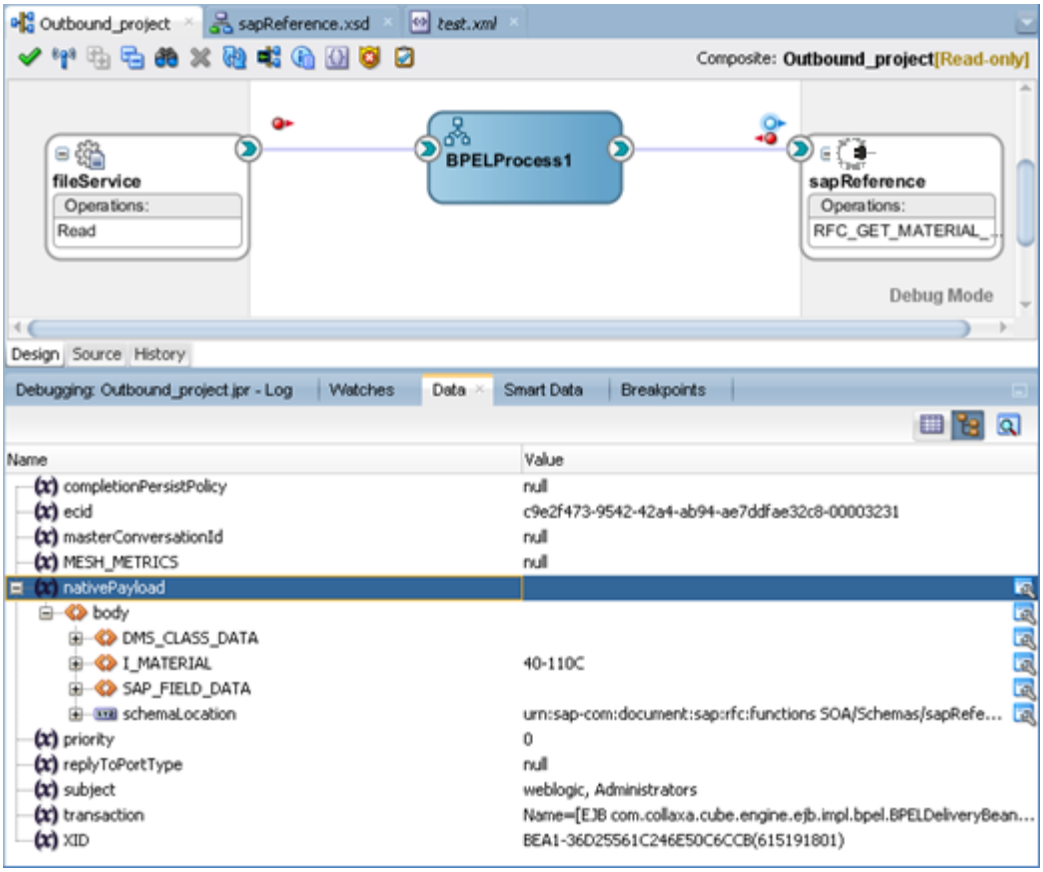
10. Click on the step over to proceed to the next breakpoint, as shown in Figure 5-81.

Figure 5-81 Breakpoint Options



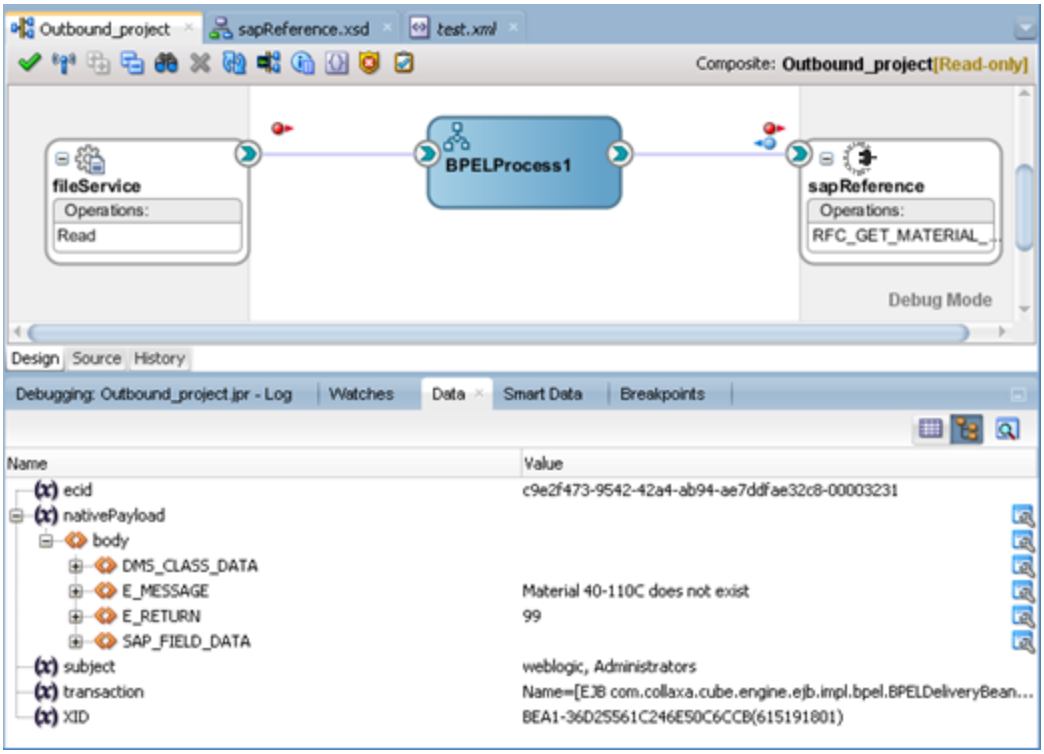
It will hit the next breakpoint, as shown in Figure 5-82.

Figure 5-82 Breakpoint Options



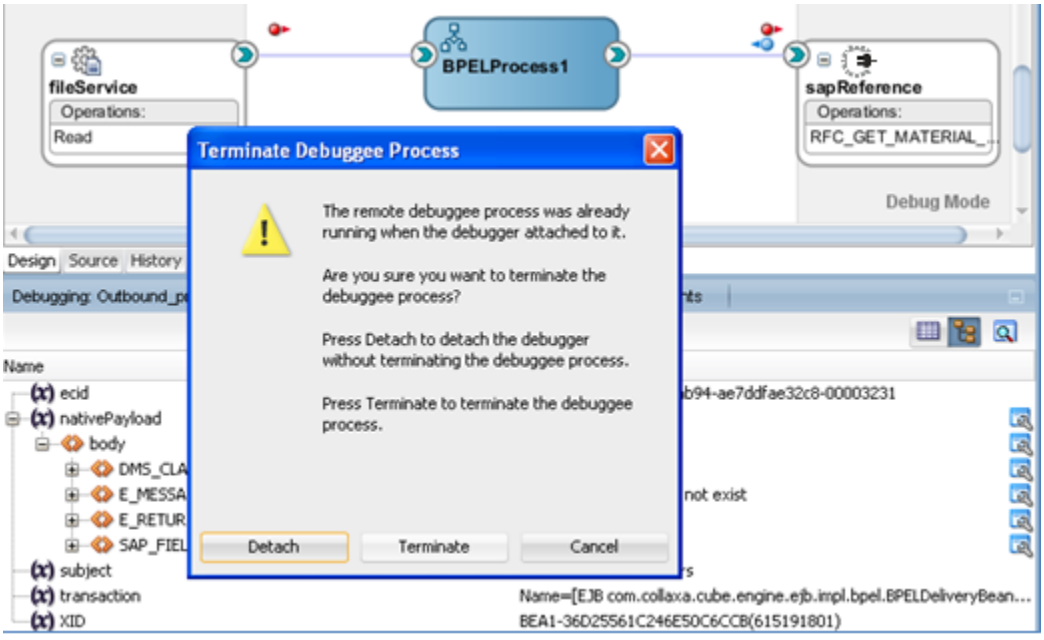
11. It will hit the Response Breakpoint, as shown in Figure 5-83.

Figure 5-83 Response Breakpoint



12. Click on **Detach** button to detach the debugger, as shown in Figure 5-84.

Figure 5-84 Detach Debugger



5.15 Non_Xml Characters Handling Feature

The Adapter for SAP provides Non-Xml character handling for the data that is coming from SAP system to the Adapter. XML does not support all characters defined in Unicode. For example, control characters, some of the control character not supported by XML 1.0.

Unicode code points in the following ranges are valid in XML 1.0 documents:

- U+0009, U+000A, U+000D: these are the only C0 controls accepted in XML 1.0.
- U+0020–U+D7FF, U+E000–U+FFFD: this excludes some (not all) non-characters in the BMP (all surrogates, U+FFFE and U+FFFF are forbidden).
- U+10000–U+10FFFF: this includes all code points in supplementary planes, including non-characters.

The preceding code points ranges contain the following controls which are only valid in certain contexts in XML 1.0 documents, and whose usage is restricted and highly discouraged:

- U+007F–U+0084, U+0086–U+009F: this includes a C0 control character and all but one C1 control.

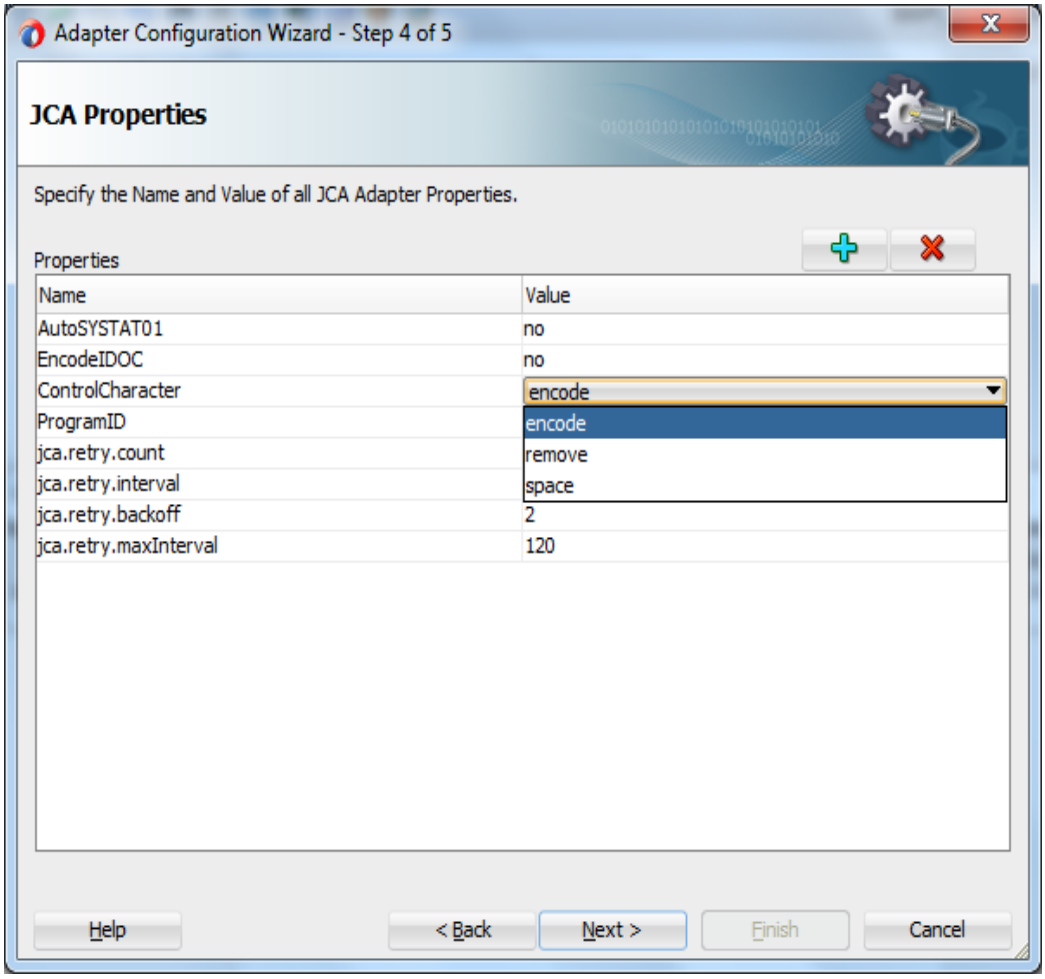
Any character in payload if not supported by XML 1.0, either can be removed or can be escaped. The Adapter for SAP provides one of the JCA property “ControlCharacter” as JCA property, which have following option to be operated on non-xml character. This property is available in case of Inbound Project.

- **remove:** This will remove character from payload.
- **space:** This will replace character with space.
- **encode:** This will encode character with its decimal format.

In Outbound project case in request payload, if any XML character already escaped, will be unescaped before sending payload to the Adapter for SAP.

You can see **ControlCharacter** property in SAP design-time in the properties page, as shown in Figure 5-85. This property is included in the JCA properties in case of Inbound project.

Figure 5-85 ControlCharacter Property



Note that encoding of the control characters like (ctrl+shift+underscore) is not supported and hence for such characters, **ControlCharacter** property has to be set to either "**remove**" or "**space**".

Note: Control Character Translation option is only applicable to XML payload not the Flat file. When the encoded IDoc option is selected, property ControlCharacter is not available to select any operation.

5.16 Error Document Support

This feature provides feasibility of returning xml payload instead of throwing error when SAP returning Type E as response in outbound scenario. This feature is configurable and can be updated at design-time.

Perform the following steps to create an SAP Endpoint with Error Document feature:

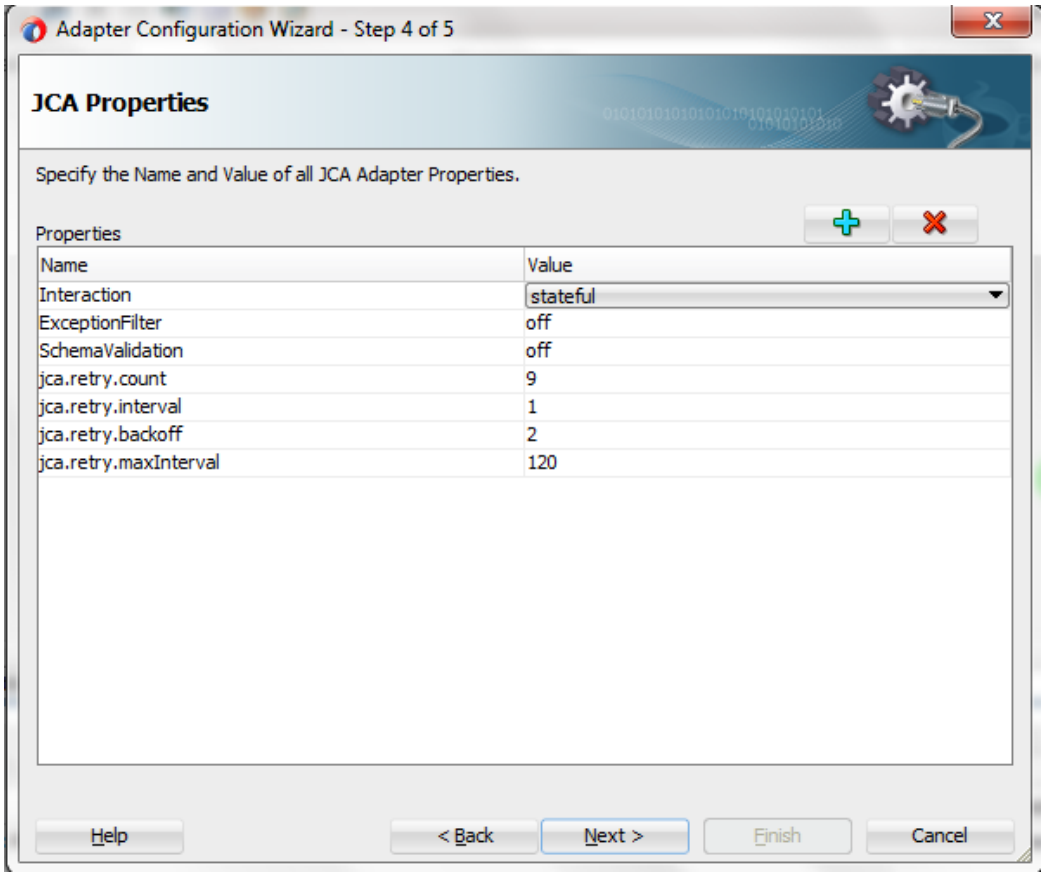
1. Create an outbound BAPI/RFC endpoint using the Adapter for SAP.

(For more information, refer to the section "Configure the Adapter Component" under BPEL Outbound Process)

2. Set "ErrorDocument" property to **ON** in the JCA Properties page.

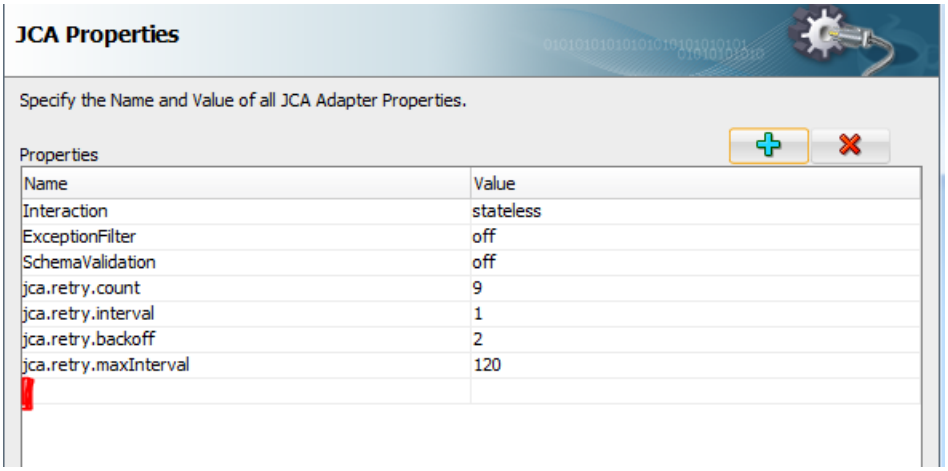
3. In the JCA Properties page add new property using add button as shown in the Figure below.

Figure 5-86 JCA Property



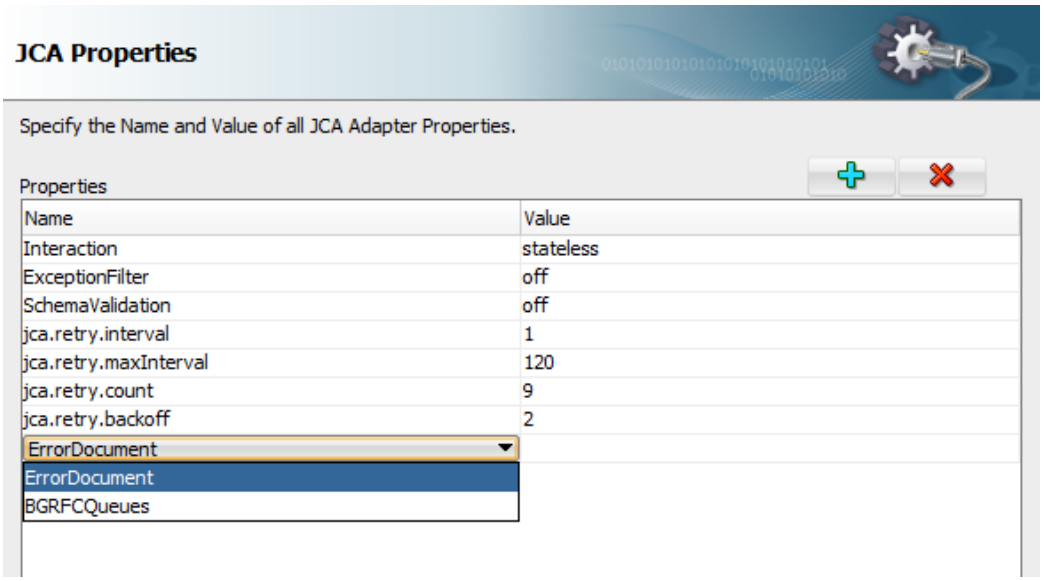
4. Click on the newly appeared row in the JCA Properties table as shown in the Figure below.

Figure 5-87 JCA Property



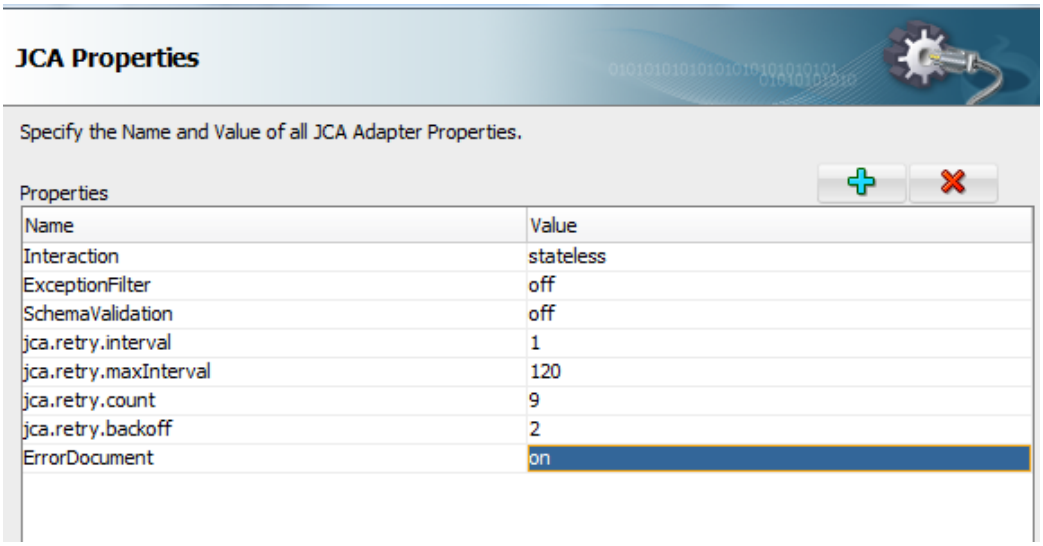
5. Select Error Document from the drop-down menu as shown in the Figure below.

Figure 5-88 JCA Property



6. Set the value to ON as shown in the Figure below.

Figure 5-89 JCA Property



7. Click Finish.

5.17 Payload Threshold Support

The Adapter for SAP enables payloadSizeThreshold support wherein the processing can be controlled based on the Response Message/Payload size.

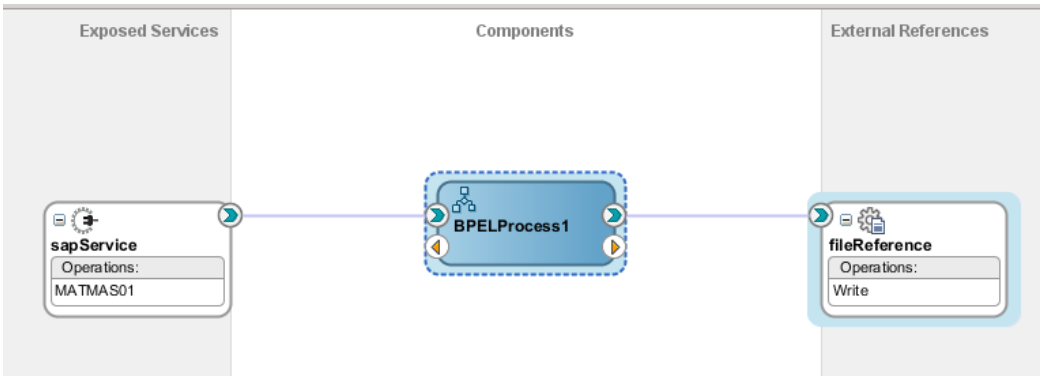
Here, for the response message size more than payloadSizeThreshold set, the response is rejected and for response message size less than threshold, the flow is completed successfully.

5.17.1 Inbound Project with payloadSizeThreshold support

To create an Inbound Project with payloadSizeThreshold support, perform the following steps:

1. Create Inbound Endpoint for IDoc. For more information, refer to the section 8.2.4, 'Design an Inbound BPEL Process for BAPI/RFC/IDoc'. A file adapter can be used to receive the IDoc.

Figure 5-90 JCA Property



2. Open Composite.xml and add following property under binding.jca, as shown in Figure 5-91.

<property name="payloadSizeThreshold" type="xs:string" many="false" override="may">24000</property>

Figure 5-91 JCA Property

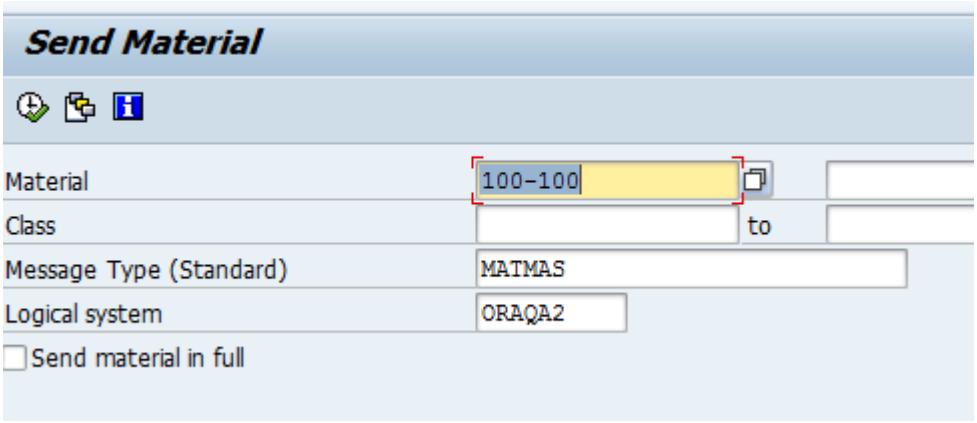
```
<import namespace="http://xmlns.oracle.com/pcbpel/adapter/file/SOA_STG12/Threshold_Inbound/fileReference"
        location="WSDLs/fileReference.wsdl" importType="wsdl"/>
<service name="sapService" ui:wsdlLocation="WSDLs/sapService.wsdl">
 <interface.wsdl interface="http://xmlns.oracle.com/pcbpel/adapter/sap/SOA_STG12/Threshold_Inbound/sapServic
 <binding.jca config="Adapters/sapService_sap.jca">
  <property name="payloadSizeThreshold" type="xs:string" many="false" override="may">24000</property>
  <property name="useRejectedMessageRecovery" type="xs:string" many="false" override="may">true</property>
 </binding.jca>
   <property name="jca.retry.count" type="xs:int" many="false" override="may">3</property>
   <property name="jca.retry.interval" type="xs:int" many="false" override="may">1</property>
```

3. Deploy the project. For more information, refer to the section “Deploy the Defined Process”.

Testing

Test deployed project by sending an IDoc from SAP. For example, a MATMAS IDoc can be sent from BD10 tcode of SAP. IDoc sent should have size greater than the payloadSizeThreshold specified in composite.

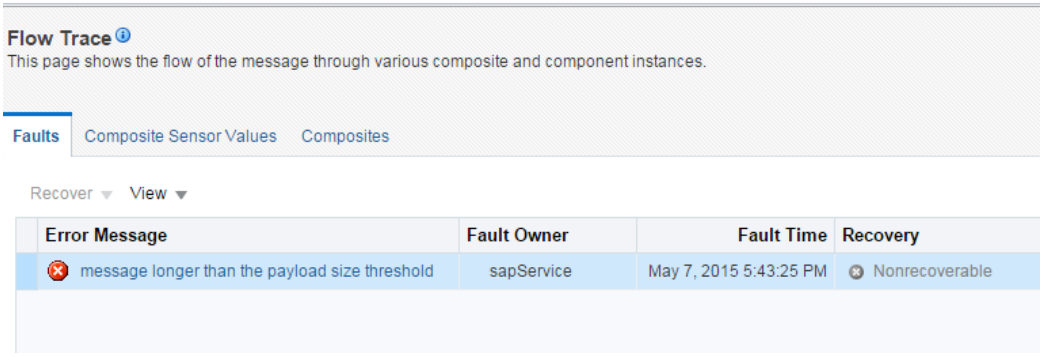
Figure 5-92 JCA Property



This IDoc is not processed/rejected and error is encountered with the message being sent to the rejected Message folder.

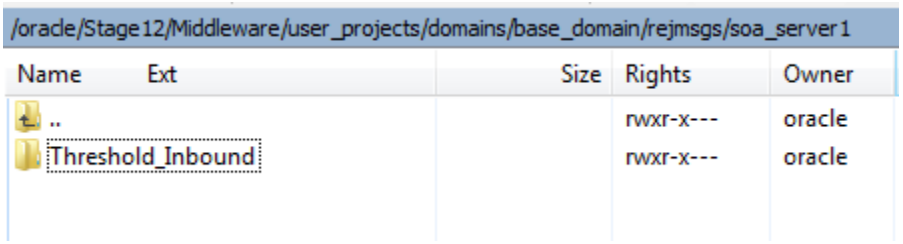
Check the Flow instance in EM console - Error is encountered as shown in Figure below.

Figure 5-93 JCA Property



Check the 'rejmsgs' Folder in SOA - the Message is sent to the rejected Message Folder as shown in Figure below.

Figure 5-94 JCA Property



5.17.2 Outbound Project with payloadSizeThreshold Support

This section explains the steps to create an Outbound Project with payloadSizeThreshold support.

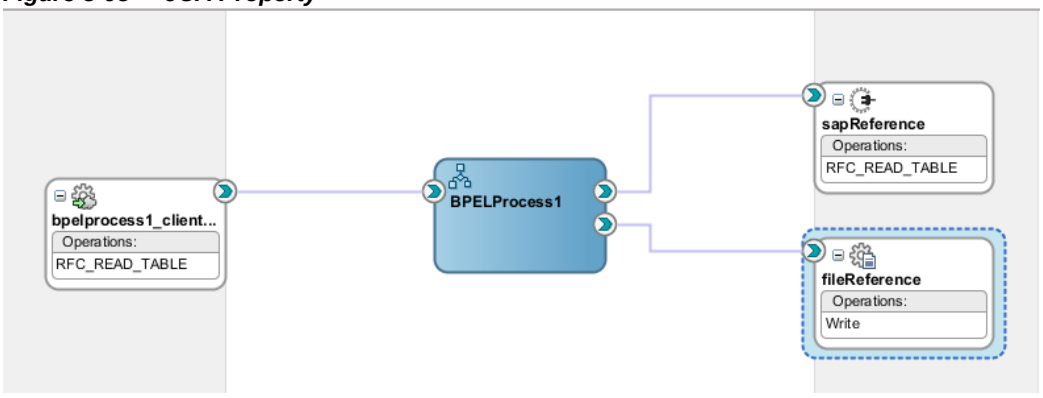
Perform the following steps to create an SAP Endpoint for payloadSizeThreshold support:

1. Create an outbound BAPI/RFC endpoint using the Adapter for SAP.

   For more information, refer to the section 8.2.3, 'Configure the Adapter Component" under BPEL Outbound Process'.

2. Capture the Output in a file using File Adapter

Figure 5-95 JCA Property



3. Open Composite.xml and add following property under reference as shown in Fig --

<property name="payloadSizeThreshold" type="xs:string" many="false" override="may">24000</property>

Figure 5-96 JCA Property

```
</component>
<reference name="sapReference" ui:wsdlLocation="WSDLs/sapReference.wsdl">
  <interface.wsdl interface="http://xmlns.oracle.com/pcbpel/adapter/sap/SOASTG11/ThresholdChkOUT/sapReference#wsdl.
  <binding.jca config="Adapters/sapReference_sap.jca"/>
  <property name="jca.retry.count" type="xs:int" many="false" override="may">9</property>
  <property name="jca.retry.interval" type="xs:int" many="false" override="may">1</property>
  <property name="jca.retry.backoff" type="xs:int" many="false" override="may">2</property>
  <property name="jca.retry.maxInterval" type="xs:int" many="false" override="may">120</property>
  <property name="payloadSizeThreshold" type="xs:string" many="false" override="may">24000</property>
</reference>
```

Testing payloadSizeThreshold support for Outbound

Deploy the project. For more information, refer to the section “Deploy the Defined Process”.

Execute the outbound project with input whose output size is greater than the payloadSizeThreshold specified in the composite.xml.

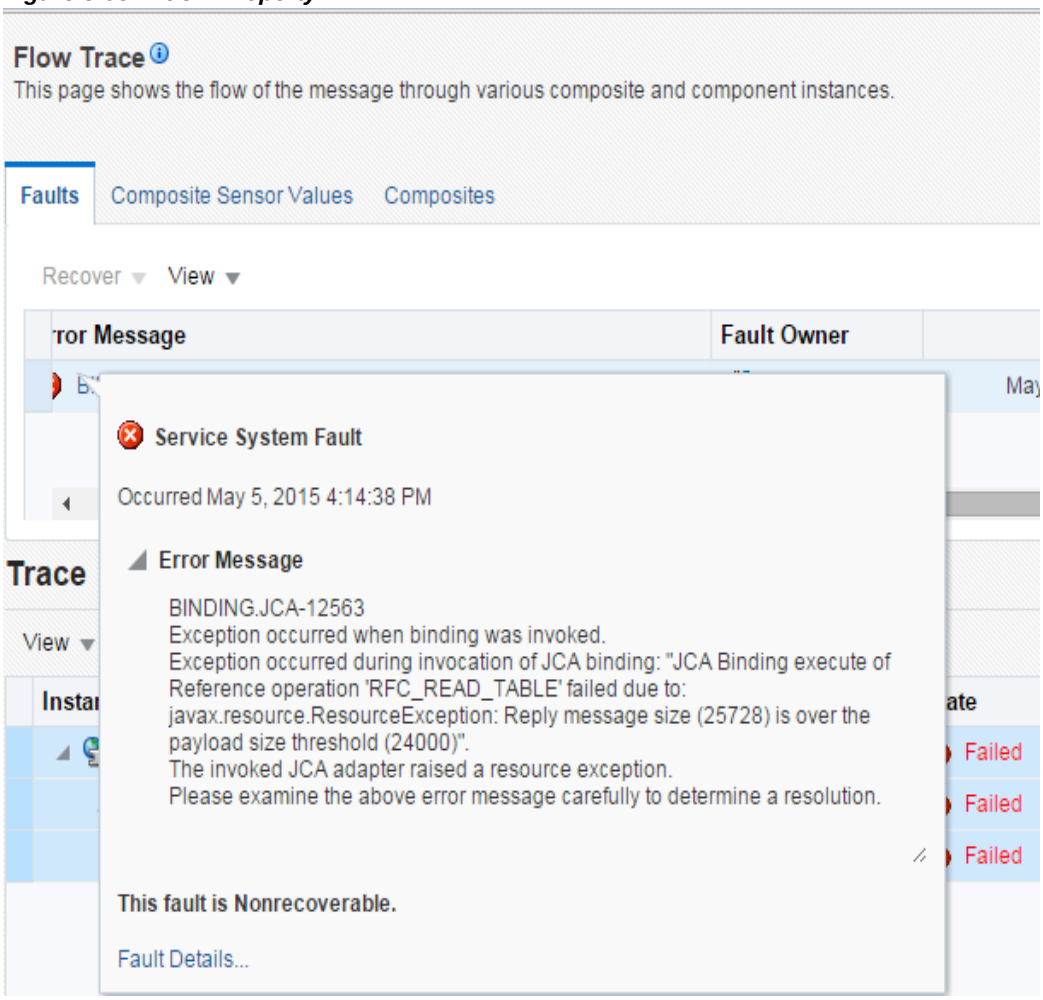
Figure 5-97 JCA Property

```
<soapenv:Envelope xmlns:soapenv="http://
   <soapenv:Header/>
   <soapenv:Body>
      <urn:RFC_READ_TABLE>
         <!--You may enter the following
               <urn:NO_DATA></urn:NO_DA
         <urn:QUERY_TABLE>MARA</urn:QUER
      </urn:RFC_READ_TABLE>
   </soapenv:Body>
</soapenv:Envelope>
```

```
<env:Envelope xmlns:env="http://schemas.xmlsoap.org/soap/envelope/">
   <env:Header>
      <tracking:faultId xmlns:tracking="http://oracle.soa.tracking.core.TrackingProperty">30001</trackin
   </env:Header>
   <env:Body>
      <env:Fault>
         <faultcode>env:Server</faultcode>
         <faultstring>Exception occurred when binding was invoked.
Exception occurred during invocation of JCA binding: "JCA Binding execute of Reference operation
'RFC_READ_TABLE' failed due to: javax.resource.ResourceException:
Reply message size (25728) is over the payload size threshold (24000)".
The invoked JCA adapter raised a resource exception.
Please examine the above error message carefully to determine a resolution.</faultstring>
         <faultactor/>
         <detail>
            <exception>Reply message size (25728) is over the payload size threshold (24000)</exception>
         </detail>
      </env:Fault>
   </env:Body>
</env:Envelope>
```

Check the Flow instance in EM console - Error is encountered as shown in Figure below.

Figure 5-98 JCA Property

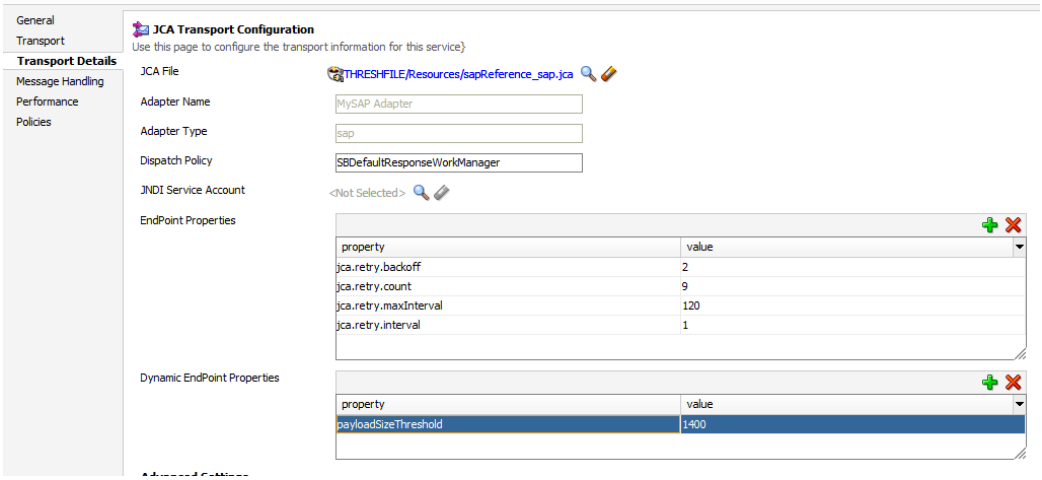


Same error message can be seen in the diagnostic log as well, as shown in Figure 5-99.

Figure 5-99 Diagnostic Log

Note: In case of OSB, this property need to be added as Dynamic Property and size should be provided in Bytes. Moreover, the user must set this property in the Bix file for outbound and in proxy for Inbound as shown in Figure 5-100.

Figure 5-100 JCA Transport Configuration



5.18 TID Backstore Support

TID Backstore avoids duplicate execution of the same transaction if abrupt network failure occurs in middle of the execution. The data sent from SAP system is identified by the TID (Transaction ID) which is unique in nature. Tracking of TID in SOA is possible which helps in case of any intermediate failure and the same transaction once recorded, need not to be send again. This functionality records the data in SOA database once IDoc message is received from SAP.

For this, create a table to store TID in persistent store with the following fields:

CREATE USER TIDUSER IDENTIFIED BY TIDUSER;

ALTER USER TIDUSER DEFAULT TABLESPACE users

QUOTA UNLIMITED ON users;

ALTER USER TIDUSER TEMPORARY TABLESPACE temp;

GRANT create session

, create table

, create procedure

, create sequence

, create trigger

, create view

, create synonym

, alter session

TO TIDUSER;

CONNECT TIDUSER/TIDUSER

CREATE TABLE TIDSTORE

(

TID CHARACTER (100) ,

CREATED_ON CHARACTER (50) ,

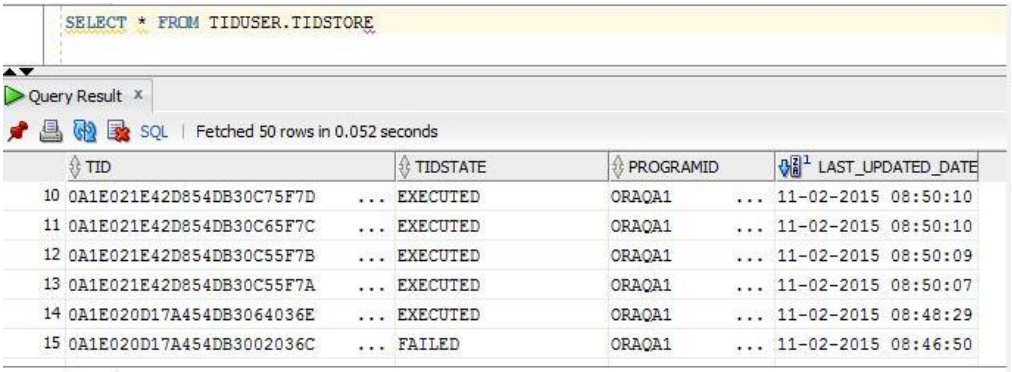
PROGRAMID CHARACTER (50),

TIDSTATE CHARACTER(50)

);

Table entries shows whether the final status is EXECUTED or FAILED along with the Program ID and Date/Time, indicating if the Transaction needs to be retried in case of failure.

Figure 5-101 Status of IDoc



Create a JDBC data source for the database where you have created this table and specify this JDBC data source in the JNDI →property DataSourceName as shown in figures below:

Figure 5-102 JDBC Data Source

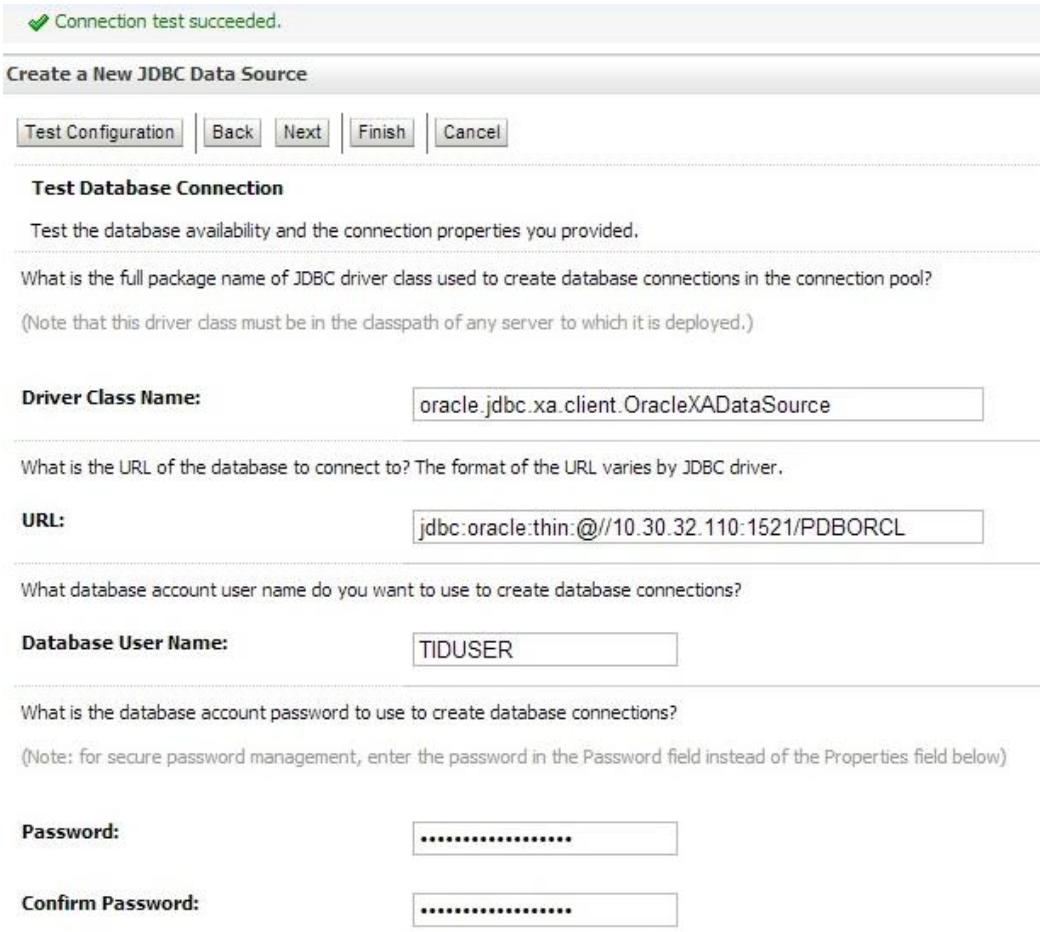
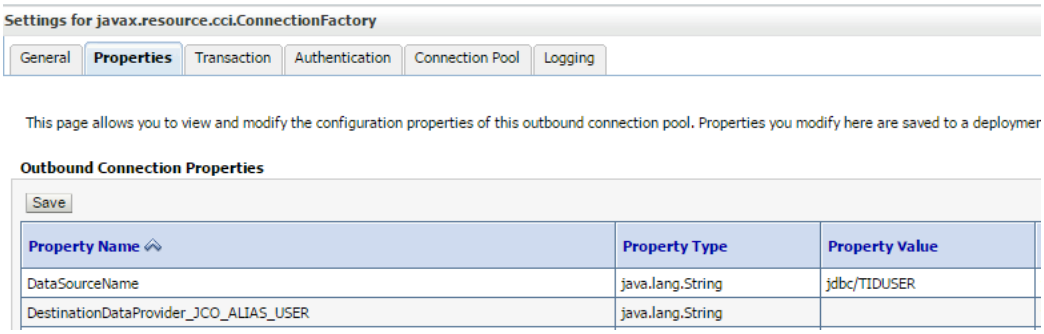


Figure 5-103 DataSourceName



Status of the Transaction is recorded in the database. Hence, the need to retry the transaction is identified easily. This concept helps developer eliminate data redundancy and would greatly reduce the overall workload by identifying the transaction completion status on time.

5.19 Large Payload Support (AsAttachment)

Large Payload Support (AsAttachment) feature in SAP Adapter provides support for transferring large files as attachments. This option opaquely transfer large IDocs as an

attachment without processing their content. This feature provides a faster way to post IDocs from sender to receiver.

AsAttachment support for Inbound

Perform the following steps to create an SAP Endpoint for Large payload support:

1. Create an Inbound Idoc endpoint using the SAP Adapter for SAP.

2. For more information, refer to the section 8.2.4, "Design an Inbound BPEL Process for BAPI/RFC/IDoc".
3. While configuring SAP Adapter, add 'AsAttachment' property from JCA properties page after selecting IDoc.

Figure 5-104 Select IDoc and proceed to JCA properties page

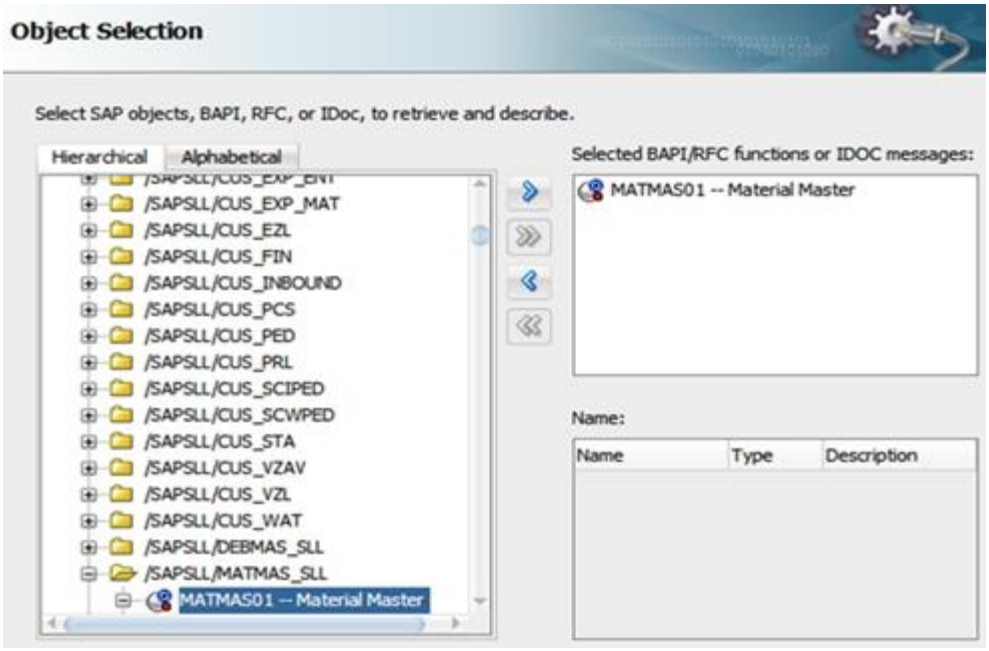
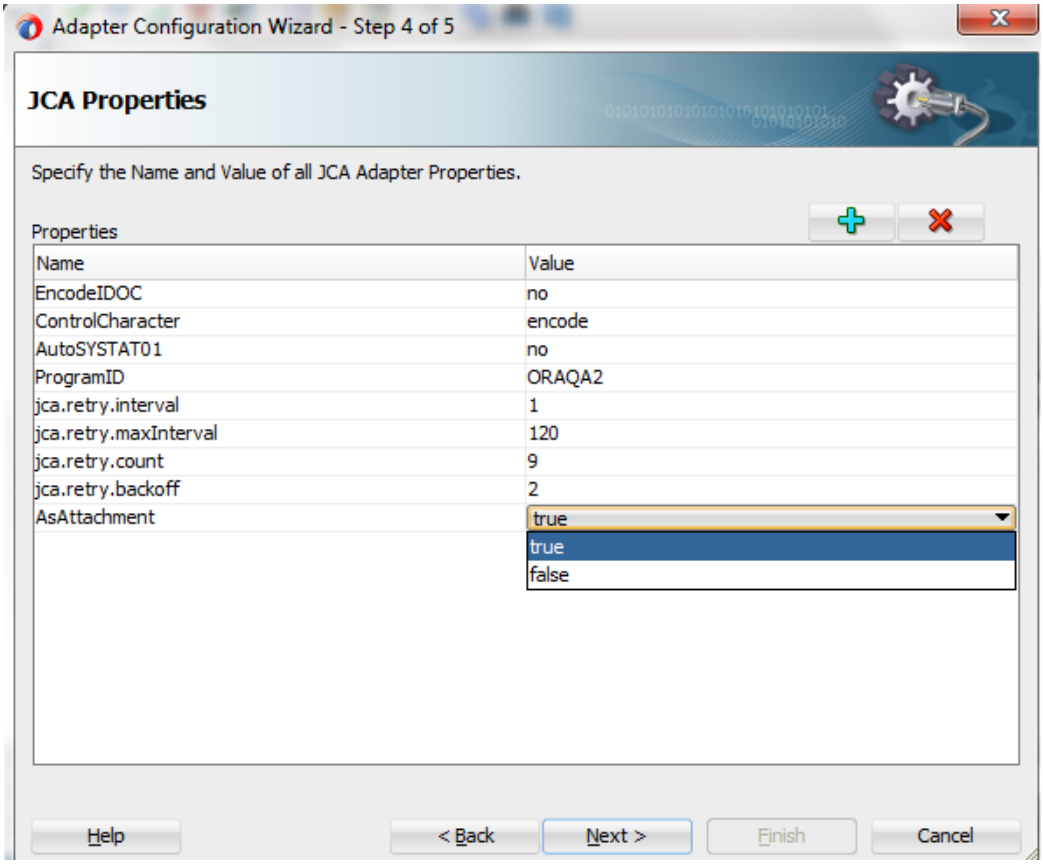


Figure 5-105 JCA Properties



4. Complete SAP Adapter configuration and verify the jca file for 'AsAttachment' as shown in the figure below.

Figure 5-106 AsAttachment added in JCA file

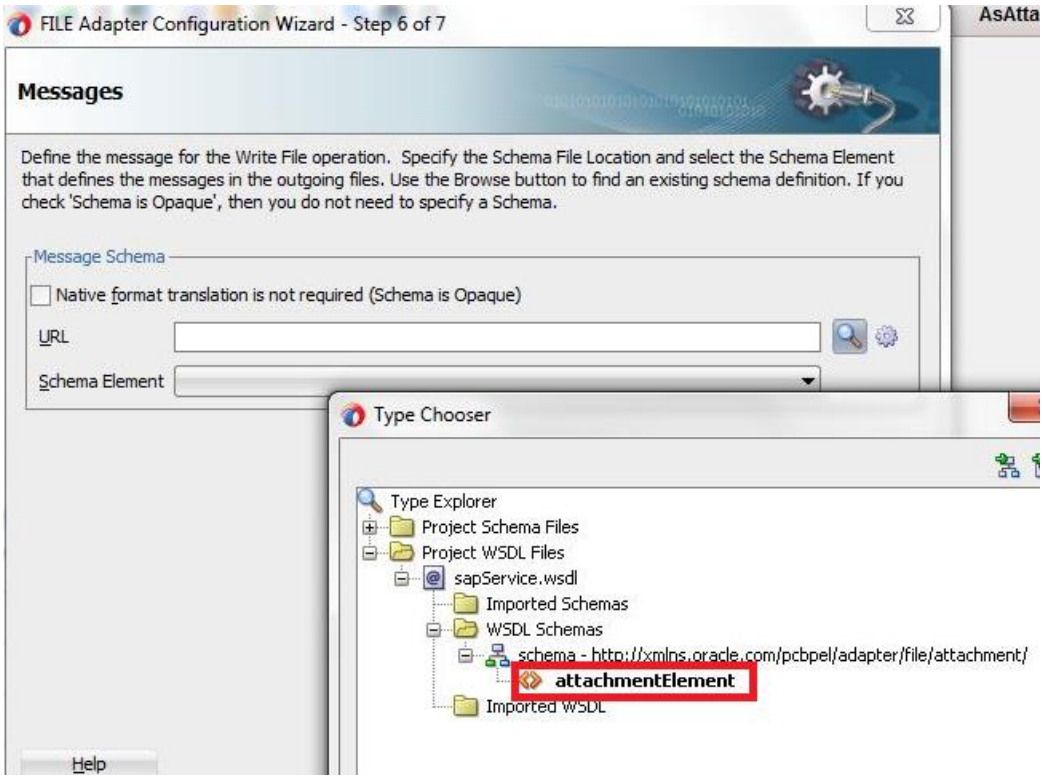
```
<adapter-config name="sapService" adapter="sap" wsdlLocation="../WSDLs/sapService.wsdl" xmlns="http://pla

  <connection-factory UIConnectionName="IB1" location="eis/SAP/FMWDEMO"/>
  <endpoint-activation portType="sapService_PT" operation="sapService">
    <activation-spec className="oracle.tip.adapter.sap.inbound.SAPActivationSpecImpl">
      <property name="EncodeIDOC" value="no"/>
      <property name="AsAttachment" value="true"/>
      <property name="ControlCharacter" value="encode"/>
      <property name="AutoSYSTAT01" value="no"/>
      <property name="ProgramID" value="ORAQA2"/>
      <property name="IDOC" value="MATMAS01"/>
      <property name="Type" value="IDOC"/>
    </activation-spec>
  </endpoint-activation>

</adapter-config>
```

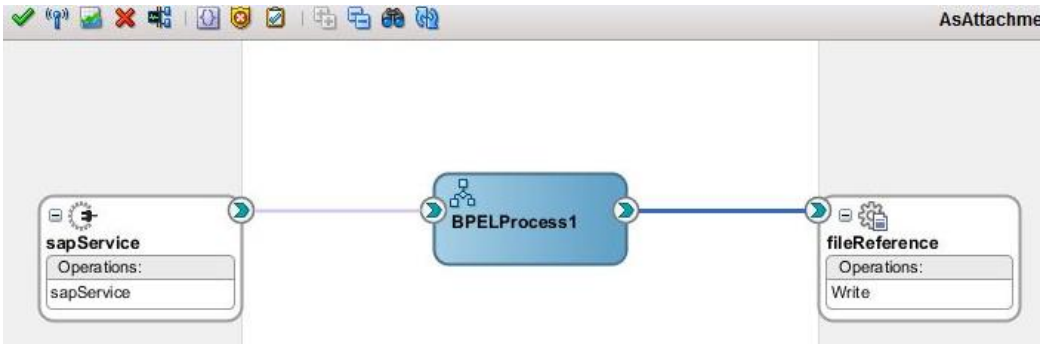
5. After successful configuration of SAP Adapter, Configure file Adapter and select schema as shown below.

Figure 5-107 Select Attachment schema as shown below



6. Configure BPEL Process

Figure 5-108 Configured BPEL process



7. Add recive and invoke activity as shown below.
8. Add assign activity to map 'href_id' field of sender with the 'href_id' of reciever as shown in below figure

Figure 5-109 Add assign activity

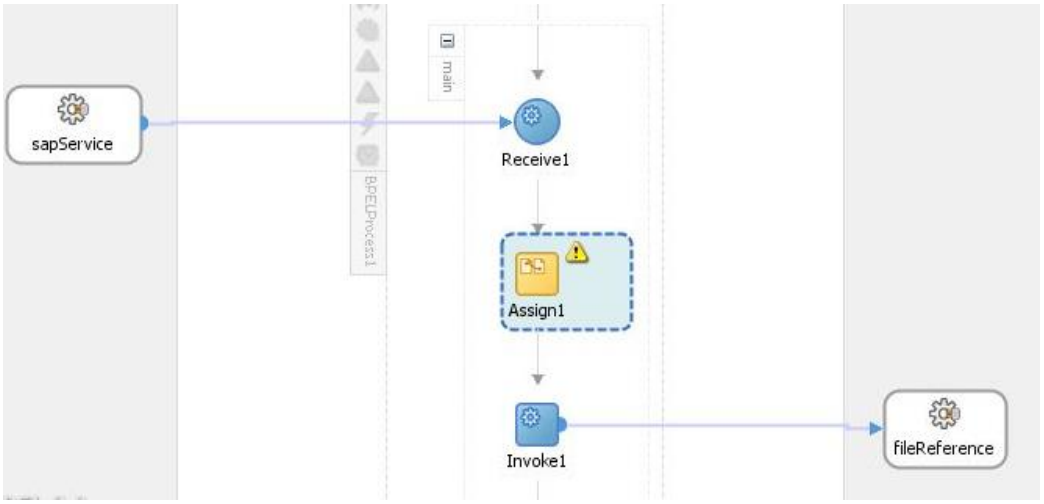
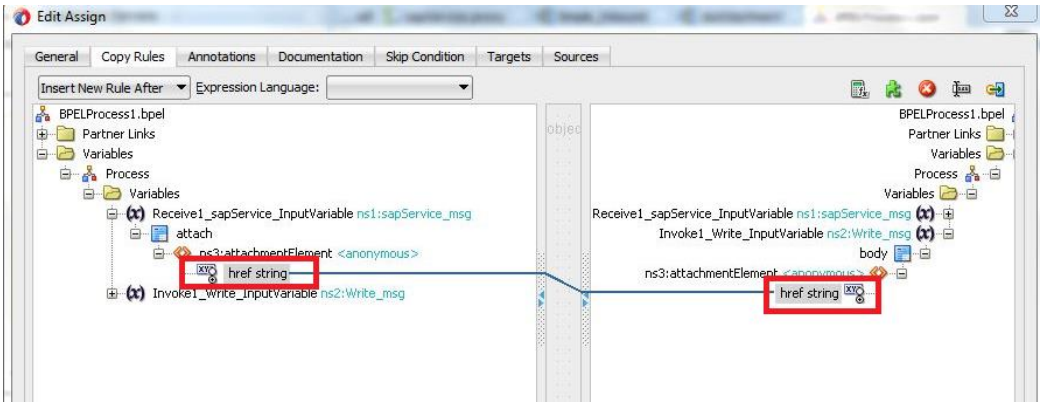


Figure 5-110 Open assign activity and Map 'href_id'



9. After project creation, deploy the respective composite to the server and trigger IDoc from SAP.
10. After receiving IDoc as an attachment successfully, check the flow instance and verify 'href_id' of the attachment.

Figure 5-111 Flow Instance

5.20 Resiliency Support

Resilience is a generic feature supported by SAP Adapter for Oracle SOA Suite 12C. Main goal of the resiliency project is to make the SOA server more robust and to better handle overload and failure situations.

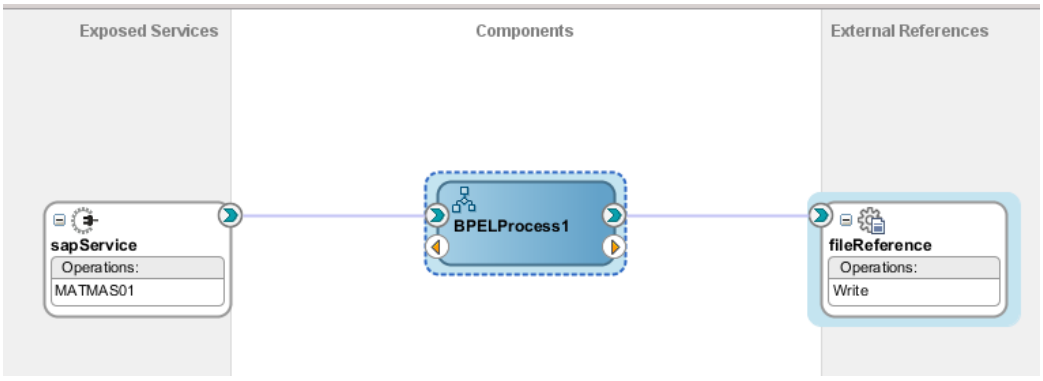
Resiliency-Failure: Gracefully handle downstream endpoint failures to prevent faults from building up in the system/error hospital by shutting down incoming requests for the flow.

5.20.1 Inbound Project with Resilience support

To create an Inbound Project with Resilience support, perform the following steps:

1. Create Inbound Endpoint for IDoc. For more information, refer to the section 8.2.4, 'Design an Inbound BPEL Process for BAPI/RFC/IDoc'. A file adapter can be used to receive the IDoc.

Figure 5-112 Design of Composite

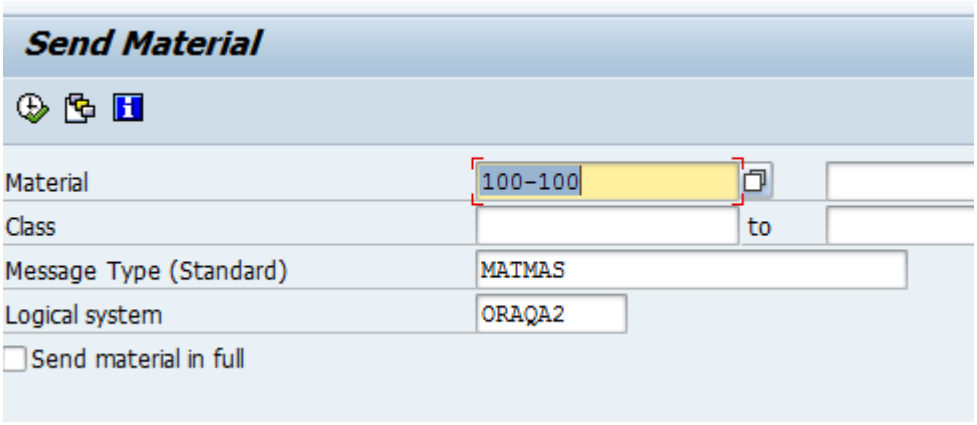


2. Deploy the project. For more information, refer to the section 2.5.2, 'How to Deploy'.

Testing

Test deployed project by sending an IDoc from SAP. For example, a MATMAS IDoc can be sent from BD10 tcode of SAP.

Figure 5-113 Test Deployed Project



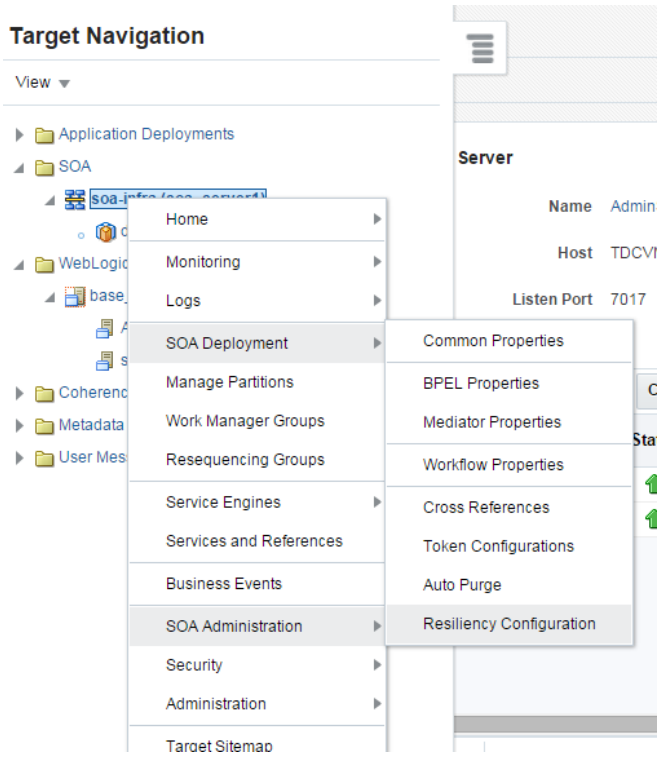
Note: Considering the case where IDoc is written into file and file has no write permission in Linux environment

This IDoc is not processed/rejected and error is encountered because of no writing permission. Check the Flow instance in EM console – It will be in recovery mode.

Configuring Resilience from Enterprise Manager.

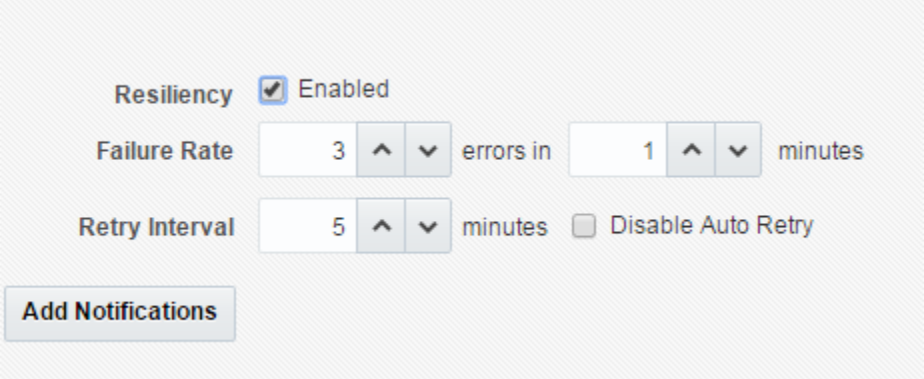
1. From EM, Go to SOA → soa_infra(soa_server1) → SOA Depoyment → Resiliency Configuration

Figure 5-114 Test Deployed Project



2. Enable Resilience by checking the Resiliency checkbox and specify the parameters as given in figure, i.e., when 3 or more error appear within 1 minute.

Figure 5-115 Resiliency Configuration

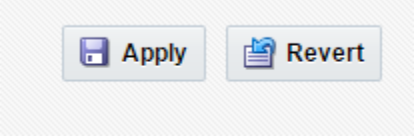


Failure Rate: Number of errors that need to be captured in given amount of time.

Retry interval: Time in minutes for retry to occur from EM level.

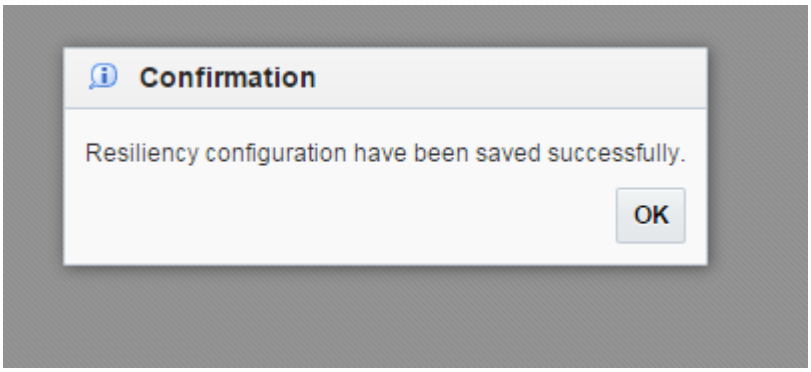
3. After configuration, click Apply button located at right side of the Resilience configuration panel.

Figure 5-116 Apply button at Resilience Configuration Panel



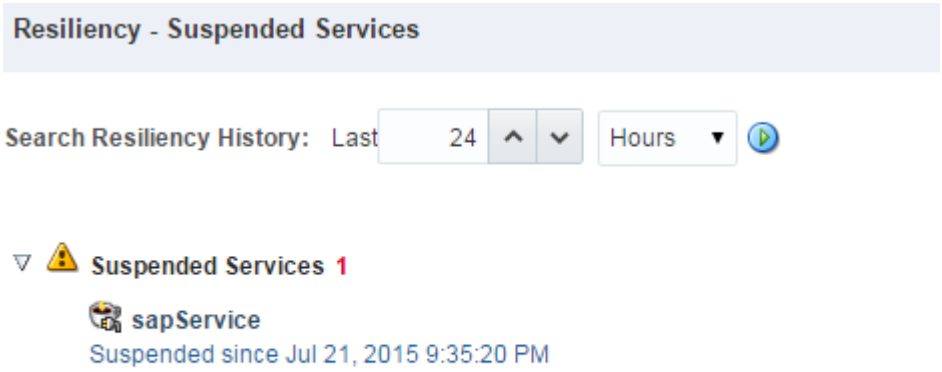
4. Click OK for confirmation.

Figure 5-117 Confirmation Window



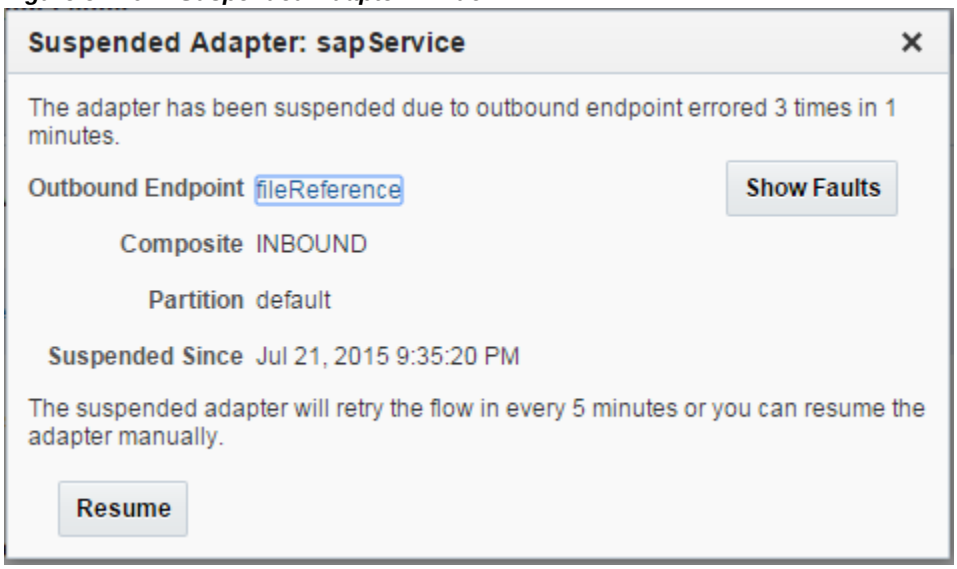
5. If any error is encountered then service will be seen suspended at the dashboard.

Figure 5-118 Resiliency Suspended Services



Since this endpoint is suspended, no more requests would be processed for this endpoint. Endpoint would be resumed when resume option is clicked from “Suspended since Jul 21.2015 9:35:20PM” Hyperlink.

Figure 5-119 Suspended Adapter Window



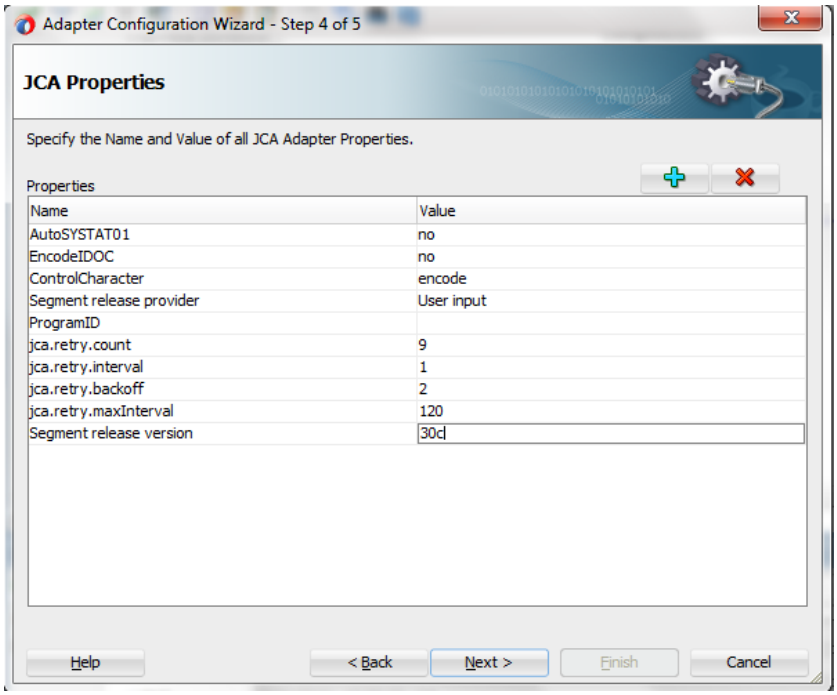
After giving the permissions, suspended service can be resumed and hence, it is written into a file.

5.21 Segment Release Design Time and Runtime Support

SAP adapter supports segment release option for IDoc. At the time of SAP adapter configuration, you can either choose user input or the default version.

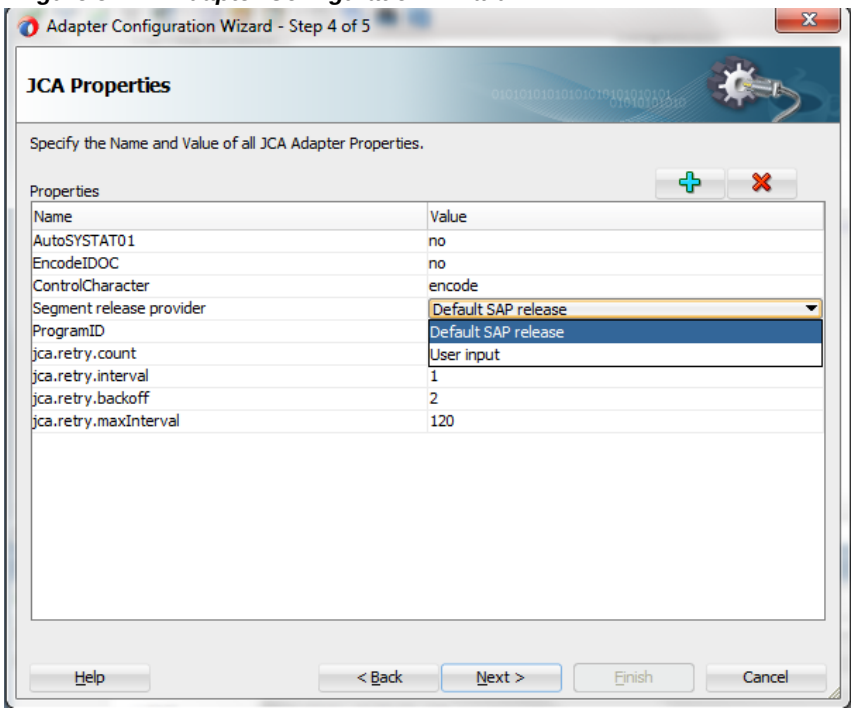
If you choose user input, you need to provide a value for segment release version.

Figure 5-120 Segment release version (User input)



If you choose the default SAP release version, the SAP adapter will fetch the latest release version.

Figure 5-121 Adapter Configuration Wizard



5.22 Special Character Support for Inbound IDoc

The SAP adapter supports valid as well as invalid characters, which include special characters emoji's and all HTML characters in ASCII format.

5.23 Dynamic RFC Cache Update

If any changes occur in an SAP object, you can reflect those changes in composites or projects without restarting the SOA/OSB servers.

Steps for SAP side configuration:

1. Edit the required SAP object.
2. After completing the required changes, activate the object.

Note: In case of IDoc, the object needs to be released again using set release option.

Perform the following steps to update SAP objects' cache dynamically in run time:

1. Restart JDeveloper.
2. Reconfigure the SAP adapter endpoints with updated SAP object in JDeveloper.
3. Reconfigure any other endpoints such as DB and File in composite that depend on schema/WSDL of the SAP endpoint.

4. Save and refresh the SOA project.
5. Deploy the edited project in the server without restarting it.

6

Complete Walkthrough of the Adapter Configuration Wizard

This chapter explains how to configure an Adapter for SAP in design-time. It contains the following topics:

- Section 6.1, "Overview"
- Section 6.2, "The Adapter Wizard in JDeveloper "
- Section 6.3, "Specifying the Service Name"
- Section 6.4, "Connecting to SAP"
- Section 6.5, "Select SAP Objects from Objects Selection"
- Section 6.6, "JCA Properties Page"
- Section 6.7,"Finishing with Adapter Configuration Wizard"

6.1 Overview

The design-time plug-in enables you to access the SAP server, browse SAP repository, and generate SCA artifacts such as XSD, WSDL, and JCA properties for SAP endpoints directly within the composite designer of JDeveloper for SAP RFC , BAPI , and IDoc objects. It also enables you to test BAPI and RFC directly in the JDeveloper.

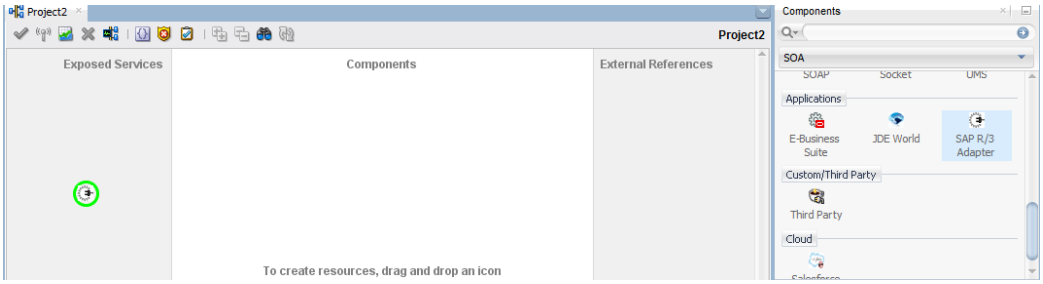
6.2 The Adapter Wizard in JDeveloper

To use Adapter for SAP in JDeveloper Composite, open Oracle JDeveloper and drag and drop the **Adapter** from **Component** to the **Composite** either on **Exposed Services** pane or **External Reference** pane, as shown in Figure 6-1.

OR

Right-click on **Exposed Services** pane or **External Reference**, Select **Insert** and select the **Adapter for SAP** from the list available.

Figure 6-1 Adapter Component



6.3 Specifying the Service Name

When the Adapter for SAP is drag and dropped to the Composite, the first page appears for the Adapter configuration wizard, as shown in Figure 6-2.

Figure 6-2 Adapter Configuration Wizard

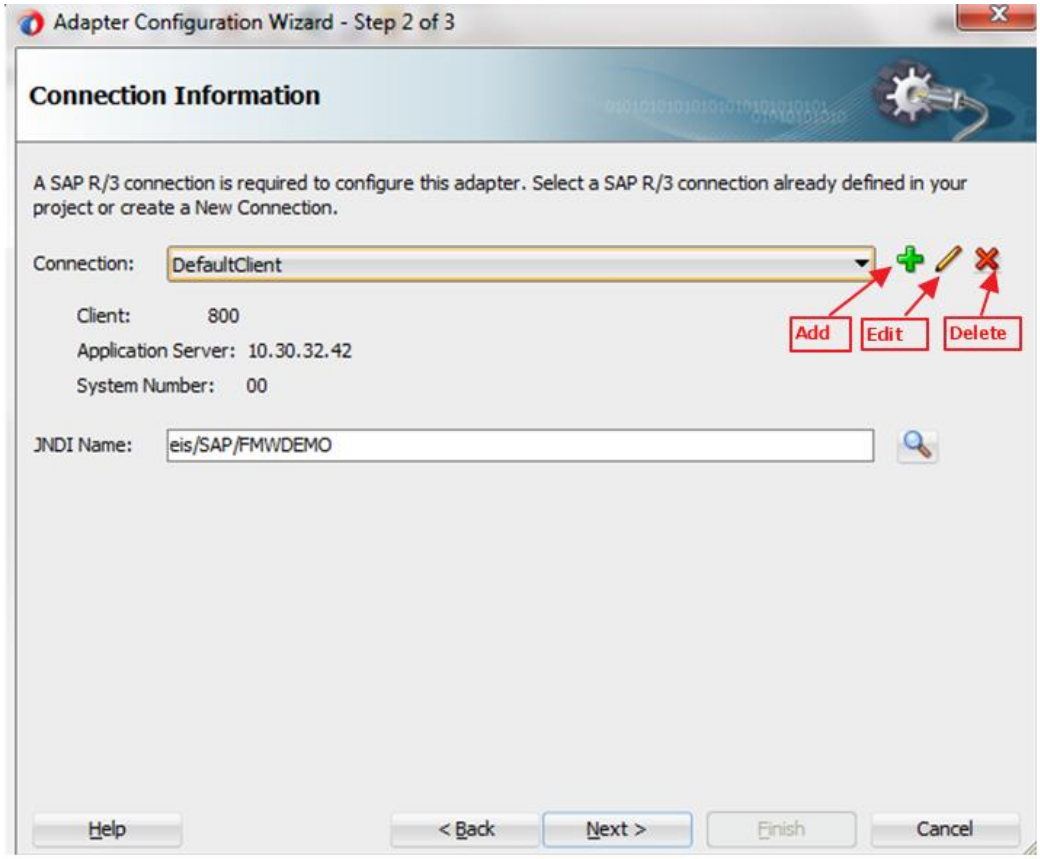
Provide a service name and when the wizard completes defining an adapter service, a WSDL file by this name will appear in the Application Navigator.

6.4 Connecting to SAP

A Connection Information page opens up next to define the SAP connection for the adapter. This page enables you to create a new connection or update/edit an existing connection. Connection summary with JNDI name is displayed on the page, as shown in Figure 6-3.

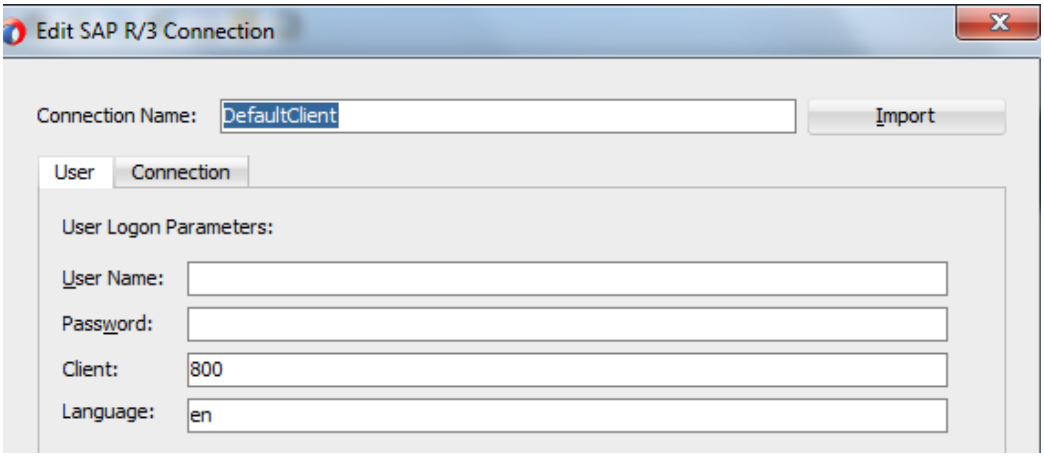
Use the default Java Naming and Directory Interface (JNDI) name or specify a custom name. This connection enables you to configure the adapter during design-time and to connect to the SAP server during run-time.

Figure 6-3 Connection Information Page



Edit SAP Connection: Edit SAP Connection button can be used to edit SAP connection details, as shown in Figure 6-4. You can also use **Import** button to set connection parameters. Refer to the section "Note" mentioned in the section.

Figure 6-4 Import Button



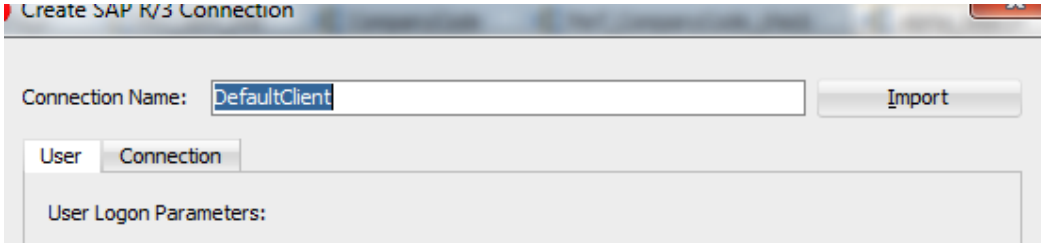
Delete SAP Connection: Delete SAP Connection button can be used to delete any existing connection from the Connection list. Once clicked, it shows **Delete SAP R/3 Connection** page, as shown in Figure 6-5.

Figure 6-5 Delete SAP R/3 Connection

6.4.1 Define a Connection Name

To create a new SAP R/3 connection, click on the + icon. A new connection dialog appears where user needs to provide **Connection Name** or can use default name, as shown in Figure 6-6.

Figure 6-6 Create New SAP R/3 Connection Page

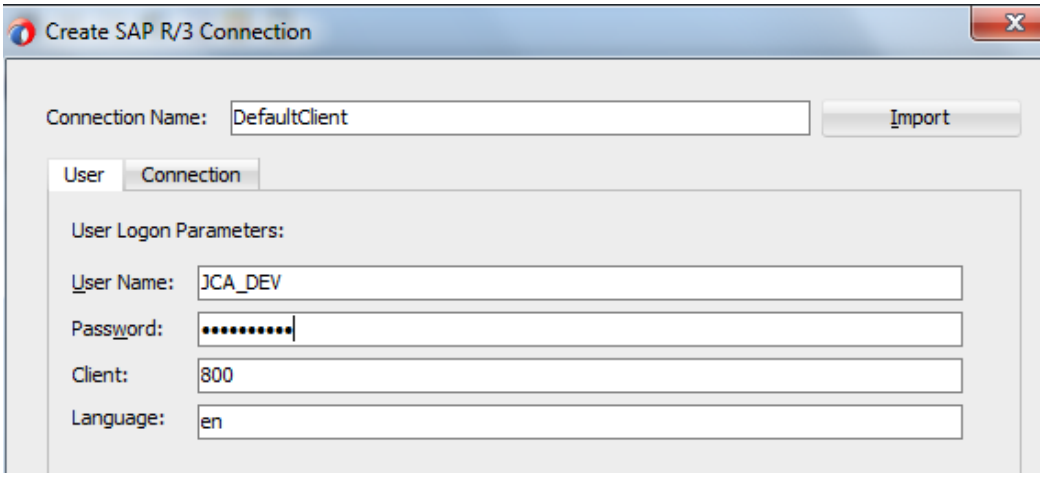


6.4.2 Define the Connection Parameters to the Connection Name

Provide the **SAP User Logon Parameters** (Username, Password , Client , and Language) in the **User** tab, as shown in Figure 6-7.

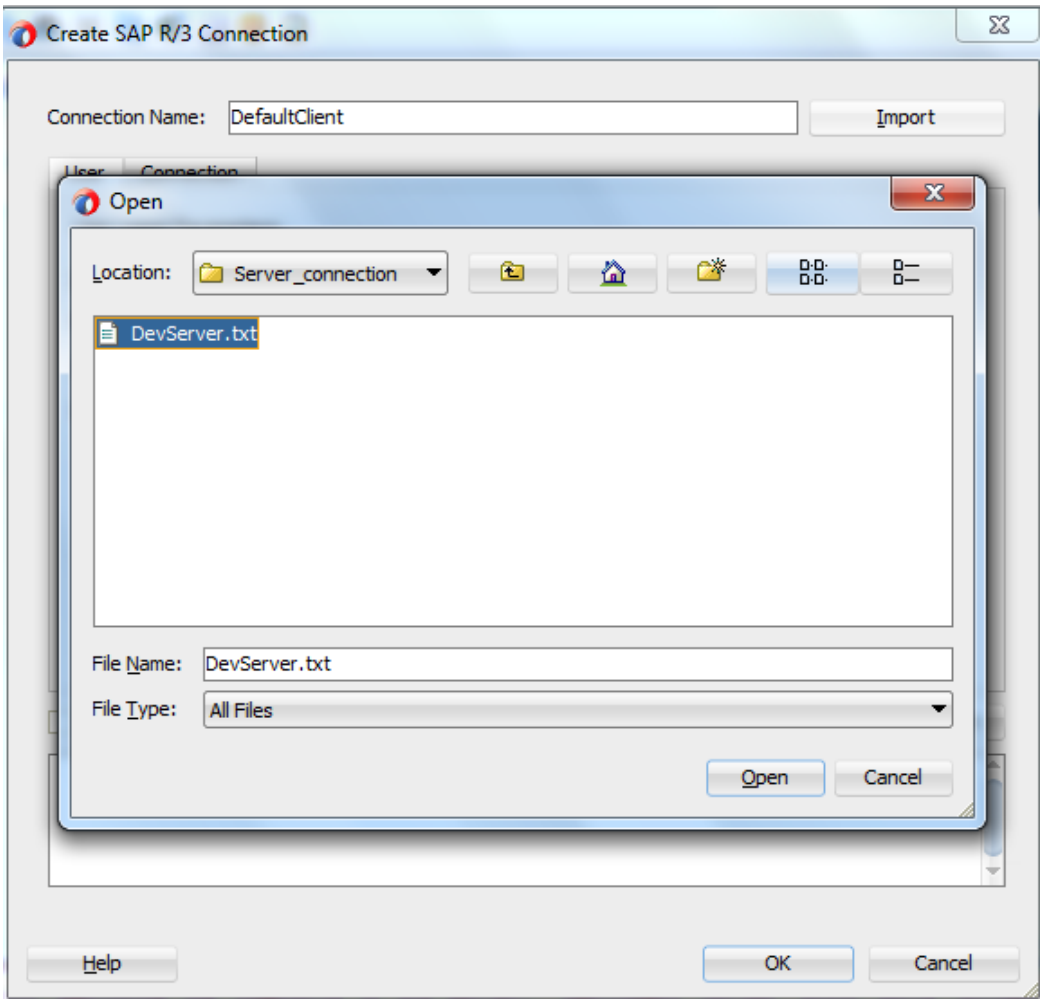
- **User Name:** The user name on the SAP system, this value is case sensitive. The Adapter for SAP preserves the case of the value that the user enters for the user name when it opens a connection on the SAP system.
- **Password :** The password for the user on the SAP system, this value is case sensitive. The Adapter for SAP preserves the case of the value that the user enters for the password when it opens a connection on the SAP system.
- **Client :** The SAP system client ID. Default is 800.
- **Language :** The current logon language of SAP. Default is English.

Figure 6-7 User Logon Parameters



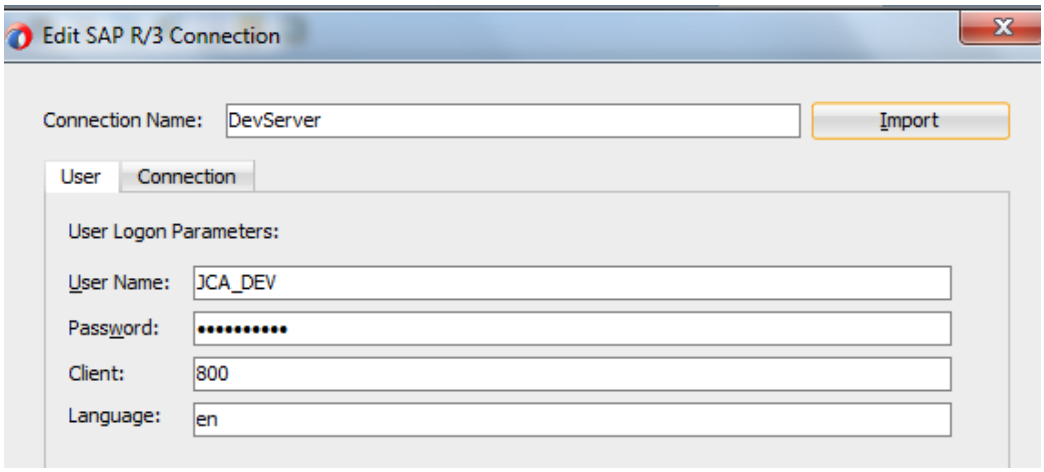
Note: User can import the connection parameters from a properties file by selecting the **Import** button and can test the connection. In that case, default connection name would be same as properties file name, as shown in Figure 6-8.

Figure 6-8 Import Button



If you click on **Open** button, it will set the values of properties file, as shown in Figure 6-9.

Figure 6-9 Set the Values of Properties File



6.4.3 Connect to a Defined SAP connection

SAP Connection can be defined in the **Connection** tab by selecting either of **Direct Connection** or **Load Balanced** option.

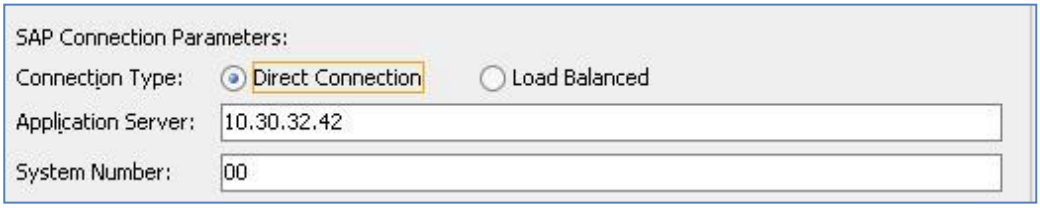
- **Direct Connection**: For direct connection to a single application server. Direct connection is by Default.
- **Load Balanced Connection**: For connecting the Adapter with load balance.

Direct Connection

When connecting using **Direct Connection** option, you need to provide following parameters, as shown in Figure 6-10.

- **Application Server:** Define system application server (Host name or IP Address of SAP system).
- **System Number:** It is SAP instance of the SAP application server. This property should be used when you are not using SAP load balancing.

Figure 6-10 Direct Connection

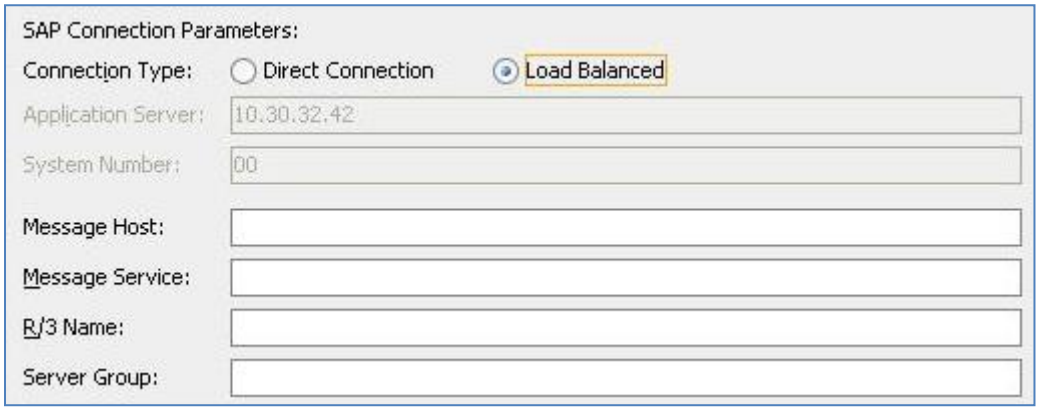


Load Balanced Connection

When connecting using **Load Balanced** connection option for load balancing, you need to provide following parameters, as shown in Figure 6-11.

- **Message Host:** Message Host is the IP of message server host.
- **Message Service:** Message Service is the service name of the load balancer service.
- **R/3 Name:** R/3 Name is the System ID/Name of SAP system.
- **Server Group:** Select any one of logon group to which you want to connect. This is the name of the group that is logging in to the SAP system.

Figure 6-11 Load Balanced



SAP Route String

In addition, there is an option for **SAP Route String** , as shown in Figure 6-12, which describes a connection required between two hosts using one or more SAP routers.

To connect to an SAP server from the internet, one uses SAP router as a proxy between the SAP GUI and the SAP server.

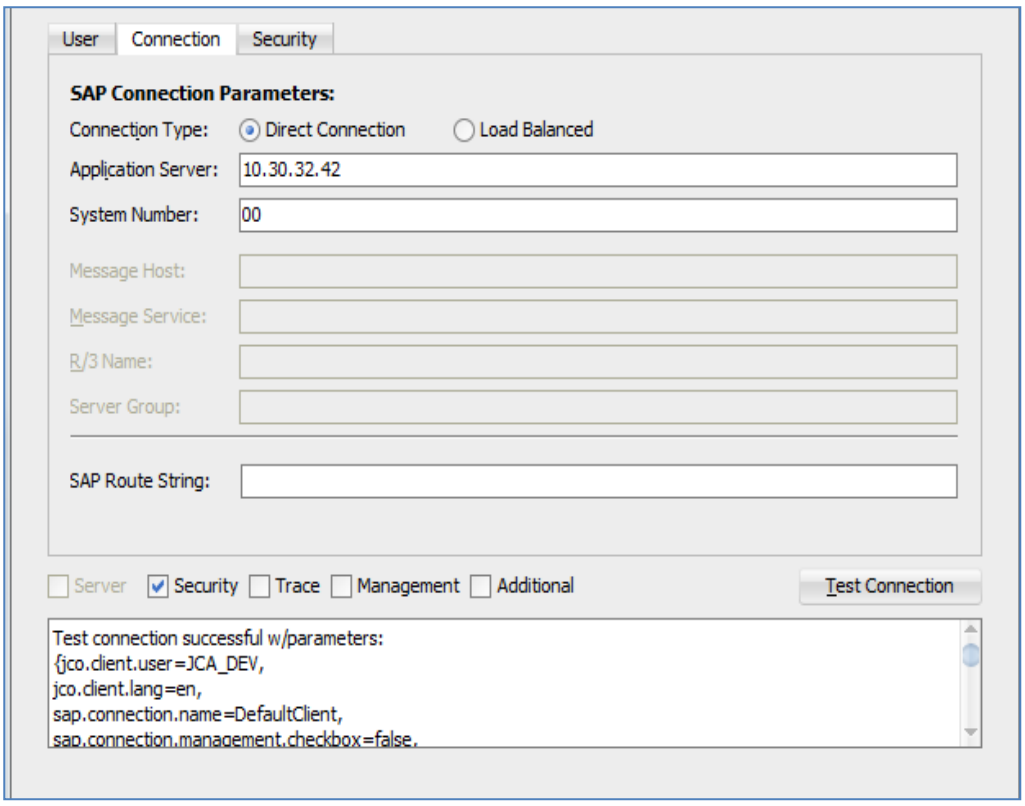
Note: Load balancing enables the administrator to distribute logins evenly between several application servers. It also allows configuring a bigger system landscape transparently, since the client does not need to know the address of all application servers, but only the address of the message server (load balancer).

Primarily used when you want more than one user to be able to log in to the SAP system.

Test Connection

A Test Connection button is also available on Connection tab, as shown in Figure 6-12. The **Test Connection** button test the connection to SAP with the Specified parameters.

Figure 6-12 Connection Tab



Optional tabs can be added by selecting the corresponding check bos:

- Server tab (**Note**: In case of outbound adapter, this tab is disable.)
- Security tab
- Trace tab
- Management tab
- Additional tab

Server Tab

This tab appears in case of Inbound adapter. Parameters available in this tab is useful in inbound communication with SAP, as shown in Figure 6-13.

Figure 6-13 Server Tab

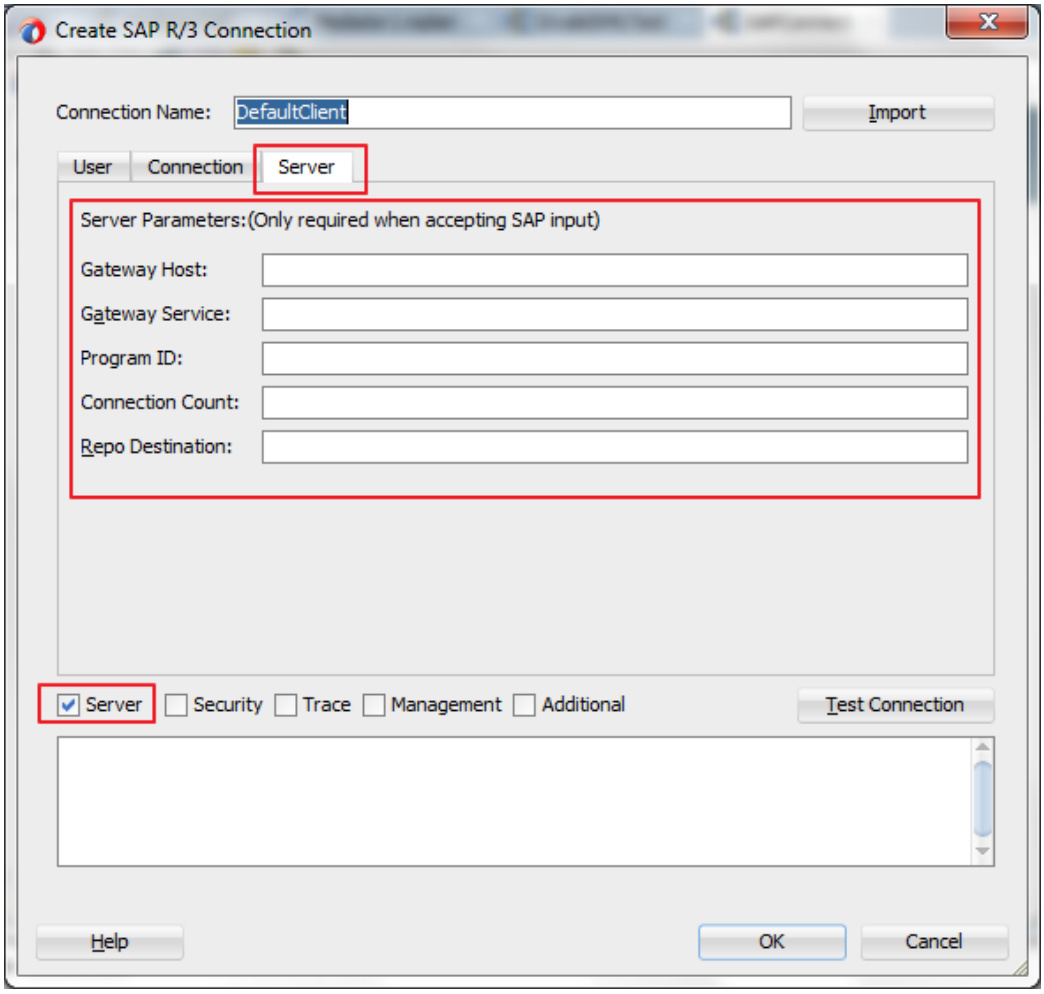


Table 6-1 lists the parameters available in **Server** tab.

Table 6-1

Element	Description
Gateway Host	Enter Gateway host name of the sender system.
Gateway Service	Gateway service of the sender system. This can be the numeric description of the service port in the sender system or the alphanumeric equivalent (e.g., sapgwXX, where XX is the system number of the sender system).
Program ID	Program ID of the registered server program in SAP. The selected program ID must uniquely describe the RFC sender channel in the configured gateway (Application Server (Gateway) and Application Server Service (Gateway) parameters).
Connection Count	Number of initial connections required between sender system and adapter.
Repo Destination	The repository used by the server to lookup the definitions of an incoming function call.

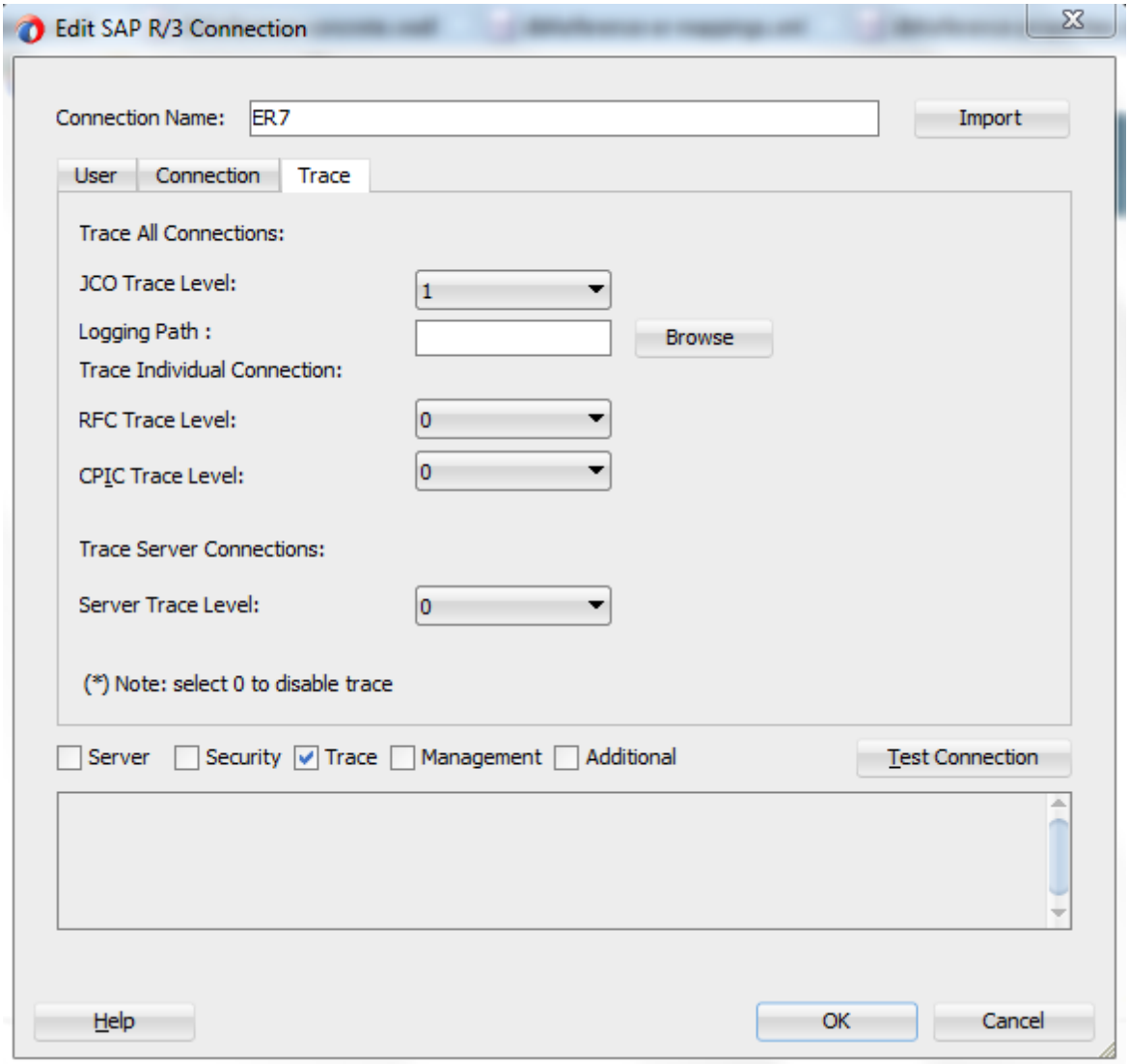
Note: The server tab is not supported in the current release.This will be implemented for future releases.

Trace Tab

Trace Parameters (Optional)

To change the logging level of SAP JCo using following parameters, specify trace level based on JCo level or individual level like RFC Trace Level, CPIC Trace Level or Server Trace Level, as shown in Figure 6-14.

Figure 6-14 Trace Tab



JCo Trace Level

Use this procedure to trace JCo calls coming from the SAP systems. The JCo Traces write information about the invocated methods and the data passed through the underlying communication layers throughout the call.

Note: The activation of JCo Traces significantly slows down the communication. Therefore, you must only activate them if necessary

Trace level of 0 means disabled and 1 means enabled.

JCo Trace Level: Select values from 0 or 1.

User need to provide the Logging Path to generate the trace file for desired location in case path is not given,default location for the trace file would be $jdev_home/jdev/bin

Figure 6-15 JCo Trace Level

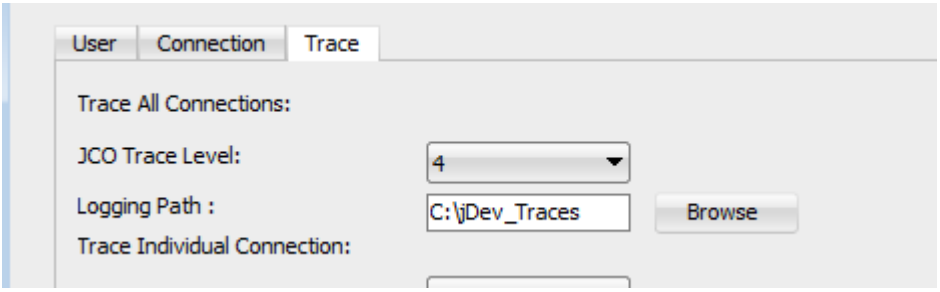
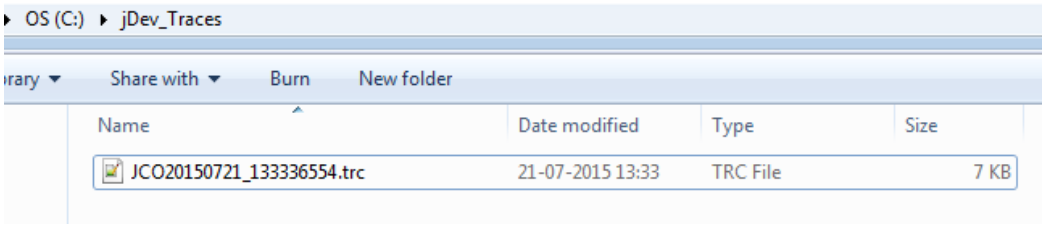


Figure 6-16 JCo Trace Level



RFC Trace Level

Using the RFC trace, users can track which remote calls application or the SAP System triggers and on which instance these calls are executed. Users can display and further analyze the trace records logged in the trace file.

From the time users turn on the RFC trace function, to the time they turn it off again, all RFC calls occurring either for a specific user or for a user group are recorded.

From the recorded trace, user can deduce:

- Which function modules have been called remotely by the program to be analyzed.
- Whether the RFC was executed successfully.
- The total time used to process the remote call.
- The marking of the RFC communication (RFC client or RFC server).
- On which instance the remote call was executed.
- With which technical parameters this instance is characterized.
- The number of bytes sent and received during the RFC .

RFC Trace Level: Select this if user wants theRFC level trace to be either 0 or 1.

CPIC Trace Level

Common Programming Interface - Communication (CPIC) tracing. This is the communication layer under JRFC (or JCo). You can choose a trace level from 0 to 3, where 3 is the highest and most detailed level of tracing.

Since JCo is internally using the RFC and CPIC libraries, the related traces of these components are also sometimes required for an error analysis.

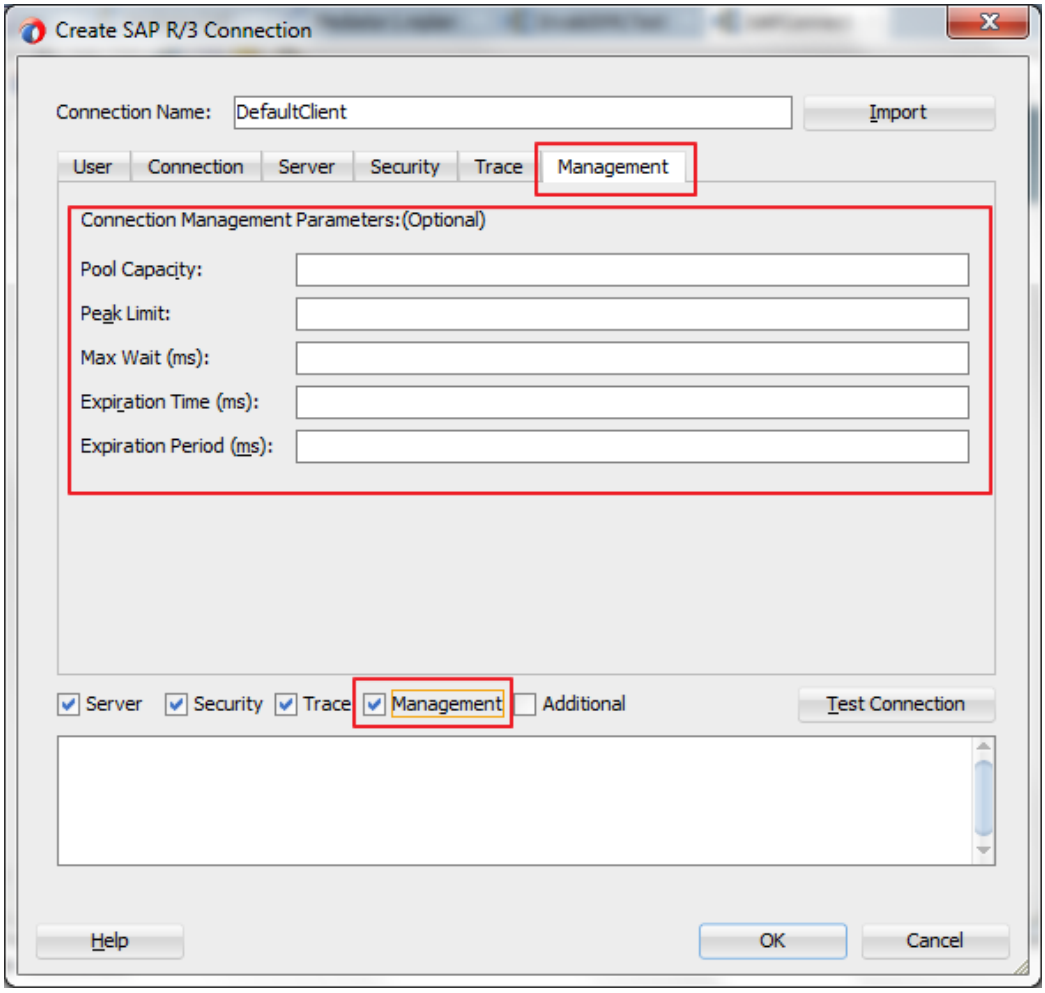
CPIC Trace Level: Select one of the given trace level for CPIC tracing from 0 to 3.

Management Tab

Management Parameters (Optional)

This tab provides parameters that help in managing the connection life. You can define connection pool size and other parameters to ensure connection life, as shown in Figure 6-17.

Figure 6-17 Management Tab



1. **Pool Capacity:** Maximum number of connections which will be kept open by the pool for possible reuse. These connections will be automatically closed if they cannot be reused for more than the **Connection Timeout** period. A value of 0 has the effect that there is no connection pooling, i.e. connections will be closed after each request.

2. **Peak Limit:** Maximum number of connections which can be allocated from the pool. This enables the user to create more connections as specified by the Peak Limit parameter, e.g. for temporary peak usage times. If the value for **Maximum connections** is less than the value of the parameter **Peak Limit**, the parameter will automatically be reset to the value of **Peak Limit**. All allocated connections exceeding the **Peak Limit** will be closed immediately, if they are released from the application to the pool again.

3. **Max Wait (ms):** Defines the maximum time to wait to obtain a requested connection. If the connection pool is exhausted (that means the **Maximum Connections** limit is reached) and another thread is requesting an additional connection, this is the time that is being waited for some connection to be released by another thread so that that one can be handed out to the waiting thread. If the maximum waiting time is reached, and no connection became available in the mean time, then a JCO.Exception with the key *JCO_ERROR_RESOURCE* is thrown. The default value for the **Maximum Waiting Time** is 30 seconds (30,000 ms).

4. **Expiration Time (ms):** Time in ms after which the connections held by the internal pool can be closed.

5. **Expiration Period (ms):** Enter expiration period in milliseconds, this is the interval in ms with which the timeout checker thread checks the connections in the pool for expiration.

Note: The Management tab is not supported in the current release. This will be implemented for future releases.

Security Tab

SAP Security Parameters

The Adapter for SAP uses the Java Connector (JCo) to communicate with the SAP. You can have the SNC connection in the case of both inbound and outbound. The JCo needs the information as mentioned below to be able to use SNC for the connection.

Prerequisite for SNC Communication (Inbound or Outbound)

You have an SNC communication between the client server (Adapter for SAP) and the SAP, only once the SNC configuration is done on both the partner sides and the required certificates are exchanged according to the procedure mentioned by SAP.

SNC parameters for Outbound

SNC Parameters required for Outbound Connection to the SAP Server, as shown in Figure 6-18.

Figure 6-18 Security Tab

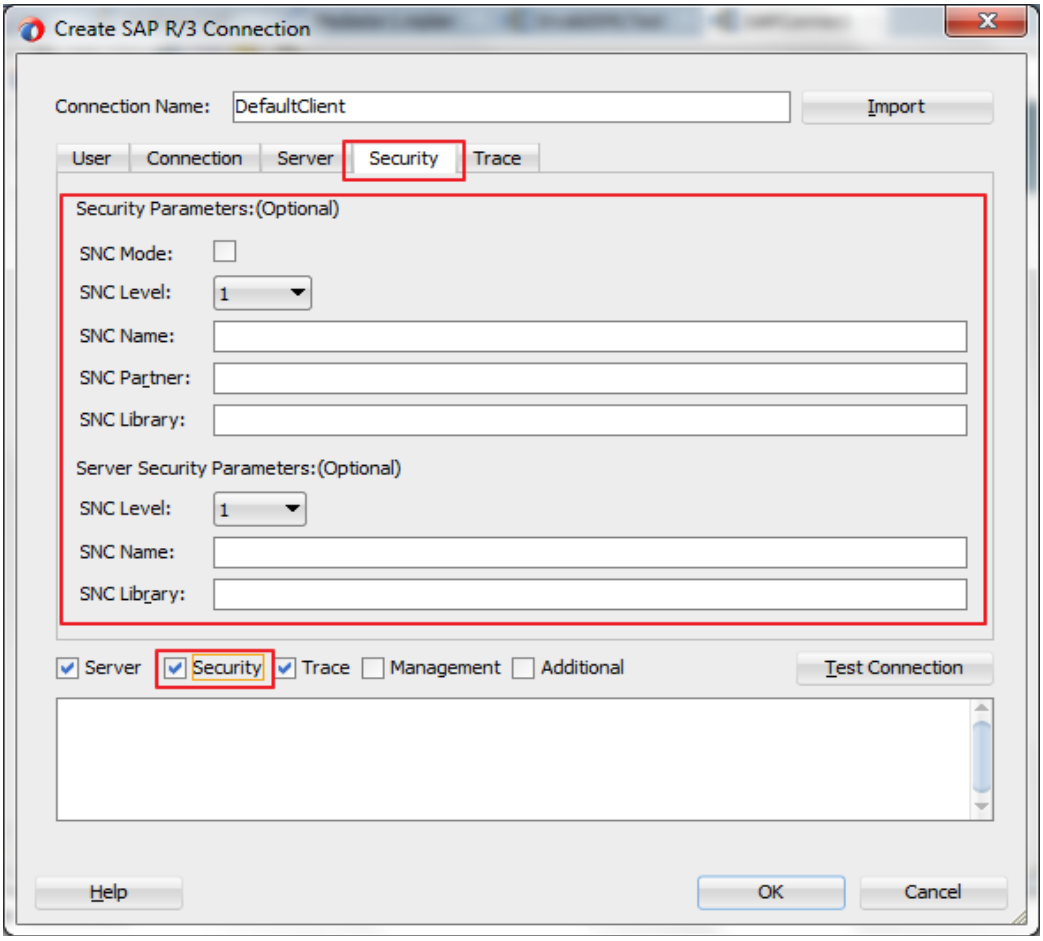


Table 6-2 lists the parameters available in **Security** tab.

Table 6-2 Parameter Available in Security Tab

Parameter	Description
SNC mode (Required field)	This is a flag for activating SNC . Check the checkbox for enabling and uncheck for disabling the SNC connection.
SNC library	This specifies the path and file name of the external library (SAP Cryptographic library file downloaded from the SAP). The sample path is *'C:\SAPNW_AS_Java\SAPCryptolib\sapcrypto.dll'*.
SNC Level	This specifies the level of protection to use for the connection. Default value is **3**. Possible values of this field are as mentioned below: 1: Authentication only. 2: Integrity protection. 3: Privacy protection (default). 8: Use the value from profile parameter '*snc/data_protection/use'* maintained on the SAP server.

	9: Use the value from profile parameter '*snc/data_protection/max'* maintained on the SAP server.
Parameter	Description
SNC Name	This specifies the SNC name of the environment where user is testing SNC communication. The sample name is 'p:CN=AS Java, O=MyCompany, C=US'. Although this parameter is optional, use it to make sure that the correct SNC name is used for the connection.
SNC Partner	This specifies the AS ABAP 's SNC name. The sample name is 'p: CN=EQ6, OU=I0020070395, OU=SAP Web AS, O=SAP Trust Community, C=DE'.

SNC Parameters for Inbound

Prerequisite for Inbound SNC Communication

Inbound SNC communication after defining the RFC options for the Program ID that you have used for the connection and enabling the SNC by activating the same in the corresponding RFC destination. This can be done in the tcode SM59. The parameters to be passed in the 'SNC options' are as follows:

1. In the **RFC Destination**, select the **SNC** button in the **Logon & Security** tab. Pass the below values:
   - **QoP :** Select any of the values of 1,2,3,8 & 9 as displayed in the drop-down box. This specifies the level of protection to use for the connection.
   - **PartnersPartners:** The RFC server program's SNC name has to be specified here. For e.g., 'p: CN=RFC, OU=IT, O=CSW, C=DE'.
   - Save the parameters.
2. Activate the SNC by selecting the radio button **Active** in the **Logon & Security** tab of the RFC destination.

Table 6-3 shows the SNC Parameters required for Inbound Connection to the SAP Server:

Table 6-3 SNC Parameters required for Inbound Connection

Element	Description
SNC Level (Optional field)	This specifies the level of protection to use for the connection for the inbound connection from SAP. Default value is '3'. Possible values of this field are as mentioned below: 1: Authentication only. 2: Integrity protection. 3: Privacy protection (default). 8: Use the value from profile parameter '*snc/data_protection/use'* maintained on the SAP server. 9: Use the value from profile parameter '*snc/data_protection/max'* maintained on the SAP server.

Table 6-3 SNC Parameters required for Inbound Connection Continues

Element	Description
SNC Name (Optional field)	This Specifies the SNC name of the environment where user is testing SNC communication. The sample name is 'p:CN=AS Java, O=MyCompany, C=US'. Although this parameter is optional, set it to make sure that the correct SNC name is used for the connection.
SNC library (Optional field)	This Specifies the path and file name of the external library (SAP Cryptographic library file downloaded from the SAP). The sample path is '*C:\SAPNW_AS_Java\SAPCryptolib\sapcrypto.dll'*.

The Properties in the WebLogic console can be used for run-time SNC communication of Adapter for SAP. The corresponding parameters in the DT and RT are given in the Table 6-4.

Table 6-4 Parameters in the DT and RT

Parameters in Design-Time	Corresponding Parameters for Run-time
Client Security Parameters:	
SNC mode	DestinationDataProvider_JCO_SNC _MODE
SNC library	DestinationDataProvider_JCO_SNC _LIBRARY
SNC Level	DestinationDataProvider_JCO_SNC _QOP
SNC name	DestinationDataProvider_JCO_SNC _MYNAME
SNC Partner	DestinationDataProvider_JCO_SNC _PARTNERNAME
Server Security Parameters:	
SNC Level	ServerDataProvider_JCO_SNC _QOP
SNC name	ServerDataProvider_JCO_SNC _MYNAME
SNC library	ServerDataProvider_JCO_SNC _LIBRARY

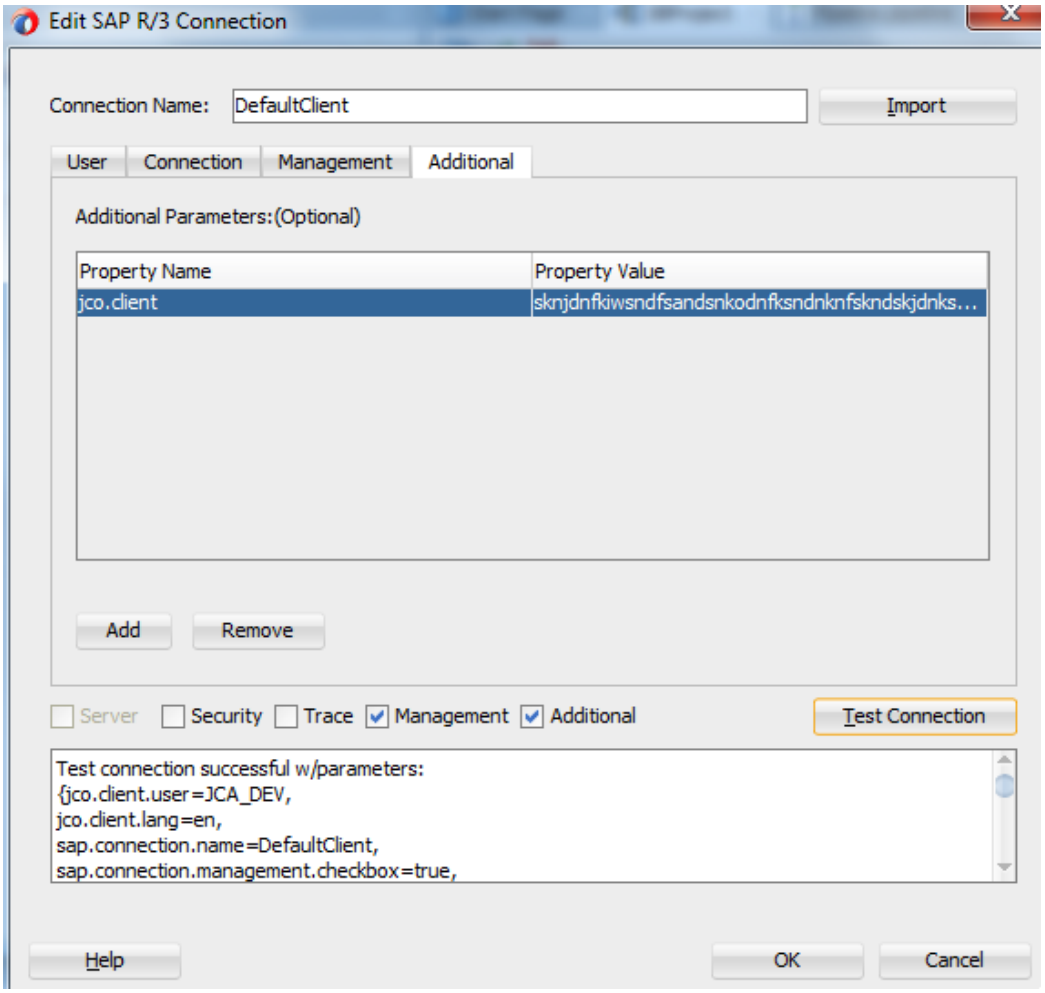
Additional Tab

This tab enables you to provide extra JCo connection parameters that are not defined in the other tabs of the Connection page in the wizard. In **Property Name** provide JCo property and in **Property Value** column provide value of that particular JCo parameter.

When these properties are defined in the Additional tab, the same is used for connection. These properties and corresponding values are also reflected while checking the parameters through **Test Connection** button, as shown in Figure 6-19.

Note: The additional tab is not supported in the current release.This will be implemented for future releases.

Figure 6-19 Additional Tab



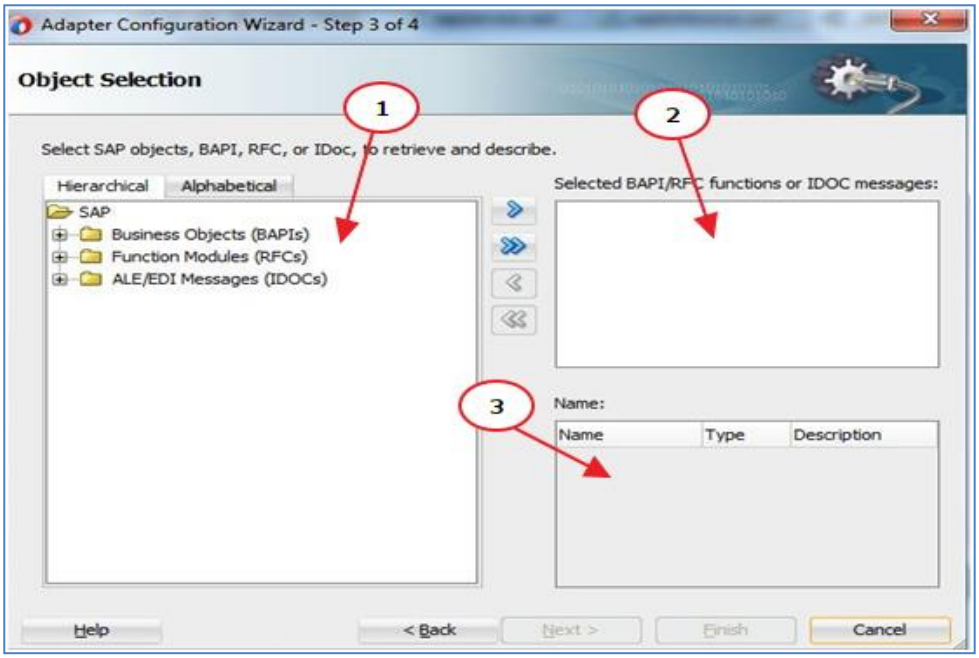
6.5 Select SAP Objects from Objects Selection

Once connected to an SAP server using the connection definition, the **Object Selection** page appears which enables you to select SAP BAPI , RFC , or IDoc objects.

This wizard has three panels, as shown in Figure 6-20.

1. Object panel.
2. Selected BAPI /RFC functions or IDoc messages panel.
3. Definition panel.

Figure 6-20 Object Selection Page



6.5.1 Object Panel

The Object Panel shows two tabs, that is, Hierarchical and Alphabetical .

- **Hierarchical** : This tab shows all the SAP Objects (RFC /BAPI /IDoc) available in that SAP system in hierarchical form, as shown in Figure 6-21.

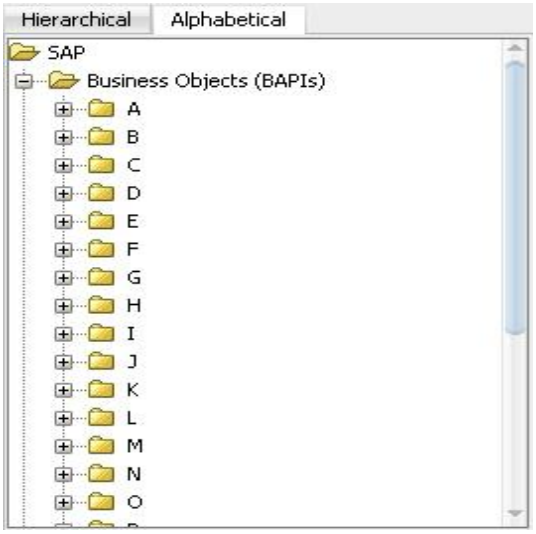
  For each of the root notes BAPI/RFC/IDoc, The hierarchy is arranged with the Application Components, Subcomponents, Business Object types, Business Objects, Methods with the levels of hierarchy directed from the root node to leaf node.

Figure 6-21 Hierarchical Tab

- **Alphabetical :** This tab shows all the Business Objects available in that SAP system in the

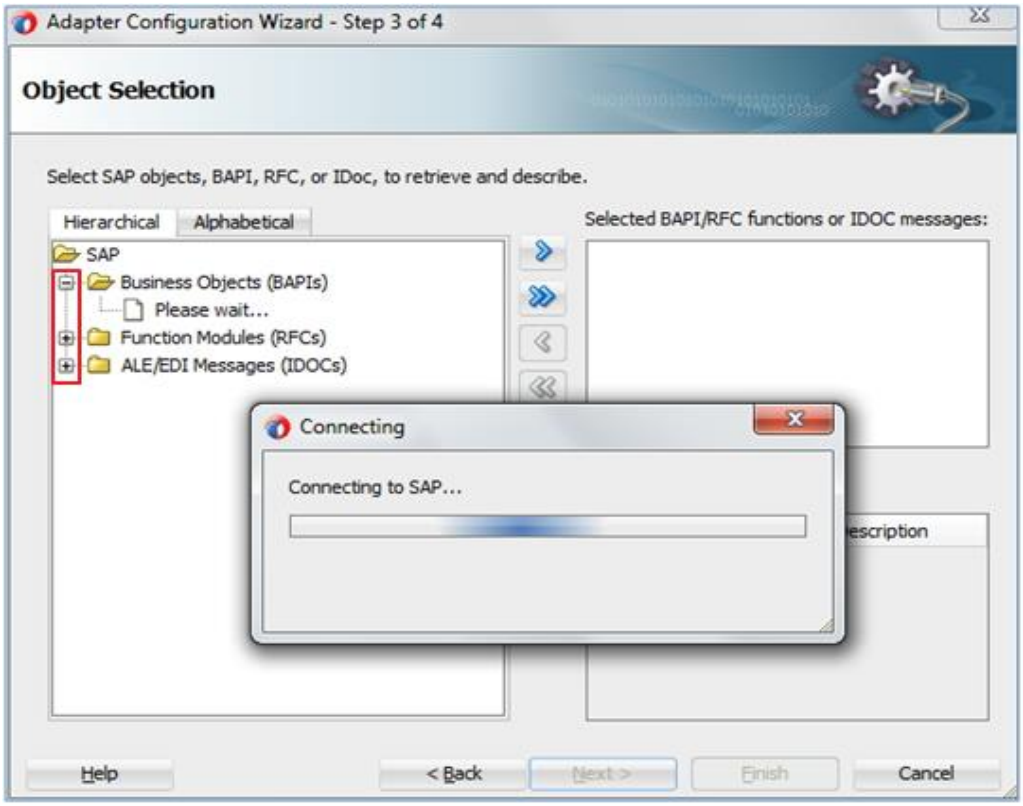
alphabetical form(A to Z), as shown in Figure 6-22.

Figure 6-22 Alphabetical Tab



You can select any option for browsing the SAP business objects. This can be done by clicking on + icon that establish a connection to SAP and displays all the objects of the expanded node as shown in Figure 6-23.

Figure 6-23 Expanded Node



Once the SAP connection is established and all objects are displayed, you can search and select the desired object using **Search SAP Repository** and providing exact or pattern matched string.

To search the object, select the required object, right-click and select **Search** option as shown in Figure 6-24.

Figure 6-24 Search Option

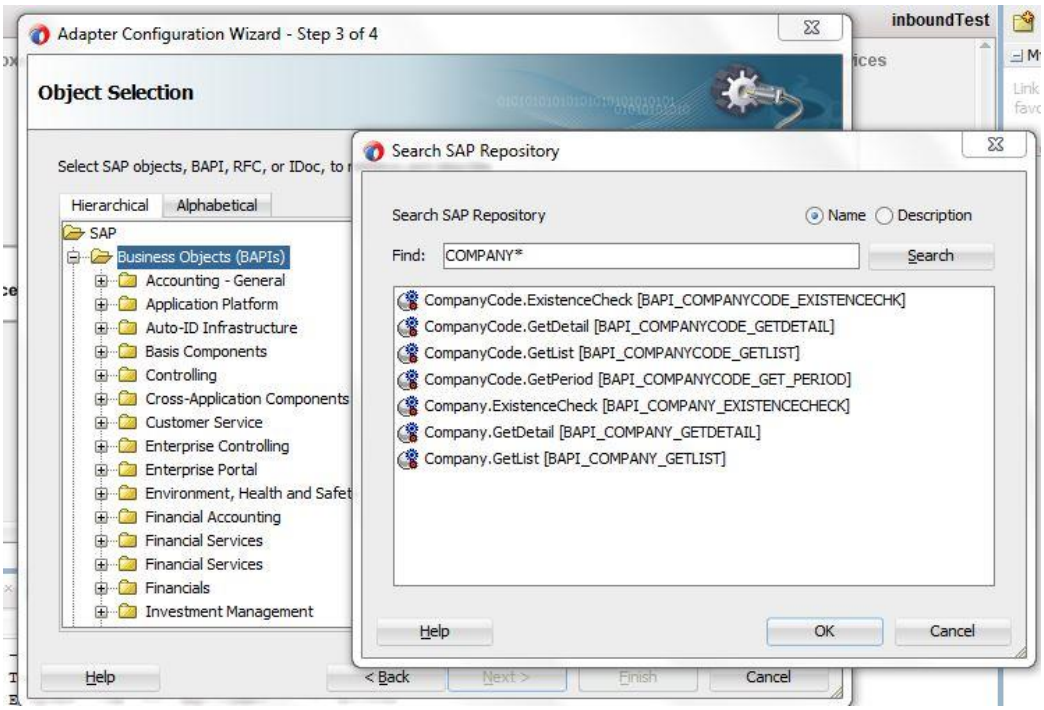
The object can be searched by two ways, **Name** or **Description,** as shown is Figure 6-25.

- **Name :** If you select the **Name** radio button, the search occurs only on the basis of name of the object.
- **Description :** If you select the **Description** radio button, the search occurs only on the basis of description of the object.

To search any object, the search criteria needs to be passed in the **Find** field. Once you provide the criteria and click on **Search** button, the objects matching the search criteria is displayed in the text area just below to the **Find** field.

Once the objects are displayed in the text area, you can select the objects by clicking on **OK** button.

Figure 6-25 Search SAP Repository



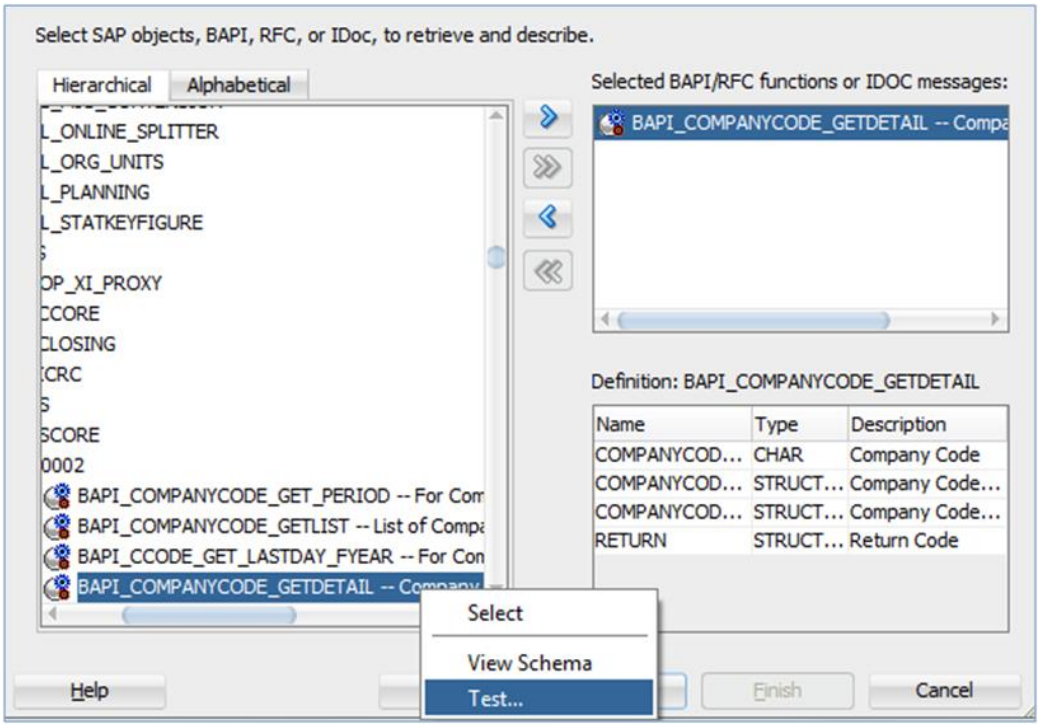
Once the desired object is selected, it is moved to **Selected BAPI /RFC functions** or **IDoc messages** panel.

After identifying the required object in the Hierarchy/Alphabetical list, below three operations can be performed on object, as shown in Figure 6-26.

Select the required object, right-click and select **Select**, **View Schema**, or **Test** option.

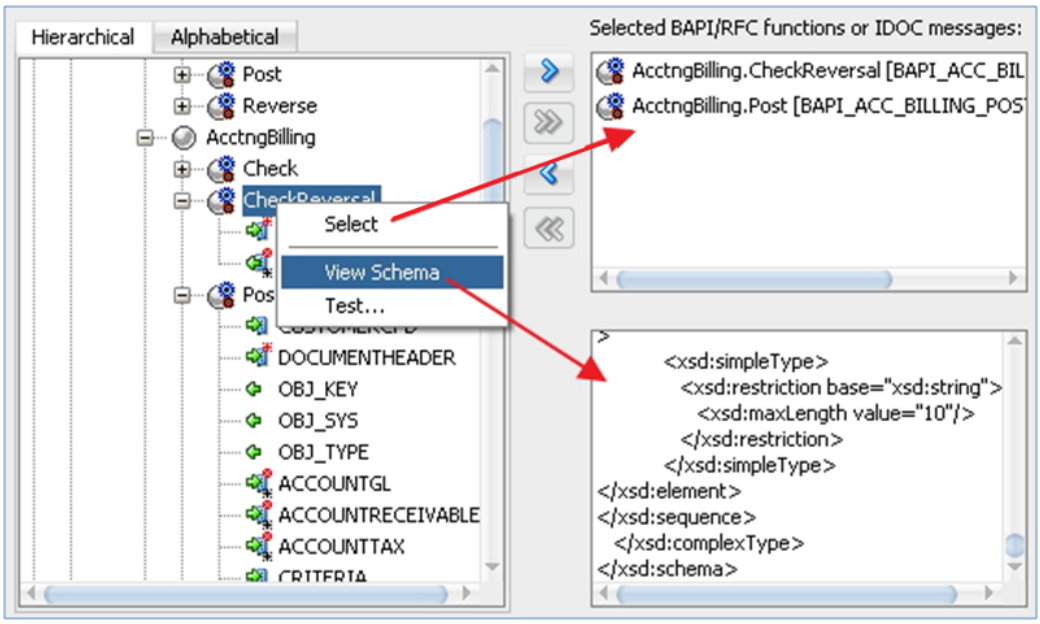
- **Select:** Once **Select** is clicked, the selected object is added to the **Selected BAPI /RFC functions or IDoc messages** panel.

Figure 6-26 Select, View Schema, and Test



- **View Schema**: You can view the created xsd schema of the object in the **Definition** panel, as shown in Figure 6-27.
- **Test :** You can test the created schema by this option. This feature is supported only for BAPI and RFC .

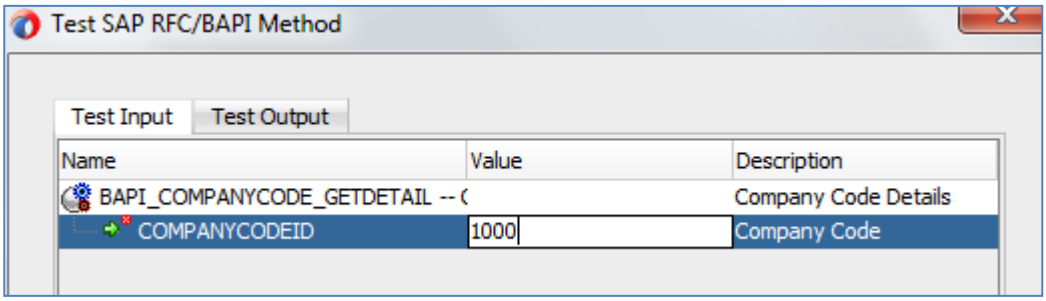
Figure 6-27 Select and View Schema Result



Once the **Test** option is clicked, a popup window appears, with **Test Input** and **Test Output** tabs, as shown in Figure 6-28.

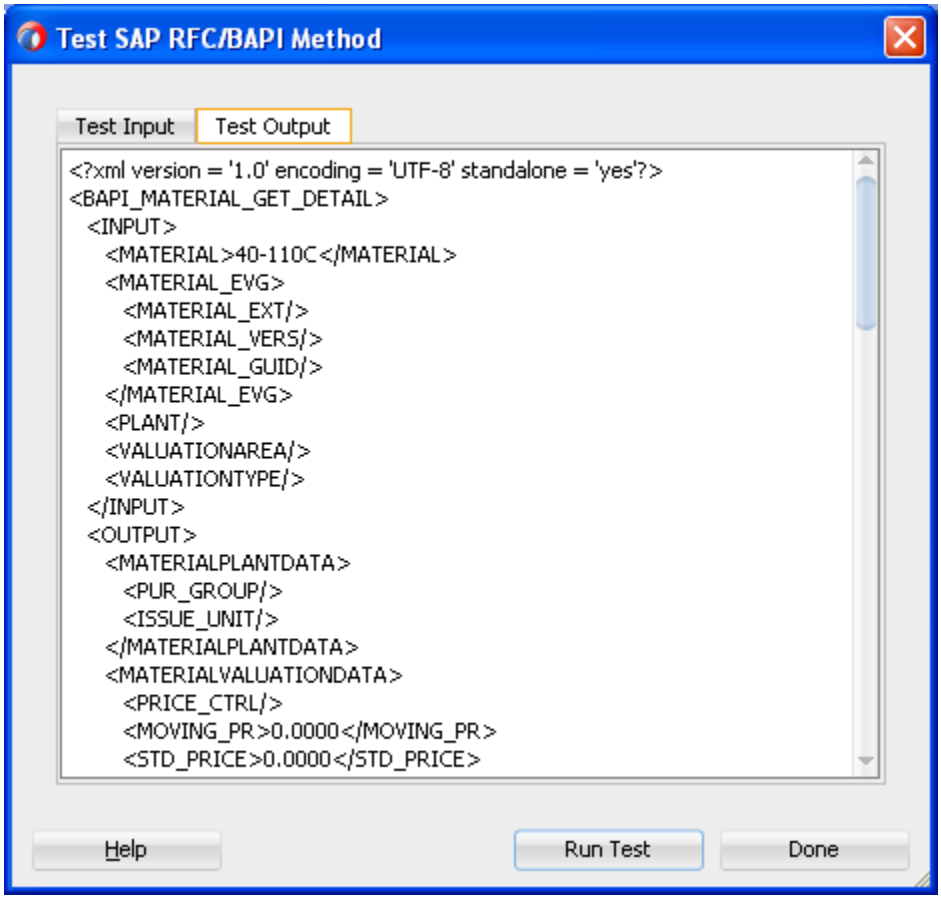
1. **Test Input:** Test Input tab has three columns as mentioned bellow:
   - **Name :** Name of the object.
   - **Value :** Value is given by the user as an input to test the created schema of the selected object.
   - **Description :** Description of the each field of the object.

Figure 6-28 Test Input Tab



2. **Test Output:** Once you have provided the input and clicked on **Run Test**, this option tests the created schema of the selected object and displays the result in the text area of the **Test Output** tab, as shown in Figure 6-29.

Figure 6-29 Test Output Tab



You can close the test window by clicking on **Done** button.

6.5.2 Selected BAPI /RFC functions or IDoc messages panel

This panel contains the selected BAPI /RFC functions or IDoc messages, as shown in Figure 6-30. Once you select the desired object, the selected object can be added or removed from the **Selected BAPI/RFC functions or IDoc messages** panel by clicking on the icons mentioned in Table 6-5.

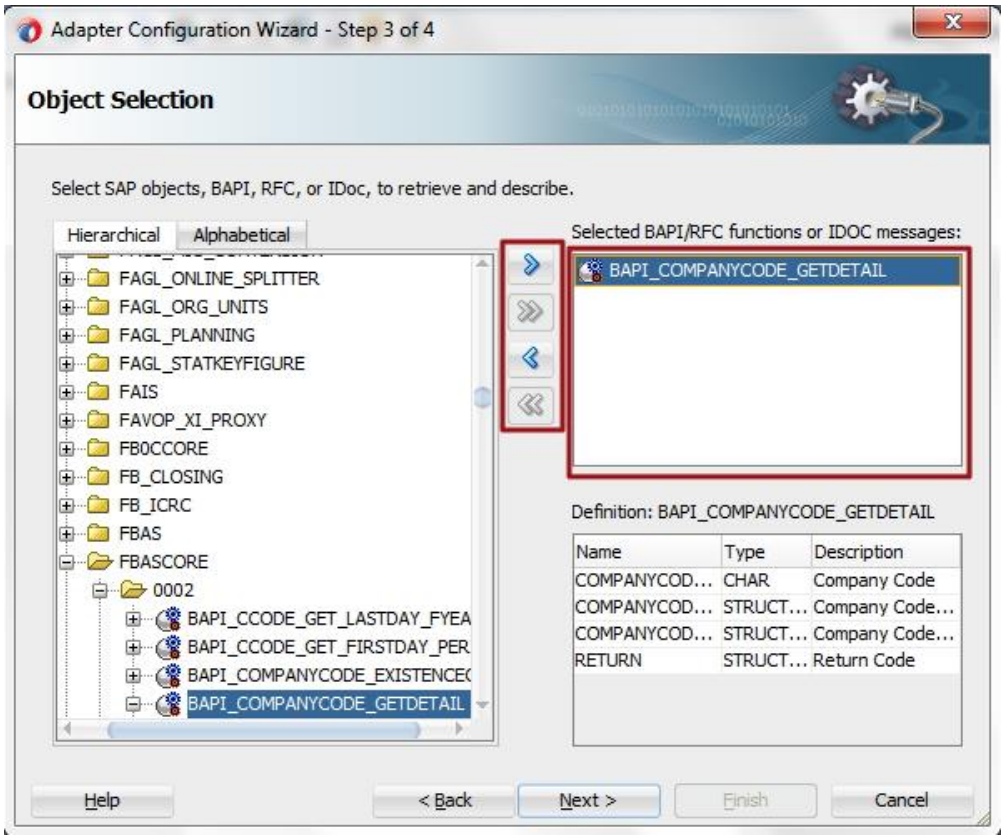
Table 6-5 Add/Remove Object Icon

Icon	Description
	This icon gets enabled when you select only one object to shifts into the selection panel.
	This icon gets enabled when you select only one object to remove from the selection panel.
	This icon gets enabled when you select more than one object to shift into the selection panel.
	This icon gets enabled when you select more than one object to remove from the selection panel.

Once any corresponding object is selected in the **Search** window, it will be automatically added to this panel.

Note: If you select the RFC Object while creating an outbound endpoint, an option is available to define type (sRFC, tRFC, qRFC, bgRFC) of RFC connection you wanted to use while executing this object. A popup window appears, where you can choose the RFC type when you right-click on the selected RFC Object.

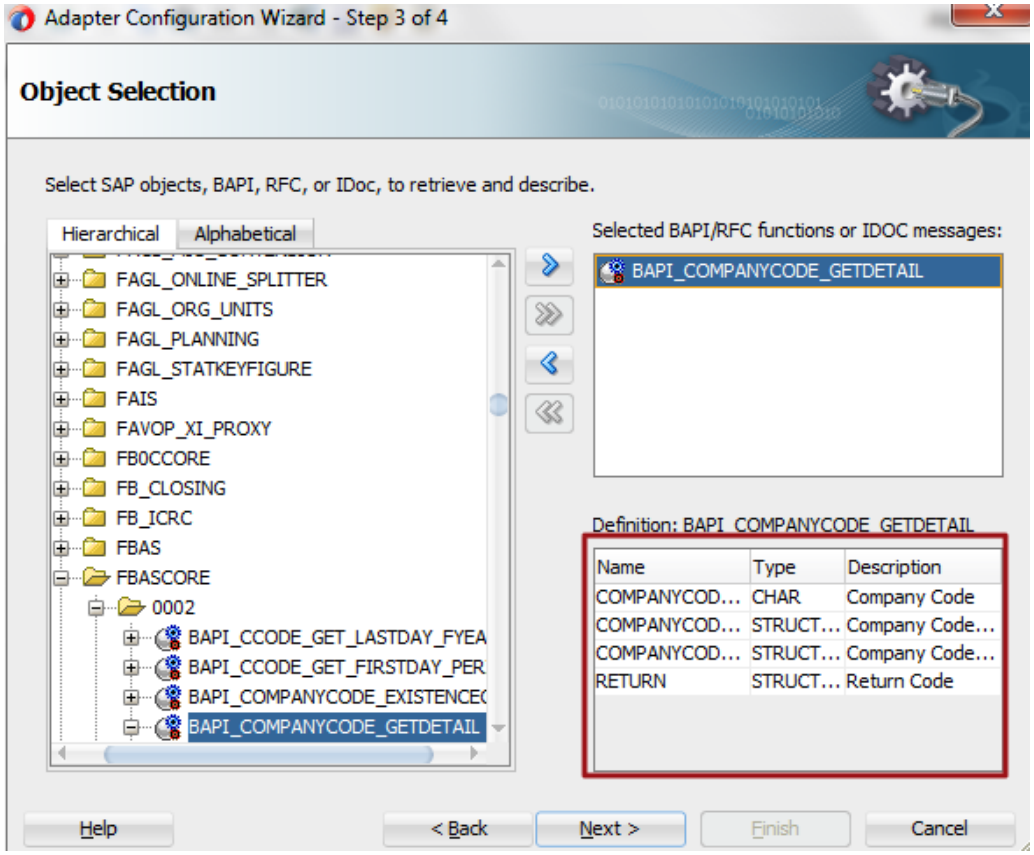
Figure 6-30 Selected BAPI /RFC functions or IDoc messages panel



6.5.3 Definition panel

This panel contains the further definition of the selected object. Object Schema Details are visible in this panel. Definition panel has three columns: **Name** , **Type**, and **Description** which defines the fields of the selected object, as shown in Figure 6-31.

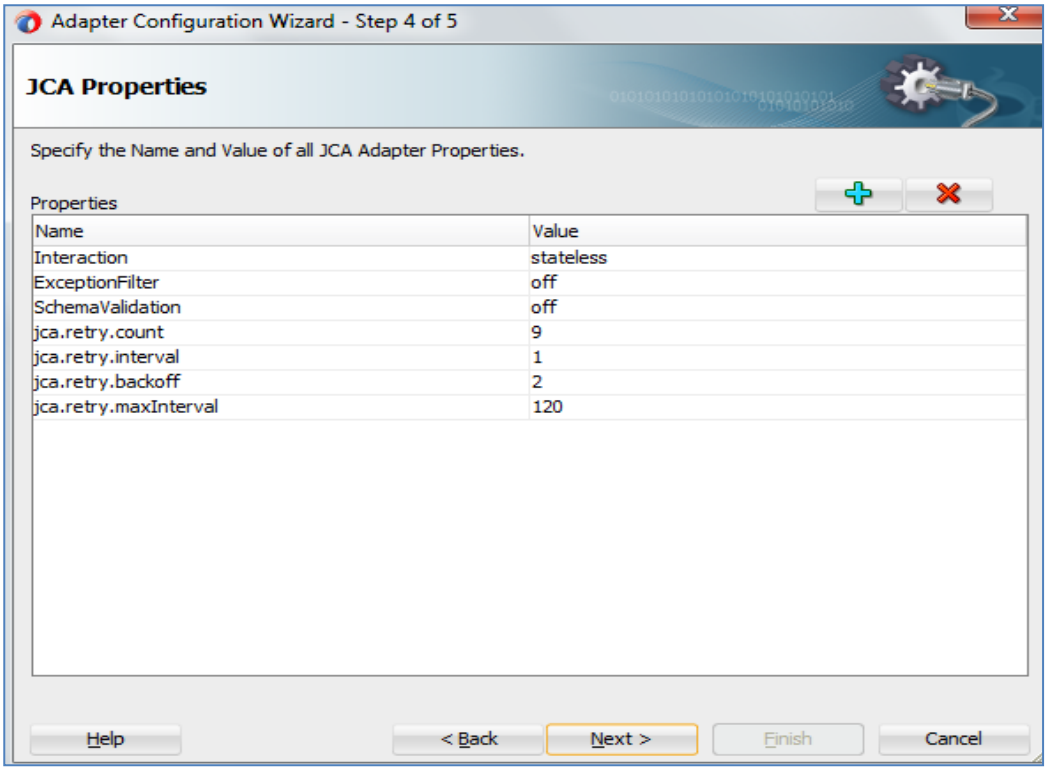
Figure 6-31 Definition panel



6.6 JCA Properties Page

JCA properties page enables the user to define JCA properties of the SAP endpoint. This page has two tabs i.e. + (ADD) and **x** (REMOVE). You can **Add**, **Delete** and **Update** the properties and respective values, as shown in Figure 6-32.

Figure 6-32 JCA Properties



6.6.1 Interaction of JCA Properties (Outbound to the Adapter)

Interaction

- **Stateless**

This treats each request as an independent transaction that is unrelated to any previous request so that the communication consists of independent pairs of requests and responses. This does not require the server to retain session information or status about each communications partner for the duration of multiple requests. Note that the default value is **Stateless** .

- **Stateful**

The state of the session is maintained in the session ID for the duration of the conversation between the client and the stateful session. If user selects **Interaction pattern** as stateful then the following extra operations automatically get added.

This is required in case you are creating or changing data in SAP through Standard/Custom BAPI /RFC which does not support an internal commit to database.

ExceptionFilter

- **On**

This property enables the user to set a custom exception filter class that implements the interface:

oracle.tip.adapter.api.exception.ExceptionFilter

The exception filter is supported only for outbound processes. This class name is defined in the .jca file to filter the generated exceptions and categorizes them into the following categories:

- PCRetriableResourceException - A remote fault.
- PCResourceException - A binding fault.

This exception can then be handled by the SOA composite fault policy files.

- **Off**

In this case, no exception filter class is added in the .jca file and no exceptions like *PCRetriableResourceException/PCResourceException* are thrown in case of remote or binding faults. Note that the default Value is **off** .

SchemaValidation

- **On**

SchemaValidation **ON** is used to validate the Input XML document with the schema in the WSDL document during run-time. On failure, the XML record is rejected with the error **Invalid Input Xml**. This can be configured in a .jca file.

- **Off**

No Validation of Input XML is done with the xsd. Anything wrong in the input XML is rejected with the JCO exception. Note that the default value is **off** .

Queue Name

Queue Name needs to be specified to serialize the data that is being sent, like function modules which depend on each other (such as update and then change) i.e. Queued RFC **(**QRFC) connections are used to transport outbound messages to SAP through the queue. This queue needs to be configured in SAP first, and is given in the **Queue name** field of the configuration wizard.

Note that the default value is blank. This is applicable for IDOCs.

jca.retry.interval

This property specifies the time interval between each retry.

jca.retry.maxInterval

This property specifies the maximum value of retry interval, i.e. a cap if backoff>1.

jca.retry.count

This property specifies the number of times that user wants the retry to be carried out.

jca.retry.backoff

This property specifies the retry interval growth factor (positive integer). The user have to wait for increasing periods of time between retries 9 attempts with a starting interval of 1 and a back off of 2 will lead to retries after 1, 2, 4, 8, 16, 32, 64, 128, and 256 (28) seconds.

6.6.2 Activation of JCA Properties (Inbound to the Adapter) ControlCharacter

The Adapter for SAP provides Non-Xml character handling for the data that is coming from SAP system to the adapter. XML does not support all characters defined in Unicode. For example, control characters, some of the control character not supported by XML 1.0.

- **encode**

Any character in payload if not supported by XML 1.0, will encode character with its decimal format.

- **remove**

Any character in payload if not supported by XML 1.0, will remove character.

- **space**

Any character in payload if not supported by XML 1.0, will replaces the character with space.

AutoSYSTAT01

- **Yes**

In this case, Adapter for SAP is able to auto return the sent SYSTAT01 IDoc back to SAP with a positive response (code 53) upon a successful reception of an IDoc message.

- **No**

In this case, nothing is sent back to SAP by the Adapter upon a successful reception of an IDoc message. Note that the default value is **No**.

EncodeIDoc

- **Flatfile**

SAP uses a non-XML text-based format, called the Flatfile IDoc format, for serializing IDoc messages to file system. In a Flatfile IDoc, all IDoc records including control record and data record are stored in lines of text separated by a line delimiter.

- **No**

SAP uses the XML format to send IDoc records the field names and complete data.

Note that the default value is **No**.

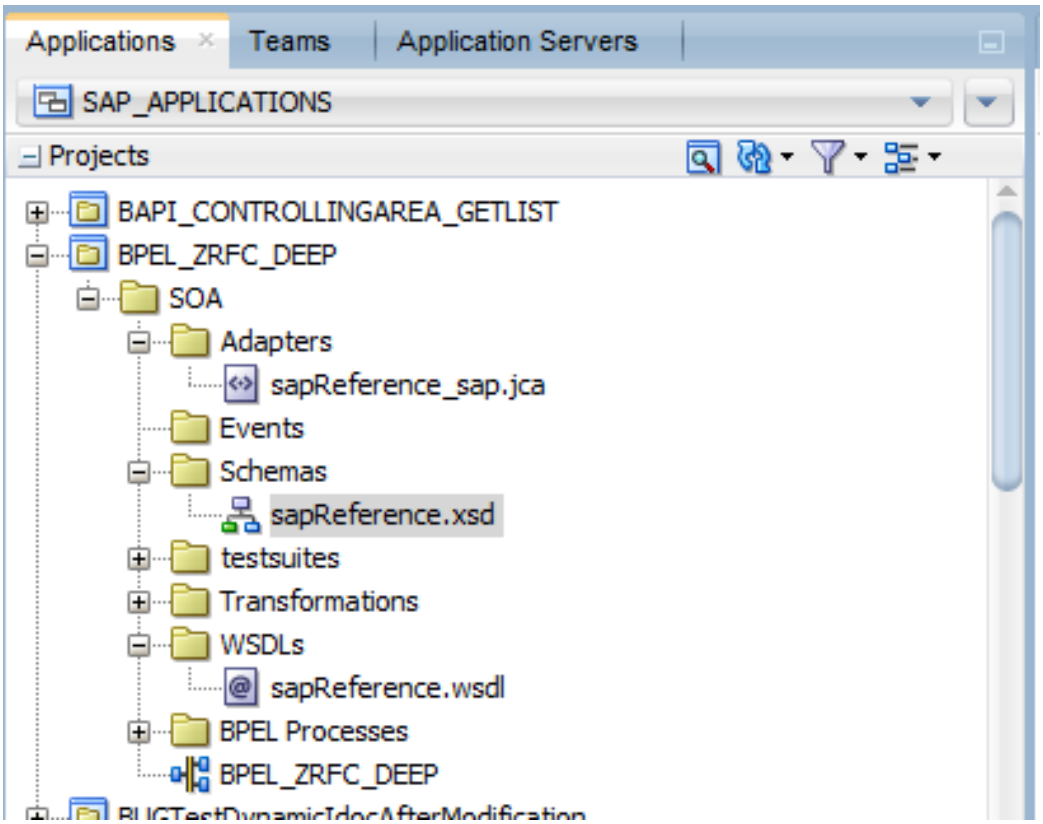
programID

The programID specified at the DT level overrides with RT.

6.6.3 Generation of Corresponding (JCA) Artifacts (WSDL/XML Schemas)

SCA artifacts such as XSD, WSDL, and JCA properties are generated for SAP endpoints directly within the composite designer of JDeveloper. The .xsd defines the schema definition for the selected object whereas .jca file contains all the JCA properties for that project like ConnectionFactory JNDI name UIConnectionName, portType operation and various properties like ExceptionFilter, SchemaValidation, QueueName, and object type along with the respected values, as shown in Figure 6-33.

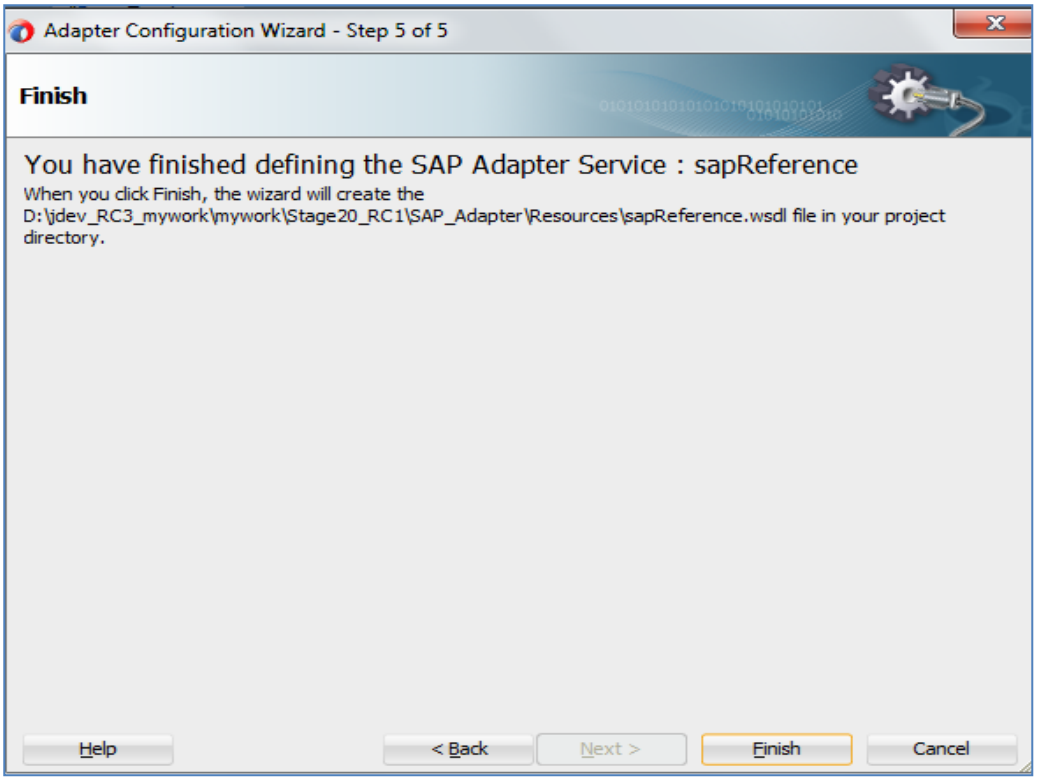
Figure 6-33 Generation WSDL/ XML Schemas Screen



6.7 Finishing with Adapter Configuration Wizard

The finish page provides a summary of the SAP endpoint definition and location of generated interface files, as shown in Figure 5-34.

Figure 6-34 Finish Page



7

Configuring the Adapter Run-Time Parameters on the WebLogic Server

This chapter describes the procedure to configure the Oracle Adapter for SAP on the Oracle WebLogic Server. This chapter contains the following topics:

- Section 7.1, "Adapter Integration with Oracle WebLogic Server"

Prerequisites:

- The WebLogic Application server is running.
- SAP JCo jars and library is installed in the WebLogic application server.

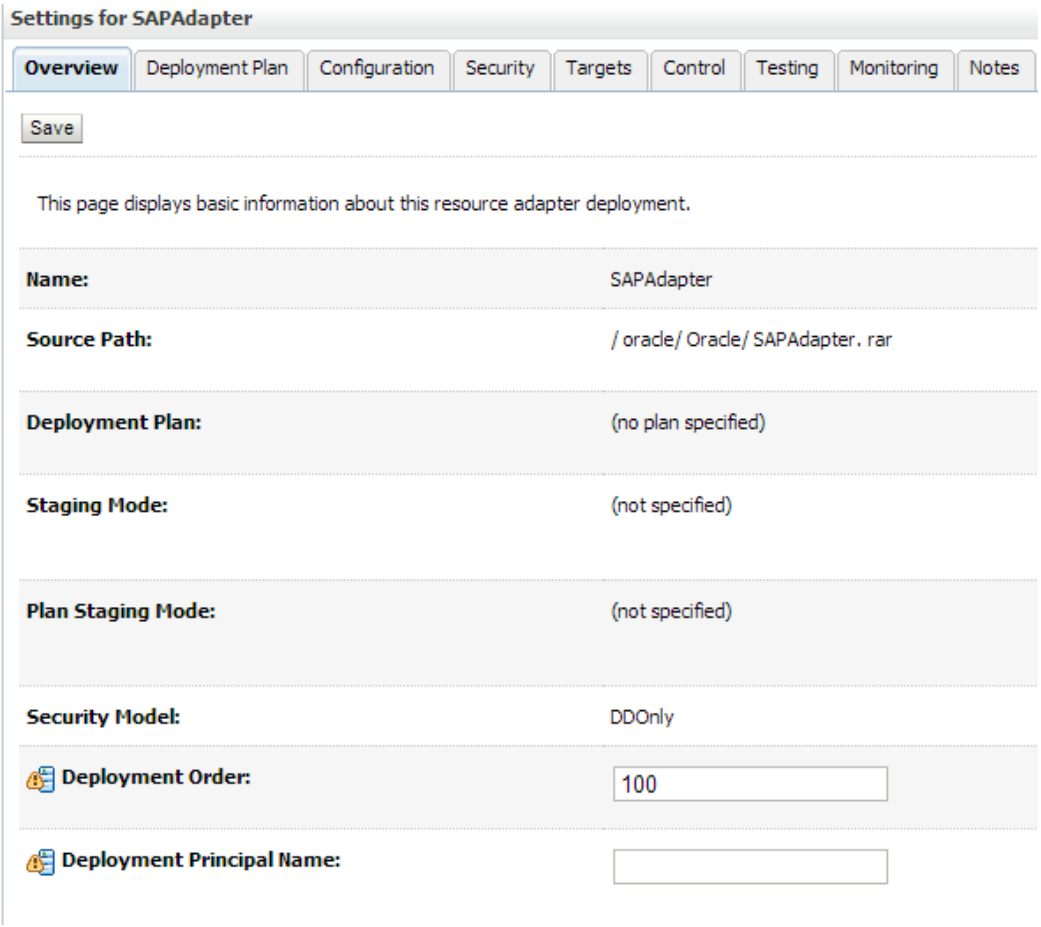
7.1 Adapter Integration with Oracle WebLogic Server

Oracle Adapter for SAP is deployed within an Oracle WLS container during installation. All client applications run within the Oracle WLS environment. In a run-time service scenario, an Enterprise Java Bean, servlet, or Java program client makes the Common Client Interface (CCI) calls to resource adapters. The adapters process the calls as requests and send them to the EIS. The EIS response is then sent back to the client.

7.1.1 Configure Run-time Parameters for the Adapter for SAP

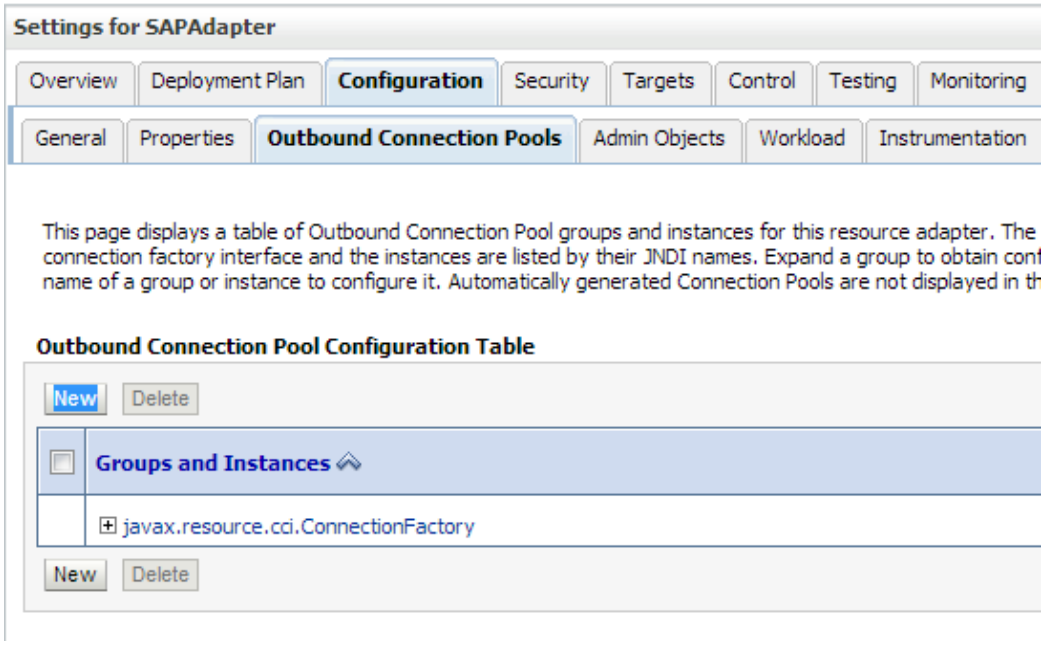
1. To configure run-time parameters for the Adapter, navigate to the setting page of the deployed adapter. This page displays basic information about this resource adapter, as shown in Figure 7-1.

Figure 7-1 Setting Page



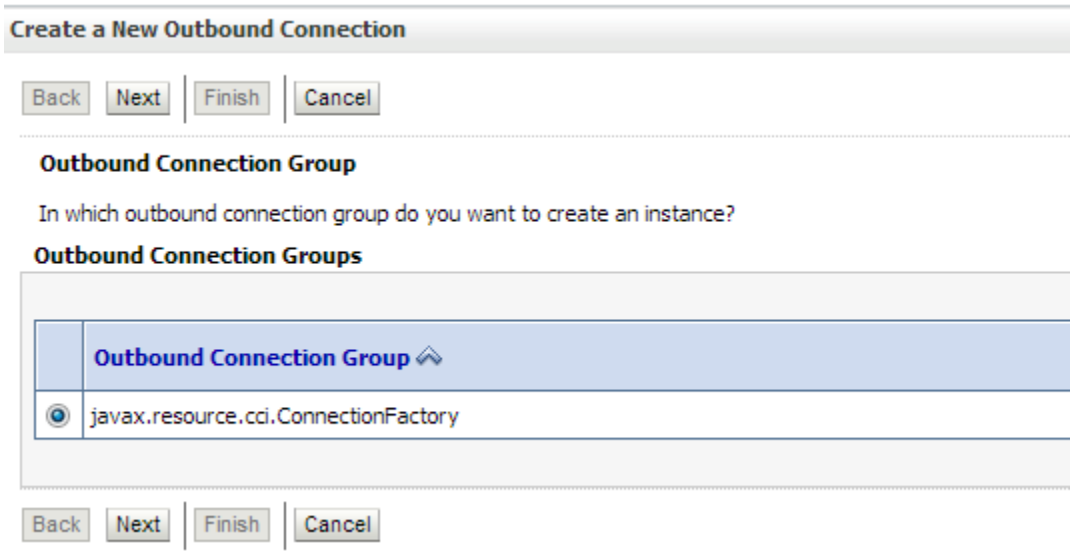
2. Open the SAP JCA Adapter **Configuration** panel and select **Outbound Connection Pools** tab, a default `javax.resource.cci.ConnectionFactory` is available, as shown in Figure 7-2.

Figure 7-2 Outbound Connection Pools Tab



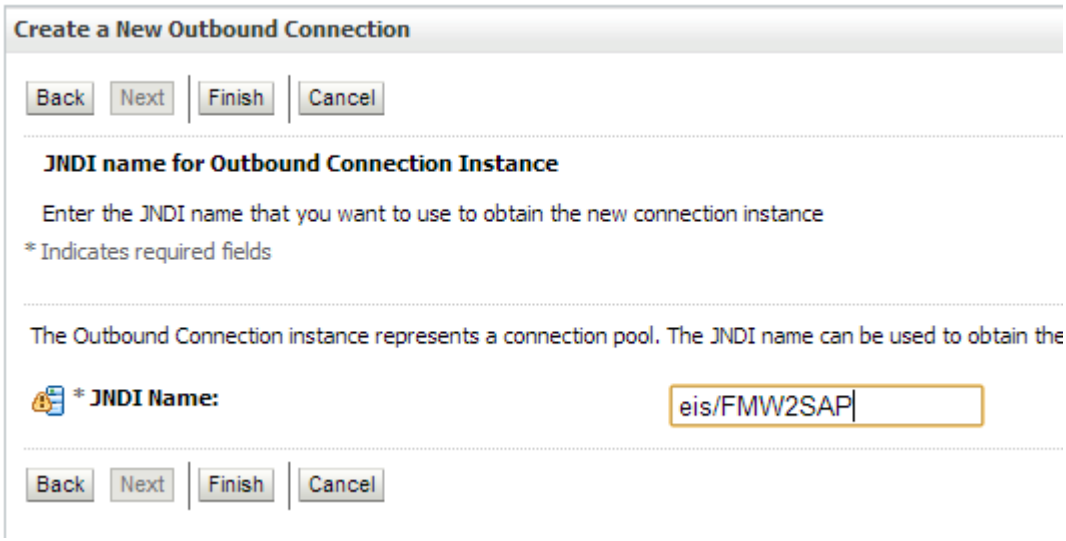
3. Click **New** to create a new outbound connection.
4. Select **Outbound Connection Group** in which user want to create outbound connection group.
5. Select *javax.resource.cci.ConnectionFactory* and click on **Next** button, as shown in Figure 7-3.

Figure 7-3 Create a New Outbound Connection



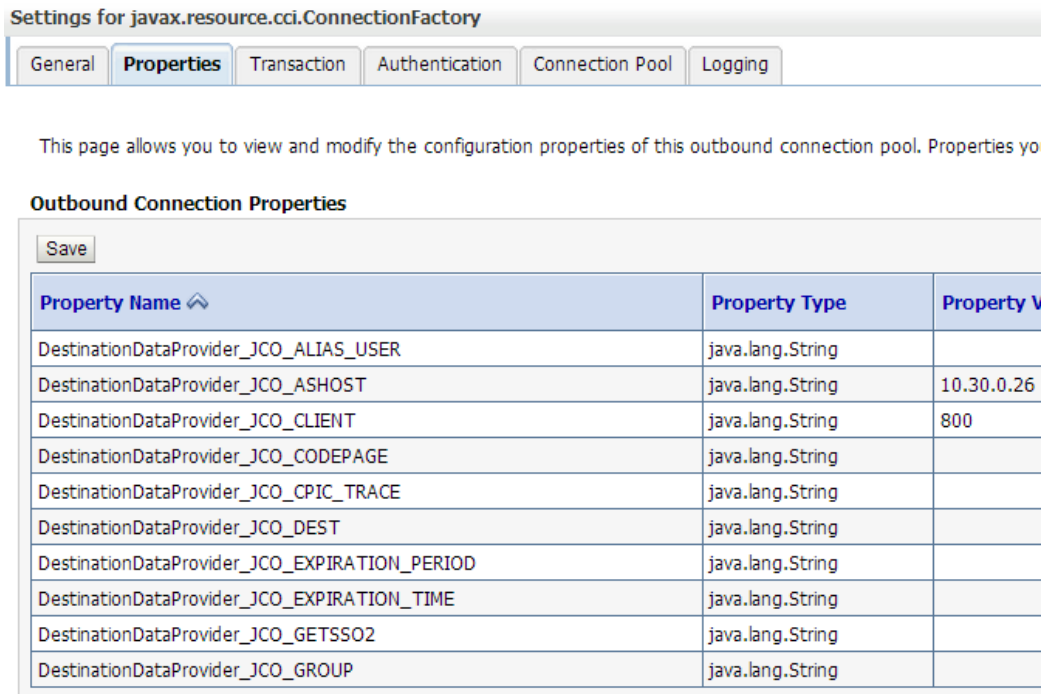
6. Enter a JNDI name, e.g., `eis/FMW2SAP` in the **JNDI Name** field and then click on **Finish** button, as shown in Figure 7-4.

Figure 7-4 Create a New Outbound Connection



7. Click **OK**.
8. Click **Save**.
9. Click the *eis/FMW2SAP* ConnectionFactory, as shown in Figure 7-5.

Figure 7-5 Outbound Connection Properties



Property Name	Property Type	Property V
DestinationDataProvider_JCO_ALIAS_USER	java.lang.String	
DestinationDataProvider_JCO_ASHOST	java.lang.String	10.30.0.26
DestinationDataProvider_JCO_CLIENT	java.lang.String	800
DestinationDataProvider_JCO_CODEPAGE	java.lang.String	
DestinationDataProvider_JCO_CPIC_TRACE	java.lang.String	
DestinationDataProvider_JCO_DEST	java.lang.String	
DestinationDataProvider_JCO_EXPIRATION_PERIOD	java.lang.String	
DestinationDataProvider_JCO_EXPIRATION_TIME	java.lang.String	
DestinationDataProvider_JCO_GETSSO2	java.lang.String	
DestinationDataProvider_JCO_GROUP	java.lang.String	

10. You have to update the mandatory connection properties:

For Outbound connection:

- DestinationDataProvider_JCO_ASHOST
- DestinationDataProvider_JCO_CLIENT
- DestinationDataProvider_JCO_LANG
- DestinationDataProvider_JCO_PASSWD
- DestinationDataProvider_JCO_PEAK_LIMIT
- DestinationDataProvider_JCO_POOL_CAPACITY
- DestinationDataProvider_JCO_SYSNR
- DestinationDataProvider_JCO_USER

For Inbound connection(apart from above):

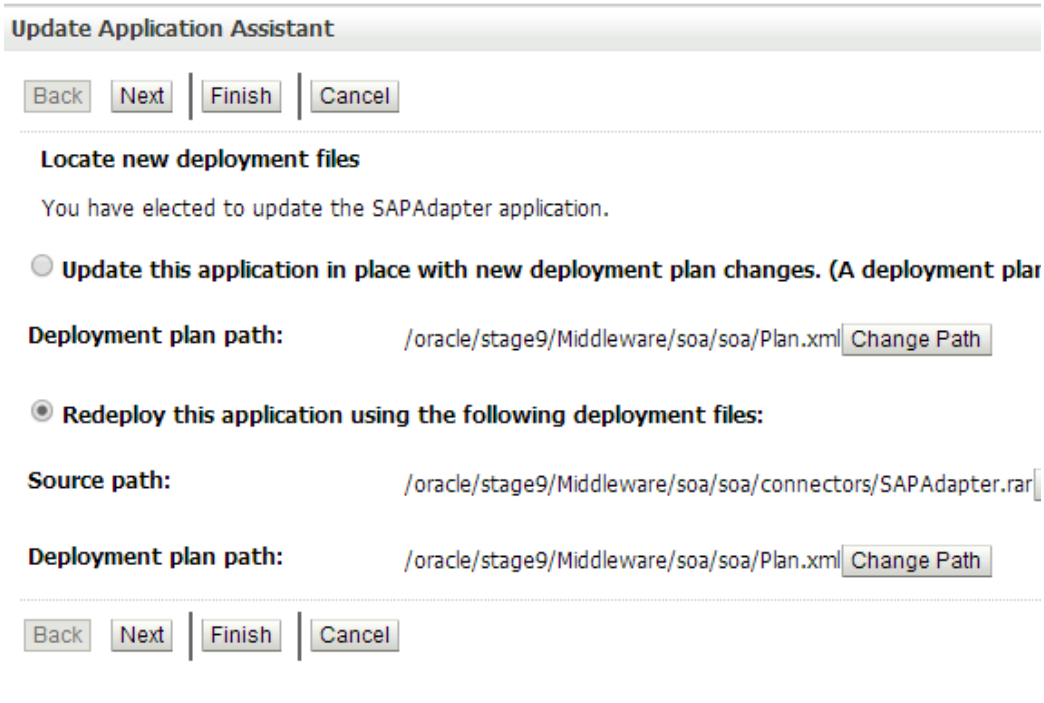
- ServerDataProvider_JCO_CONNECTION_COUNT
- ServerDataProvider_JCO_GWHOST
- ServerDataProvider_JCO_GWSERV
- ServerDataProvider_JCO_PROGID

11. Click **Save** to save the connection configuration and then return and click on the **Deployments** panel.

12. Select the **Adapter** from the list and click **Update** to redeploy the SAP JCA adapter with updated configuration, as shown in Figure 7-6.

13. Plan.xml would be updated with the latest connection configuration parameters.

Figure 7-6 Updated Application Assistant



The Adapter for SAP is now configured for desired connection in the WebLogic Application Server.

8 Integration Scenarios in Oracle SOA Suite

This chapter demonstrates how to create composites to perform Inbound and Outbound communication with SAP using the Adapter for SAP. The different components used in this chapter are BPEL, Mediator, OSB, and BPM. You will use different components for orchestration, transformation and routing, and interact with SAP using the The Adapter for SAP to create the end-to-end processes.

This chapter contains the following topics:

- Section 8.1, "Integration Overview"
- Section 8.2, "The Adapter Integration with SOA Service Components"
- Section 8.3, "The The Adapter Integration with BPM Service Components"
- Section 8.4, "The Adapter Integration with Oracle Service Bus (OSB)"
- Section 8.5, "Deploy the Defined Process"
- Section 8.6, "Test the Deployed Process"

8.1 Integration Overview

The Oracle Adapter for SAP enables middleware components to interact and exchange data with the SAP R/3 system. Similar to other WebLogic adapters and applications, the Adapter should be deployed in WebLogic console under Deployments. SOA/OSB can be successfully deployed to SOA/OSB server after deployment WSDL is generated in JDeveloper which is used for both inbound and outbound communication. After deployment to server, the application can be controlled from EM/Console.

8.2 The Adapter Integration With SOA Service Components

Tool required for the design-time configuration of an Oracle SOA process:

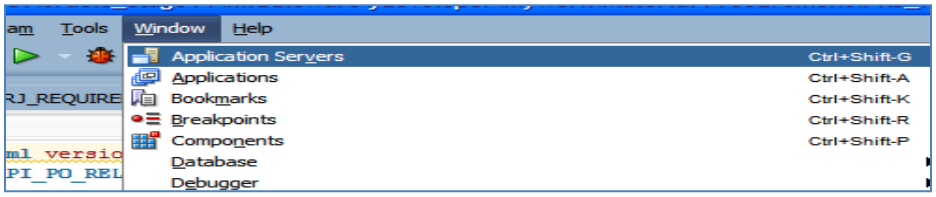
- Oracle JDeveloper 12.2.1.

8.2.1 Create a New Application Server Connection

Follow the below steps to create a new Application Server connection in Oracle JDeveloper 12.2.1.

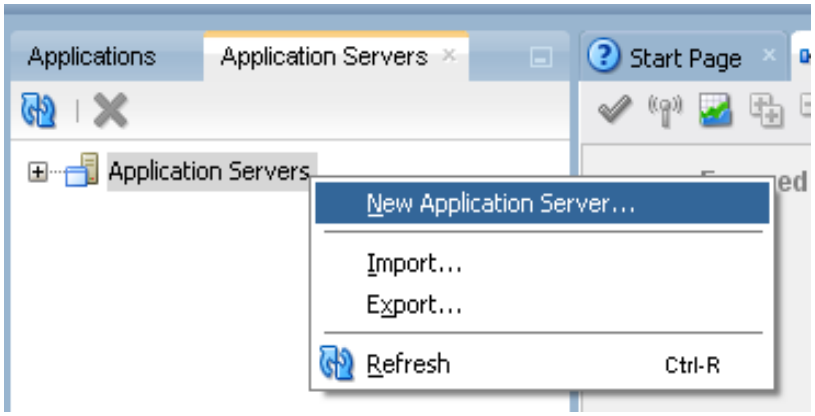
1. Open Oracle JDeveloper 12.2.1.
2. Click **Window** from the menu bar and select **Application Servers** to view the Application Server Navigator pane on the JDeveloper IDE, as shown in Figure 8-1.

Figure 8-1 Application Server Navigator



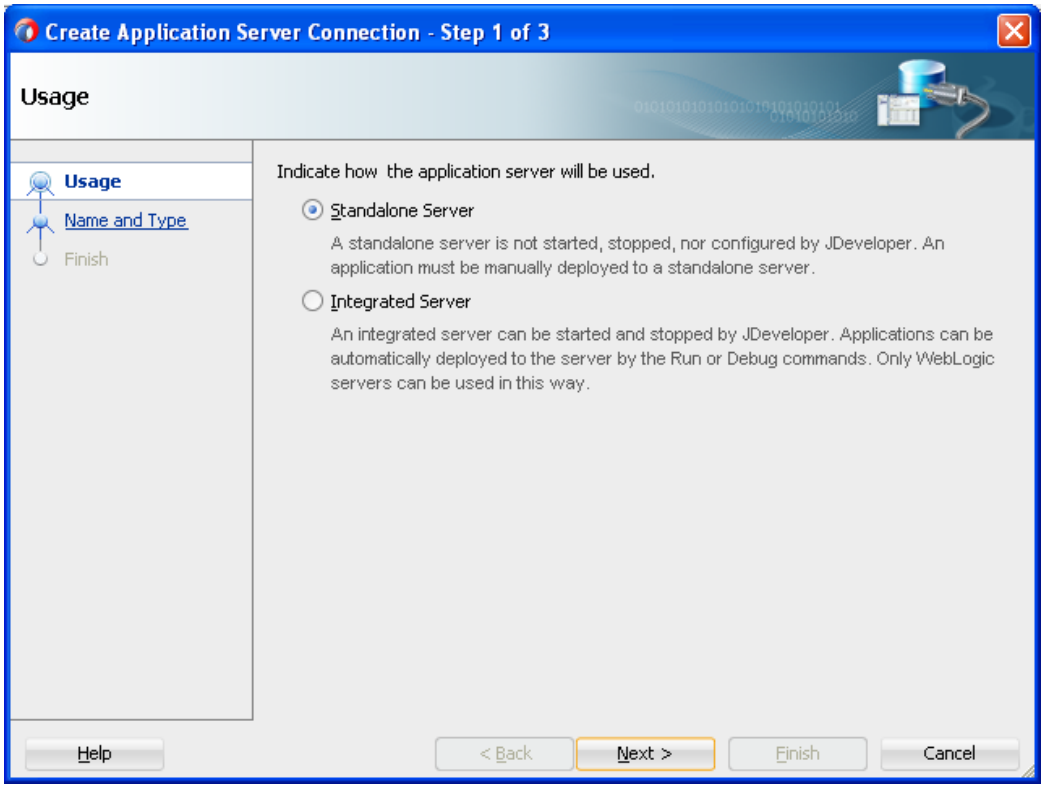
The Application Server tab is displayed, as shown in Figure 8-2.

Figure 8-2 Application Server



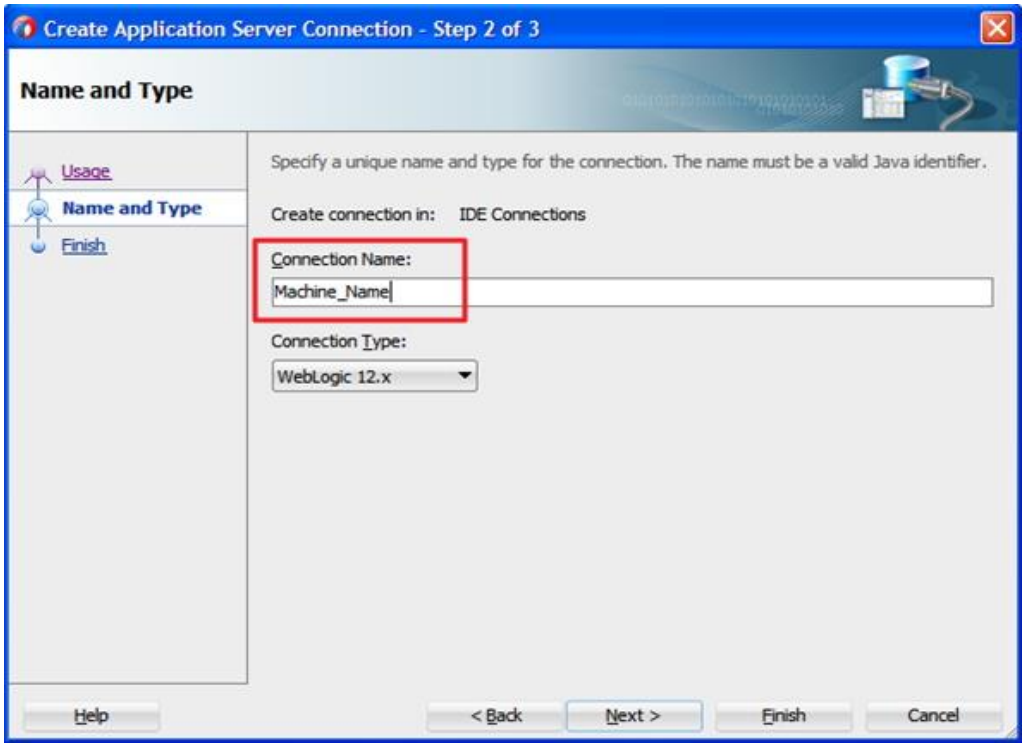
3. Right-click **Application Servers** and select **New Application Server.** A pop-up wizard appears which will help you to create an Application Server Connection, as shown in Figure 8-3.

Figure 8-3 Create Application Server Connection Wizard



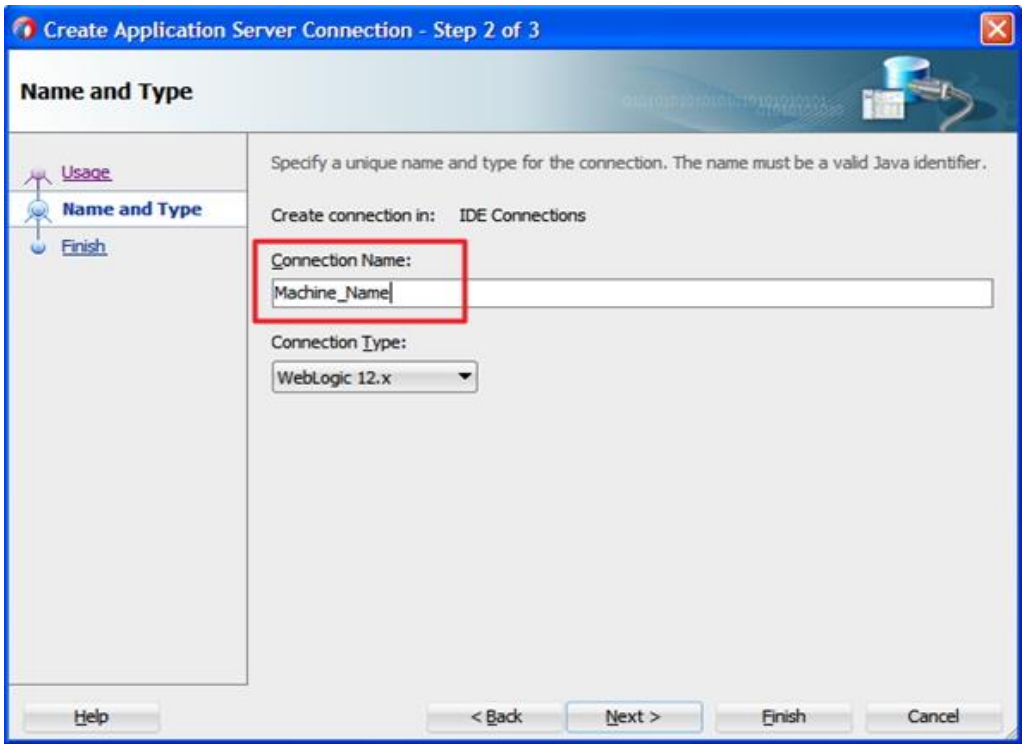
4. Leave the default selection on the wizard screen. Click **Next**, as shown in Figure 8-4.

Figure 8-4 Name and Type Page



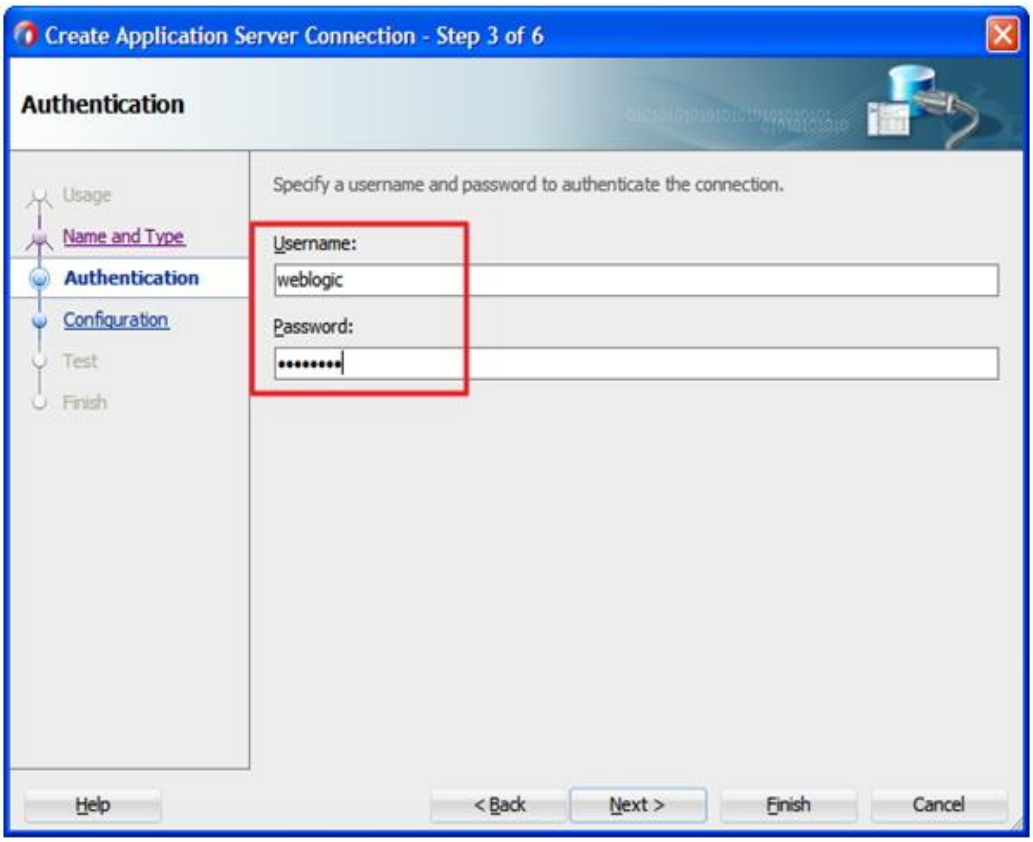
5. The **Name and Type** screen appears, as shown in Figure 8-5.

Figure 8-5 Name and Type Window



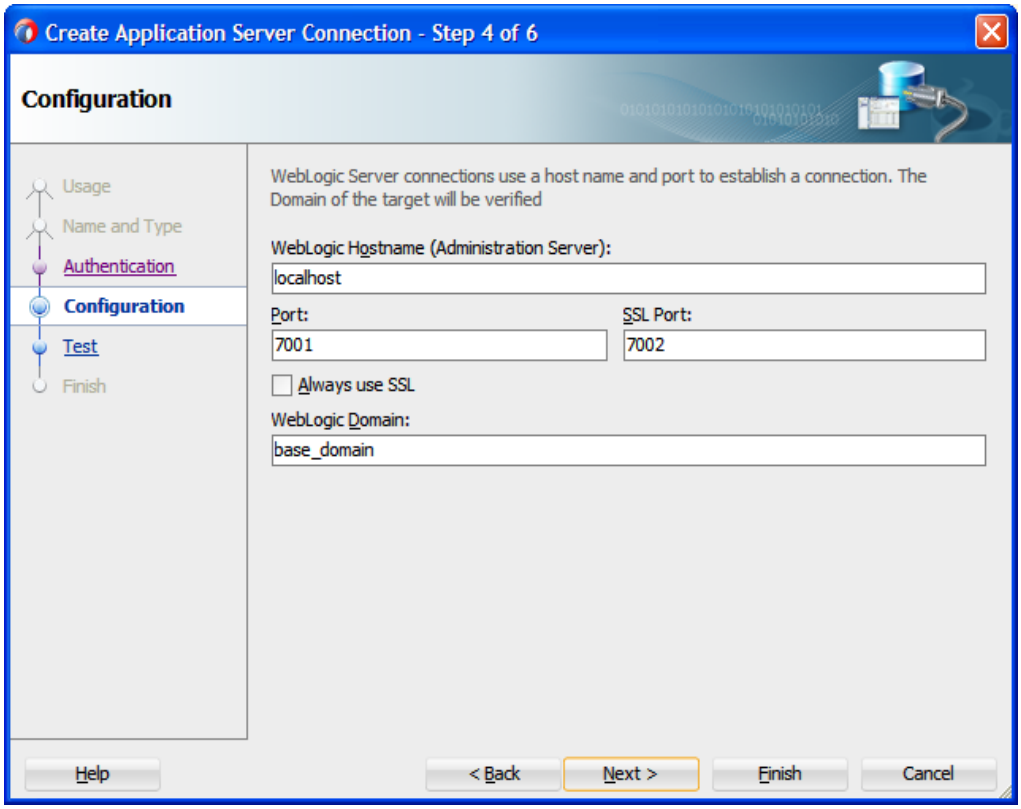
6. Give the name to the connection server and set connection type as WebLogic12.x and click **Next**. The Authentication page is displayed, as shown in Figure 8-6.

Figure 8-6 Authentication Page



7. Enter a valid user name and corresponding password for the application server connection that you have mentioned during installation. This will be used to connect to the application server.
8. Click **Next**. The Configuration page is displayed, as shown in Figure 8-7.

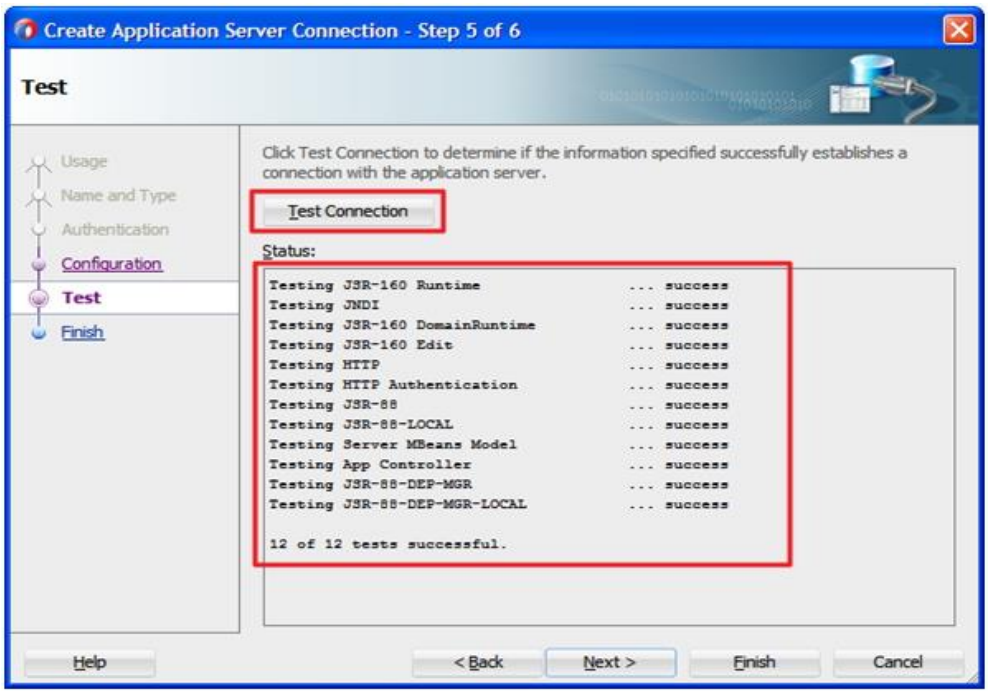
Figure 8-7 Configuration Page



9. Enter the host name of the machine where Oracle WebLogic server has been installed. Provide the Port and Domain name as defined during the WebLogic installation and configuration process.

10. Click **Next**. The Test page is displayed as shown in Figure 8-8.

Figure 8-8 Test Page

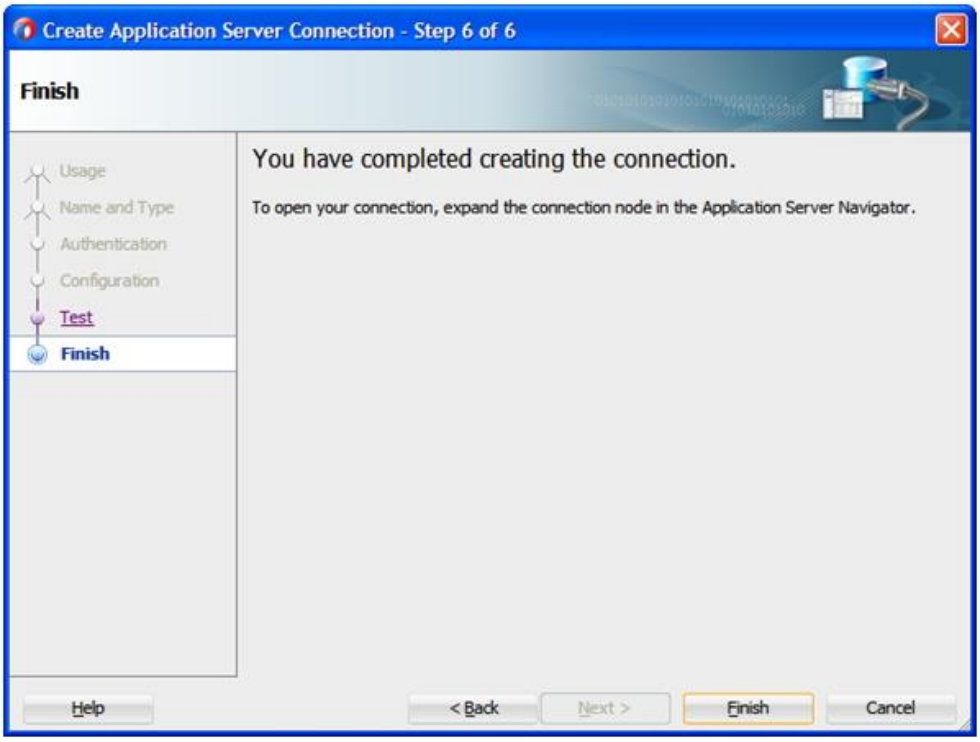


11. Click on the **Test Connection** button.

12. The status should return **Success** for all tests.

13. This completes the connection configuration for a new Application Server Connection in JDeveloper 12.2.1. Click **Next**. The Finish page is displayed as shown in Figure 8-9.

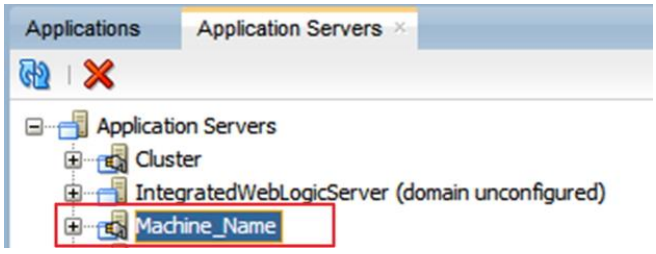
Figure 8-9 Finish Page



14. Click on the **Finish** button.

15. The New Application Server is listed under the Application Servers tab as shown in Figure 8-10.

Figure 8-10 New Application Server Connection



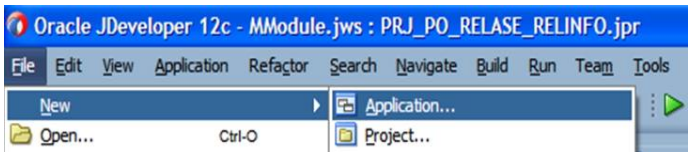
8.2.2 Create an Empty Composite for SOA

Perform the following steps to create an empty composite for SOA:

1. You can either use an existing SOA Application or create a new SOA application. To create a new SOA Application, click on **File** tab from the JDeveloper menu.

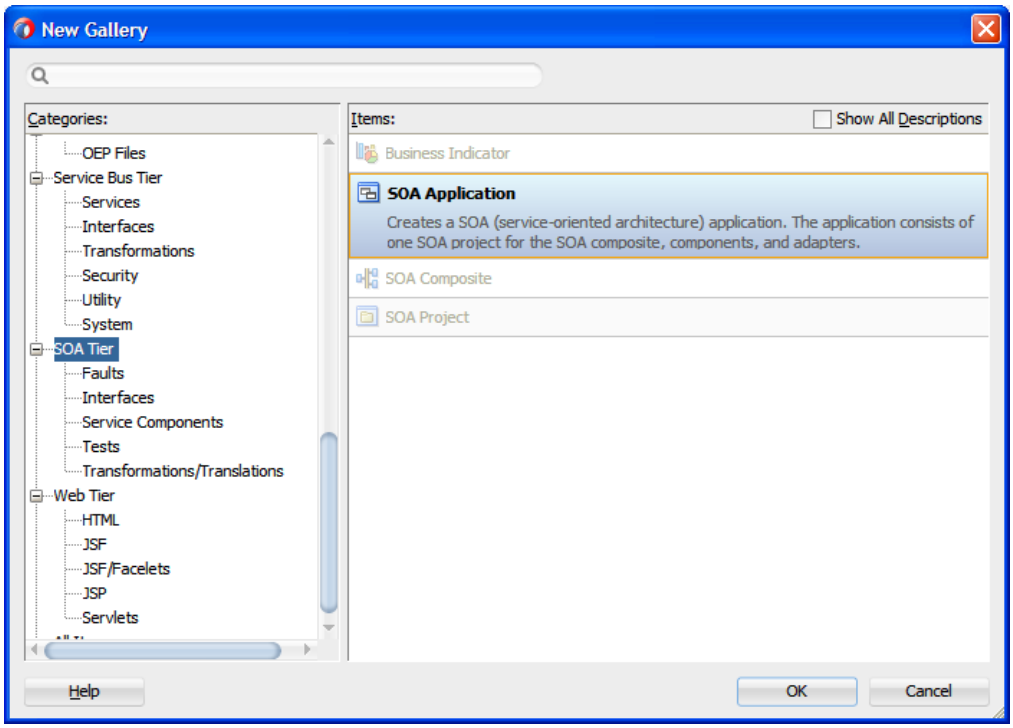
2. Select **File > New > Application** as shown in Figure 8-11.

Figure 8-11 New Application Page



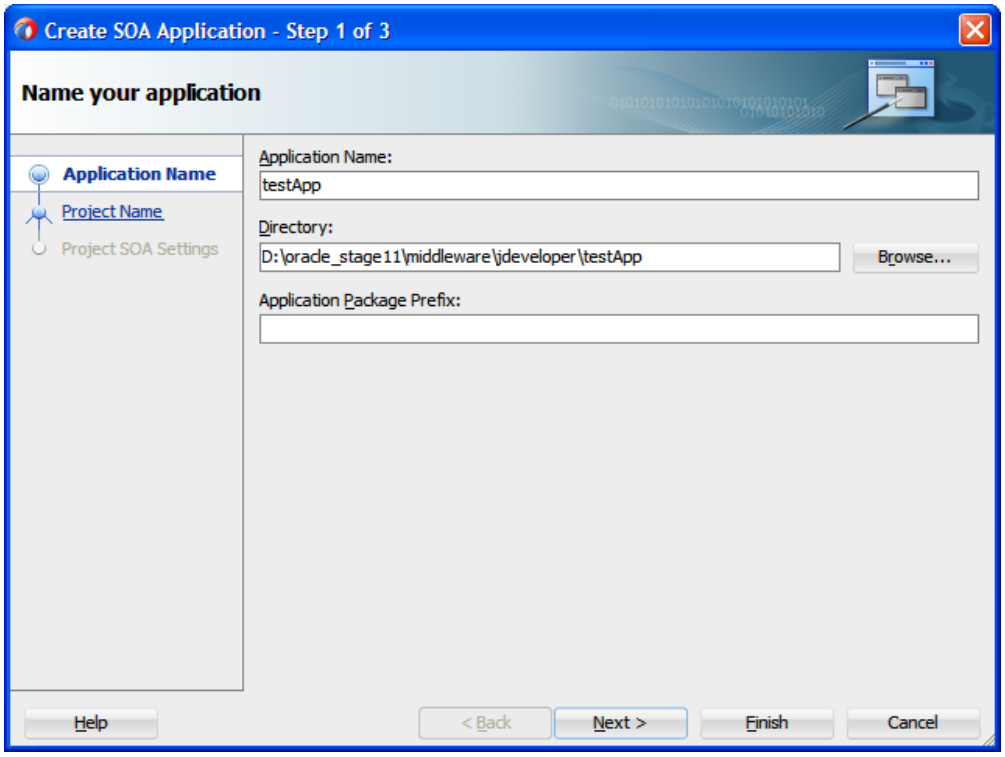
The New Gallery page is displayed, as shown in Figure 8-12.

Figure 8-12 New Gallery Page



3. From the listed items, select **SOA Application** and click **OK** as shown in Figure 8-13.

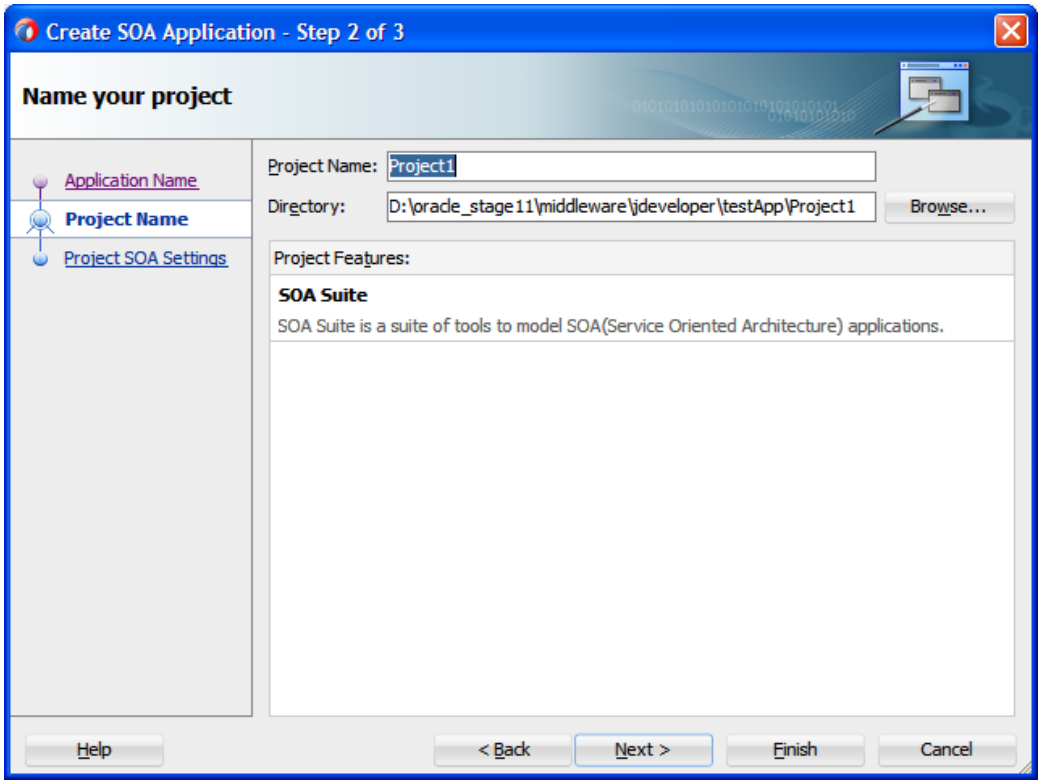
Figure 8-13 Name Your Application Page



4. Enter a name for the SOA Application. You may choose the source directory for the application by clicking on the **Browse** button. By default it chooses the default workspace of the JDeveloper. Click **Next.**

TheName your project page is appears, as shown in Figure 8-14.

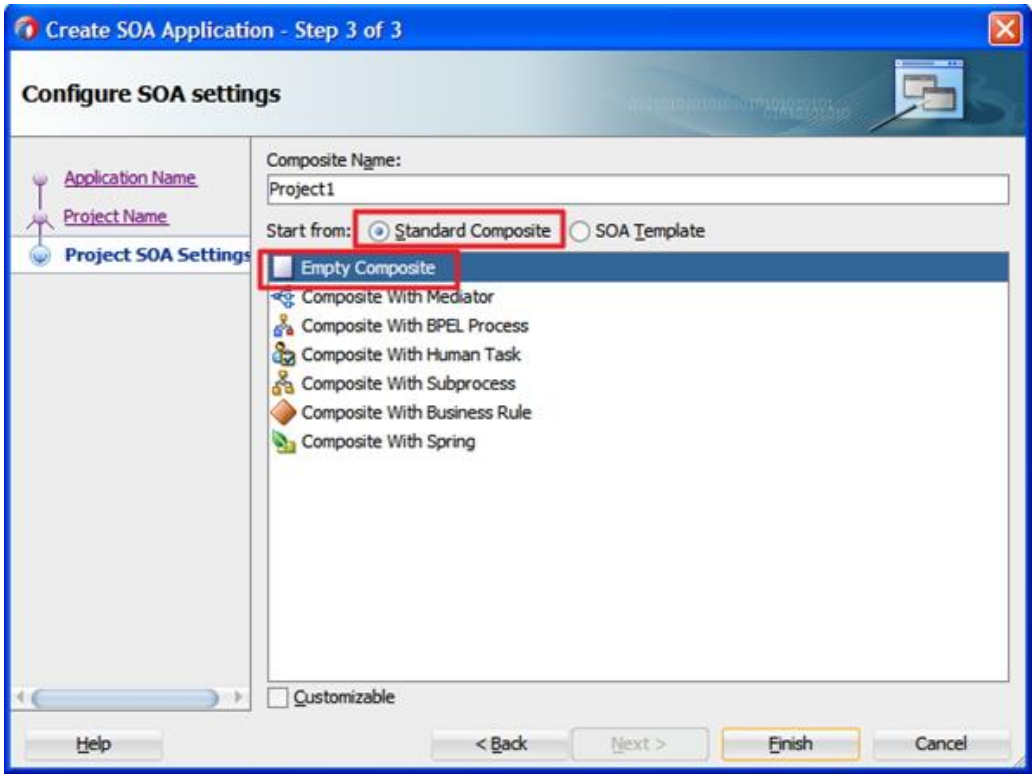
Figure 8-14 Name Your Project Page



5. Enter a project name of your choice and click **Next**.

   The **Configure SOA settings** page appears, as shown in Figure 8-15.

Figure 8-15 Configure SOA Settings Page



6. Enter a Composite Name of your choice. A list of templates is displayed on the wizard screen. From the **Standard Composite** template list, select **Empty Composite** and click **Finish**.

8.2.3 Design an Outbound BPEL Process for BAPI/RFC/IDOC

This section describes how to design an outbound BPEL process, which consists of the following stages:

1. Create an Empty Composite
2. Configure an Adapter Component.
3. Configure an Outbound BPEL Process Component.

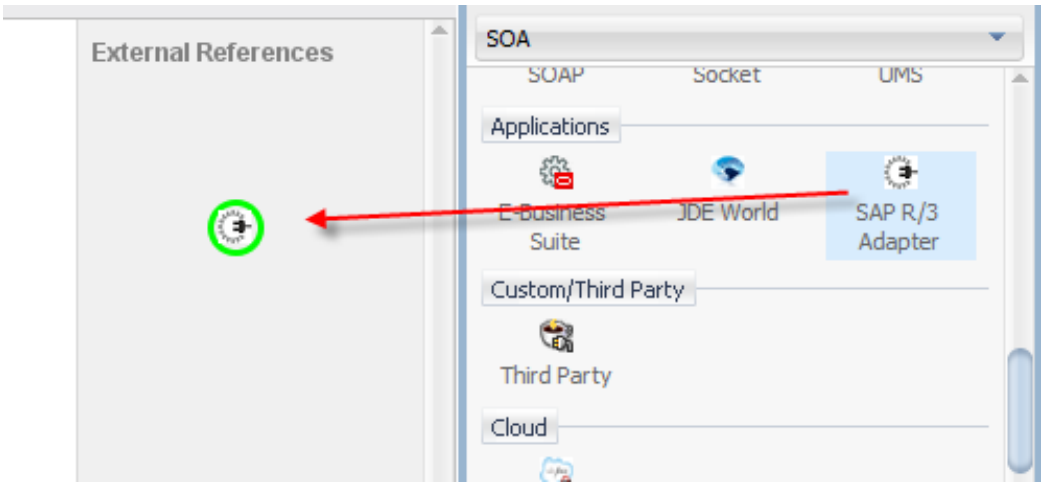
Create an Empty Composite

To create an empty composite, you can follow the same procedure that is described in "Create an Empty Composite"

Configure an Adapter Component

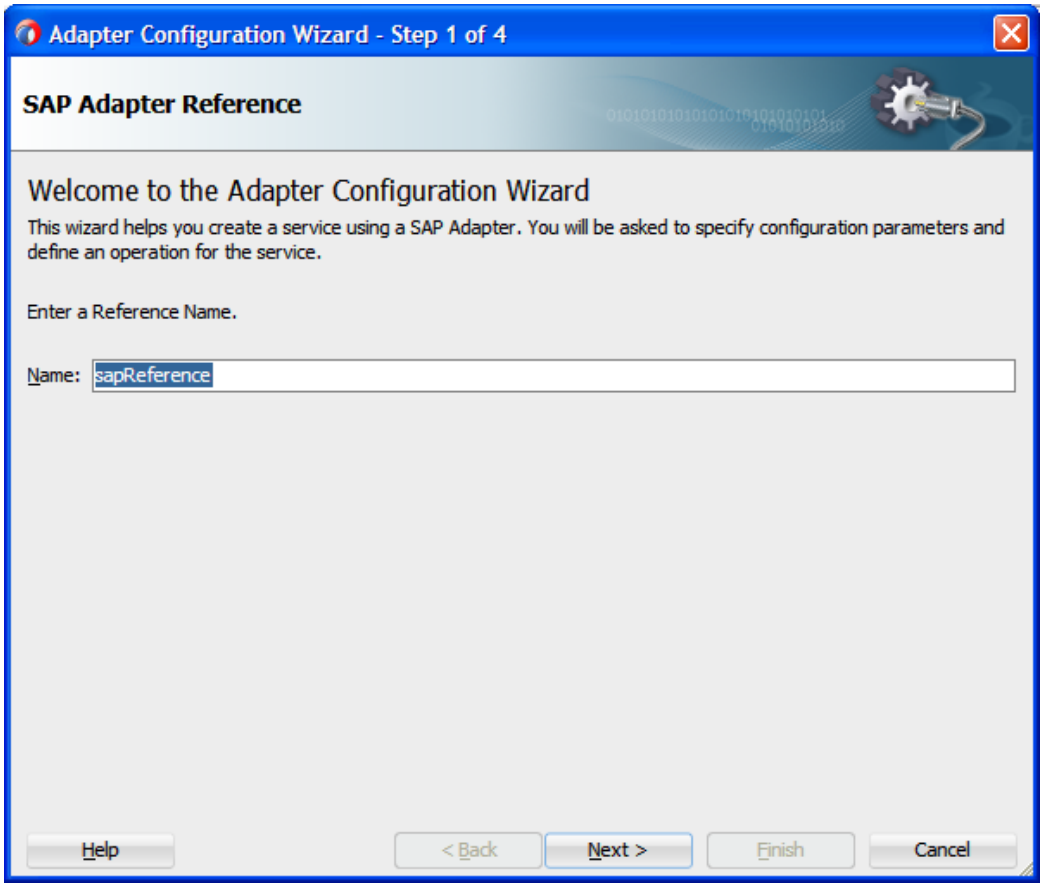
1. Open JDeveloper.
2. Click on the Application created in previous section "Create an Empty Composite". Click on the SOA project created under this application.
3. Double-click on the composite.xml for this project. The Design space for the composite appears in the JDeveloper.
4. Drag and drop the Adapter component from the **Application Adapters** pane to the **External References** pane, as shown in Figure 8-16.

Figure 8-16 Adapter Component



The Welcome page of the Adapter configuration wizard is displayed, as shown in Figure 8-17.

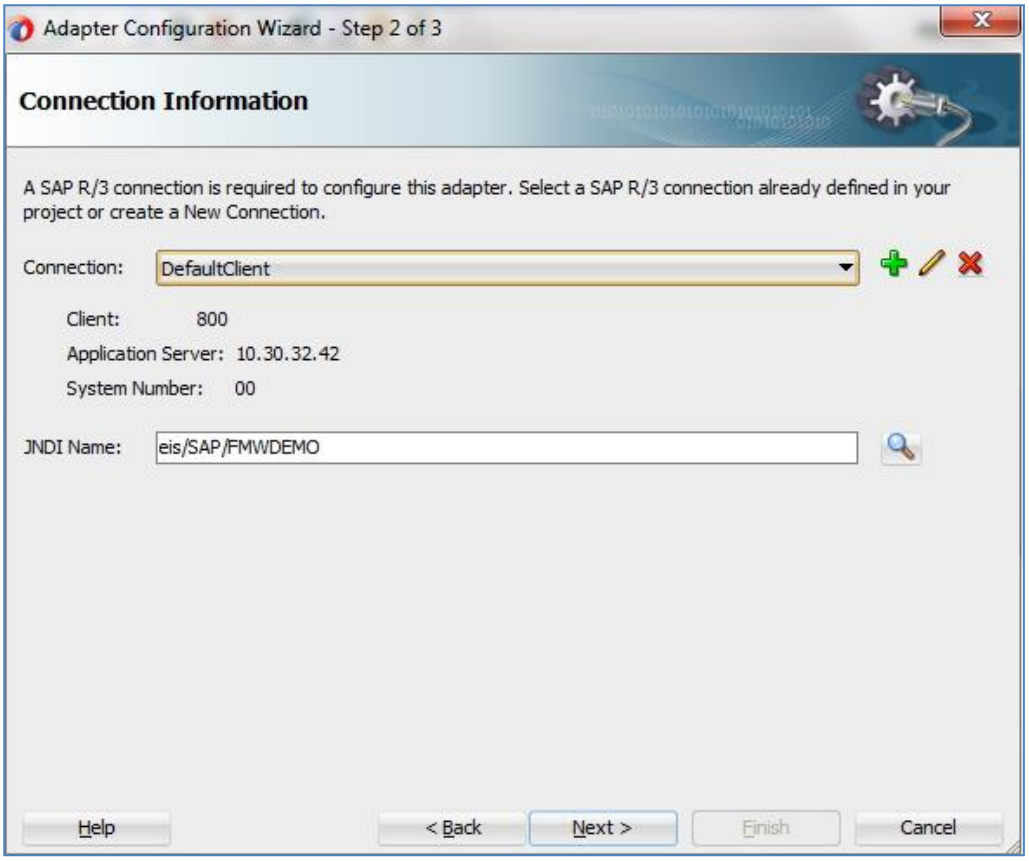
Figure 8-17 Adapter Configuration Wizard



5. Enter a reference name for the Adapter reference in the **Name** field and then click **Next**.

   The Connection information page is displayed, as shown in Figure 8-18.

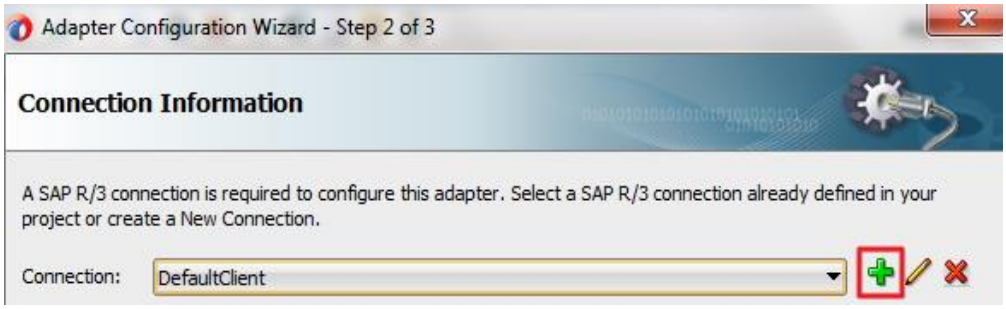
Figure 8-18 Connection Information Page



6. On the **Connection Information** page, click + icon which is located to the right of the **Connection** field, to create a new connection, as shown in Figure 8-19.

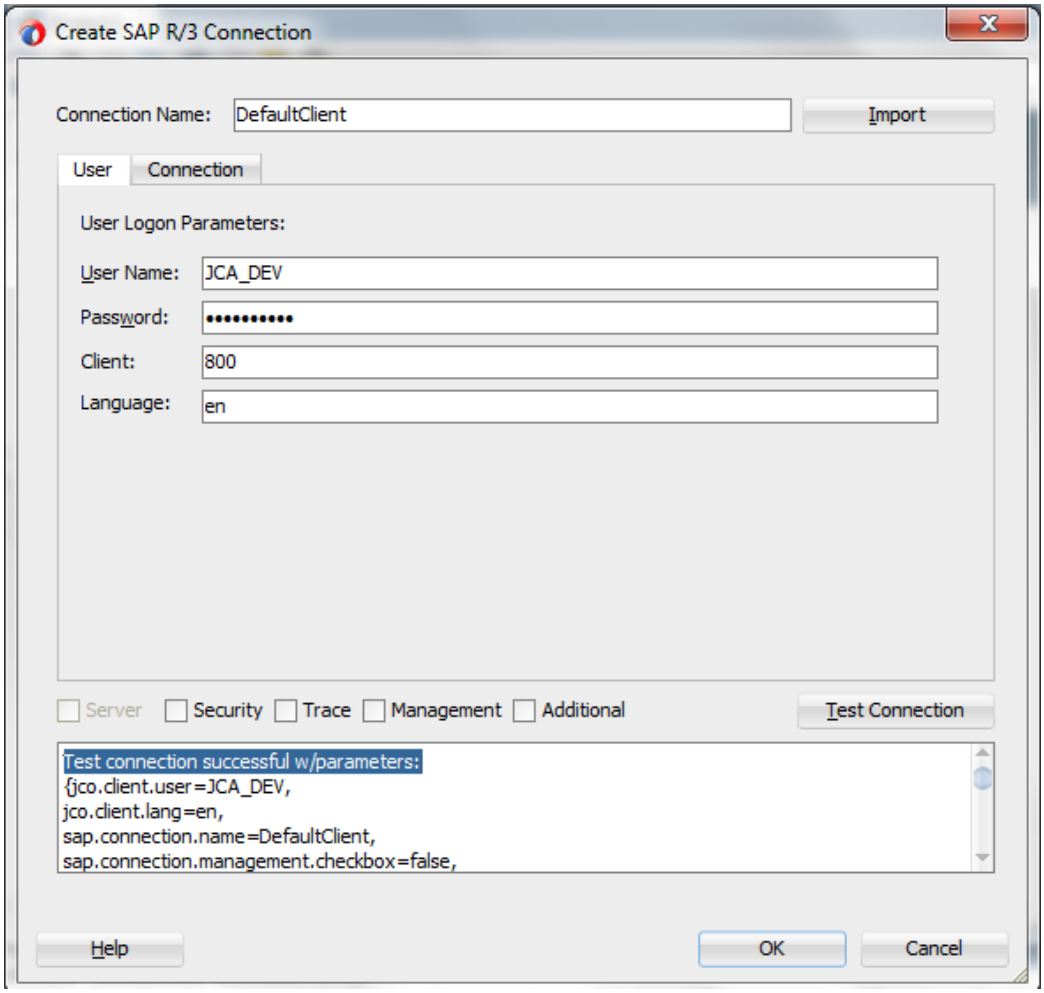
   Note: Use the default JNDI name.

Figure 8-19 Create New SAP Connection



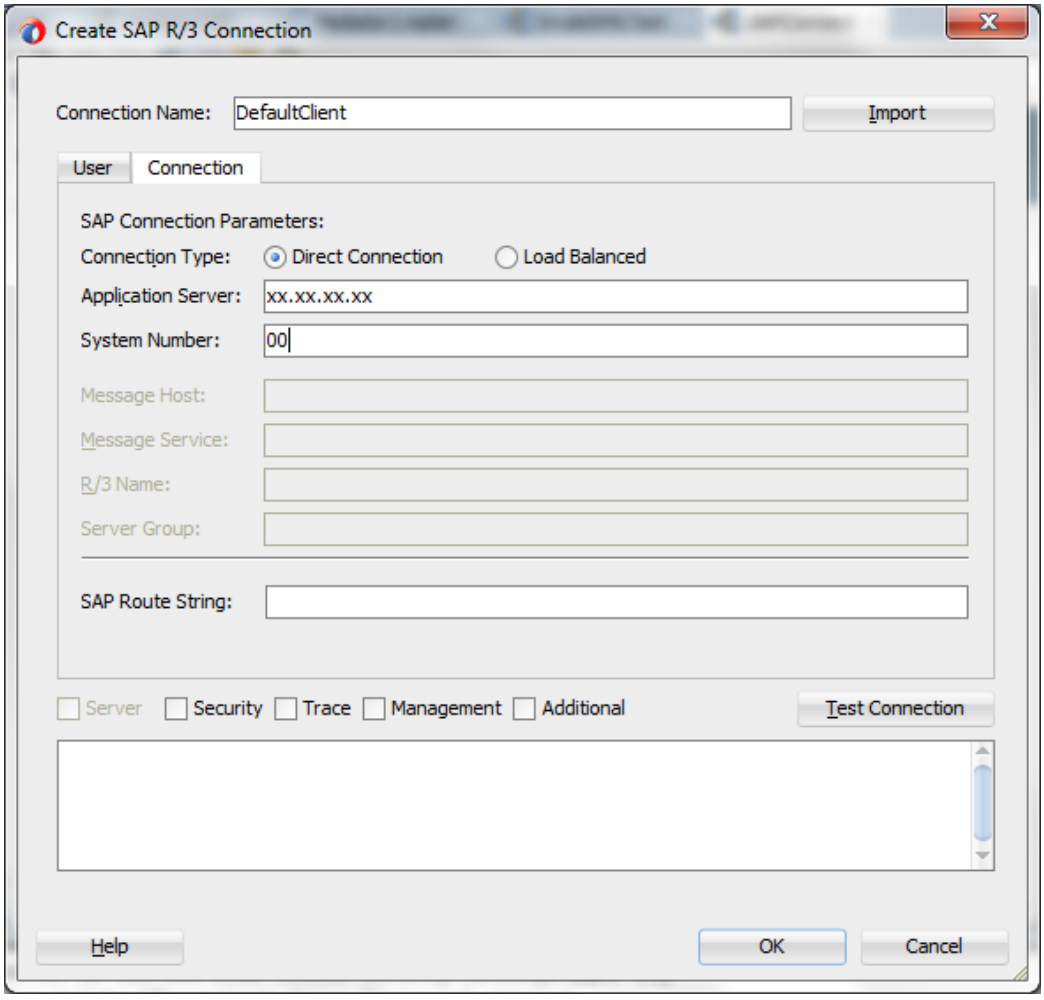
The Create SAP R/3 Connection page is displayed, as shown in Figure 8-20.

Figure 8-20 Create SAP R/3 Connection Page



7. Under the **User** tab, enter a user name for the SAP connection.
8. Enter a password for the SAP connection in the **Password** field.
9. Enter the SAP system client ID in the **Client** field.
10. Select language. Default is en (English).
11. Click on **Connection** tab on the wizard screen. Enter the Application Server host details, as shown in Figure 8-21.
12. Enter a connection name as DefaultClient in the **Connection Name** field.

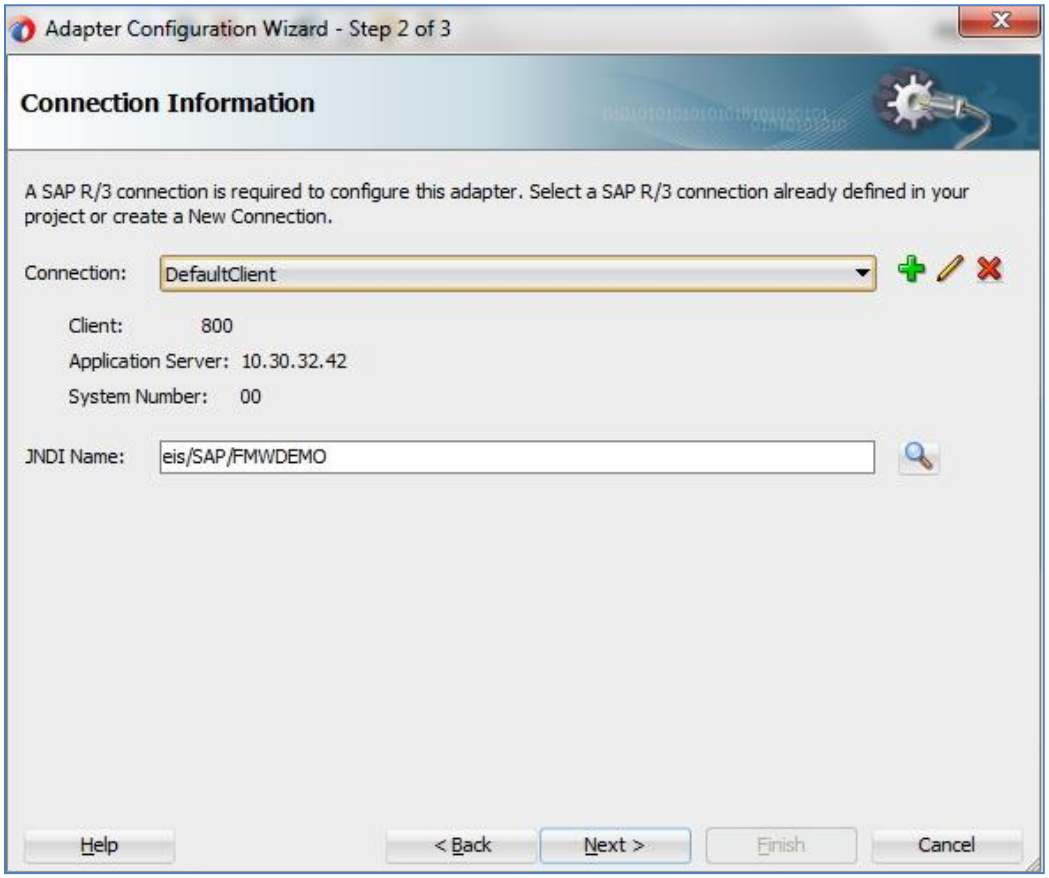
Figure 8-21 Create SAP R/3 Connection Page



13. Enter a value for the **System Number**.
14. Test the SAP connection by clicking the **Test Connection** button.
15. On successful connection test, click **OK**.

    You are returned to the Connection Information page, as shown in Figure 8-22.

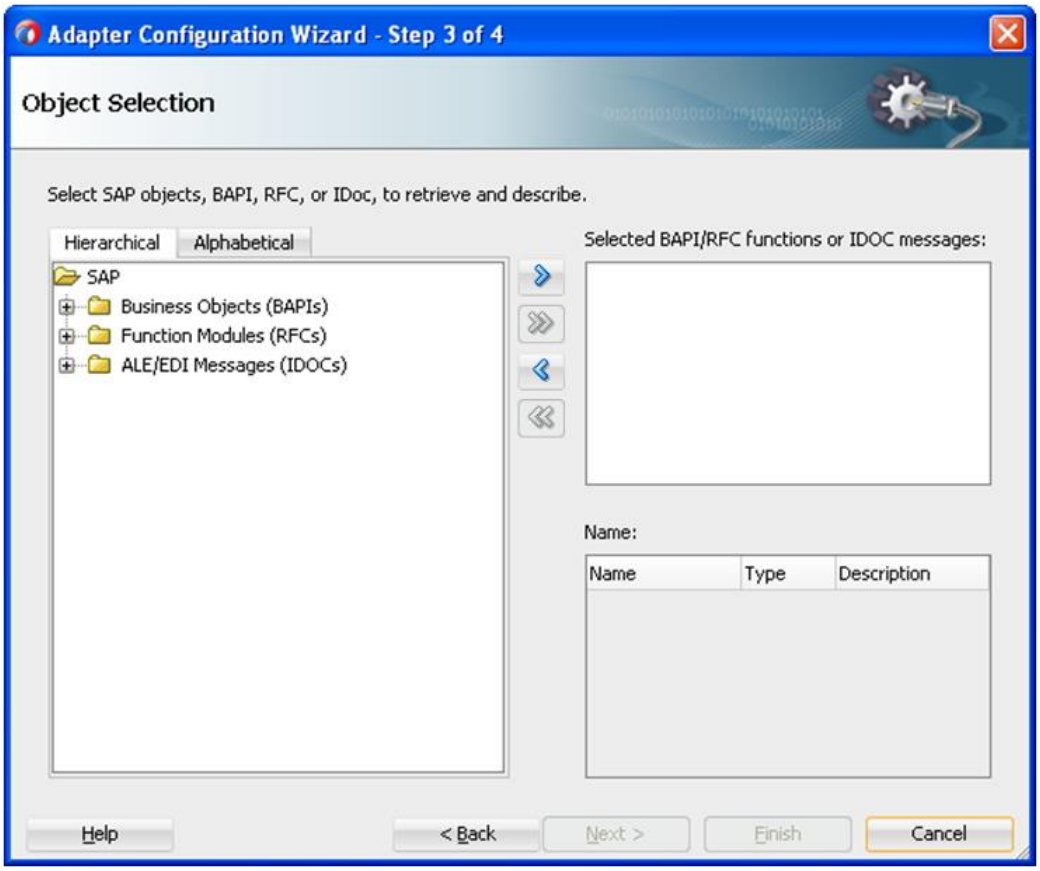
Figure 8-22 Connection Information Page



16. Click **Next**.

The Object selection page is displayed, as shown in Figure 8-23.

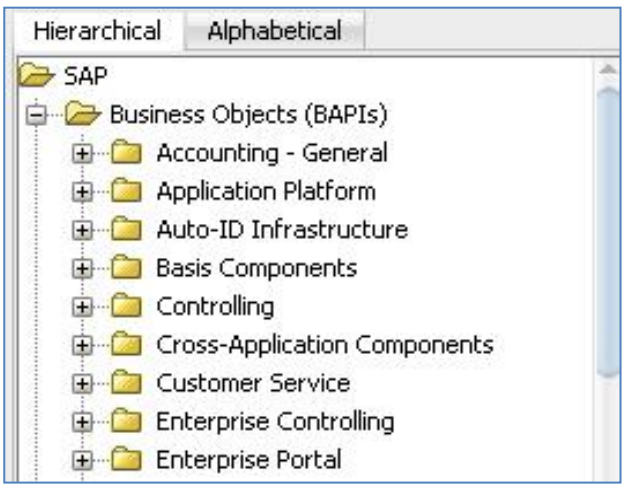
Figure 8-23 Object Selection Page



17. Click the **Hierarchical** tab, and then click on + icon to expand the node.

This tab shows all the SAP Objects (RFC/BAPI/IDoc) available in the SAP system that you are connected to, in a hierarchical form, as shown in Figure 8-24.

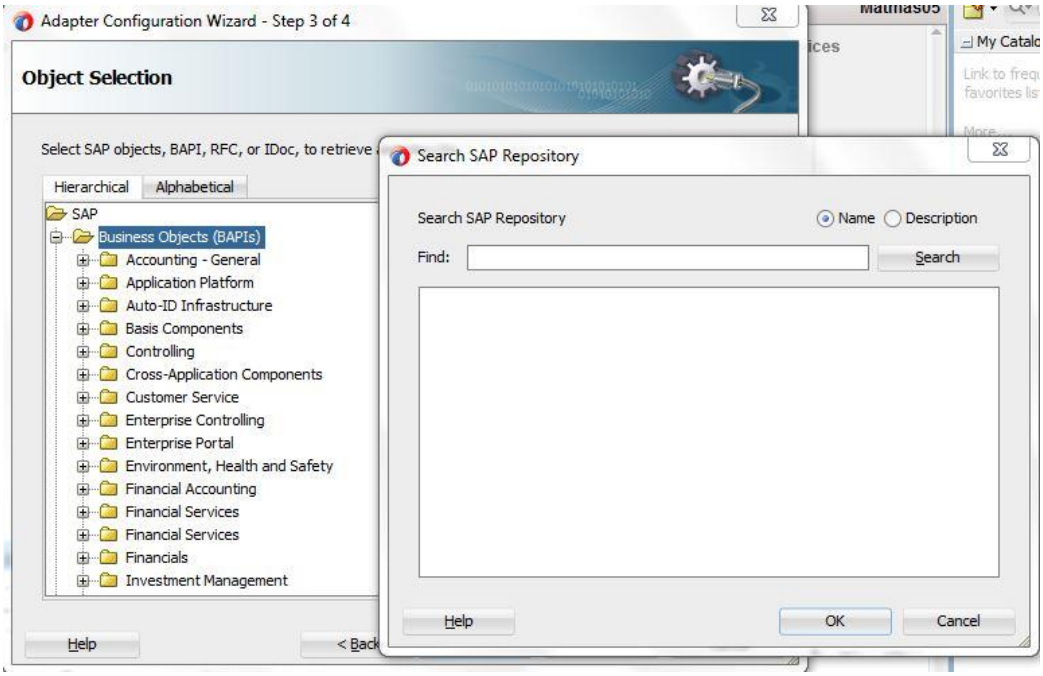
Figure 8-24 Hierarchical Tab



18. Select one or more Business Object from the list and click on > or >> icon to move the selected object(s) from '**Select SAP objects, BAPI, RFC, or IDoc, to retrieve and**

describe' pane to '**Selected BAPI/RFC functions or IDOC messages'** pane as shown in Figure 8-25. You will see that the definition of the selected BAPI appears on the lower right of the Object Selection page.

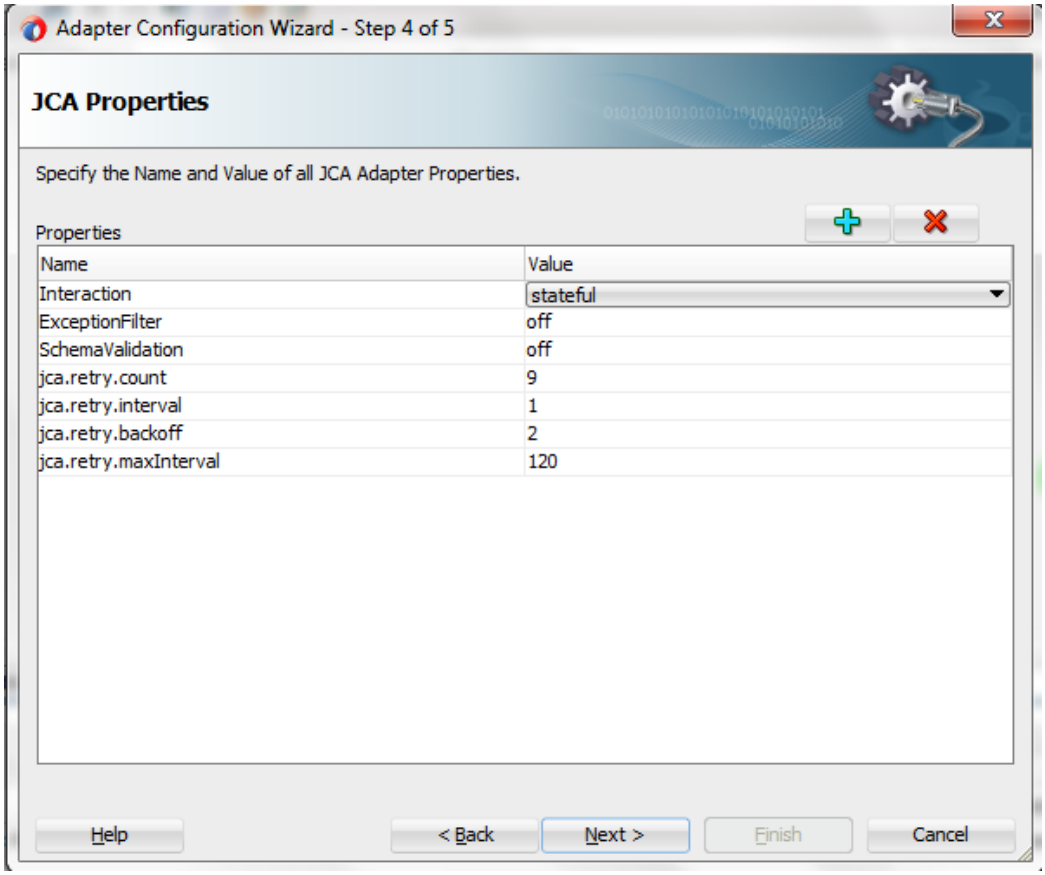
Figure 8-25 Objects Selection Page



19. Retain the defaults and Click **Next**.

The JCA Properties page is displayed, as shown in Figure 8-26.

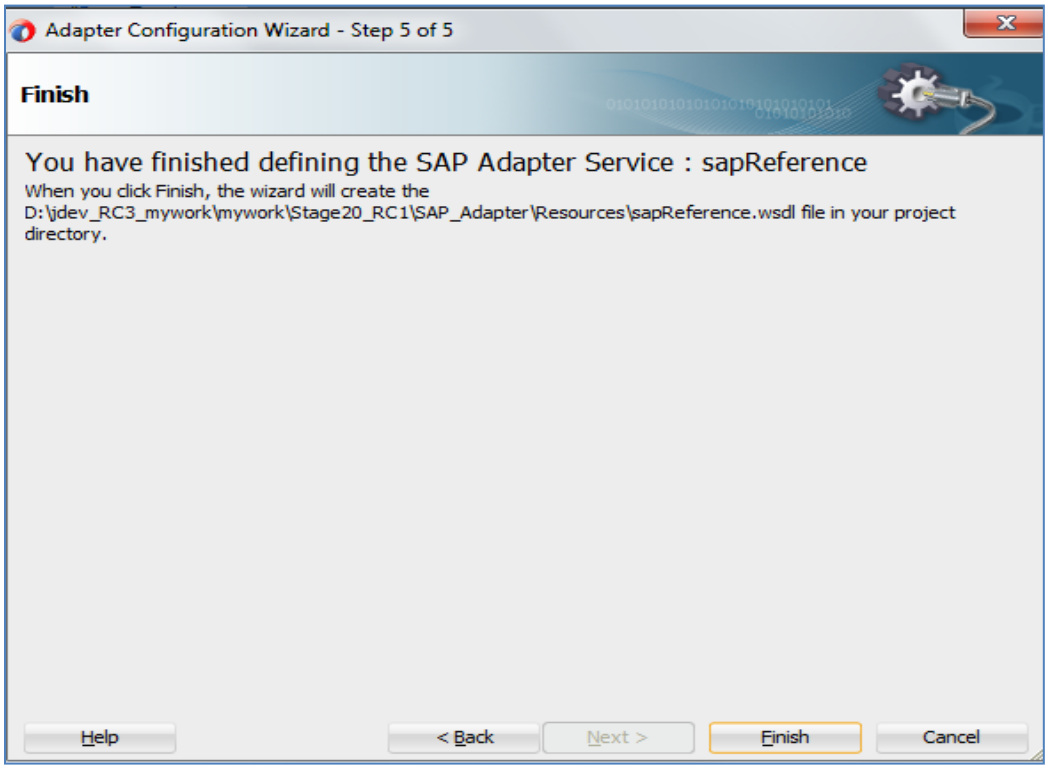
Figure 8-26 JCA Properties Page



20. Click **Next**.

The Finish page is displayed, as shown in Figure 8-27.

Figure 8-27 Finish Page



21. Click **Finish**.

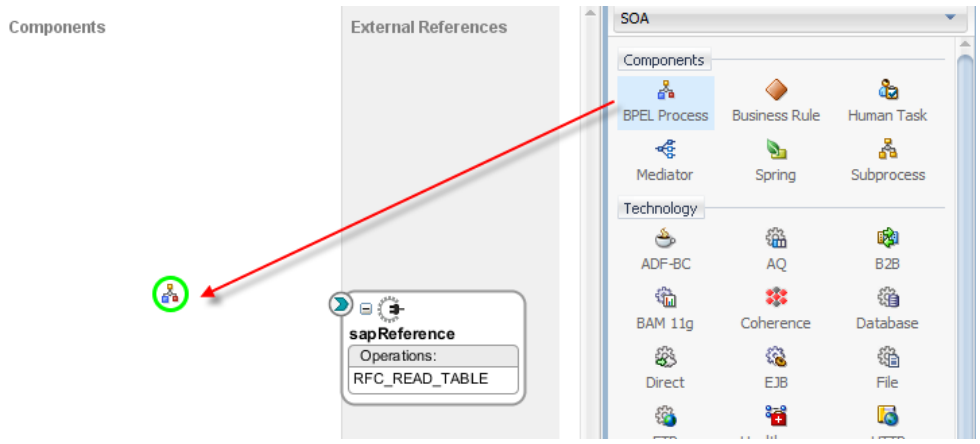
For more information on how to configuring an Adapter Component, refer to the section "Using the Adapter for SAP in JDeveloper Composite".

Configure an Outbound BPEL Process Component

Perform the following steps to configure an Outbound BPEL Process Component:

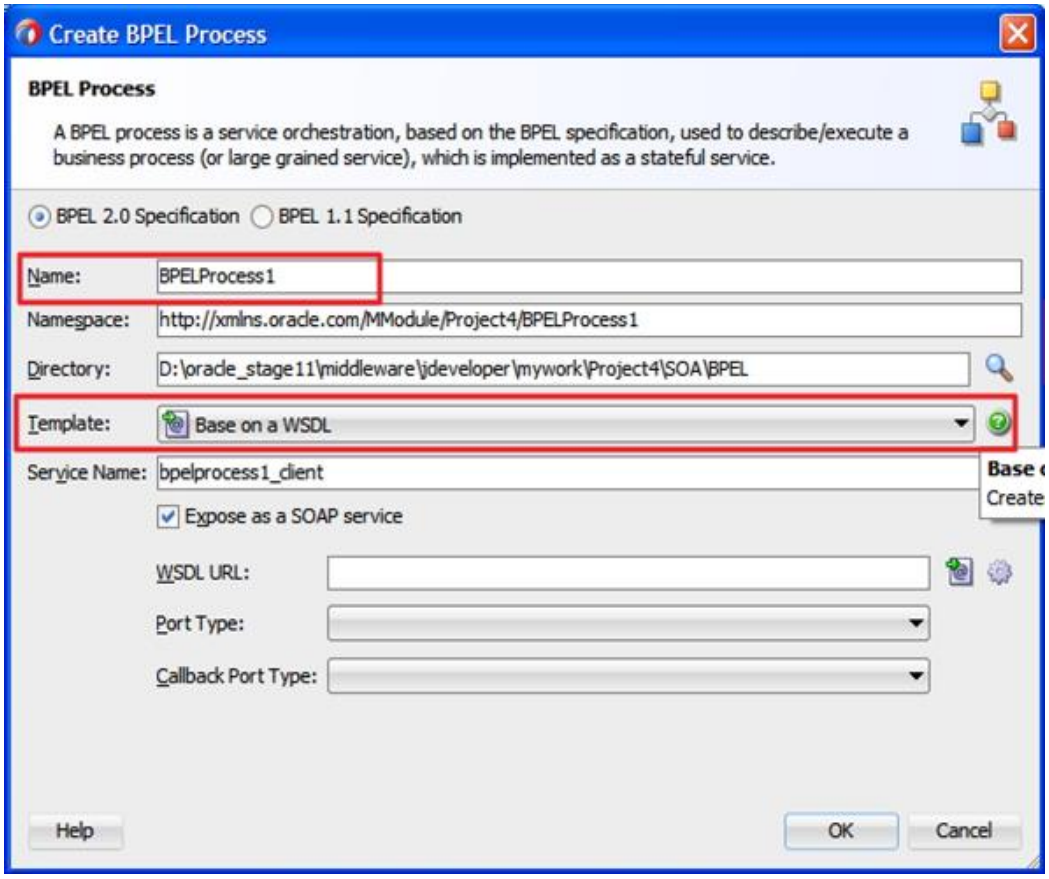
1. In the design window for the same composite created and used above in section ("Create an Empty Composite"). Drag and drop the **BPEL Process** component from the **Service Components -> SOA** pane to the Components pane, as shown in Figure 8-28.

Figure 8-28 BPEL Process Component



The Create BPEL Process dialog is displayed, as shown in Figure 8-29.

Figure 8-29 Create BPEL Process Dialog



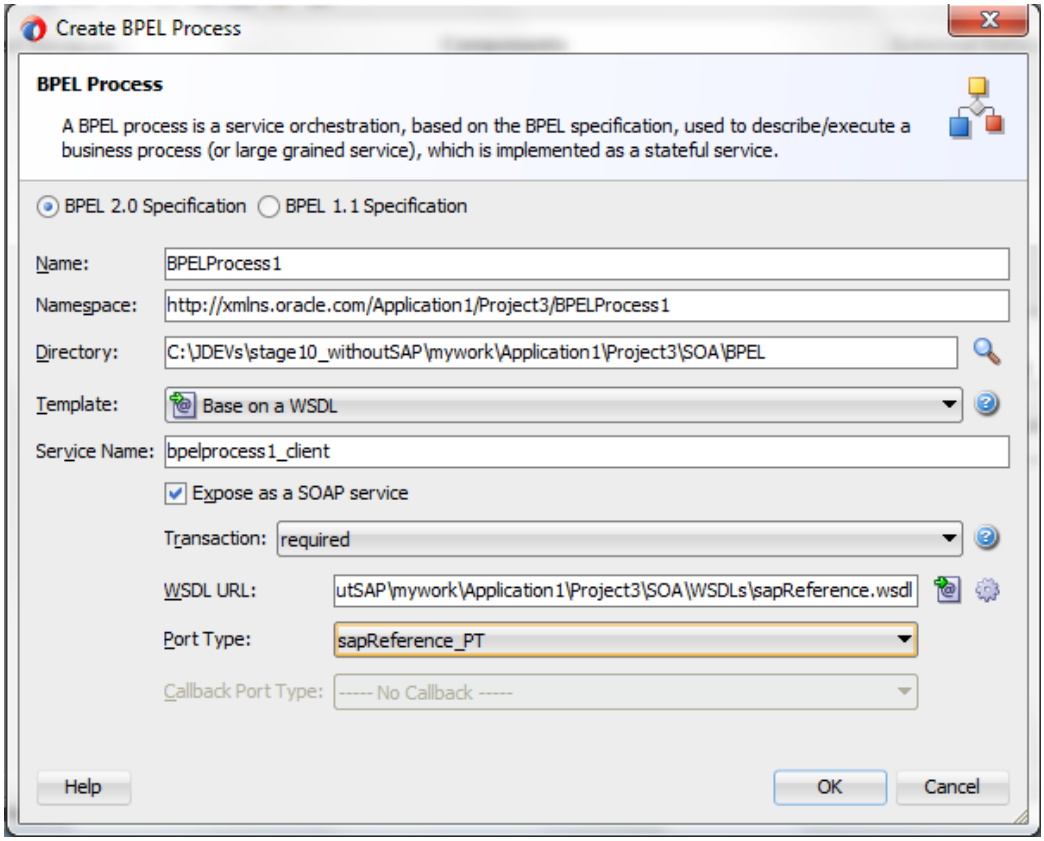
2. Enter a name for the new outbound BPEL process component in the **Name** field.
3. The **Namesapce** is automatically generated as you type the name of the BPEL process.
4. Choose a **Directory** for the new BPEL process component by clicking on **Browse**. The default Directory would be the workspace of the JDeveloper.
5. Select **Base on a WSDL** from the **Template** drop-down list.
6. To select **WSDL URL**, click the **Browse** icon as shown in Figure 8-30. You need to select a WSDL from the project source directory,

Figure 8-30 Select WSDL URL

7. Click on **File System**, expand the **SOA\WSDLs** folder and select the WSDL of the Adapter reference, **sapReference** created above in section Configure an Adapter Component, as shown in Figure 8-31.
8. Click **OK**.

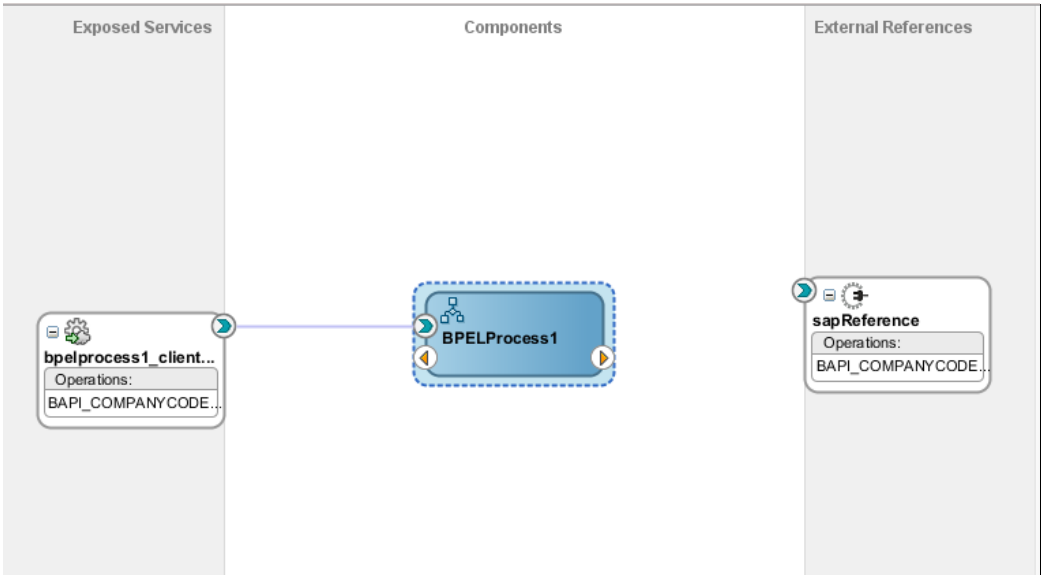
You are returned to the Create BPEL Process dialog, as shown in Figure 8-32. The **Port Type** is automatically filled from the chosen WSDL. Click **OK**.

Figure 8-31 Create BPEL Process Dialog



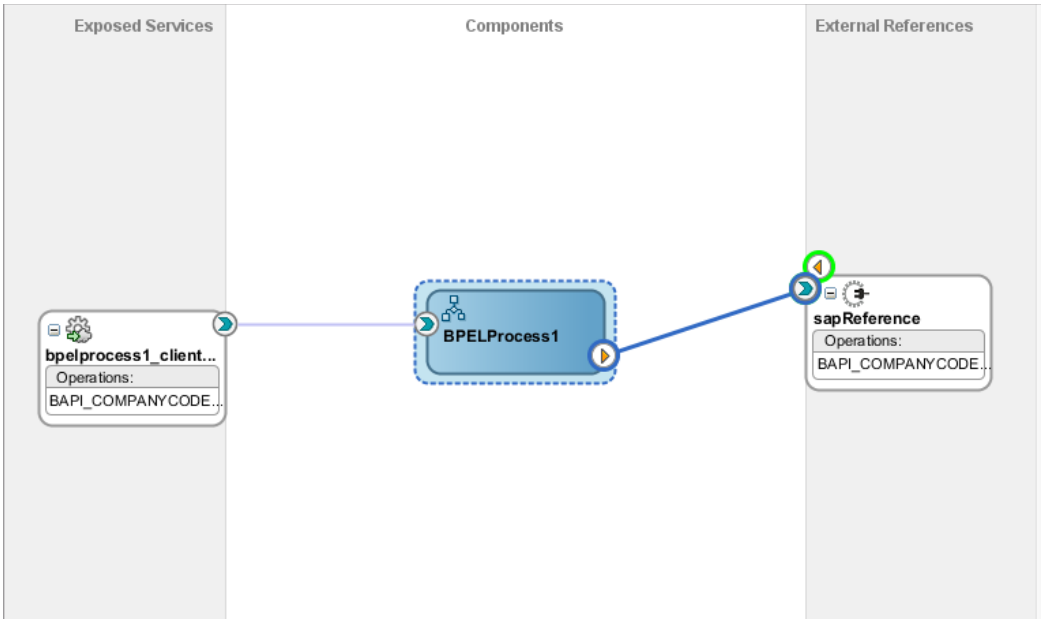
You are returned on the below screen, as shown in Figure 8-32.

Figure 8-32 Create BPEL Process Dialog



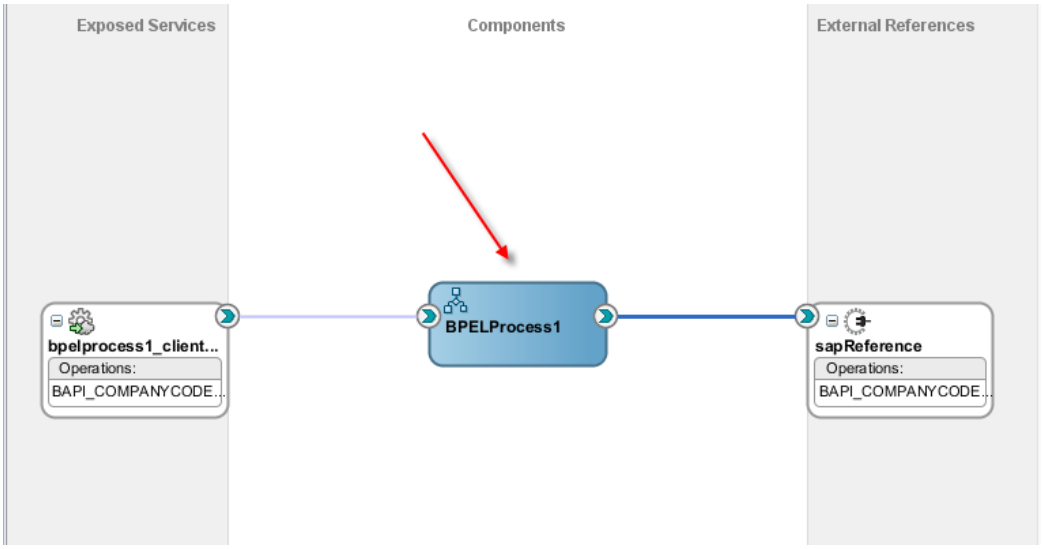
9. Create a connection between the BPELProcess1 component and sapReference component, as shown in Figure 8-33.

Figure 8-33 Wiring BPELProcess1 to sapReference



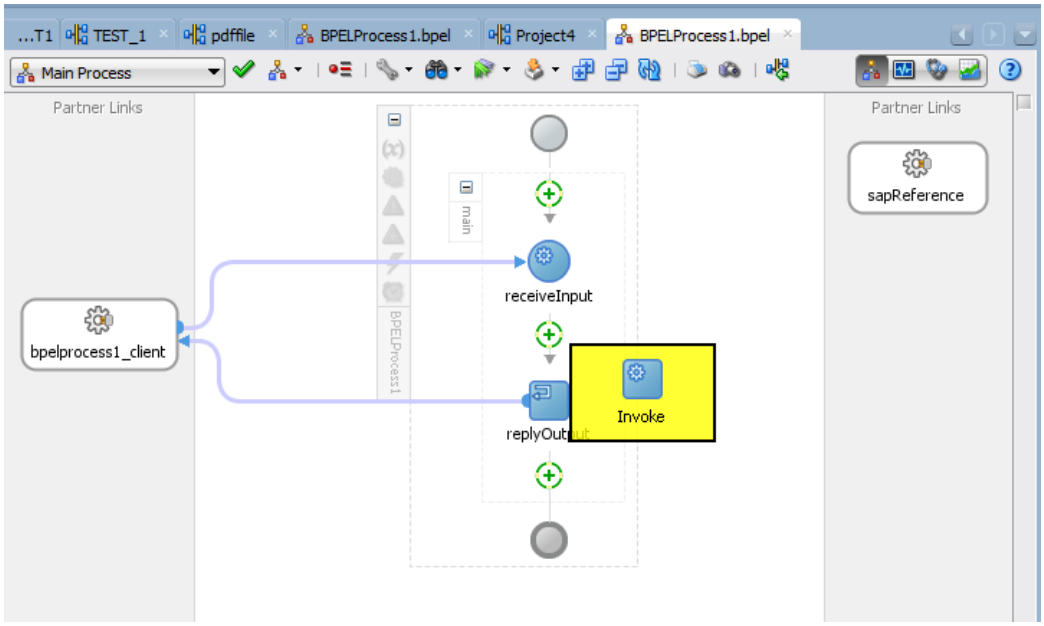
10. Double-click the outbound BPEL process component in the Components pane, as shown in Figure 8-34.

Figure 8-34 Outbound BPEL Process Component



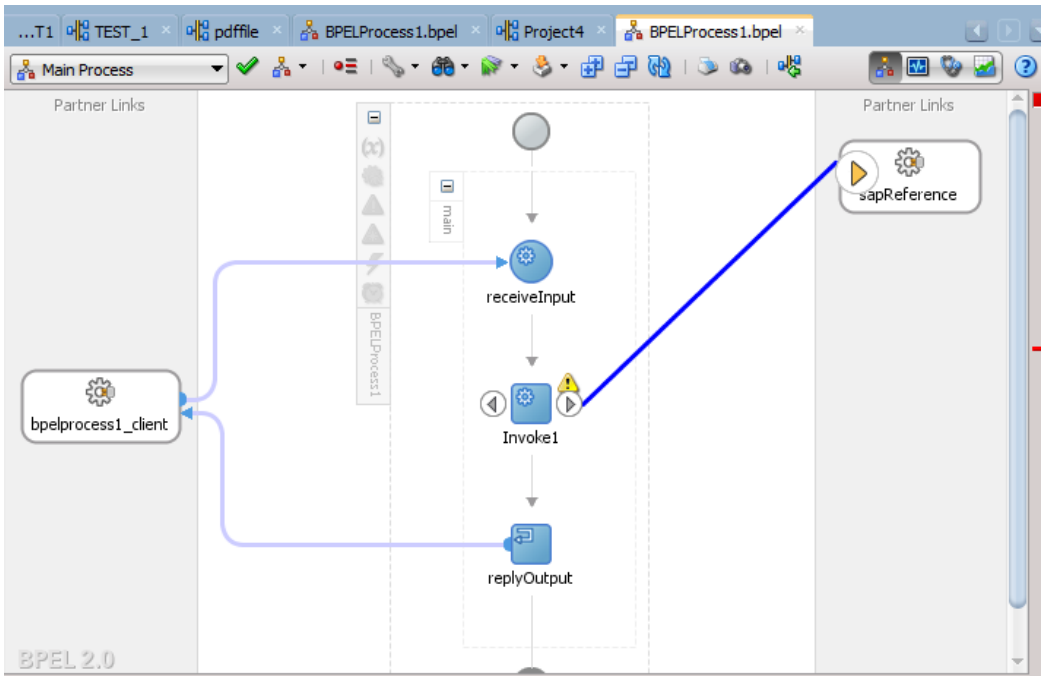
11. Drag and drop the **Invoke** activity component to the Components pane and place it between the **receiveInput** activity component and the **replyOutput** activity component, as shown in Figure 8-35.

Figure 8-35 Adding Invoke Activity



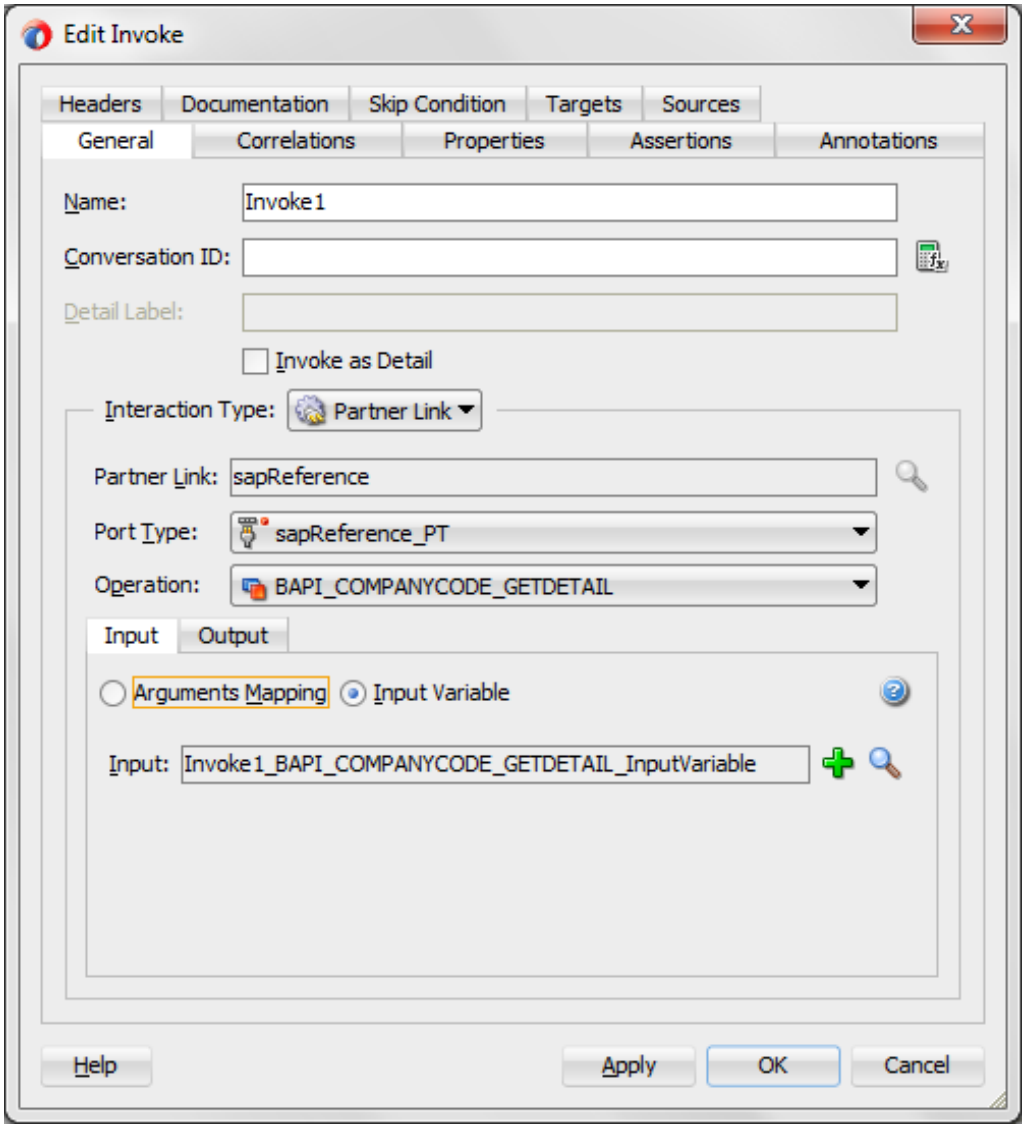
12. Create a connection between the new Invoke activity component (Invoke1) and the sapReferenc component, as shown in Figure 8-36.

Figure 8-36 Wiring Invoke activity to sapReference



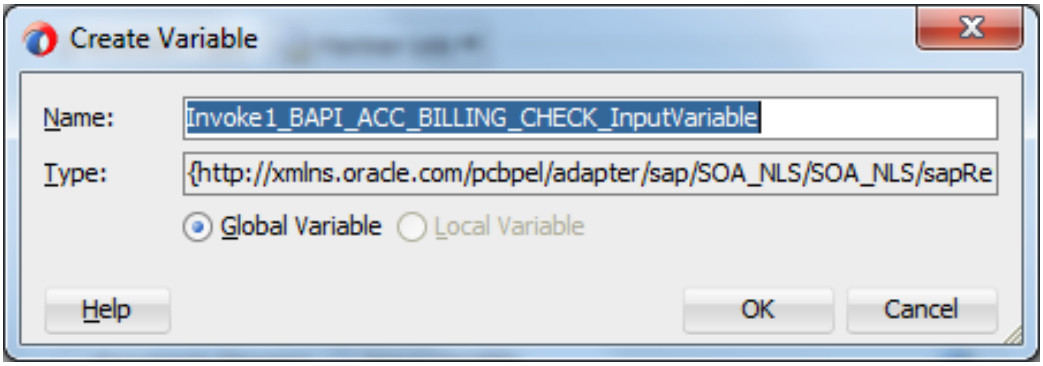
The Edit Invoke dialog is displayed, as shown in Figure 8-37.

Figure 8-37 Edit Invoke Dialog



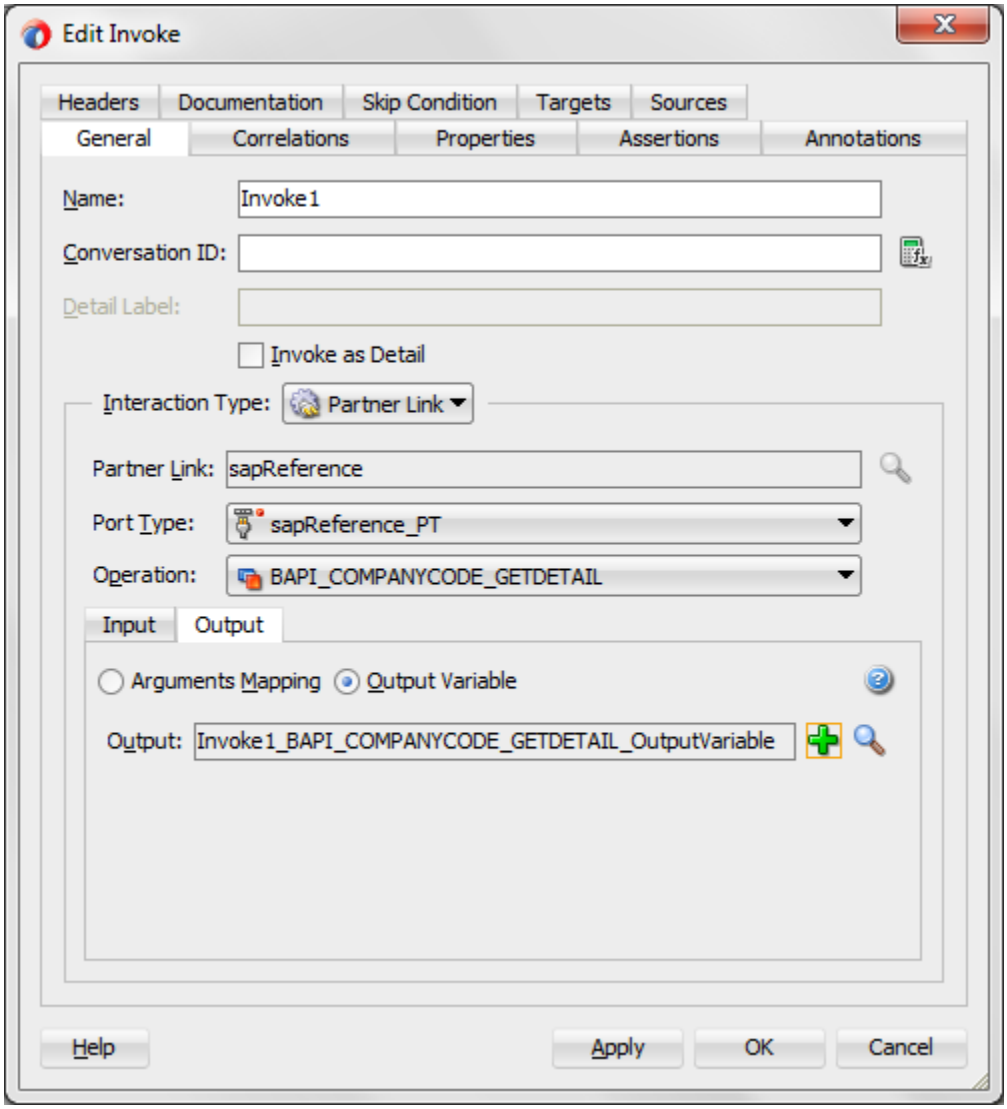
13. Under the **Input** tab, click on the **Input Variable** radio button. To configure a new input variable, click **'+'** icon located to the right of the **Input** field. The **Create Variable** pop-up appears, as shown in Figure 8-38.

Figure 8-38 Create Variable



14. Accept the default values and click **OK**. You are returned to the Edit Invoke dialog, as shown in Figure 8-39.

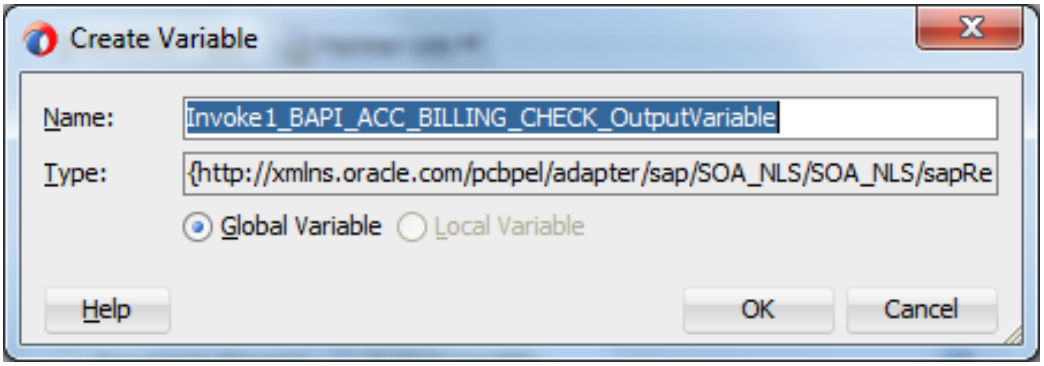
Figure 8-39 Edit Invoke Window Dialog



15. Click on **Output** tab.

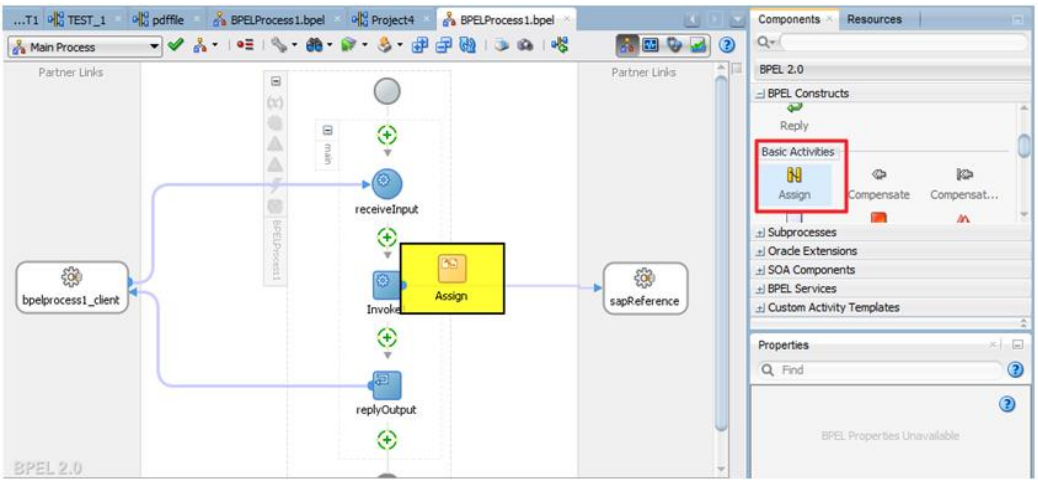
16. Click on the Output Variable radio button. To configure a new output variable, click the '+' icon, which is located to the right of the **Output** field. The Create Variable dialog is displayed, as shown in Figure 8-40.

Figure 8-40 Create Variable



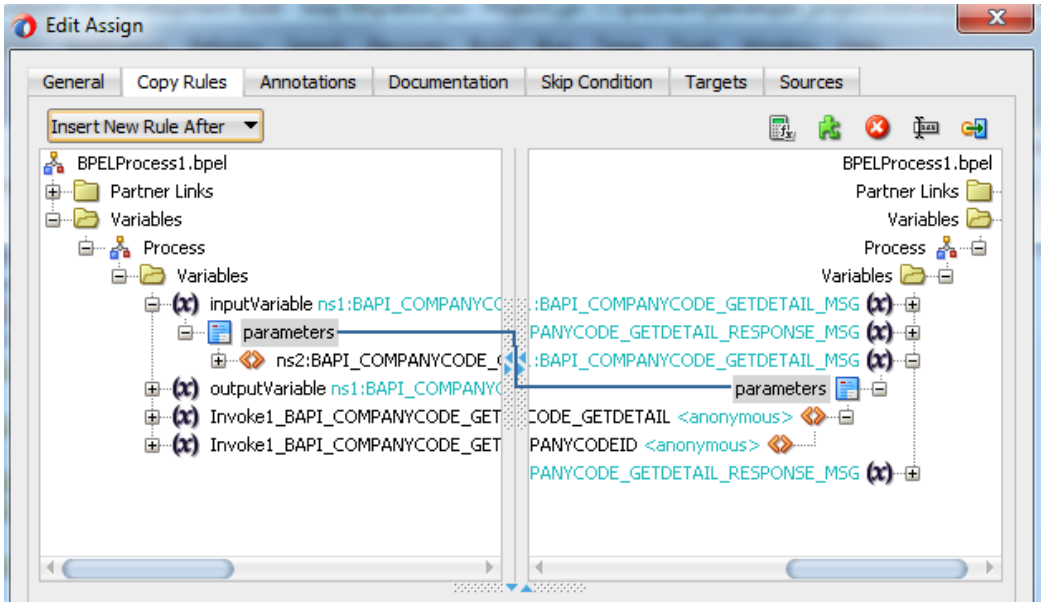
17. Select the default values and click **OK**. You are returned to the Edit Invoke dialog.
18. Click **Apply** and then **OK**.
19. Drag and drop the Assign activity from under the **BPEL Constructs** in the **Component** pane between the **Receive** activity (receiveInput) and the **Invoke activity** (Invoke1), as shown in Figure 8-41.

Figure 8-41 Assign Activity Component



20. Double-click the new Assign activity (Assign1). The **Edit Assign** dialog is displayed, as shown in Figure 8-42.

Figure 8-42 Edit Assign Dialog



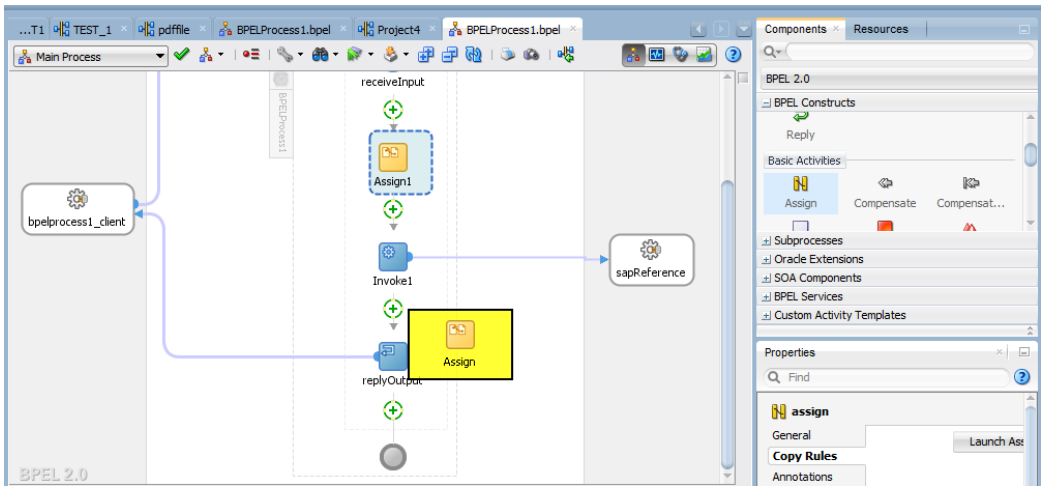
21. Expand **InputVariable** and then select **ns2.COMPANYCODEID**, which is available under **Variables** in the left pane.

22. Drag and map the selected inputVariable element ns2.COMPANYCODEID on the left pane over to the selected Invoke1_GetDetail_InputVariable element ns2.COMPANYCODEID. A wire shows the mapping between the two selected elements.

23. Click **Apply** and then **OK**.

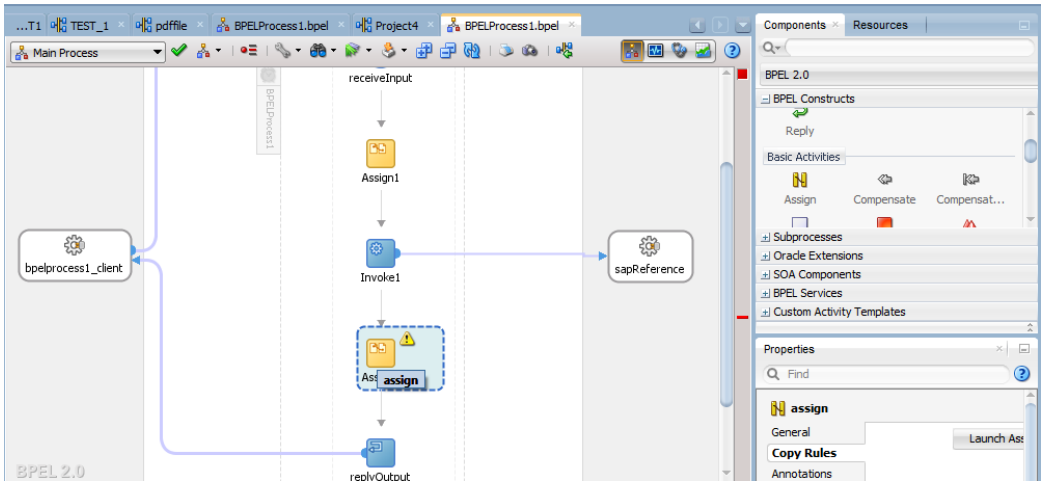
24. Drag and drop the Assign activity from BPEL Constructs from the Component Pane between the Invoke activity (Invoke1) and the Reply activity (replyOutput), as shown in Figure 8-43.

Figure 8-43 Assign Activity Component



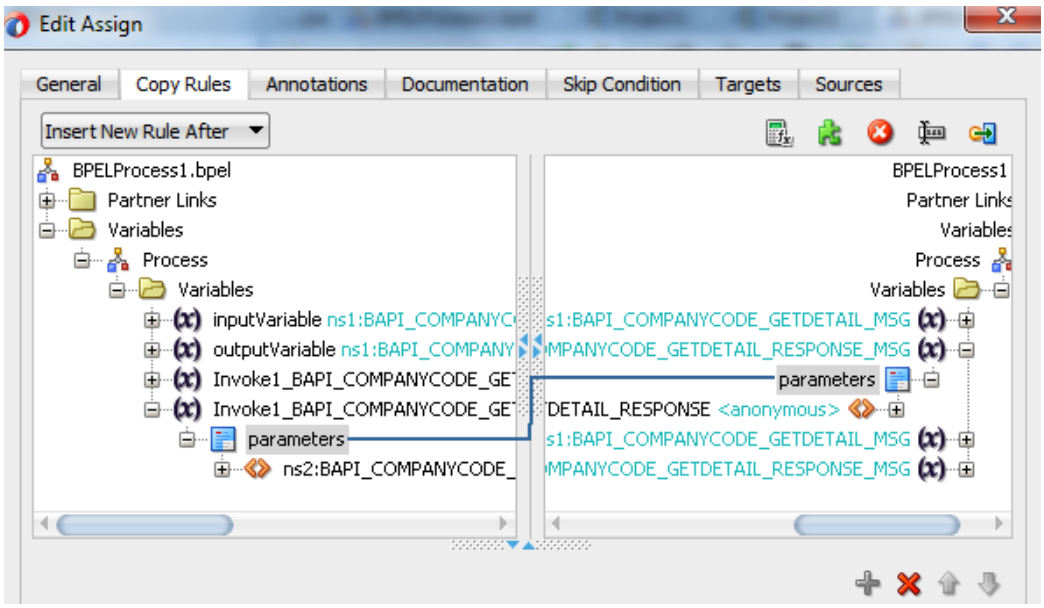
25. Double-click the new Assign activity (Assign2), as shown in Figure 8-44.

Figure 8-44 New Assign Activity



The **Edit Assign** dialog is displayed, as shown in Figure 8-45.

Figure 8-45 Edit Assign Dialog



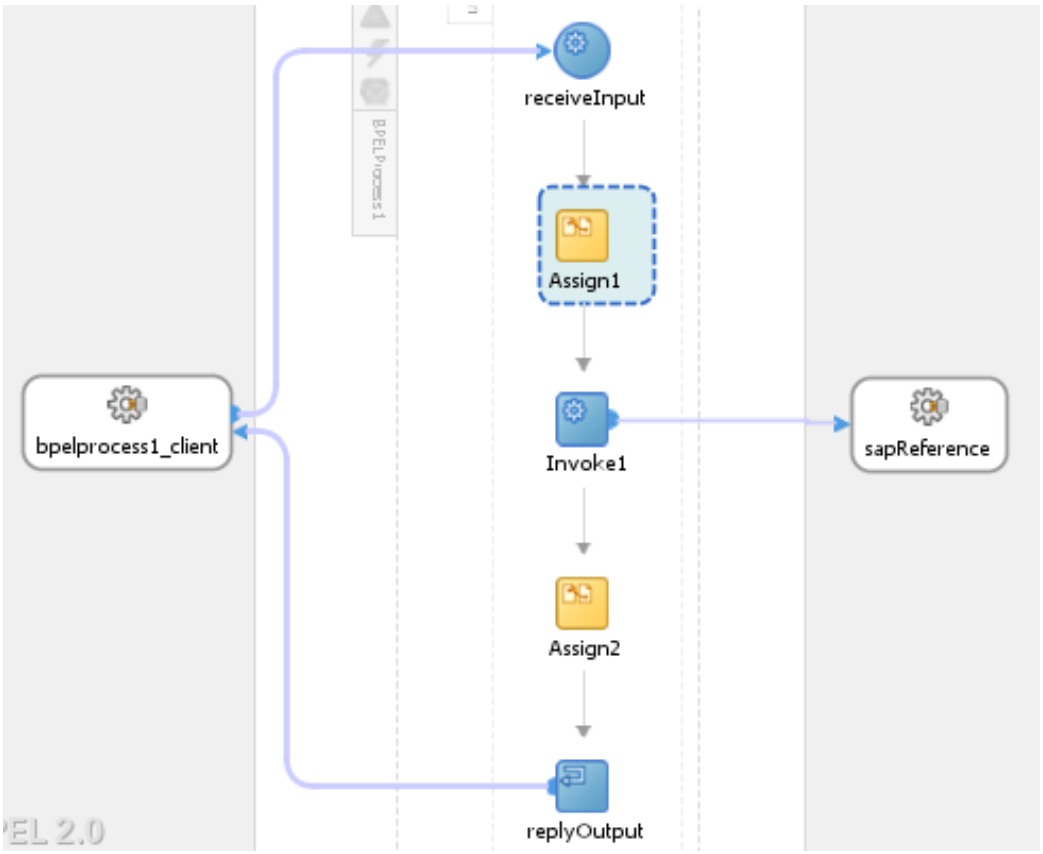
26. Expand Invoke1_BAPI_COMPANYCODE_OutputVariable, and then select ns2:BAPI_COMPANYCODE_GETDETAIL_RESPONSE, which is available under **Variables** in the left pane.

27. Expand outputVariable under the right side variable list and select ns2:BAPI_COMPANYCODE_GETDETAIL_RESPONSE.

28. Drag and map left side ns2:BAPI_COMPANYCODE_GETDETAIL_RESPONSE to right ns2:BAPI_COMPANYCODE_GETDETAIL_RESPONSE.

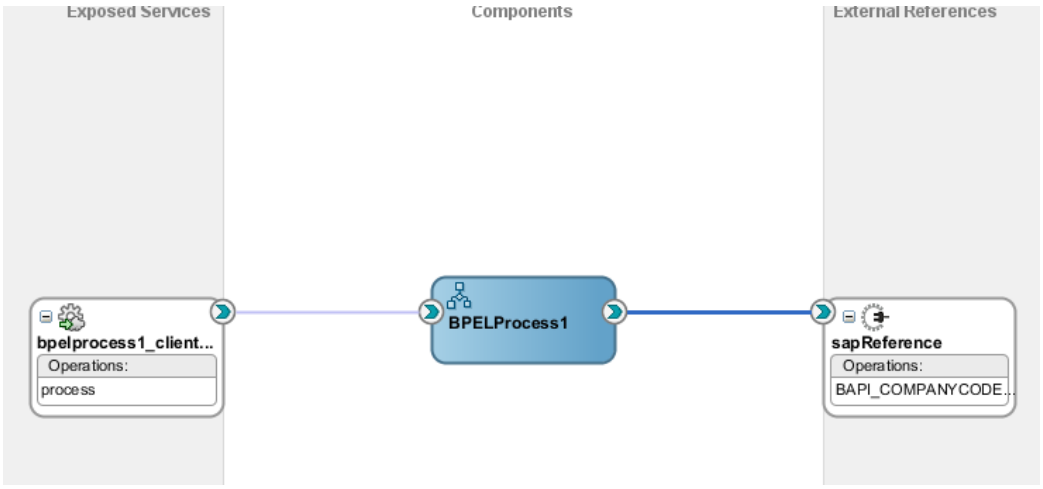
29. Click **OK**. The below screen appears, as shown in Figure 8-46.

Figure 8-46 Composite.xml



30. From the JDeveloper menu bar, click the **Save All** icon to save the new outbound BPEL process, as shown in Figure 8-47.

Figure 8-47 Save All Icon



You are now ready to deploy the BPEL outbound process.

Deploy the BPEL Outbound Process

To deploy the BPEL outbound process, you can follow the same procedure which is described in "Deploy the Defined Process".

Test the BPEL Outbound Process

After deploying the BPEL outbound process, you are ready to test the BPEL outbound process. To test the process, you should follow the same procedure that is described in "Test the Deployed Process".

8.2.4 Design an Inbound BPEL Process for BAPI/RFC/IDoc

This section describes how to design an inbound BPEL process, which consists of the following two stages:

1. Configure an Adapter Service Component
2. Configure an Inbound BPEL Process Component

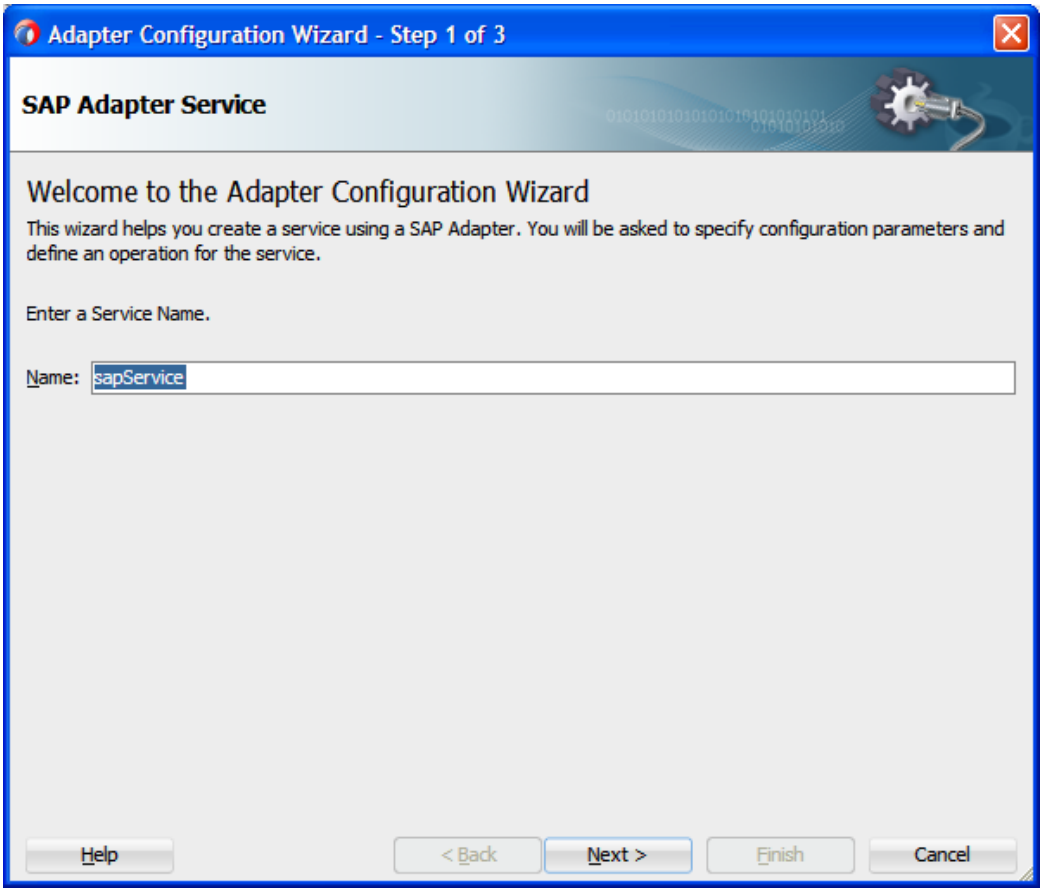
Configure an Adapter Service Component

1. Drag and drop the Adapter component from the **Application Adapters** SOA component palette to the **Exposed Services** pane, as shown in Figure 8-48.

Figure 8-48 Adapter Component

The Welcome page of the Adapter configuration wizard is displayed, as shown in Figure 8-49.

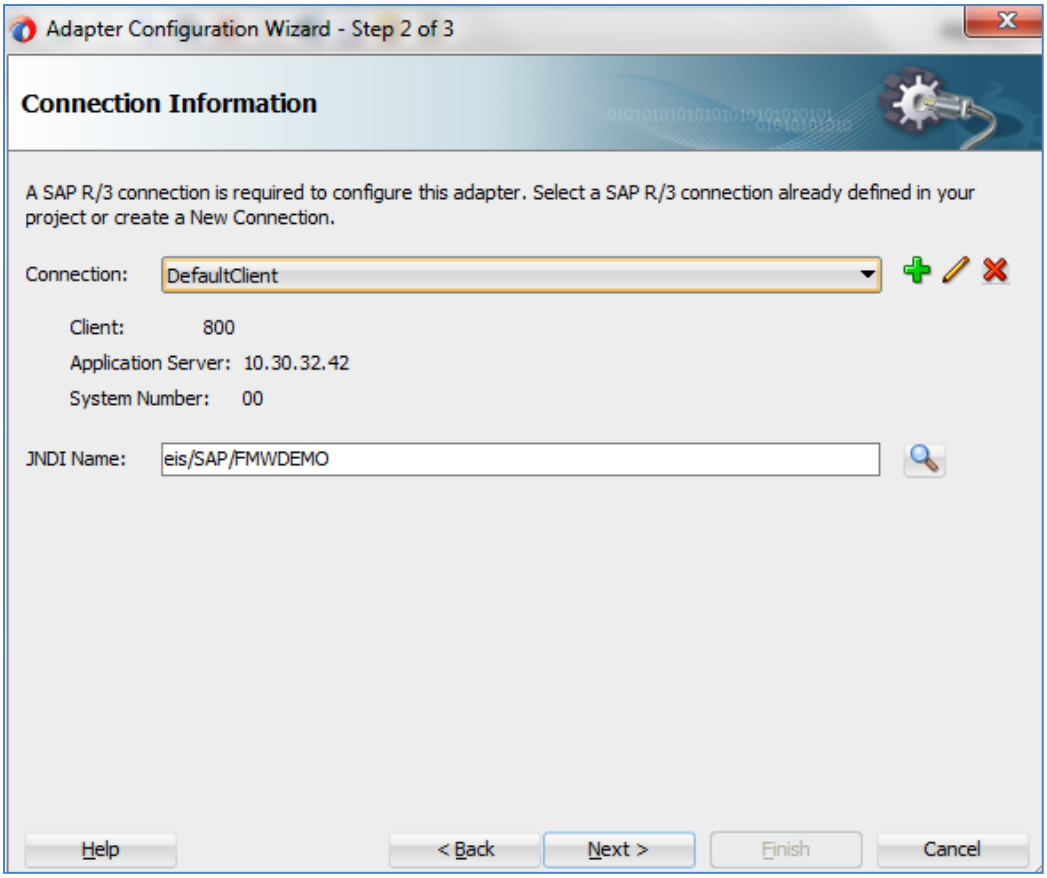
Figure 8-49 Adapter Configuration Wizard



2. Enter a service name for the Adapter Service component in the **Name** field and then click **Next**.

   The Connection information page is displayed, as shown in Figure 8-50.

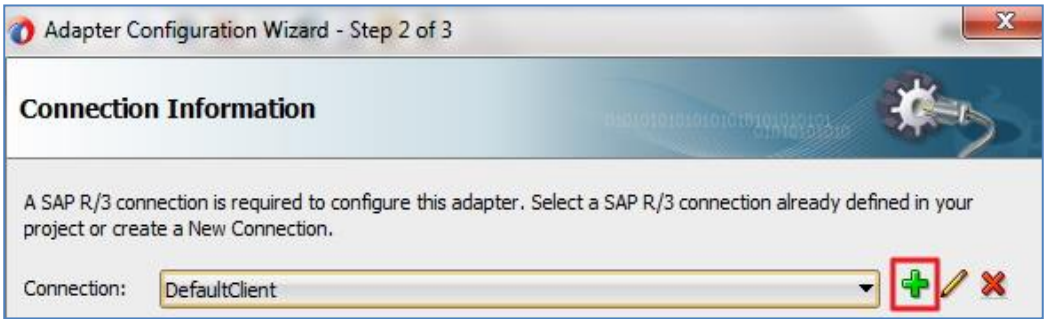
Figure 8-50 Connection Information Page



3. On the **Connection Information** page, click + icon, which is located to the right of the **Connection** field, to create a new connection, as shown in Figure 8-51.

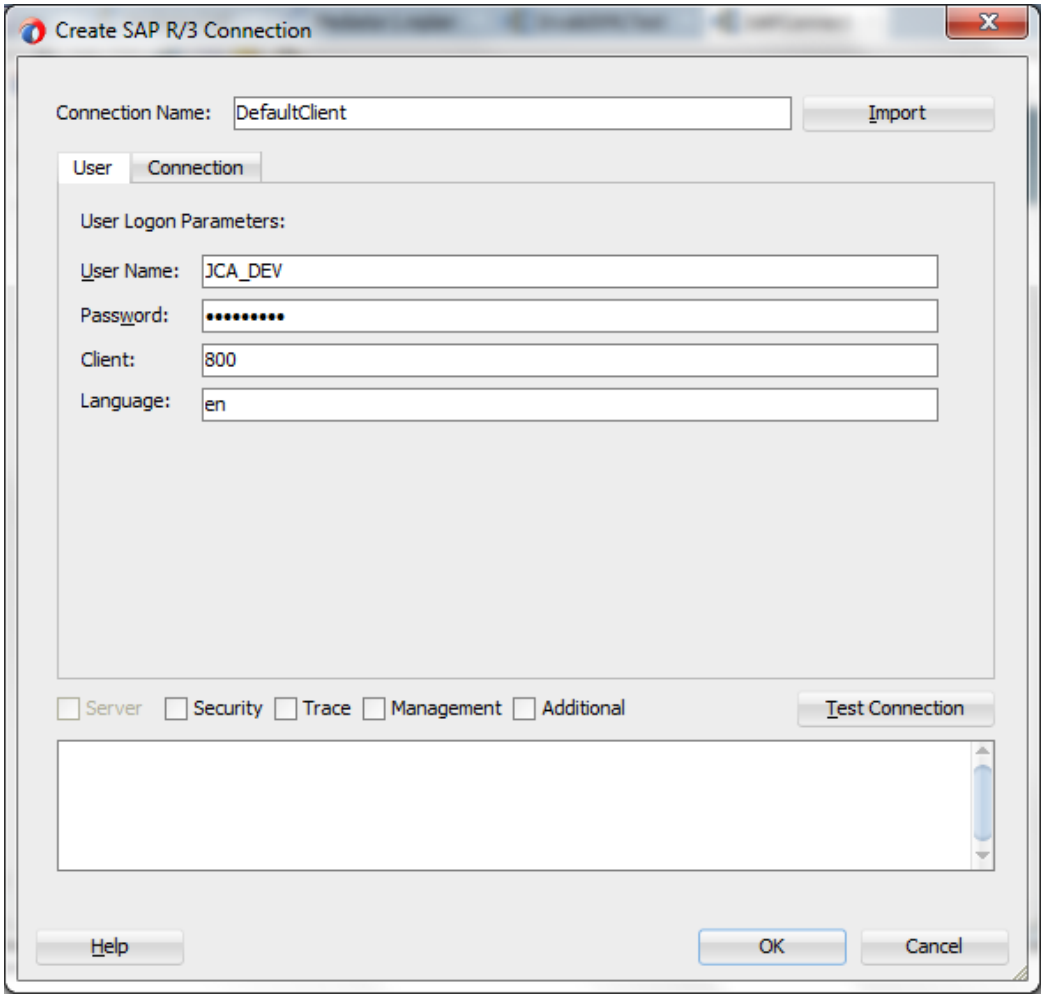
   Note: Use the default JNDI name.

Figure 8-51 Create New SAP Connection



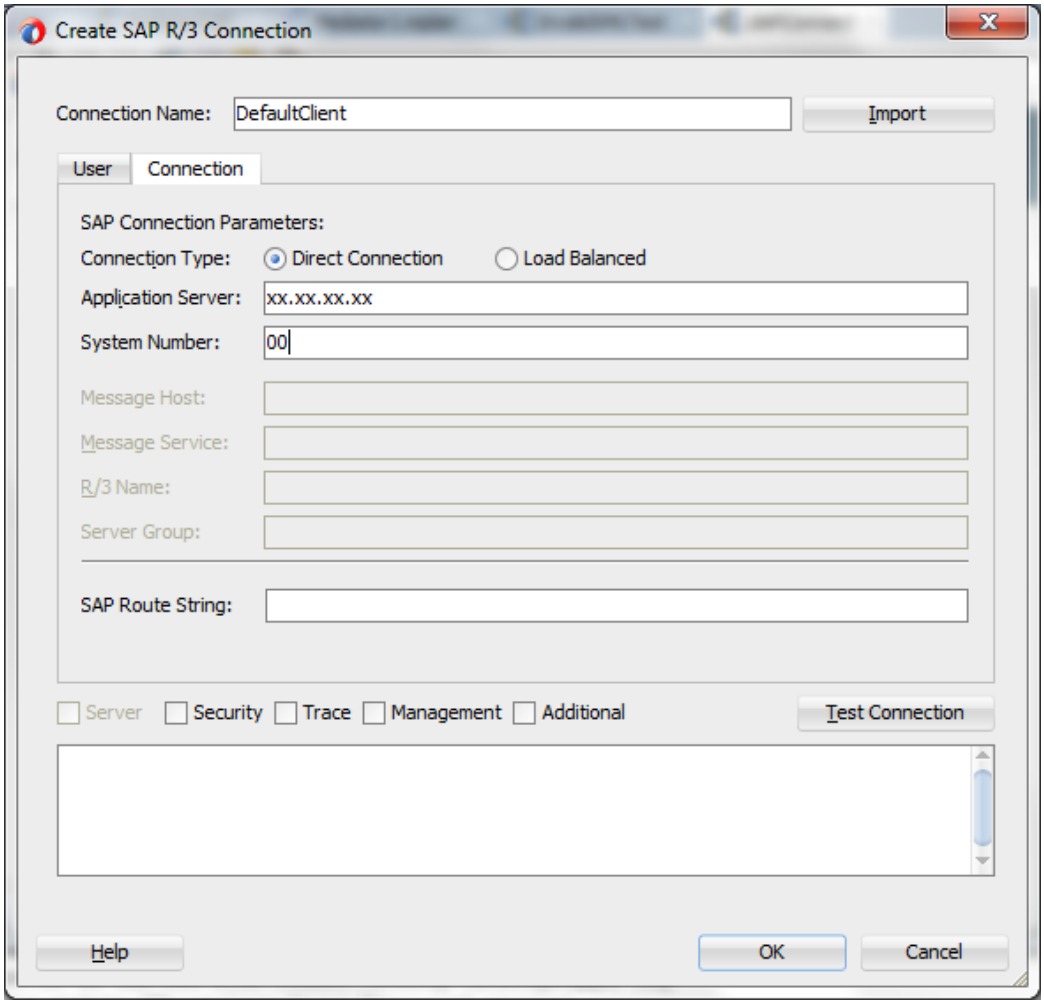
The **Create SAP R/3 Connection** page is displayed, as shown in Figure 8-52.

Figure 8-52 Create SAP R/3 Connection Page



4. Enter a connection name as DefaultClient in the **Connection Name** field.
5. Enter a user name for an SAP system (for example JCA_DEV) in **User Name** field.
6. Enter a password for an SAP system (for example ORACLEABCD) in the **Password** field.
7. Enter the SAP system client ID in the **Client** field.
8. Select language. Default is en (English).
9. Click on **Connection** tab.
10. Enter Application Server details and System Number, as shown in Figure 8-53.

Figure 8-53 Create SAP R/3 Connection Page

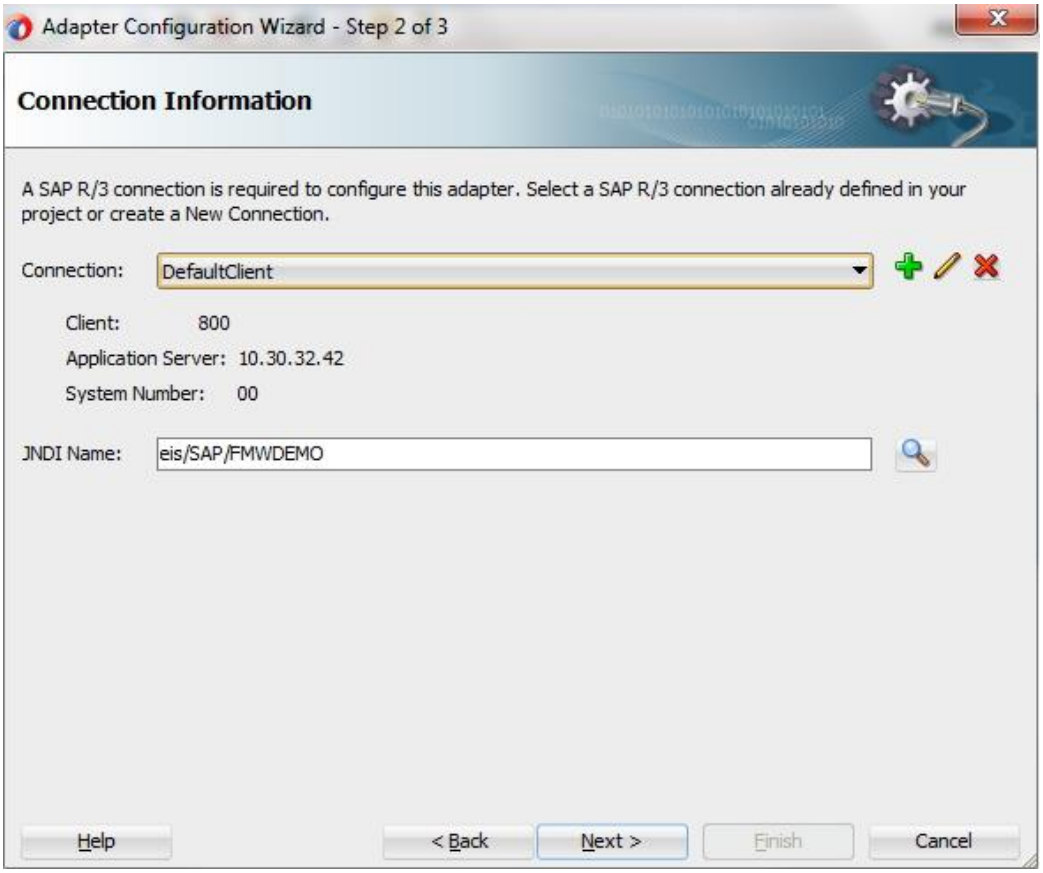


11. After entering the details, you can click on the **Test Connection** button to test if the SAP connection is successful.

12. Click **OK**.

    You are returned to the Connection Information page, as shown in Figure 8-54.

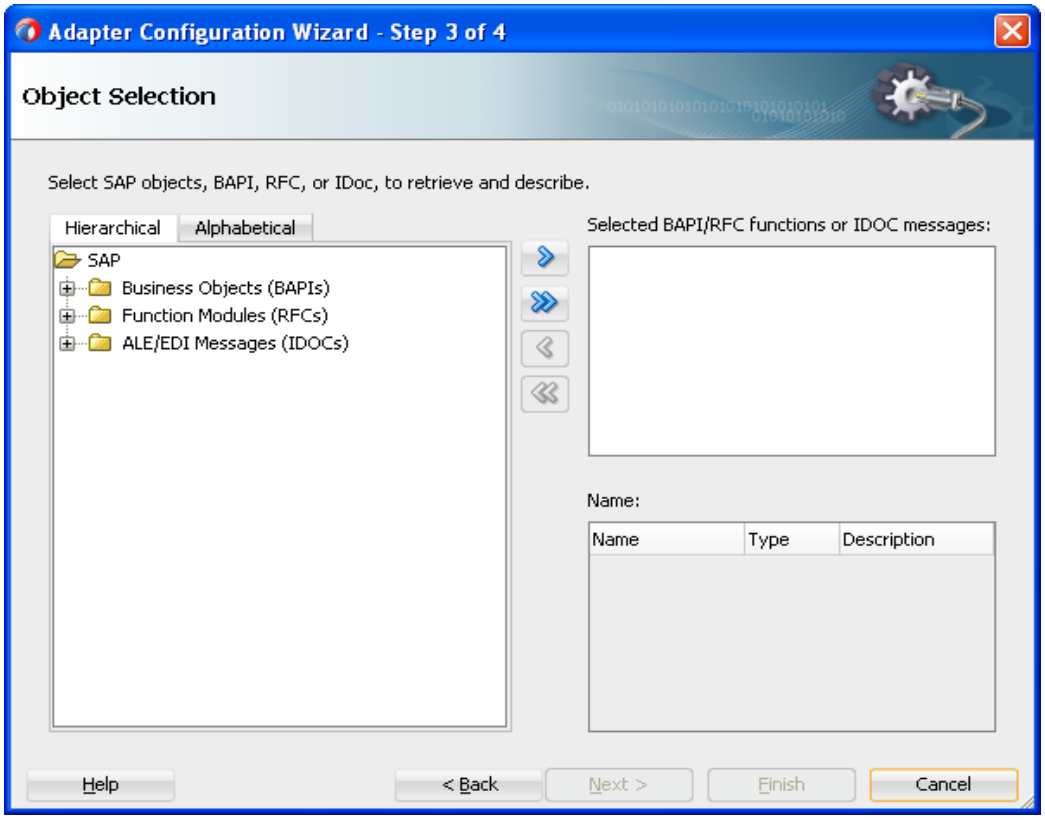
Figure 8-54 Connection Information Page



13. Click **Next**.

The **Object Selection** page is displayed, as shown in Figure 8-55.

Figure 8-55 Object Selection Page



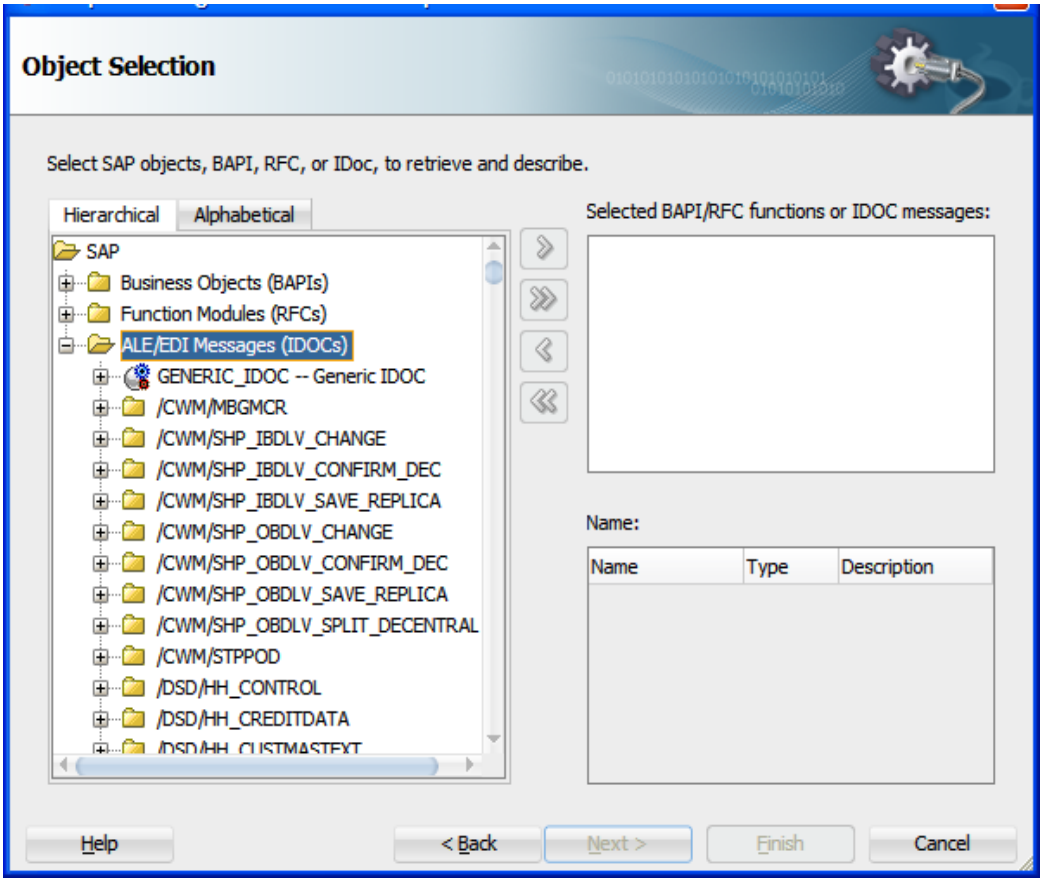
14. Click the **Hierarchical** tab, and then click on + icon to expand the node.

This tab shows all the SAP Objects (RFC/BAPI/IDoc) available in that SAP system in hierarchical form, as shown in Figure 8-56.

Figure 8-56 Hierarchical Tab

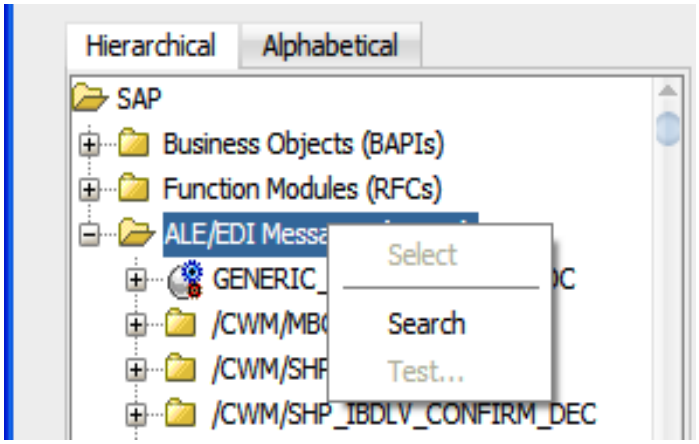
15. On the **Object Selection** page, expand the **ALE/EDI Messages (IDOCs)** node and search **MATMAS01**, as shown in Figure 8-57.

Figure 8-57 Object Selection Page



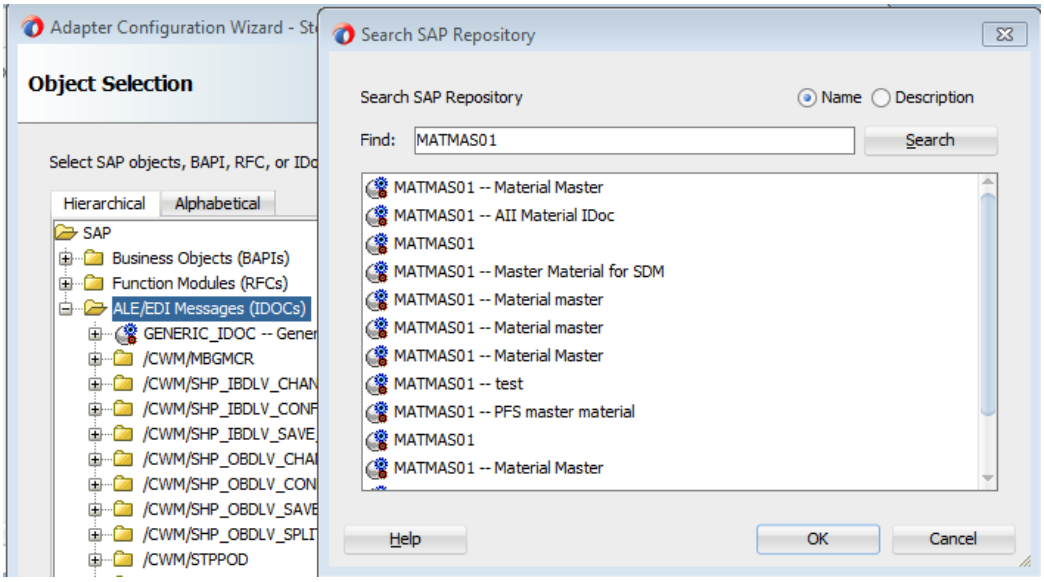
16. Right-click on **ALE/EDI Messages (IDOCs)** node and select **Search**, as shown in Figure 8-58.

Figure 8-58 Search Page



17. In the **Search** window, search for **matmas01**, as shown in Figure 8-59.

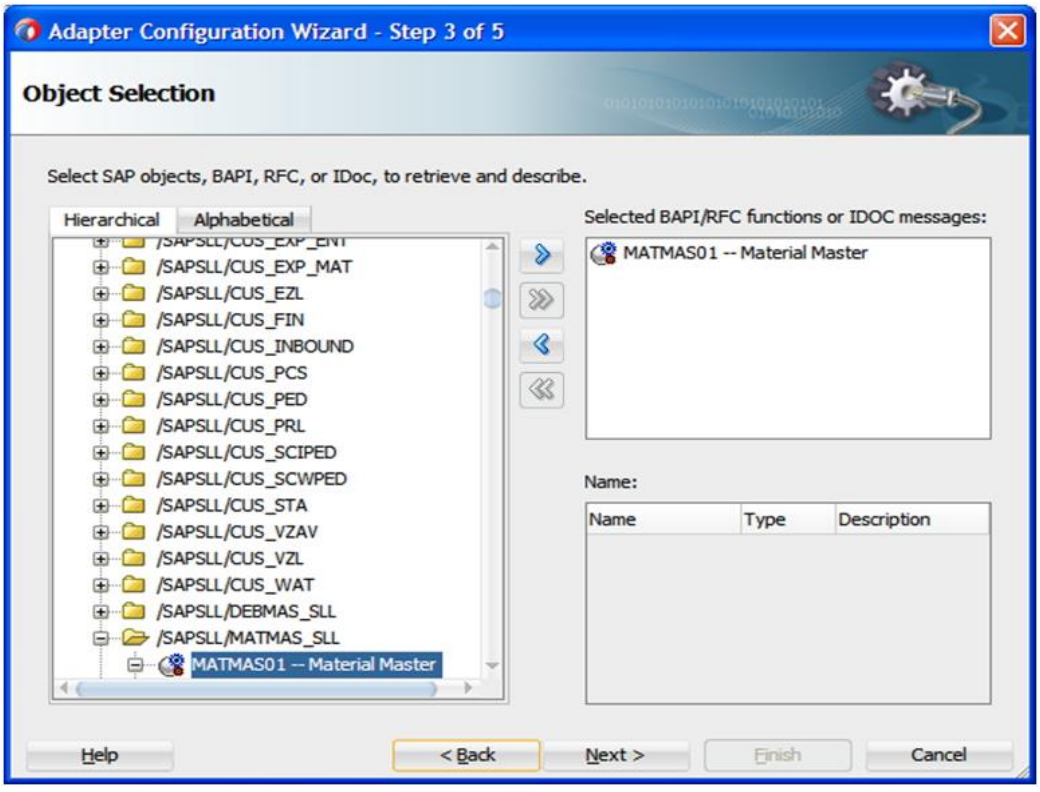
Figure 8-59 Search SAP Repository Page



18. Select **MATMAS01-Material Master** from the search result, and click **OK**.

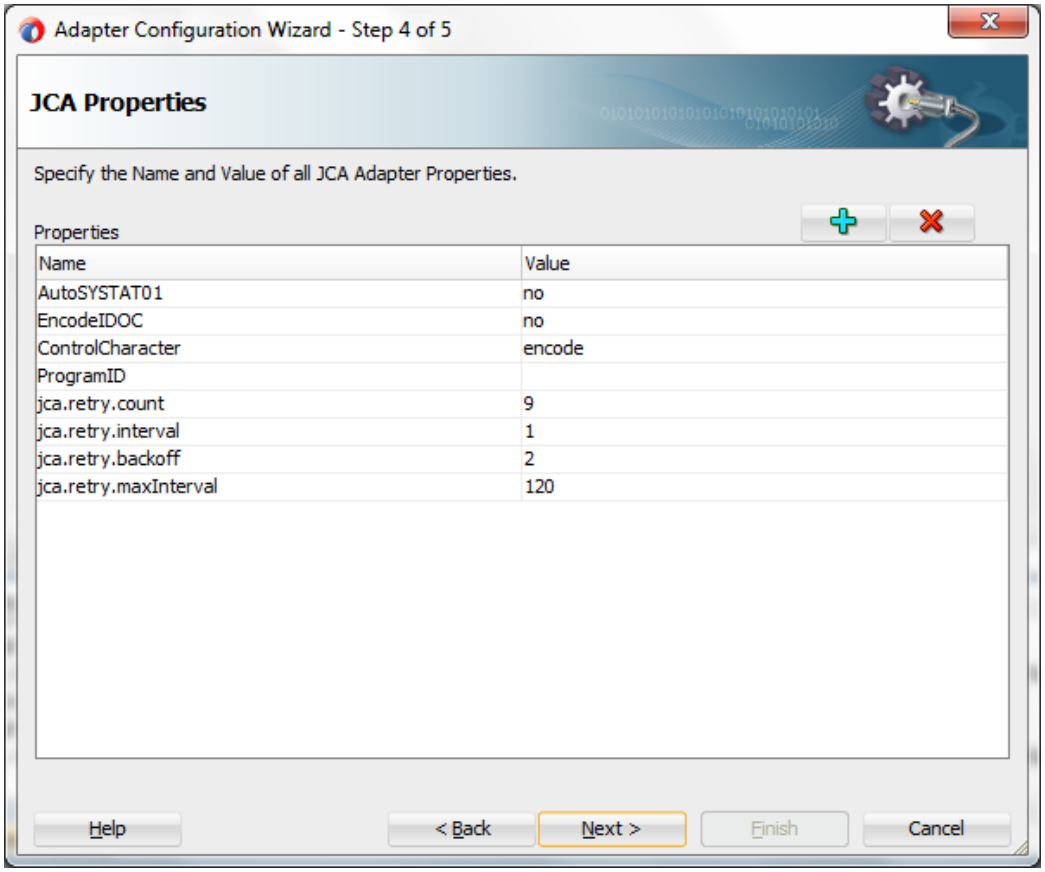
You are returned to the **Object Selection** page, as shown in Figure 8-60.

Figure 8-60 Object Selection Page



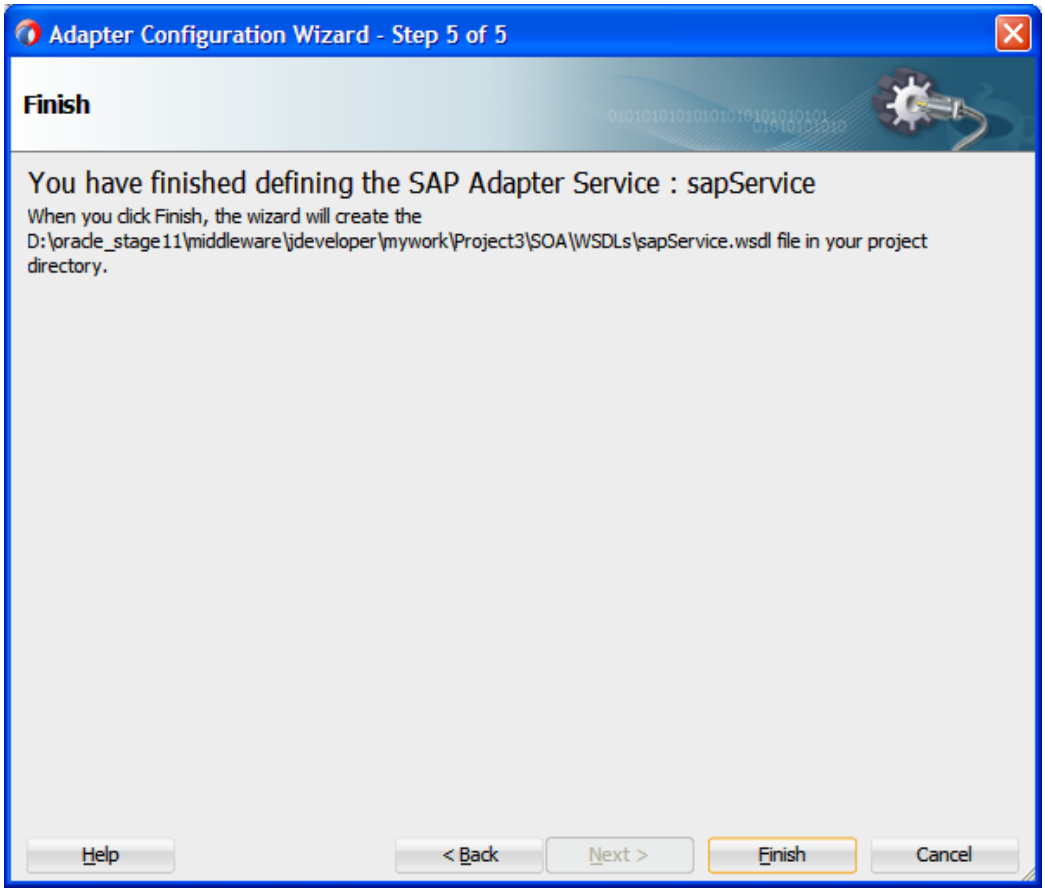
19. Click '>' icon to move the object to the right side under the **Selected BAPI/RFC functions or IDOC messages**.
20. Click **Next**. The **JCA Properties** page is displayed, as shown in Figure 8-61.

Figure 8-61 JCA Properties Page



21. Click **Next**, the **Finish** page is displayed, as shown in Figure 8-62.

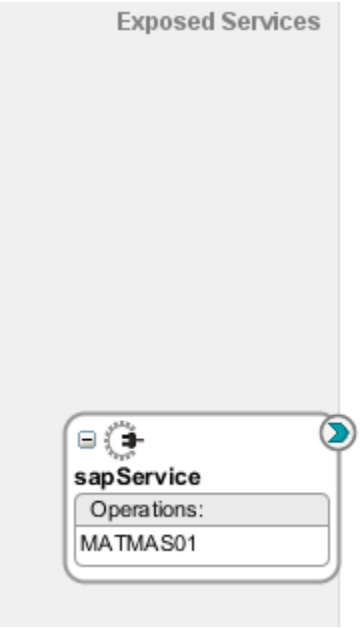
Figure 8-62 Finish Page



22. Click **Finish**.

The Adapter for SAP is created and displayed in the **Exposed Services** pane, as shown in Figure 8-63.

Figure 8-63 Adapter Component



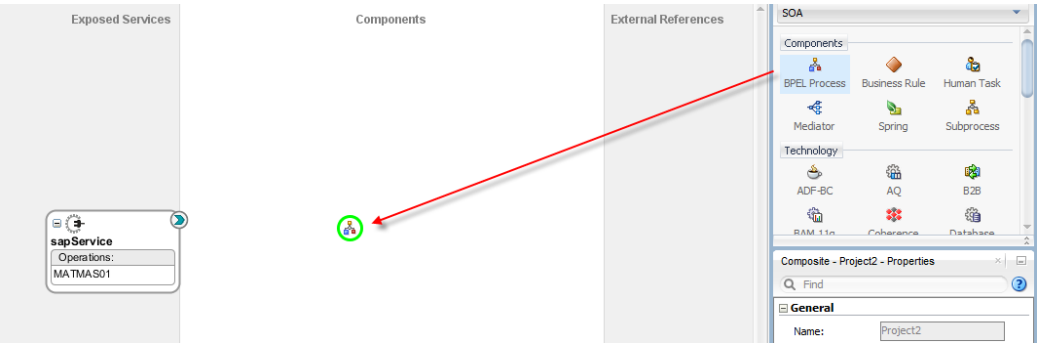
You are now ready to configure an inbound BPEL process component.

Configuring an Inbound BPEL Process Component

Perform the following steps to create an inbound BPEL process component:

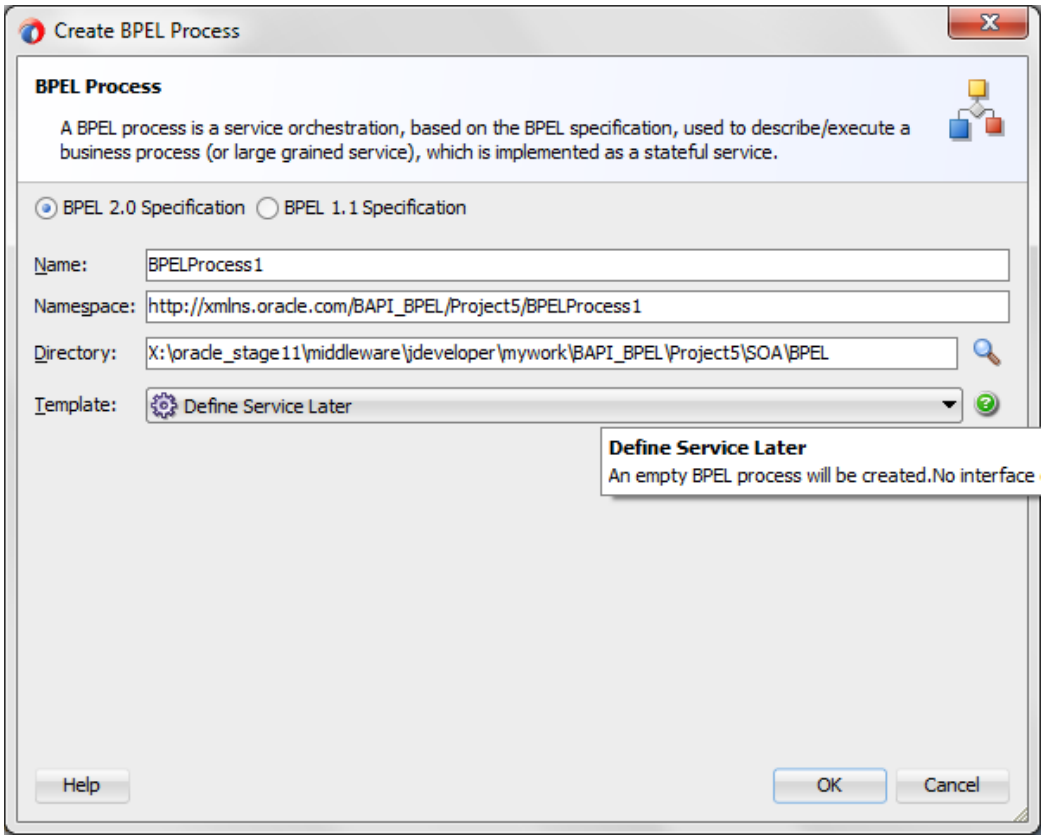
1. Create an Empty composite. Refer to section "Create an Empty Composite"
2. Drag and drop the **BPEL Process** component from the **SOA Components** palette to the **Components** pane in the composite, as shown in Figure 8-64.

Figure 8-64 BPEL Process Component



The **Create BPEL Process** dialog is displayed, as shown in Figure 8-65.

Figure 8-65 Create BPEL Process Dialog

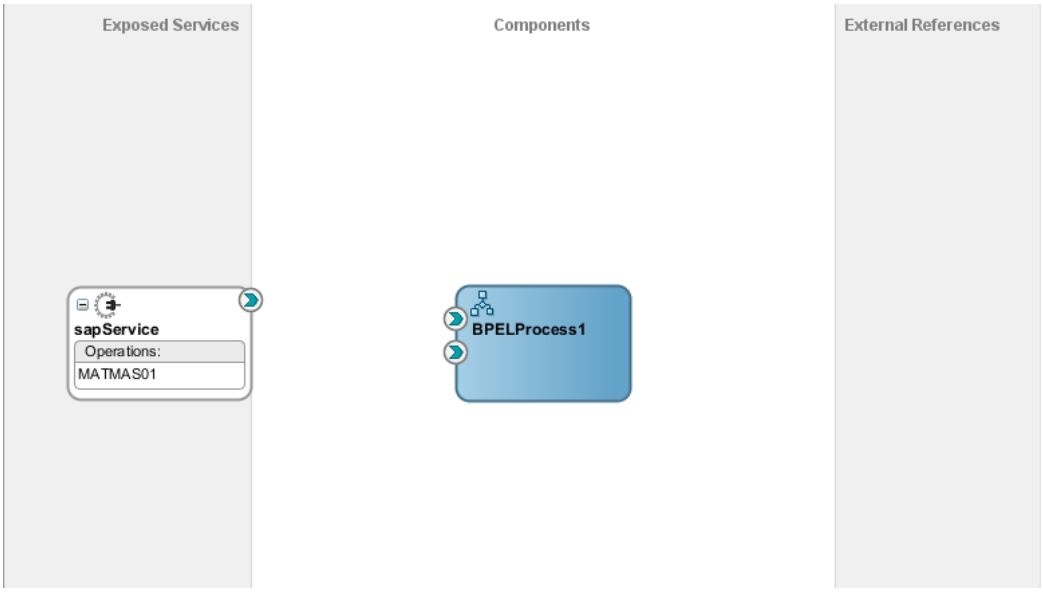


3. Enter a name in the **Name** field to identify the new inbound BPEL process component (for example, matmas_inbound).

4. Click **OK**.

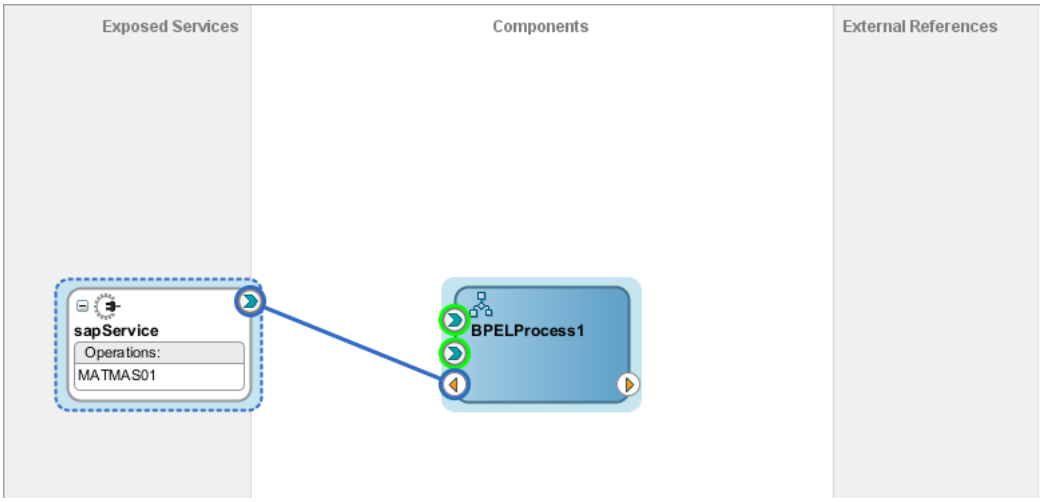
   The Inbound BPEL process component is created and displayed in the Components pane, as shown in Figure 8-66.

Figure 8-66 BPEL Process Component



5. Create a connection between the Adapter Service component (MATMAS01) and the Inbound BPEL process component (matmas_inbound), as shown in Figure 8-67.

Figure 8-67 Create Connection Dialog



8.2.5 Deploy the Composite with Inbound BPEL Process

To deploy the Composite with Inbound BPEL Process, you can follow the same procedure as described in "Deploy the Defined Process".

8.2.6 Generate an Event in SAP R/3 and Process It by the SOA Composite

Once an event message is triggered through SAP GUI, it invokes the Adapter Service which in-turn initiates a BPEL process instance. BPEL process invokes the File Adapter Service and the input received from the SAP event is written as the output XML in a file in the location that was specified for the File adapter service component. For more information on Generate events in SAP R/3, refer to the section "Generate an Event in SAP R/3".

8.2.7 Define an Outbound Mediator Process

This section describes how to define an Outbound Mediator process, which consists of the following stages:

1. Create an Empty Composite for SOA
2. Configure an Adapter Component
3. Configure an Outbound Mediator Process Component
4. Configure the Routing Rules

Create an Empty Composite

To create an empty composite, you can follow the same procedure as described in "Create an Empty Composite"

Configure an Adapter Component

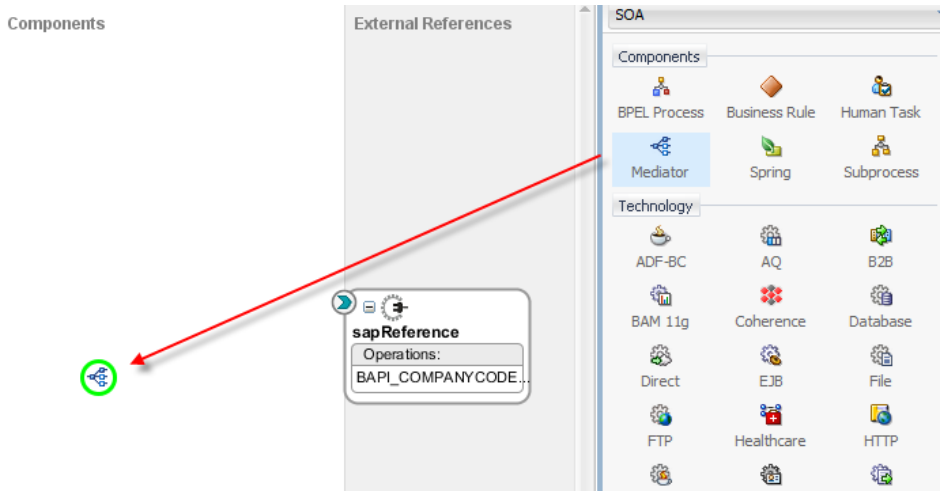
For more information, refer to the section "Configure an Adapter Component" as described in "Define an outbound BPEL Process".

Configure an Outbound Mediator Process Component

Perform the following steps to configure an Outbound Mediator process component:

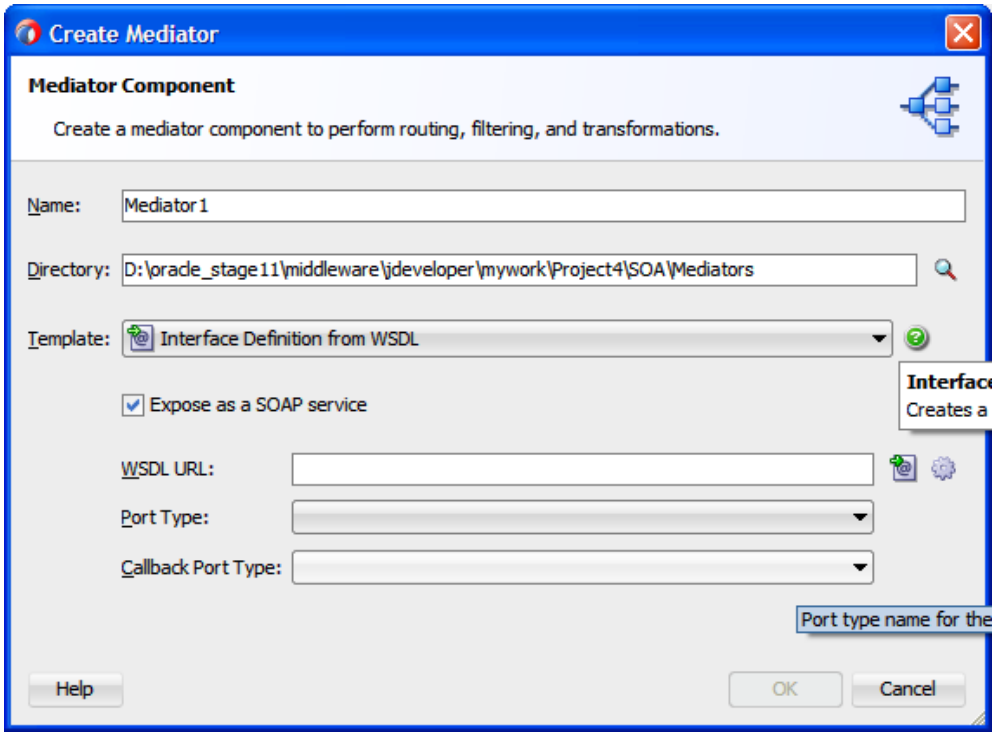
1. Open the composite created above in JDeveloper 12.2.1.
2. Drag and drop the **Mediator Process** component from the **SOA Components** palette to the **Components** pane, as shown in Figure 8-68.

Figure 8-68 Mediator Process Component



The Create Mediator dialog is displayed, as shown in Figure 8-69.

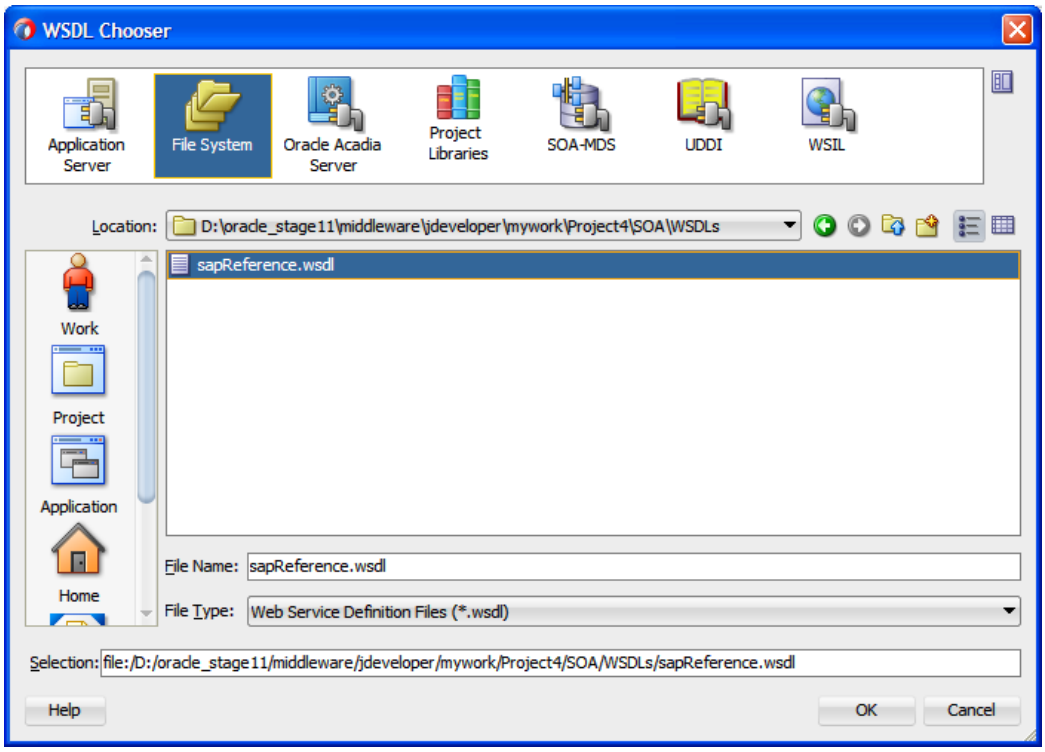
Figure 8-69 Create Mediator Dialog



3. Click the drop-down icon to the right of **Template** field and select **Interface Definition** from WSDL.
4. Click the **Find existing WSDLs** icon, which is located to the right of the **WSDL URL** field.
5. Select an inbound WSDL file from the following directory:

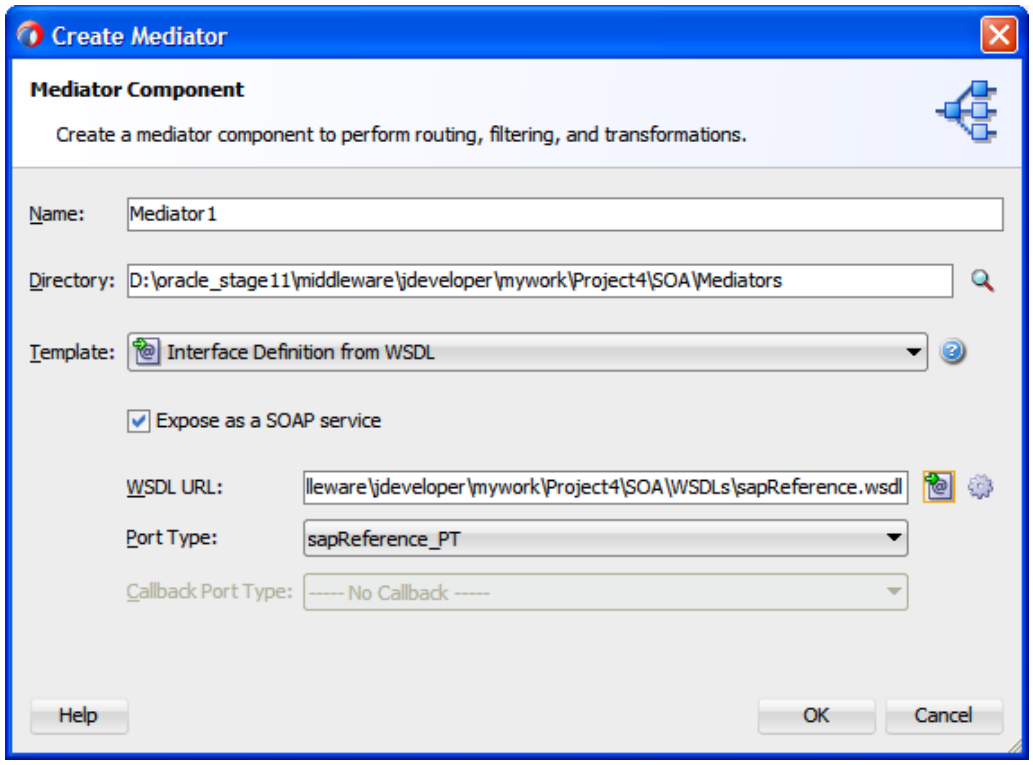
   Project path directory\SOA\WSDLs, as shown in Figure 8-70.

Figure 8-70 WSDL Chooser Dialog



6. Click **OK**. You are returned to the **Create Mediator** dialog, as shown in Figure 8-71.

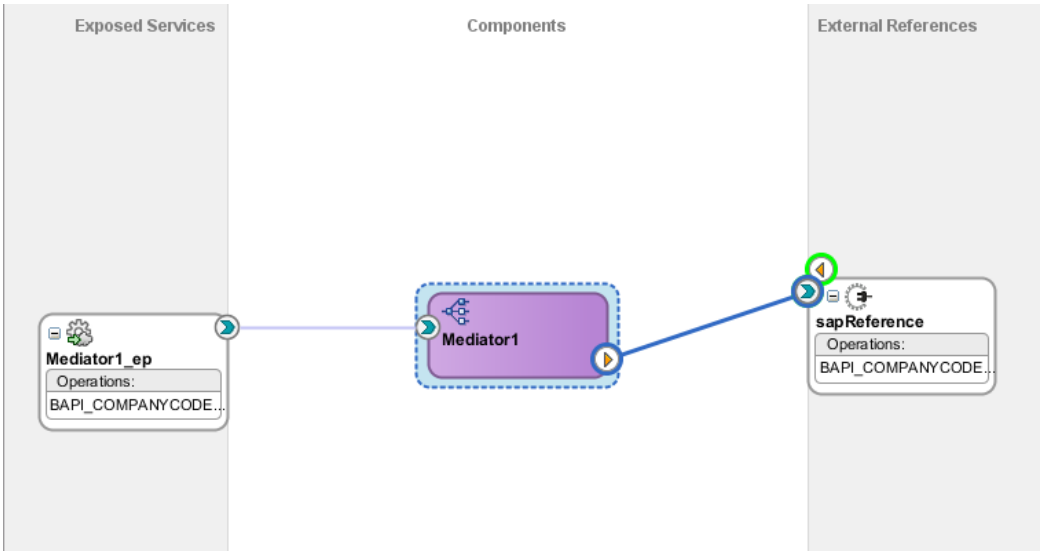
Figure 8-71 Create Mediator Dialog



7. Click **OK**.

8. Create a connection between the Outbound Mediator process component (CompanyCode_GetDetail) and the Adapter Service component (GetDetail), as shown in Figure 8-72.

Figure 8-72 Create Connection Dialog



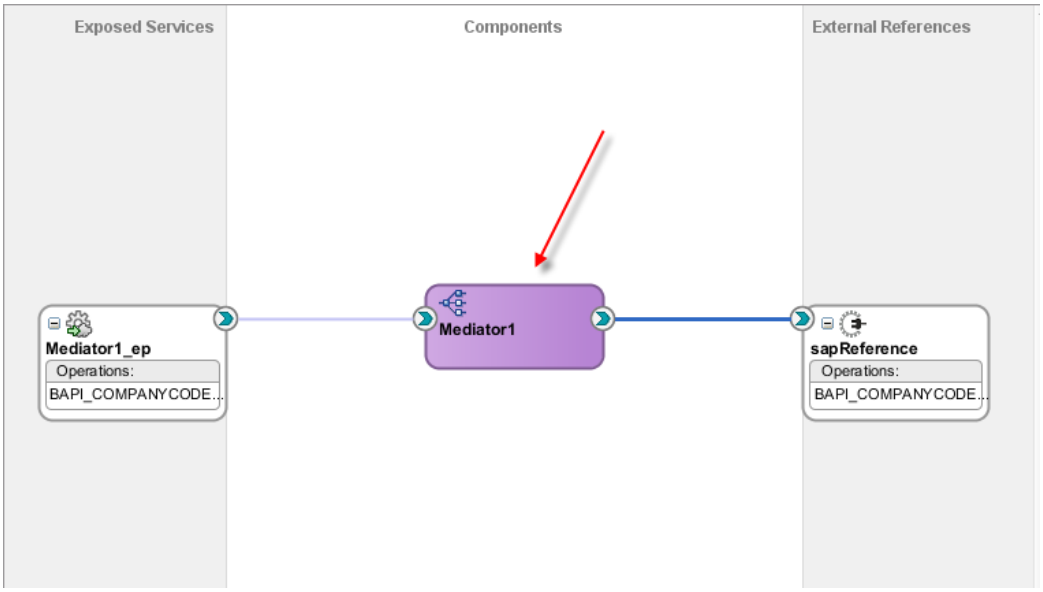
You are now ready to configure the routing rules.

Configuring the Routing Rules

Perform the following steps to configure the routing rules for the Outbound Mediator process component:

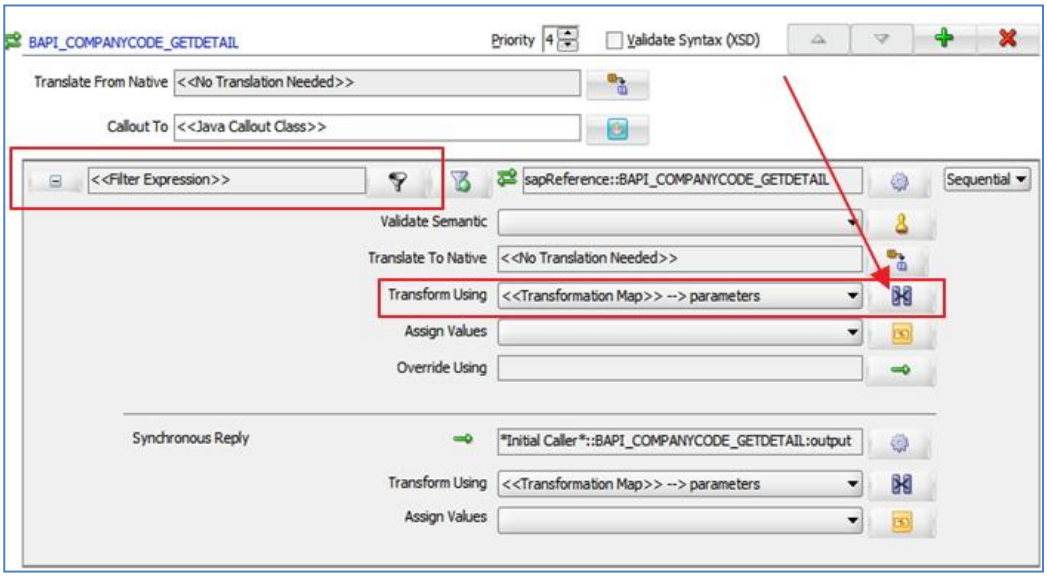
1. Double-click the Outbound Mediator process component (CompanyCode_GetDetail) in the Components pane, as shown in Figure 8-73.

Figure 8-73 Mediator Process Component



The **Routing Rules** dialog is displayed, as shown in Figure 8-74.

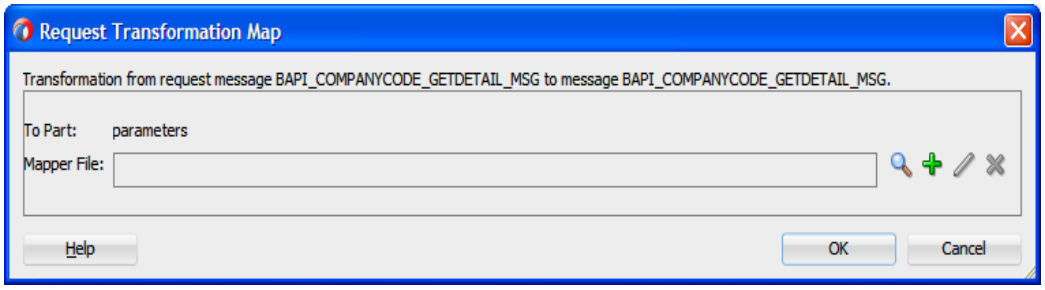
Figure 8-74 Routing Rules Dialog



2. In the <<Filter Expression>> area, click the icon to the right of the **Transform Using** field.

   The **Request Transformation Map** dialog is displayed, as shown in Figure 8-75.

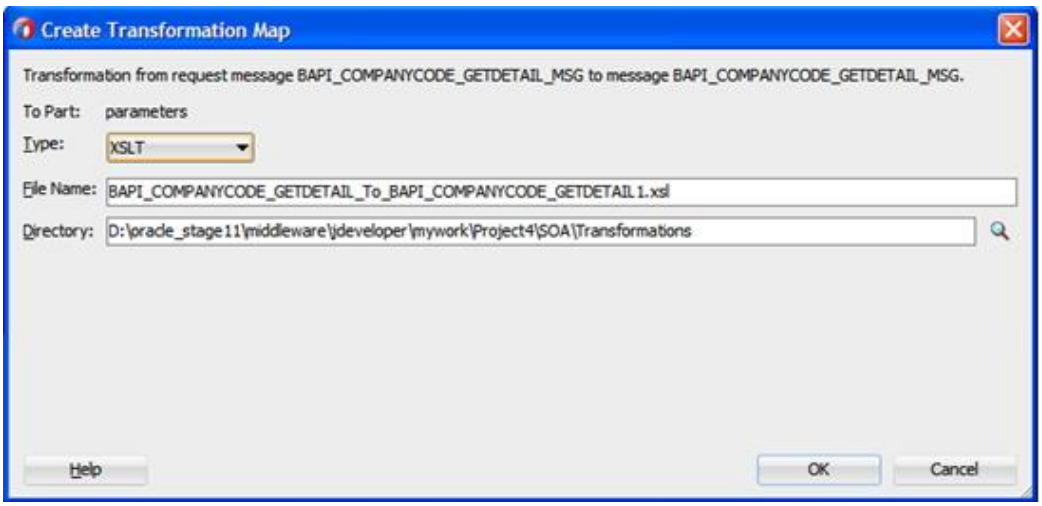
Figure 8-75 Request Transformation Map Dialog



3. Click on '+' to create a new Transformation map.

   The **Create Transformation Map** page is displayed, as shown in Figure 8-76.

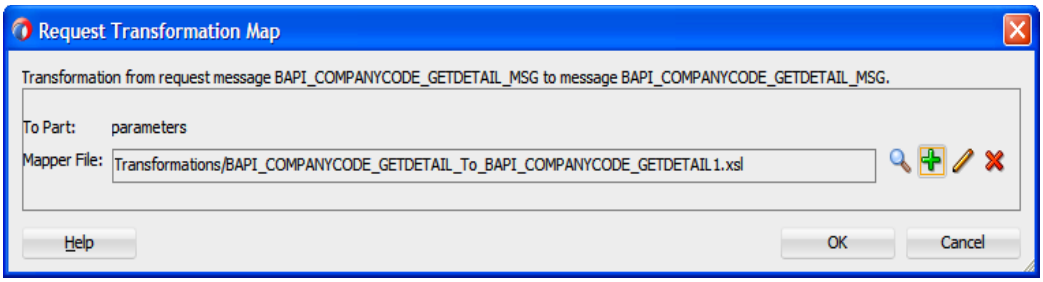
Figure 8-76 Create Transformation Map



4. Click **OK**.

   The **Request Transformation Map** dialog is displayed, as shown in Figure 8-77.

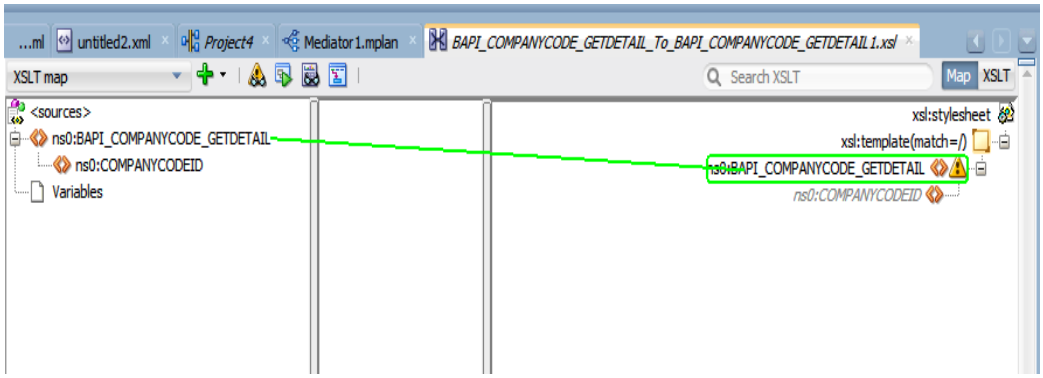
Figure 8-77 Request Transformation Map



5. Click **OK**.

   The following Mapping page is displayed, as shown in Figure 8-78.

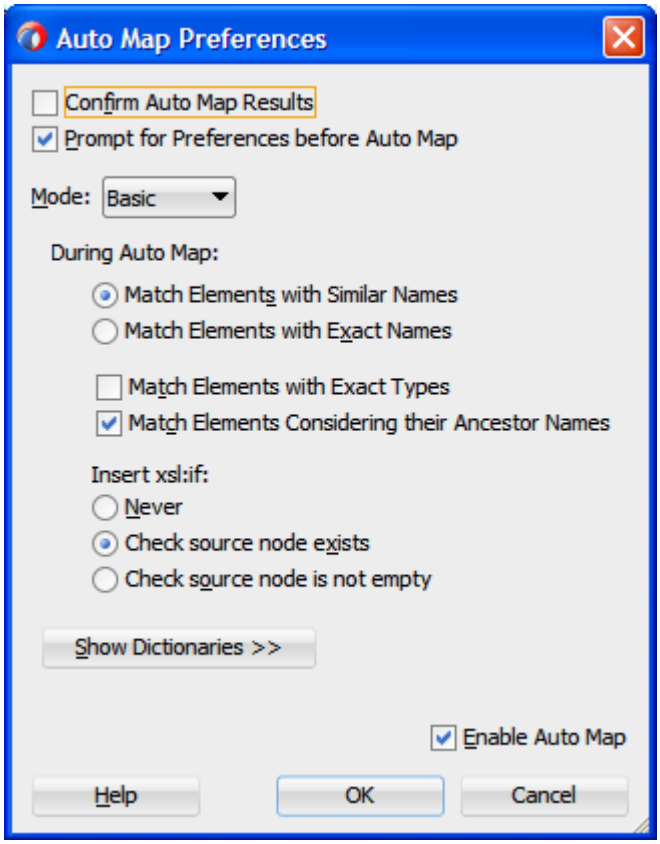
Figure 8-78 Mapping Page



6. Map the **CompanyCode.GetDetail** source element to the **CompanyCode.GetDetail** target element.

   The **Auto Map Preferences** dialog is displayed, as shown in Figure 8-79.

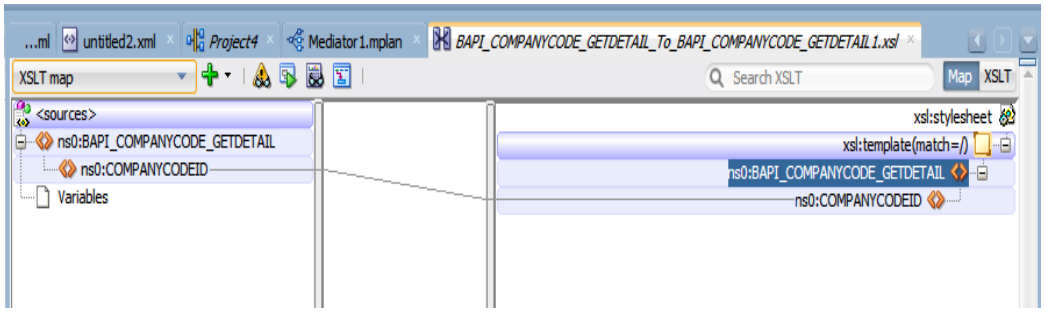
Figure 8-79 Auto Map Preferences Dialog



7. Retain the default values and click **OK**.

   You are returned to the Mapping page, as shown in Figure 8-80.

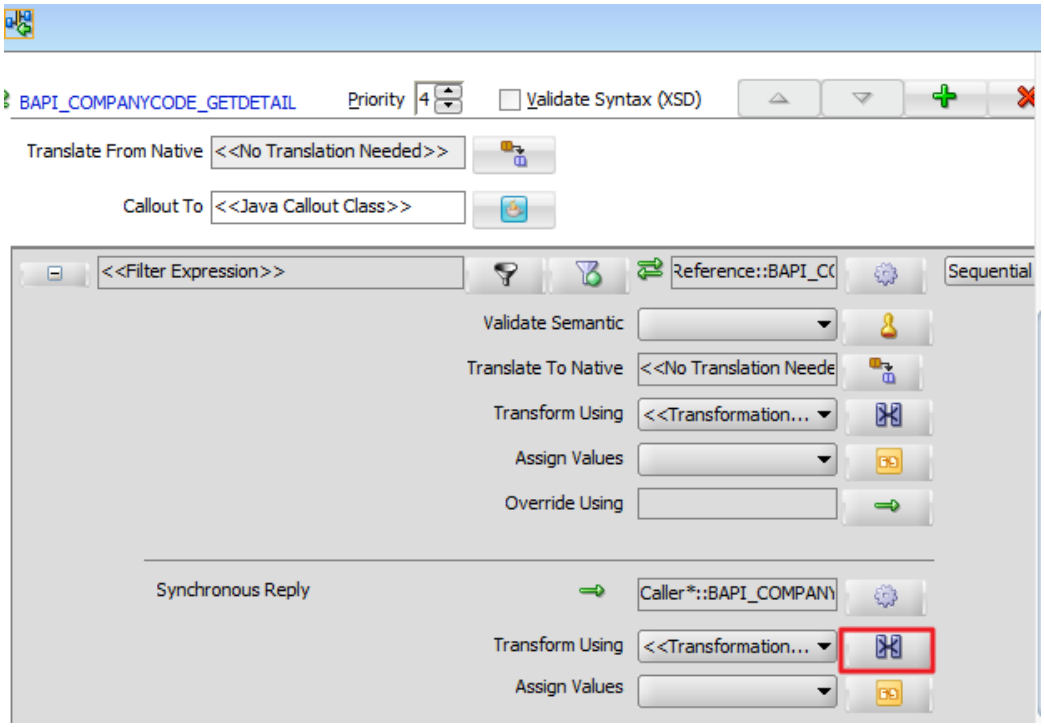
Figure 8-80 Mapping Dialog



8. Select **Save All** from the menu bar to save and close the mapping.xsl file.

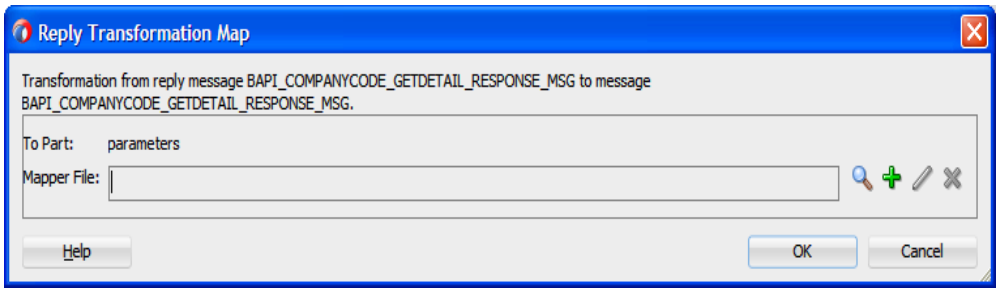
9. In the **Synchronous Reply** area, click the icon to the right of the **Transform Using** field, as shown in Figure 8-81.

Figure 8-81 Synchronous Reply Dialog



The Reply Transformation Map dialog is displayed, as shown in Figure 8-82.

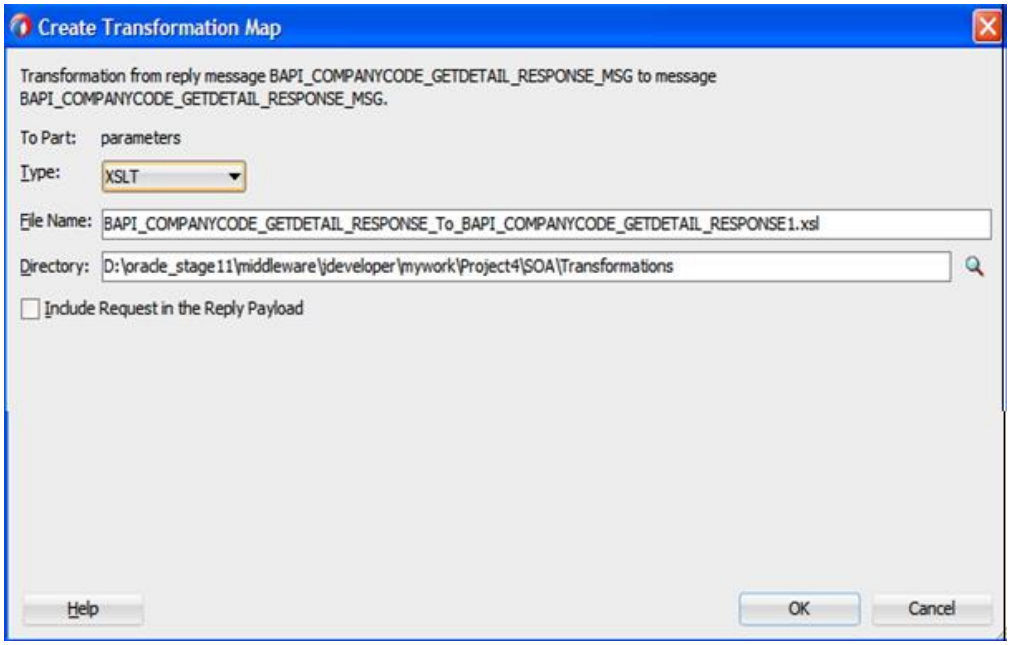
Figure 8-82 Reply Transformation Map



10. Click on + to create the new target mapping file.

The following **Create Transformation Map** page is displayed, as shown in Figure 8-83.

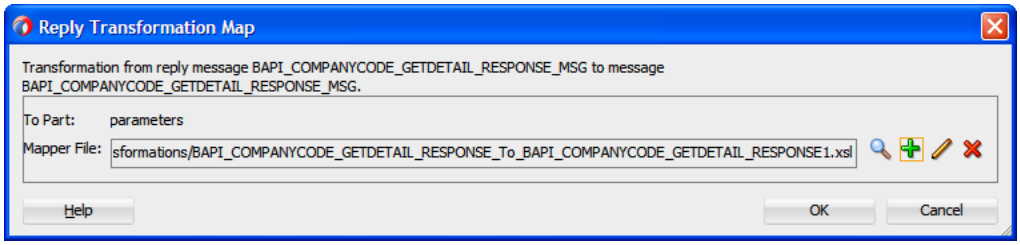
Figure 8-83 Create Transformation Map



11. Click **OK**.

You are returned to the **Reply Transformation Map** dialog, as shown in Figure 8-84.

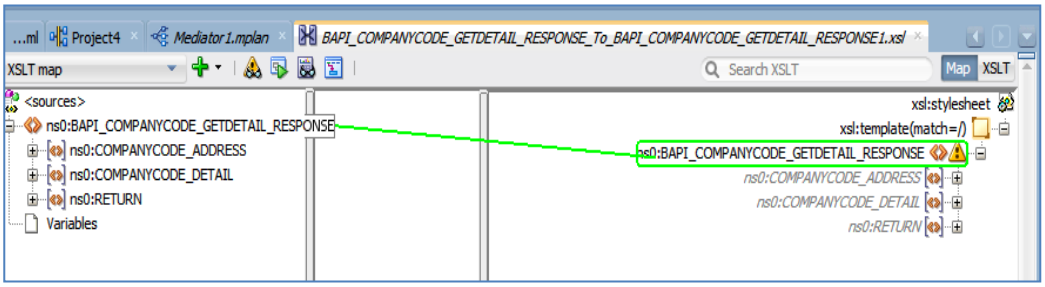
Figure 8-84 Reply Transformation Map



12. Click **OK**.

You are returned to the Mapping page, as shown in Figure 8-85.

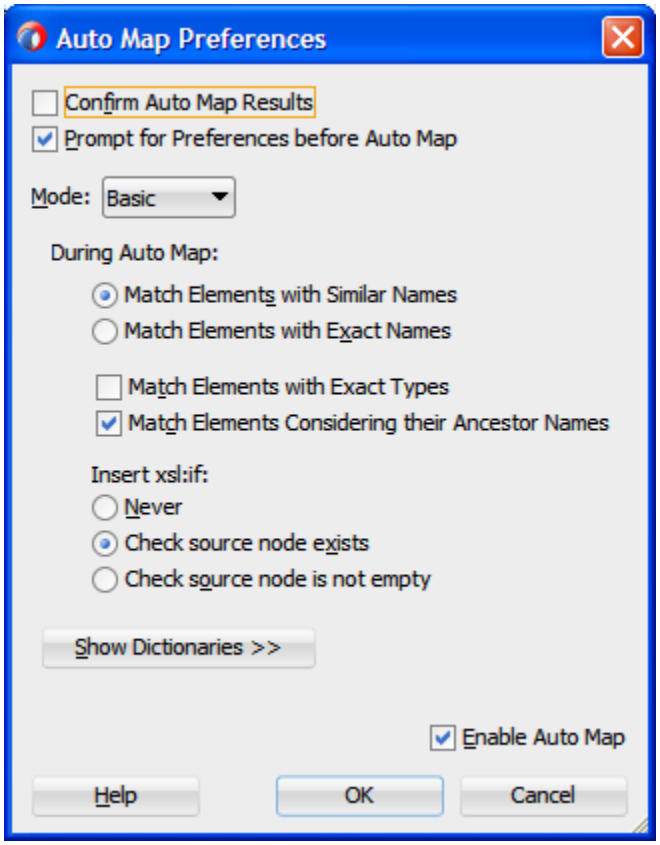
Figure 8-85 Mapping Page



13. Drag and map the ns0:BAPI_COMPANYCODE_GETIDETAIL_RESPONSE variable from left pane to the ns0:BAPI_COMPANYCODE_GETIDETAIL_RESPONSE variable in the right pane, as shown in Figure.

    The **Auto Map Preferences** dialog is displayed, as shown in Figure 8-86.

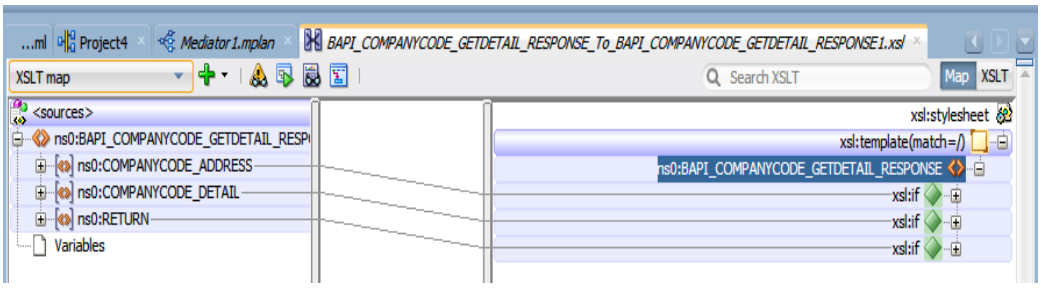
Figure 8-86 Auto Map Preferences Dialog



14. Retain the default values and Click **OK**.

    The mapping is completed, as shown in Figure 8-87.

Figure 8-87 Completed Mapping



15. Click the **Save All** icon in the menu bar to save the new outbound Mediator process component that was configured.

    You are now ready to deploy the Outbound Mediator process.

Deploy the Mediator Outbound Process

To deployment the Mediator Outbound Process, you can follow the same procedure that is described in "Deploy the Defined Process".

Test the Mediator Outbound Process

After deploy the Mediator Outbound Process, you are ready to test the Mediator outbound process, you can follow the same procedure that is described in "Test the Deployed Process".

8.2.8 Define an Inbound Mediator Process

This section describes how to define an Inbound Mediator process, which consists of the following stages:

1. Configuring an Adapter Component
2. Configuring an Inbound Mediator Process Component With a File Adapter
3. Configuring the Routing Rules

Configuring an Adapter Component

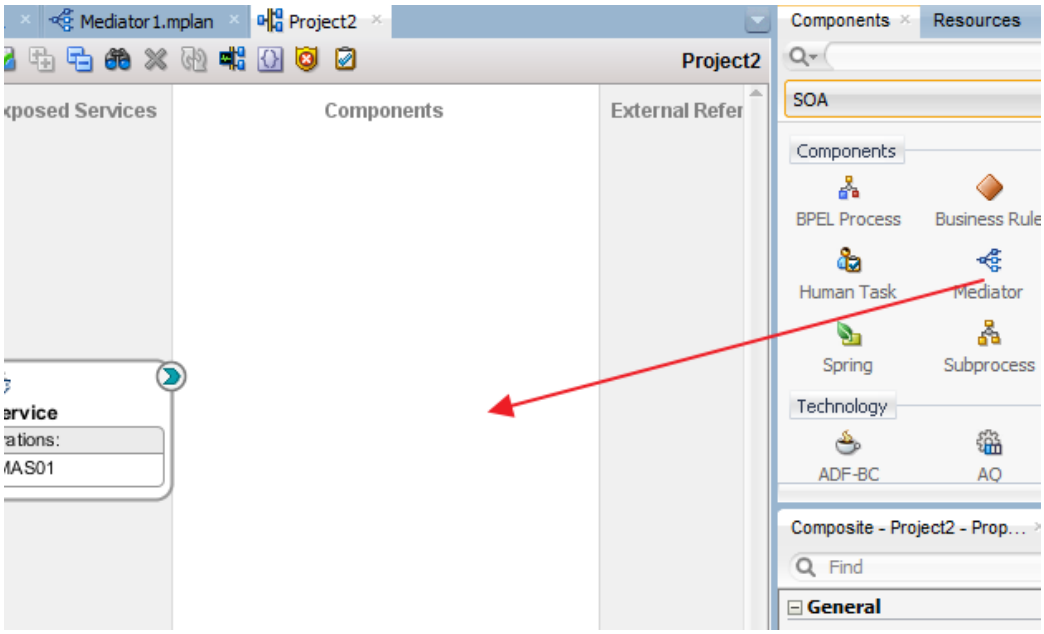
For more information on how to configure an Adapter Component for SAP, refer to the section "Configure an Adapter Component" under "Defining an inbound BPEL Process".

Configuring an Inbound Mediator Process Component with a File Adapter

Perform the following steps to configure an Inbound Mediator process component with a File adapter.

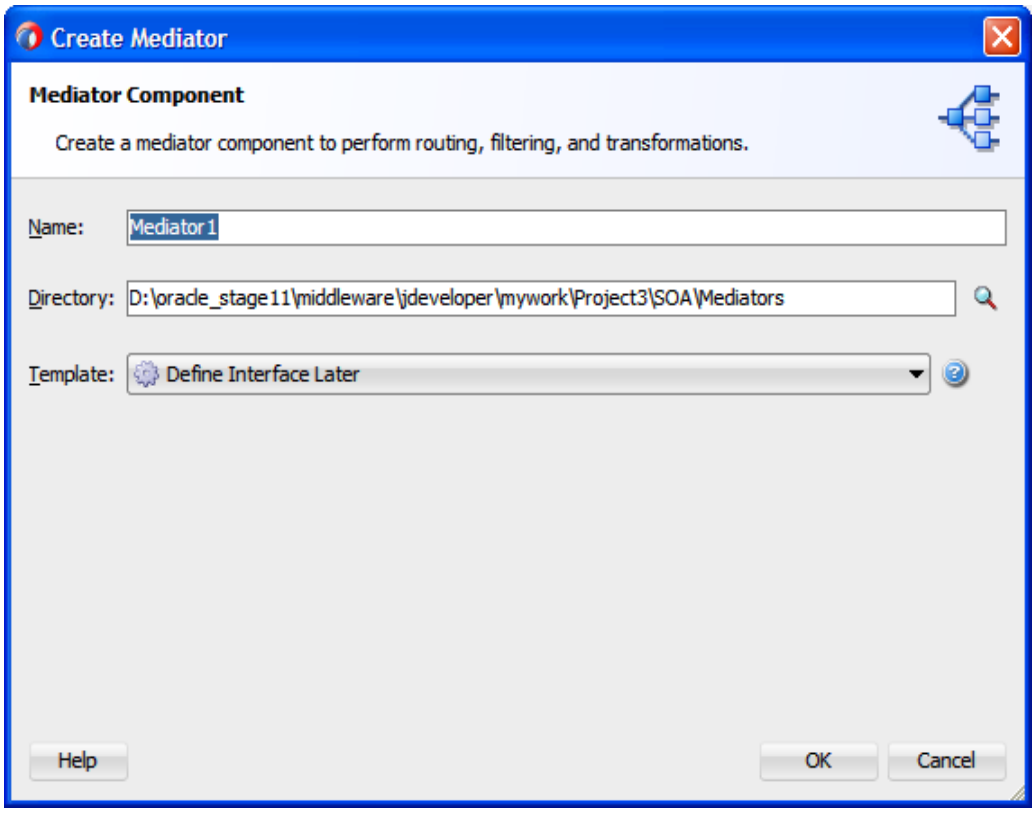
1. Drag and drop the **Mediator Process** component from the **Service Components** pane to the **Components** pane, as shown in Figure 8-88.

Figure 8-88 Mediator Process Component



The **Create Mediator** dialog is displayed, as shown in Figure 8-89.

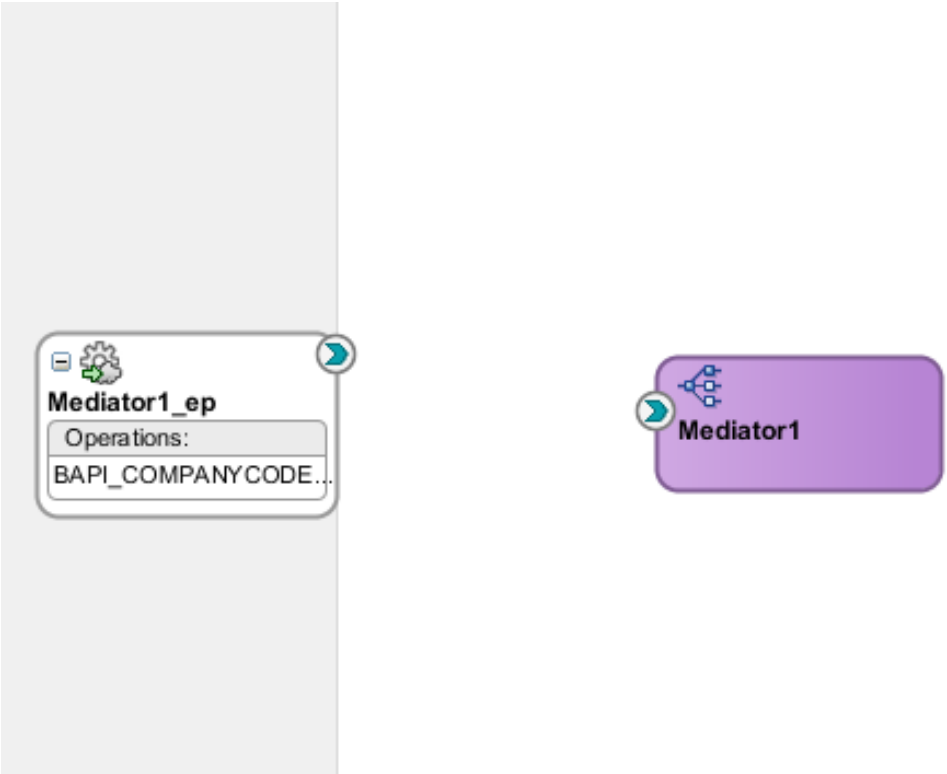
Figure 8-89 Create Mediator Dialog



2. Click the drop-down icon to the right of **Template** field and select **Define Interface Later**.
3. Click **OK**.

   The new Mediator process component is added to the Components pane, as shown in Figure 8-90.

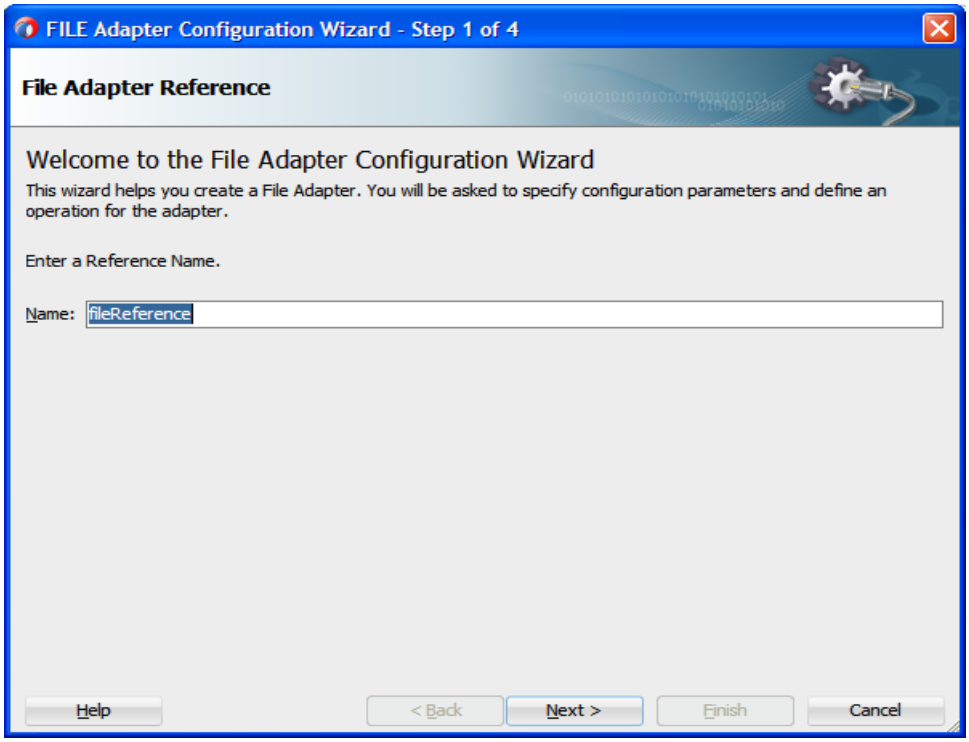
Figure 8-90 Mediator Process Component



4. Drag and drop the **File Adapter** component from the Service Adapters pane to the External References pane.

   The File Adapter Configuration Wizard is displayed, showing the Service Name page, as shown in Figure 8-91.

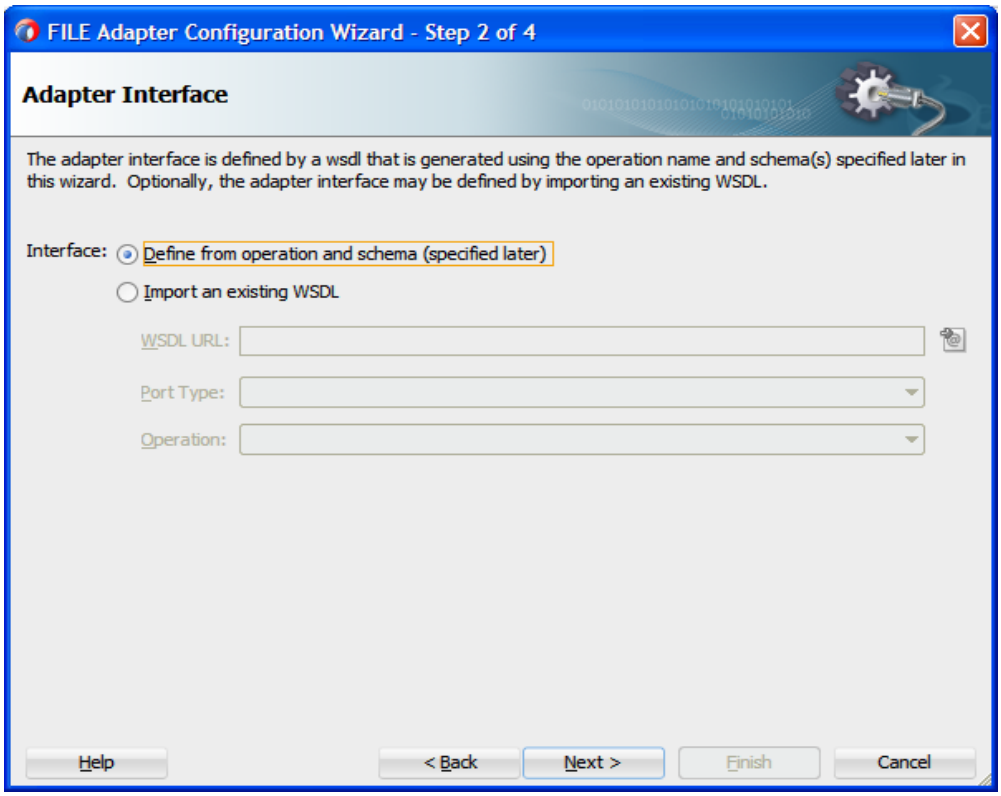
Figure 8-91 Adapter Configuration Wizard



5. Type a name for the new File adapter in the **Name** field and click **Next**.

   The Adapter Interface page is displayed, as shown in Figure 8-92.

Figure 8-92 Adapter Interface Page

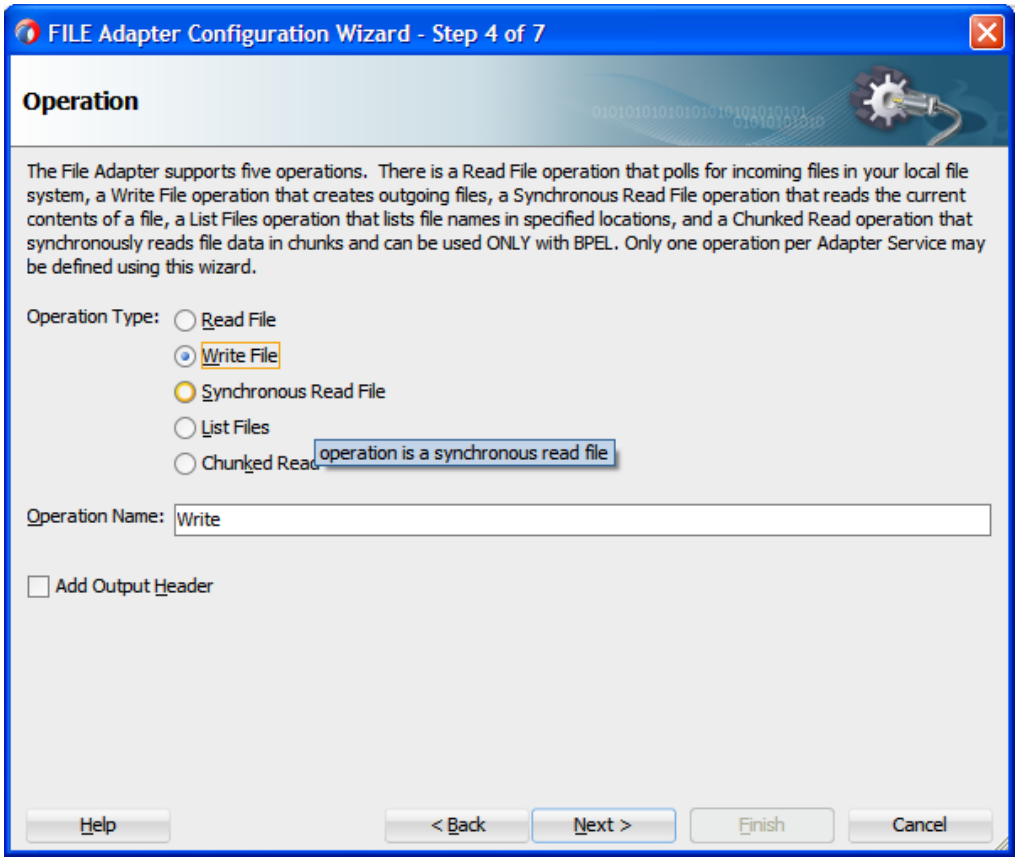


6. Ensure that the **Define from operation and schema (specified later)** option is selected.

7. Click **Next**.

   The Operation page is displayed, as shown in Figure 8-93.

Figure 8-93 Operation Page

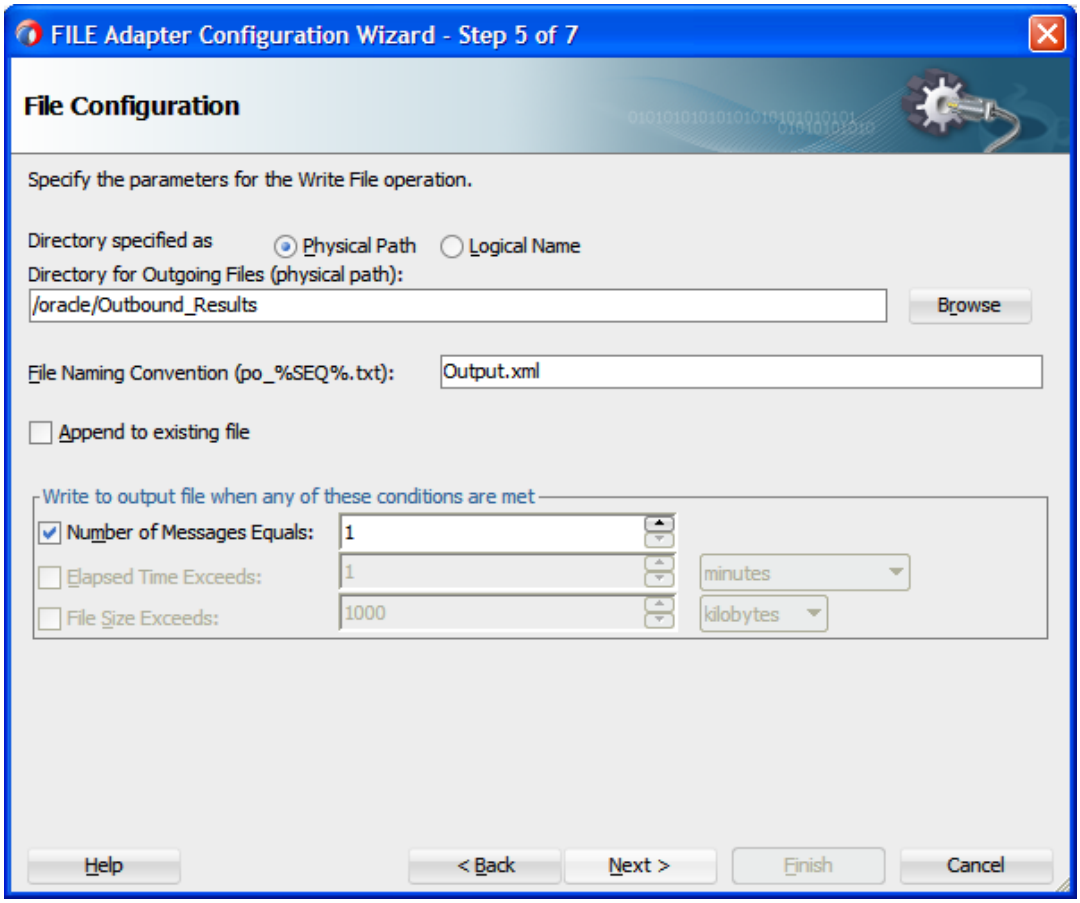


8. Select **Write File** from the list of **Operation Type** options and specify an **Operation Name** (for example, Write).

9. Click **Next**.

   The **File Configuration** page is displayed, as shown in Figure 8-94.

Figure 8-94 File Configuration Page



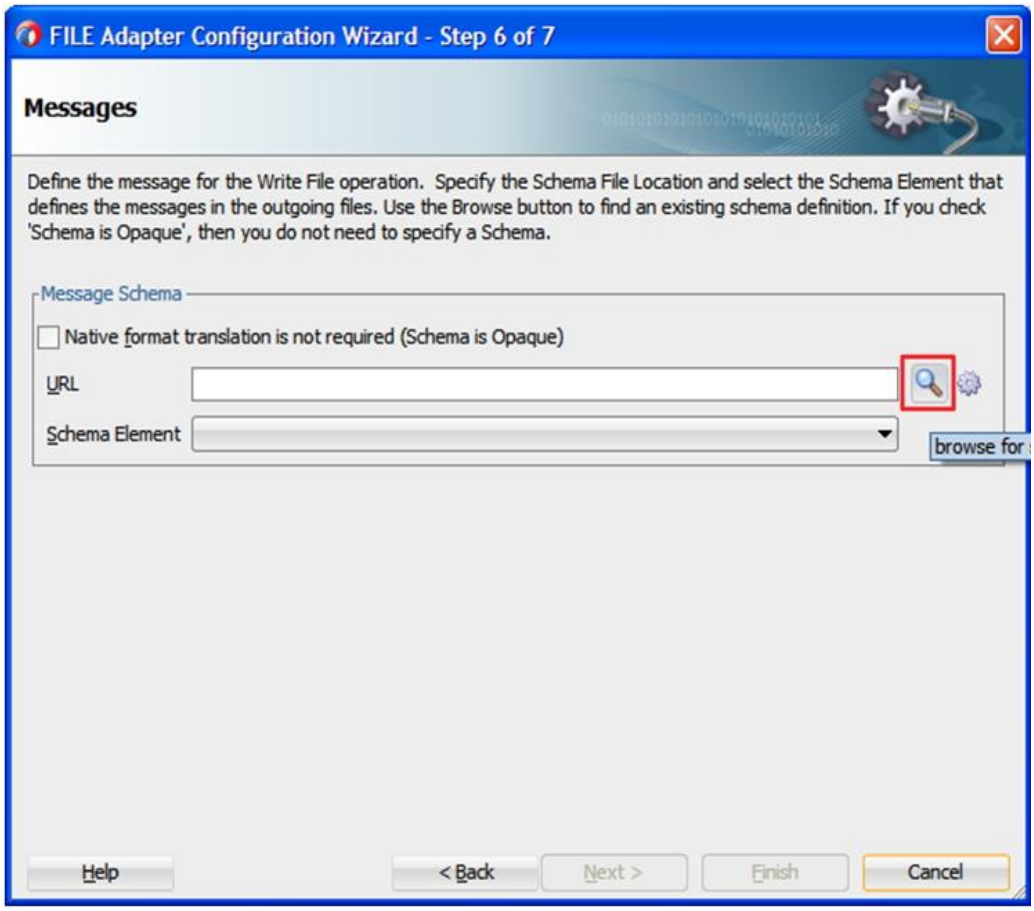
10. Specify a location on your file system where the output file is written.

11. In the **File Naming Convention** field, specify a name for the output file.

12. Click **Next**.

The **Messages** page is displayed, as shown in Figure 8-95.

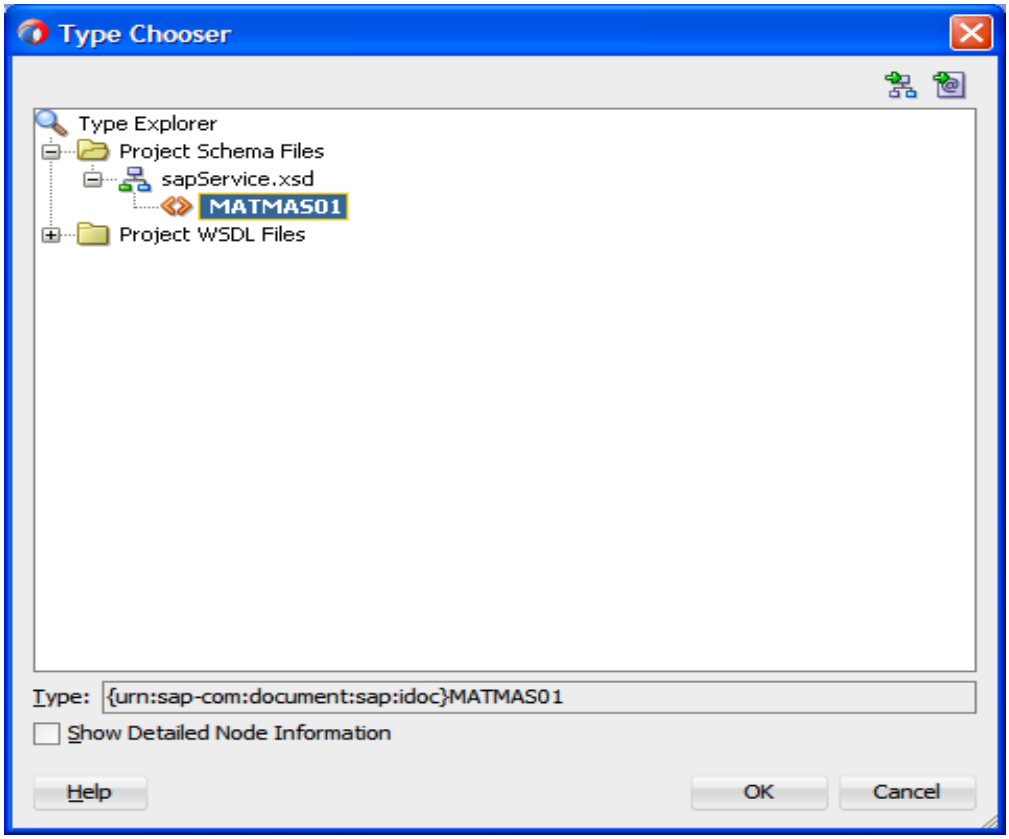
Figure 8-95 Messages Page



13. Click **Browse**, which is located to the right of the **URL** field.

The **Type Chooser** dialog is displayed, as shown in Figure 8-96.

Figure 8-96 Type Chooser Dialog

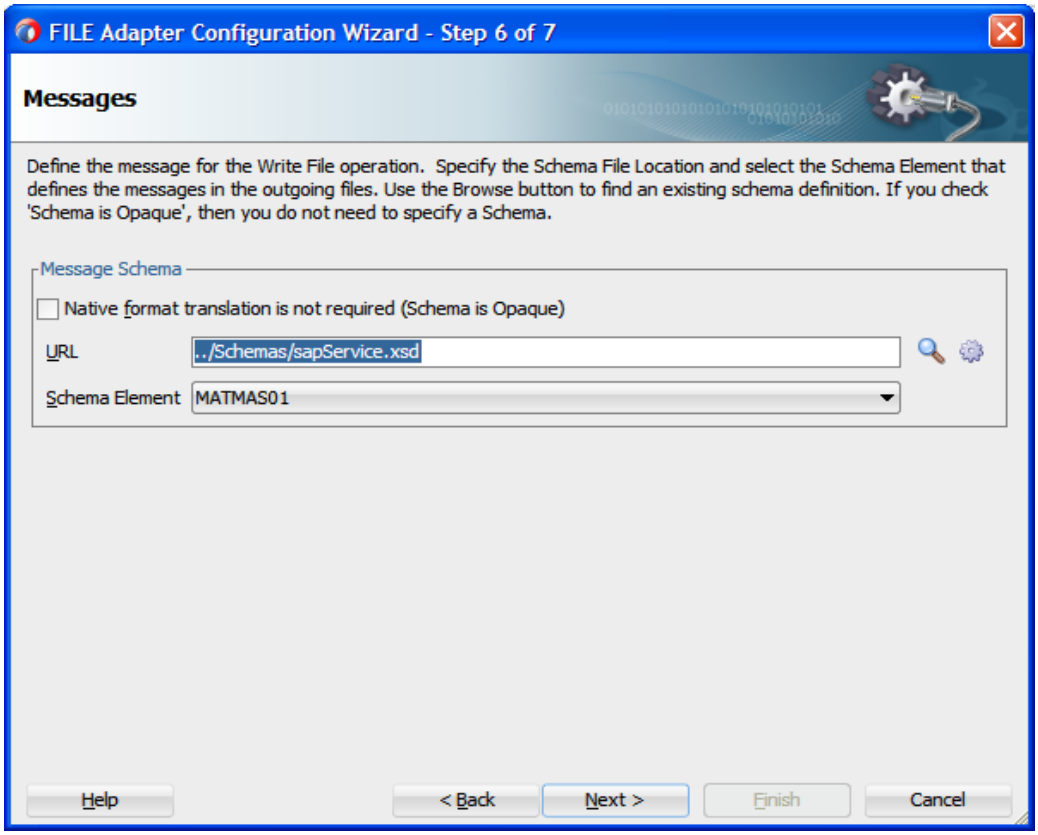


14. Expand Project WSDL Files and select the available schema.

15. Click **OK**.

You are returned to the **Messages** page, as shown in Figure 8-97.

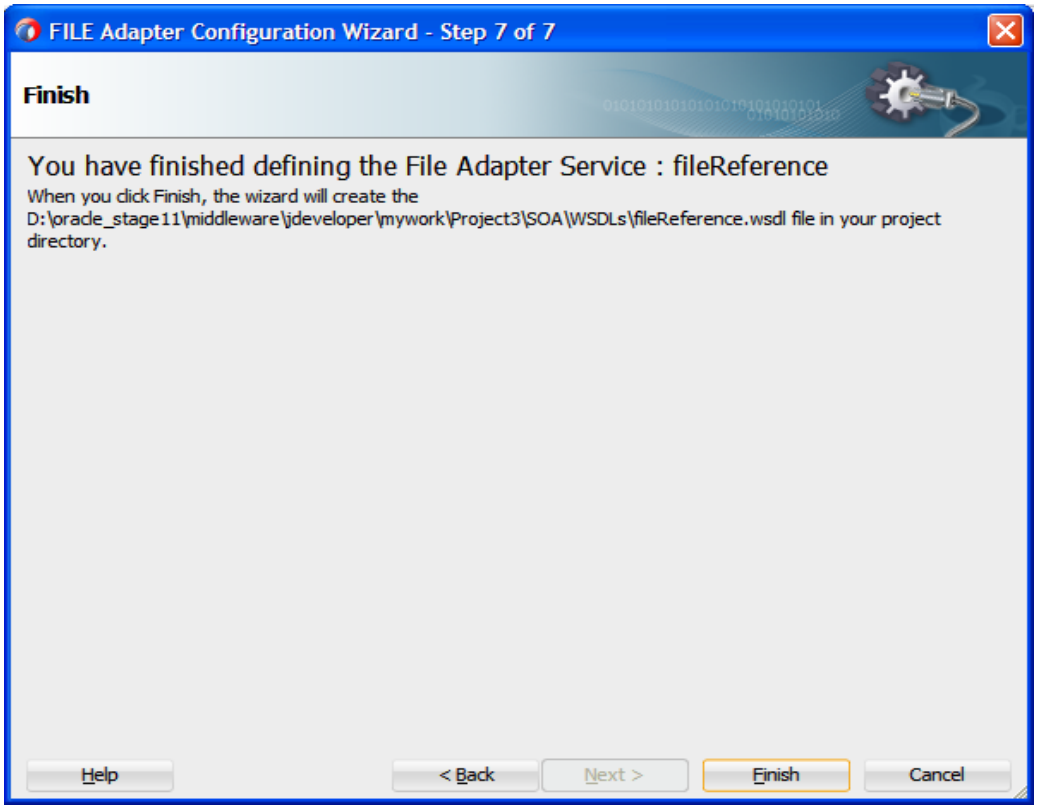
Figure 8-97 Messages Page



16. Click **Next**.

The **Finish** page is displayed, as shown in Figure 8-98.

Figure 8-98 Finish Page

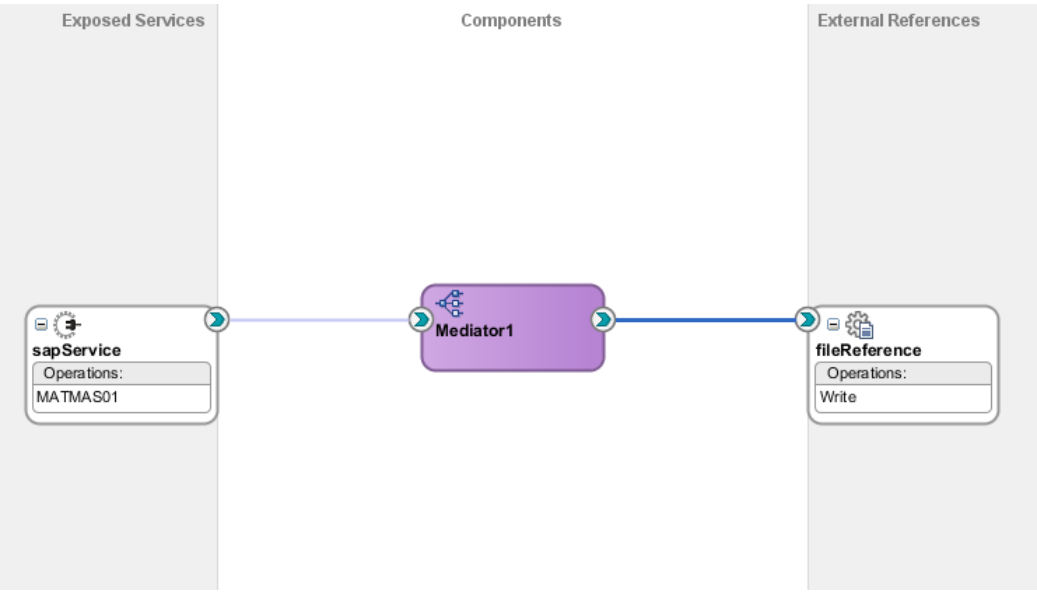


17. Click **Finish**.

18. Create a connection between the Inbound Mediator process component and the SAP service component.

19. Create a connection between the Inbound Mediator process component and the File adapter component, as shown in Figure 8-99.

Figure 8-99 Created Connection



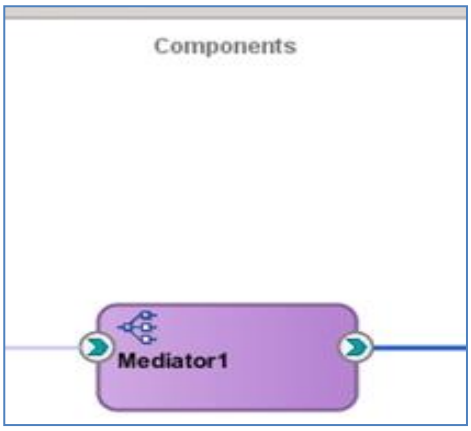
You are now ready to configure the routing rules.

Configuring the Routing Rules

Perform the following steps to configure the routing rules for the Inbound Mediator process component:

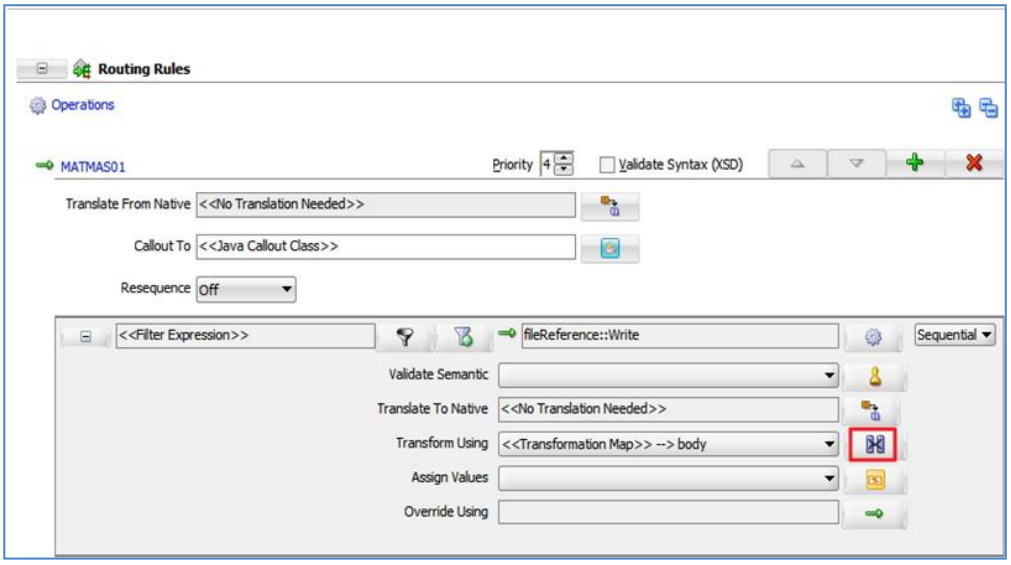
1. Double-click the Inbound Mediator process component in the Components page, as shown in Figure 8-100.

Figure 8-100 Inbound Mediator Process Component



The **Routing Rules** dialog is displayed, as shown in Figure 8-101.

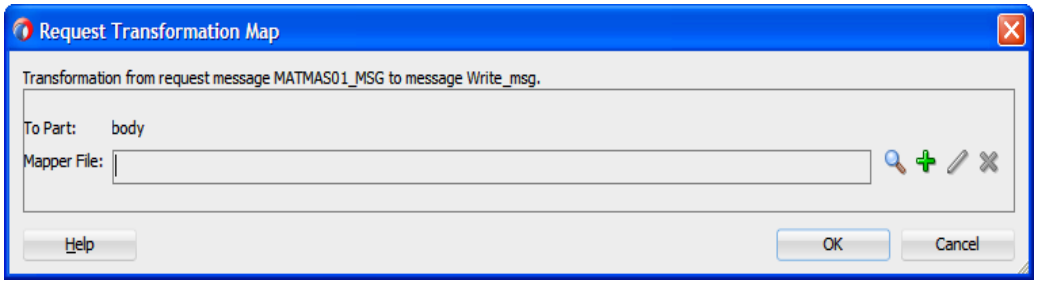
Figure 8-101 Routing Rules Dialog



2. In the <<Filter Expression>> area, click the icon to the right of the **Transform Using** field.

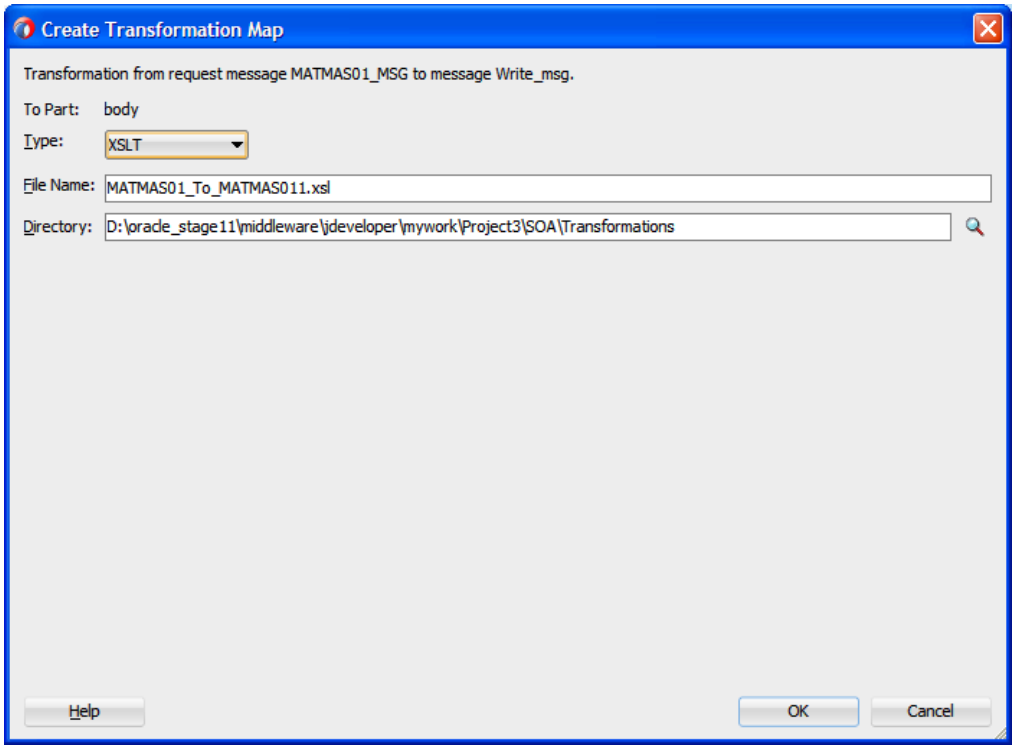
   The **Request Transformation Map** dialog is displayed, as shown in Figure 8-102.

Figure 8-102 Request Transformation Map Dialog



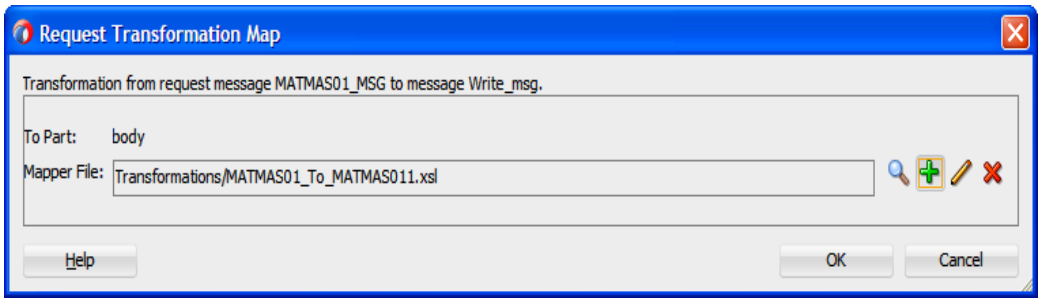
3. Click '+' icon to create a new transformation map and then click **OK**.
4. Give the name to the mapping file, as shown in Figure 8-103.

Figure 8-103 Create Transformation Map



5. Click **OK** by accepting the default name, as shown in Figure 8-104.

Figure 8-104 Request Transformation Map

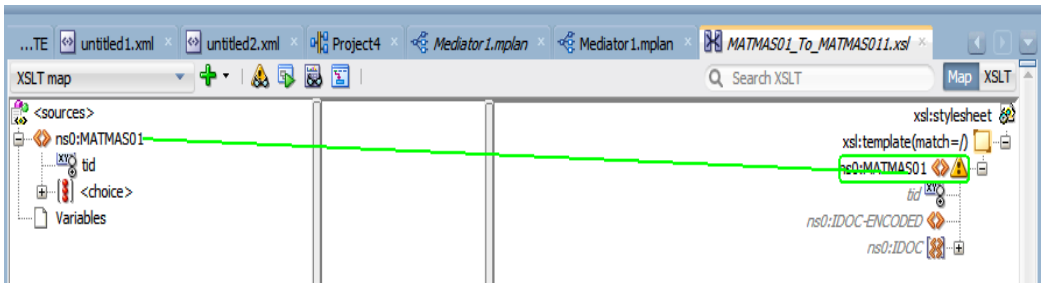


6. Click **OK**.

The mapping page is displayed.

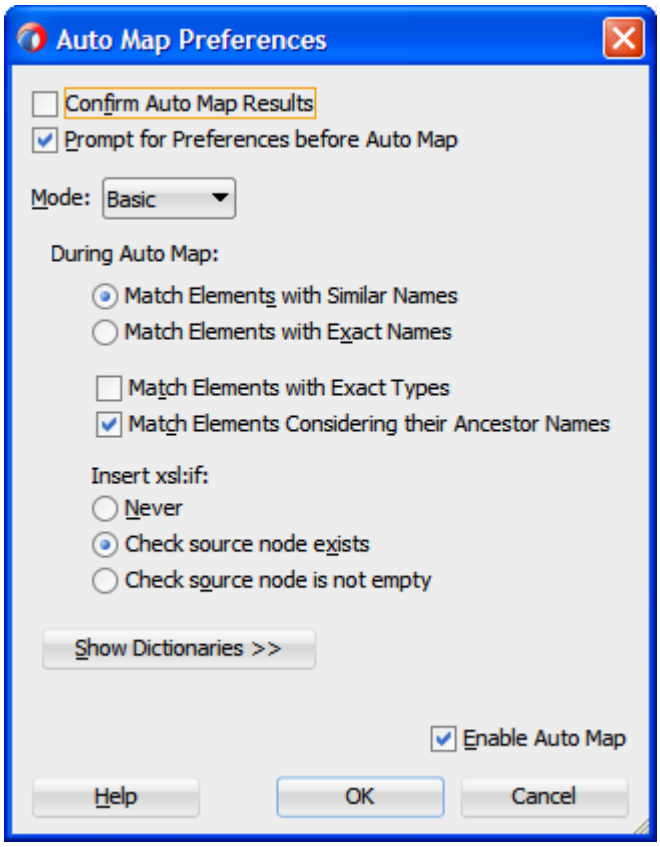
7. Map the **MATMAS01** source element to the **MATMAS01** target element, as shown in Figure 8-105.

Figure 8-105 Mapping Page



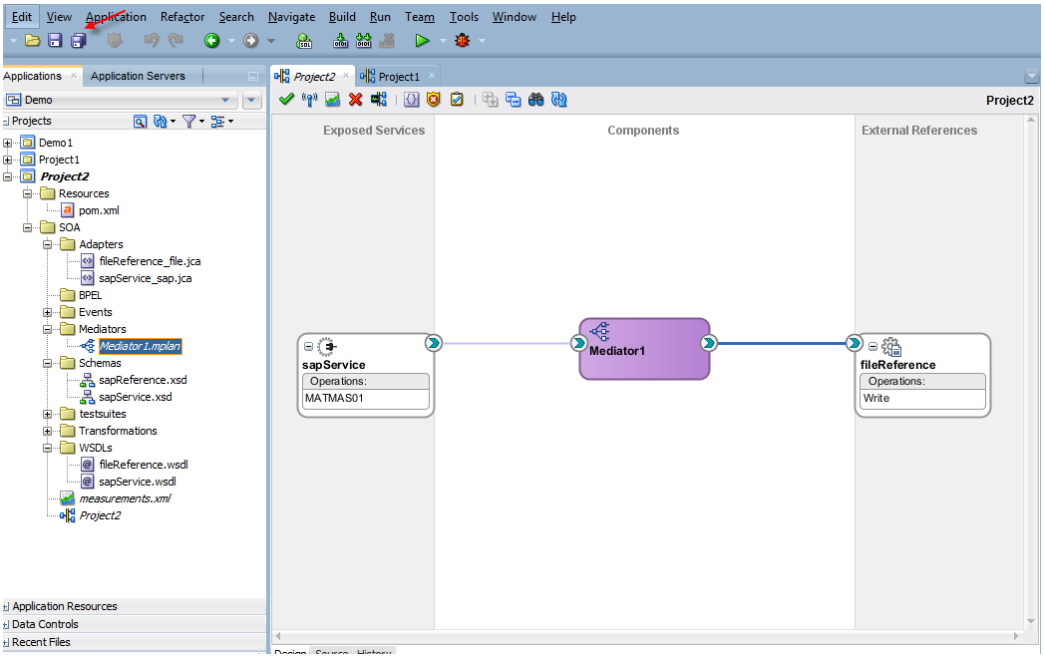
The **Auto Map Preferences** dialog is displayed, as shown in Figure 8-106.

Figure 8-106 Auto Map Preferences Dialog



8. Click **OK**.
9. Click the **Save All** icon in the menu bar to save the new Inbound Mediator process component that was configured, as shown in Figure 8-107.

Figure 8-107 Save All



You are now ready to deploy the Inbound Mediator process.

8.2.9 Deployment of Inbound Mediator Process

To deploy the Inbound Mediator process, you can follow the same procedure as described in "Deploy the Defined Process".

8.2.10 Generate an Event in SAP R/3 for Testing Mediator Inbound and Outbound Process

Once event messages are triggered through SAP GUI, output XML is received in the location that was specified for the File adapter component. For more information on Generate events in SAP R/3, see "Generate an Event in SAP R/3".

8.3 The Adapter Integration with BPM Service Components

Oracle Integration Adapter for SAP R/3 seamlessly integrates with Business Process Management (BPM) to facilitate the Web Service integration. Oracle BPM is based on the Service-Oriented Architecture (SOA). It consumes the adapter services that are exposed as Web Service Definition Language (WSDL) documents.

8.3.1 Deployment of Adapter

Oracle Integration Adapter for SAP R/3 should be deployed on soa_server in the WebLogic console under deployments.

The following tools are required to complete your outbound design-time configuration:

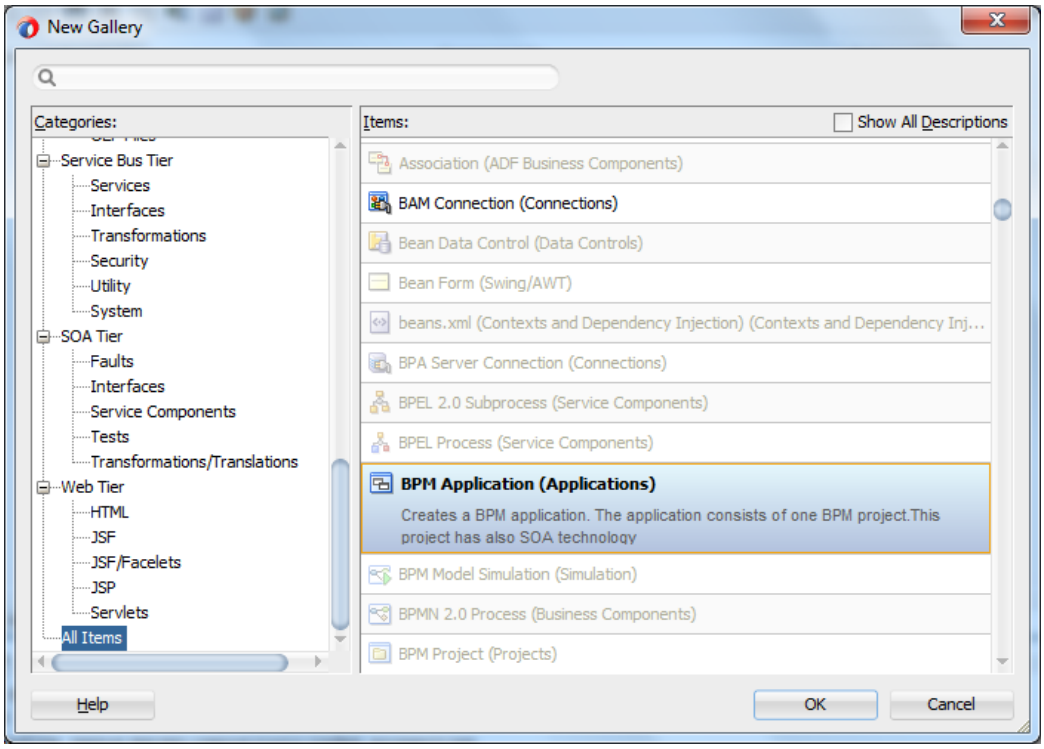
- Oracle JDeveloper BPM Designer (JDeveloper) or Eclipse

8.3.2 Create an Empty Composite for BPM

Perform the following steps to create an empty composite for BPM:

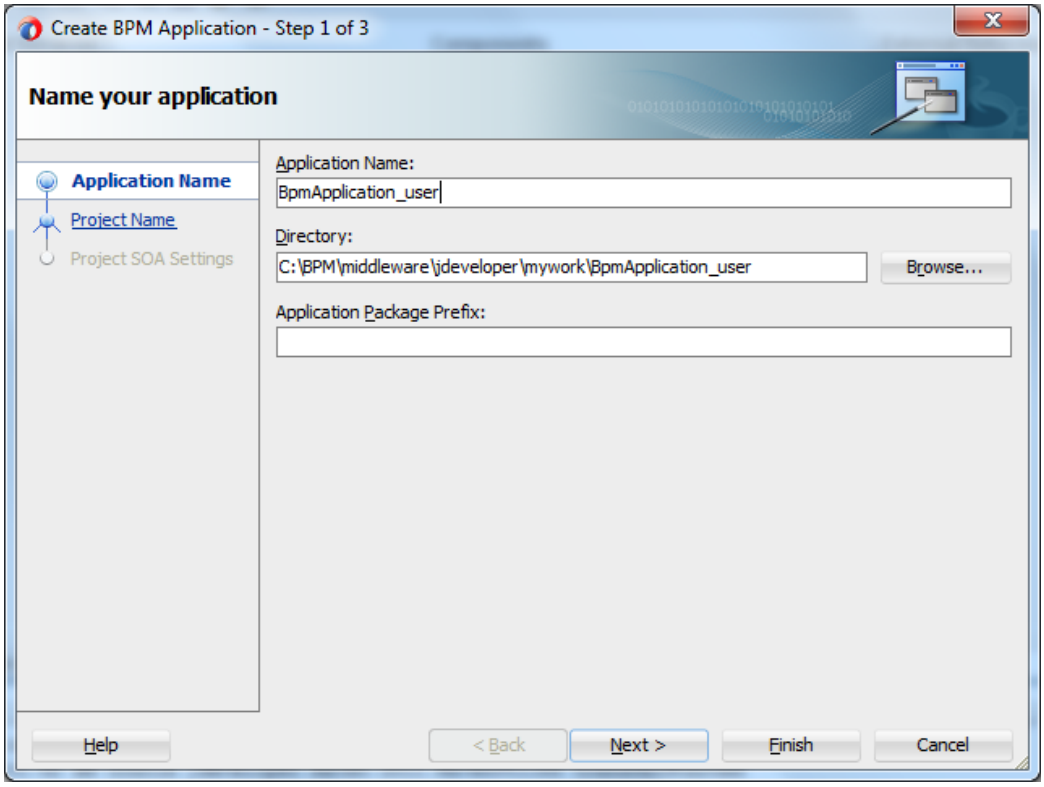
1. Create a new BPM application, as shown in Figure 8-108.

Figure 8-108 New Gallery Page



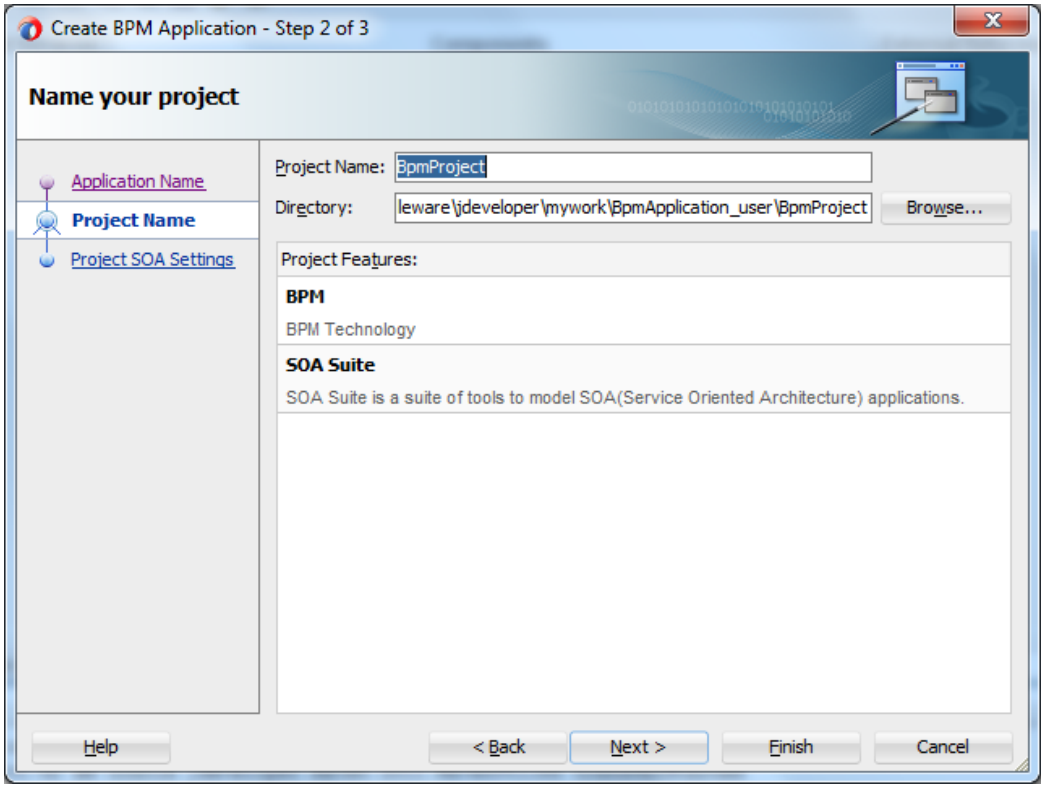
2. Enter a name for the new BPM application and click **Next**, as shown in Figure 8-109.

Figure 8-109 Name Your Application Page



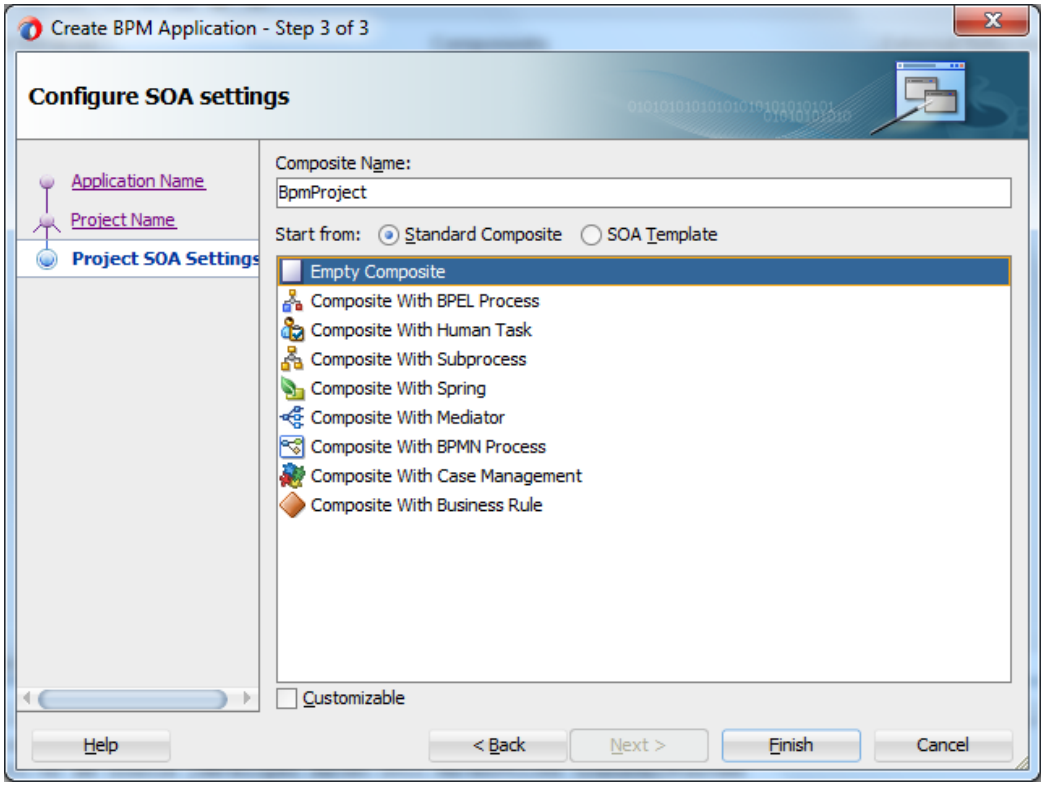
The **Name your project** page is displayed, as shown in Figure 8-110.

Figure 8-110 Name Your Project Page



3. Enter a Composite Name (for example, BpmProject) and click **Next**. The **Configure SOA settings** page is displayed, as shown in Figure 8-111.

Figure 8-111 Configure SOA Settings Page



4. From the **Composite Template** list, select **Empty Composite** and click **Finish**.

8.3.3 Define a BPM Outbound Process

This section describes how to define a BPM outbound process, which consists of the following stages:

1. Configure an Adapter Component
2. Configure an Outbound BPM Process Component

Configure an Adapter Component

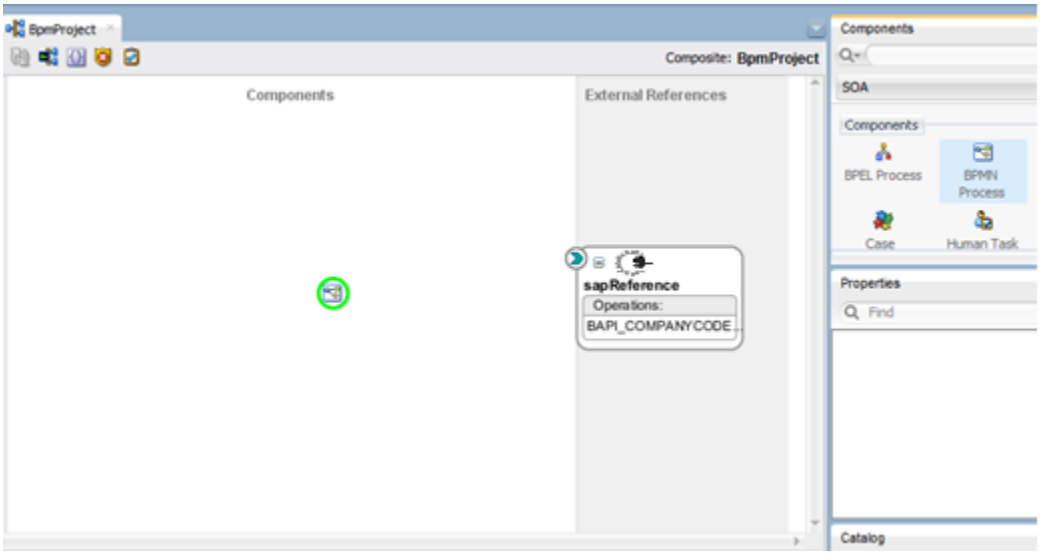
For more information, refer to the section "Configure an Adapter Component" that is described in "Define an Outbound BPEL Process".

Configuring an Outbound BPM Process Component

Perform the following steps to configure an Outbound BPM process component:

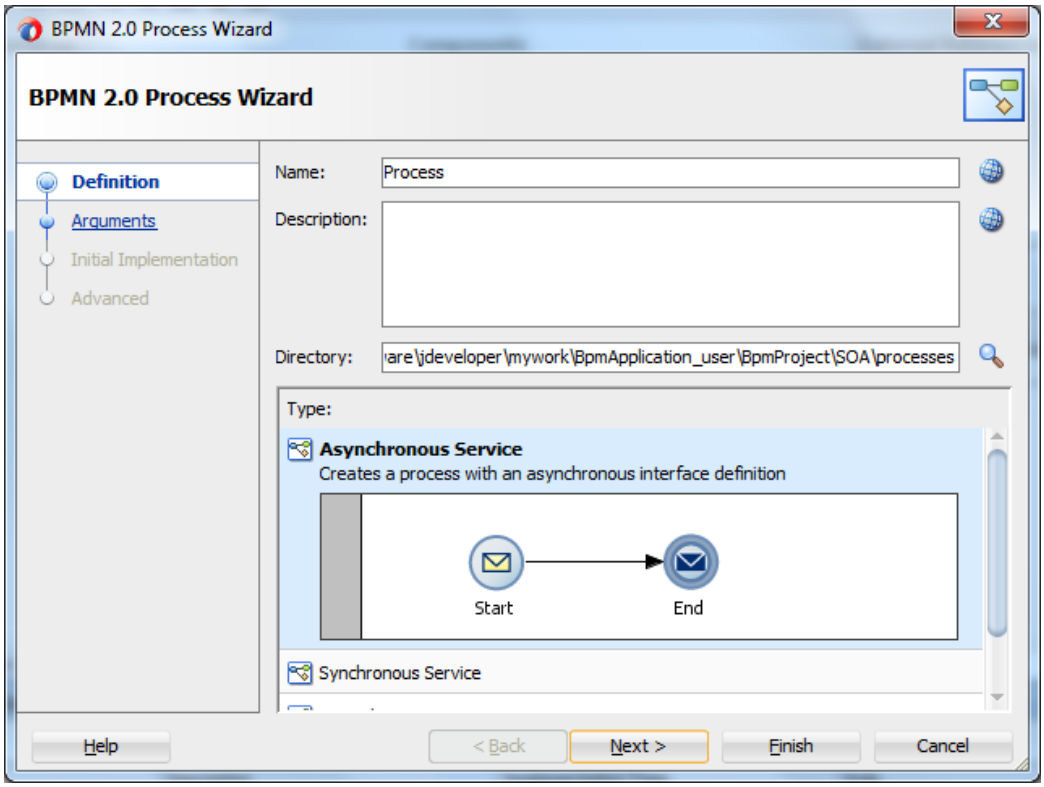
1. Drag and drop the **BPMN Process** component from the **Service Components** pane to the **Components** pane, as shown in Figure 8-112.

Figure 8-112 BPMN Process Component



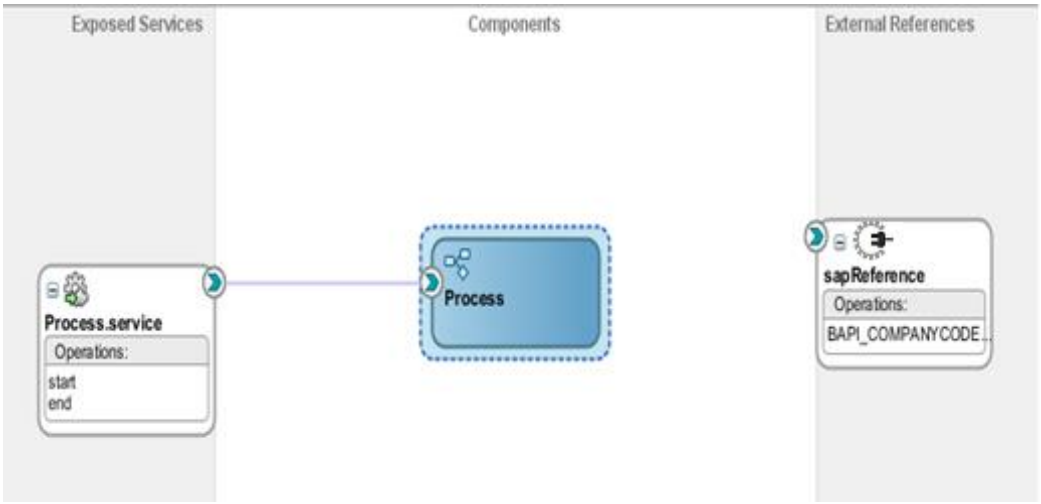
The **BPMN 2.0 Process Wizard** dialog is displayed, as shown in Figure 8-113.

Figure 8-113 BPMN 2.0 Process Wizard



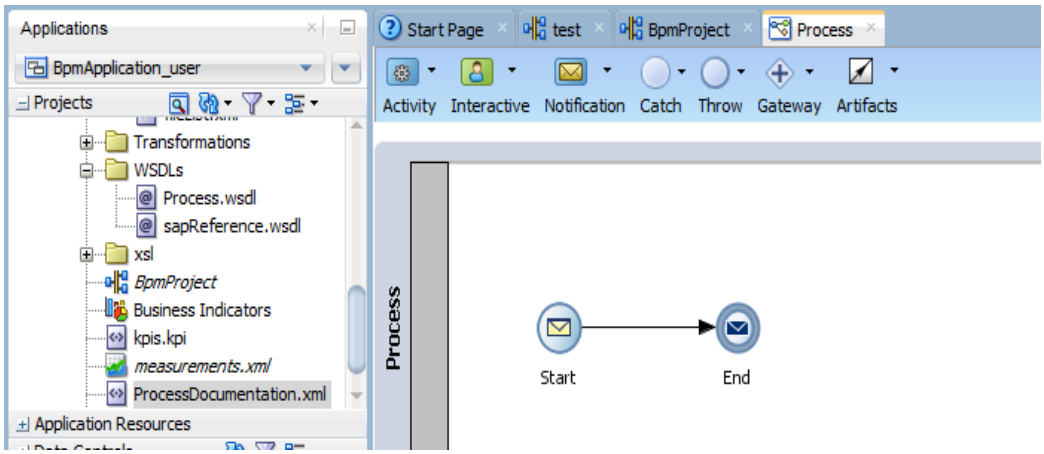
2. Select the default option that is selected under **Type** area (Asynchronous Service) and click **Finish**. The BPMN Process component is created, as shown in Figure 8-114.

Figure 8-114 BPMN Process Component



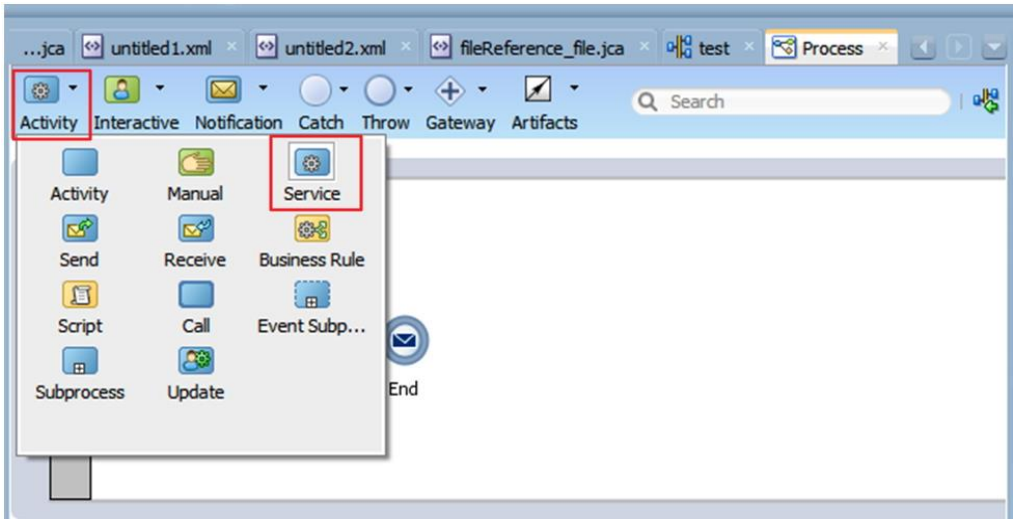
3. Double-click the BPMN Process component in the Components pane. The BPMN process is displayed, as shown in Figure 8-115.

Figure 8-115 BPMN Process



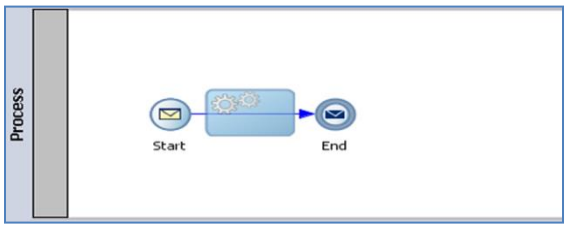
4. Click the **Activity** icon, as shown in Figure 8-116.

Figure 8-116 Activity Icon



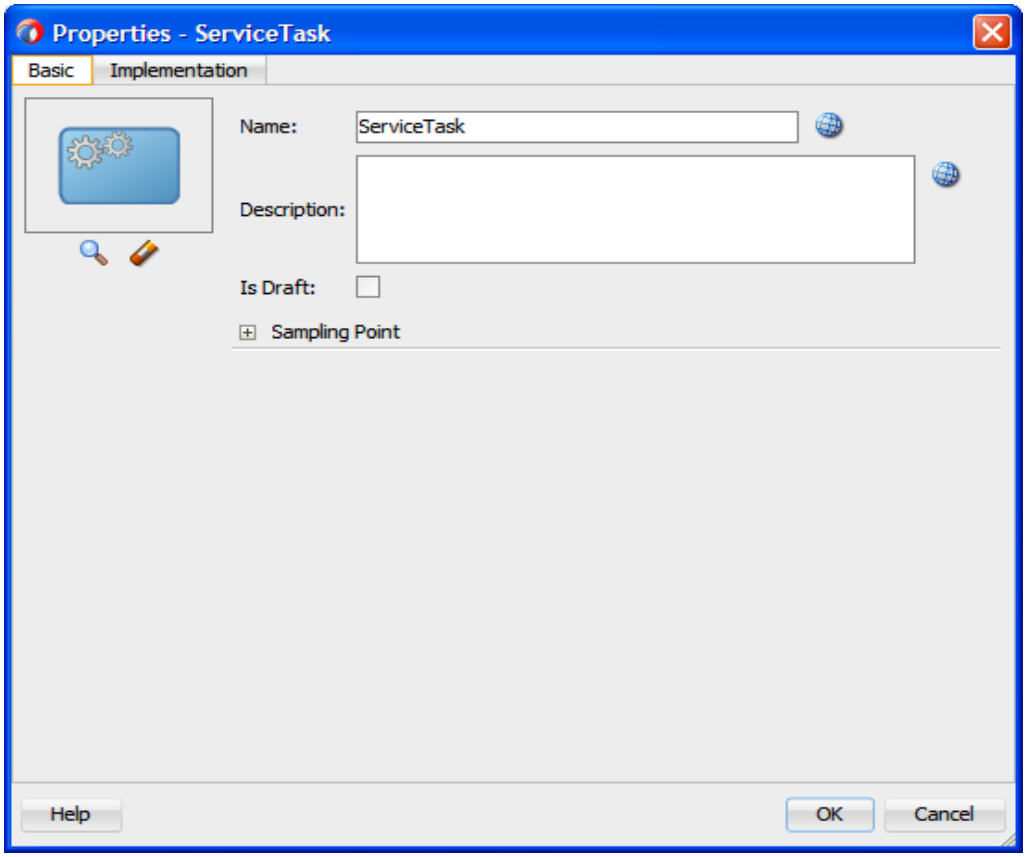
5. Click on **Activity** icon from the menu bar and drop the **Service** icon on the wire between the **Start** and **End** event components, as shown in Figure 8-117.

Figure 8-117 Activity Icon



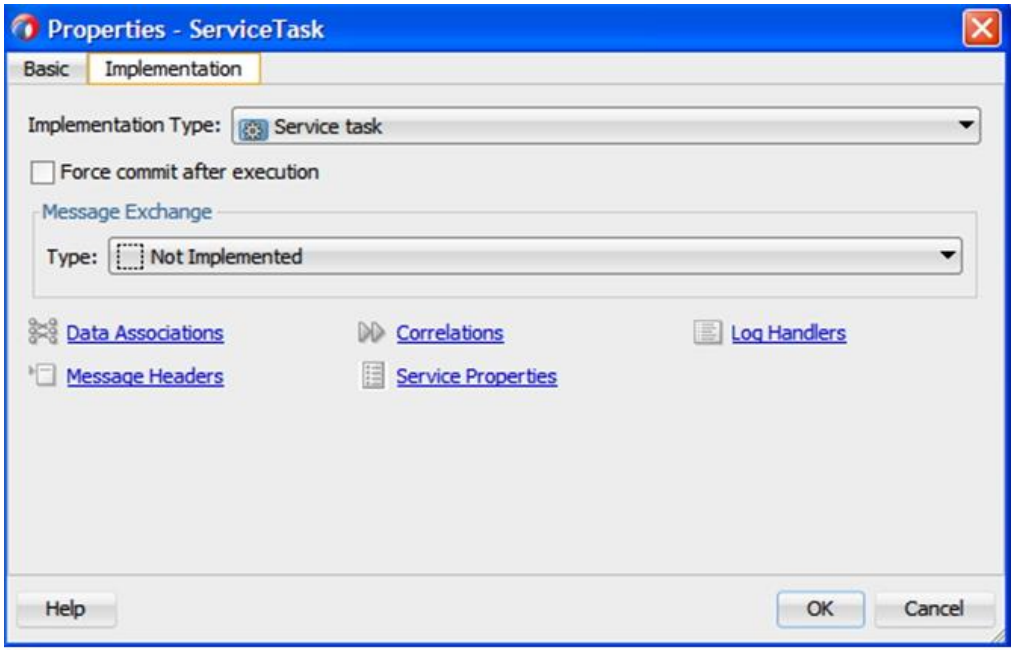
The Properties – Service Task dialog is displayed, as shown in Figure 8-118.

Figure 8-118 Properties – Service Task



6. Click the **Implementation** tab, as shown in Figure 8-119.

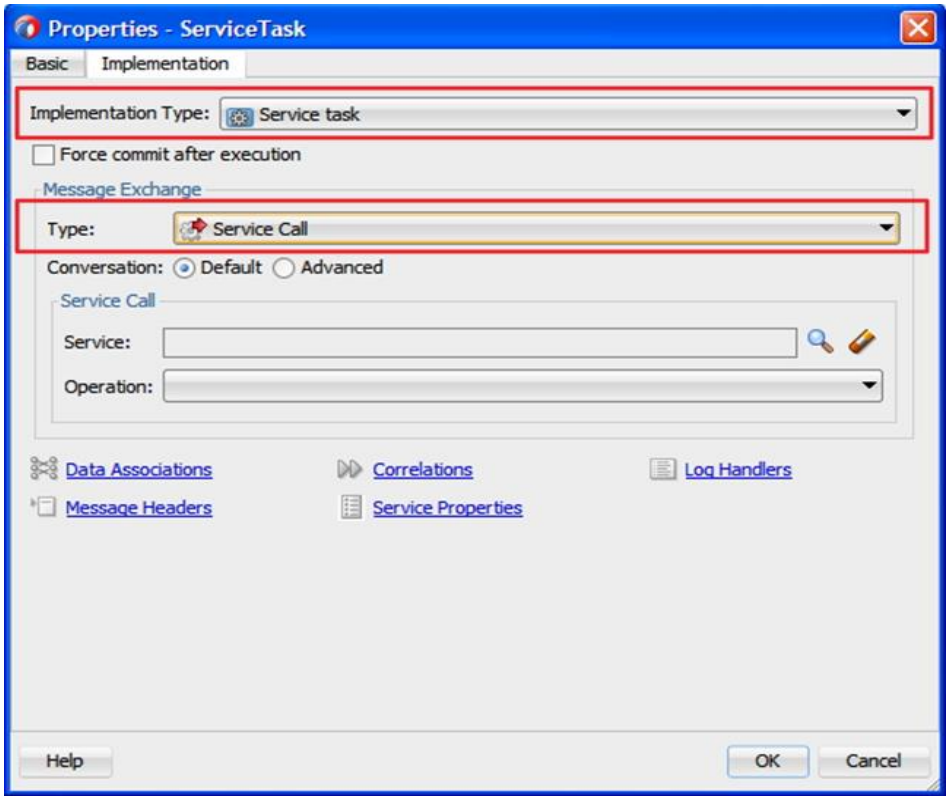
Figure 8-119 Implementation Tab



7. Select **Service task** from the **Implementation Type** list.

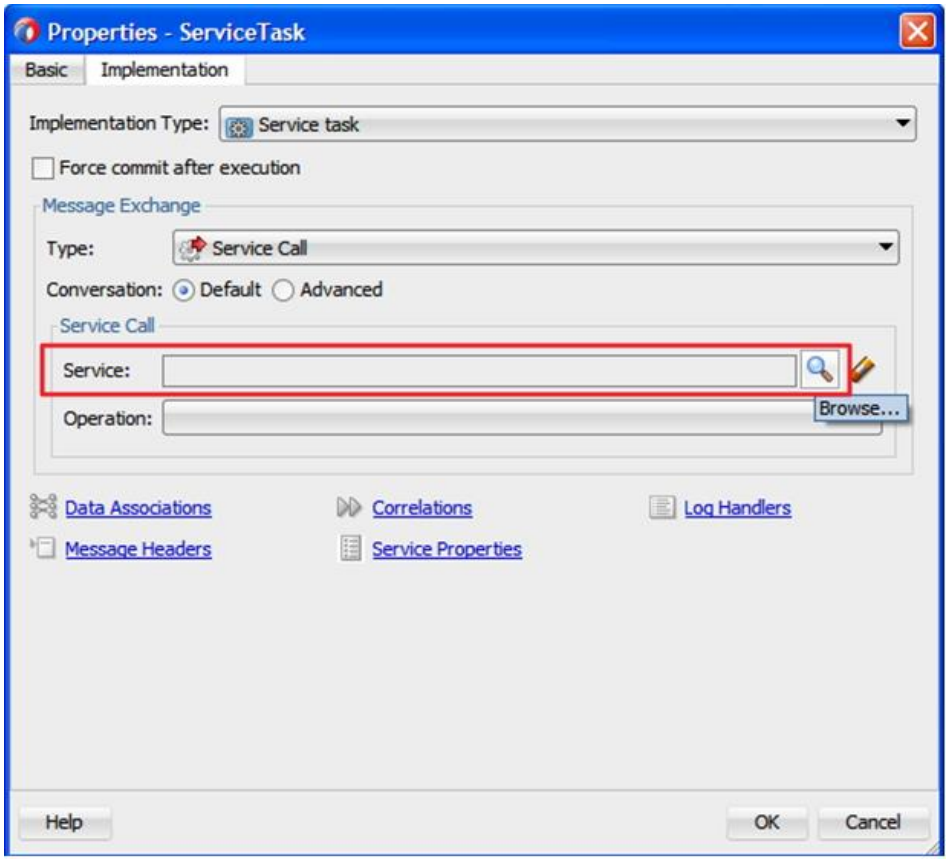
8. Select **Service Call** from the **Type** list, as shown in Figure 8-120.

Figure 8-120 Properties – Service Task Dialog



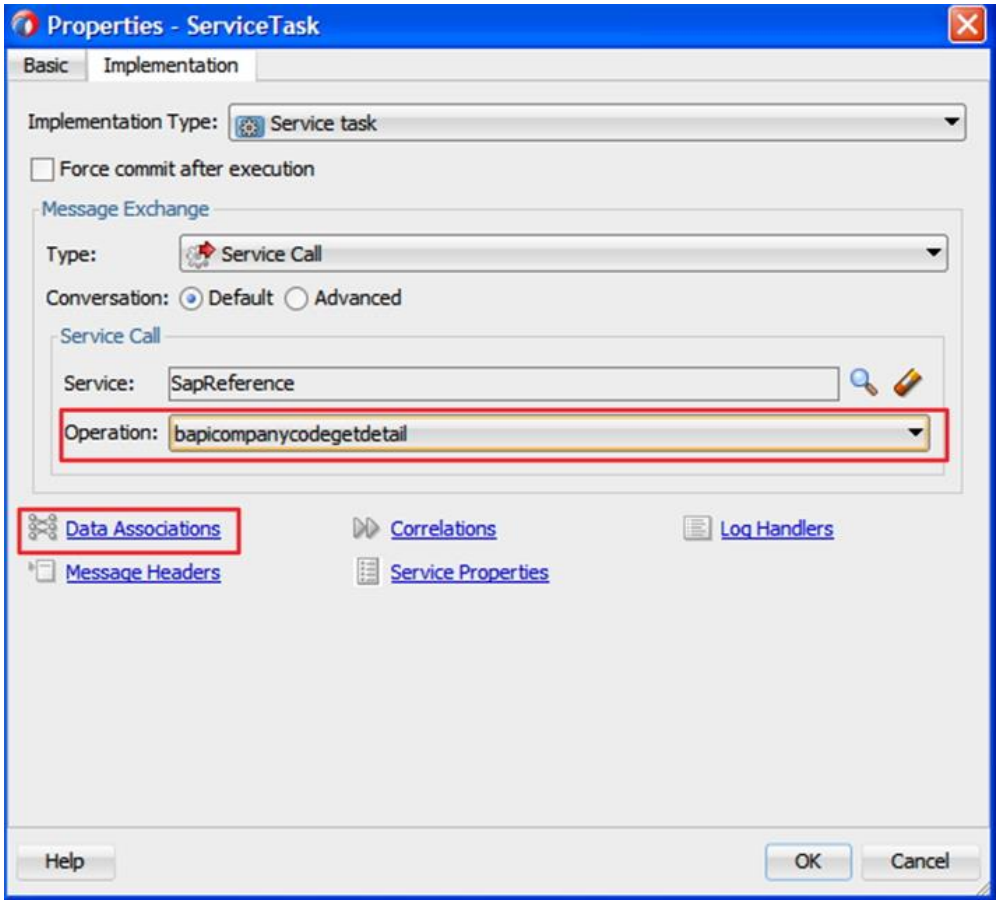
9. Click the **Browse** icon to the right of the **Service** field, as shown in Figure 8-121.

Figure 8-121 Browse Icon



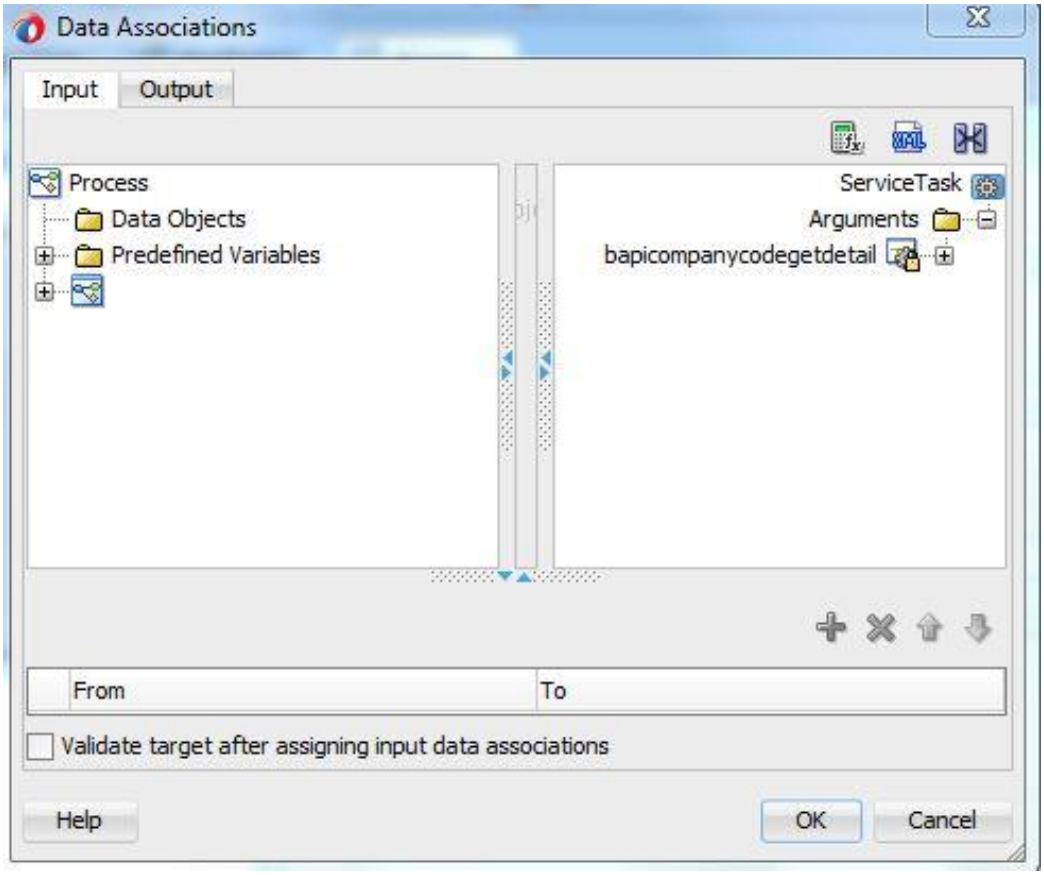
10. Select the **SapReference** that has been created from **Service** field and click **OK**.
11. Select the input operation (for example, bapicompanucodegetdetail) from **Operation** drop-down.
12. Click on the **Data Associations** link, as shown in Figure 8-122.

Figure 8-122 Data Associations Link



The **Data Associations** Dialog is displayed, as shown in Figure 8-123.

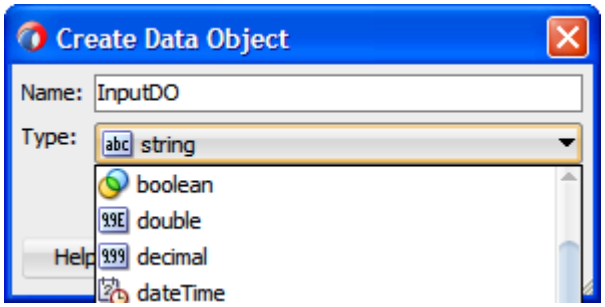
Figure 8-123 Data Associations Dialog



13. Right-click on **Data Objects** and create input object.

    The **Create Data Object** is displayed, as shown in Figure 8-124.

Figure 8-124 Create Data Object



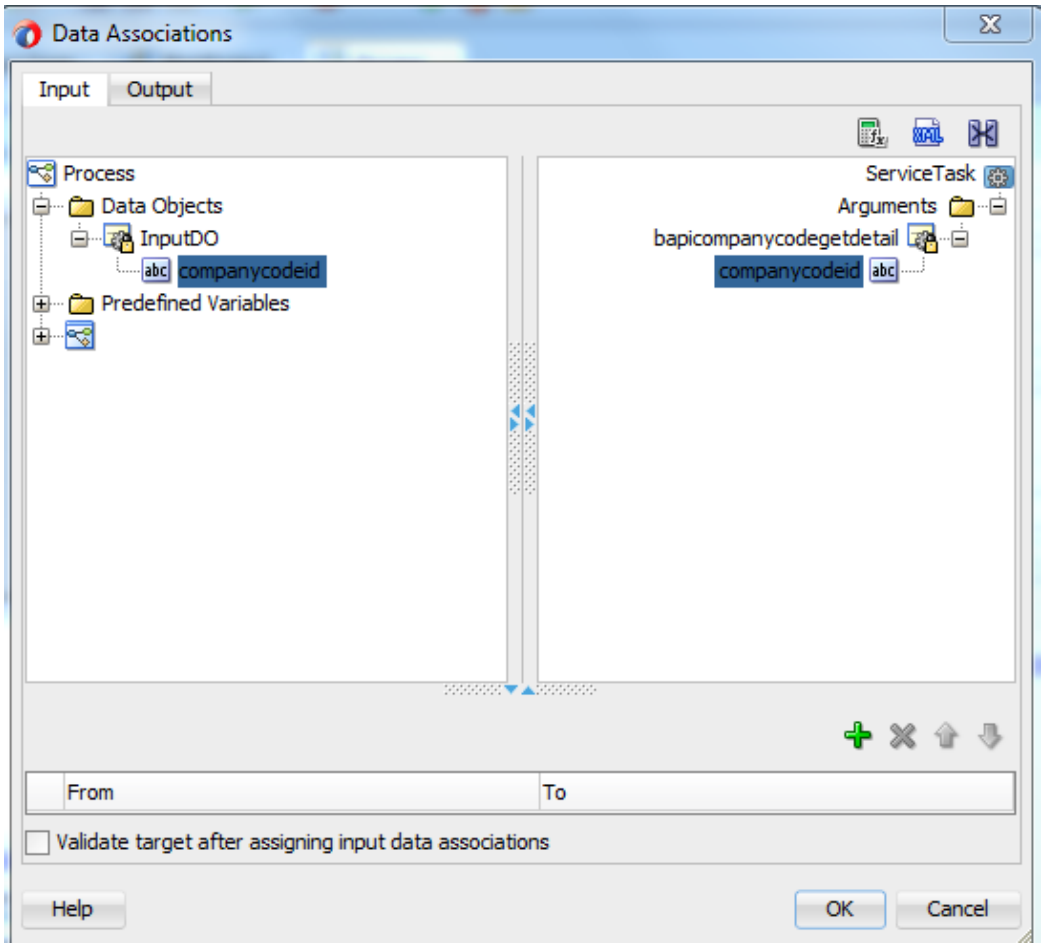
14. Enter a name in the **Name** field (for example, InputDo) and then click the drop-down button in the **Type** field and select <Component> from the list.

15. Select **Browse** option and choose the input.

16. Click **OK**.

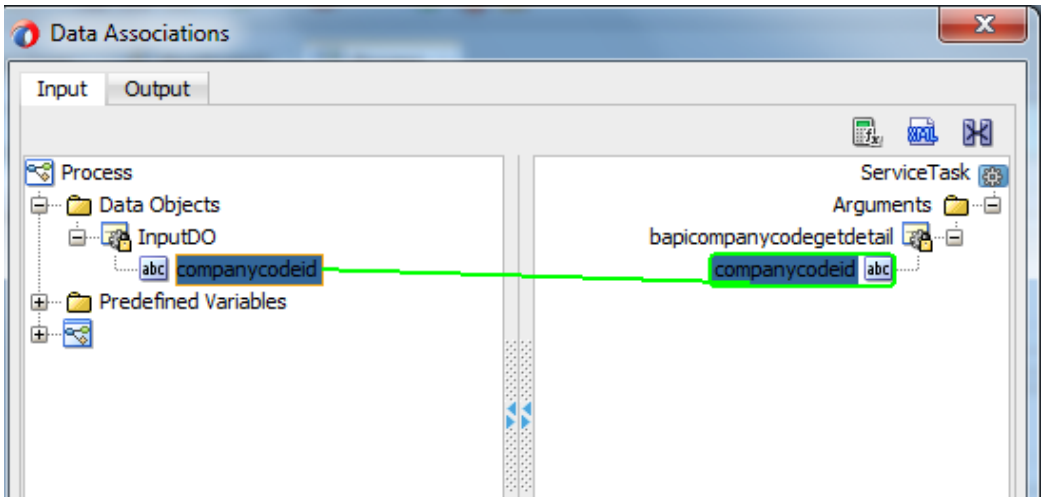
    The **Data Associations** dialog, as shown in Figure 8-125.

Figure 8-125 Data Associations Dialog



17. Map the **InputDO** created in the above step. To map it, select **Companycode** under **InputDO** node in the left pane and drag it to the **Companycodeid** input on the right side, as shown in Figure 8-126.

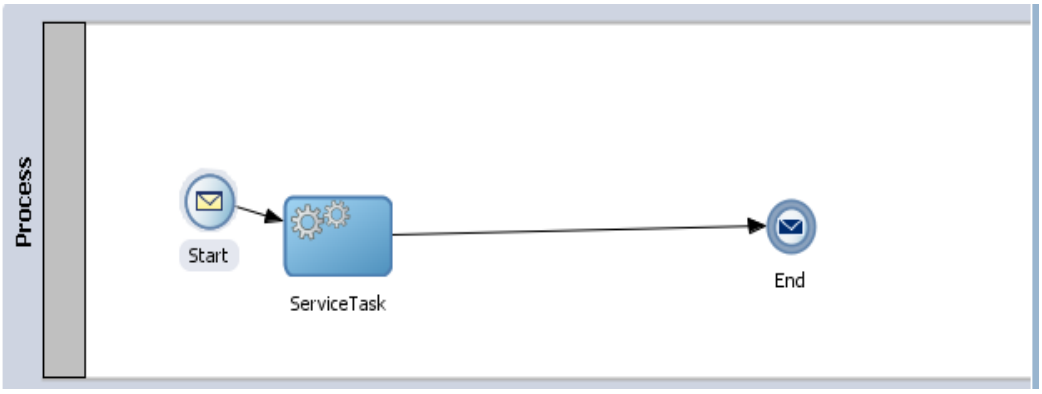
Figure 8-126 Map Dialog Box



18. Click **OK**.

    The Service Task is created between the Start and End Event components, as shown in Figure 8-127.

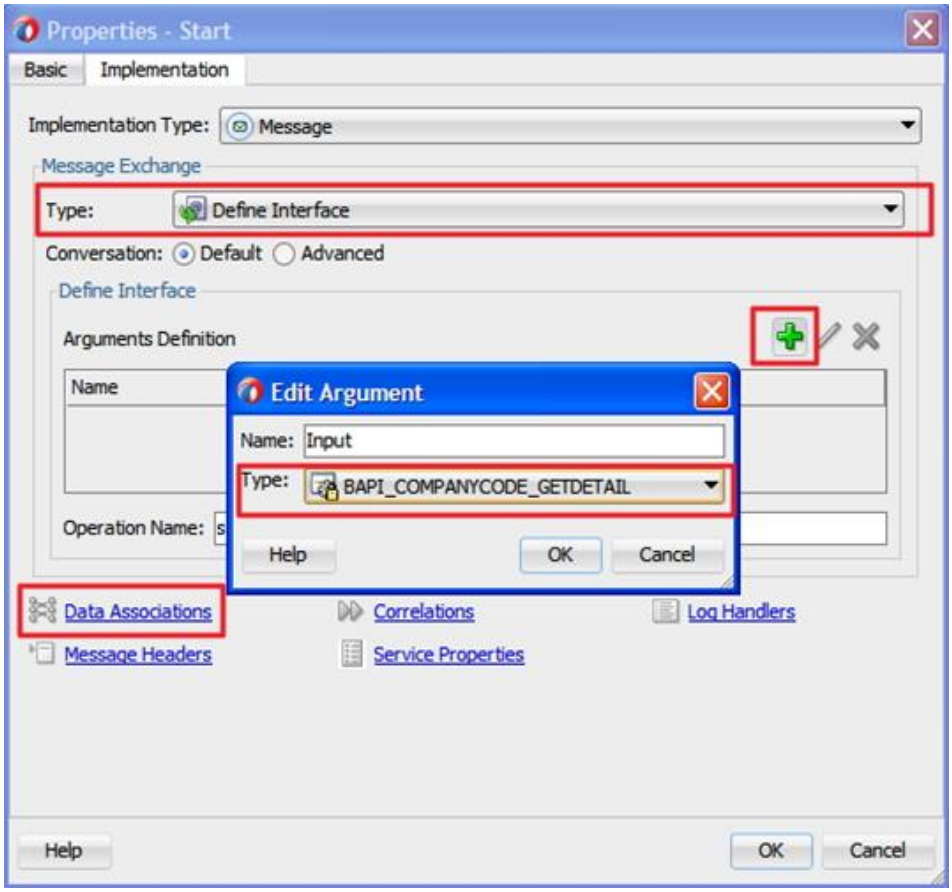
Figure 8-127 Service Task



19. Double-click on **Start** point.

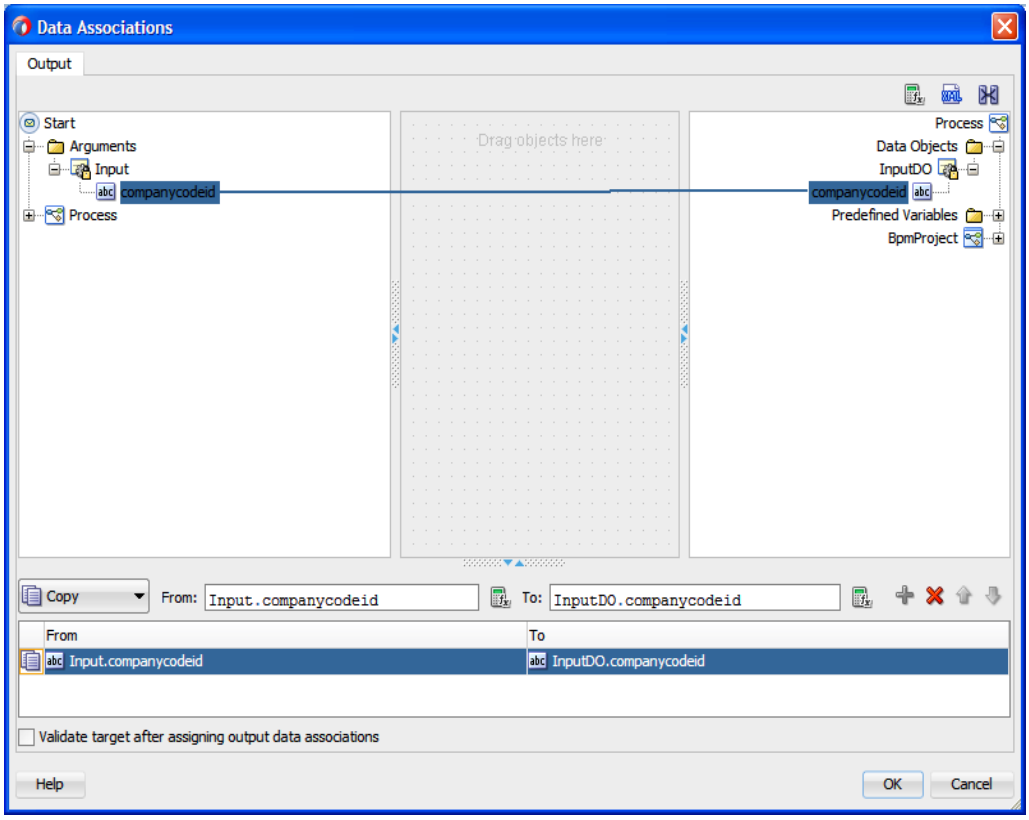
    The **Properties-Start** dialog is displayed, as shown in Figure 8-128.

Figure 8-128 Properties-Start Dialog



20. Click the **Implementation** tab.
21. Select **Define Interface** from the **Type** list.
22. Click the '**+**' icon to the right of the **Arguments Definition** field.
23. Enter a name in the **Name** field, click the drop-down button in the **Type** field and browse the input operation.
24. Click **OK**.
25. Click on the **Data Associations** Link.
26. Drag the **Input Argument** from the left pane to the **Data Object** to the right pane, created during the service task configuration, as shown in Figure 8-129.

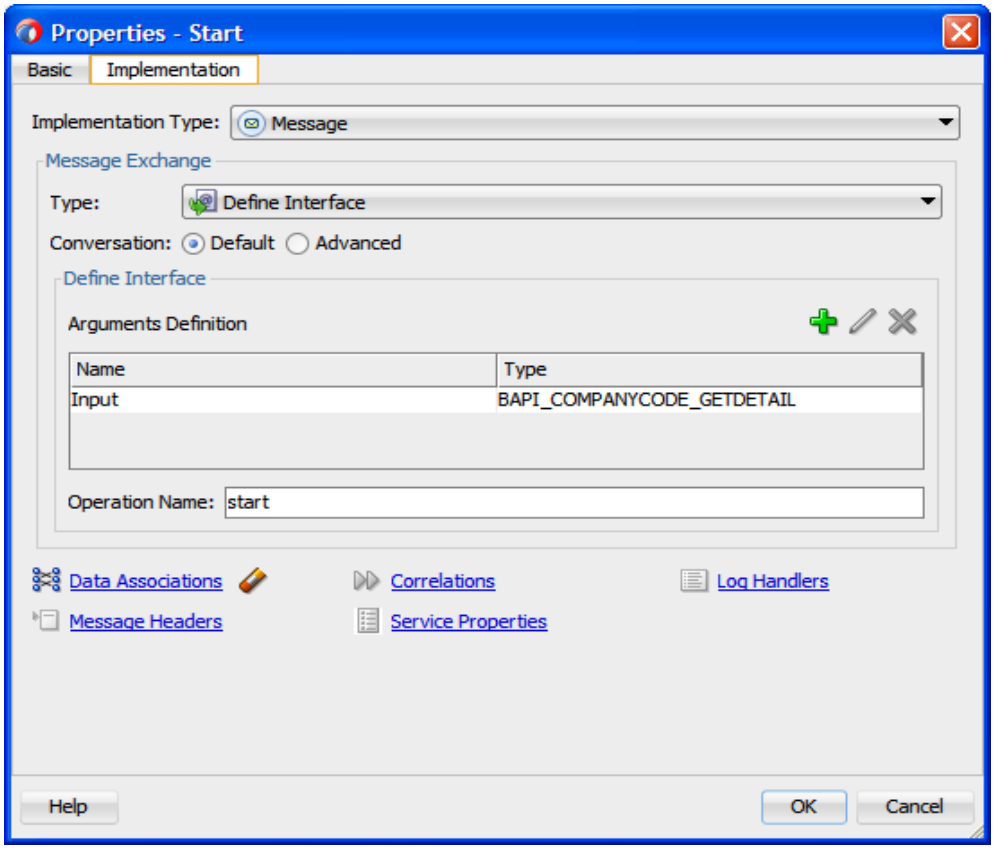
Figure 8-129 Data Associations Dialog



27. Click **OK**.

    You are returned to the **Properties-Start** dialog, as shown in Figure 8-130.

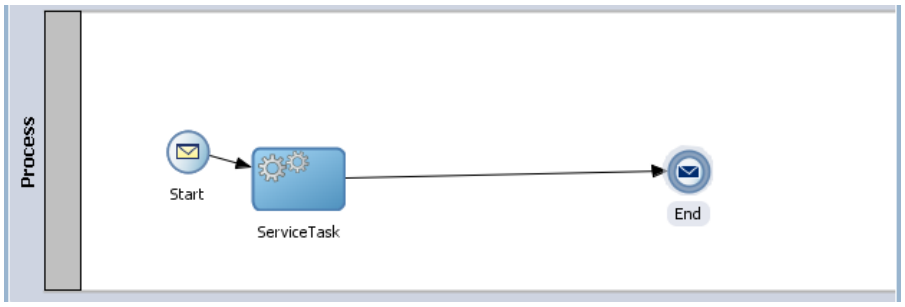
Figure 8-130 Properties-Start Dialog



28. Click **OK**.

Service Task dialog is displayed, as shown in Figure 8-131.

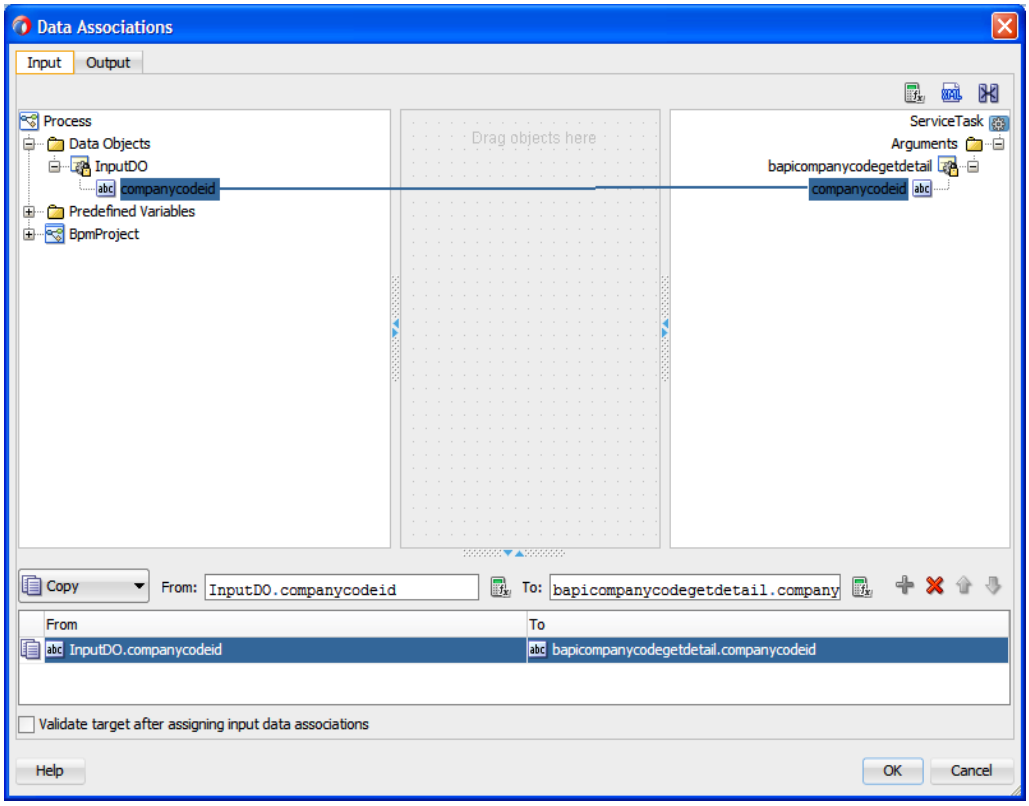
Figure 8-131 Service Task Dialog



29. Double-click on the **Service Task** point.

The **Data Associations** dialog is displayed, as shown in Figure 8-132.

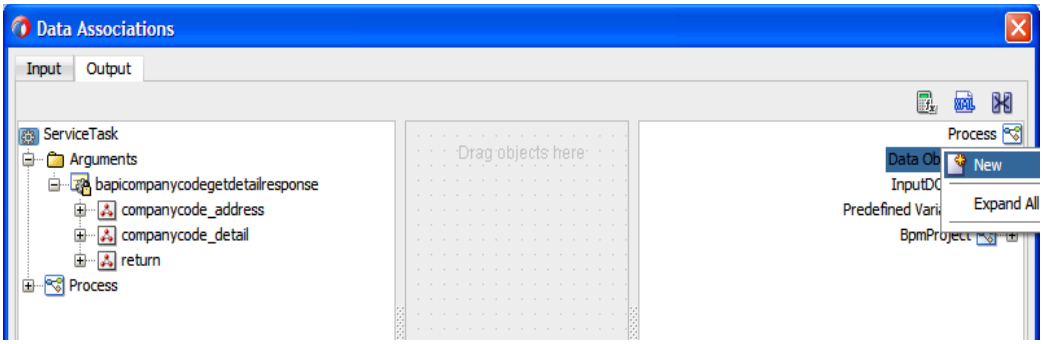
Figure 8-132 Data Associations Dialog



30. Click on the **Output** tab, as shown in Figure 8-133.

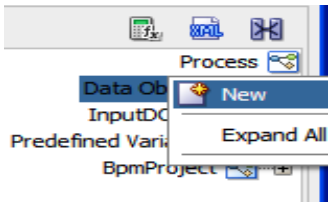
31. Create the Data Object on the right side to hold the response.

Figure 8-133 Output Tab



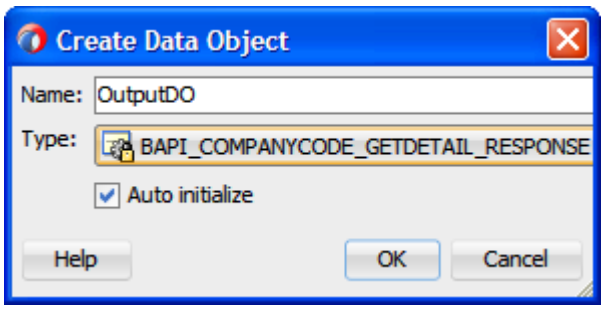
32. Right-click the **Data Object** node and select **New** from the context menu, as shown in Figure 8-134.

Figure 8-134 Data Object



The **Create Data Object** dialog is displayed, as shown in Figure 8-135.

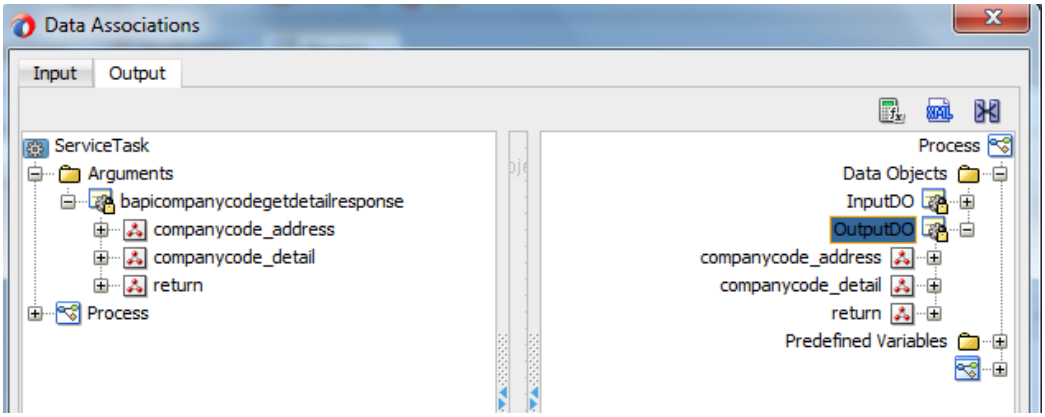
Figure 8-135 Create Data Object Dialog



33. Enter a name in the **Name** field (for example, OutputDO) and then click the drop-down button in the **Type** field and select BAPI_COMPANYCODE_GETDETAIL_RESPONSE from the list.
34. Click **OK**.

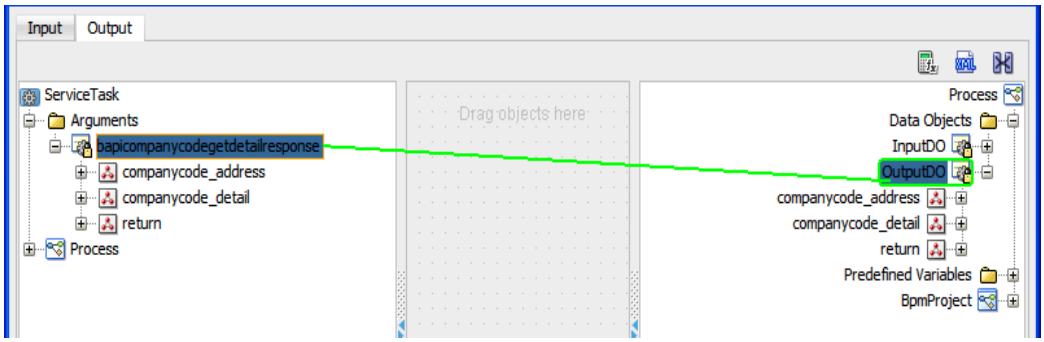
    You are returned to the **Data Associations** dialog, as shown in Figure 8-136.

Figure 8-136 Data Associations Dialog



35. Drag the **bapicompanycodegetdetailresponse** to the **OutputDO**, as shown in Figure 8-137.

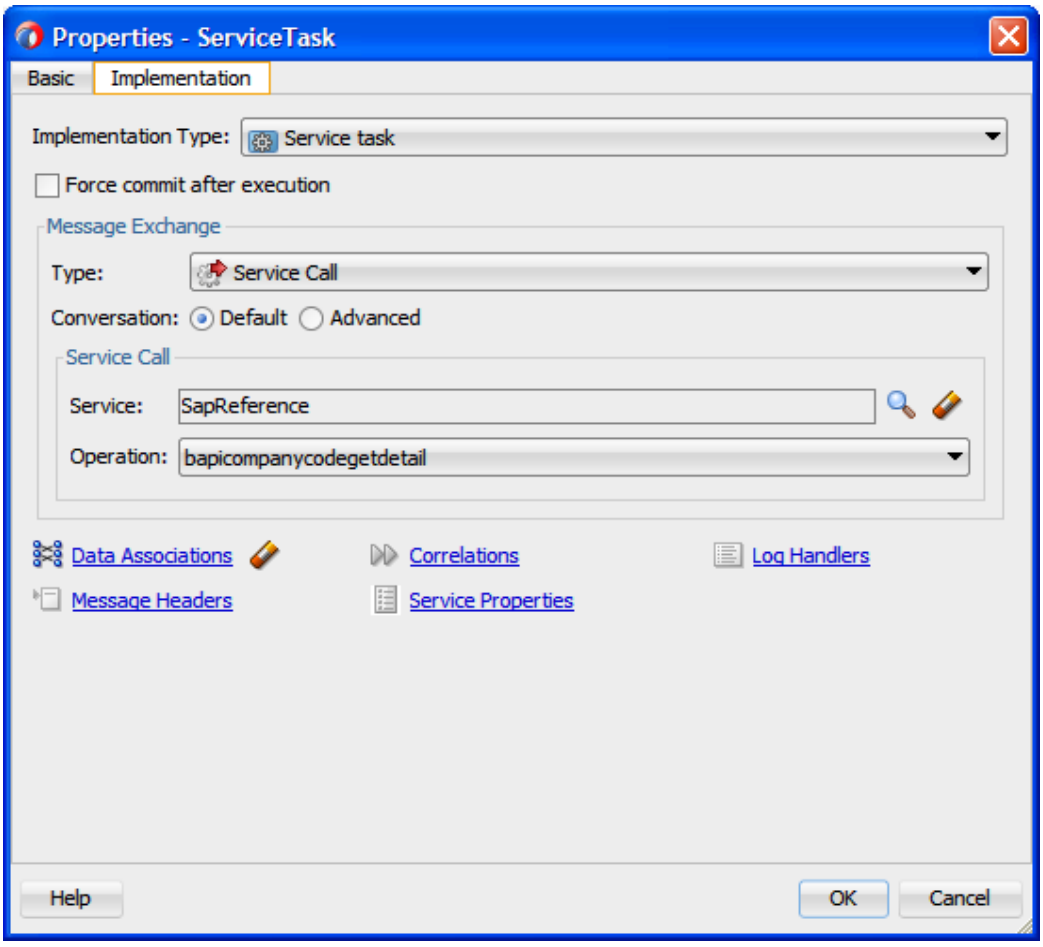
Figure 8-137 Data Associations Dialog



36. Click **OK**.

You are returned to the **Properties-ServiceTask** dialog, as shown in Figure 8-138.

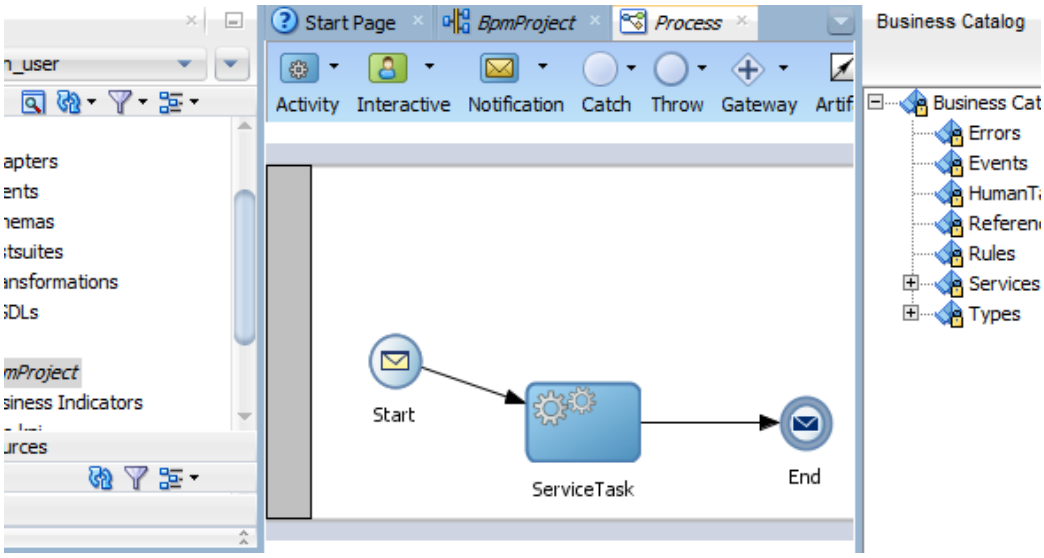
Figure 8-138 Properties - ServiceTask Dialog



37. Click **OK**.

You are returned to the Process Workspace area, as shown in Figure 8-139.

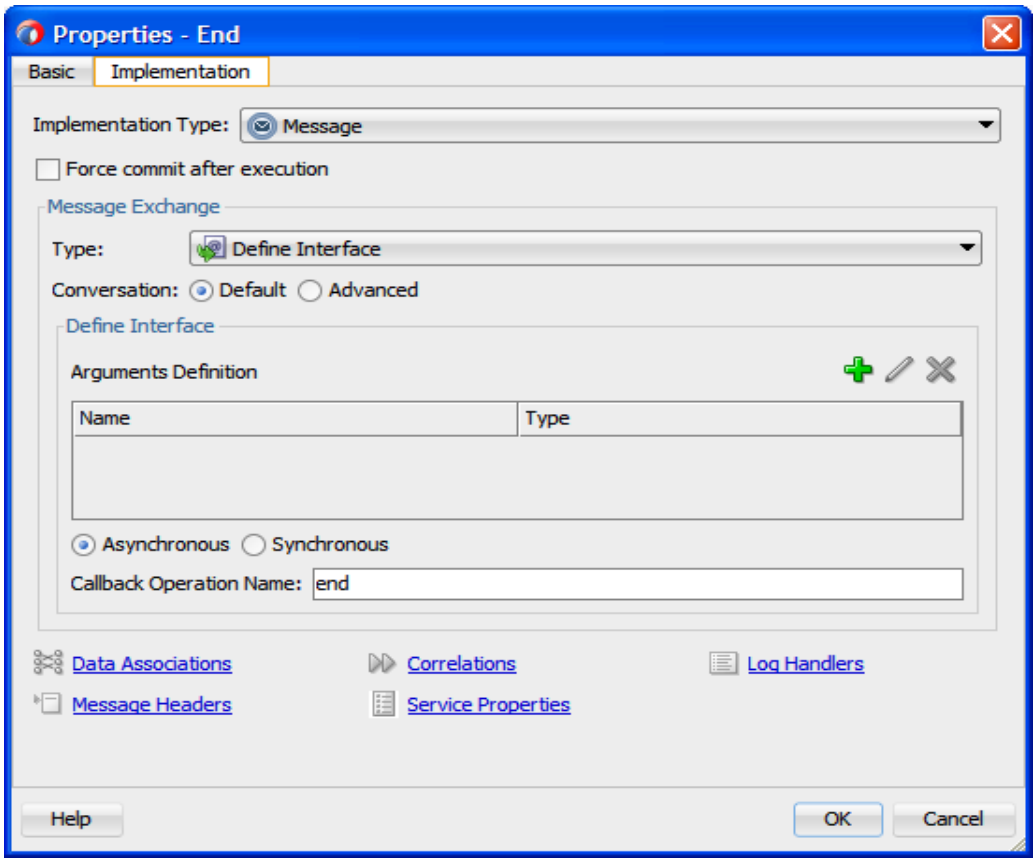
Figure 8-139 Process Workspace Area



38. Double-click on **End** icon.

    The **Properties-End** dialog is displayed, as shown in Figure 8-140.

Figure 8-140 Properties-End Dialog



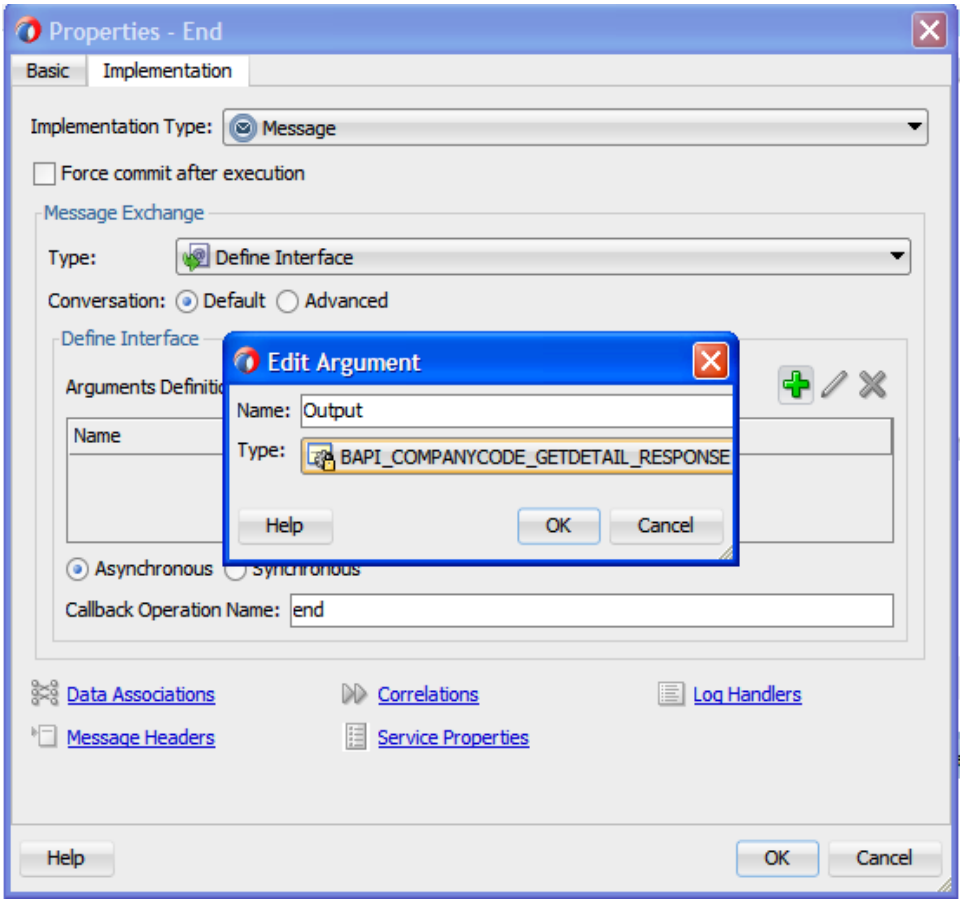
39. Click on **Implementation** tab, as shown in Figure 8-141.

40. Click the + icon to the right of the **Arguments Definition** field, the **Create Argument** dialog is displayed.

41. Enter a name in the **Name** field (as Output) and then click the drop-down button in the **Type** field and select BAPI_COMPANYCODE_GETDETAIL-RESPONSE from the list.

42. Click **OK**.

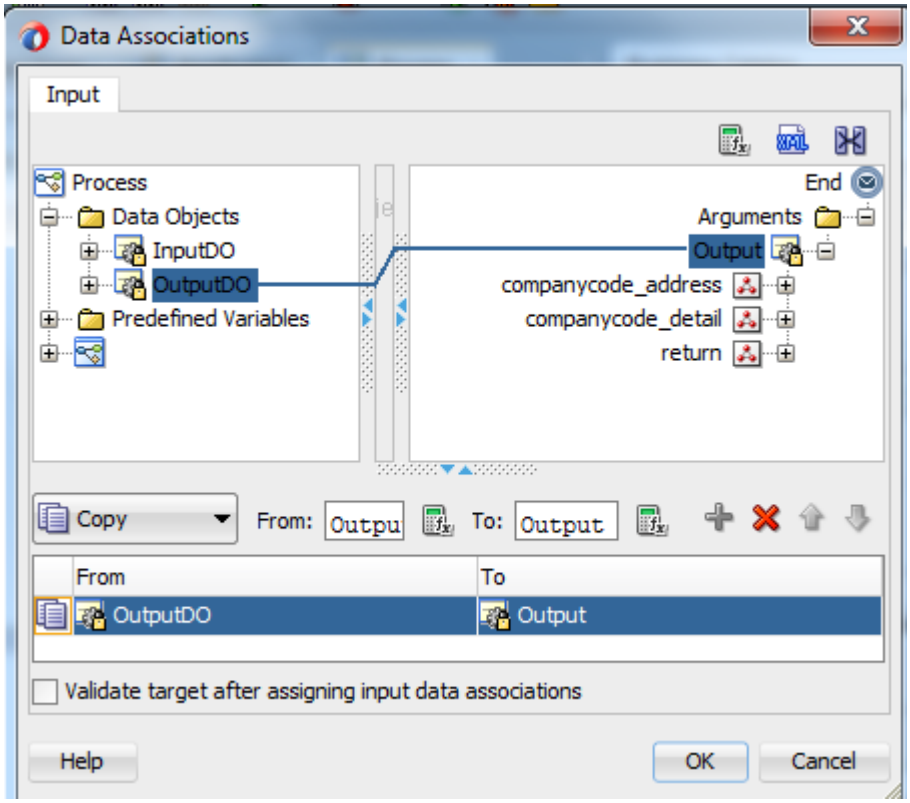
Figure 8-141 Implementation Tab



43. Click on **Data Associations** link.

You are returned to the **Data Associations** dialog, as shown in Figure 8-142.

Figure 8-142 Data Associations Dialog

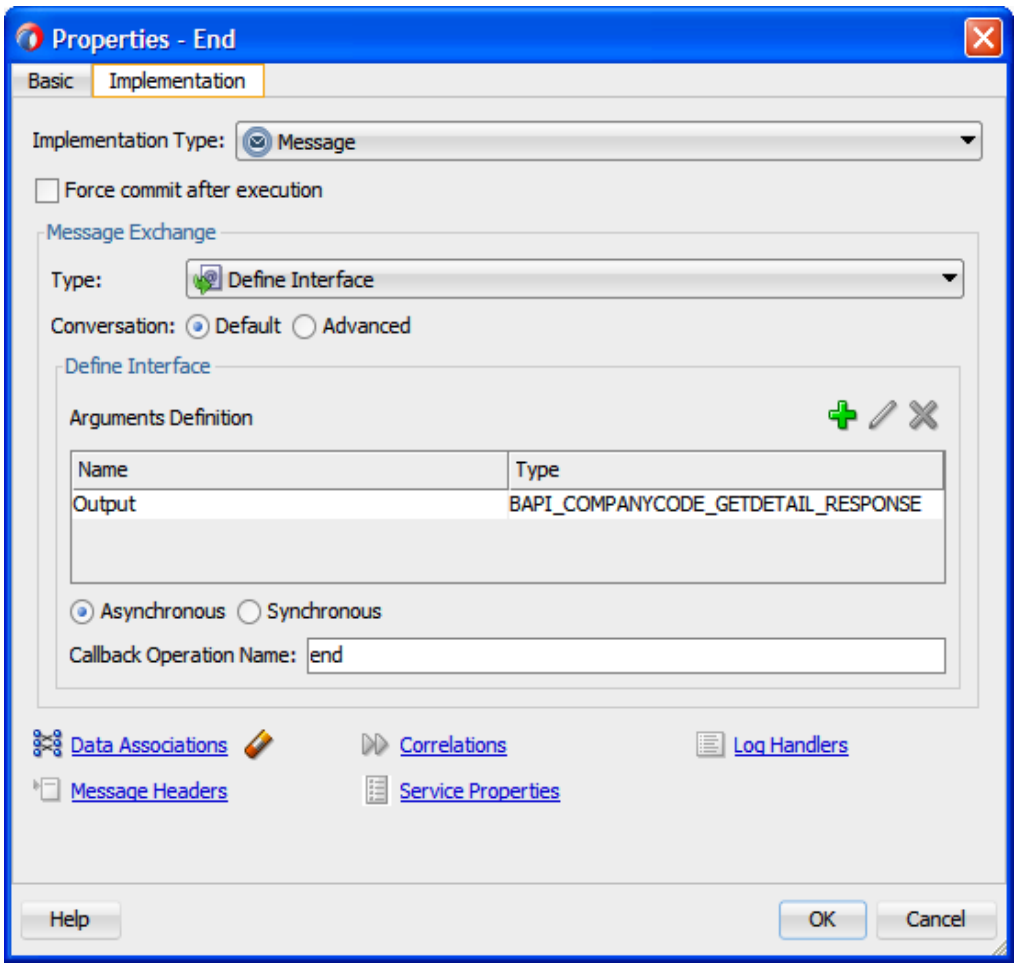


44. Drag the **OutputDO** node in the left pane to the **Output** node in the right side.

45. Click **OK**.

You are returned to the **Properties - End** dialog, as shown in Figure 8-143.

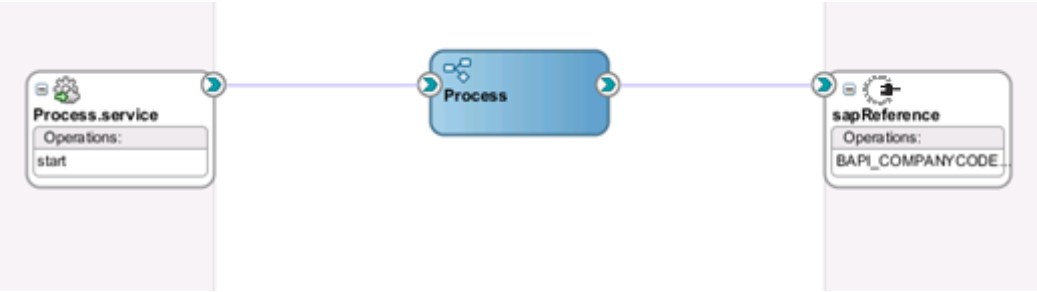
Figure 8-143 Properties - End Dialog



46. Click **OK**.

47. Click the **Save All** icon in the menu bar to save the new outbound BPM process component that was configured, as shown in Figure 8-144.

Figure 8-144 BPM Process Component



8.3.4 Design a BPM Inbound Process

This section describes how to define an Inbound BPM Process, which consists of the following stages:

1. Creating an Empty Composite for BPM
2. Defining a BPM Inbound Process

Create an Empty Composite for BPM

For more information, refer to the section “Create an Empty Composite for BPM”.

Define a BPM Inbound Process

This section describes how to define a BPM inbound process, which consists of the following stages:

1. Configuring an Adapter Service Component
2. Configuring an Inbound BPM Process Component

Configuring an Adapter Service Component

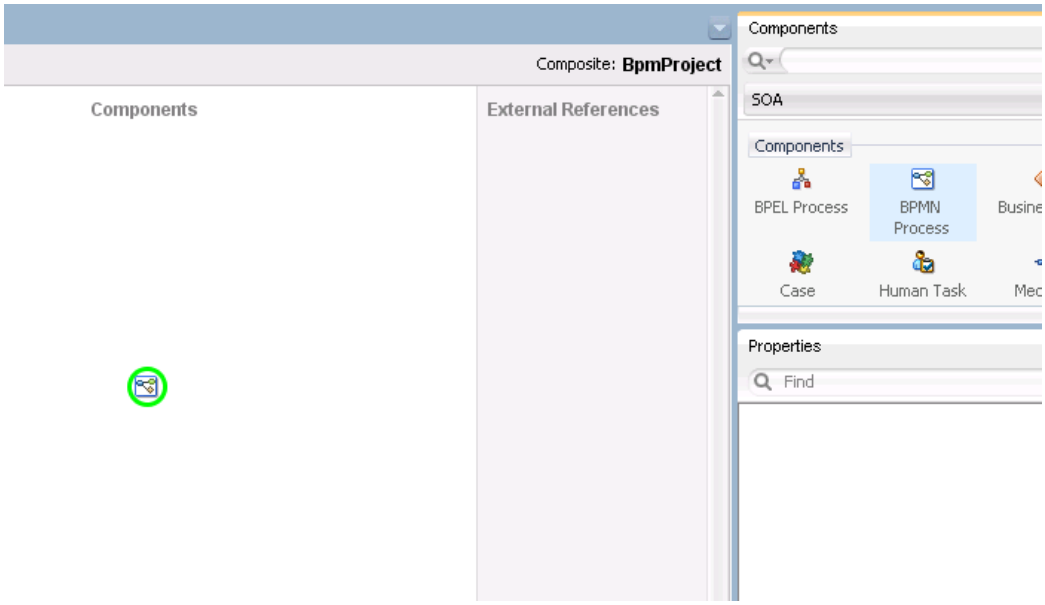
For more information, refer to the section "Configure an Adapter Component" that is described in "Define an inbound BPEL Process".

Configuring an Inbound BPM Process Component

Perform the following steps to configure an inbound BPM process component:

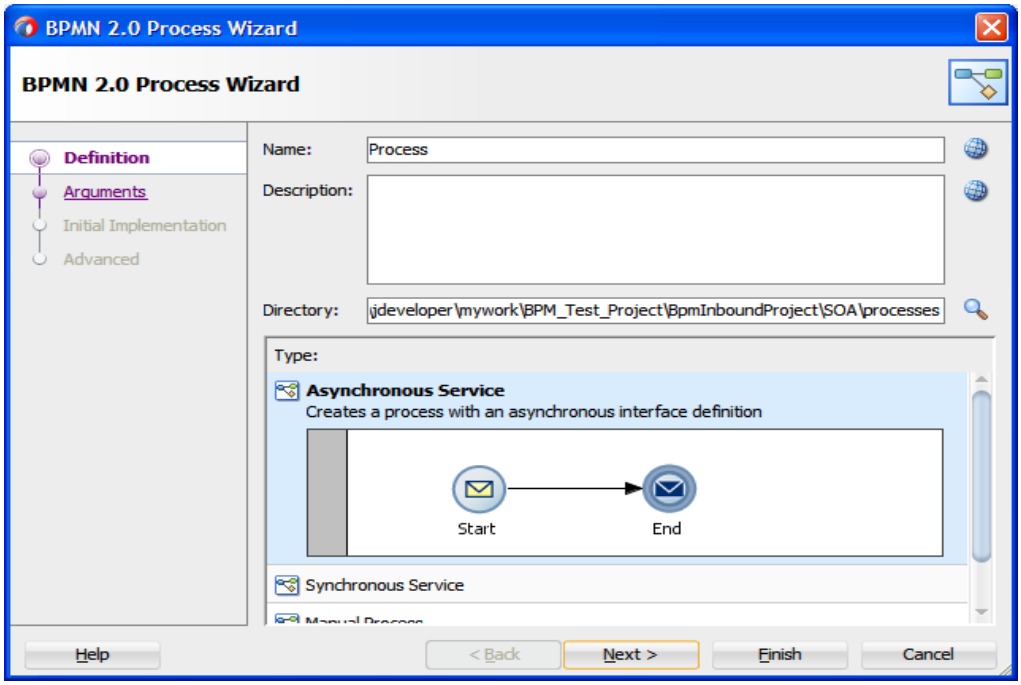
1. Drag and drop the **BPMN Process** component from the Service Components pane to the Components pane, as shown in Figure 8-145.

Figure 8-145 BPMN Process Component



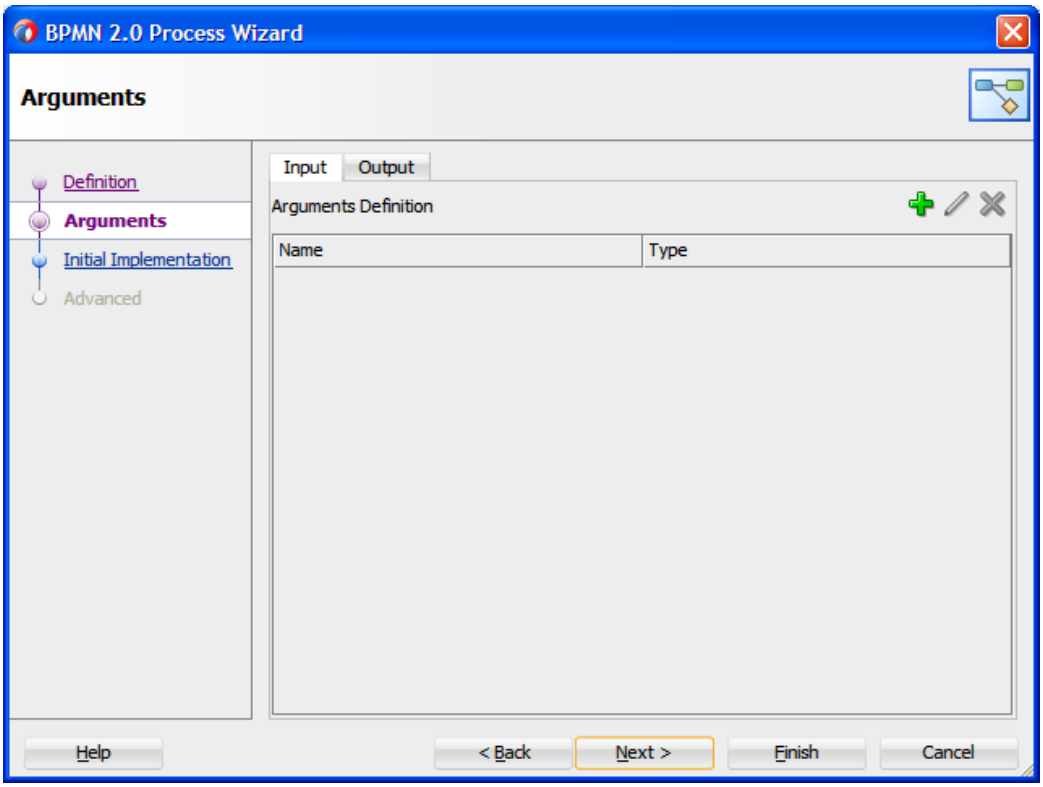
The **BPMN Process** wizard is displayed, as shown in Figure 8-146.

Figure 8-146 BPMN Process Wizard



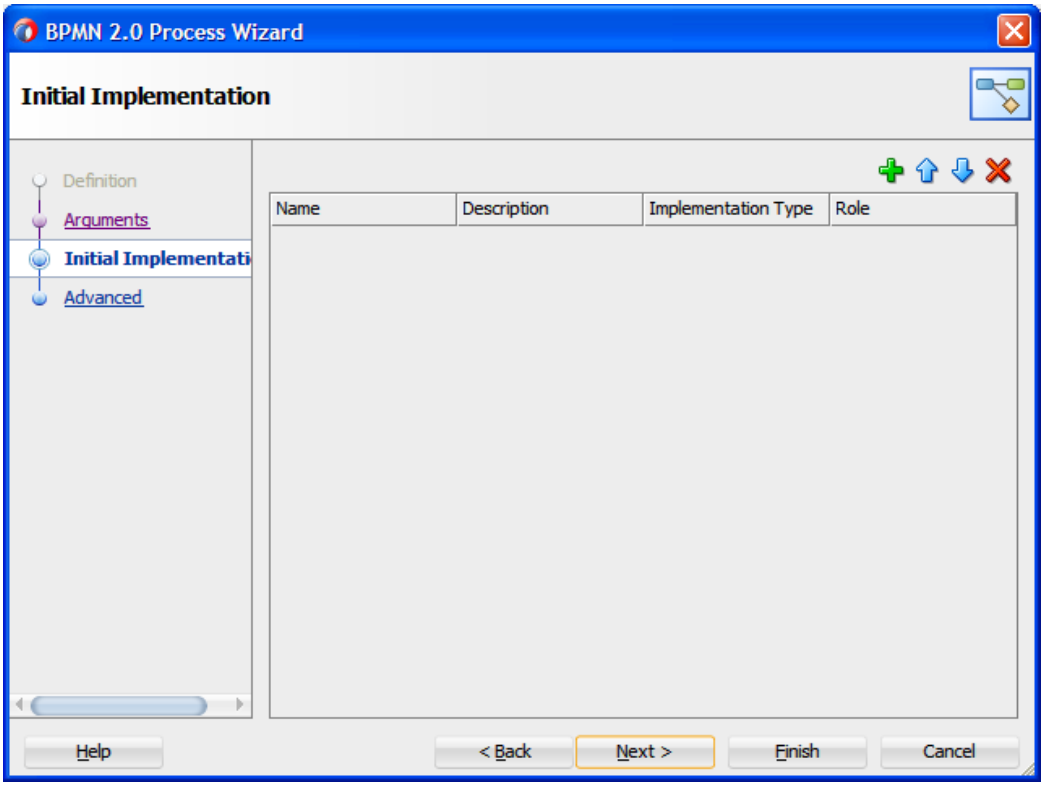
2. Click **Next**. The **Arguments** page is displayed, as shown in Figure 8-147.

Figure 8-147 Arguments Page



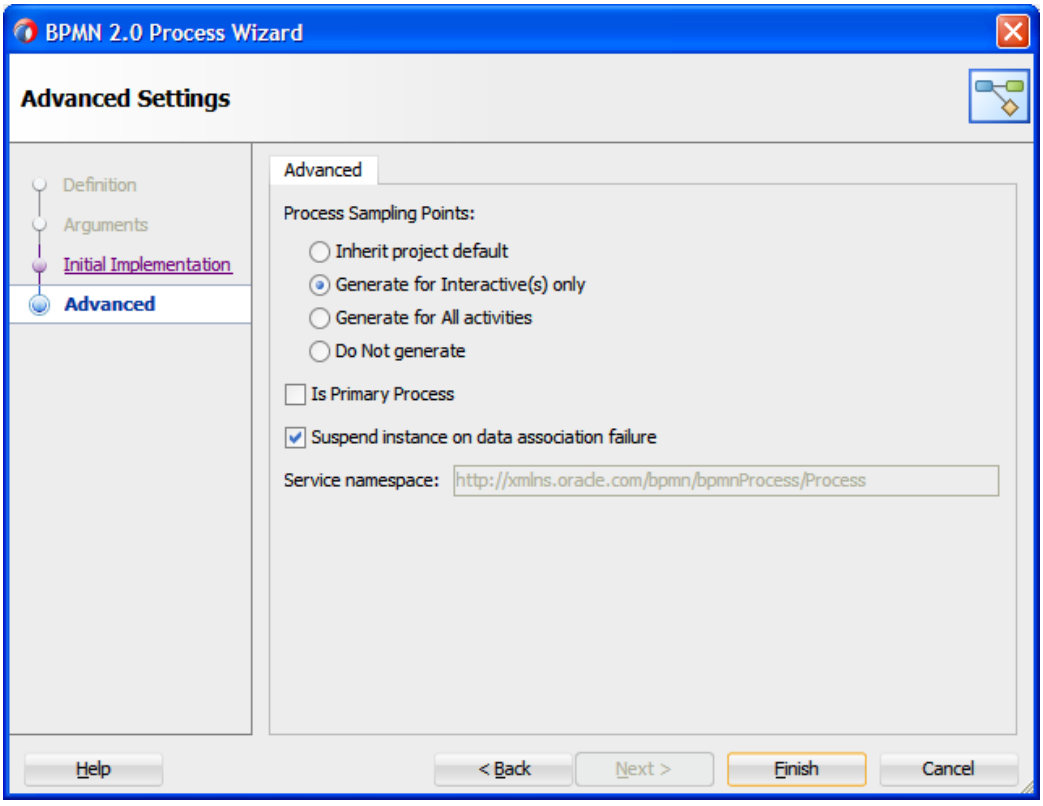
3. Click **Next**. The **Initial Implementation** page is displayed, as shown in Figure 8-148.

Figure 8-148 Initial Implementation Page



4. Click **Next**. The **Advanced Settings** page is displayed, as shown in Figure 8-149.

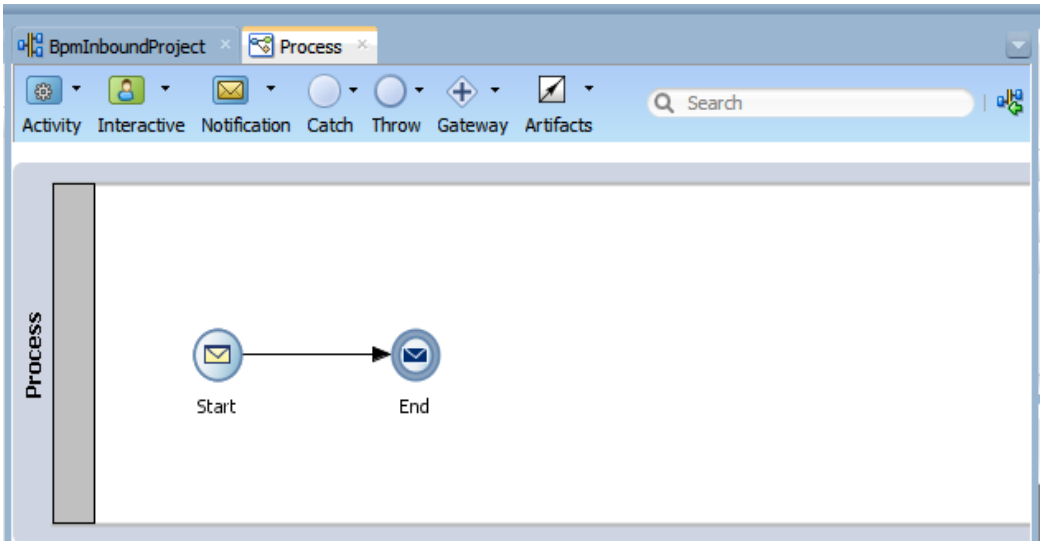
Figure 8-149 Advanced Setting Page



5. Click **Finish**.

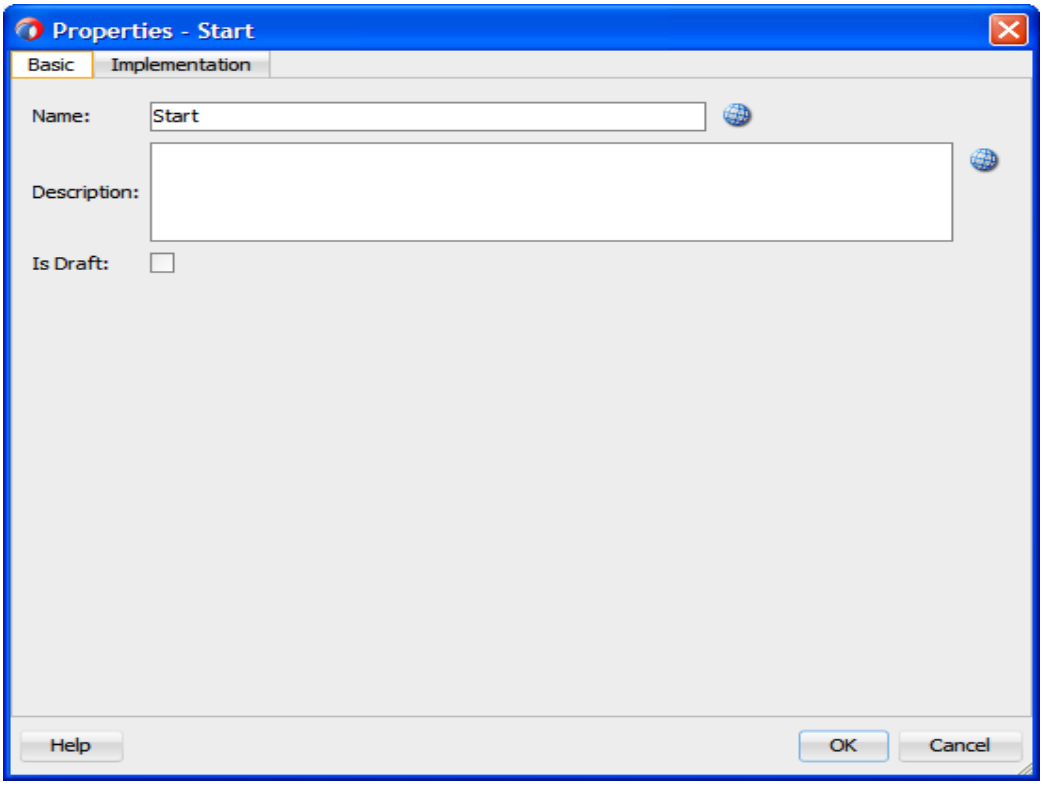
   The following screen appears, as shown in Figure 8-150.

Figure 8-150 BPMN Process



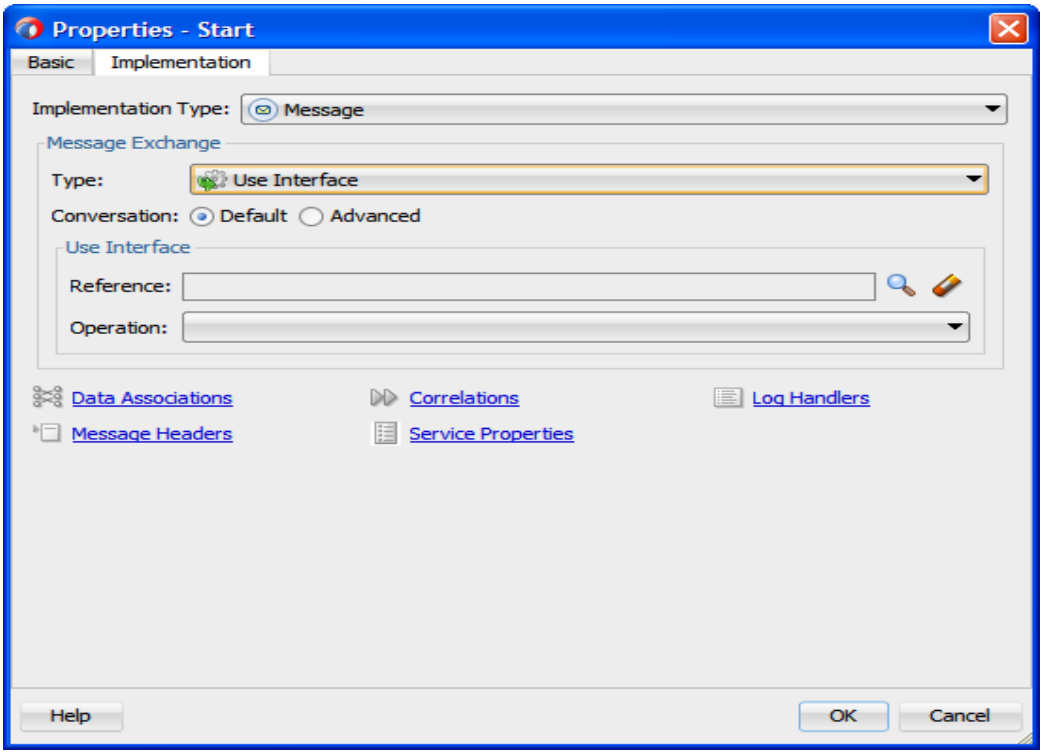
6. Double-click on the **Start** icon. The **Properties - Start** dialog is displayed, as shown in Figure 8-151.

Figure 8-151 Properties - Start Dialog



7. Click the **Implementation** tab.
8. Select **Use Interface** from the **Type** list.
9. Click on the **Browse** icon to the right of the **Reference** field, under **Use Interface** section, as shown in Figure 8-152.

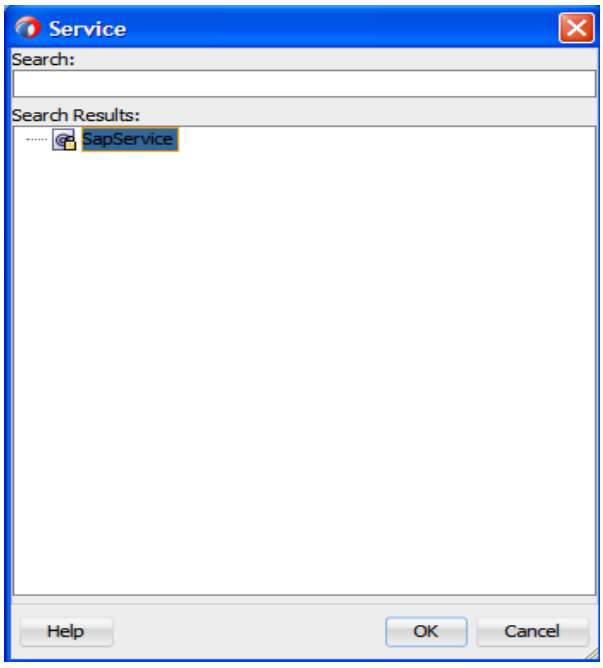
Figure 8-152 Implementation Tab



The **Service** dialog is displayed, as shown in Figure 8-153.

10. Select **SapService** from Search Results.
11. Click **OK**.

Figure 8-153 Service Dialog

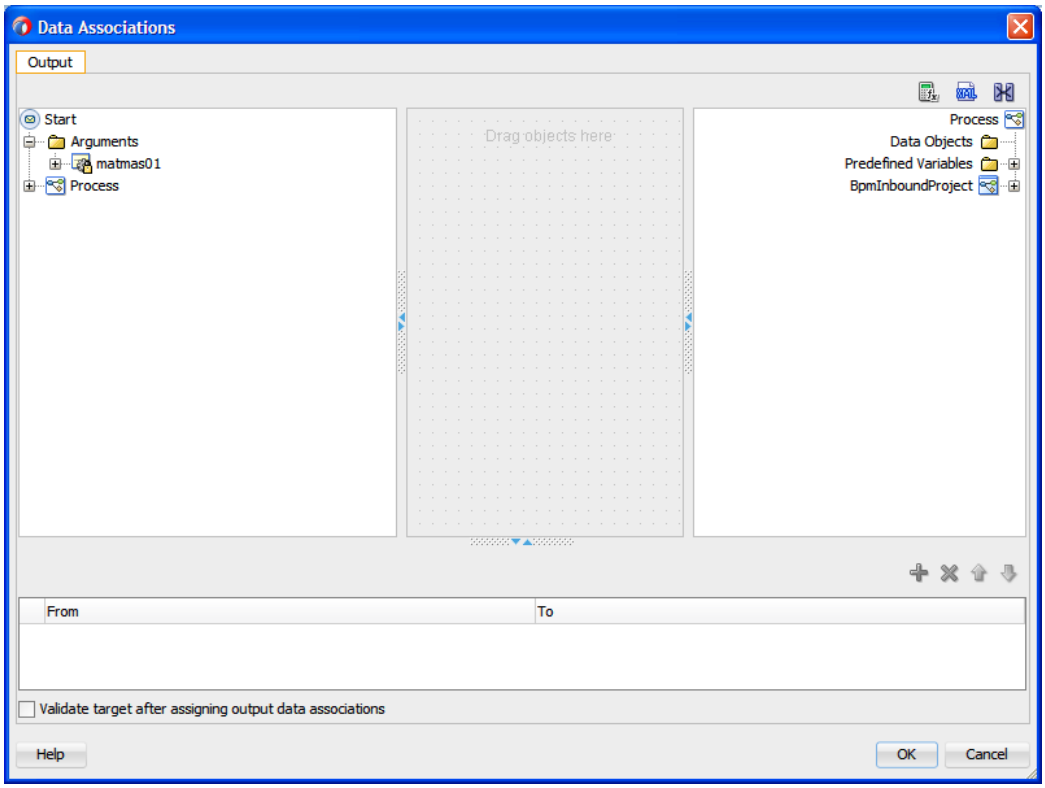


You are returned to the **Properties - Start** dialog.

19. Click on the **Data Associations** link.

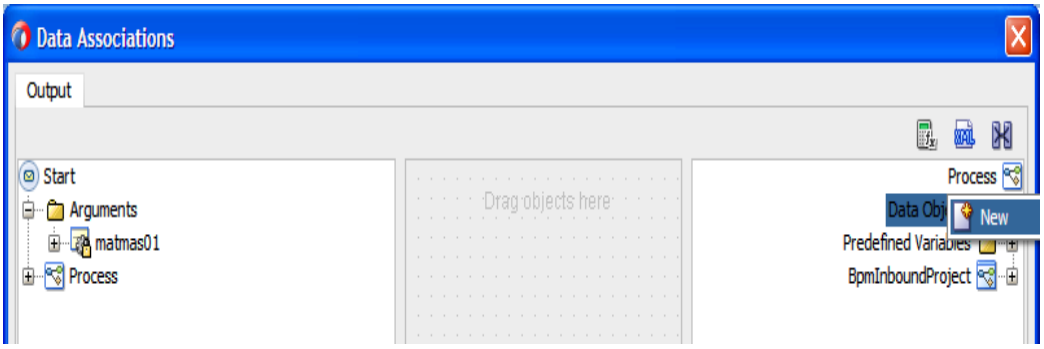
The **Data Associations** dialog is displayed, as shown in Figure 8-154.

Figure 8-154 Data Associations Dialog



20. Create the Data Object as shown in Figure 8-155.

Figure 8-155 Create Data Object

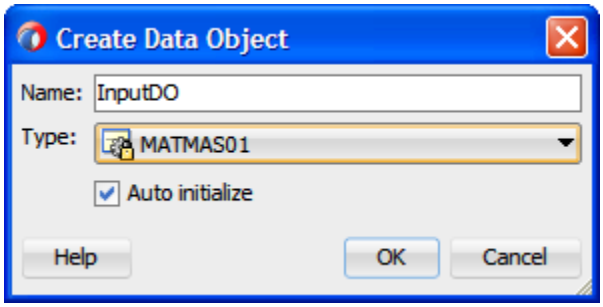


21. Right-click on **Data Object** and select **New**.

    The **Create Data Object** dialog is displayed, as shown in Figure 8-156.

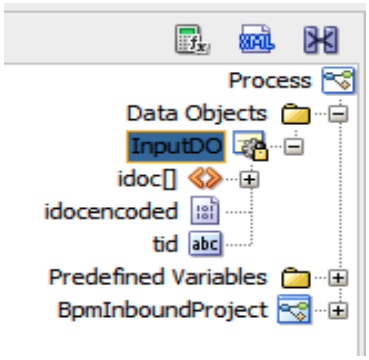
22. Enter a name in the **Name** field (for example, InputDO) and then click the drop-down button in the **Type** field and select **MATMAS01**from the list.

Figure 8-156 Create Data Object Dialog



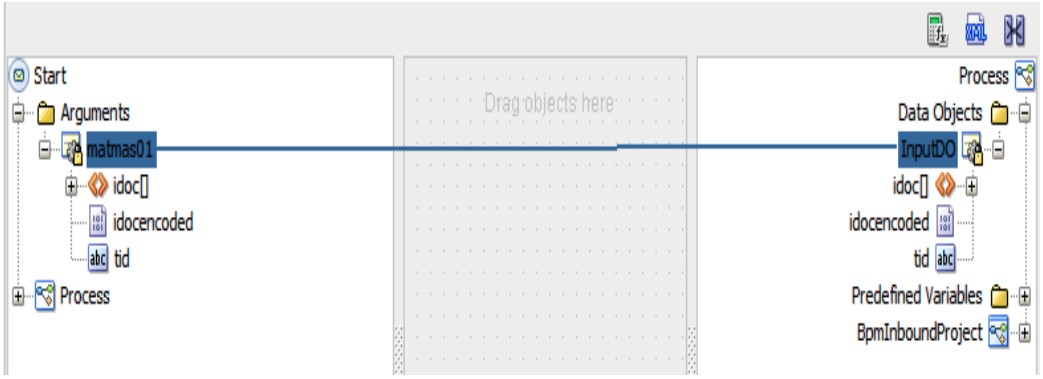
23. The **InputDO** is created, as shown in Figure 8-157.

Figure 8-157 Data Object



24. Drag the **matmas01** argument of the start to the **InputDO** of the Process, as shown in Figure 8- 158.

Figure 8-158 Data Association Dialog

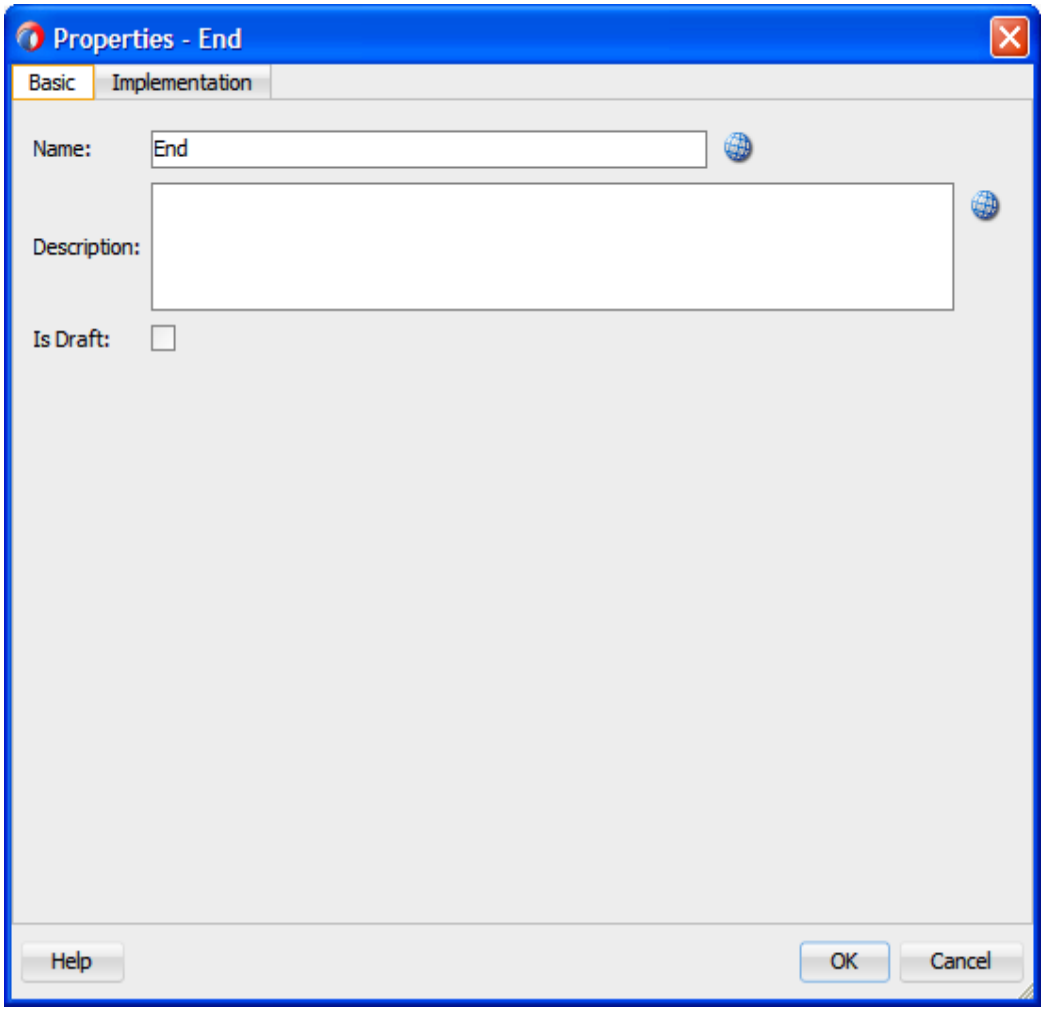


25. Click **OK**.

26. Double-click on the **End** icon.

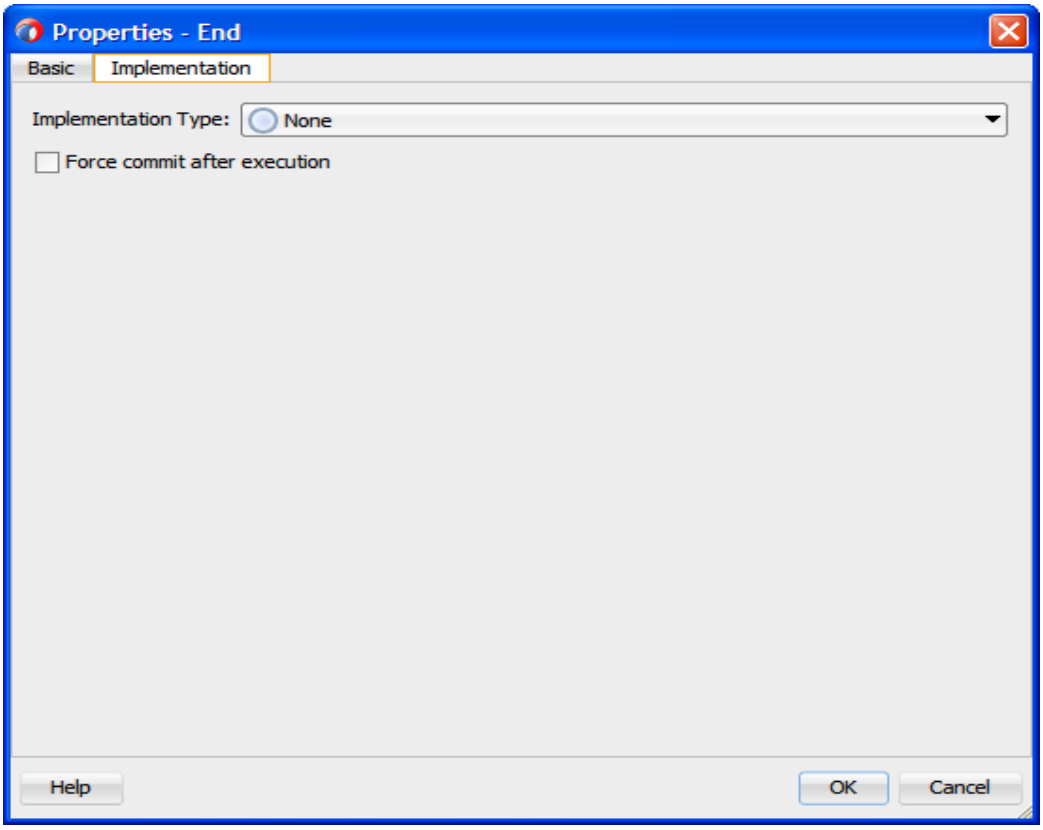
The **Properties - End** dialog is displayed, as shown in Figure 8- 159.

Figure 8-159 Properties - End Dialog



27. Click the **Implementation** tab.
28. Select **None** from the **Implementation Type** list, as shown in Figure 8- 160.

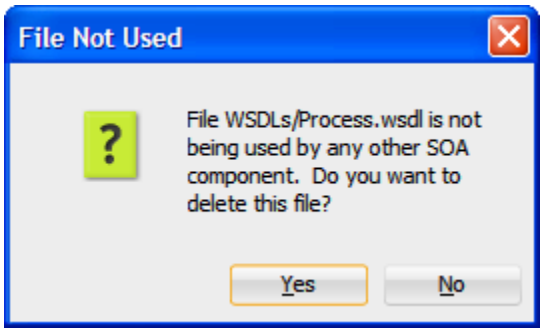
Figure 8-160 Implementation Type



29. Click **OK**.

The **File Not Used** dialog is displayed, as shown in Figure 8- 161.

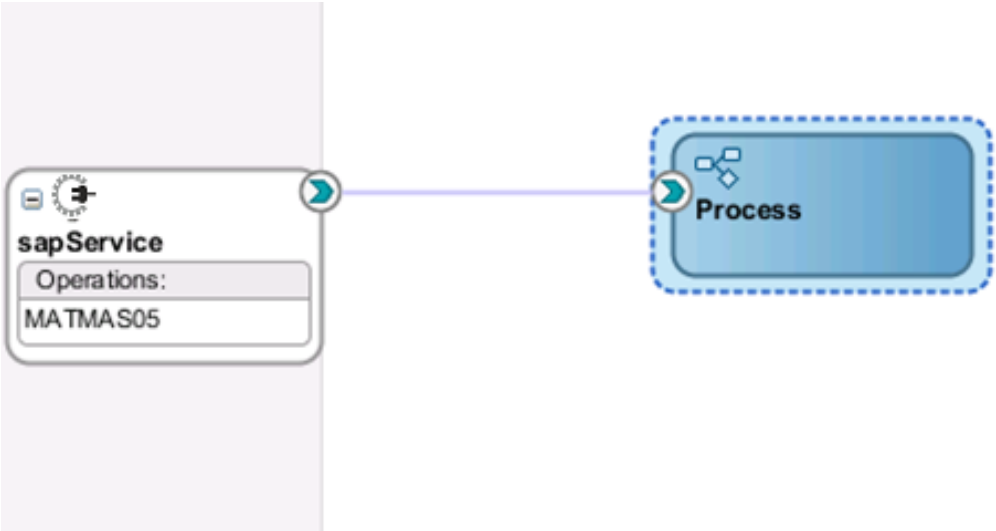
Figure 8-161 File Not Used Dialog



30. Click **Yes**.

31. Click the **Save All** icon in the menu bar to save the new inbound BPM process component that was configured, as shown in Figure 8-162.

Figure 8-162 Inbound BPM Process Component



You are now ready to deploy the Inbound BPM Process.

Deployment Inbound BPM Process

To deployment the Inbound BPM Process, you can follow the same procedure as described in "Deploy the Defined Process".

8.4 The Adapter Integration with Oracle Service Bus (OSB)

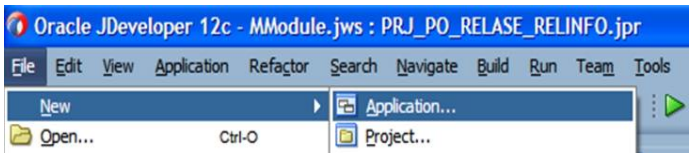
The Oracle Integration Adapter for SAP R/3 seamlessly integrates with Oracle Service Bus (OSB) to facilitate the Web service integration. OSB is based on the Service-Oriented Architecture (SOA). It consumes the adapter services that are exposed as Web Service Definition Language (WSDL) documents.

8.4.1 Create an Empty Composite for OSB

Perform the following steps to create an empty composite for OSB:

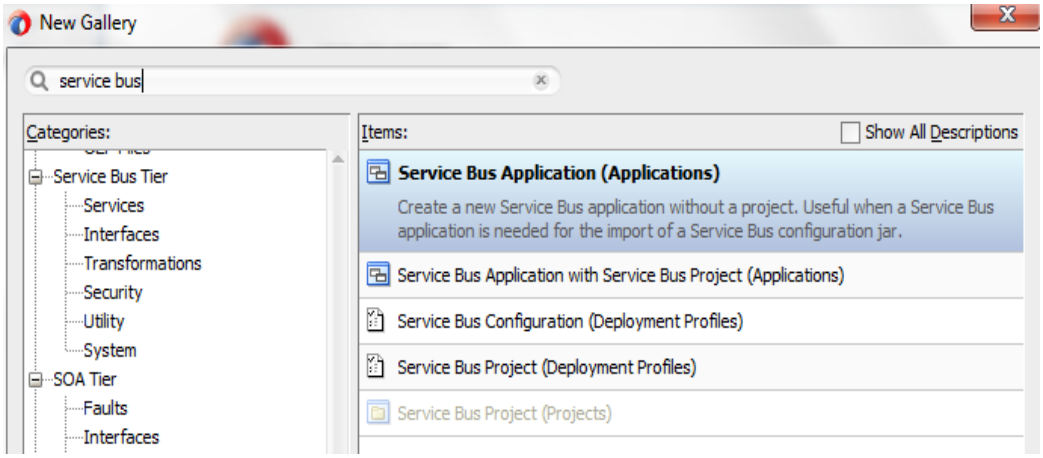
1. Create a new OSB application, Select **File > New > Application**, as shown in Figure 8- 163.

Figure 8-163 New Application Page



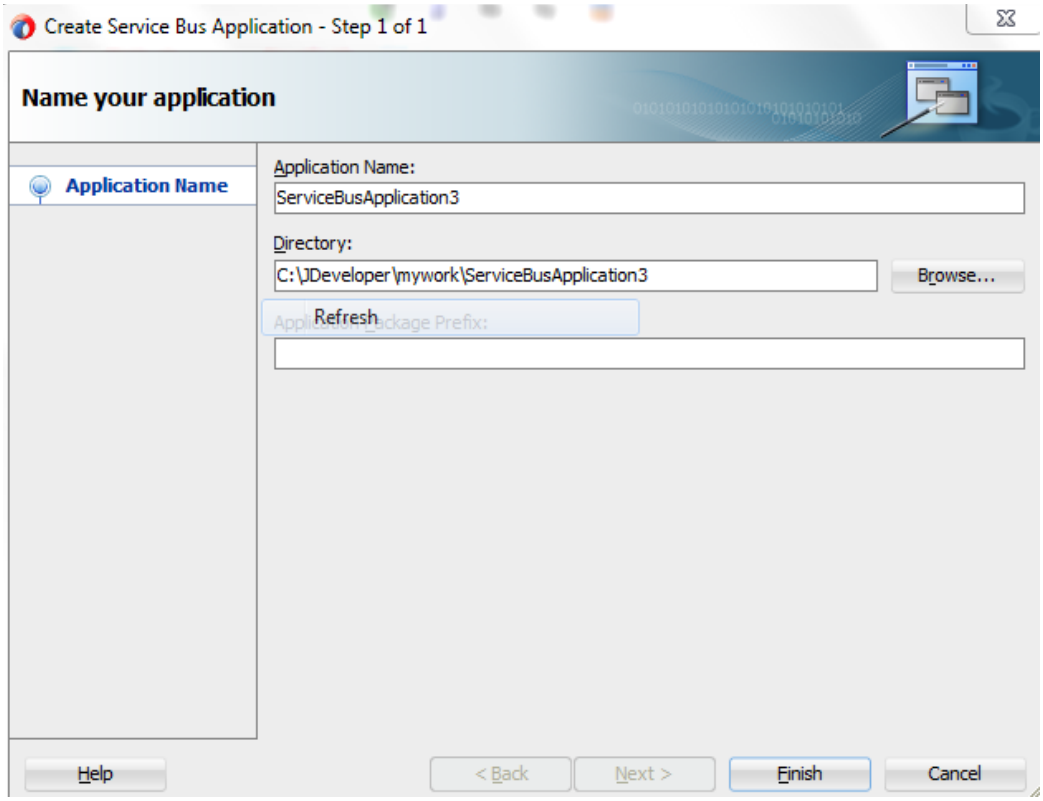
The **New Gallery** page is displayed as shown in Figure 8- 164.

Figure 8-164 New Gallery Page



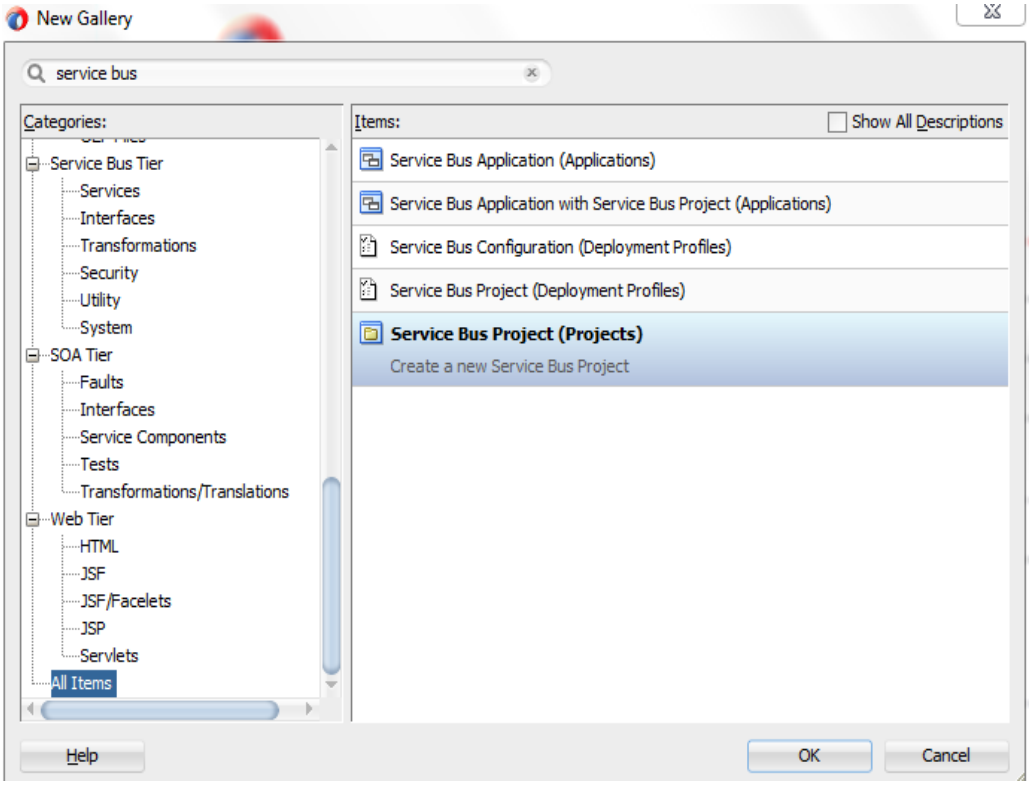
2. Enter a name for the new SOA Application and click **Next**, as shown in Figure 8- 165.

Figure 8-165 Name Your Application



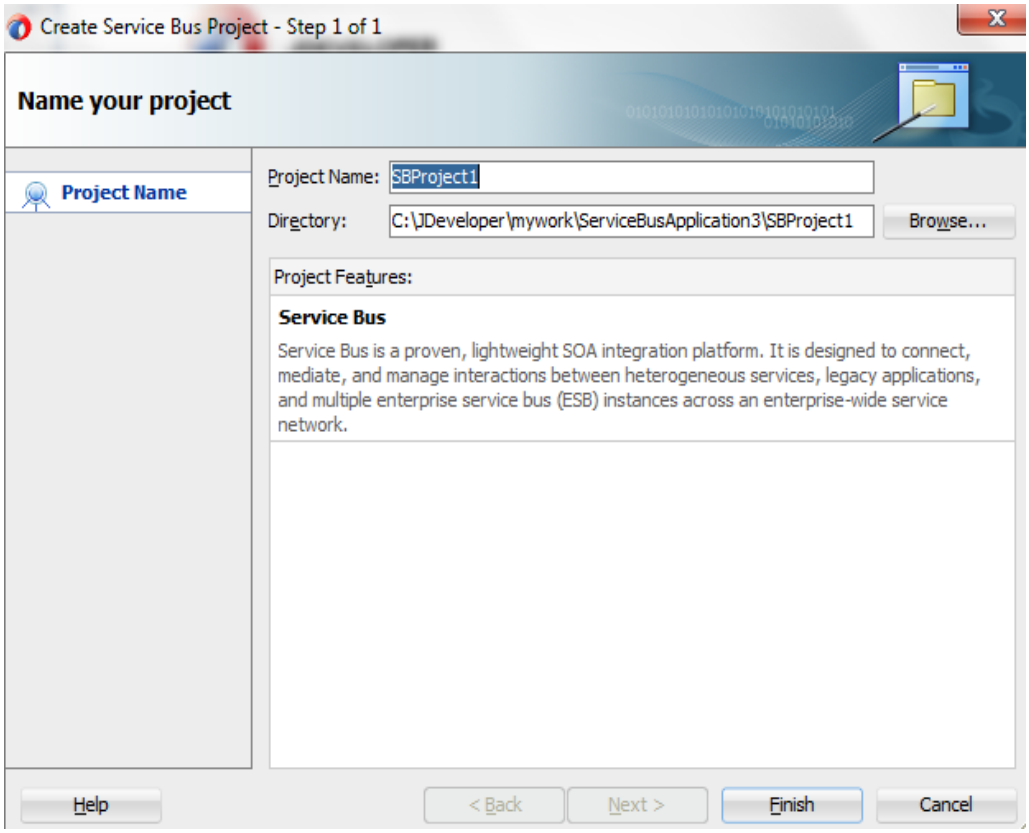
3. Create a new OSB application, Select **File > New > Project**, as shown in Figure 8- 166.

Figure 8-166 New Project Page



4. The **Name Your Project** page is displayed, as shown in Figure 8-167.

Figure 8-167 Name Your Project Page



5. Click **Finish**.

8.4.2 Define an OSB Outbound Process

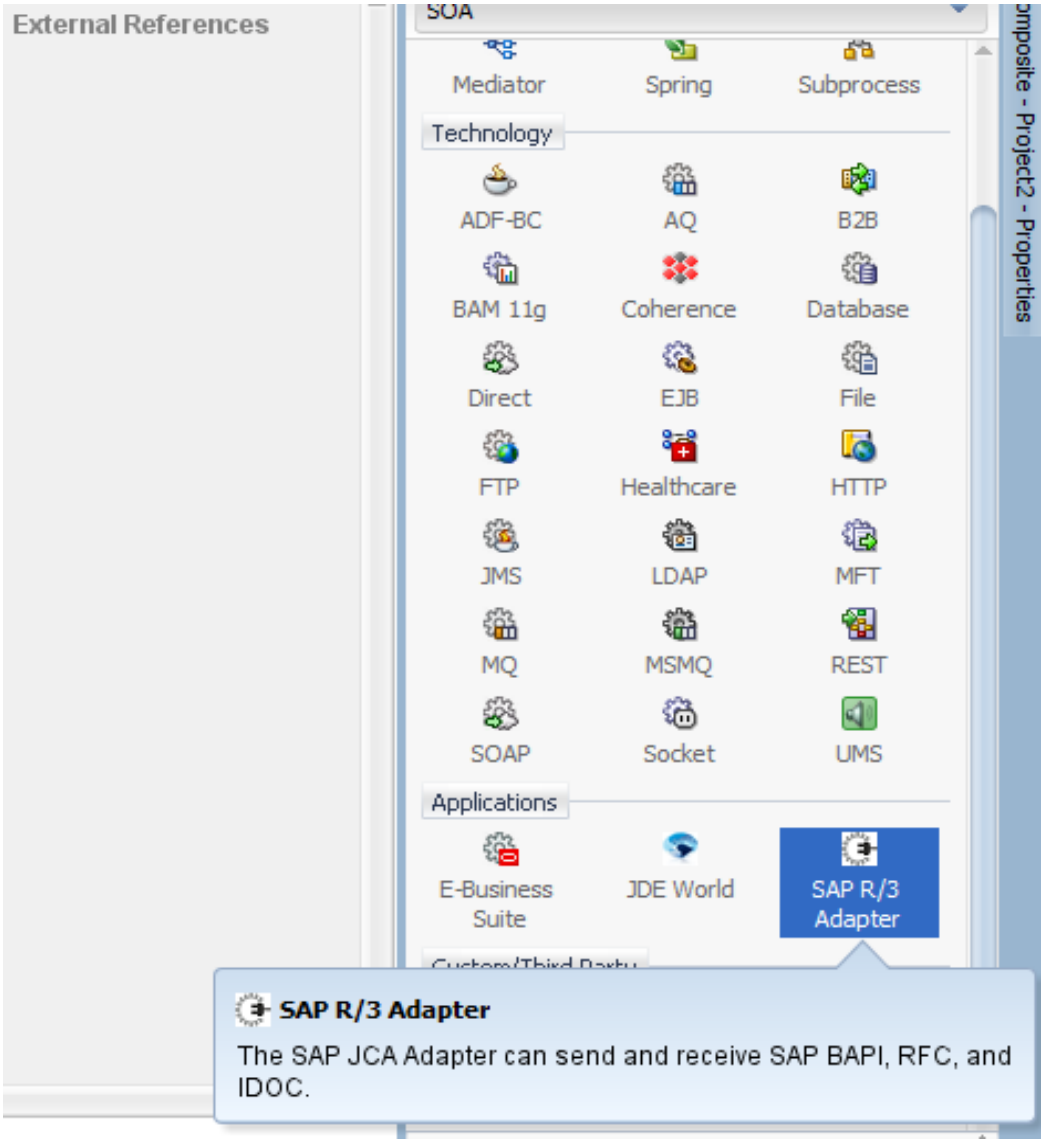
This section describes how to define an OSB outbound process, which consists of the following stages:

1. Configure the Component of Apdapter for SAP.
2. Configure an Outbound OSB Process Component.

Configure the Component of Adapter for SAP

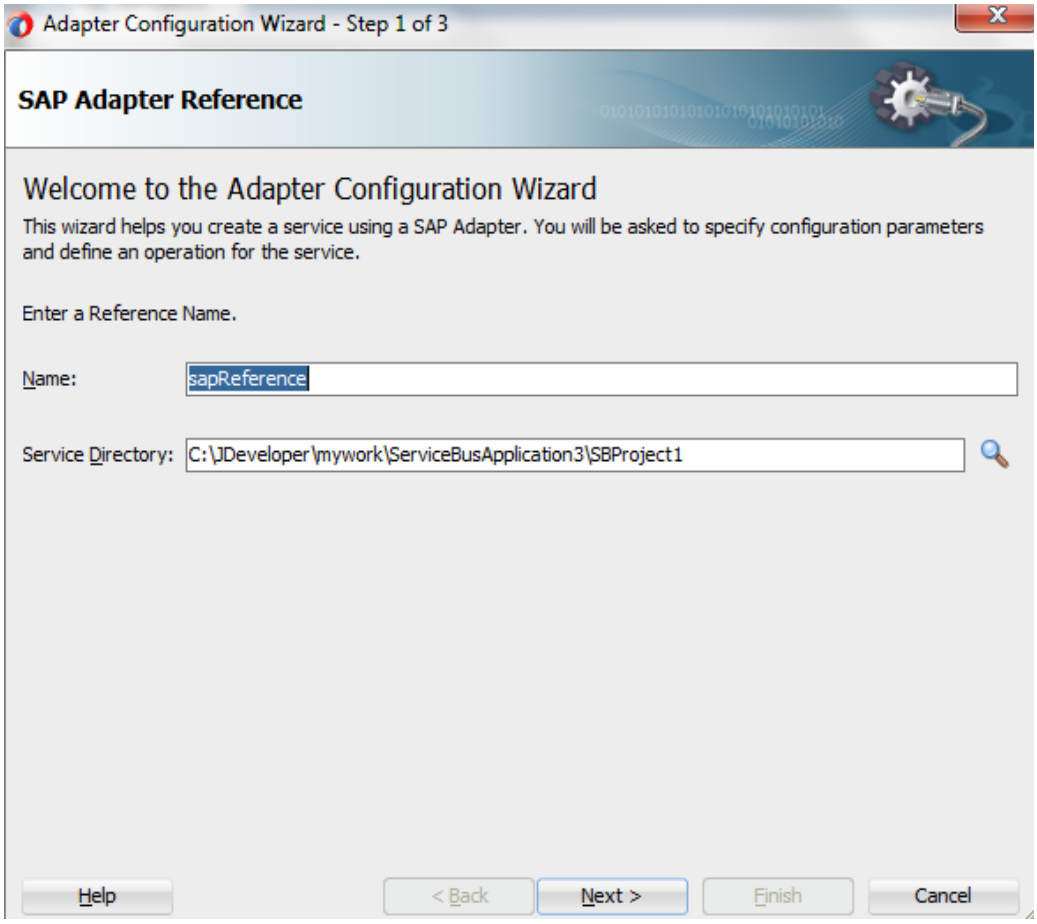
1. Open JDeveloper.
2. Drag and drop the Component of Apdapter for SAP from the **Resources Components** pane to the **External Service** pane, as shown in Figure 8- 168.

Figure 8-168 Component of Apdapter for SAP Configuration Wizard



The **Welcome** page of the Adapter configuration wizard is displayed, as shown in Figure 8-169.

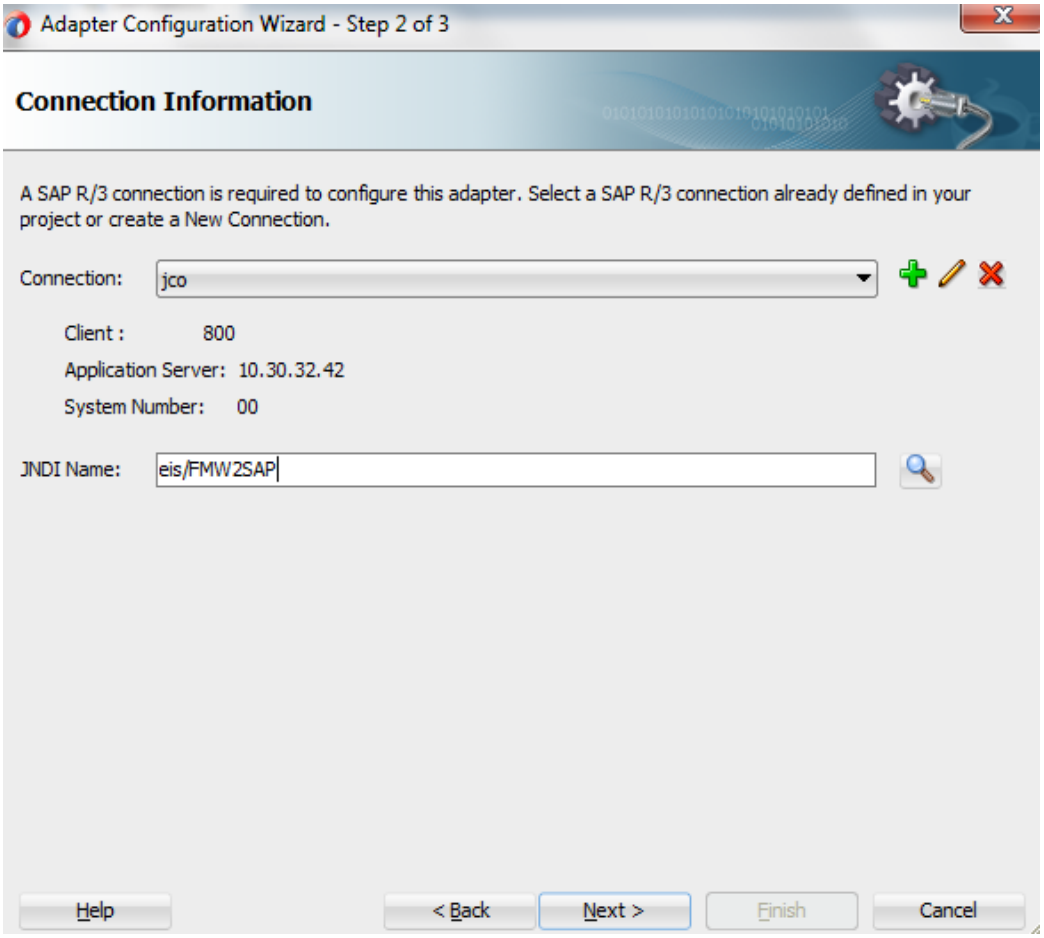
Figure 8-169 Welcome Page



3. Enter a reference name for the Adapter for SAP reference in the **Name** field and then click **Next**.

   The Connection information page is displayed, as shown in Figure 8- 170.

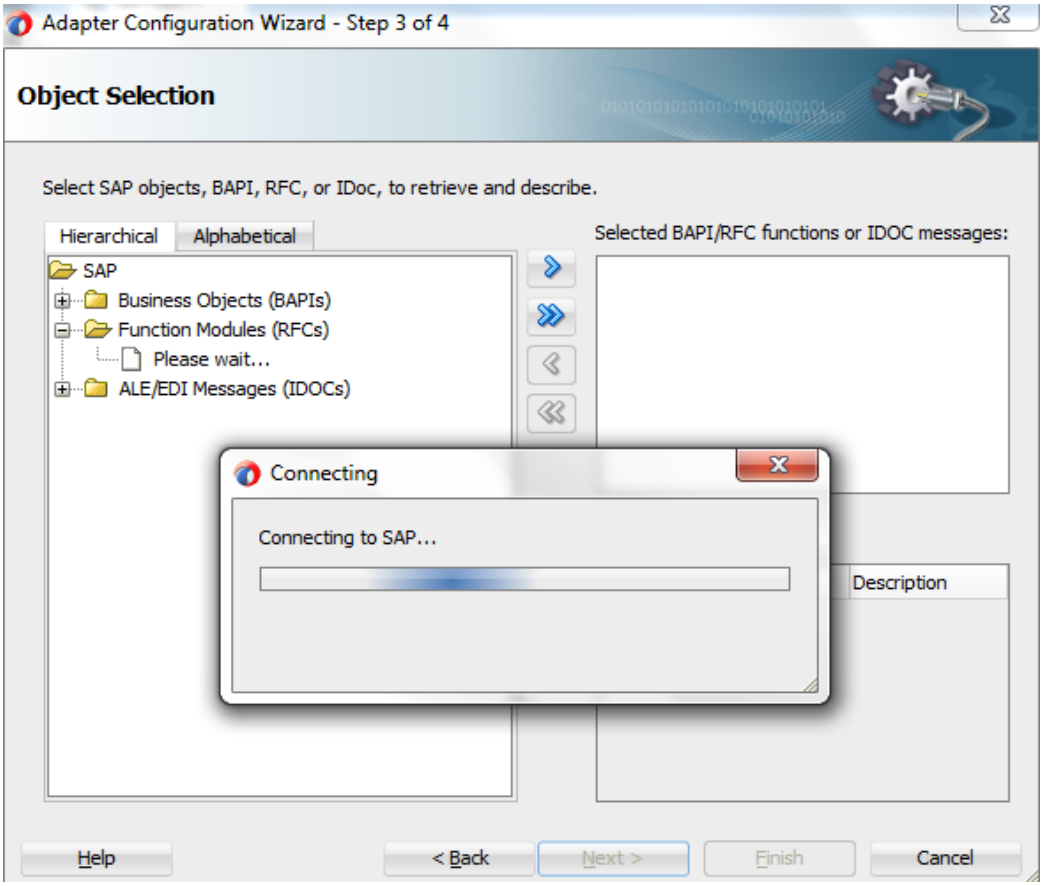
Figure 8-170 Connection Information Page



4. On the Connection Information page, select the connection to use and the default JNDI name.
5. Click **Next**.

   The **Object Selection** page is displayed, as shown in Figure 8- 171.

Figure 8-171 Object Selection Page



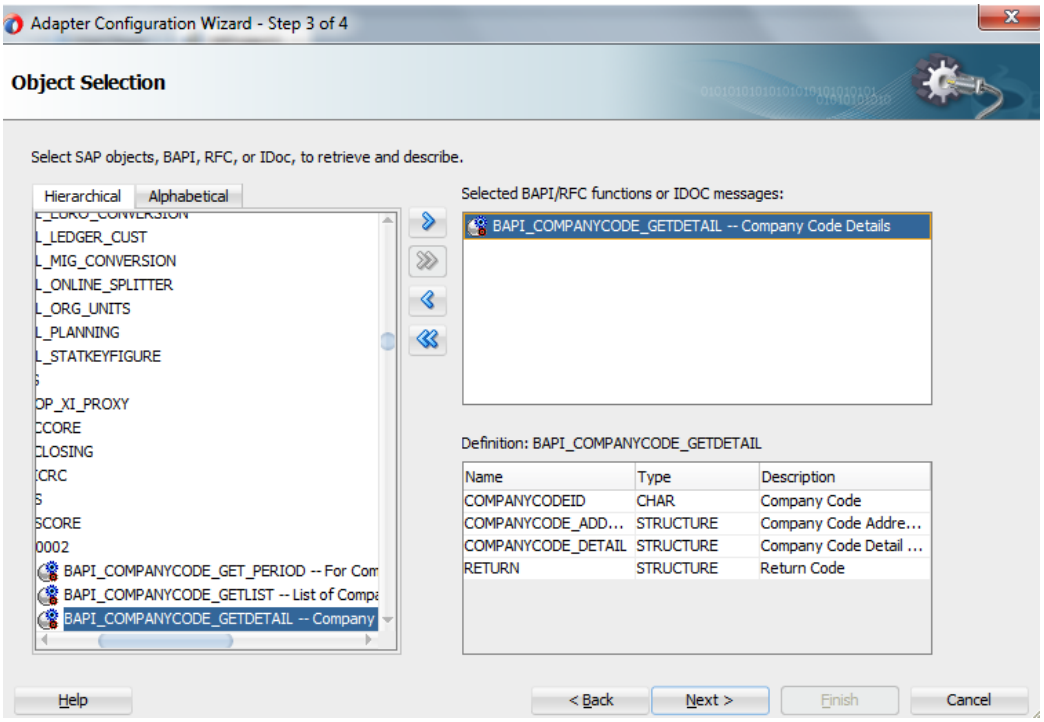
6. Click the **Hierarchical** tab and then click on + icon to expand the node.

This tab shows all the SAP Objects (RFC/BAPI/IDoc) available in that SAP system in hierarchical form, as shown in Figure 8- 172.

Figure 8-172 Hierarchical Tab

7. Select business object from the list and click on > or >> icon to move the selected object(s) from **Select SAP objects, BAPI, RFC, or IDoc, to retrieves and describe** field to **Selected BAPI/RFC functions or IDOC messages** field, as shown in Figure 8- 173.

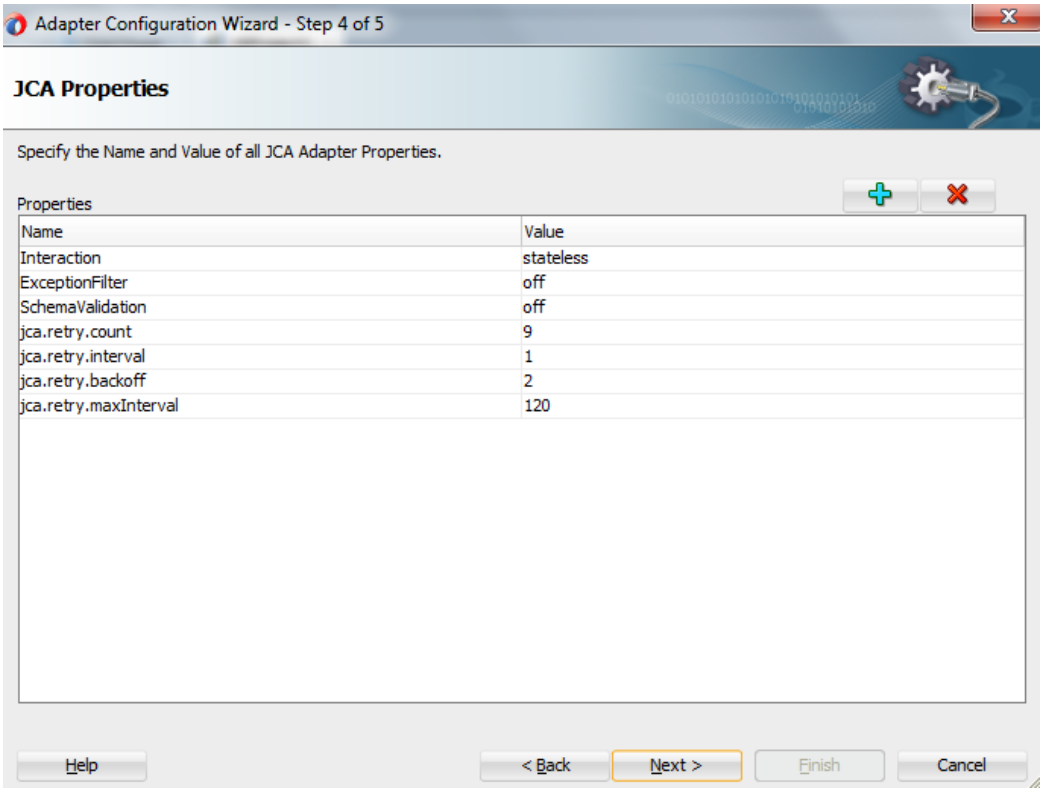
Figure 8-173 Object Selection Page



8. Click **Next**.

9. The **JCA Properties** page is displayed, as shown in Figure 8- 174.

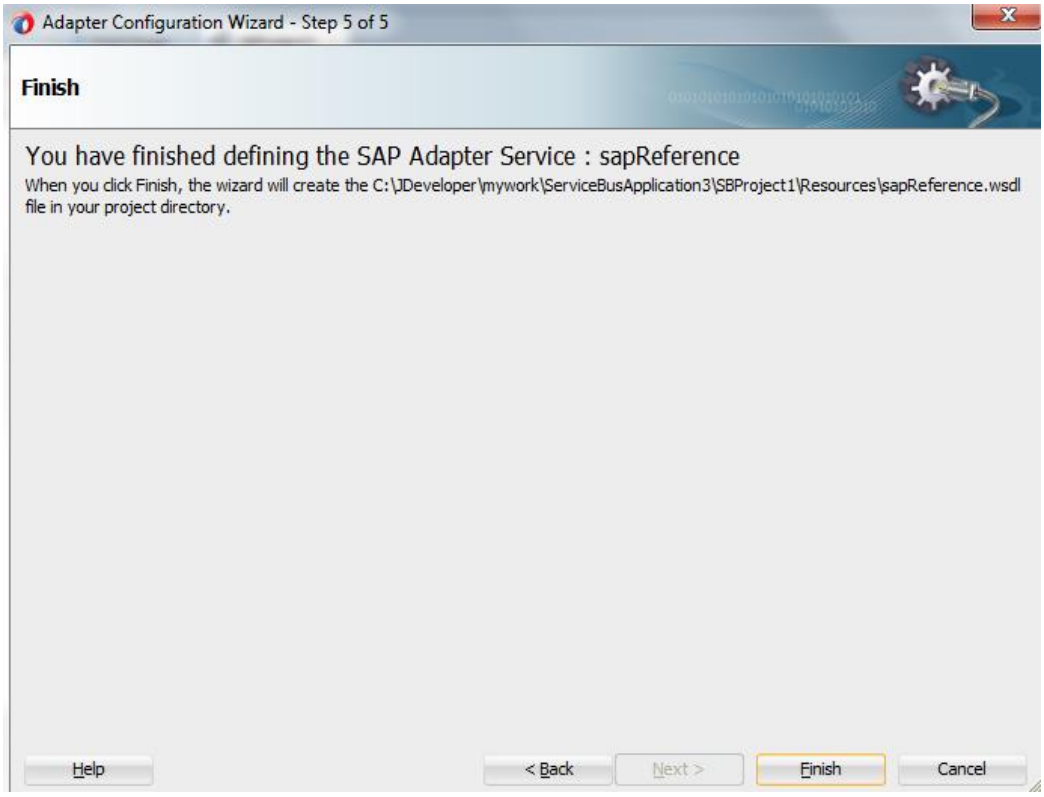
Figure 8-174 JCA Properties Page



10. Click **Next**.

The **Finish** page is displayed, as shown in Figure 8- 175.

Figure 8-175 Finish Page

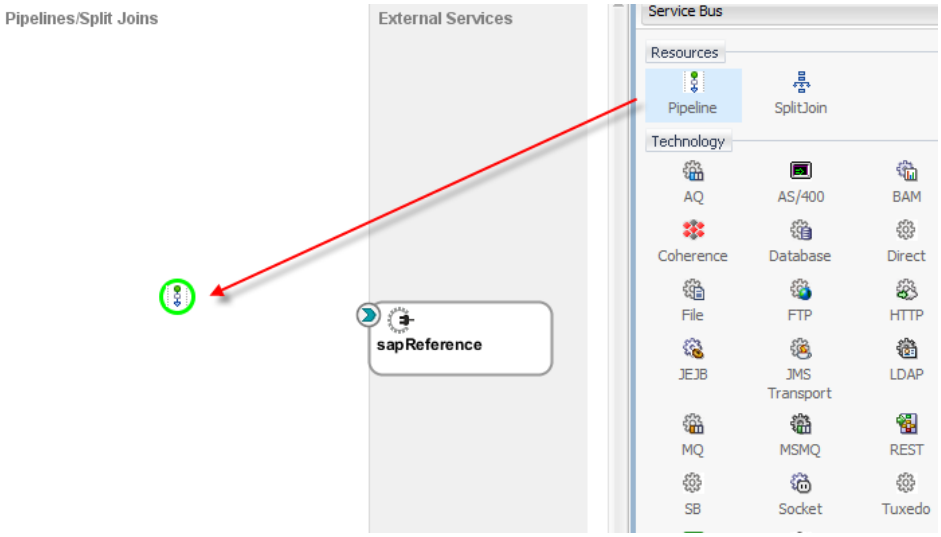


Configure an Outbound OSB Process Component

Perform the following steps to configure an Outbound OSB Process Component:

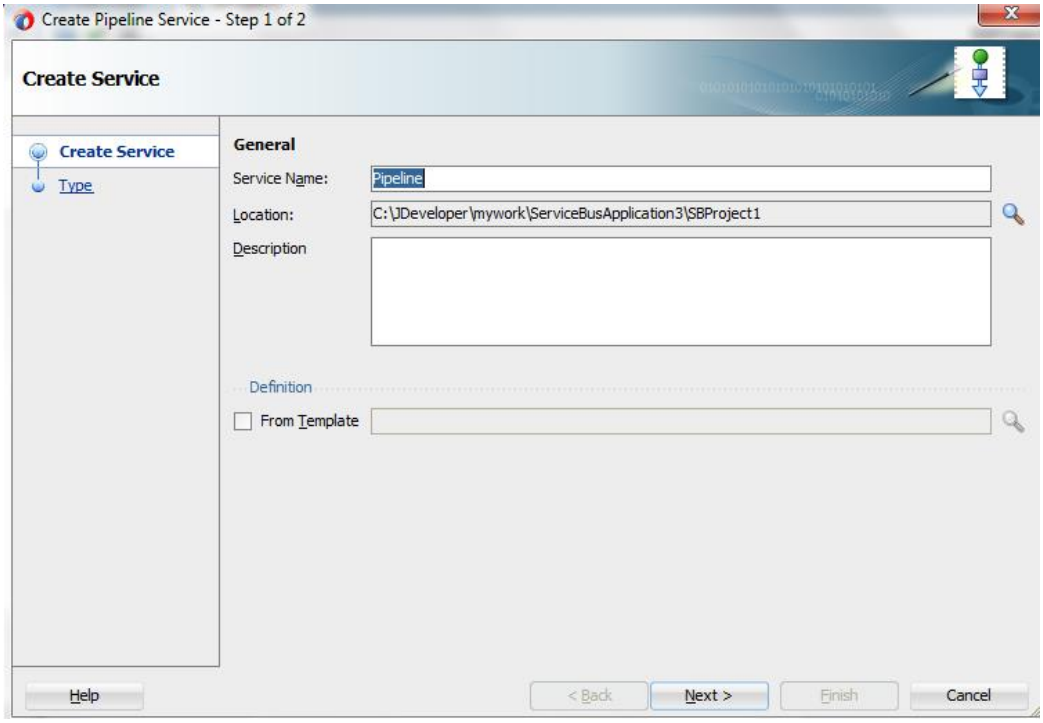
1. Drag and drop the **Pipeline Process** component from the **Resources Components** pane to the **Pipelines/Split Joins** pane, as shown in Figure 8- 176.

Figure 8-176 Pipeline Component



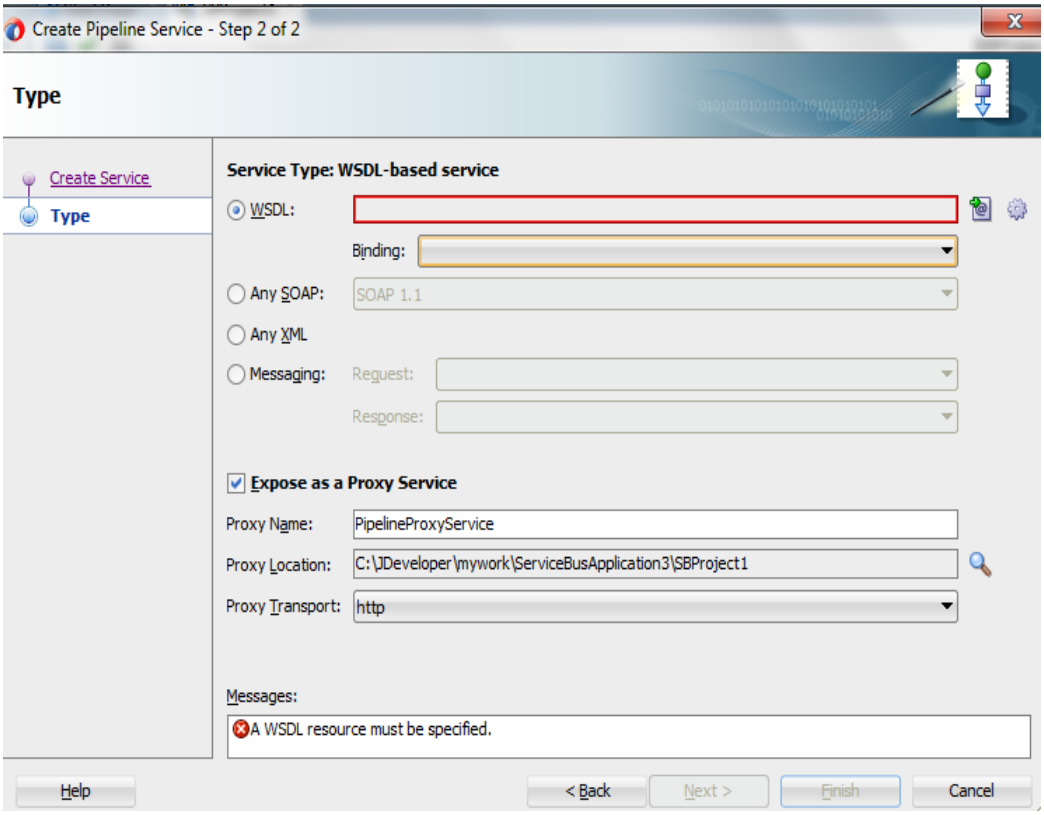
The **Create Pipeline Service** dialog is displayed, as shown in Figure 8- 177.

Figure 8-177 Create Service Page



2. In the **Service Name** field, enter a name to identify the pipeline name and select the corresponding location of the project.
3. Click **Next** and select the **Service Type** as WSDL, as shown in Figure 8- 178.

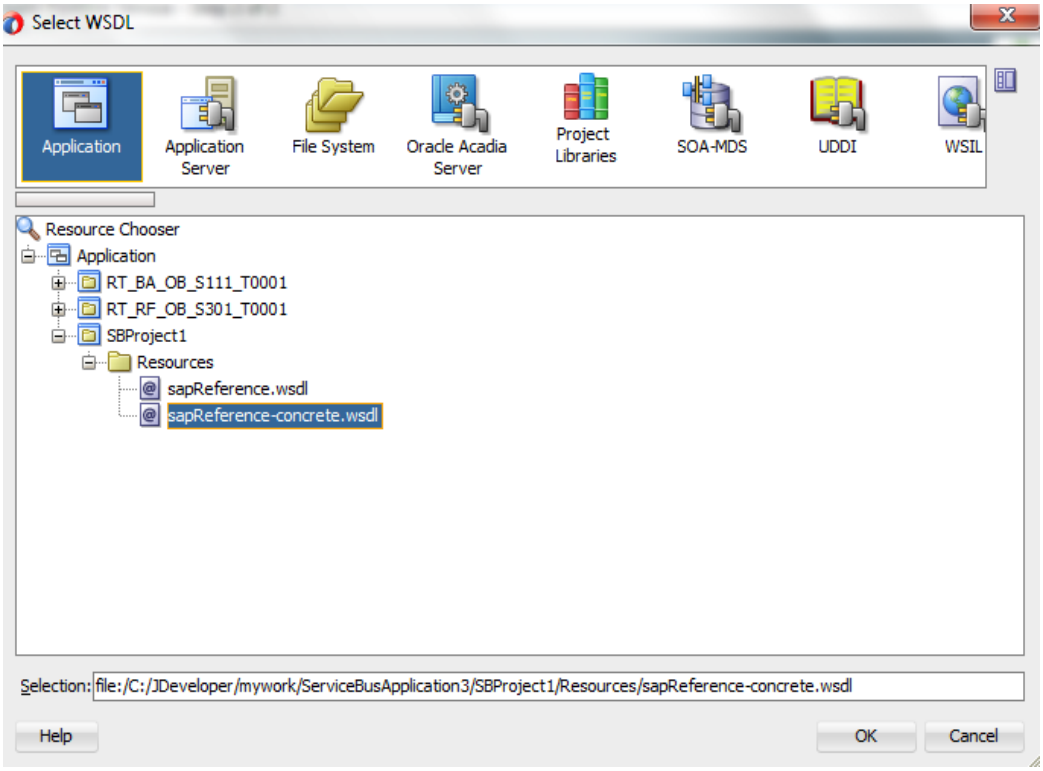
Figure 8-178 Type Page



4. Click **Browse** icon, which is located to the right of the WSDL URL to select WSDL from file system.

5. Select the appropriate WSDL file from the Application -> Resources, as shown in Figure 8-179.

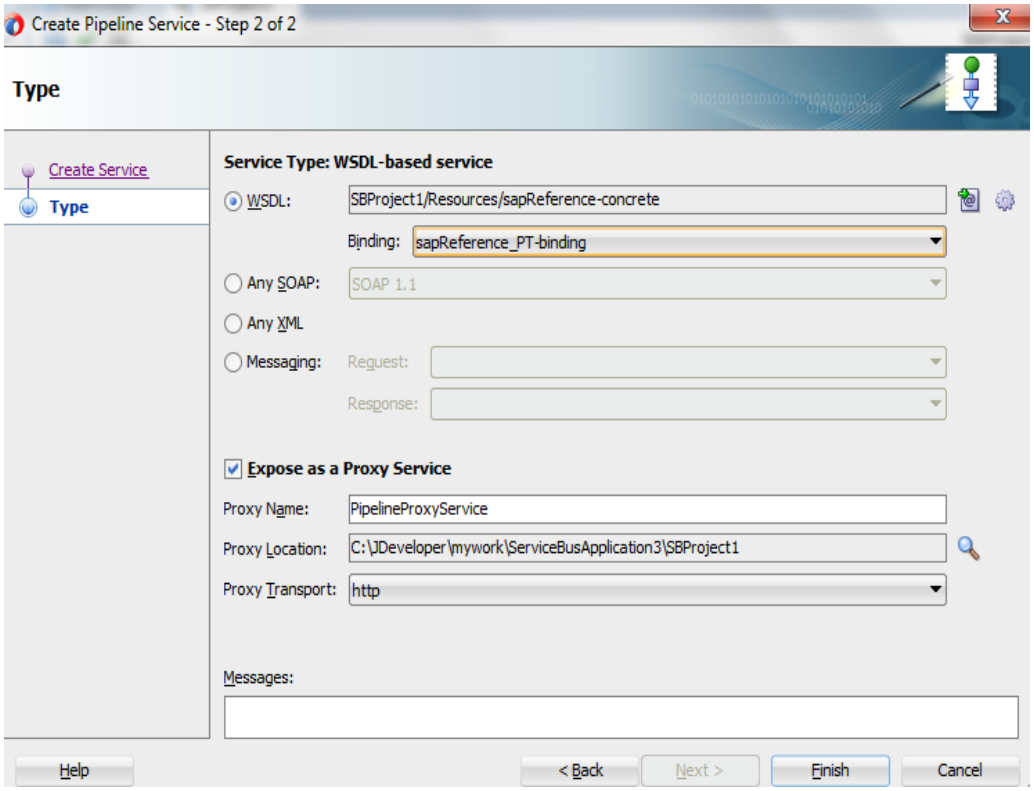
Figure 8-179 Select WSDL Page



6. Click **OK**.

The selected WSDL and corresponding binding is displayed, as shown in Figure 8- 180.

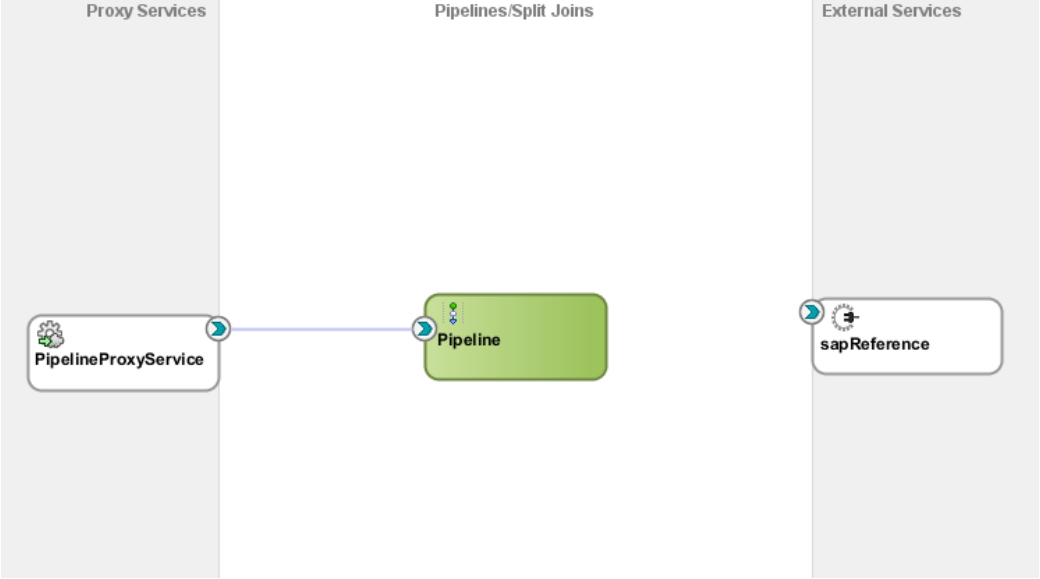
Figure 8-180 Type Page



7. Select checkbox for **Expose as a Proxy Service**.
8. Select **Proxy Transport** as **http**.
9. Click **Finish**.

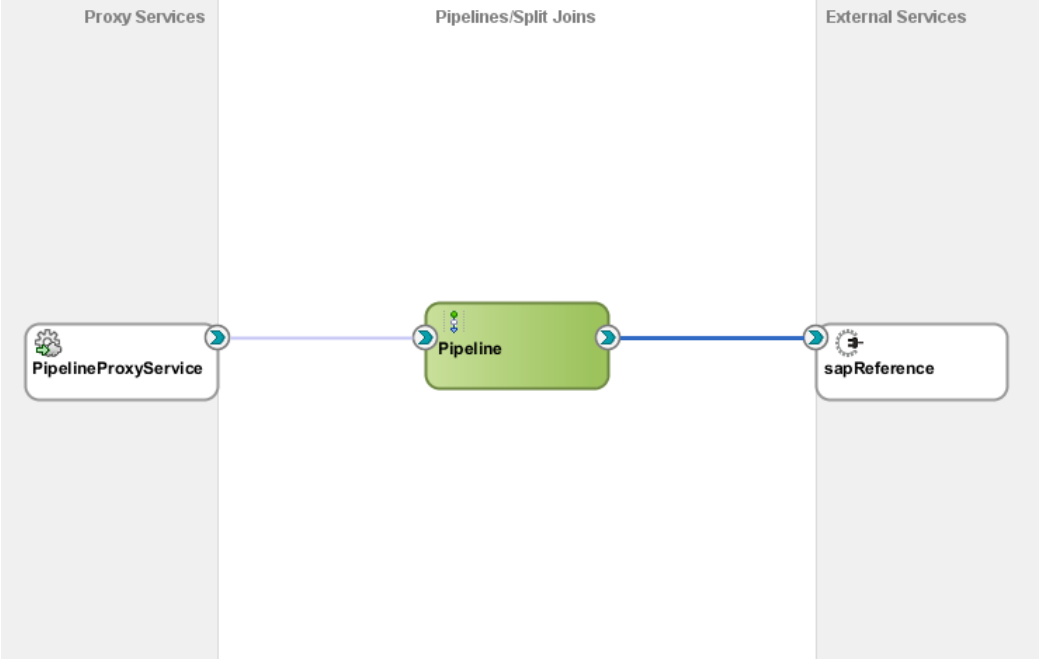
   The Pipeline component is displayed as shown in Figure 8- 181.

Figure 8-181 Pipeline Component



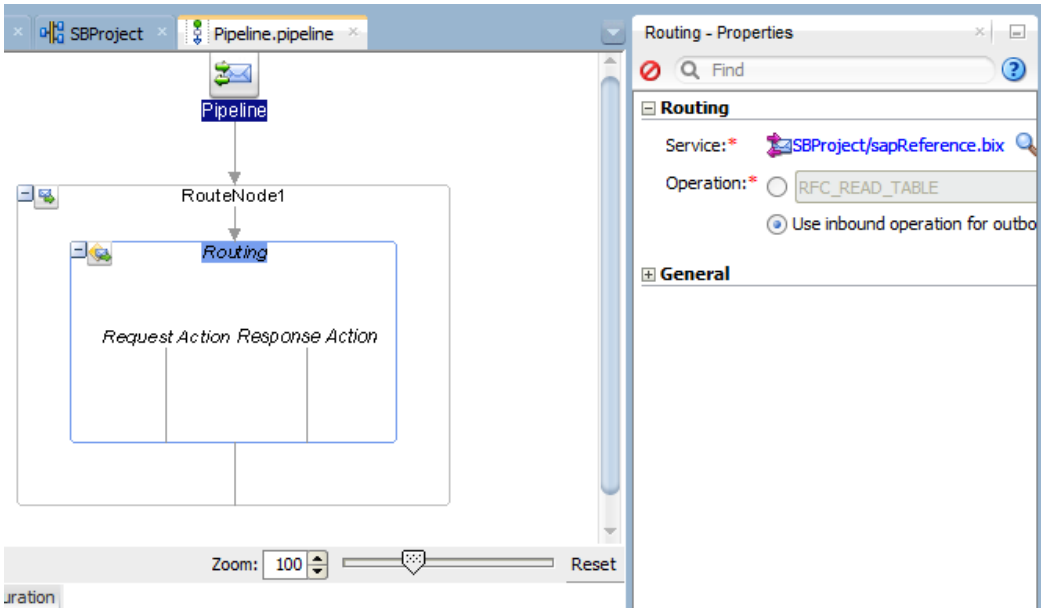
10. Connect **sapReference** to the **Pipeline**, as shown in Figure 8- 182.

Figure 8-182 Pipeline Component



11. Open the pipeline which shows the default routing. Verify the service and corresponding operation is displayed in the **Routing-Properties**, as shown in Figure 8- 183.

Figure 8-183 Routing Properties



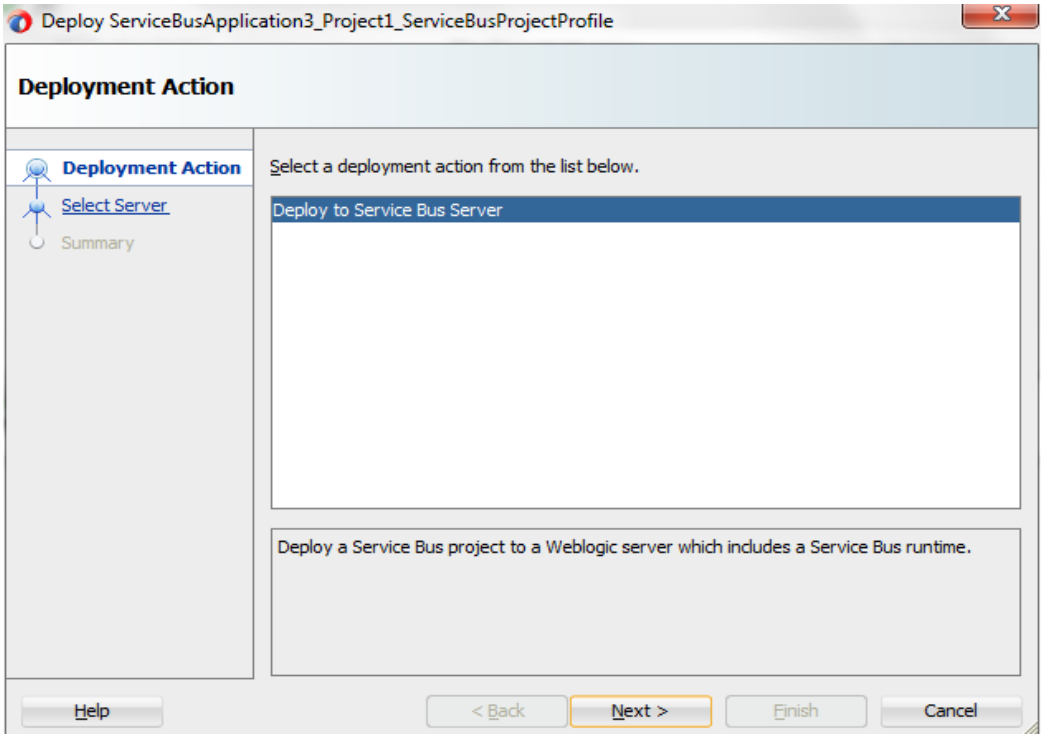
The outbound endpoint is ready to be deployed.

Deployment Outbound OSB Process

Perform the following steps to deploy the outbound OSB Process:

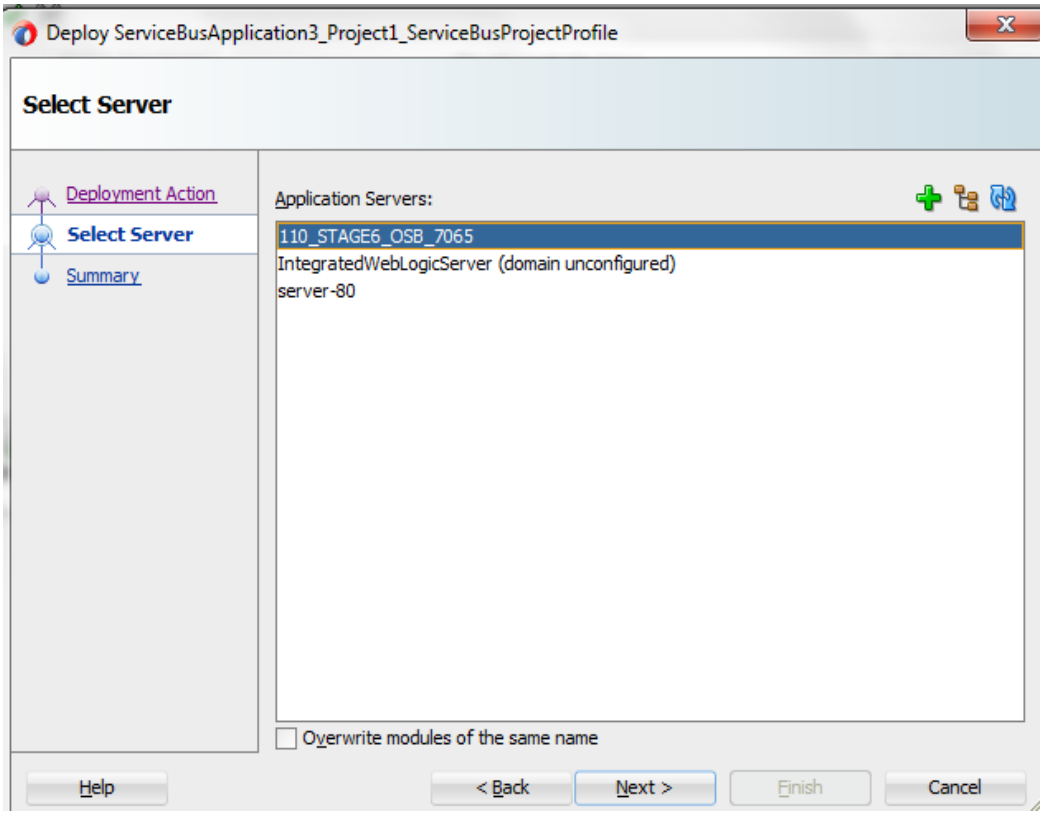
1. Select the project and **Deploy to Service Bus Server**, as shown in Figure 8- 184.

Figure 8-184 Deployment Action Page



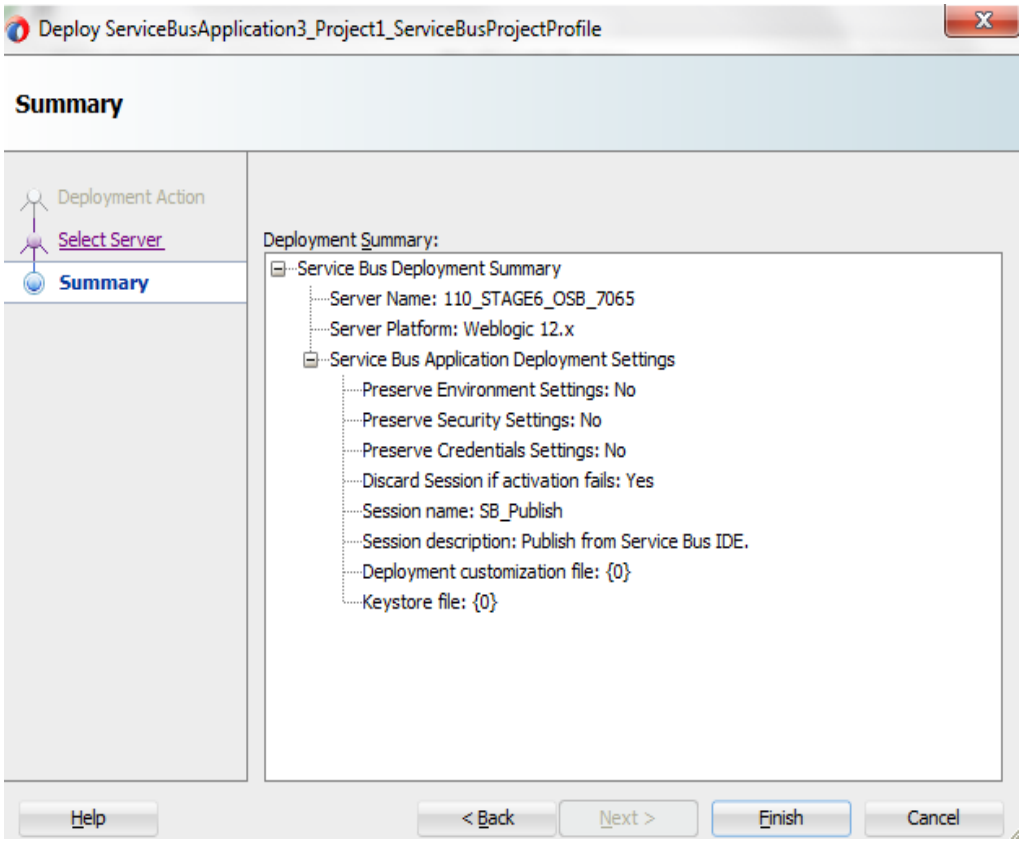
2. Select the already configured Application Server and click **Next**, as shown in Figure 8- 185.

Figure 8-185 Select Server Page



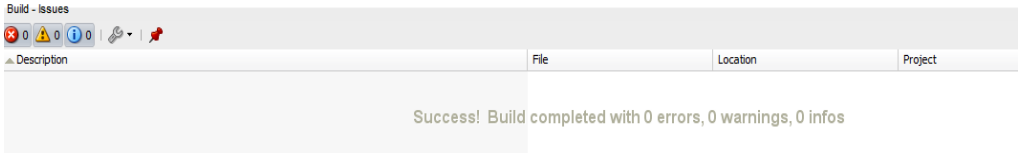
3. Check the deployment summary and click **Finish**, as shown in Figure 8- 186.

Figure 8-186 Summary Page



4. The Project is successfully deployed, as shown in Figure 8- 187.

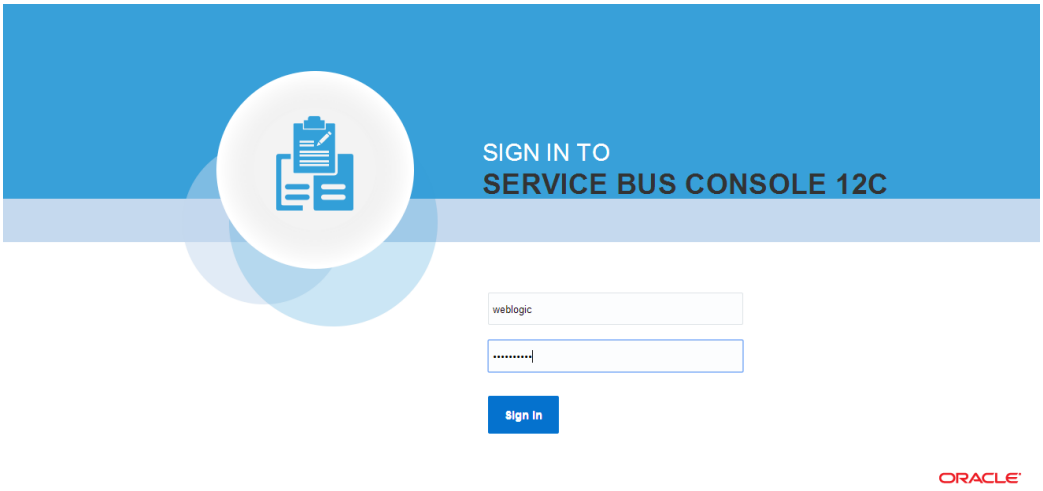
Figure 8-187 Success Message Page



The successfully deployed project can be tested from service bus console.

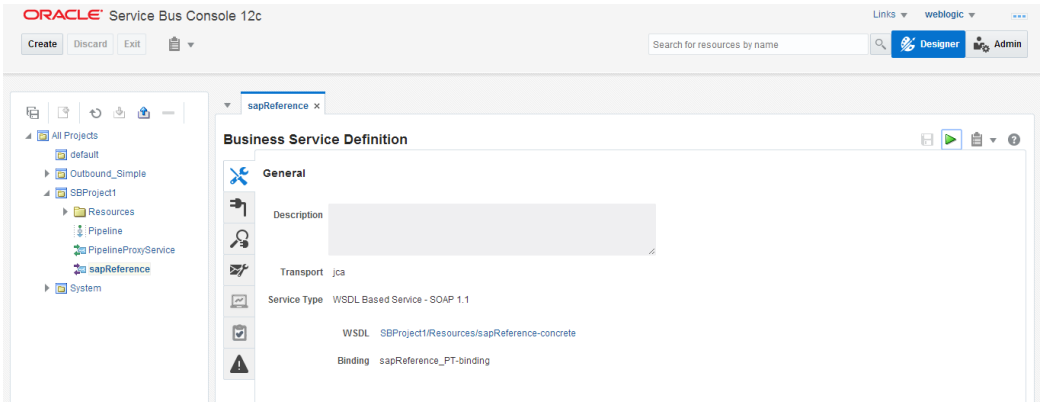
5. Open the **Service Bus Console** and enter User ID (weblogic) and Password (welcome1), as shown in Figure 8- 188.

Figure 8-188 Service Bus Console



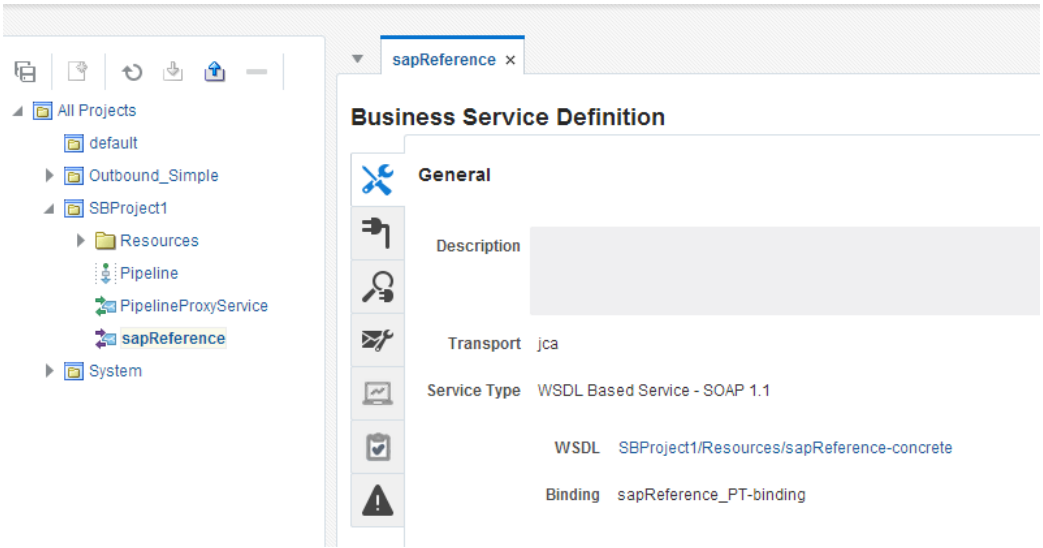
6. All the deployed projects are displayed under **All Projects**, as shown in Figure 8- 189.

Figure 8-189 Service Bus Console



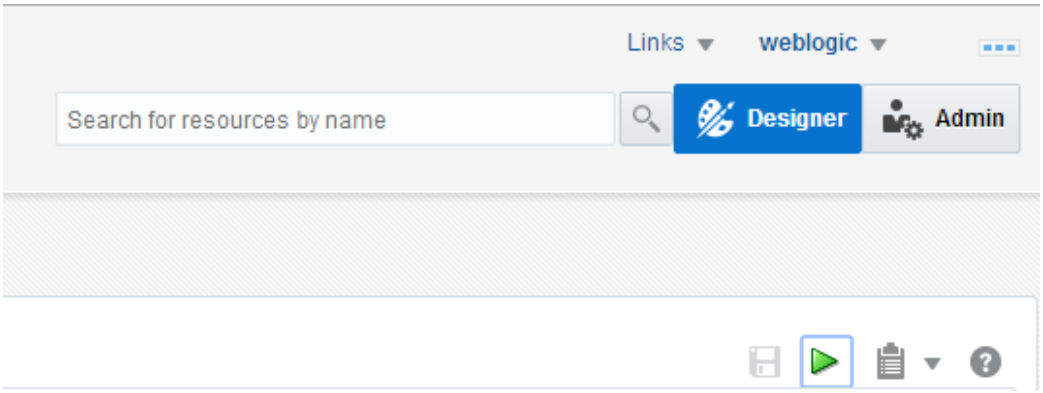
7. Open the deployed project and click on **sapReference**, as shown in Figure 8- 190.

Figure 8-190 Business Service Definition



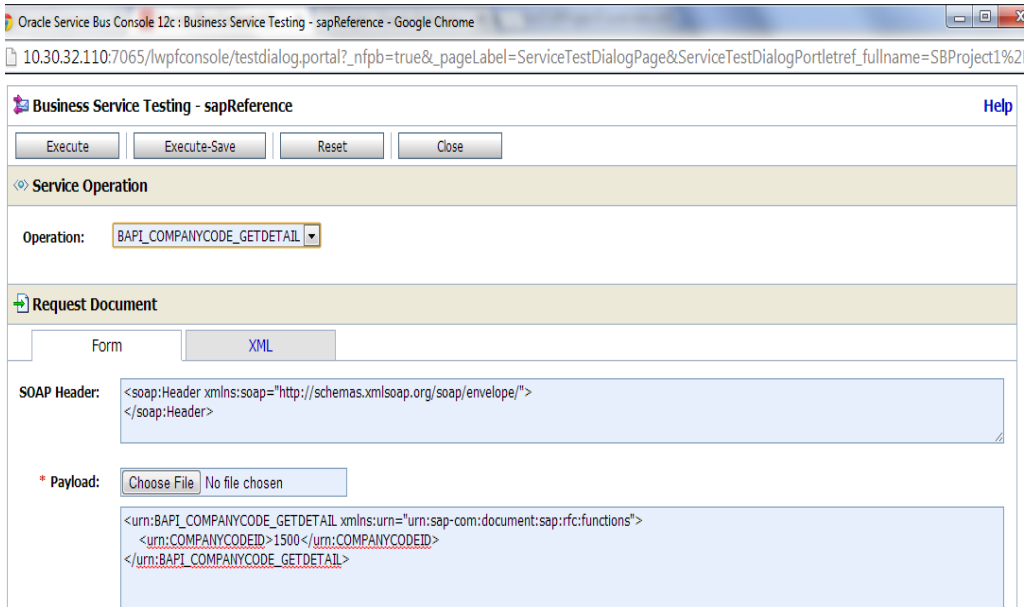
8. Option for **Launch Test Console** (Green arrow button) is displayed for testing the outbound endpoint, as shown in Figure 8- 191.

Figure 8-191 Launch Test Console



9. **Launching Test Console** opens new window displaying Business Service and the operation to test along with **Execute**, **Execute-Save**, **Reset** and **Close** button, as shown in Figure 8- 192.

Figure 8-192 Business Service Testing Page

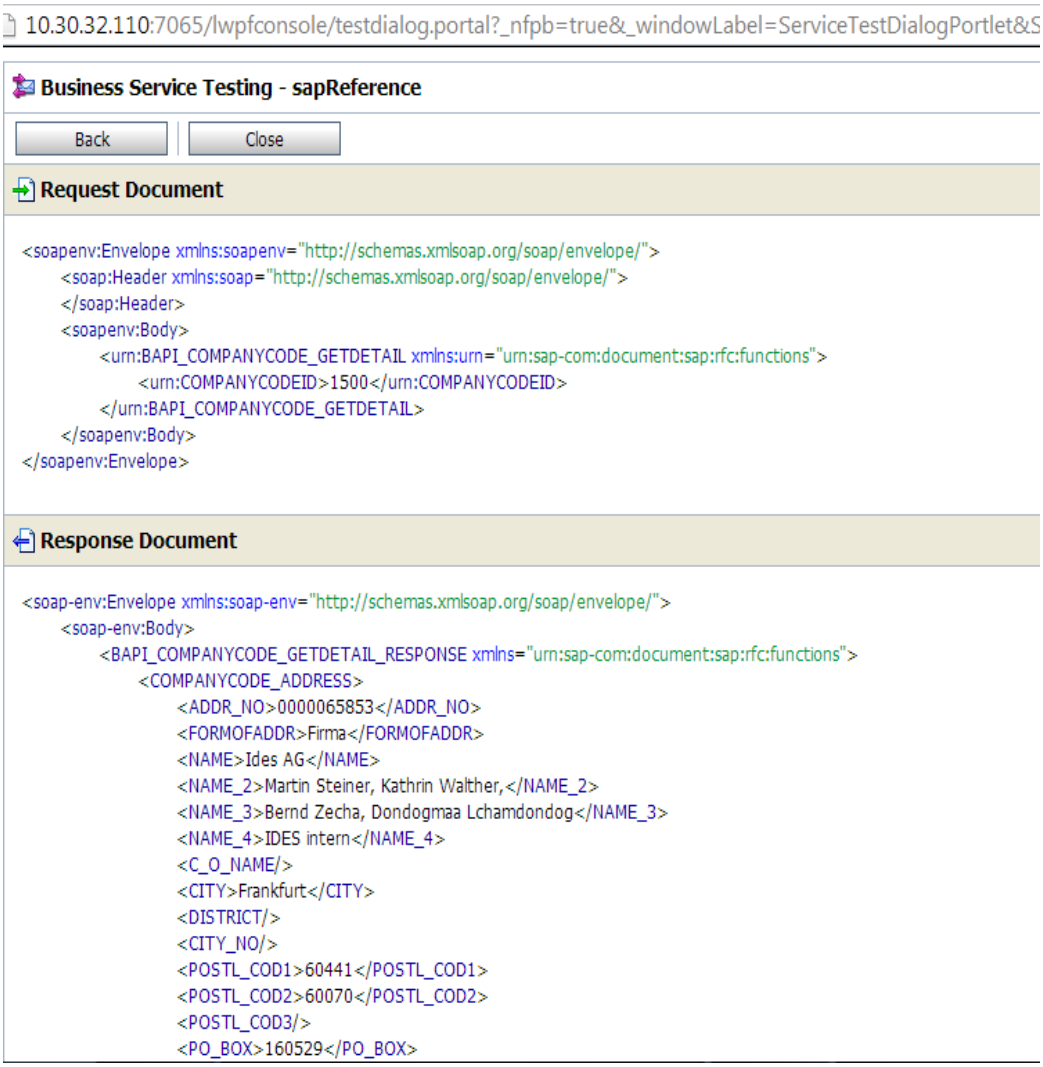


Request Document section contains the Request Payload.

10. Provide the input and click on **Execute** button.

This would send the payload to SAP and the response is displayed under **Response Document** section, as shown in Figure 8- 193.

Figure 8-193 Request Document Page



8.4.3 Define an OSB Inbound Process

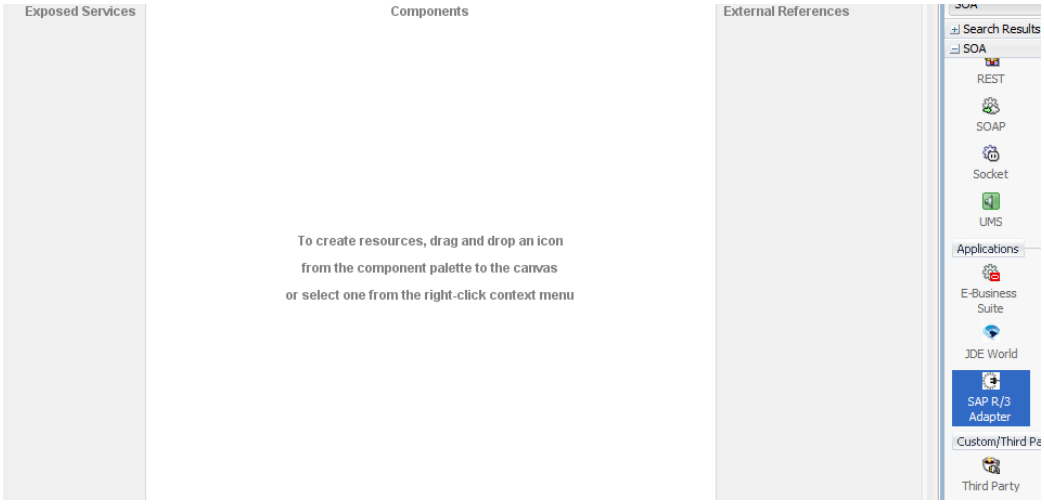
This section describes how to define an OSB Inbound process, which consists of the following stages:

1. Configure the Component of Apdapter for SAP.
2. Configure an Inbound OSB Process Component

Configure the Component of Apdapter for SAP

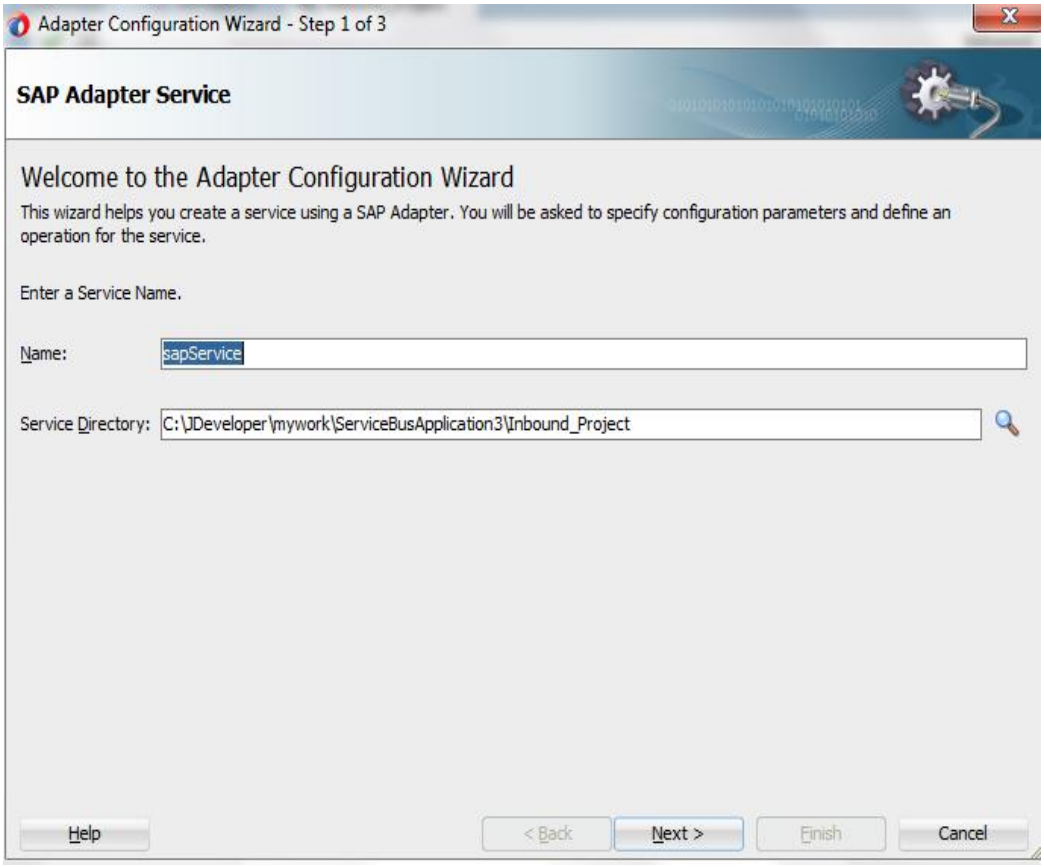
1. Open JDeveloper.
2. Drag and drop the Component of Apdapter for SAP from the **Resources Components** pane to the **Proxy Services** pane, as shown in Figure 8- 194.

Figure 8-194 Adapter for SAP Configuration Wizard



The **Welcome** page of the Adapter Configuration Wizard is displayed, as shown in Figure 8-195.

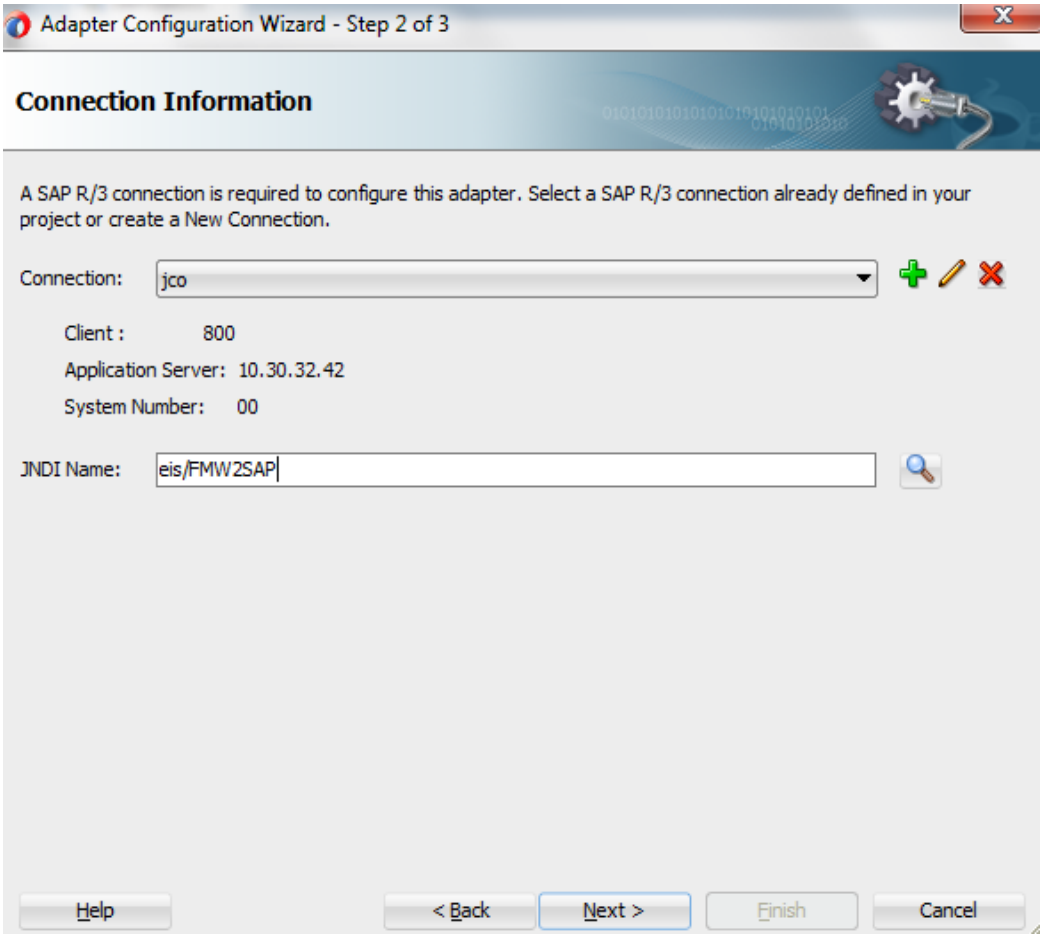
Figure 8-195 Welcome Page



3. Enter a service name for the Adapter for SAP reference in the **Name** field and then click **Next**.

The **Connection Information** page is displayed, as shown in Figure 8- 196.

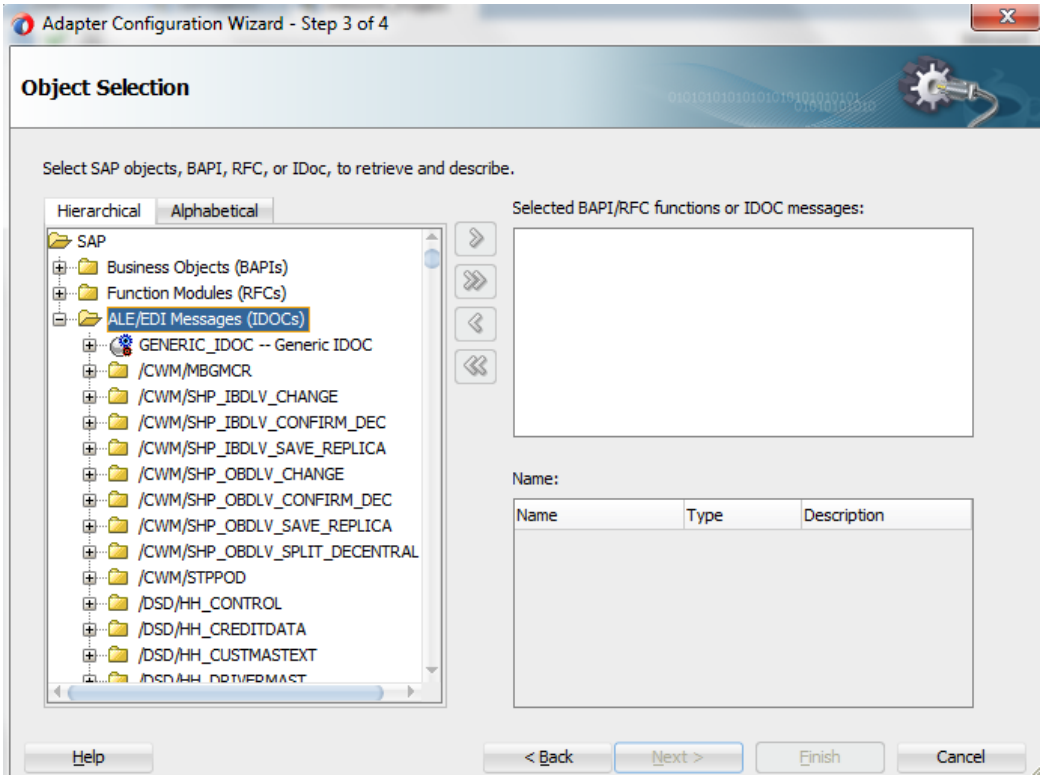
Figure 8-196 Connection Information Page



4. On the **Connection Information** page, select the connection to use and the default JNDI name.
5. Click **Next**.

   The Object selection page is displayed, as shown in Figure 8- 197.

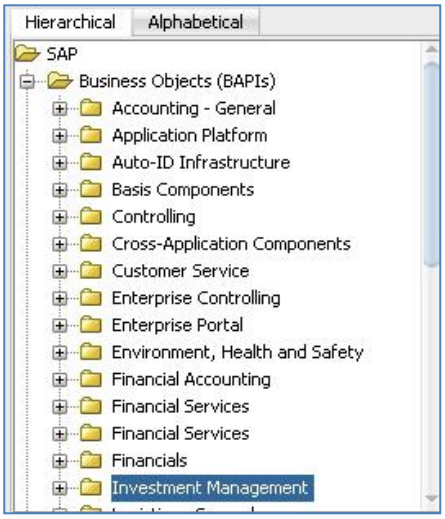
Figure 8-197 Object Selection Page



6. Click the **Hierarchical** tab and then click on + icon to expand the node.

   This tab shows all the SAP Objects (RFC/BAPI/IDoc) available in that SAP system in hierarchical form, as shown in Figure 8- 198.

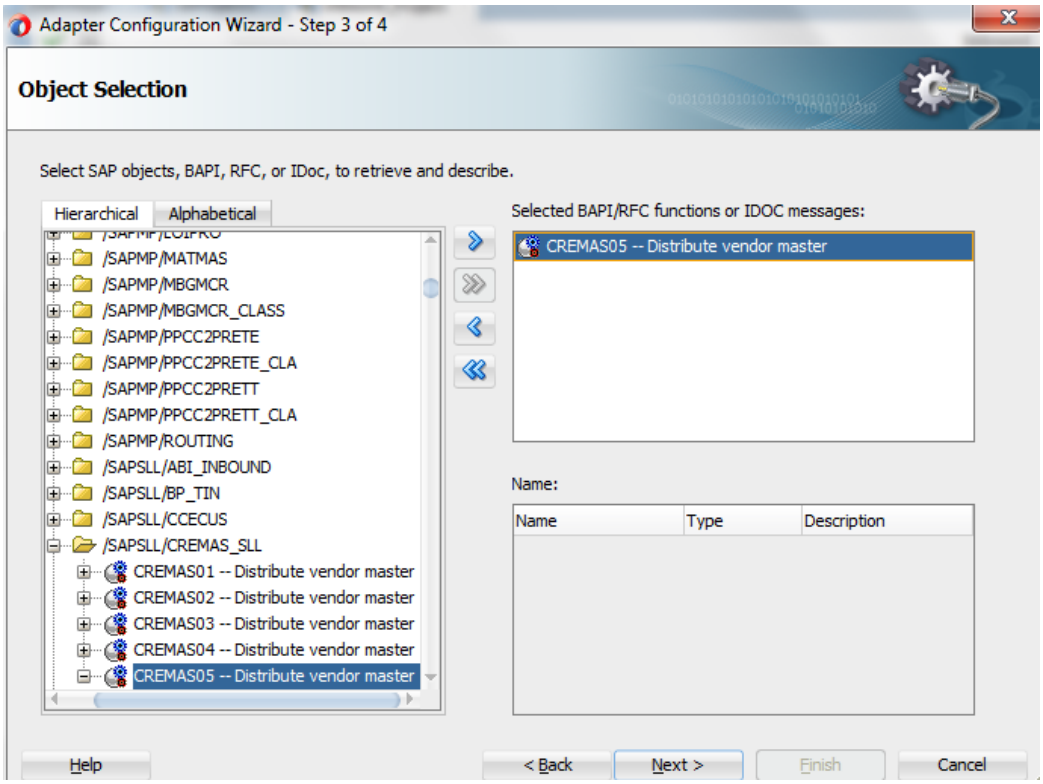
Figure 8-198 Hierarchical Tab



7. On the **Object Selection** page, expand the **ALE (IDOCs)** node and search **CREMAS05**.

8. Select business object from the list and click on > or >> icon to move the selected object(s) from **Select SAP objects, BAPI, RFC, or IDoc, to retrieves and describe** field to **Selected BAPI/RFC functions or IDOC messages** field, as shown in Figure 8- 199.

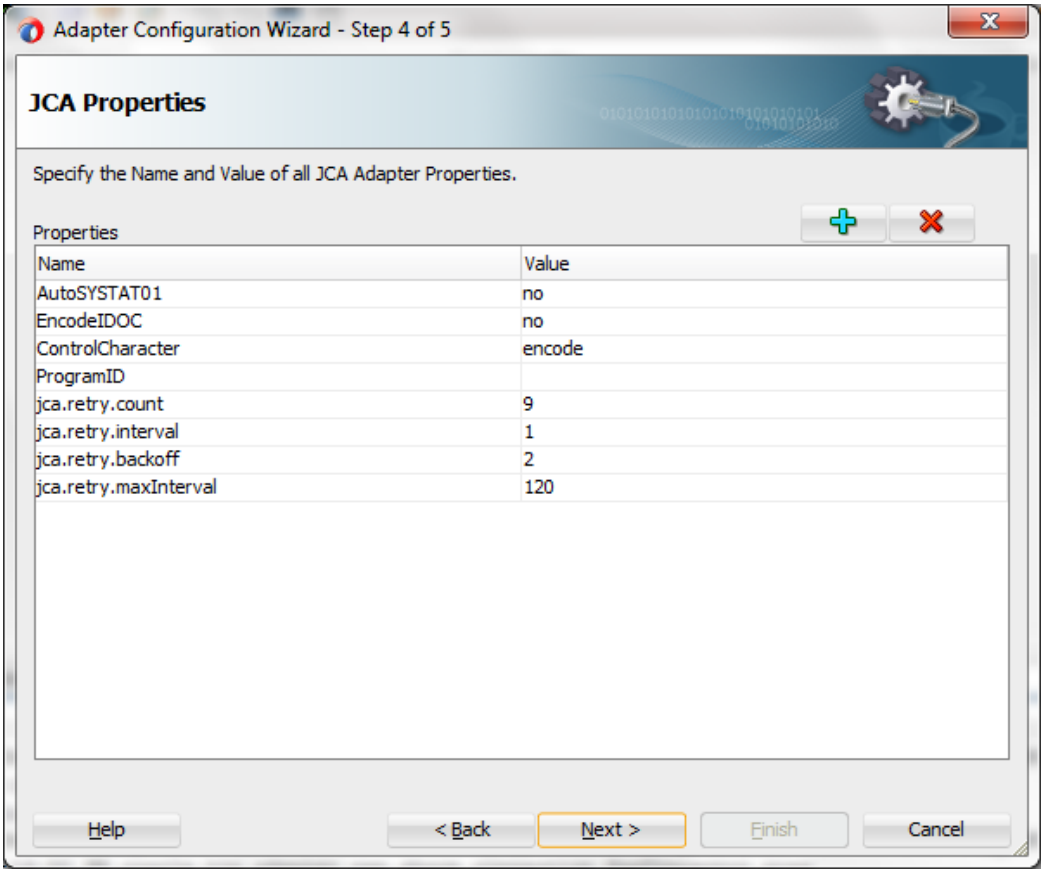
Figure 8-199 Object Selection Page



9. Click **Next**.

10. The **JCA Properties** page is displayed, as shown in Figure 8- 200.

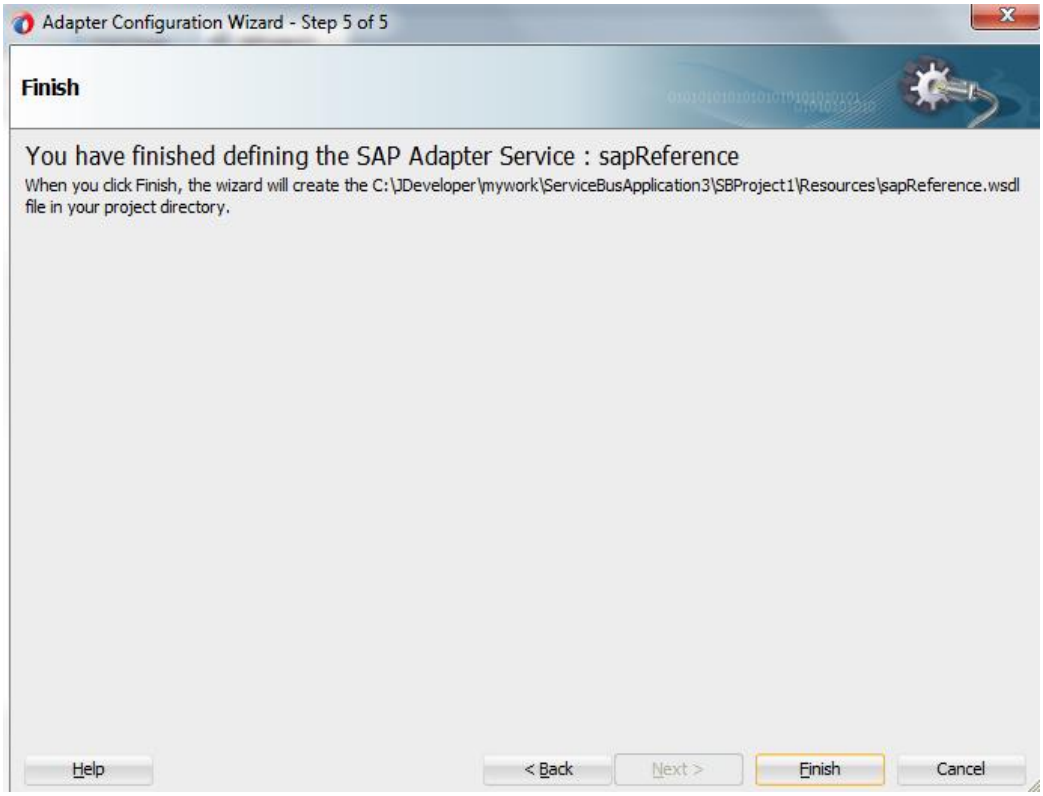
Figure 8-200 JCA Properties Page



11. Click **Next**.

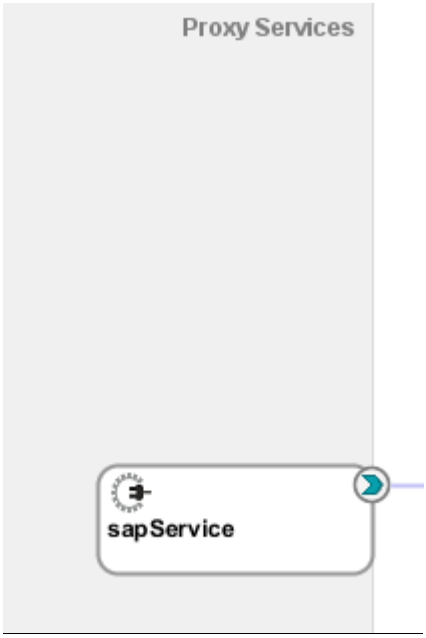
The **Finish** page is displayed, as shown in Figure 8- 201.

Figure 8-201 Finish Page



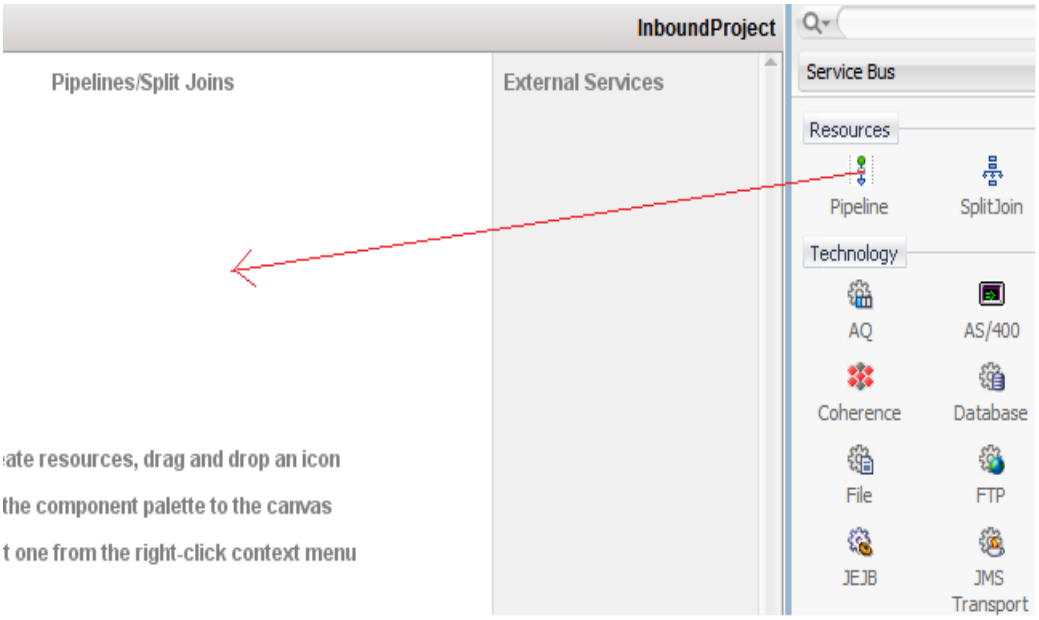
The Adapter for SAP is created and displayed in the **Proxy Services** pane, as shown in Figure 8- 202.

Figure 8-202 Adapter for SAP



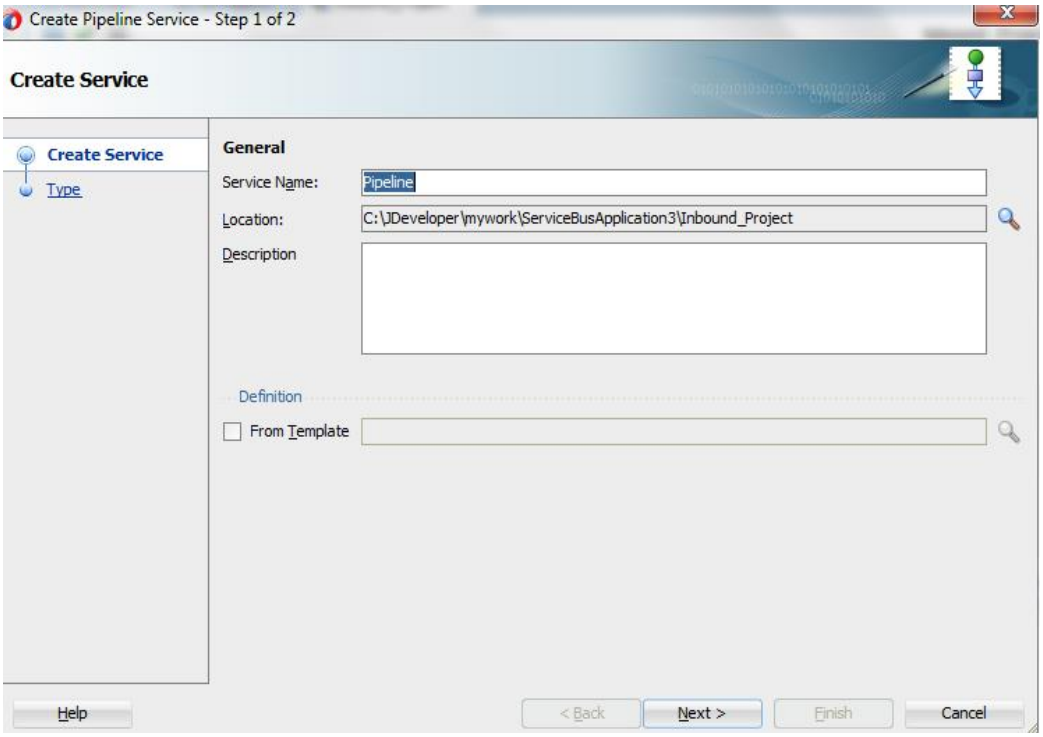
12. Drag and drop the **Pipeline** component in **Pipeline/Split Joins** lane, as shown in Figure 8-203.

Figure 8-203 Drop Pipeline in Pipeline/Split



13. Provide appropriate service name in the **Service Name** field, as shown in Figure 8- 204.

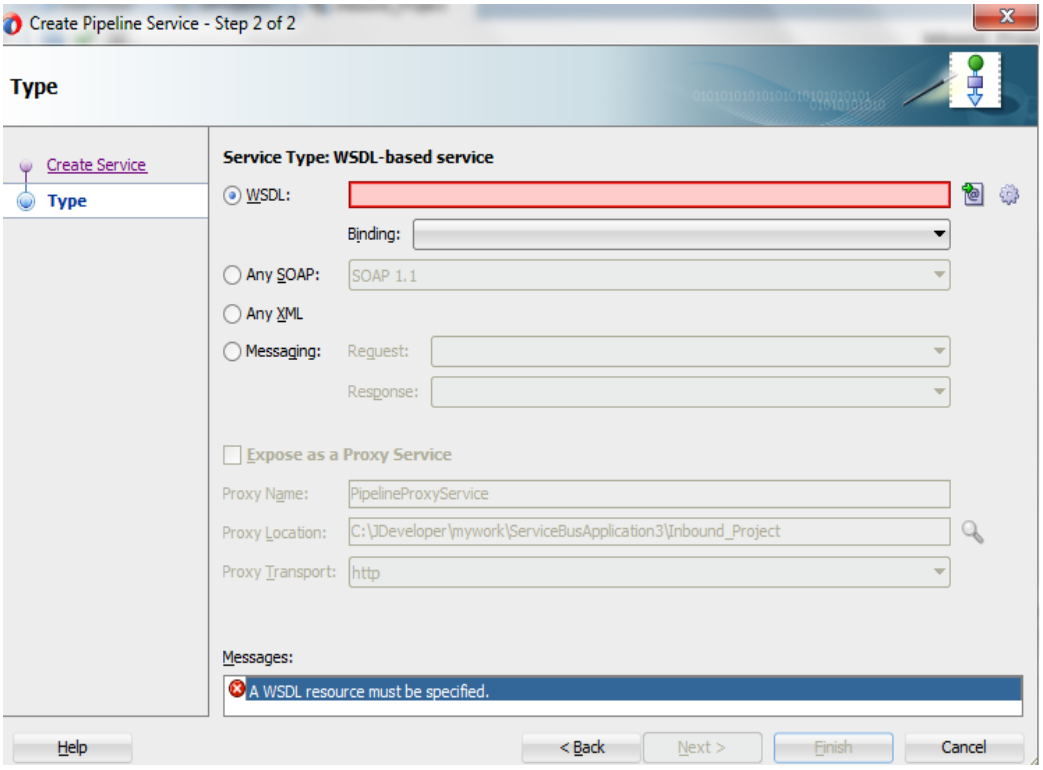
Figure 8-204 Create Service Page



14. Click **Next** and select the **Service Type** as WSDL.

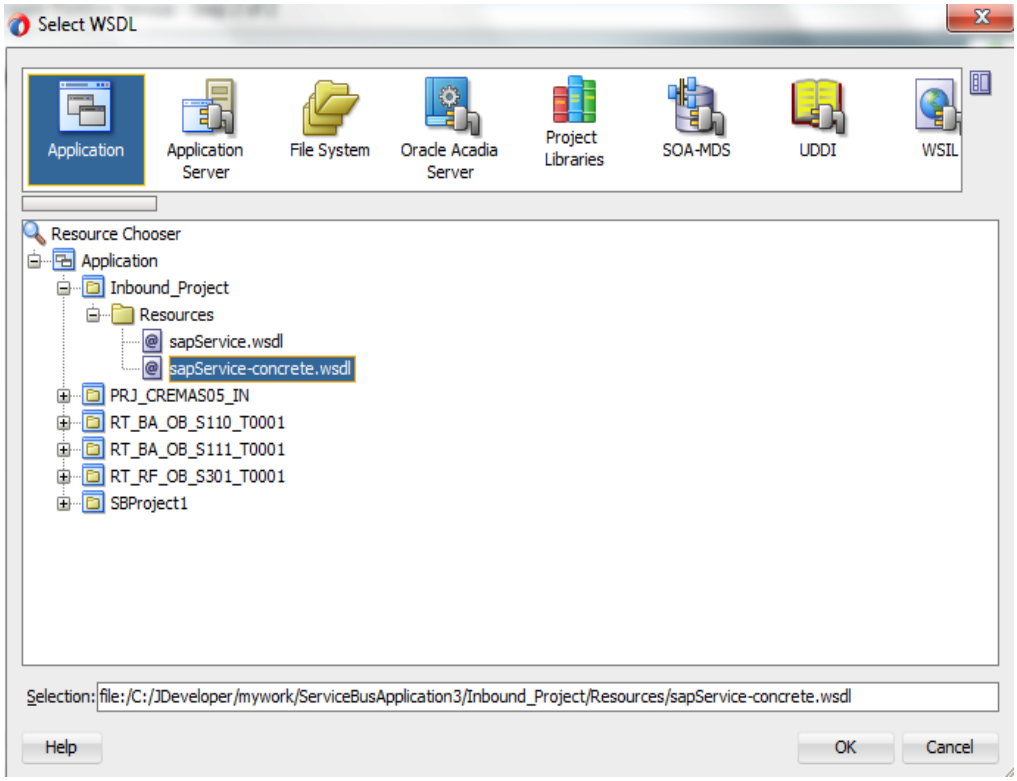
15. Click on the **Browse** icon, which is located to the right of the **WSDL** field to select WSDL from file system, as shown in Figure 8- 205.

Figure 8-205 Type Page



16. Select the appropriate WSDL file from Application -> Resources folder, as shown in Figure 8- 206.

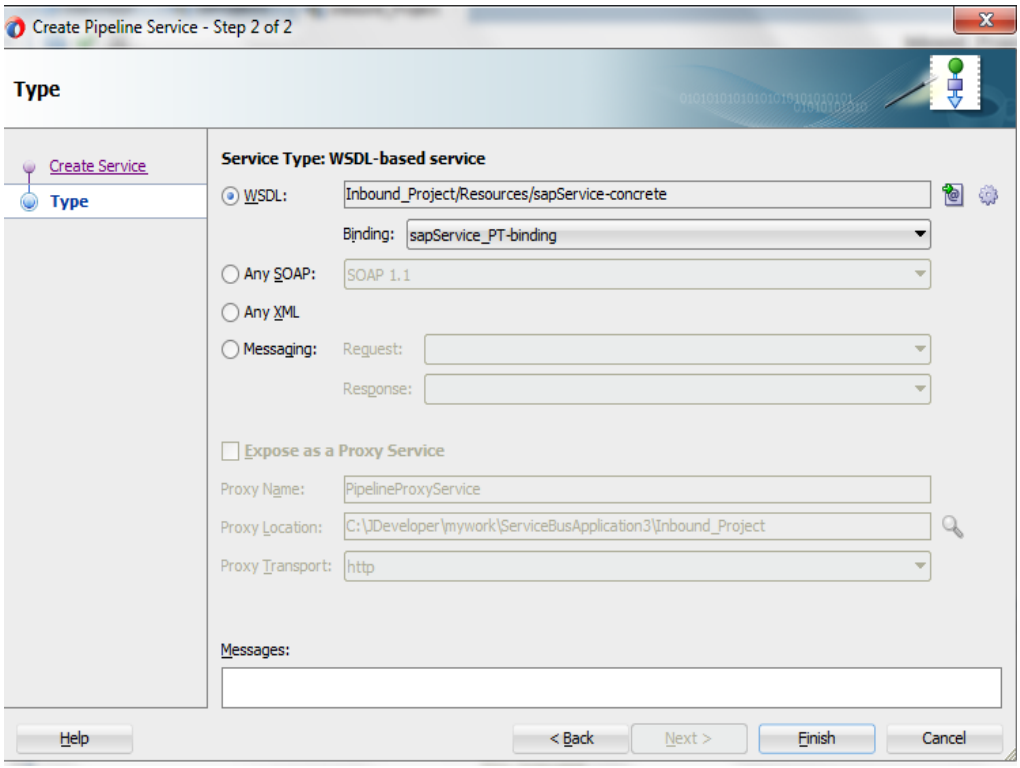
Figure 8-206 Select WSDL



17. Click **OK**.

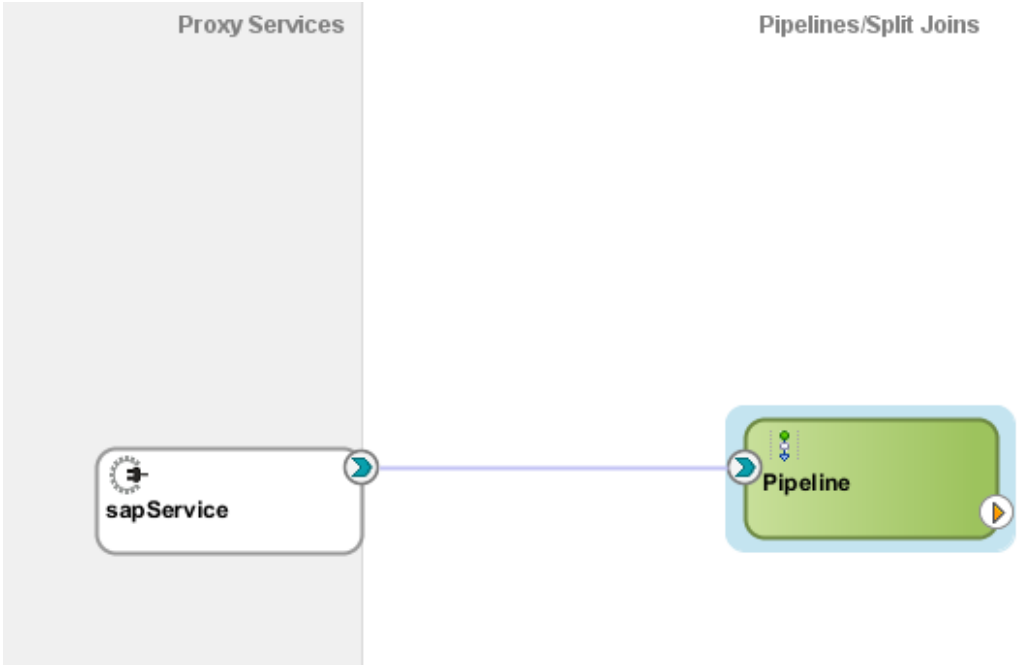
The selected WSDL and corresponding binding is displayed, as shown in Figure 8- 207.

Figure 8-207 Type Page



18. **Pipeline** is displayed connected to **sapService**, as shown in Figure 8- 208.

Figure 8-208 Pipeline Component

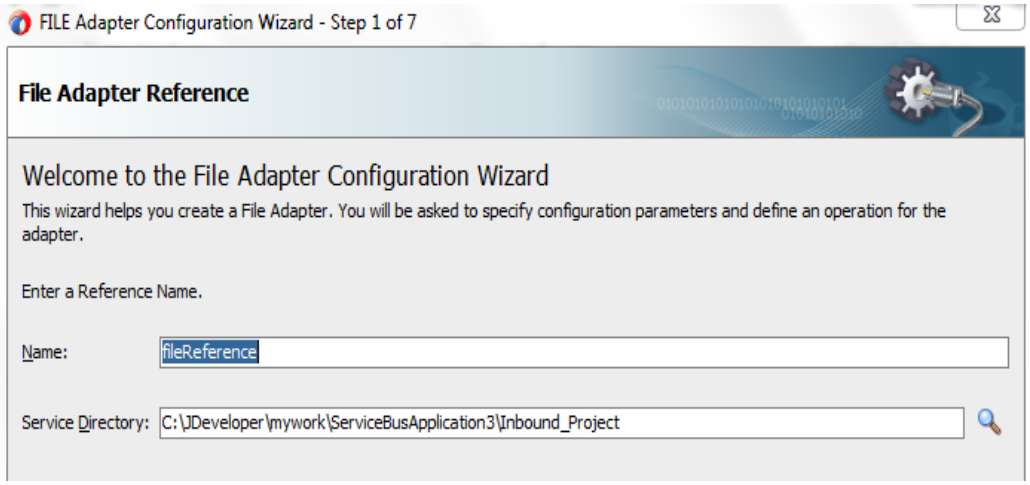


Configuring the File Adapter

Perform the following steps to configure the File Adapter:

1. Drag and drop the **File Adapter** component from the **Technology Adapters** pane to the **External Services** pane. The FILE Adapter Configuration Wizard is displayed, showing the **File Adapter Reference** page, as shown in Figure 8- 209.

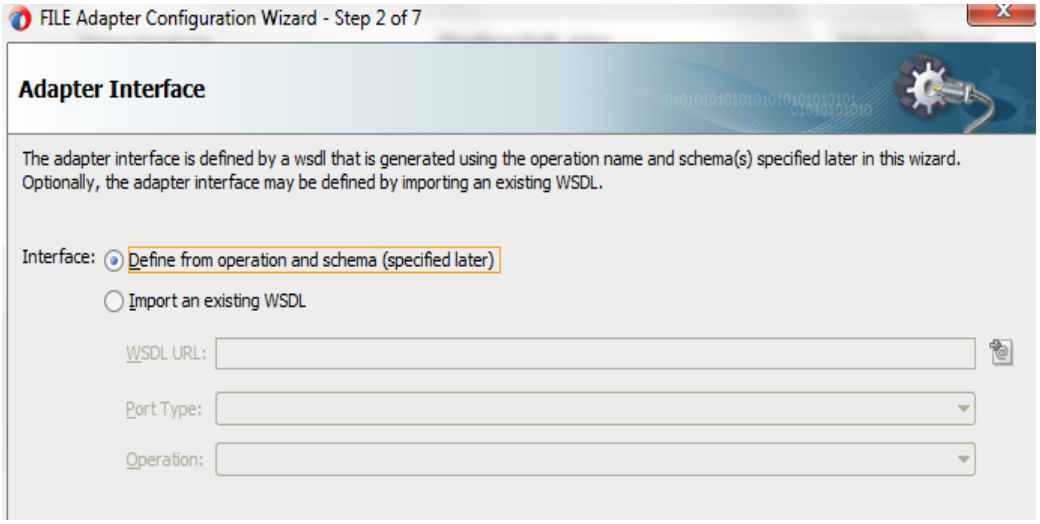
Figure 8-209 Welcome Page



2. Type a name for the new file adapter in the **Name** field and click **Next**.

   The **Adapter Interface** page is displayed, as shown in Figure 8- 210.

Figure 8-210 Adapter Interface Page



3. Ensure that the **Define from operation and schema (specified later)** option is selected.

4. Click **Next**.

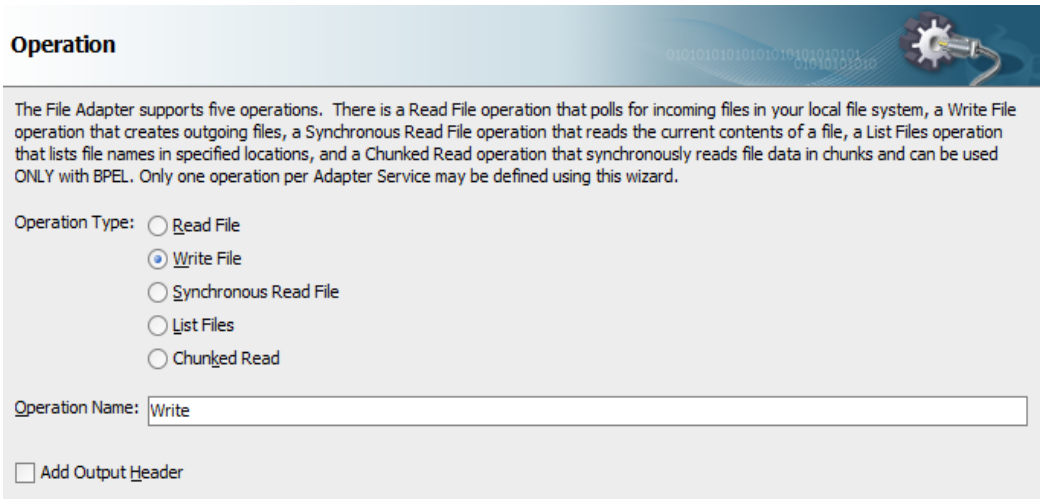
   The **File Server Connection** page is displayed, as shown in Figure 8- 211.

Figure 8-211 File Server Connection Page

5. Click **Next**.

   The **Operation** page is displayed, as shown in Figure 8- 212.

Figure 8-212 Operation Page

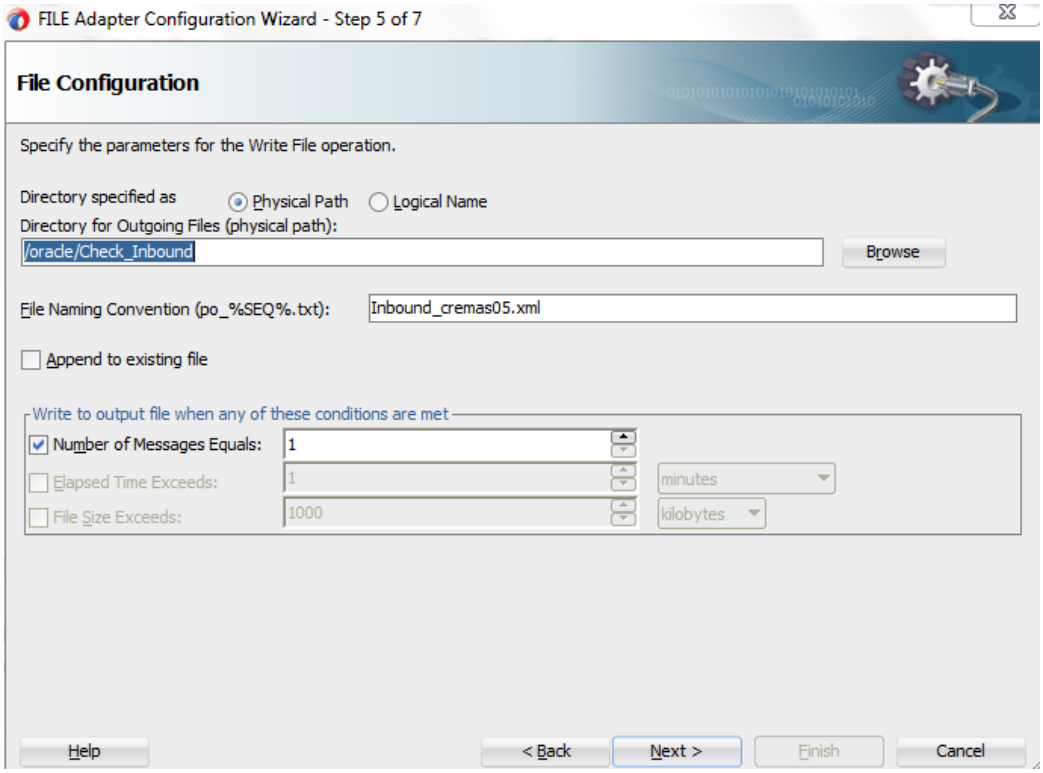


6. Select **Write File** from the list of **Operation Type** options and specify an **Operation Name** (for example, Write).

7. Click Next.

   The **File Configuration** page is displayed, as shown in Figure 8- 213.

Figure 8-213 File Configuration Page



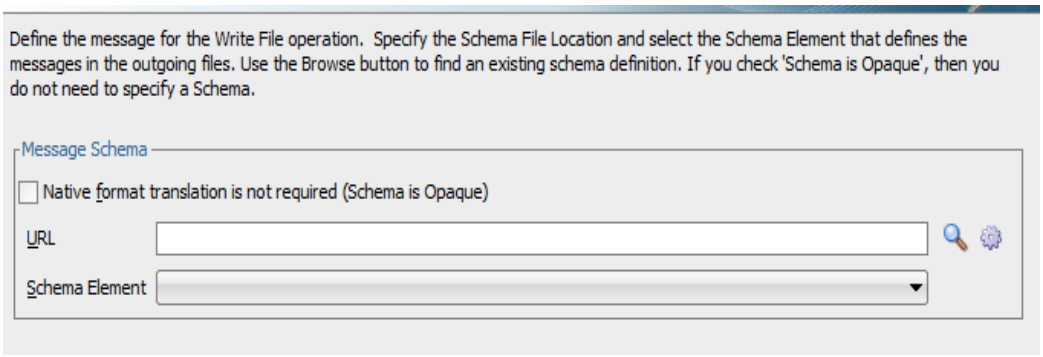
8. Specify a location on your file system where the output file is written.

9. In the **File Naming Convention field**, specify a name for the output file.

10. Click **Next**.

    The Messages page is displayed, as shown in Figure 8- 214.

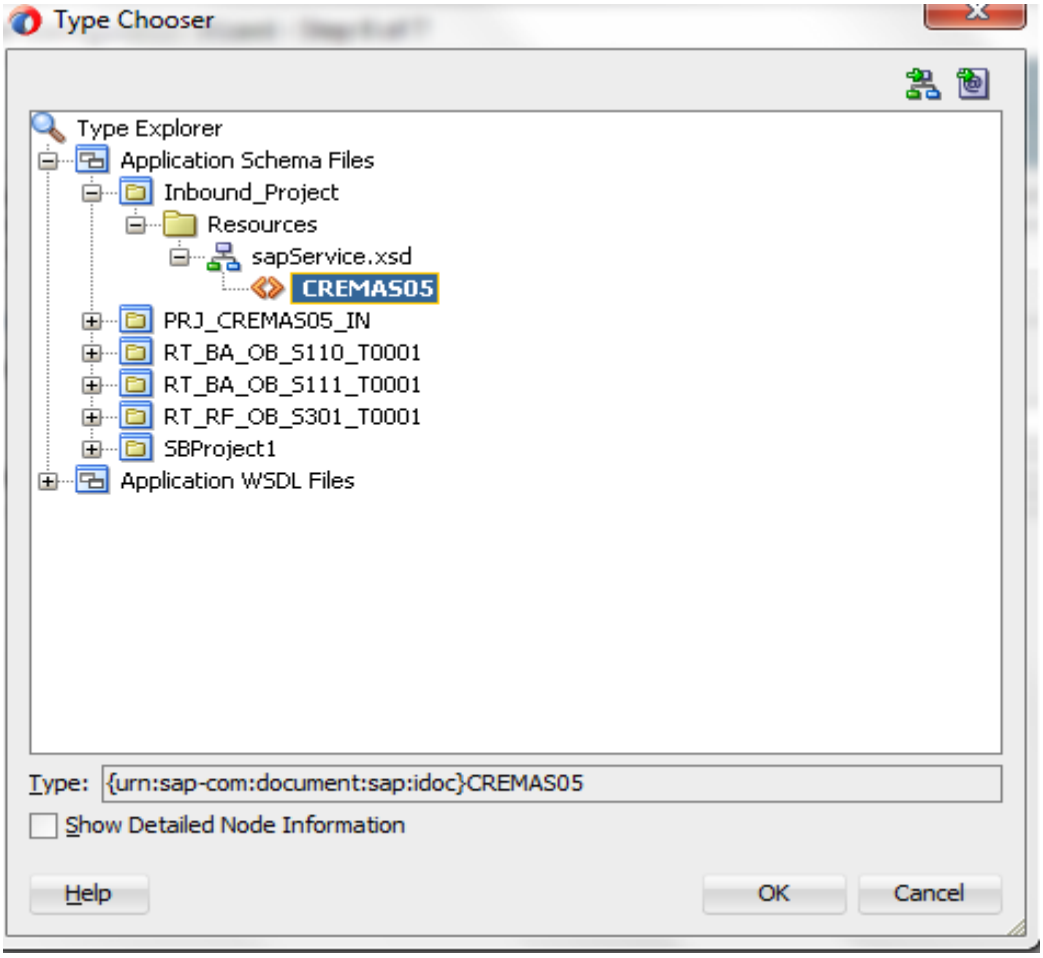
Figure 8-214 Messages Page



11. Click **Browse** icon, which is located to the right of the **URL** field.

    The **Type Chooser** dialog is displayed, as shown in Figure 8- 215.

Figure 8-215 Type Chooser

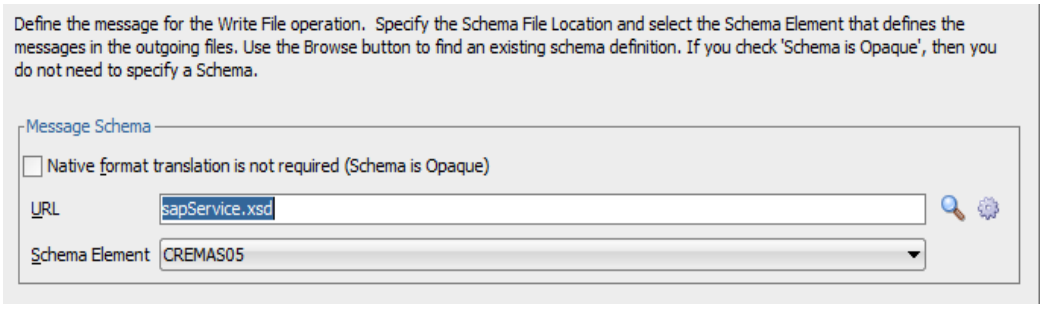


12. Expand Project WSDL Files and Select the available schema.

13. Click **OK**.

You are returned to the **Messages** page, as shown in Figure 8- 216.

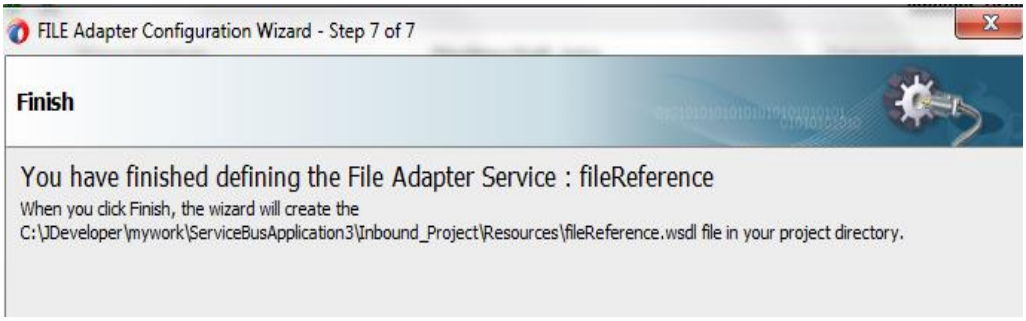
Figure 8-216 Messages Page



14. Click **Next**.

The **Finish** page is displayed, as shown in Figure 8- 217.

Figure 8-217 Finish Page

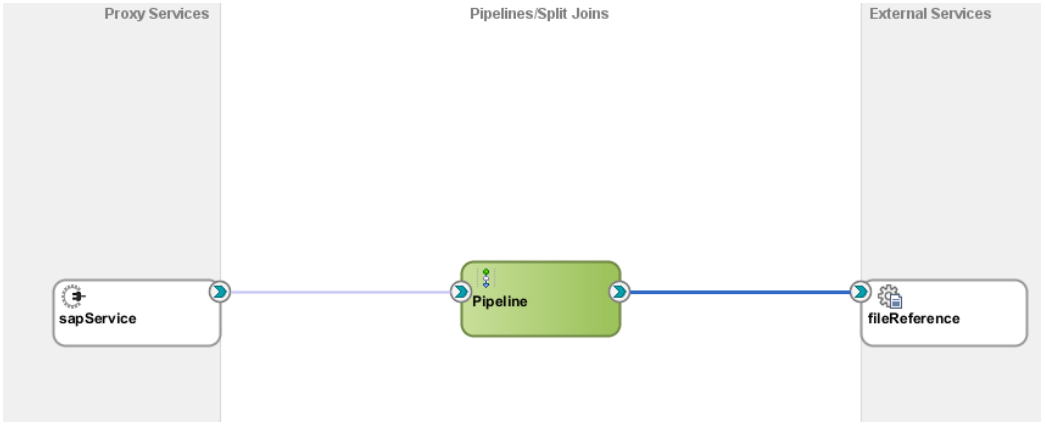


15. Click **Finish**.

The File Adapter service is created in the **External Services** pane, as shown in Figure 8- 218.

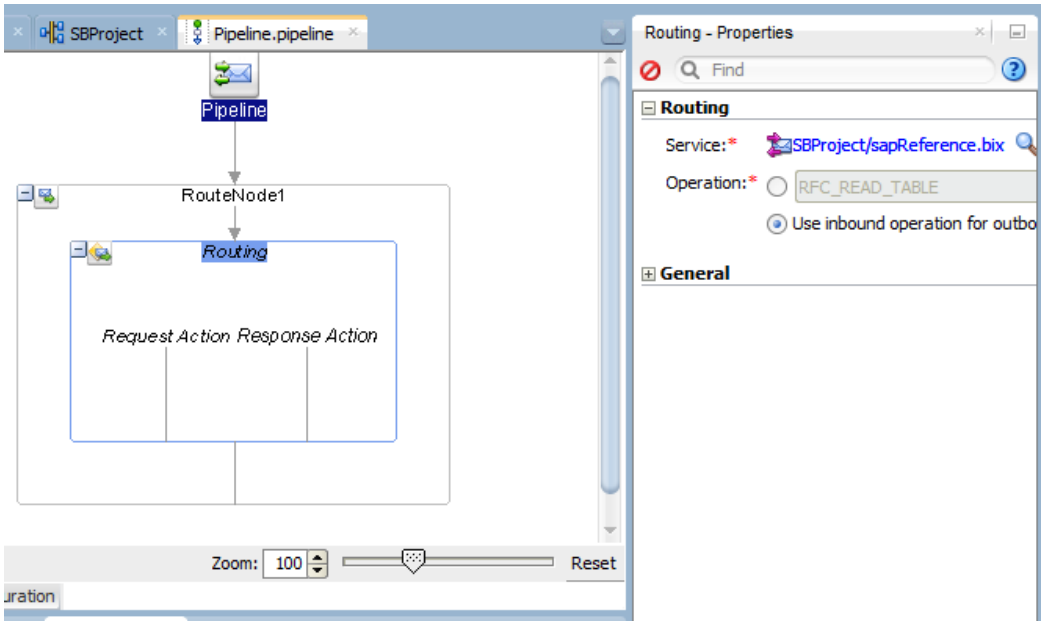
16. Join **Pipeline** to **fileReference**

Figure 8-218 File Adapter Service



17. Open the pipeline which shows the routing. Verify the service and corresponding operation, in the **Routing-Properties**, as shown in Figure 8- 219.

Figure 8-219 Routing Properties Page



18. Select the project and deploy to Service Bus Server.

Deploying Inbound OSB Process

You are now ready to deploy the inbound OSB process. You can follow the same procedure as described in "Deployment Outbound OSB Process".

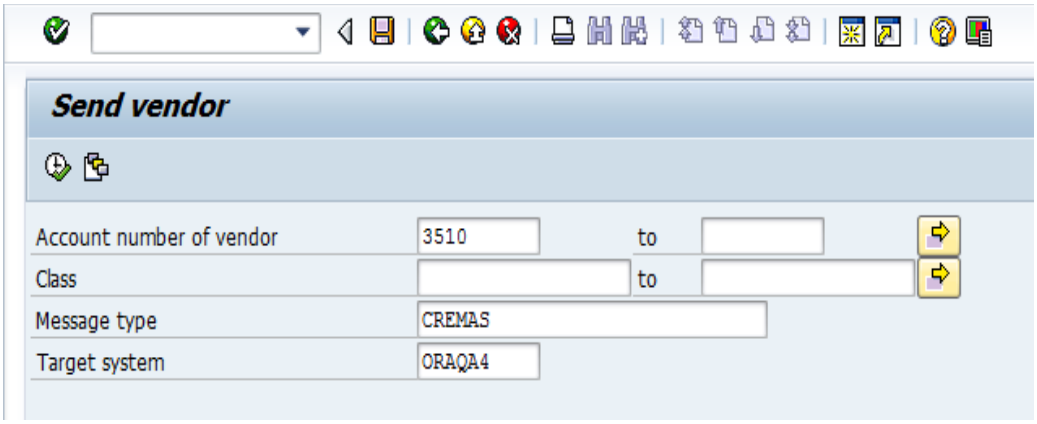
Generate an Event in SAP R/3 for Inbound OSB

Perform the following steps to generate an event in SAP R/3 for Inbound OSB:

1. Start the SAP Workbench.

2. Log in to the SAP R/3 system and run the transaction **BD14** to send Vendor, as shown in Figure 8- 220.

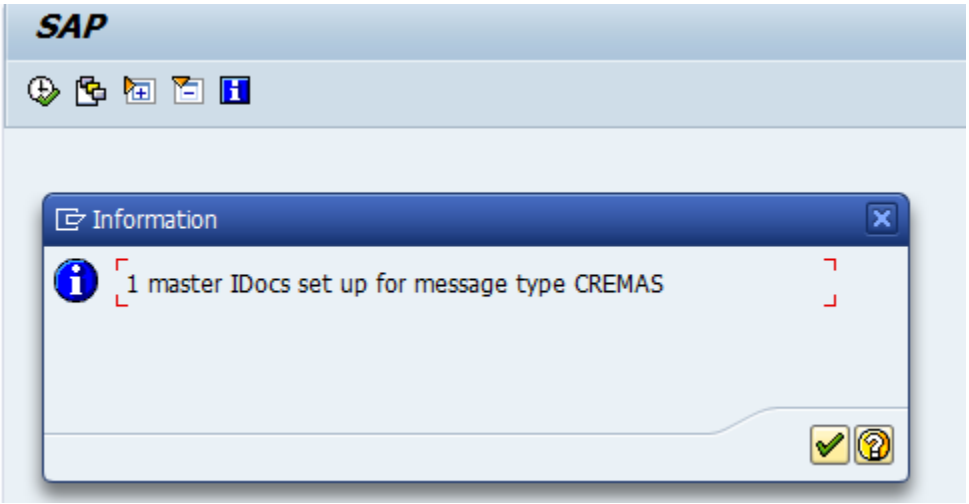
Figure 8-220 Send Vendor



3. Specify **Account number of the vendor**, **Message type** and **Target system** where the Vendor record is sent to the target (Program ID configured for destined Server project)

4. Click the **Execute** button or press **F8** key, as shown in Figure 8- 221.

Figure 8-221 Execute Option

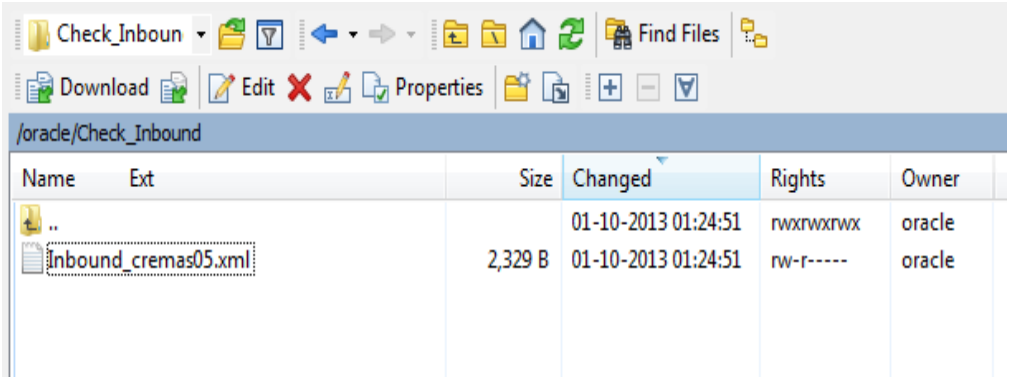


Confirmation dialog is displayed, as shown in Figure 8- 222.

Figure 8-222 Confirmation Dialog

5. Navigate to the **Server Directory** where the output was destined and verify the created file, as shown in Figure 8- 223.

Figure 8-223 Server Directory

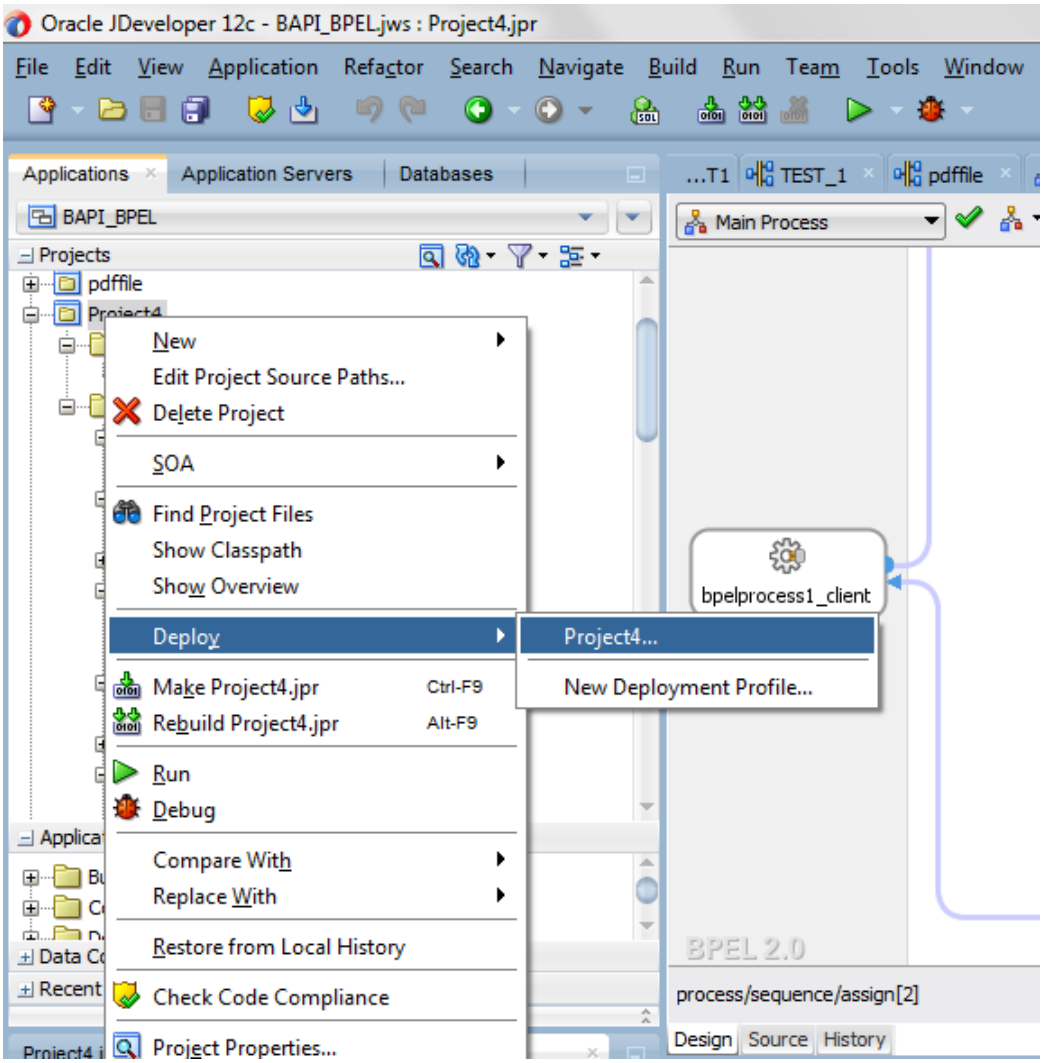


8.5 Deploy the Defined Process

Perform the following steps to deploy the process.

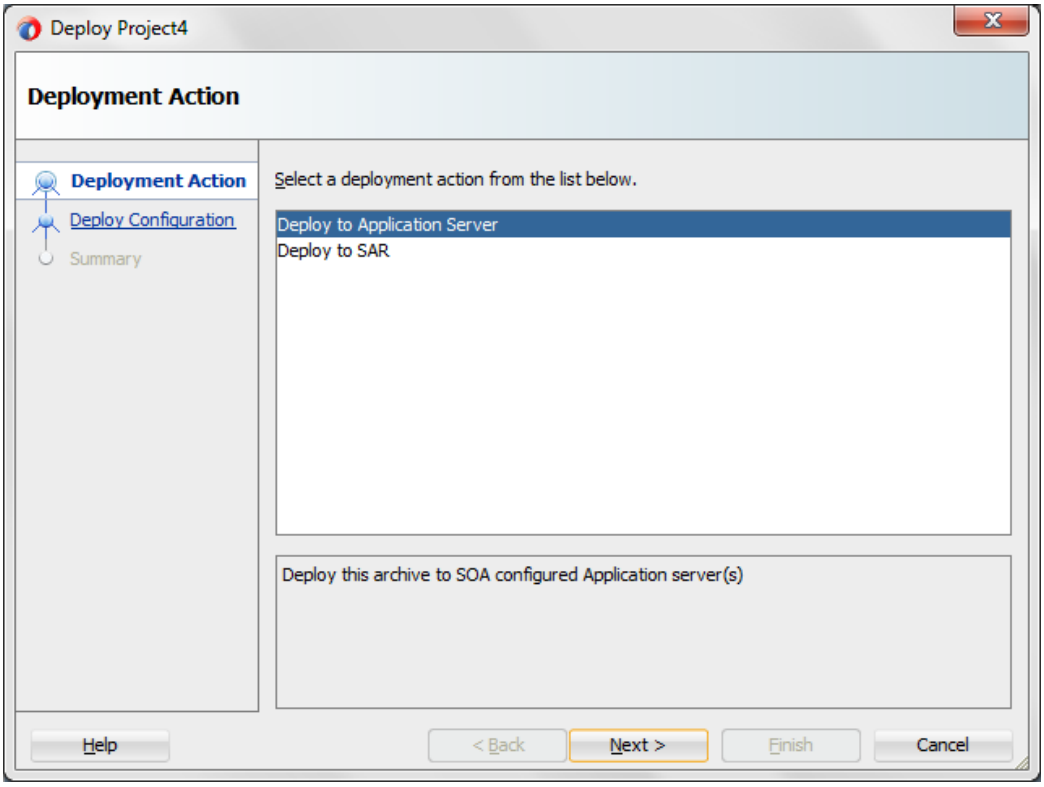
1. Right-click the project name in the left pane, select **Deploy** and then select project name, as shown in Figure 8-224

Figure 8-224 Navigation Screen



The Deployment Action page is displayed, as shown in Figure 8-225.

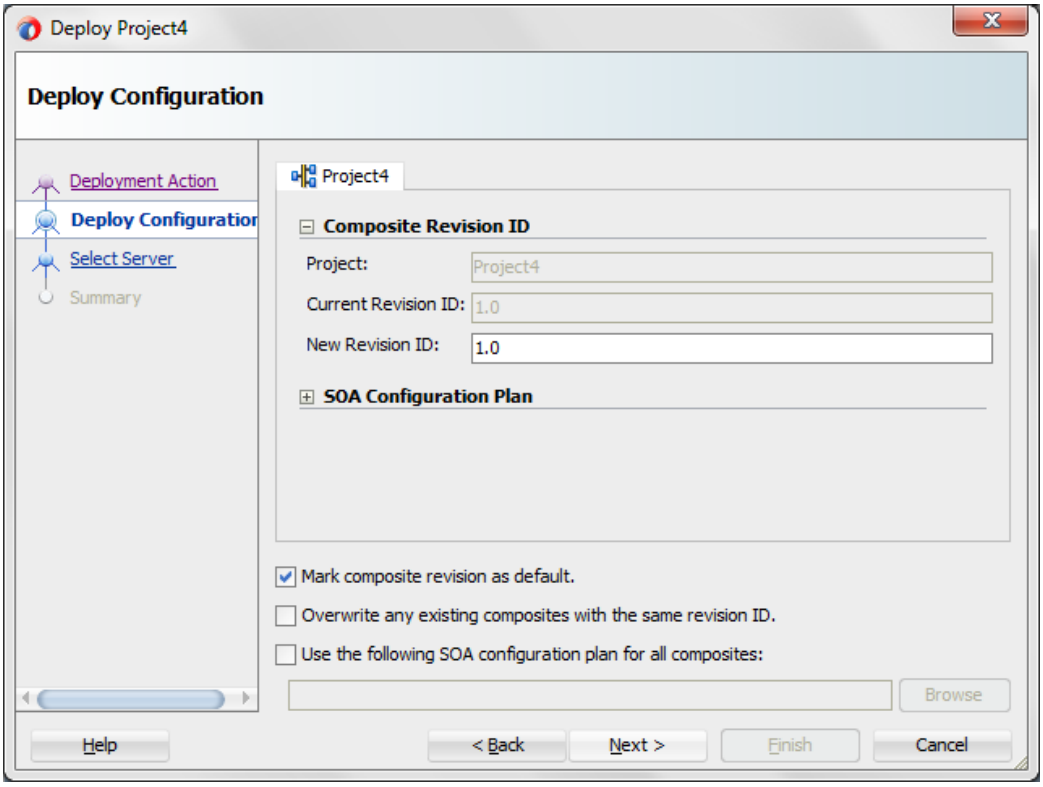
Figure 8-225 Deployment Action Page



2. Select **Deploy to Application Server**.
3. Click **Next**.

   The **Deploy Configuration** page is displayed, as shown in Figure 8-226.

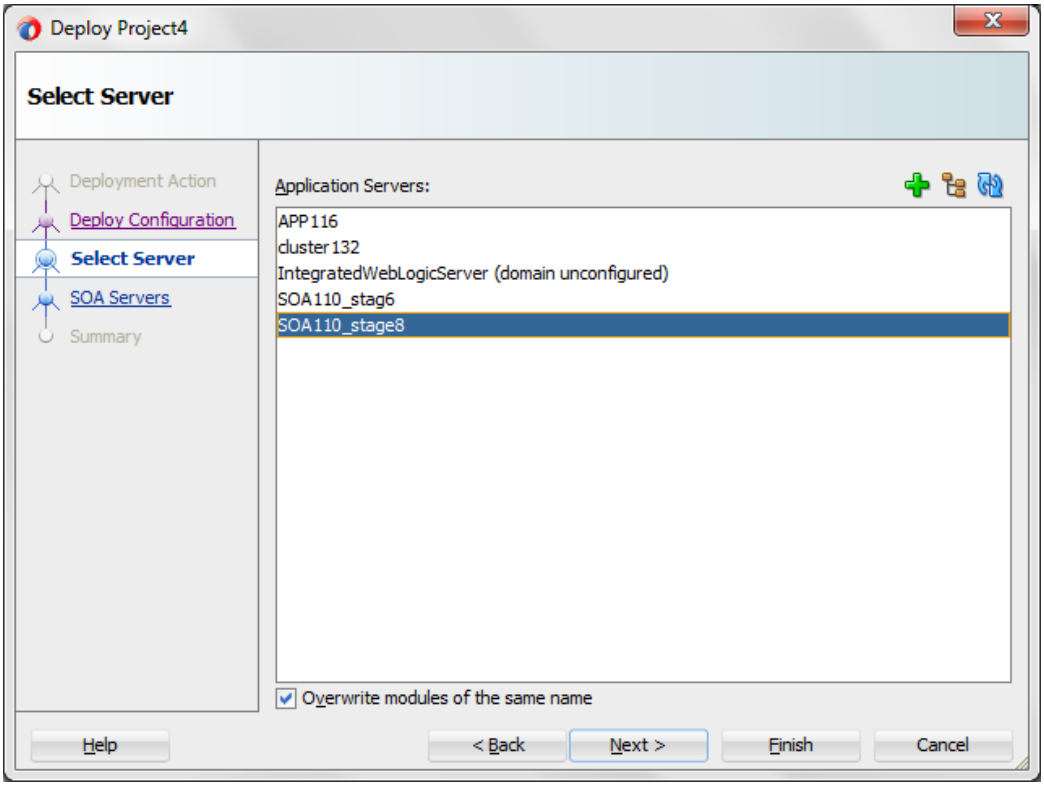
Figure 8-226 Deploy Configurations Page



4. Click **Next** with the default values.

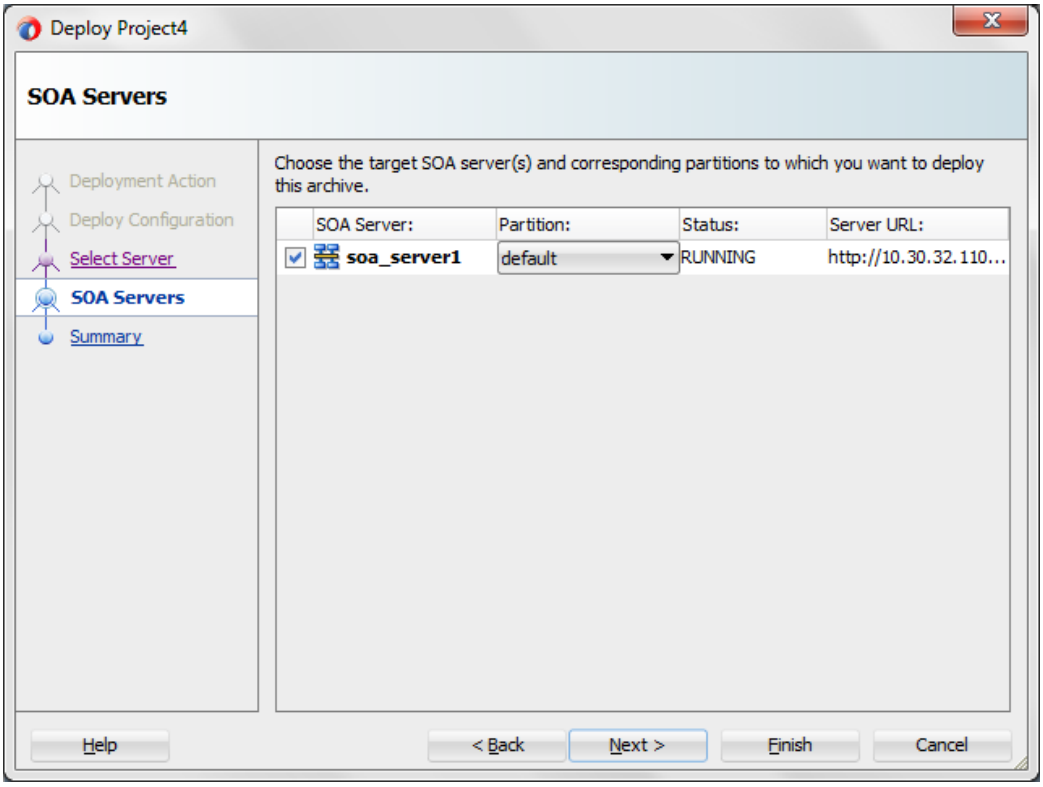
   The **Select Server** page is displayed, as shown in Figure 8-227.

Figure 8-227 Select Server Page



5. From the list of application servers configured, select the respective SOA server to deploy and click **Next**.
   The SOA Servers page is displayed, as shown in Figure 8-228.

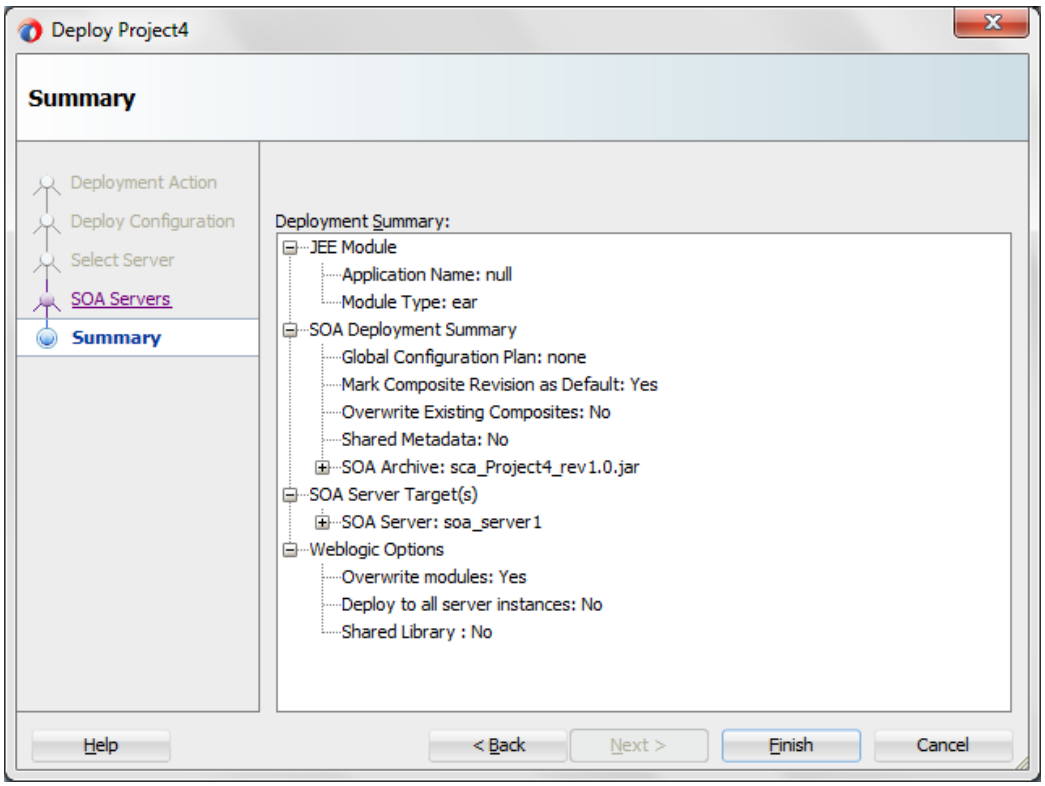
Figure 8-228 SOA Servers Page



6. Select a target SOA server and click **Next**.

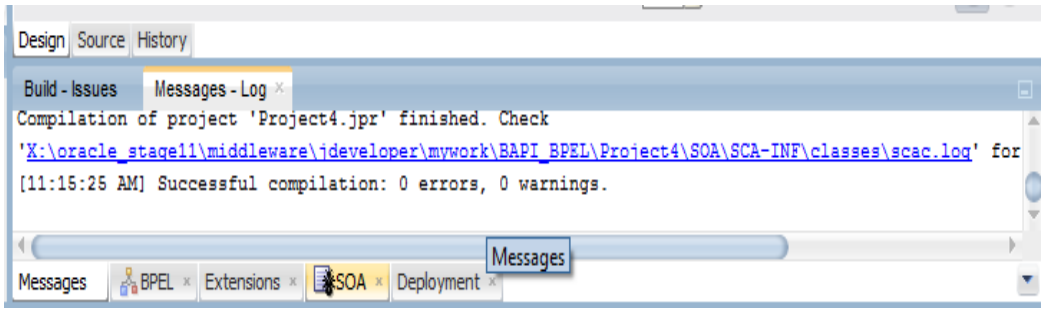
   The Summary page is displayed, as shown in Figure 8-229.

Figure 8-229 Summary Page



7. Review and verify all the available information of the project and click **Finish**.
8. The successful compilation message is displayed in the Messages-log, once the process is deployed successfully, as shown in Figure7-230.

Figure 8-230 Successful Deployment Message



8.6 Test the Deployed Process

This section describes the procedure for testing the deployed Outbound and Inbound Process.

8.6.1 Test the Outbound Process

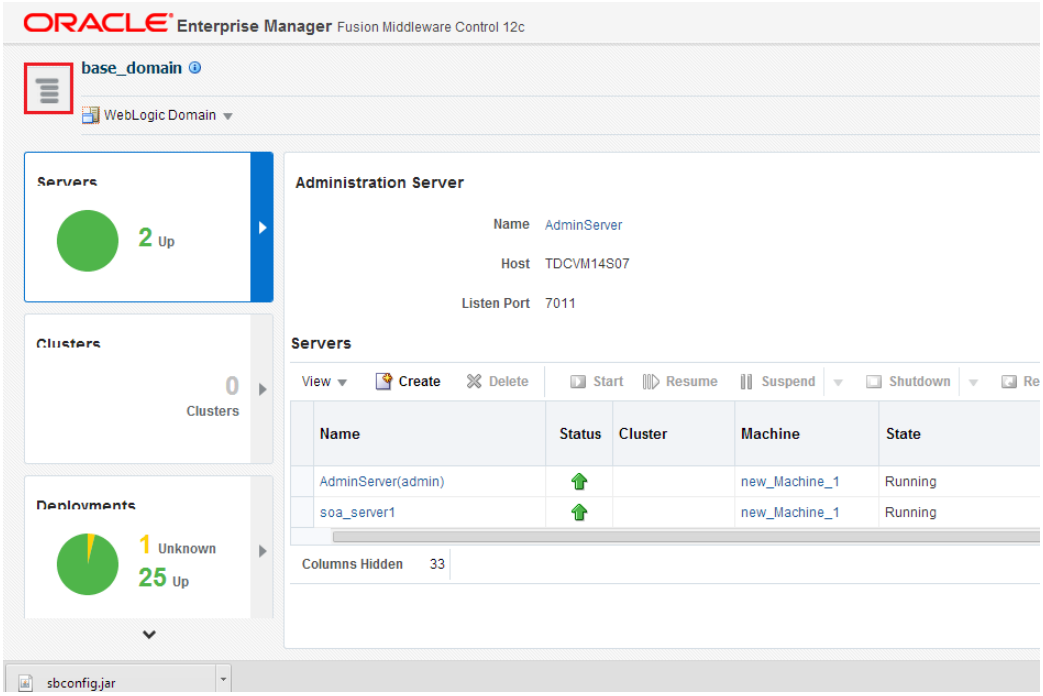
Perform the following steps to test the Outbound Process.

8.6.1.1 Invoking the Input XML Document in the Oracle Enterprise Manager Console

Perform the following steps to invoke the input XML document in the Oracle Enterprise Manager console.

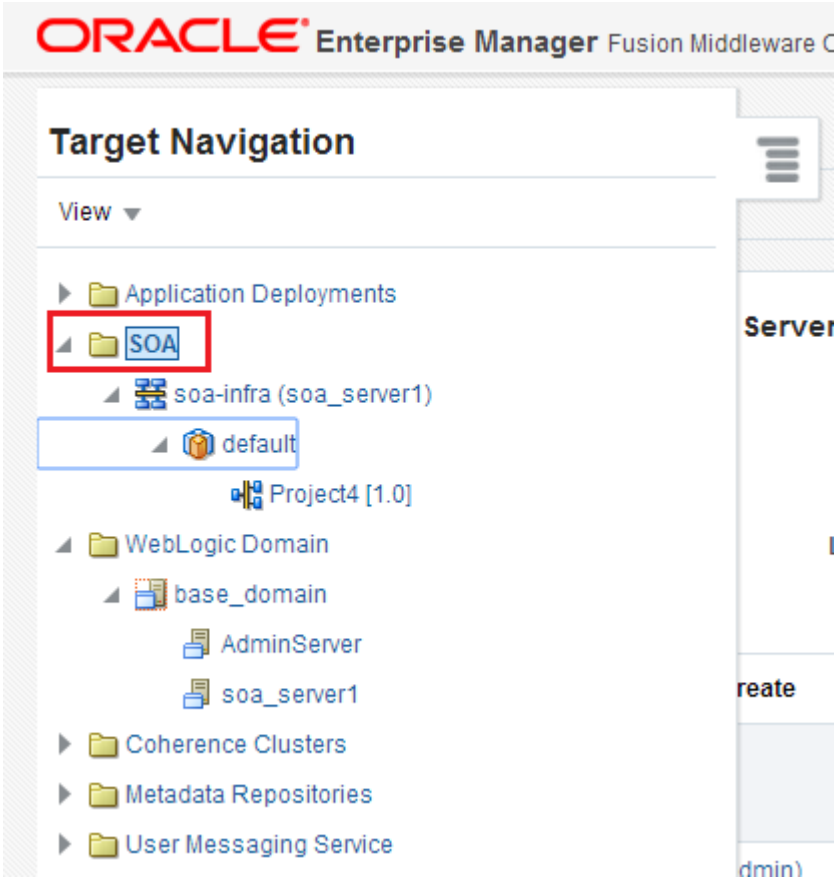
1. Login to the Oracle Enterprise Manager console using the link: `http://localhost:port/em`, as shown in Figure 8-231.

Figure 8-231 Oracle Enterprise Manager Console



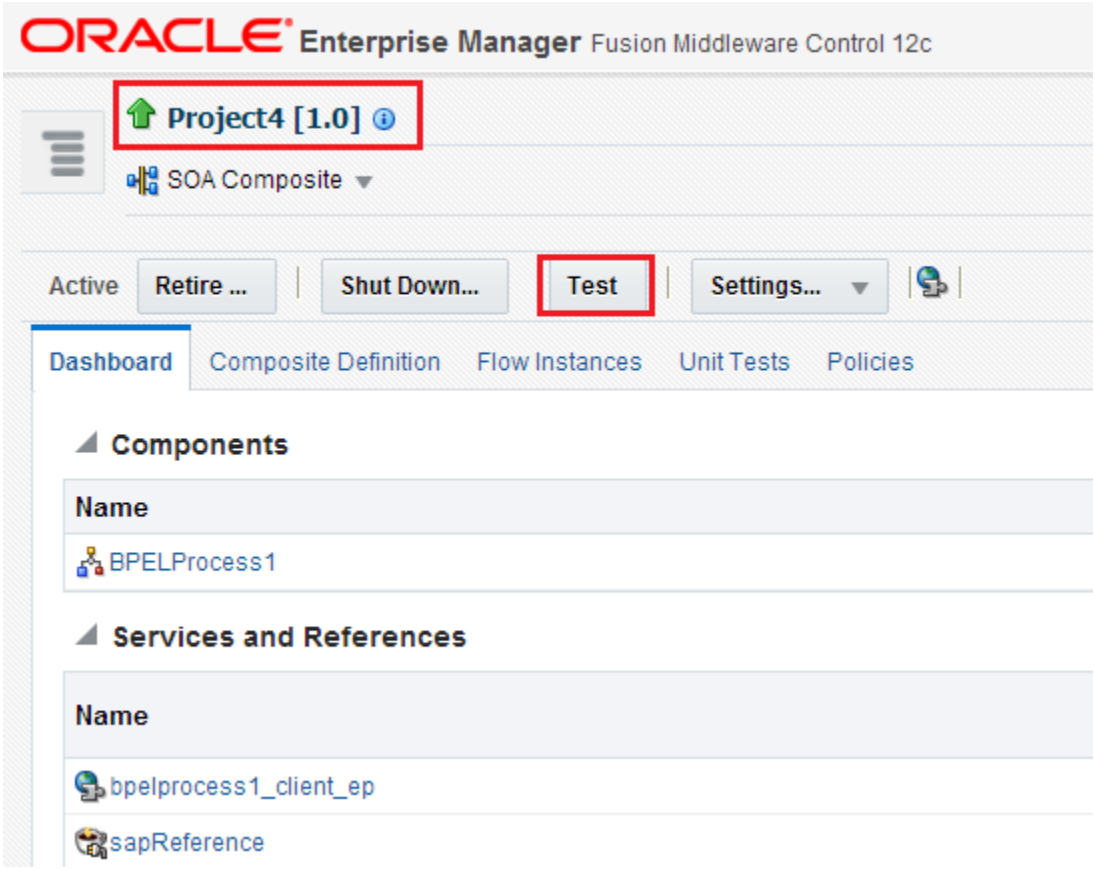
2. After clicking the highlighted tab, expand SOA to get list of deployed projects.

Figure 8-232 Expanding the SOA project list



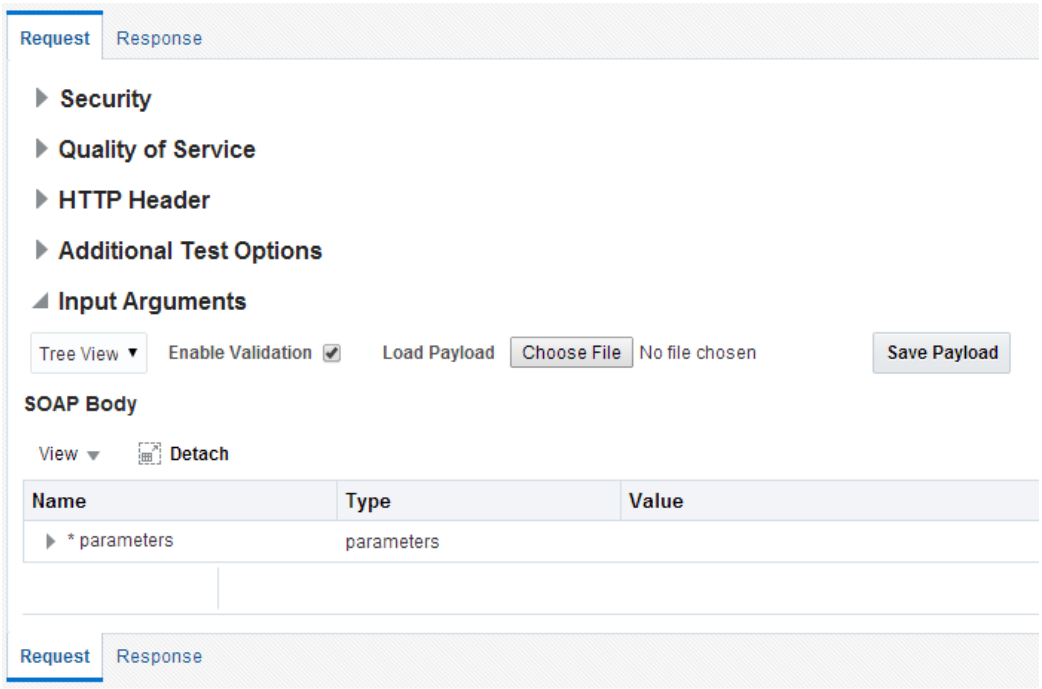
3. Select the outbound deployed project (for example, Project4).
4. Click **Test** button, as shown in Figure 8-233.

Figure 8-233 Test Button



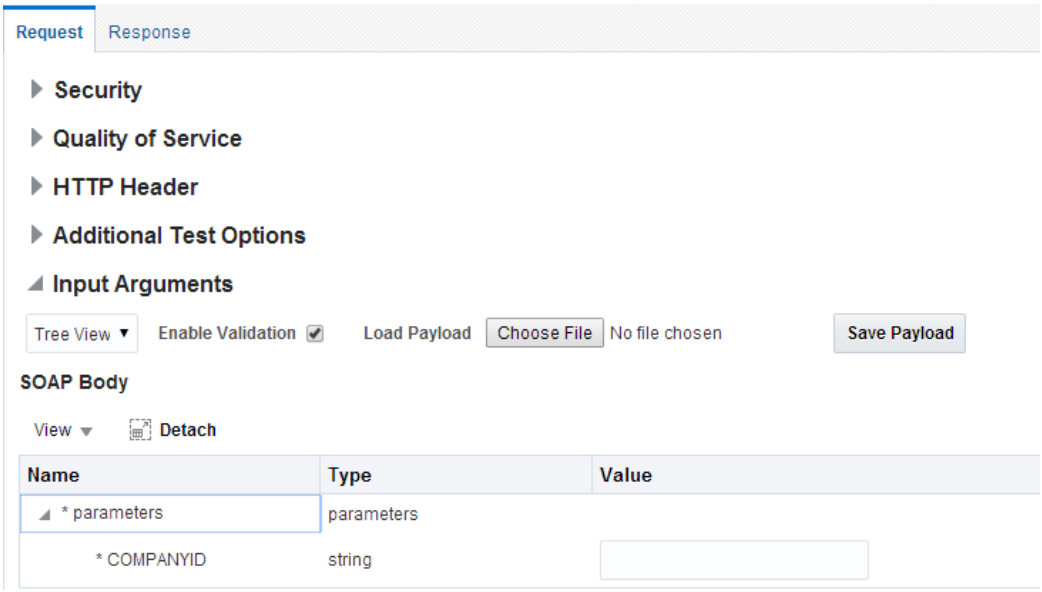
5. A new pop-up is displayed. Click the **Request** tab, as shown in Figure 8-234.

Figure 8-234 Request Tab



6. Enter the input values in the **Value** field, as shown in Figure 8-235.

Figure 8-235 Request Tab

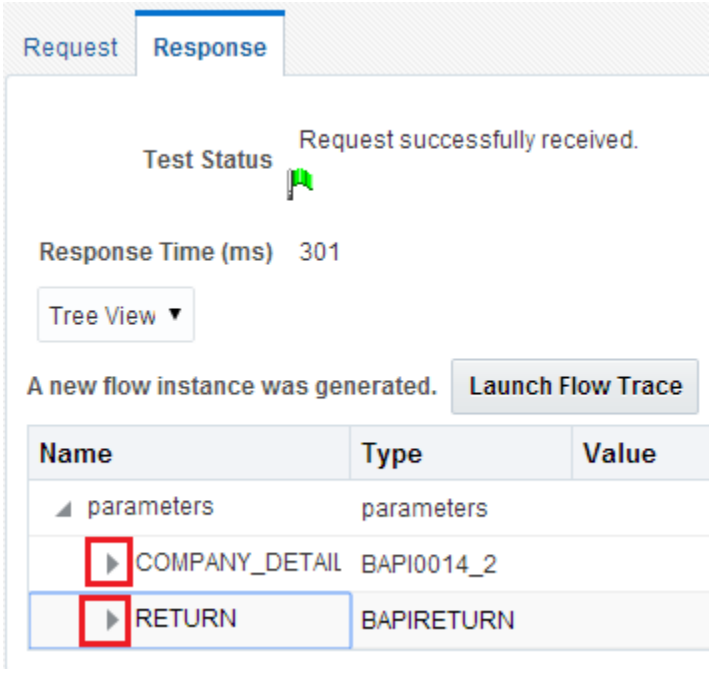


7. Click **Test Web Service** button, as shown in Figure 8-236.

Figure 8-236 Test Web Service Button

The output response is received in the Oracle Enterprise Manager console, as shown in Figure 8-237.

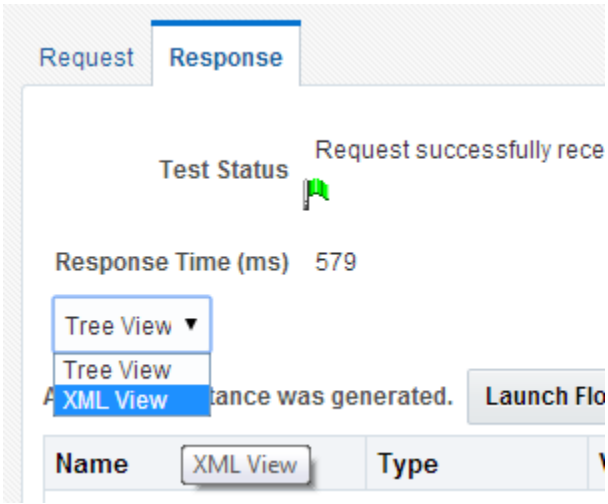
Figure 8-237 Output Response



Perform the following steps to invoke the input XML document using XML View:

a. Select XML View from the list, as shown in Figure 8-238.

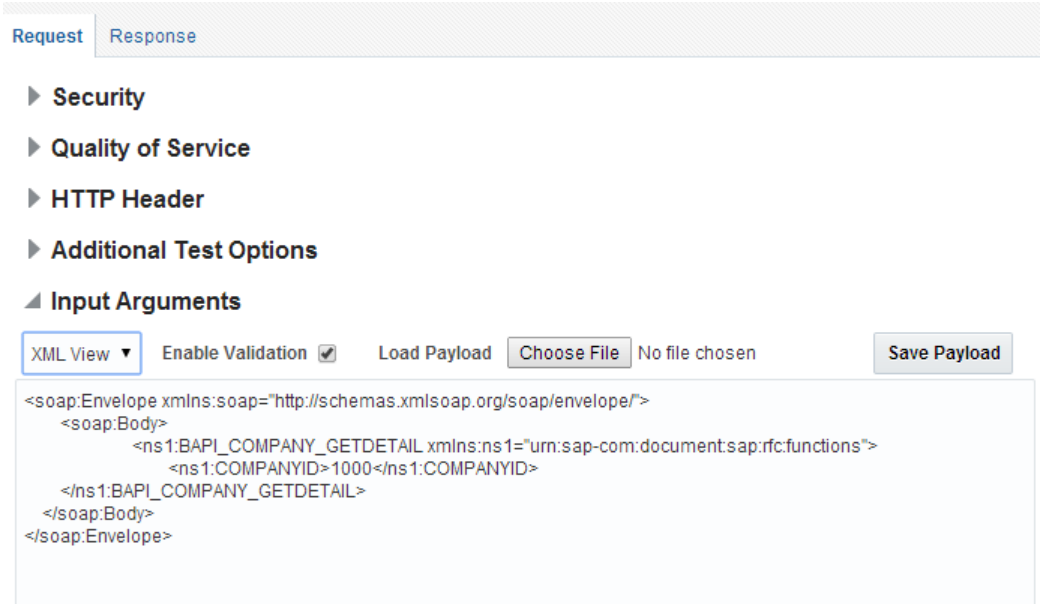
Figure 8-238 Input Arguments List



b. Enter the input XML document in the Input Arguments area and click **Test Web Service** button.

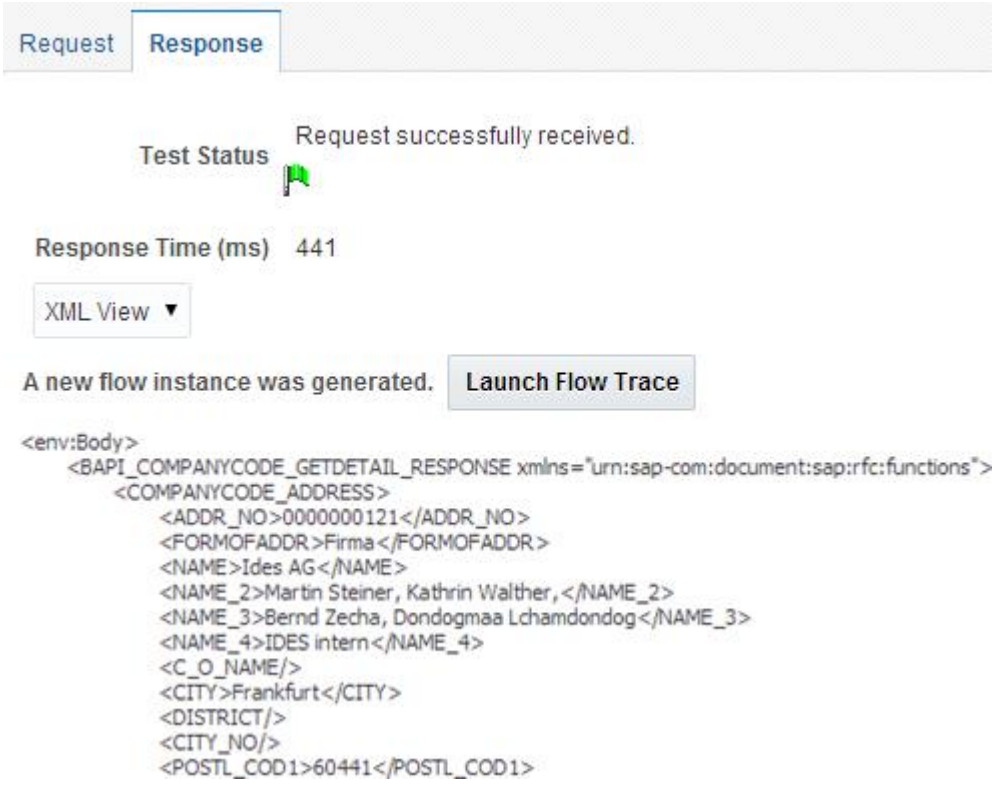
c. The output response is received in the Oracle Enterprise Manager console, as shown in Figure 8-239.

Figure 8-239 Received Output Response



d. Click on **Response** tab, below screen appears, as shown in Figure 8-240.

Figure 8-240 Response Tab



8.6.2 Test the Inbound Process

Perform the following steps to test the Inbound Process.

8.6.2.1 Generate an Event in SAP R/3

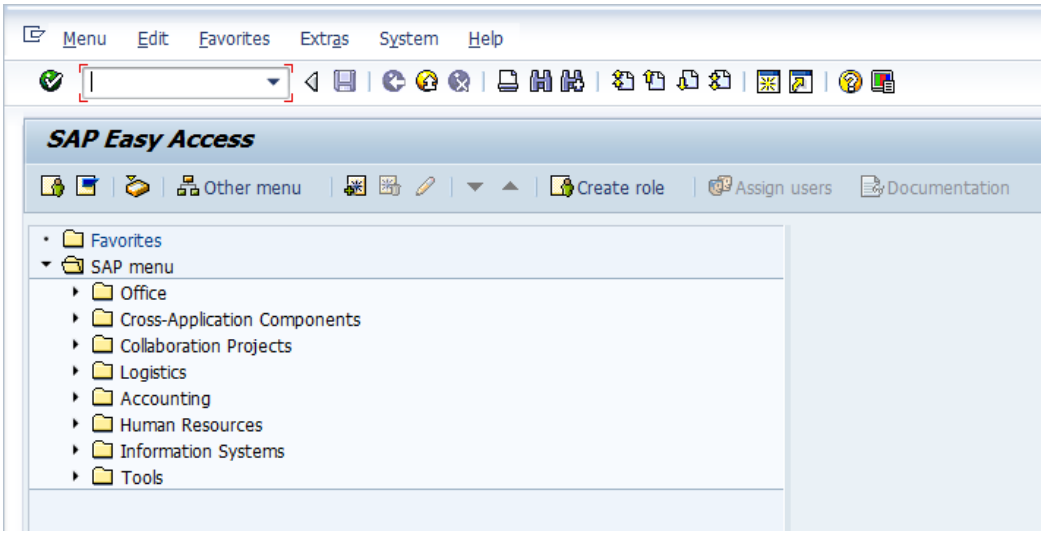
Events are generated in SAP by some activity, for example, updating the material in SAP as in case of matmas.

The below section describes how to trigger an event in SAP R/3 and verify event integration using Oracle Integration Adapter for SAP R/3.

To trigger an event in SAP R/3:

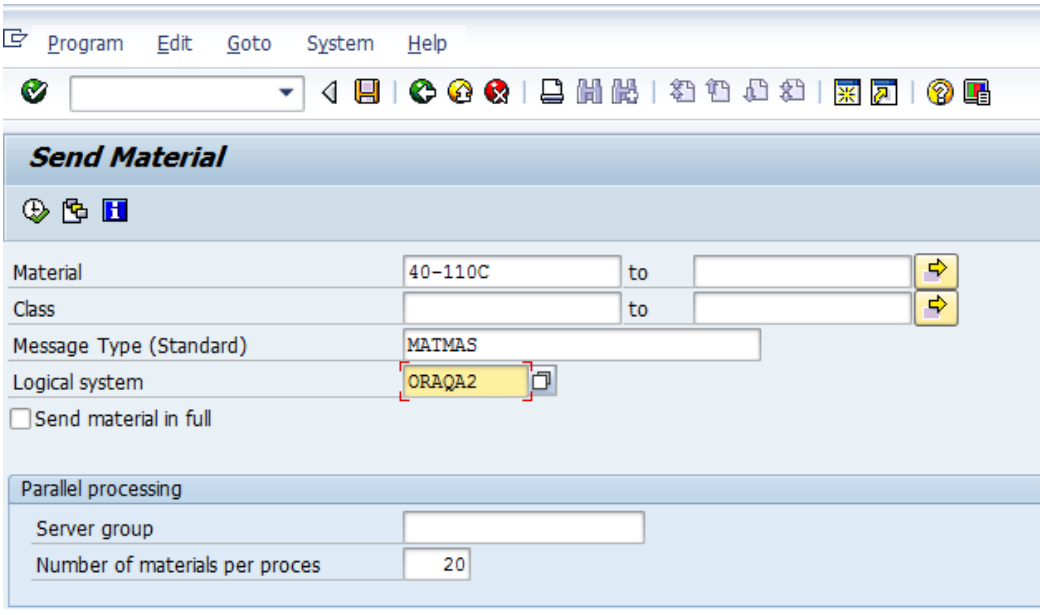
1. Logon to the SAP R/3 system, as shown in Figure 8-241.

Figure 8-241 Workbench



2. Run the **bd10** transaction, a popup window appears, as shown in Figure 8-242.

Figure 8-242 Send Material Window



Enter the following information in the **Send Material** window:

- In the **Material** field, enter a material number (e.g., 40-110C), as shown in Figure 8-243.
- In the **Logical system** field, enter the logical system (i.e. Program ID) that you are using with SAP R/3.

3. Use **F8** to execute the process.

Figure 8-243 Execute Option

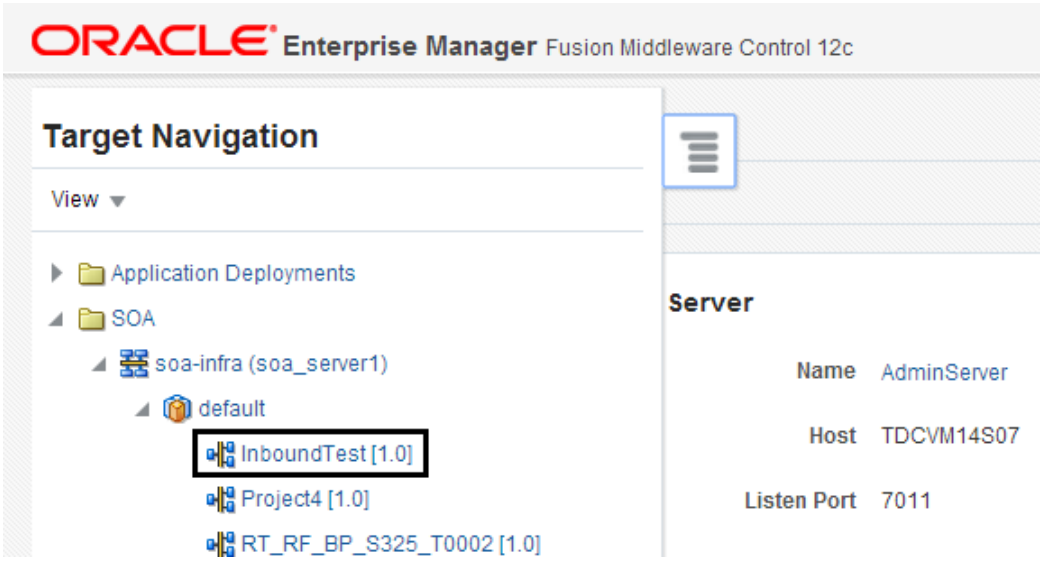
Material master data is sent to the logical system specified.

Verifying the Results

To verify your results:

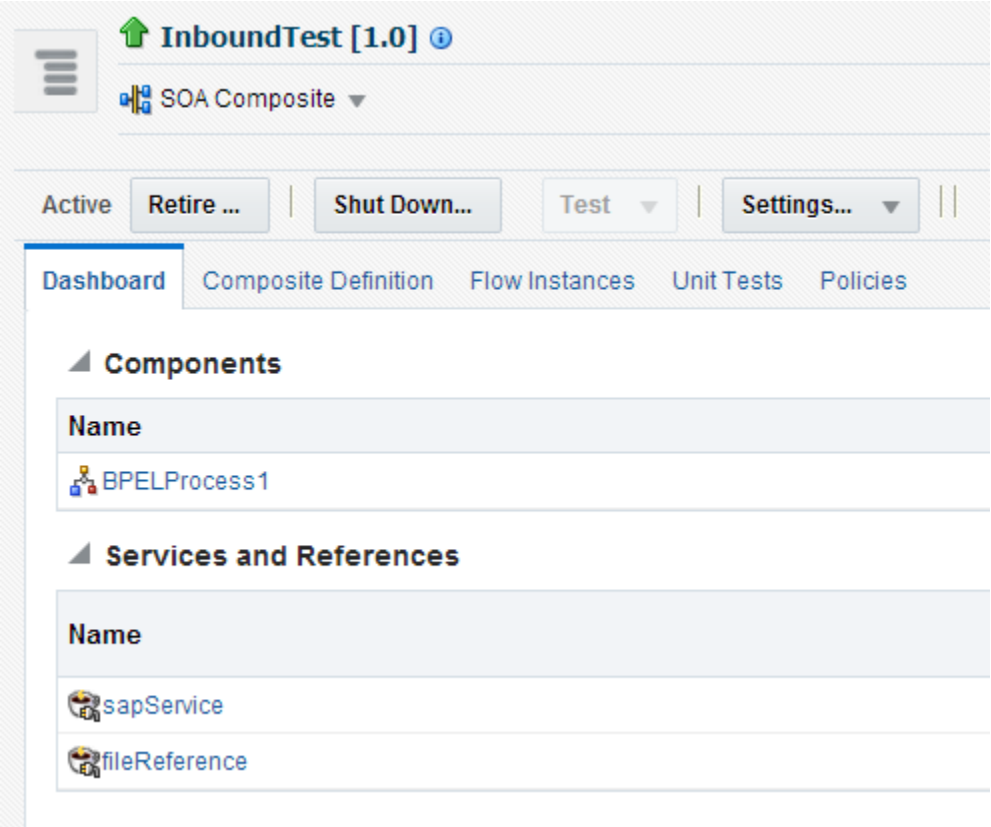
1. Logon to the Oracle Enterprise Manager console by using the following URL:
   `http://localhost:7001/em`
2. Expand your domain in the left pane followed by the SOA folder.
3. Select an available inbound BPEL process (for example, InboundTest), as shown in Figure 8-244.

Figure 8-244 Available Inbound BPEL Process



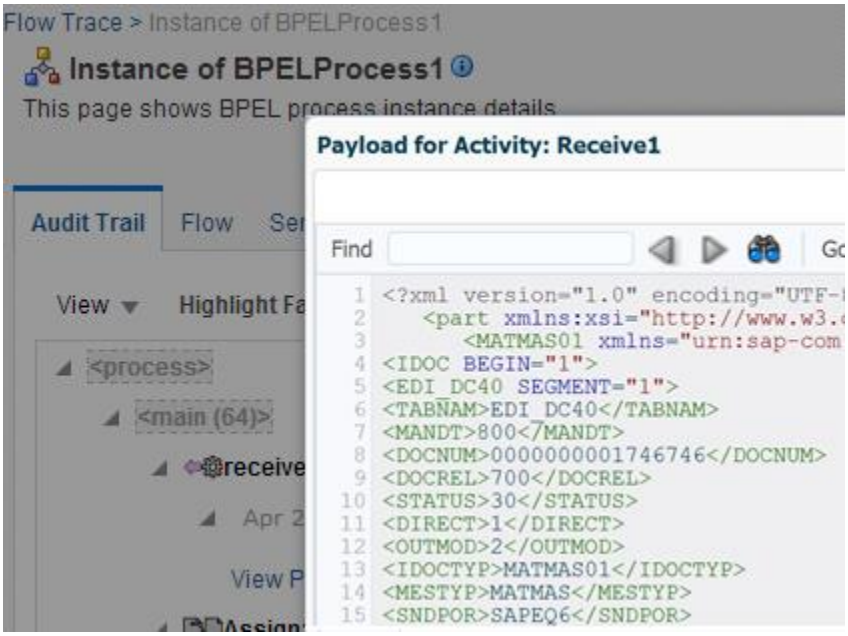
4. Recently received run-time event messages are displayed under **Services and References**, as shown in Figure 8-245.

Figure 8-245 Instances Tab



Audit trail looks like as shown in Figure 8-246.

Figure 8-246 Audit Trail



Notes:

- Inbound scenario is currently not working in the Integrated weblogic hybrid domain environment as after receiving the IDoc, it is goes to the rejection folder.
- In this release, generation of Concrete WSDL with multiple objects (IDoc or, BAPI or RFC) in OSB is currently not working.

9 Adapter for SAP Performance Tuning

This section provides SOA as well SAP JCo 3.0 tuning parameters. The section defines the tuning and performance environment and result of the same. These are the sample tuning parameters that can be used and compared with the result given in the result section.

This chapter contains the following topics:

- Section 9.1, "Tuning and Performance"
- Section 9.2, "Inbound Performance"

9.1 Tuning and Performance

This section describes about the performance consideration of Adapter for SAP. Tuning is required to make sure that the components involved should maximize the performance of Adapter for SAP.

9.1.1 Tuning Parameters

Tuning parameters should be defined to make sure that the environment components deliver maximum performance.These parameters are not fid and the values will depend on various factors and the systems involved in the integration scenario. Few factors to be looked for are: server configurations, load expected by the system – peak and non-peak, payload sizes, etc.

9.1.1.1 SAP JCo Parameter Tuning

These JCo properties should be modified in Outbound ConnectionPools of Adapter for SAP. SAP JCO is tuned differently for inbound and outbound integration scenarios. In case of outbound from the Adapter for SAP, you should tune the following parameters.

```
JCO_PEAK_LIMIT    - 300
JCO_POOL_CAPACITY - 50
```

In case of inbound to Adapter for SAP, you should tune the following JCo parameters:

```
JCO_CONNECTION_COUNT = 3
```

9.1.1.2 BPEL Infrastructure Tuning Parameters (These are provided at Enterprise Management (EM) level):

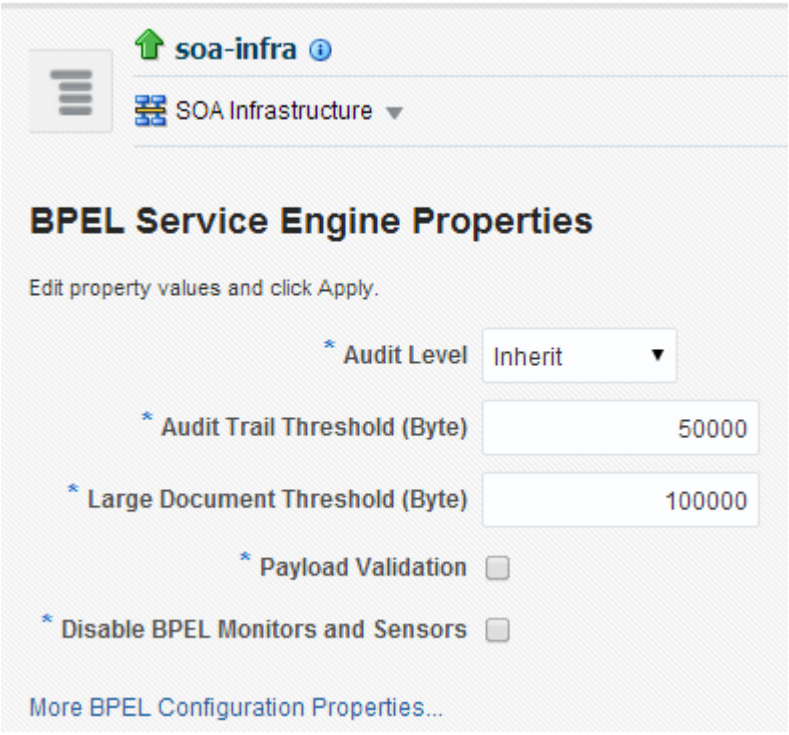
Table 9-1 lists and describes tuning parameters.

Table 9-1 Tuning Parameters

SOA Infrastructure Parameter	Old Value	New Value	Component
DispatcherEngineThreads	30	300	BPEL
DispatcherInvokeThreads	20	250	BPEL
DispatcherSystemThreads	2	50	BPEL
MaxNumberOfInvokeMessagesInCache	100000	2500000	BPEL
DispatcherMaxRequestDepth	600	1000	BPEL
AuditLevel	Inherit	Off	SOA-INFRA
LargeDocumentThreshold	100000	100000	BPEL

These properties can be modified in Enterprise Manager. For this, go to **BPEL Service Engine Properties** page in EM, as shown in Figure 9-1.

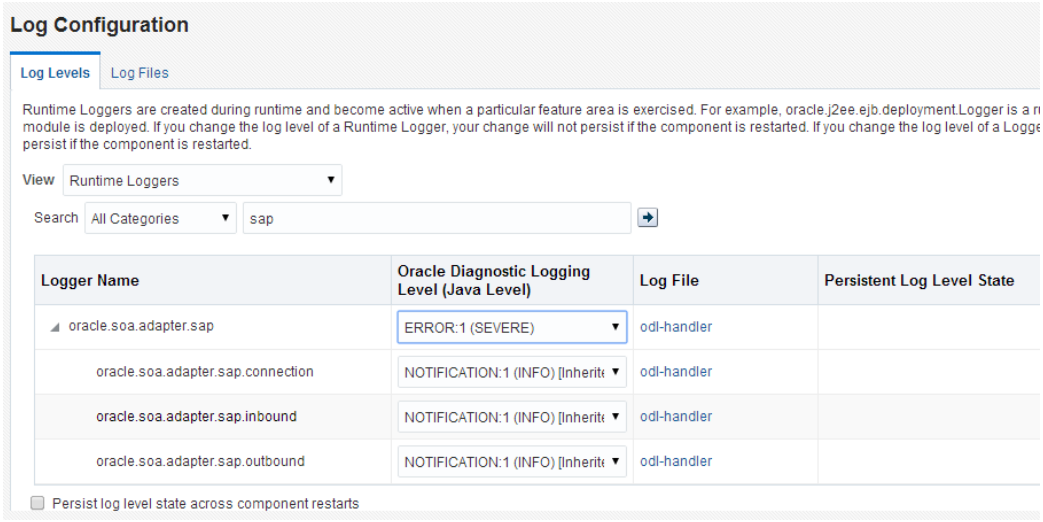
Figure 9-1 BPEL Service Engine Properties Page



Logger level tuning parameters

Logging is a very expensive activity when it comes to added performance overheads. Logging should be at the minimal level or off in order to enhance performance of the system. Recommended level for logging is ERROR:1 (SEVERE). You can modify logger level of Adapter for SAP in the following section of Enterprise Manager, as shown in Figure 9-2.

Figure 9-2 Logger level Tuning Parameters



JCoParameter Tuning

- **Outbound performance:**
  - JCO_MAX_GET_TIME = 2000ms
  - JCO_PEAK_LIMIT =100
  - JCO_POOL_CAPACITY = 40

9.1.2 System Configuration

9.1.2.1 Oracle Linux Server

This is the configuration of the system where the WebLogic server is running.

- Release 6.3
- Kernel linux 2.6.39-200.24.1.el6uek.x86_64

9.1.2.2 Hardware

- As performance is dependent on various factors including the size of the system on which a process or an application runs, the hardware information here serves as a measuring gauge to help identify actual performance tuning criteria. These are the hardware level details of the system for which the above tuning settings are made. Memory : 31.5 GiB
- Processor 0 to 8 : Quad-Core AMD Opteron™ processor 2356

9.1.3 Outbound Performance

This section describes how to configure the environment to calculate the performance of the Adapter for SAP in case of outbound requests from adapter. This summary is based on BPEL project which is used to send an outbound call to SAP (Inbound to SAP system).

9.1.3.1 Performance Summary

The Adapter for SAP was subjected to high loads to test performance for two types of operations on an SAP system. One operation was to fetch information from SAP system and another was to insert information to the SAP system, both being outbound to SAP system from Adapter for SAP.

Further sections provide a summary of the performance of the server against the Fetch and Insert scenario.

Fetch Scenario

Individual performance of the adapter is tested for the fetch operation with 1 kb request and 43 kb of response under different user loads. Please note that the response times and transactions processed per second may vary with different system configuration and network speeds.

Apart from calculating the response times and tps (transactions per second), system and hardware parameters: CPU, Disk IO, Heap, GC, threads, Network IO was monitored for the server.

Execution Summary For Fetch Scenario

Table 9-2 lists and describes the execution summary.

Table 9-2 Execution Summary

Response Time and TPS Vs User Load - Fetch Scenario (1kb request and 43 kb response)			
#	**User Load**	**Average response time(sec) Vs User Load**	**Transactions Per second**
1	50	1.106	43.9
2	100	2.395	40.9
3	200	4.796	38.7
4	300	6.782	41.1
5	500	10.521	43.6
6	1000	19.901	44.6

Insert Scenario

Individual performance of the adapter is tested for the insert operation with 5 kb request and 26 kb response under different user loads.

Execution Summary for Insert Scenario

Table 9-3 lists and describes the execution summary.

Table 9-3 Execution Summary for Insert Scenario

Response Time Vs User Load -Insert Scenario (7kb request and 26 kb response)			
#	**User Load**	**Average response time(sec) Vs User Load**	**Transactions Per second**
1	50	1.797	26.8
2	100	4.245	22.1
3	200	8.971	21.4

9.1.3.2 Enhanced Performance

The performance of the overall process using the Adapter for SAP can be enhanced by modifying various parameters on SOA as discussed in section 9.1.1. Post tuning the SOA layer and Adapter for SAP, the performance of the process increased. Table 9.4 shows the results after modifying the SOA parameters.

Table 9-4 lists and describes the execution summary

Table 9-4 Execution Summary for Insert Scenario

TPS Vs User Load - Fetch Scenario (1kb request and 43 kb response)		
#	**User Load**	**Transactions per Second**
1	100	77.5
2	200	67.5
3	300	64.2
4	400	64.1
5	500	63.9

9.2 Inbound Performance

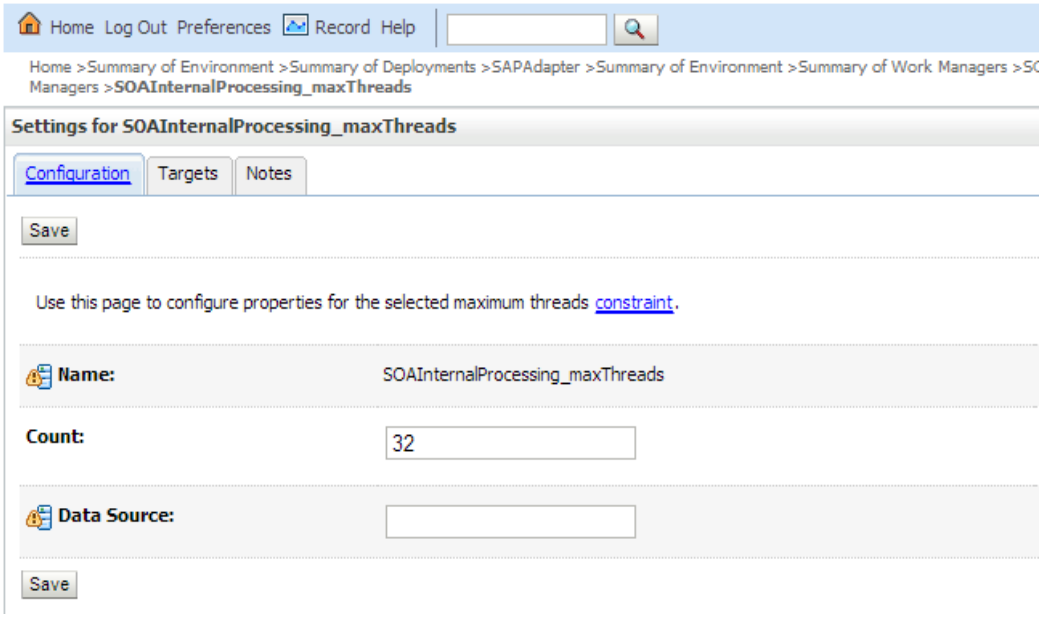
This section describes how to measure Adapter performance for Inbound calls. This summary is based on the BPEL project which is used to receive an inbound call from SAP (Outbound to SAP system).

Note: You can look at configuring different work managers to increase throughput. The properties for work manager **SOAInternalProcessing_maxThread** can be optimized for performance tuning as it will adjust the max number of threads available to the work manager.

To increase this value, go to WebLogic console-> Environment-> Work Managers-> SOAInternalProcessing_maxThreads and increase the value of **Count**, as shown in the Figure 9-

3. Similarly for SOAIncomingRequests_maxThreads, go to WebLogic console-> Environment-> Work Managers-> SOAIncomingRequests_maxThreads and increase the value of Count.

Figure 9-3 Increase the value of Count



9.2.1 Performance Summary

Adapter Inbound performance summary in this environment:

Execution Summary

Table 9-5 lists and describes the execution summary.

Table 9-5 Execution Summary

Property	Value
Total Number of iterations	50000
Event Output XML size	6kb
Configuration	Inbound BPEL Process
Adapter	SAP (JCA)
EIS Server Version	
IDoc	ALE(iDOCs) ->Material Management-> MATMAS -- Material master -> MATMAS01

Result:

Table 9-6 lists and describes the results.

Table 9-6 Results

Name	Avg TPS	No of Concurrent IDOCs
SAP	25	208

10 SOA Reports Integration

This section describes the Reports integration of the Adapter for SAP. Reports are useful in real-time monitoring of the Adapter for SAP. This feature comes up with Oracle Enterprise Manager. Using Oracle Enterprise Manager, you can see real-time adapter health report and connection monitoring, such as closed and open(ed) connections on particular session. You can see health of any deployed SAP endpoint connection created for that and which messages through this integration.

This chapter contains the following topics:

- Section 10.1, "Adapter Health Report"

10.1 Adapter Health Report

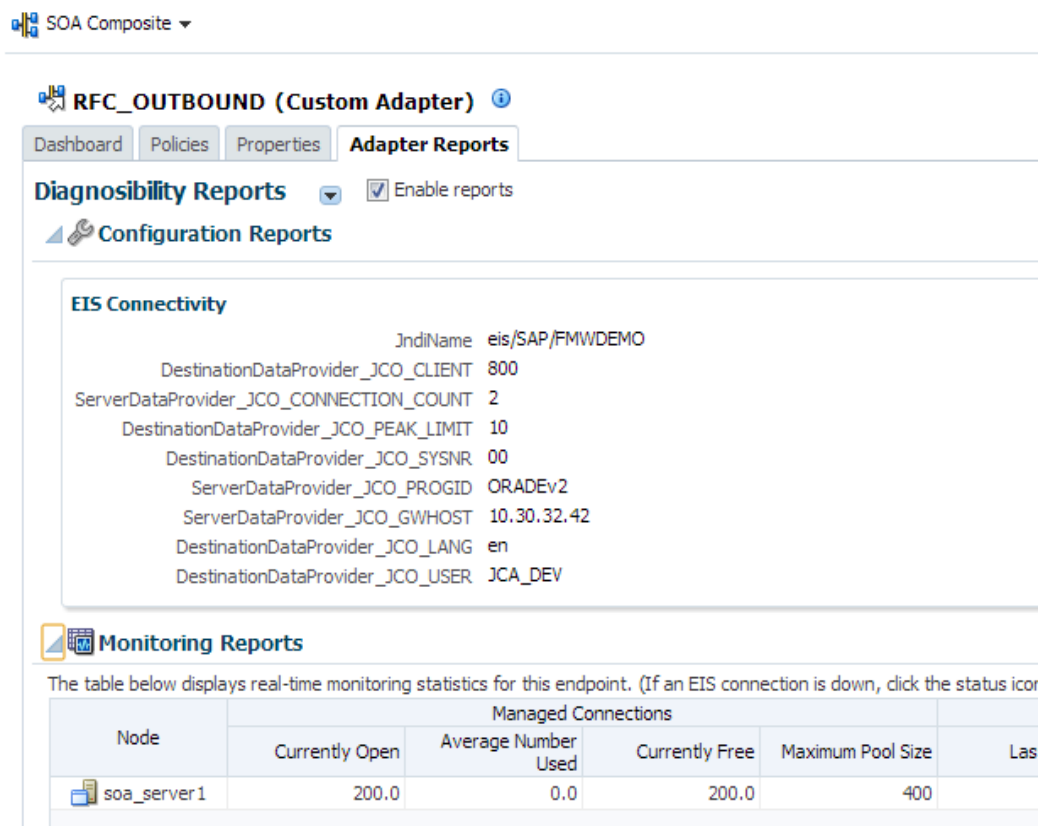
You can check real-time monitoring statistics of SAP Endpoint in Adapter health report.

Perform the following steps to open Adapter health report:

1. Open Enterprise Manager.
2. Go to **SOA→ soa-infra**.
3. Select the deployed Adapter project that you want to see.

   The Adapter Report tab is displayed as shown in Figure 10-1.
4. Select **SAP service / reference.**

Figure 10-1 Adapter Report Tab



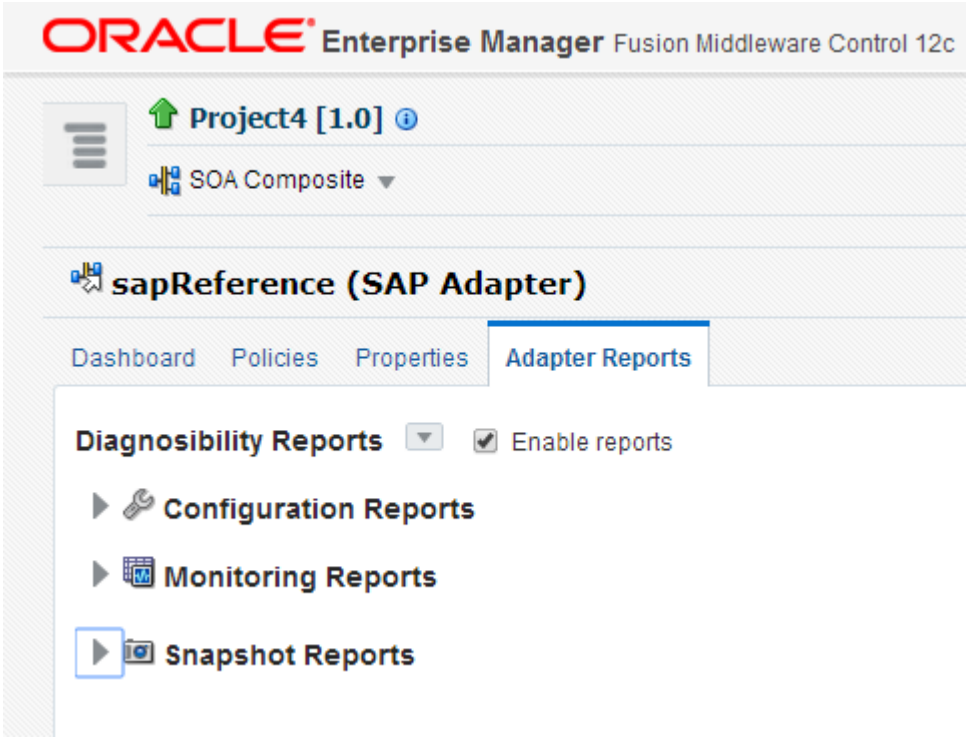
10.1.1 Configuration Report

Configuration reports contain the information of ConnectionFactory, activation and binding properties for the SAP endpoint. ConnectionFactory summary provides information about JCo parameters defined for run-time as well as JNDI name and pooling information. It also shows SOA binding properties.

Perform the following steps to see configuration report:

1. Go to **SOA → soa-infra** and select your project.
2. Select **SAP service / reference**.
3. Click on **Adapter Reports** tab. To enable report, select **Enable Reports** check box, as shown in Figure 10-2.

Figure 10-2 Enterprise Manager Console



10.1.1.1 EIS Connectivity

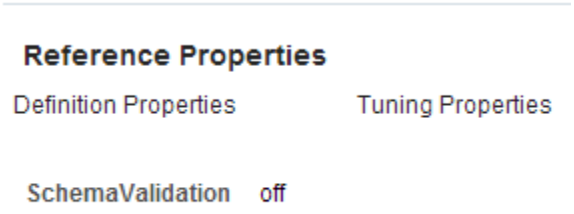
You can see ConnectionFactory configuration in **EIS Connectivity** section of health report. EIS Connectivity lists all properties of connection, as shown in Figure 10-3.

Figure 10-3 EIS Connectivity

Service/Reference Properties

Service properties tab lists all SOA properties that are used with this composite, as shown in Figure 10-4.

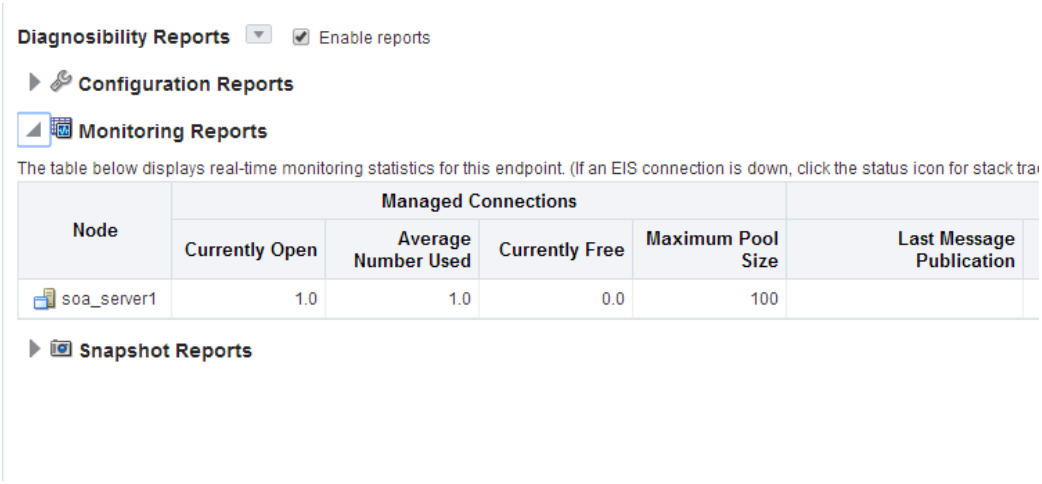
Figure 10-4 Service Properties Tab



10.1.2 Monitoring reports

Health report displays real-time connectivity status of the adapter with EIS. This gives current connection status, incaseif it is connected to EIS, total open connections from pool, peak load, pool size etc. You can see connectivity report in monitoring reports, as shown in Figure 10-5.

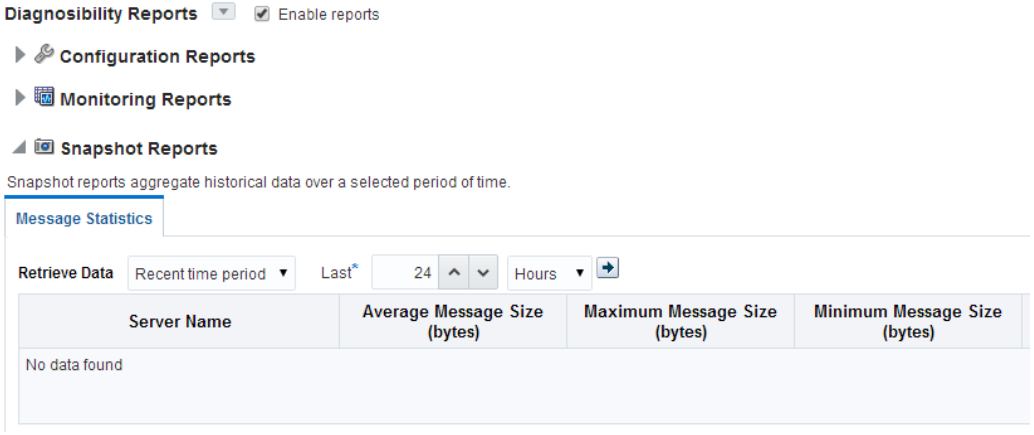
Figure 10-5 Monitoring reports



10.1.3 Snapshot Reports

This report shows how many messages have been consumed by this adapter instance, maximum size, average message size etc. You can also get historical data based on date selection, so you can define the time boundaries to get the message statistics, as shown in Figure 10-6.

Figure 10-6 Snapshots Reports



11

Troubleshooting and Error Messages

The Adapter for SAP enables the configurable logging for debugging connection and other related issues.

The Adapter for SAP supports the adapter diagnostic framework for reporting and alerting. This provides run-time adapter diagnostic information as read only reports in EM console. The framework also provides some alerting functionality.

The Adapter for SAP collects and provides reporting data per service/reference endpoint for each composite. Endpoint reports capture useful information like EIS connectivity, transaction, message, fault, downtime statistics etc.

The diagnostic reporting is configurable. There are knobs to turn it off when required. There is a generic alerting framework for sending normal alerts and rules based alerts. The Adapter for SAP provides design-time and run-time support to use the alerting framework.

This chapter mentions the possible errors that could occur while using the Adapter for SAP. These areas of error messages include SAP side error messages, Adapter Design-time issues and Adapter Run-time issues.

This chapter contains the following topics:

- Section 11.1, "Log file Information"
- Section 11.2, "Oracle Adapter for SAP Design-time JDeveloper"
- Section 11.3, "Oracle Adapter for SAP Run-time"
- Section 11.4, "SAP R/3"
- Section 11.5, “Known Issues”

11.1 Log file Information

Log file information that can be relevant in troubleshooting can be found in the following locations based the adapter installation:

For Oracle SOA Suite:

```
<ORACLE_HOME>\soa\user_projects\domains\${soa_server
domain}\servers\${soa_server name}\logs\soa-server_diagnostic.log
```

For OSB:

```
<ORACLE_HOME>\soa\user_projects\domains\${osb_server
domain}\servers\${osb_server name}\logs\osb-server_diagnostic.log
```

- The Oracle Adapter for SAP trace information can be found under the following directory:

For JCO trace at server level:

```
<ORACLE_HOME>\user_projects\domains\${domain name}\tracename.trc
```

11.2 Oracle Adapter for SAP Design-Time JDeveloper

Table 11-1 shows the common errors faced while using Adapter for SAP in JDeveloper.

Table 11-1 Adapter for SAP in JDeveloper

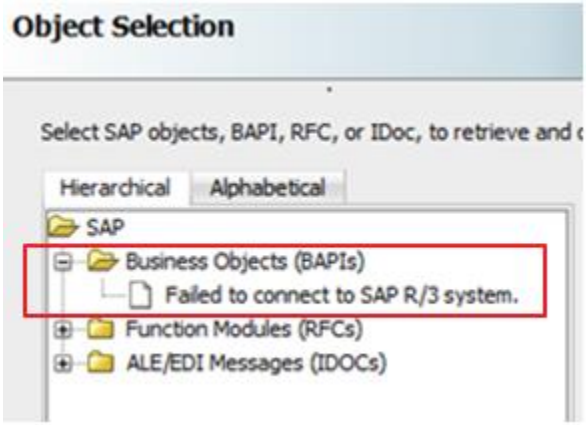
Error	Solution
SAP JCo library is not accessible.	The relevant SAP JCo jars should be kept in the design-time: *<oracle_home>*\soa\plugins\jdeveloper\integration\adapters\lib folder and restart JDeveloper.
Test connectionFAILED w/parameters: com.sap.conn.jco.JCoException: (103) JCO_ERROR_LOGON_FAILURE: Name or password is incorrect (repeat logon) on {IP ADDRESS…} sysnr XX.	Check the SAP logon credentials and ensure correct parameters are entered.
ERROR partner {I.P. ADDRESS…} not reached Exception Key = JCO_ERROR_COMMUNICATION Exception String = com.sap.conn.jco.JCoException: (102) JCO_ERROR_COMMU NICATION: Connect to SAP gateway failed Connection parameters: TYPE=A DEST=DefaultClient ASHOST= {I.P. ADDRESS…} SYSNR=XX PCS=X.	Ensure that your SAP system is up and running and give correct credentials.
JCO_ERROR_LOGON_FAILURE: Client 080 is not available in this system on {I.P. ADDRESS…}sysnr XX.	Check client number in the connection page of the Adapter wizard.
Parameter logon language ('lang') code 'enn' is invalid.	Check language entered in the connection page of the Adapter wizard.
SAPConnector: missing or invalid property.	Check whether you have missed out any mandatory field value in the connection page.
JCO_ERROR_COMMUNICATION: Connect to message server host failed.	Check message server credentials.
JCO_ERROR_COMMUNICATION: Connect to message server host failed ERROR service 'SFVSDD' unknown.	Check message service name in connection page.
JCO_ERROR_COMMUNICATION: Connect to message server host failed. ERROR Group PUBLI not found	Check your server group name in connection page.

Table 11-1 Adapter for SAP in JDeveloper Continues

Error	Solution
Object selection page fails to load the SAP objects with error “Failed to connect to SAP R/3 system”.	Check whether connection to SAP is successfully established using test connection.
RFC_ERROR_PROGRAM: Configuration of destination DefaultClient is incomplete: Parameter SNC partner name ('snc_partnername') is missing.	Check your SNC name and the partner name.

- Failed to connect to SAP R/3 system at the **Object Selection** window of the design-time, as shown in Figure 11-1. This is because SAP is not reachable at the given connection credentials on the Connection Information page of design-time.

Figure 11-1 Failed to Connect to SAP R/3 System Error



11.3 Oracle Adapter for SAP Run-Time

Table 11-2 shows the common errors faced in the SOA server Run-time.

Table 11-2 Error in SOA server Run-time

Error	Solution
Client 080 is not available in this system on {IP ADDRESS…} sysnr XX	Enter correct DestinationDataProvider_JCO_CLIENT .in the WebLogic console-JNDI properties.
Connect to SAP gateway failedConnection parameters: TYPE=A DEST=dummyFactory ASHOST= {I.P ADDRESS…}SYSNR=XX PCS=X	Enter correct DestinationDataProvider_JCO_ASHOST in the WebLogic console –JNDI properties.
<exception>Select one of the installed languages on {I.P ADDRESS…} sysnr XX</exception>	Enter correct DestinationDataProvider_JCO_LANG in the WebLogic console - JNDI properties.

Table 11-2 Error in SOA server Run-time Continues

Error	Solution
No credential provided	Check that the JNDI name is correct while deploying the project.
<exception>Name or password is incorrect (repeat logon) on {I.P ADDRESS…} sysnr XX</exception>	Enter correct DestinationDataProvider_JCO_PASSWD or DestinationDataProvider_JCO_USER in the WebLogic console - JNDI properties
<exception>ZRFC_EC_BD14 not found in SAP.</exception>	Check whether the object exists in SAP.
Error deploying the composite on soa_server1: Composite with same revision ID already exists: default/ANCD!1.0.	Check whether the project is already deployed on the server.
java.net.ConnectException: Connection refused: connect; No available router to destination.	Check whether the SOA server is up and running.

Note: In BAPIs and RFCs , if the Sap Object is returning a record with error code 'E' in the in the export(return) table, then the BAPI will fail at runtime by throwing the error message. This is applicable even if the Sap Object returns the error message along with the output data.

In the scenario, where the SAP Object (RFC/BAPI) returns an exception and data, Adapter for SAP returns only data in runtime. But in design time test functionality, only exception is thrown.

In the scenario, where the SAP Object (RFC/BAPI) returns only exception without any data in output tables, Adapter for SAP throws the exception both in runtime and designtime

Note: For some BAPIs we need to pass internal versions of the inputs as these BAPIs will execute some conversion routines to convert the input values to their internal versions (like adding the required no. of zeroes.) and these routines do not get executed when they are called externally via Adapter.

For the SAP Object (RFC/BAPI) ,if any meta data changed in SAP side , then need to restart the server to reflect the changes in current Adapter instance.

When the user is posting multiple IDOC in one request, the Adapter will split those individual IDOCs and post in SAP. User should pass multiple Idocs in such format like,each control record has to be followed by its corresponding data record.

The Adapter for SAP doesn't support SAP custom objects with optional table structure .User needs to change from optional to mandatory.All SAP standard objects only support table structure as mandatory parameter.

If the user is processing the data by using queue and the queue is not existing at SAP side ,the message will not get processed , since the queue will be created in SAP system but has to be activated manualy each time to reprocess the data .

11.4 SAP R/3

Table 11-3 shows the common errors returned back from SAP JCo and can be seen in the SOA server logs:

Table 11-3 Error in SOA Server Logs

Error	Solution
com.sap.conn.jco.JCoException: (103) JCO_ERROR_LOGON_FAILURE: Client XXX is not available in this system on {I.P ADDRESS…} sysnr XX".	Enter correct DestinationDataProvider_JCO_CLIENT in the WebLogic console-JNDI properties.
com.sap.conn.jco.JCoException: (102) JCO_ERROR_COMMUNICATION: Connect to SAP gateway failed	Connection parameters: TYPE=A DEST=dummyFactory ASHOST= {I.P. ADDRESS…} SYSNR=XX PCS=X Enter correct DestinationDataProvider_JCO_ASHOST

Table 11-4 shows the loss of message issues commonly faced in case of inbound and outbound processing:

Table 11-4 Issues in Inbound/Outbound Message Transactions

Error	Solution
IDoc's triggered from SAP are not received by SOA or the Adapter.	To verify ALE configuration, Check in we02 to verify for the IDoc status to be in Status 03 and validate the port, partner,
IDoc's are successfully sent with status 03 in we02, and still the IDoc's are not received by SOA.	Perform the connection test of the RFC Destination where the program ID is assigned and check if it is successful.
IDoc status is we02 is 03 and Connection test is successful. But still the IDoc's are not received by SOA.	Go to SMGW, check for number of servers which are connected to the program ID. If there are multiple servers connected to same Program ID, then the IDocs might be going to different server.
IDoc status is we02 is 03 and Connection test is successful and also there is only one server has registered to that program ID. But still the IDoc's are not received by SOA.	Check in SM58, if the IDoc's stuck in the transactional pool.

11.5 Known Issues

1. **No Help content appear in Japanese Language for Adapter Design Time screens:** When JDevelper is configured to work with Japanese language, all help content appears in English instead of Japanese. Awaiting Translation Resource Bundle.
2. **Error When Processing Payload for Extended IDOCs (Intermediate Documents):** The following error occurs while processing payload for an extended IDOC.

```
oracle.cloud.cpi.common.core.CpiException:
oracle.tip.adapter.sa.impl.fw.ext.org.collaxa.thirdparty.apach
e.wsif.WSIFException:
file:/home/oracle/oic_connection_agent/agenthome/agent/data/f4
68bd10-d06e-431e-b24e-
63ab1f6dac2c/Send_Worker_to_SAP_REQUEST.wsdl
[Send_Worker_to_SAP_REQUEST_PT::HRMD_A09.ZHRMD_A09(parameters,
parameters) ] - WSIF JCA Execute of operation
'HRMD_A09.ZHRMD_A09' failed due to:
SAP-IDC-O-INV-PL-1.
Adapter Exception: Payload processing error.
; nested exception is:
BINDING.JCA-00001
SAP-IDC-O-INV-PL-1.
AdapterException: Payload processing error.
The payload does not correspond with the selected Idoc fault.
```

Solution: When you map an IDOC that is to be send to SAP from Oracle Integration, ensure that you map all mandatory fields. In Mapper, map the source **CIMTYP**, **MESTYP**, and **IDOCTYP** to the target **CIMTYP**, **MESTYP**, and **IDOCTYP**. Ensure that you add/pass the value to the **CIMTYP** for payloads. In addition, ensure that values are passed as follows:

- Standard IDOC type for **IDOCTYP**
- Extended IDOC for **CIMTYP**
- A standard message type for **MESTYP**

See the below examples for `matmas` (IDOCs) and `HRMD_A09` (IDOCs) groups.

```
<urn:IDOCTYP>MATMAS01</urn:IDOCTYP>
<!--Optional:-->
<urn:CIMTYP>ZMATMAS01_EXT</urn:CIMTYP>
<!--Optional:-->
<urn:MESTYP>MATMAS</urn:MESTYP>
```

```
<urn:IDOCTYP>HRMD_A09</urn:IDOCTYP>
<!--Optional:-->
<urn:CIMTYP>ZHRMD_EXT</urn:CIMTYP>
<!--Optional:-->
<urn:MESTYP>HRMD_A</urn:MESTYP>
```

12 Migration Support

The SOA and OSB projects with iWay SAP Endpoints can be migrated over to Oracle Adapter for SAP using a migration utility within JDeveloper.

This chapter contains the following topics:

- Section 12.1, "Migration of SAP Endpoints in SOA Projects"
- Section 12.2, "Migration of SAP Endpoints in OSB Projects"
- Section 12.3, "Deploying the Adapter Migrated Project"
- Section 12.4, "Updating the JCA File in Migrated Projects"
- Section 12.5, "Execution Steps for Deployed Migrated Projects"

Prerquisites:

- The iWay projects to be migrated should have WSDL location in the JCA file. Absence of this will cause incorrect migration.
- The iWay project to be migrated should be working on the 12c environment. If the input project is incorrect, the migrated project will be malformed too.

Note: Although the migration tooling does not report all possible errors in the input iWay projects but it performs a basic check and reports errors detected in the migration or deployment process. For e.g., JCA or any other files not migrated with correct/required value or a WSDL file missing during deployment etc.

12.1 Migration of SAP Endpoints in SOA Projects

The Adapter for SAP must provide tooling to assist the user converting from the OEM version of iWay SAP Endpoints in SOA composite application to ones based on the Oracle Adapter for SAP.

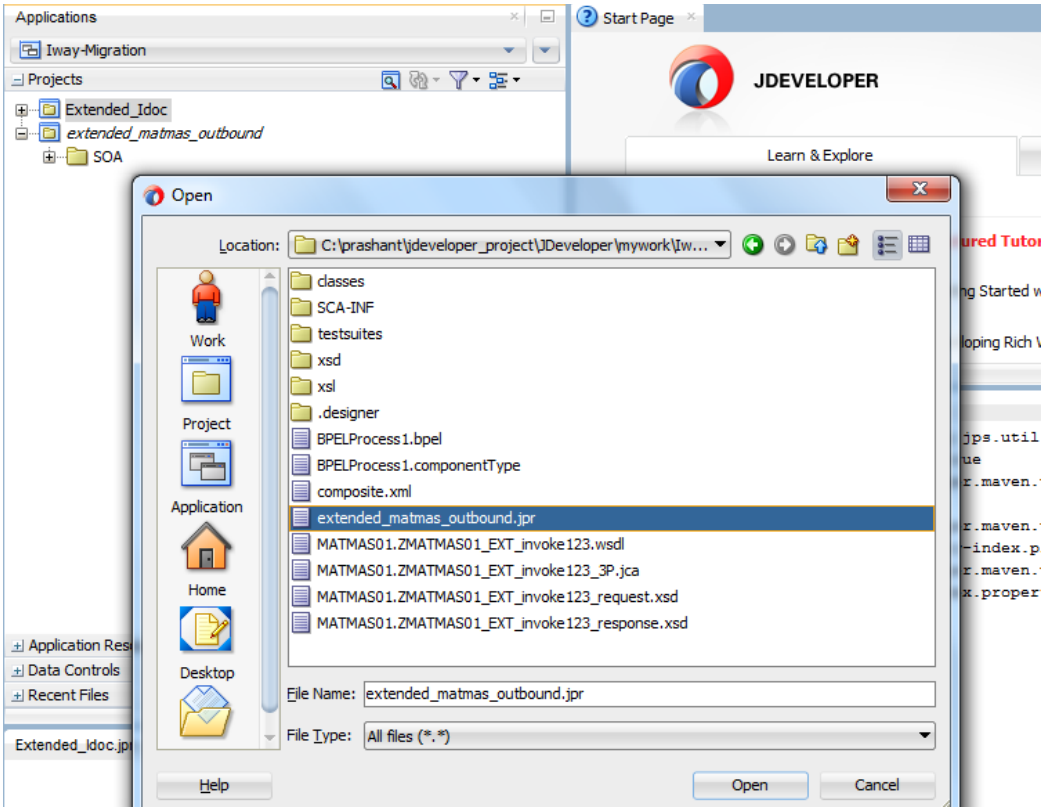
Given an existing SOA project with iWay generated SAP endpoints, the migration tooling must help to the user convert SAP endpoints in the SOA composite. After the conversion, the migrated project must:

- Reuse iWay generated XSD and WSDL files to minimize component interface changes required within the SOA composite.
- Generate a new JCA property file to replace the iWay SAP endpoint in the SOA composite.
- Work in the SOA run-time without the iWay adapter.

Steps to migrate iWay Adapter into The Adapter for SAP from JDeveloper:

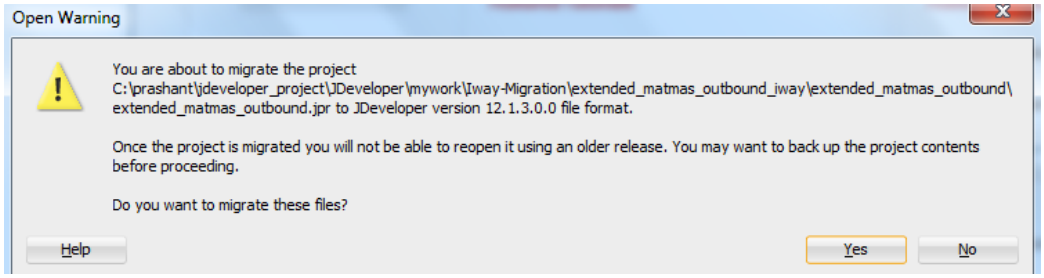
1. Open iWay project in to 12.1.3 JDeveloper, as shown in Figure 12-1.

Figure 12-1 Open iWay project in 12.1.3 JDeveloper



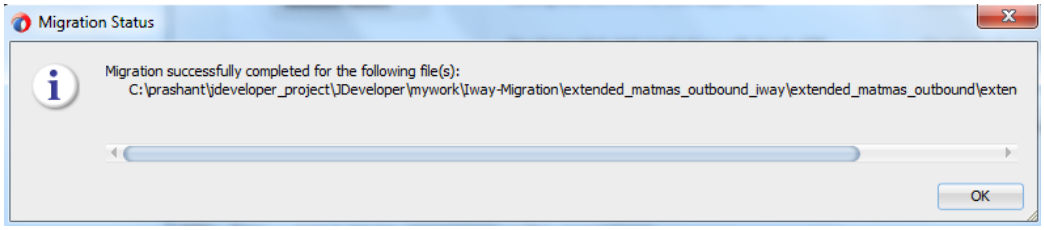
2. Once you click **Open** button, JDeveloper will try to migrate 11g project to 12.1.3 format. JDeveloper will popup a confirmation window, as shown in Figure 12-2.

Figure 12-2 Open Warning



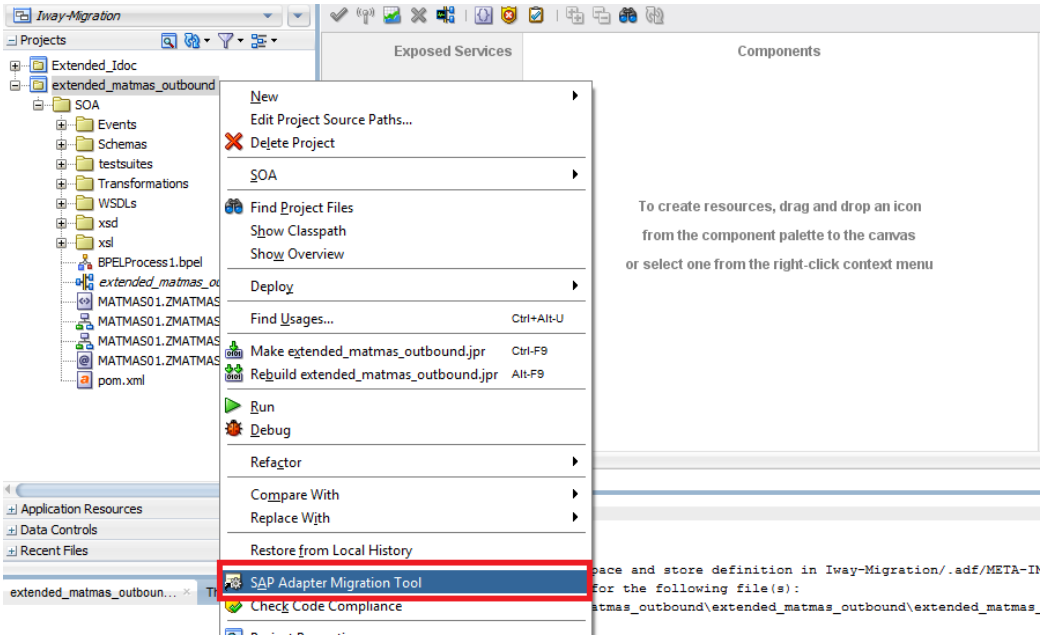
3. After 12.1.3 migration, JDeveloper will show up a migration summary pop-up, as shown in Figure 12-3.

Figure 12-3 Migration Status



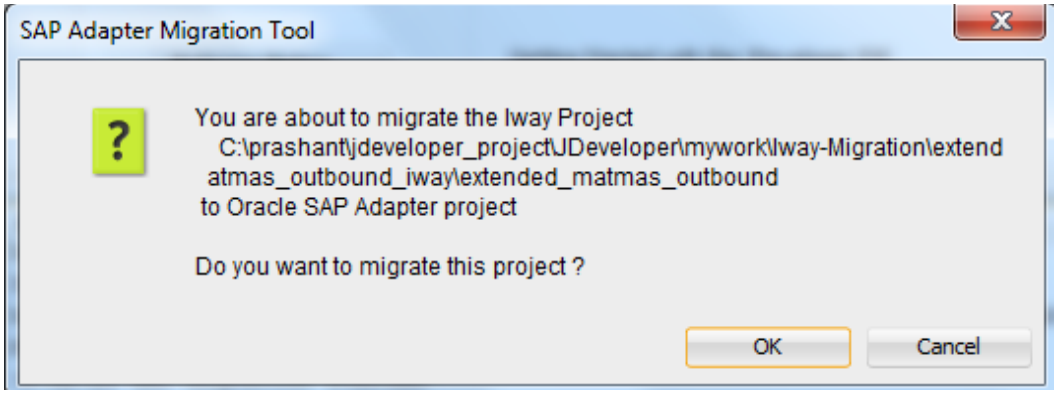
4. After 12.1.3 migration, now you can migrate this 12.1.3 iWay format project in to the Adapter project using **Adapter Migration Tool** from context menu highlighted by red rectangle, as shown in Figure 12-4.

Figure 12-4 Migration Tool



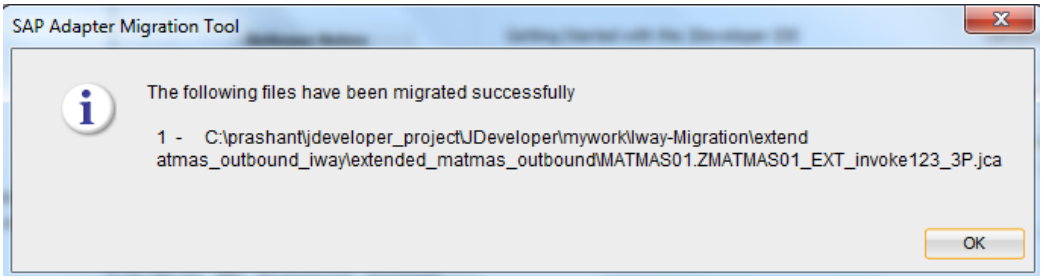
5. Once you clicked on **SAP Adapter Migration Tool** from context menu, confirmation window appears, as shown in Figure 12-5.

Figure 12-5 Confirmation Window



6. Once you confirmed the migration, project will migrate into the Adapter for SAP with a summary, as shown in Figure 12-6.

Figure 12-6 Migration Successful Message Window



7. Now your project is migrated successfully in to the Adapter project.

Notes:

- Adapter for SAP does not support migration of the projects that used the data types in XML-CDATA-ENVELOPED format.
- The Migrated projects do not have the jca property ProgramID at the design time level unlike the adapter projects.
- Changing/modifying the migrated project is not supported. The user can only deploy/run with the adapter in SOA run-time . If such a change is needed, the user need to remodel the project from scratch using Oracle's Adapter for SAP.

12.2 Migration of SAP Endpoints in OSB Projects

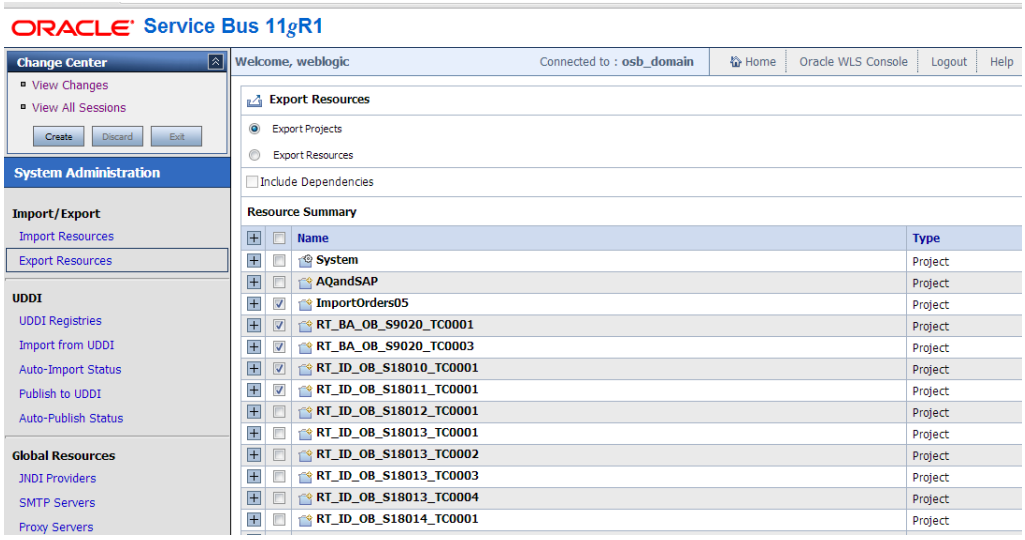
The OSB 11g projects consisting of an iWay adapter need to be migrated to 12.2.1 Adapter for SAP explicitly. The iWay adapter files in the project need to be updated to point to the new interaction specs and libraries pertaining to the Adapter for SAP in 12.2.1.

You can create a single configuration jar from OSB 11g sbconsole for multiple projects. The configuration jar for multiple projects can also be created using the Eclipse OEPE for OSB in 11g. This configuration jar when imported into 12.2.1 JDeveloper will import all projects and create directory structures for each.

Perform the following steps to migrate OSB 11g iWay projects to 12.2.1:

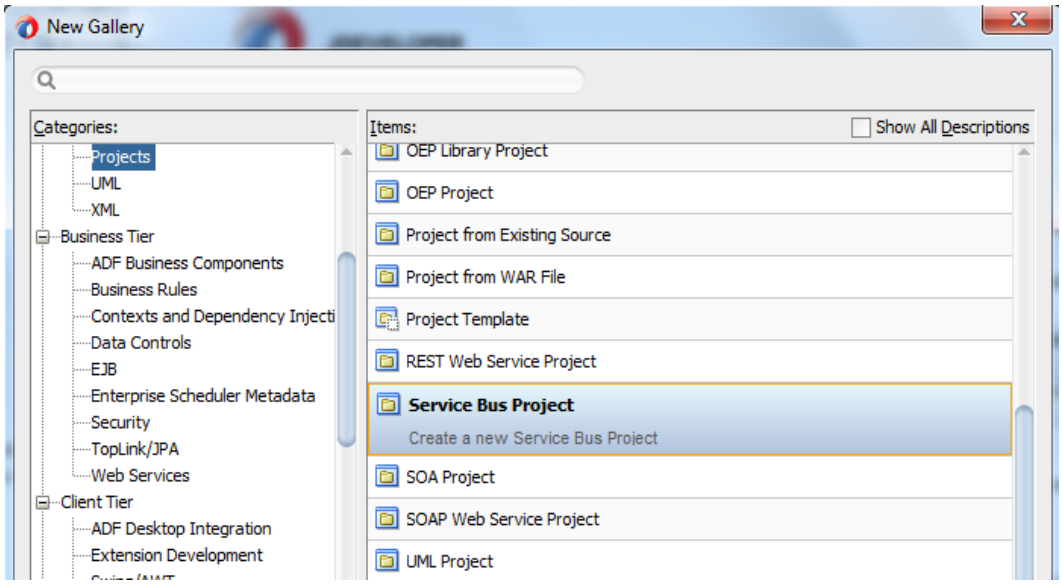
1. Create an 11g OSB configuration jar for the project (s) to be migrated, as shown in Figure 12-7.

Figure 12-7 Create an 11g OSB configuration jar



2. Create a new Service Bus Application in JDeveloper 12.2.1. Alternatively, you can also use an existing Service Bus Application, as shown in Figure 12-8.

Figure 12-8 Create new Service Bus Application

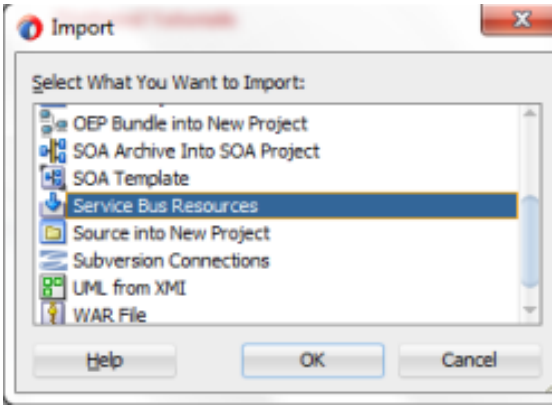


3. Import the configuration jar in JDeveloper 12.2.1 into the Service Bus Application created. It creates OSB project directories under the application. These directories and files conform to the 12.2.1 structure.

    a. Click on **File** menu and select **Import**.

    b. Select **Service Bus Resources** from list and then click **OK** as shown in Figure 12-9.

Figure 12-9 Import Window

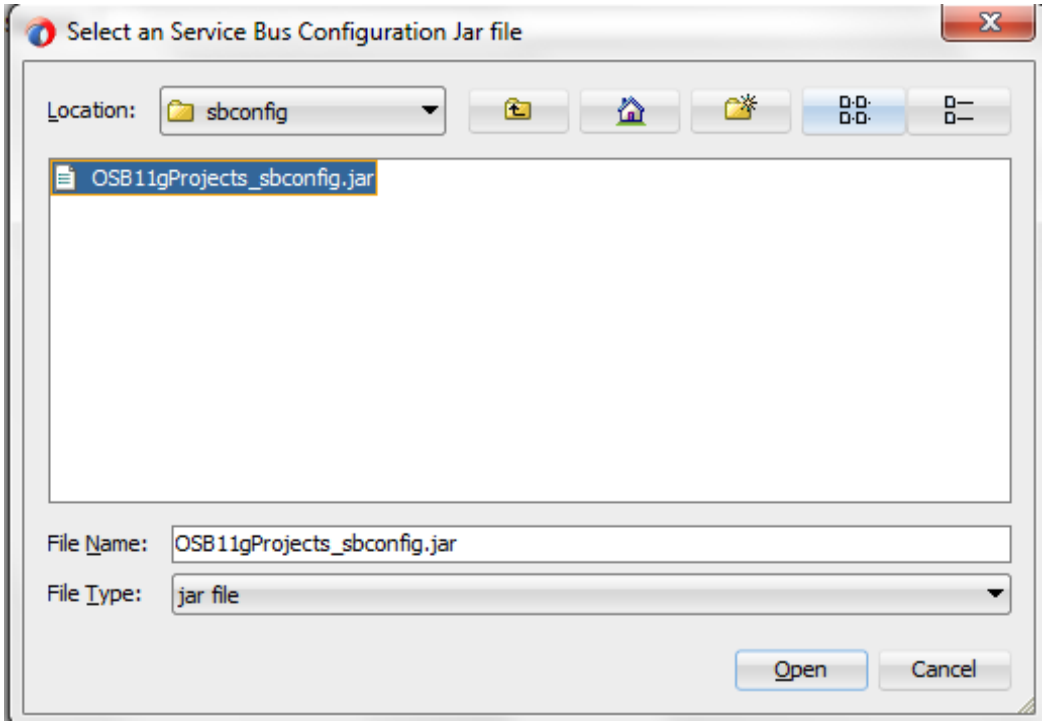


c. Select a type of resource to import. Click **Next**.

d. Browse for the Service Bus source by clicking on the **Search** icon**.**

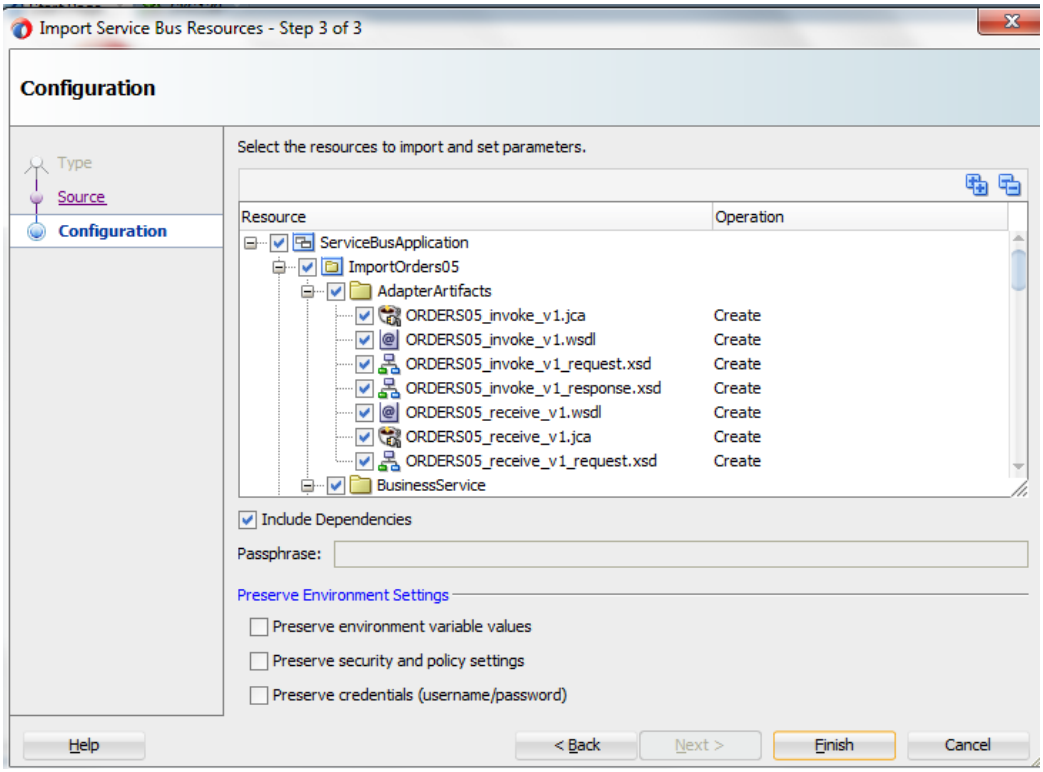
e. Select the service bus source and then click **Open**, as shown in Figure 12-10.

Figure 12-10 Select an Service Bus Configuration Jar



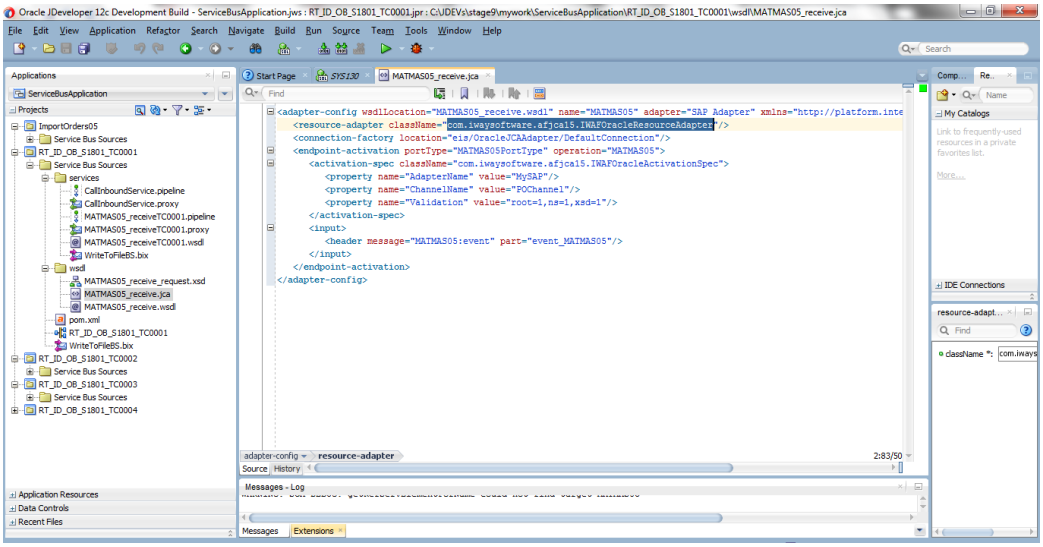
f. Select the resources to be imported and click **Finish**, as shown in Figure 12-11.

Figure 12-11 Select the Resources to Import



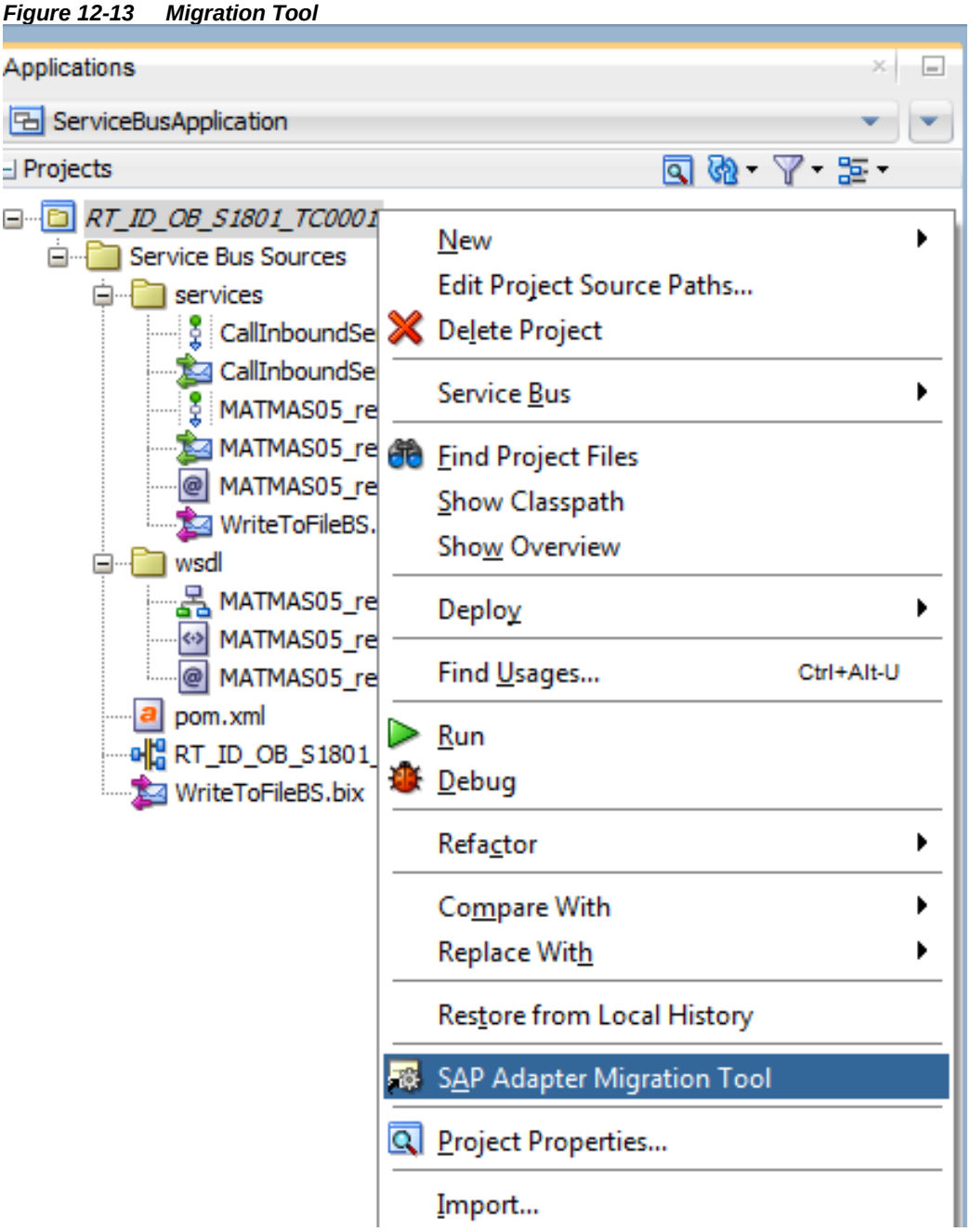
You would see the iWay related specifications in the jca file, as shown in Figure 12-12.

Figure 12-12 Specifications in jca



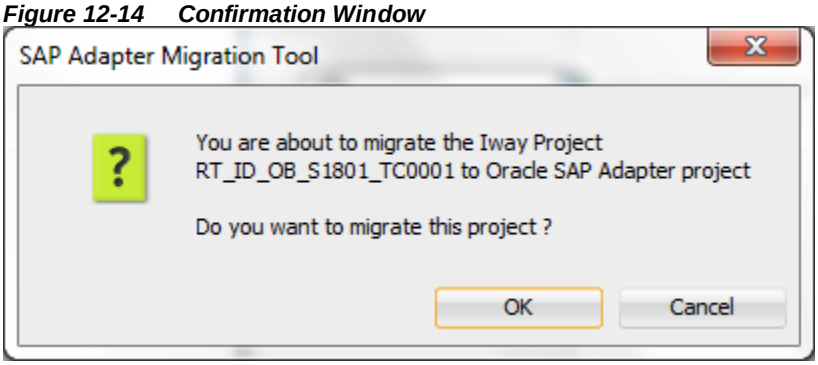
4. After migration, now you can migrate this iWay format project into the SAP Adapter project using SAP Adapter Migration Tool from the context menu.

Figure 12-13 Migration Tool



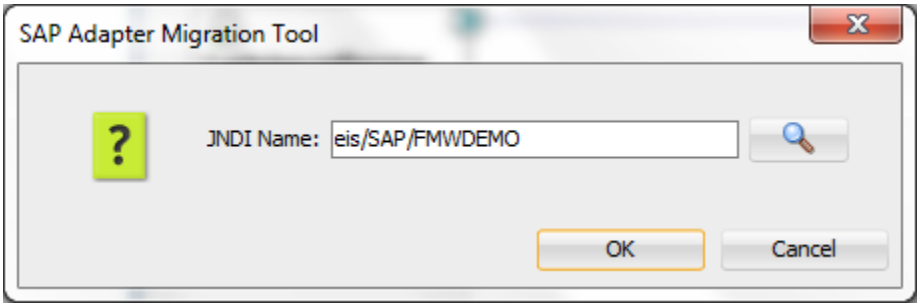
5. Once you clicked on SAP Adapter Migration Tool from context menu, the Confirmation Window appears.

Figure 12-14 Confirmation Window



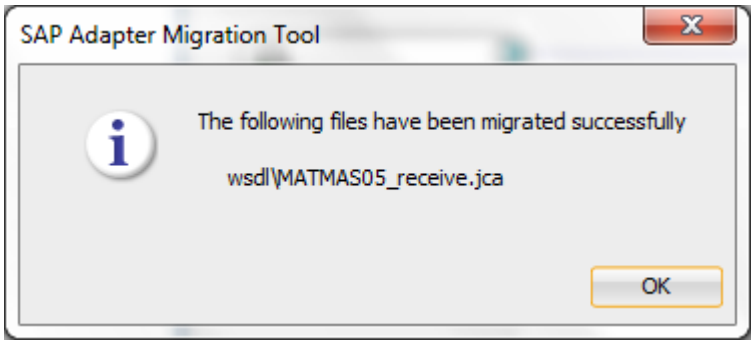
6. Once the user click on **OK**, give the appropriate JNDI name.

Figure 12-15 JNDI Naming Window



7. Once you confirmed the JNDI name, project will migrate into the SAP Adapter with a summary.

Figure 12-16 Confirmaion Window



8. The project is successfully migrated into the SAP Adapter project.

Note: After deploying the project, if the user observes any entry related to eis/OracleJCAAdapter/DefaultConnection JNDI in the diagnostic log, JDeveloper clean is required. After cleaning the JDeveloper, redeploy the project.

12.3 Deploying the Adapter Migrated Project

To deploy the Adapter project, you can follow the same procedure asdescribed in section 7.6 "Deploy the Defined Process".

12.4 Updating the JCA File in Migrated Projects

The user can add the below Segment Release property to the JCA file in migrated projects.

<property name="SegRelease" value="value"/>

For example,

<property name="SegRelease" value="30c"/>

12.5 Execution Steps for Deployed Migrated Projects

Perform the following steps to execute the deployed migrated projects.

12.5.1 Inbound Project

After deploying the migrated projects, you are ready to test the migrated projects. You can follow the same procedure as described in section 7.7.2 “Test the Inbound Process”.

12.5.2 Outbound Project

After deploying the migrated projects, you are ready to test the migrated projects. You can follow the same procedure as described in section 7.7.1 “Test the Deployed Process”.

A

SAP System Configurations for Remote Processing

The Oracle's Adapter for SAP can communicate with SAP system using three SAP message types: BAPI, RFC, and IDoc. Each user in SAP has set of authorization profiles associated with them. These authorization profiles represent the roles that the person undertakes in their day-to-day work. For example, an Accounts Payable clerk would have an authorization profile for making payments to vendors. This authorization profile consists of a number of SAP authorizations. Typically, a user would have several roles and hence have several authorization profiles. This is often described as the user profile.

This chapter explains the user roles and authorizations required to make an RFC communication.

It also describes the detailed steps for all the SAP side configurations required for communication with the adapter.

This appendix contains the following topics:

- Section A.1, "Roles and Authorizations"
- Section A.2, "RFC Authorization Object"
- Section A.3, "SAP Inbound Communication"
- Section A.4, "SAP Outbound Communication"
- Section A.5, "SAP User Authorizations for Adapter"
- Section A.6, "SAP bgRFC Configuration"

A.1 Roles and Authorizations

SAP users are assigned access to the system using a "role" or "roles" that are based on the tasks they perform in their departments. A user's role includes the access he/she has in the components of SAP.
When remote call happens for a function module in SAP an authorization check is performed if the profile parameter auth/rfc_authority_check is set to 1.
The authorization object S_RFC is used to check whether the user defined in the destination has RFC authorization for the function group.

A.2 RFC Authorization Object

If you want to create a user in the SAP system, you can use the existing TR or you can use the below authorization table.

Object	Description	Fieldname	Value

S_RFC	The basic authorization object used to secure RFC access is	ACTVT	16
		RFC_NAME	SYST,RFC1,SDIFRUNTIME,SDTX,EDIMEXT,EDIN,ARFC,ERFC,
		RFC_TYPE	FUGR
S_TABU_DIS	Individual tables may be secured from access by using the following authorization object	DICBERCLS(Authorization Group)	Table: MARA is in group “MA”
		ACTVT	03(Display)

Object	**Description**	**Fieldname**	**Value**
B_ALE_RECV ALE/EDI:	Receiving IDocs via RFC		
S_IDOCCTRL			
		ACTVT	03,16
S_IDOCDEFT	Permitted activity	ACTVT	03
	Permitted Extension	EDI_CIM	' '
	Permitted IDOC Type	EDI_DOC	MATMAS01,MATMAS02,MATMAS05
	Executed Transaction	EDI_TCD	WE30

A.3 SAP Inbound Communication

In case of SAP inbound communication, Adapter for SAP acts as a client sending requests to SAP system.

Prerequisites:

Following entries need to be updated in the system where the Weblogic server is running:

1. Hosts File of the system (maintained in the ‘etc’ folder) should have the following entry:

   <IP> <Hostname> <Hostname with domain name>

2. Service File of the system (maintained in the ‘etc’folder) should have the following entries:

   sapgw<sysnr> 33<sys no>/tcp

   sapdp<sysnr> 32<sys no>/tcp

Here ‘sysnr’ is the system number of the SAP server.

To connect to SAP using Message server, following information need to be maintained in the Services File (maintained in the ‘etc’ folder) in addition to the above two entries:

sapms<SID> 36<sysnr>/tcp

Here SID is the system ID of SAP server.

ALE Inbound Configurations in SAP:

The following steps are required for inbound IDoc processing:

A.3.1 Configuring a Logical System.

A.3.2 Configuring a Partner Profile.

A.3.3 Configuring Inbound Process Code.

A.3.4 Configuring a Distribution Model.

A.3.1 Configure a Logical System

Prerquisites:

1. To connect to SAP using hostname, following entries need to be maintained in the Hosts file:

   <IP> <Hostname> <FQ Hostname>

2. To connect to SAP using MS, following info needs to be maintained in the Service file:

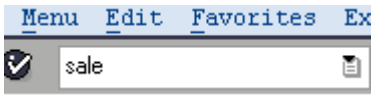
   Sapms<SID>36<sysnr>/tcp

Logical system is used to identify an individual client in a system, for ALE communication between SAP systems.

To define a logical system:

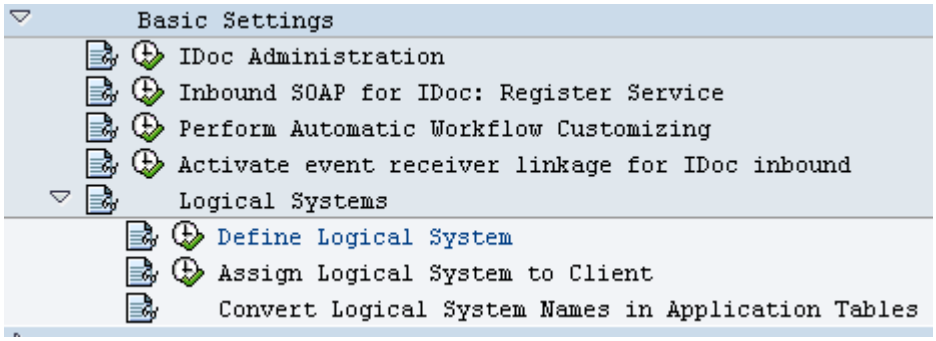
1. From SAP easy access screen, navigate to the SALE transaction, as shown in Figure A–1.

Figure A–1 SALE Transaction



2. Open the basic settings and then the Logical systems node, as shown in Figure A–2.

Figure A–2 Basic Settings

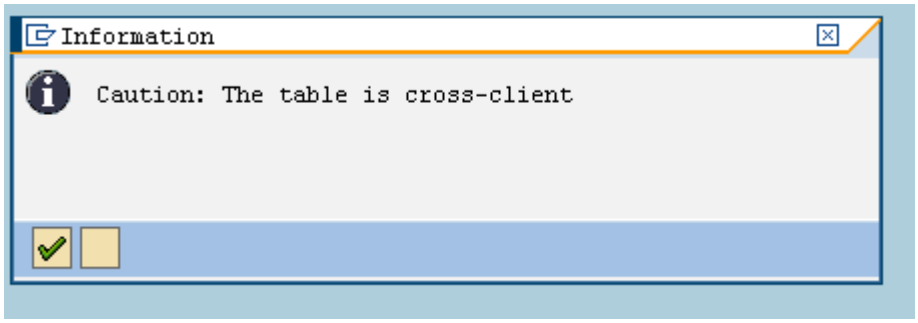


3. Click on **Define Logical Systems**, as shown in Figure A–3.

Figure A–3 Define Logical Systems

A popup window appears with the message, Caution: The table is cross-client, as shown in Figure A–4.

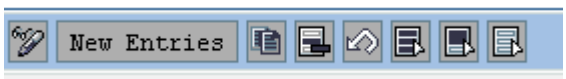
Figure A–4 Caution Window



4. Click on **Enter** button.

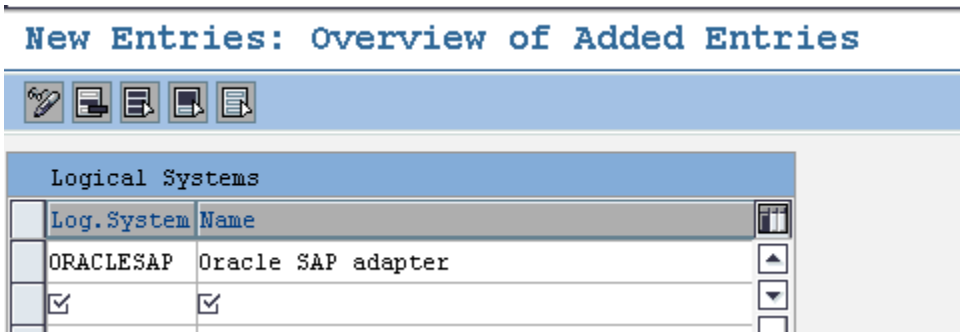
5. Click on **New Entries**, as shown in Figure A–5.

Figure A–5 New Entries Window



6. Enter the Logical System name and description, as shown in Figure A–6.

Figure A–6 Logical System Window

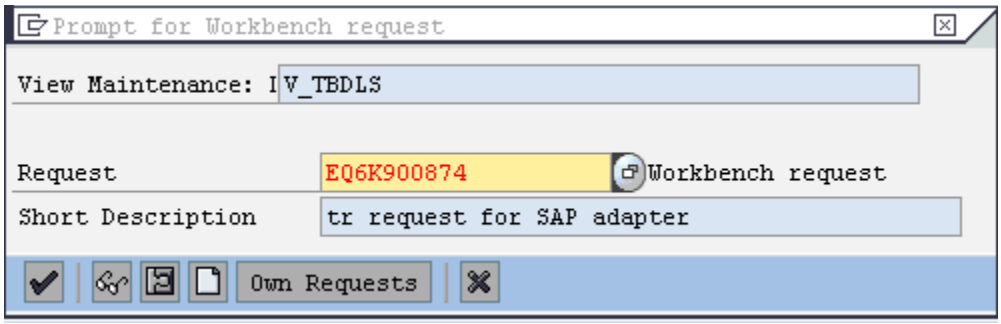


7. Click on **Save** icon, as shown in Figure A–7.

Figure A–7 Save Icon

8. A popup window appears for saving the objects in a transport request, as shown in Figure A–8.

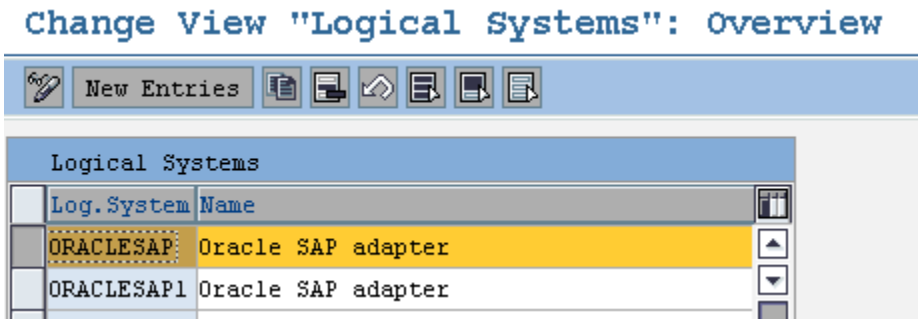
Figure A–8 Prompt for Workbench Request Dialog



9. Press **Enter**.

10. The entry for Logical System will now be visible in the table, as shown in Figure A–9.

Figure A–9 Logical System Entries Window



A.3.2 Configure a Partner Profile

In SAP, all partners systems involved in a distribution model have a profile. There exist several profile types such as customer's profiles, vendor's profiles, but this distinction between profiles is generally not necessary and you will create in most cases your partners profiles using a generic Logical System type.

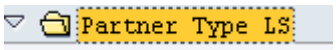
To Creating a Partner Profile:

1. Run the we20 transaction, as shown in Figure A–10.

Figure A–10 we20 Transaction

2. Click on, **Partner Type LS**, as shown in Figure A–11.

Figure A–11 Partner Type LS

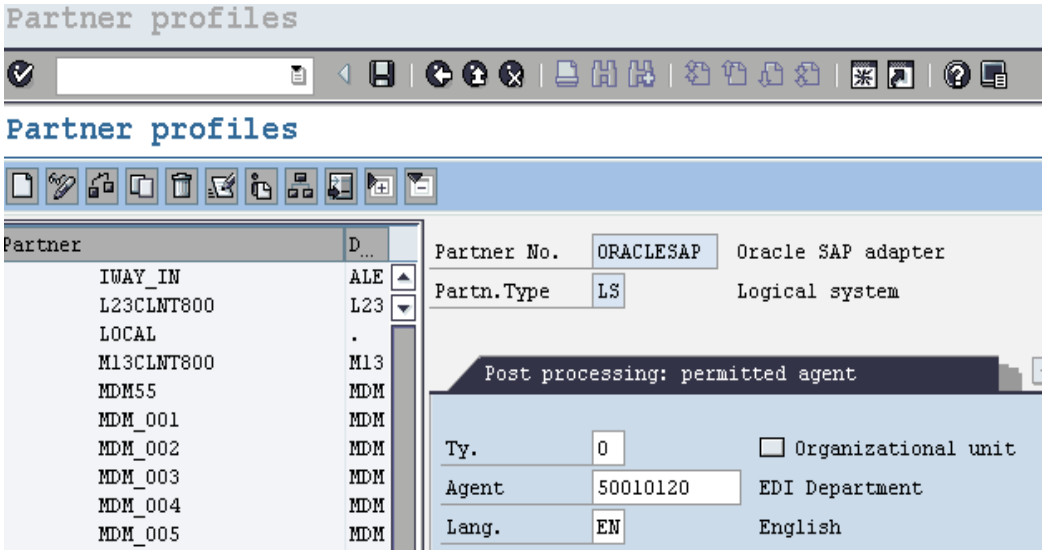


3. Click on **Create** icon, as shown in Figure A–12.

Figure A–12 Create Icon

4. Enter the partner no. which is the logical system name that was created earlier, as shown in Figure A–13.

Figure A–13 Partner Profiles



5. Click on **Save** icon, as shown in Figure A–14.

Figure A–14 Save Icon

6. Add the inbound parameters using **Add** icon, as shown in Figure A–15.

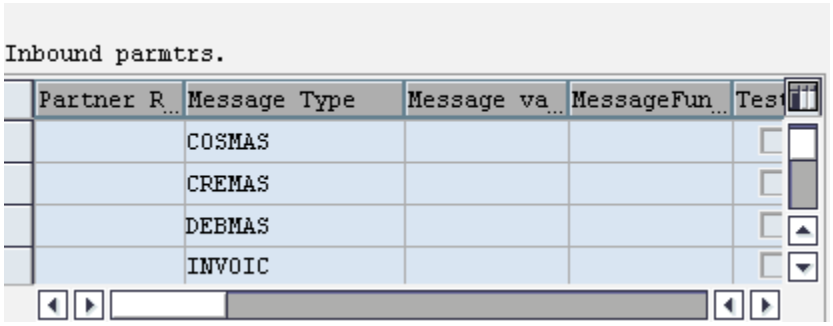
Figure A–15 Add Icon

For a sender partner system (inbound parameters are filled in), following important settings are set per message type in the partner profile:

- A process code used to indicate which function module will be used to convert the IDoc data to SAP data.
- The time of input of the IDoc: as soon as the IDoc is created in the system or on request (using program RBDAPP01).
- The post processing agent who will have to treat the data input errors if need be. The post processing agent may be either a user or any other HR organizational unit.

9. Enter the message types which need to be received from the partner systems, as shown in Figure A–16.

Figure A–16 Message Type



Multiple IDocs(Collected IDocs)
When using collected IDocs on any platform during inbound processing (service mode), if the DOCNUM field does not have a unique document number for each IDoc, the system creates an IDoc for each header record in the collected IDoc file and duplicates the data for each IDoc. Make sure the DOCNUM field is included in the EDI_DC40 structure and that each IDoc has a unique sequence number within the collected IDoc file

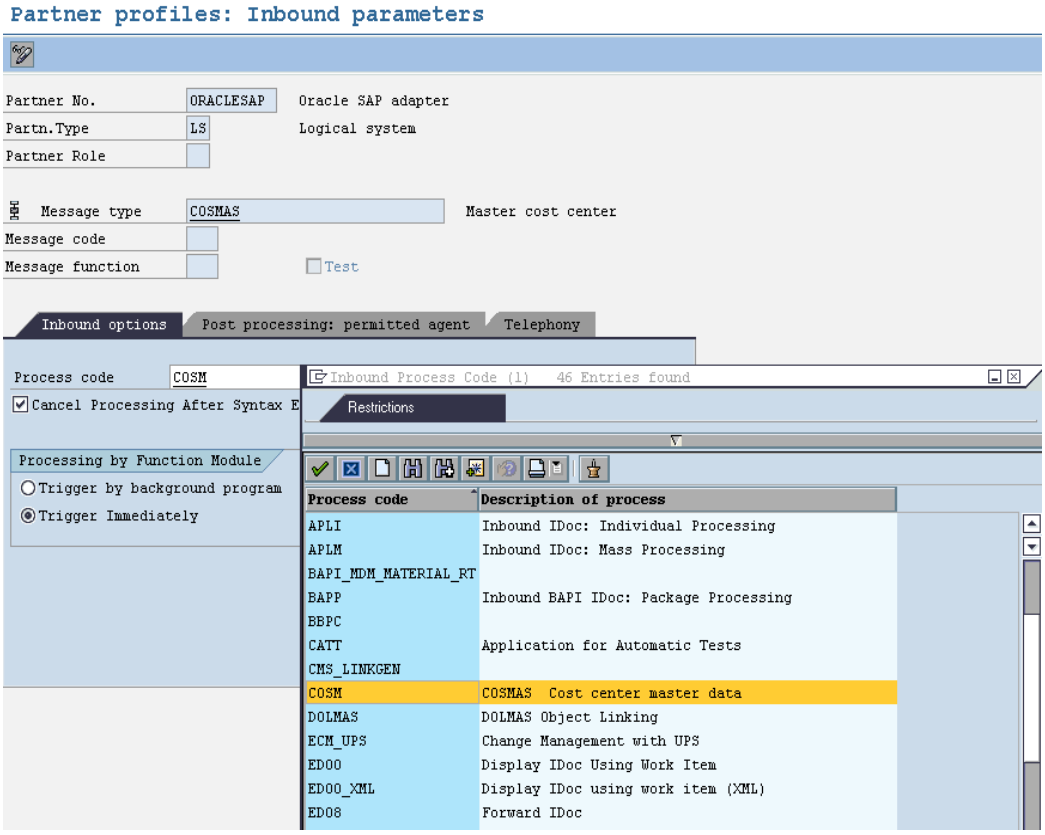
A.3.3 Configure Inbound Process Code

The process code contains the details of the Function Module that are used for IDoc processing. Message Type can be linked to the Process code.

To define the process code:

1. Click on the message type in inbound parameters.
2. Click on the process code and press F4 to get the process codes available in SAP system.
3. Choose the appropriate process code for that particular message type.
4. Check the Trigger Immediately radio button and Cancel processing after syntax error check box, as shown in Figure A–17.

Figure A–17 Partner Profiles, Inbound Parameters



5. Click on **Save** button.

A.3.4 Configure a Distribution Model

Distribution model determines the sender and receiver of the IDoc's and defines the transfer rules.

To create a distribution model:

1. Run the **bd64** transaction, as shown in Figure A–18.

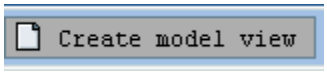
Figure A–18 bd64 Transaction

2. Click **Edit** icon, as shown in Figure A–19.

Figure A–19 Edit Icon

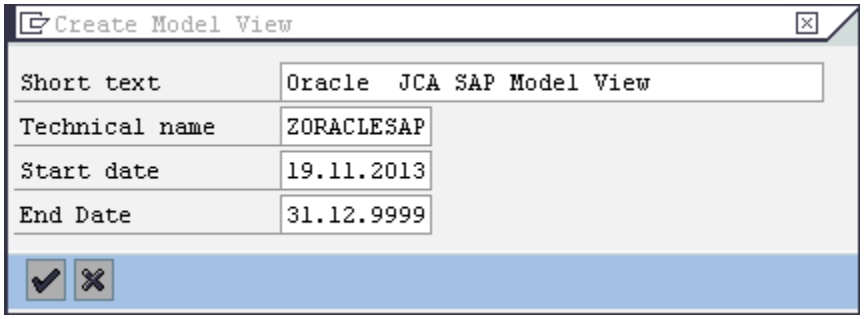
3. Click on the **Create model view** button, as shown in Figure A–20.

Figure A–20 Create Model View Icon



4. Enter the distribution model name and description, as shown in Figure A–21.

Figure A–21 Distribution Model Name and Description



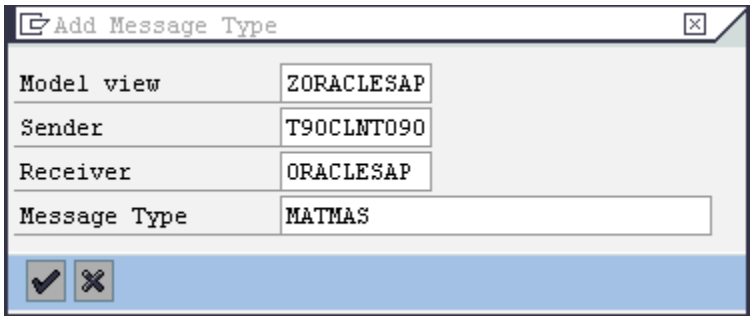
5. Highlight the model view created, as shown in Figure A–22.

Figure A–22 Model View

6. Click on the **Add message type** button.

7. Enter the **Sender** (Logical system maintained for that SAP system), **Receiver** (logical system name for partner system), and the **Message Type** which has to be sent to the partner system, as shown in Figure A–23.

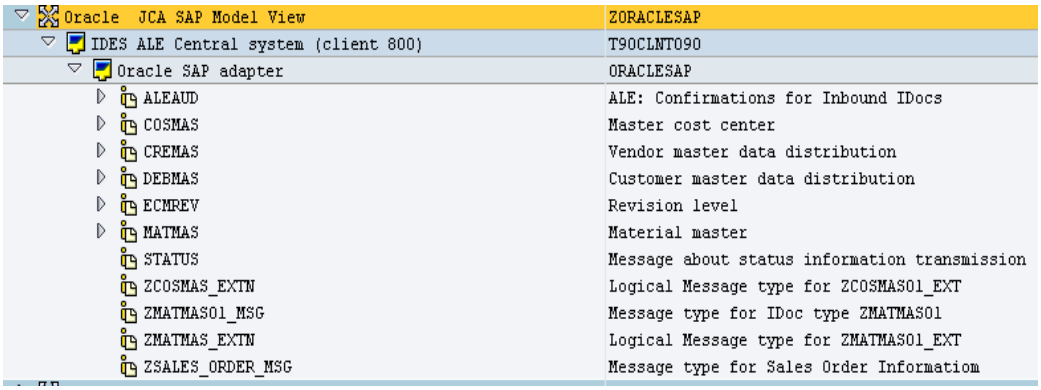
Figure A–23 Add Message Type



8. Add all required message types.

9. After adding all required message type, the model view will be look like, as shown in Figure A–24.

Figure A–24 Oracle JCA SAP Model View



A.4 SAP Outbound Communication

In SAP outbound communication, the Adapter for SAP act as a server receiving requests from SAP System.

Configurations:

For outbound SAP communication following configurations are required:

A.4.1 Configuring an RFC Destination and Program ID.

A.4.2 Creating a Port.

A.4.3 Configuring a Logical System.

A.4.4 Configuring a Distribution Model.

A.4.5 Configuring Partner Profile.

A.4.1 Configure RFC Destination and Program ID

An RFC destination may be seen as a set of settings necessary to connect to a system using the RFC protocol. These settings include the address and type of the partner system along with connection information such as the user ID and password to use.

The RFC destinations of all partners systems must be defined on all systems to include in the distribution model. The transaction to use for this purpose is SM59.

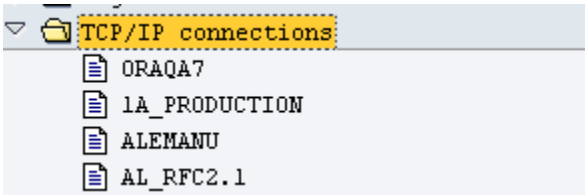
To define an RFC destination:

1. Navigate to the SM59 transaction, as shown in Figure A–25.

Figure A–25 SM59 Transaction

2. Click on **TCP/IP connections**, as shown in Figure A–26.

Figure A–26 TCP/IP Connections

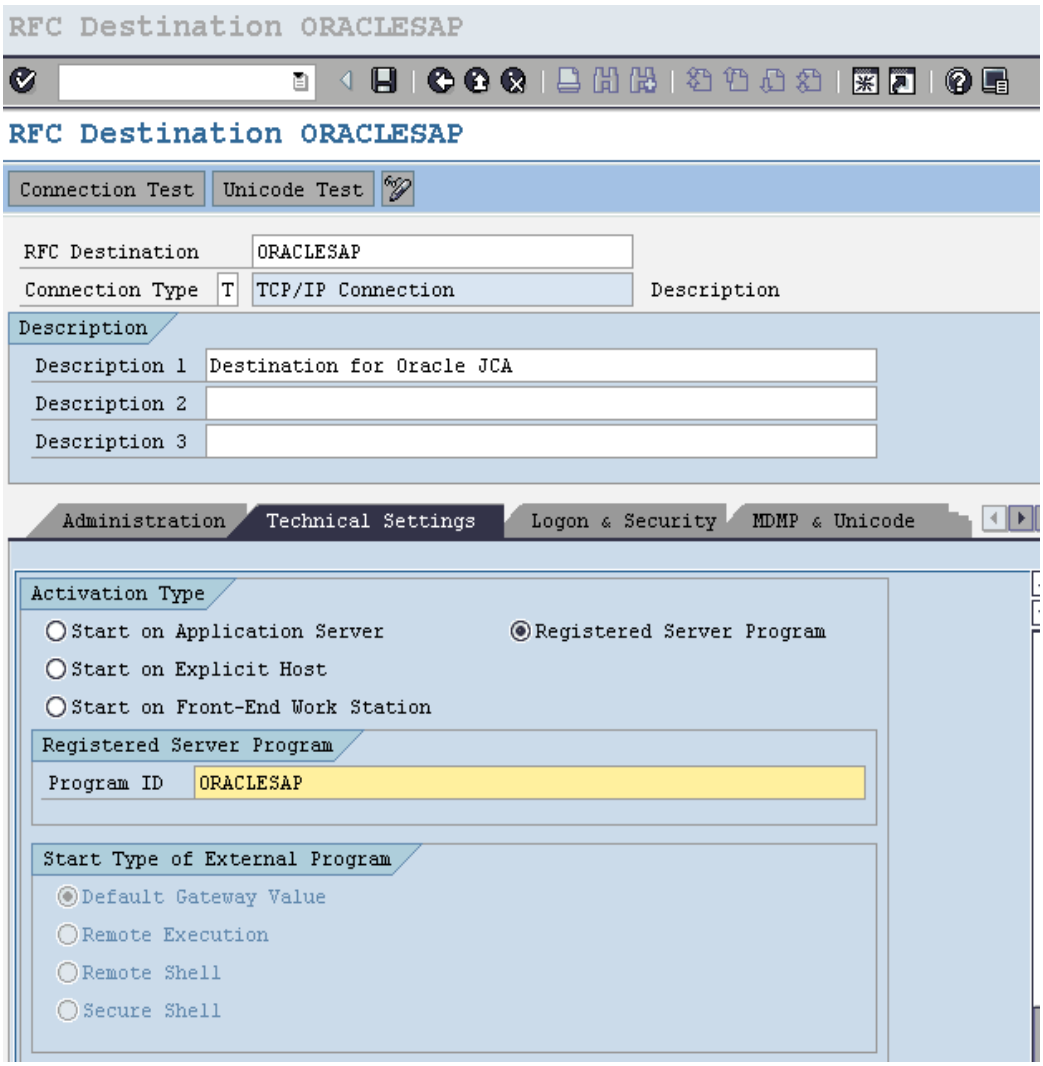


3. Click on **Create** icon, as shown in Figure A–27.

Figure A–27 Create Icon

4. Enter the RFC destination name and description along with program ID and click on **Registered Server Program**, as shown in Figure A–28.

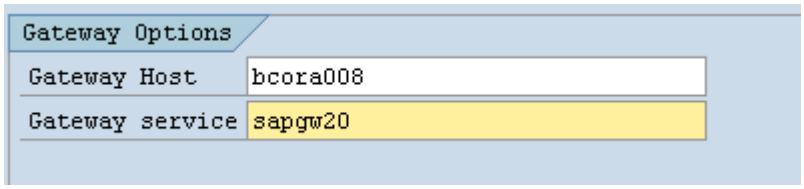
Figure A–28 RFC Destination ORACLESAP



An RFC server program registers itself under the Program ID.

5. Enter the **Gateway Host** and **Gateway Service** name, as shown in Figure A–29.

Figure A–29 Gateway Options



6. Click on **Save**, as shown in Figure A–30.

Figure A–30 Save Icon

The RFC destination is now configured.

Note: Program ID is Case Sensitive. For e.g., ORAQA1 is not same as oraqa1.

A.4.2 Configure a Port

IDoc Port contains the information about the way data is sent between the source or target system. The type of port defines the information contained within the port. For port type “Internet” Port will contain IP address of the target system. For port type “file”, directory or file name information is maintained. “tRFC” port contains information about the RFC destination of the target system. For IDoc transmission using ALE “tRFC” ports are used.

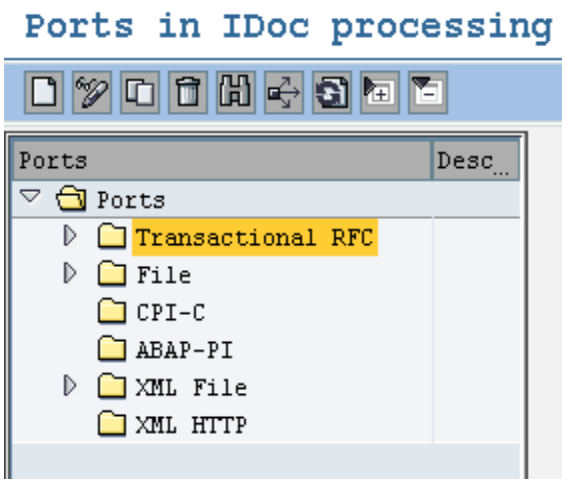
To creating a tRFC port:

1. Run the we21 transaction, as shown in Figure A–31.

Figure A–31 we21 Transaction

2. Click on transactional RFC, as shown in Figure A–32.

Figure A–32 Transactional RFC

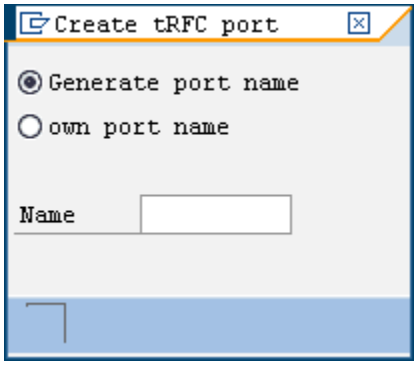


3. Click on **Create** icon, as shown in Figure A–33.

Figure A–33 Create Icon

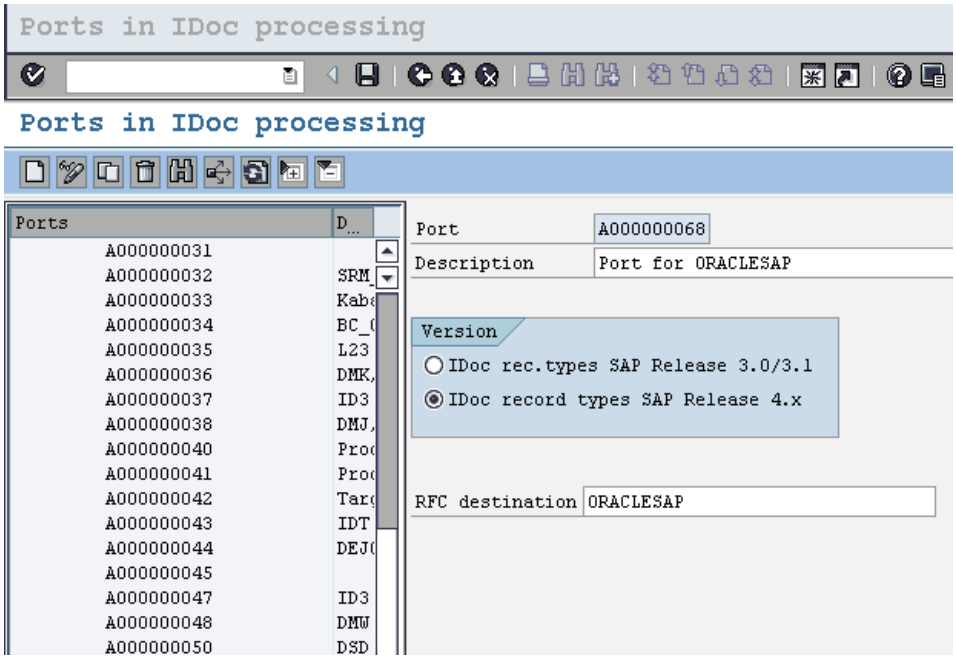
4. Click on **Generate port name** radio button or click on **own port name** radio button and enter your own port name, as shown in Figure A–34.

Figure A–34 Create tRFC Port



5. Enter the description in the **Description** field and the **RFC destination**, as shown in Figure A–35.

Figure A–35 RFC Destination



6. Click on **Save**.

A.4.3 Configure a Logical System

Configuration of Logical System is same as described in "Configure a Logical System" sections.

A.4.4 Configure a Distribution Model

Configuring a Distribution Model is same as described in "Configure a Distribution Model" sections.

A.4.5 Configure Partner Profile

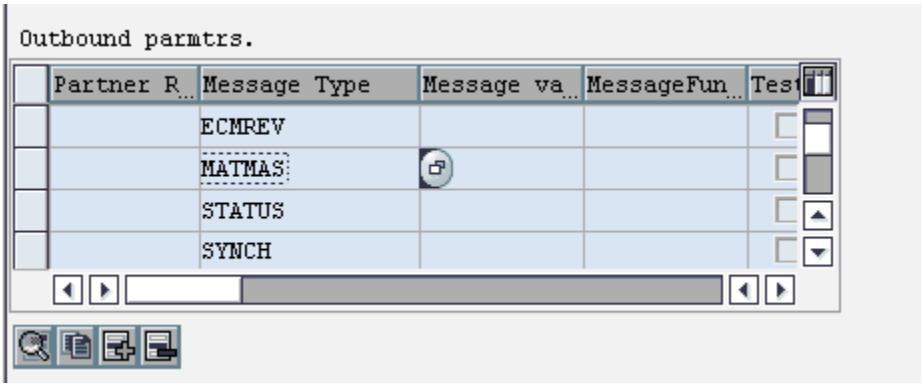
For a receiver partner system (outbound parameters are filled in), following settings are specified in the partner profile:

- The receiver port to which the data will be sent.
- The sending method: one IDoc at a time or by packets.
- The IDoc type that will be sent to that partner. For a given message type, the IDoc type sent may vary depending on the receiver system. Indeed you may have different versions of SAP in your system landscape.

Create partner profile as described in "Configuring Partner Profile" section and follow the below steps:

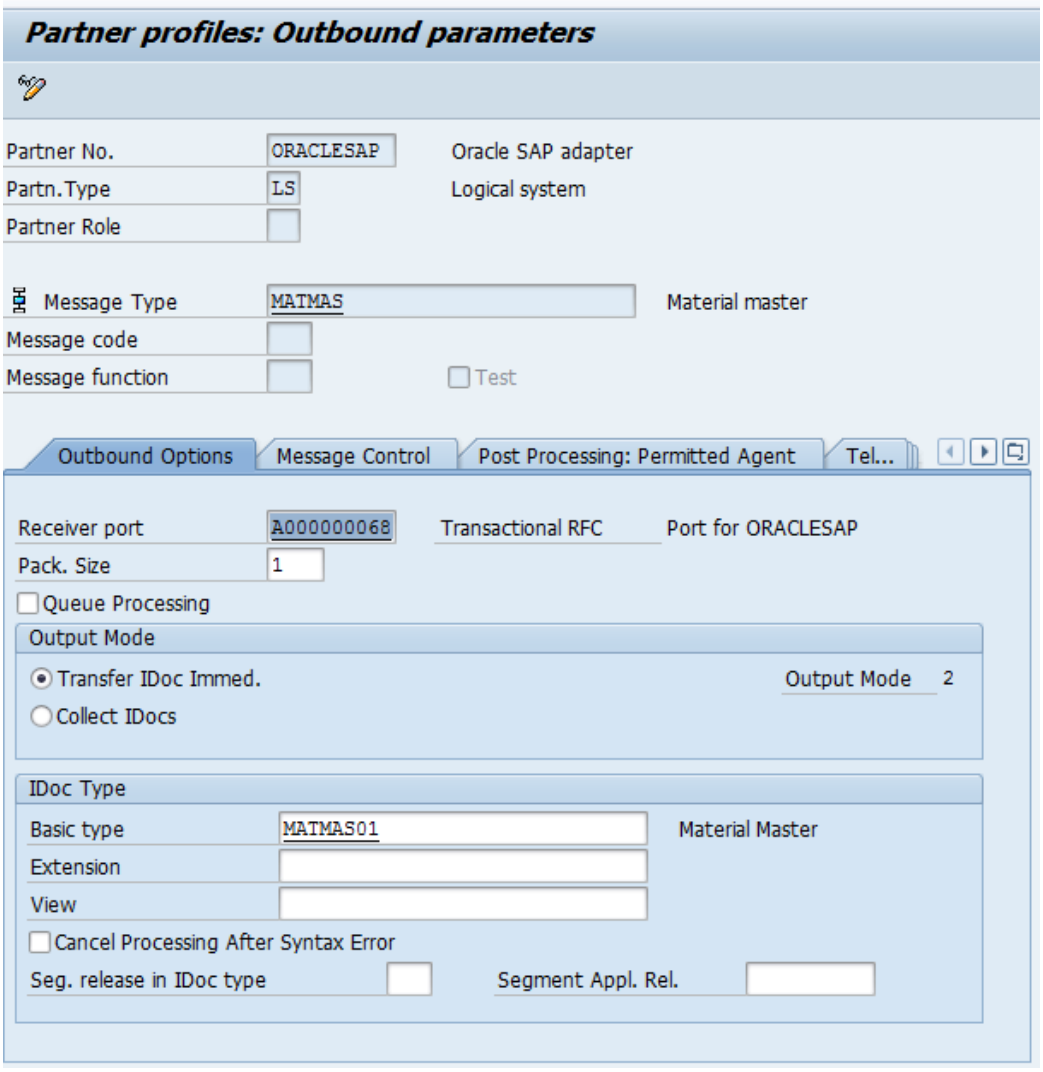
1. Enter the outbound parameters by clicking on the **Add** icon, as shown in Figure A–36.

Figure A–36 Outbound Parameters



2. Enter the **Message Type**, **Port name** and the **Basic type** for the particular message type, as shown in Figure A–37.

Figure A–37 New Entries: Overview of Added Entries Window

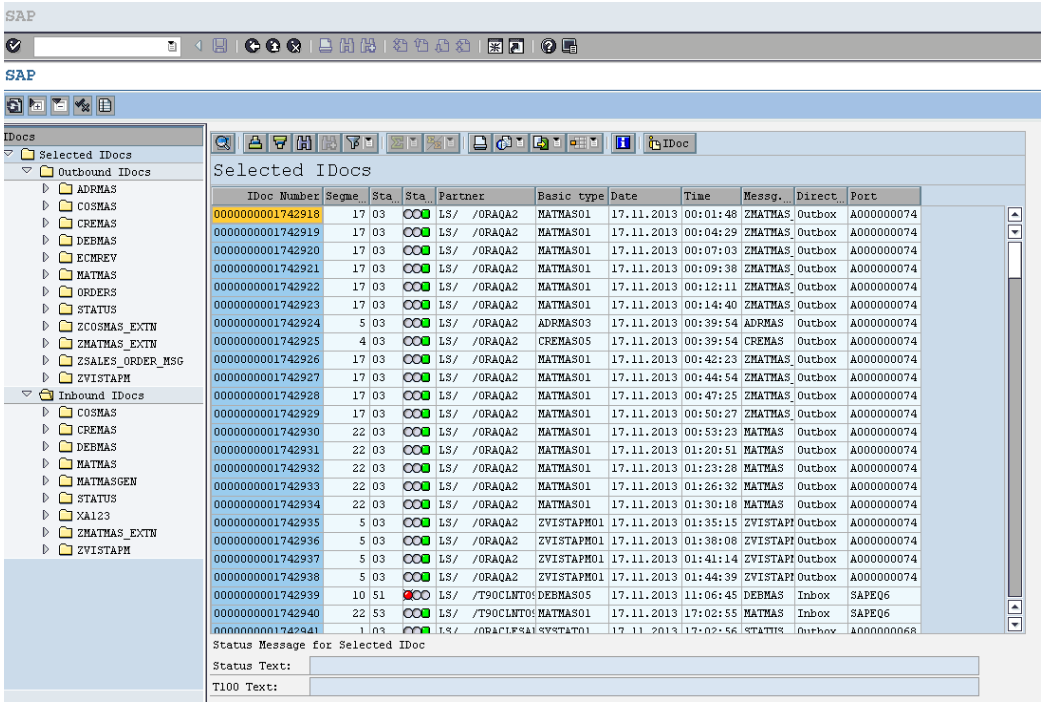


3. Click on **Save**.

The Inbound and Outbound configurations are now ready for IDoc exchange.

Now upon sending or receiving IDocs from SAP, you can see the inbound and outbound IDocs and their status in SAP tcode WE02, as shown in Figure A–38.

Figure A–38 Inbound IDocs Window



A.5 SAP User Authorizations for Adapter

The user must be having authorizations to execute RFC, BAPI, and IDoc from the Adapter for SAP. Some of the SAP tcodes and the corresponding authorizations required for them are listed in Table A-1.

Table A-1 SAP Tcodes and the Corresponding Authorizations

SAP tcodes and the Corresponding Authorizations						
1	SE38	DISPLAY	S_TCODE	TCD	se38	Run/Edit ABAP programs
			S_DEVELOP	ACTVT	3	
2	SE80	DISPLAY	S_TCODE	TCD	se80	Object Navigator (SAP Development workbench, most development functionality is available from this transaction)
			S_DEVELOP	ACTVT	3	

3	SE11	DISPLAY	S_TCODE	TCD	SE11	ABAP Dictionary Maintenance
			S_DEVELOP	ACTVT	3	
4	SE16	DISPLAY	S_TCODE	TCD	SE16	Data Browser
			S_TABU_DIS	ACTVT	3	
5	SE37	DISPLAY	S_TCODE	TCD	SE37	ABAP Function Module
			S_DEVELOP	ACTVT	3	

Table A-1 SAP Tcodes and the Corresponding Authorizations Continues

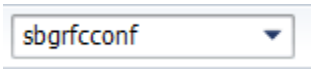
SAP tcodes and the Corresponding Authorizations						
6	SM59	CREATE, EDIT,DISPLAY	S_TCODE	TCD	SM59	RFC Destinations
			S_RFC_ADM	ACTVT	01,02,03	
			S_ADMI_FCD	S_ADMI_FCD	No Authorization	
			S_RFC	ACTVT	*	

A.6 SAP BGRFC Configuration

Before using BGRFC communication, following configuration needs to be done :

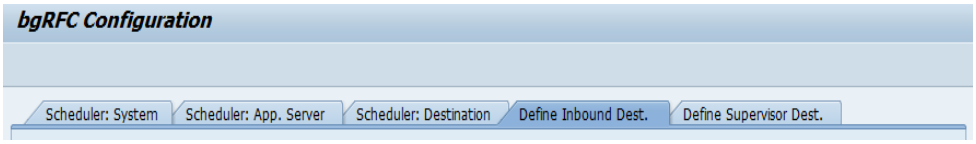
1. Run the sbgrfcconf transaction, as shown in Figure A-39.

Figure A–39 sbgrfcconf Transaction



2. Click on the **Define Inbound Dest.** tab.

Figure A–40 Define Inbound Destination

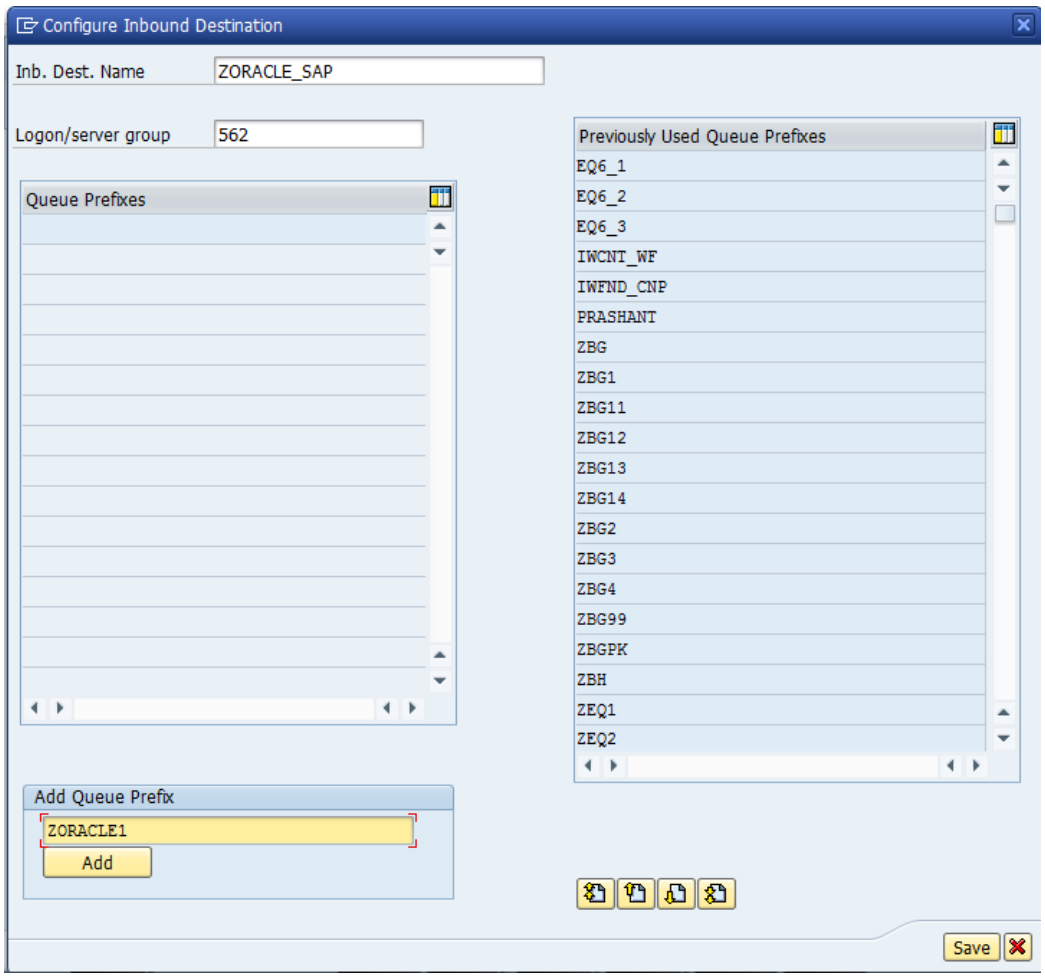


3. Click on the Create icon, as shown in Figure A–41.

Figure A–41 Create Icon

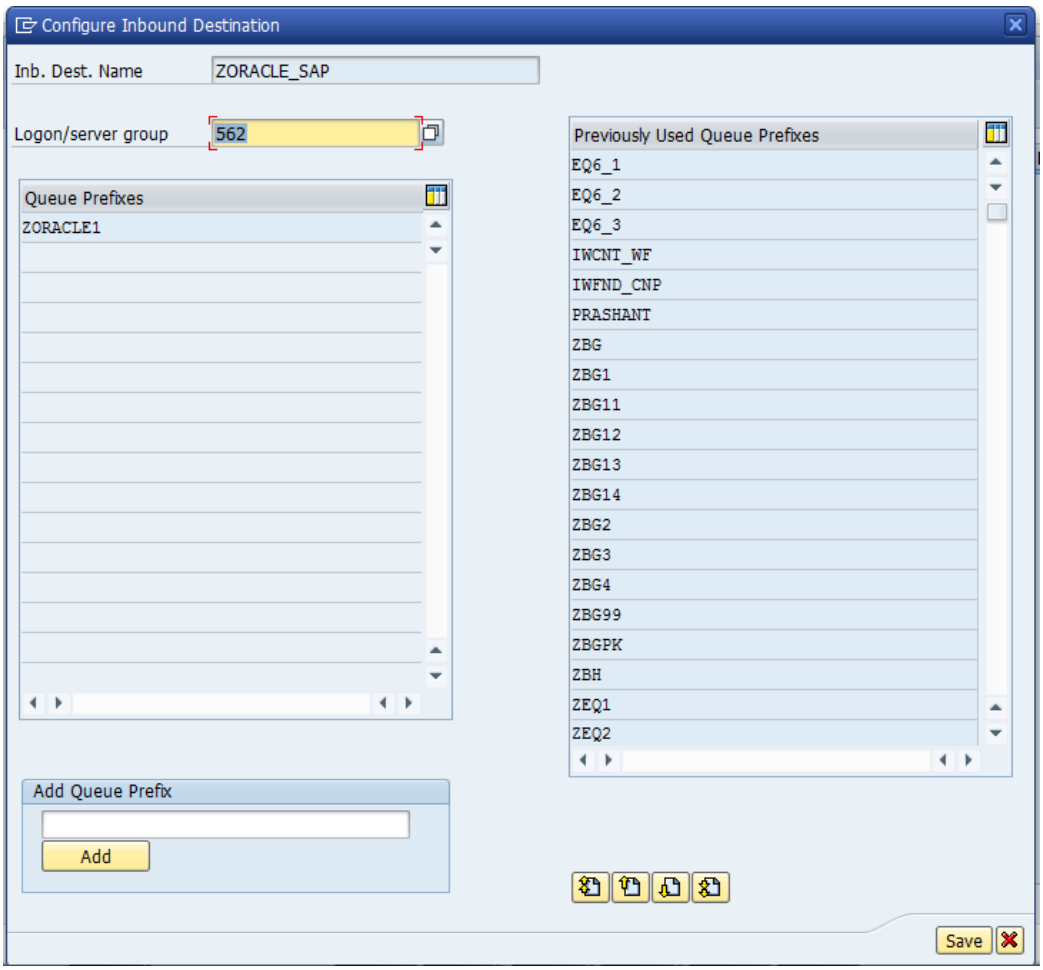
4. Give **Inbound Destination Name**, **Logon Server Group**, **Add Queue Prefix** and press **Add** as shown in Figure A–42.

Figure A–42 Configure Inbound Destination



5. Click on the Save button as shown in Figure A–43.

Figure A–43 Configure Inbound Destination

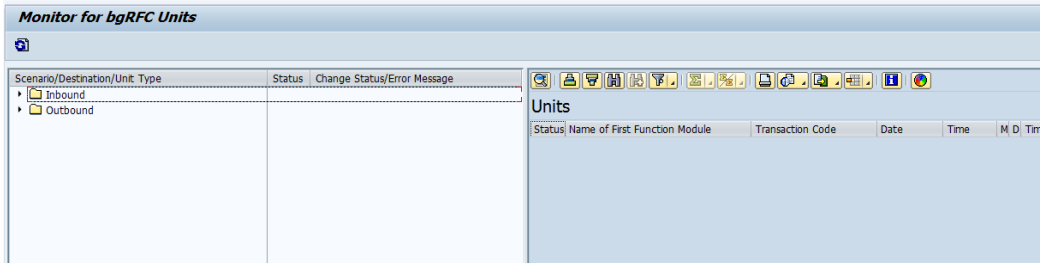


6. Click on **Save** icon as shown in Figure A–44.

Figure A–44 Save Icon

7. Now upon sending BGRFC calls to SAP, you can see the inbound BGRFC units in SAP tcode SBGRFCMON, as shown in Figure A–45.

Figure A–45 Monitor for bgRFC Units



Glossary

Adapter

Provides universal connectivity by enabling an electronic interface to be accommodated (without loss of function) to another electronic interface.

Agent

Supports service protocols in listeners and documents.

ChannelChannel

Represents configured connections to particular instances of back-end systems. A channel binds one or more event ports to a particular listener managed by an adapter.

ListenerListener

A component that accepts requests from client applications.

PortPort

Associates a particular business object exposed by the adapter with a particular disposition. A disposition is a URL that defines the protocol and location of the event data. The port defines the end point of the event consumption.

Index

A

Adapter health report, 10-1
AutoSYSTAT, 5-22

B

BAPI, 1-3

C

Configuration report, 10-2
Connection Management, 4-2
Connection pool, 4-2
Connection Pooling, 2-11
Control Character, 5-57
CPIC, 6-11
Credential mapping, 5-34
Custom BAPI, 3-2
Custom IDocs, 3-3
Custom RFC, 3-2

D

Design-time component, 1-2

E

ExceptionFilter, 5-17
Expiration Period, 6-13
Expiration Time, 6-12
Extended IDoc, 3-3

I

IDoc, 1-3, 3-3

J

JCo Traces, 6-10

M

Max Wait, 6-12

O

OSB, 8-94
Outbound Mediator process, 8-41

P

Peak Limit, 6-12

Q

qRFC, 5-1

R

Remote Function Call, 1-3
RFC trace, 6-11
Run-time component, 1-2

S

SAP Connection Parameters, 2-7
SAP JCo, 2-1
SAP RFC authorization object, 1
SAP Route String, 6-7
SchemaValidation, 5-20
SNC parameters, 2-12
Standard IDocs, 3-3
Standard RFC, 3-2
Standardized BAPI, 3-1
stateful, 5-42
stateless, 5-42

T

Test Connection button, 6-7
Trace level, 4-4
Trace parameters, 2-11
tRFC, 5-1
Tuning parameters, 9-1