Oracle® Application Integration Architecture Foundation Pack 11*g* Release 1 (11.1.1.2.0): Development Guide

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Oracle Application Integration Architecture Foundation Pack 11*g* Release 1 (11.1.1.2.0): Development Guide

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Contents

Preface

Welcome to the *Oracle Application Integration Architecture Foundation Pack 11g Release 1 (11.1.1.2.0): Development Guide.*

Oracle Application Integration Architecture (AIA) provides the following guides and resources for this release:

Oracle AIA Guides

- *Oracle Application Integration Architecture Foundation Pack: Installation Guide*
- *Oracle Application Integration Architecture Foundation Pack: Getting Started with the Oracle AIA Foundation Pack and Demo*
- *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*
- *Oracle Application Integration Architecture Foundation Pack: Development Guide*
- *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide*
- *Oracle Application Integration Architecture Foundation Pack: Reference Process Model Guide*
- *Oracle Application Integration Architecture Foundation Pack: Migration Guide for Foundation Pack 2.X to Foundation Pack 11gR1 (11.1.1.2.0)*

Additional Resources

The following resources are also available:

Resource	Location
Oracle Application Integration Architecture Foundation Pack: Product-to-Guide Index	My Oracle Support: https://support.oracle.com/
Known Issues and Workarounds	My Oracle Support: https://support.oracle.com/
Release Notes	Oracle Technology Network: http://www.oracle.com/technology/
Documentation updates	My Oracle Support: https://support.oracle.com/

1. Getting Started with the AIA Development Guide

This chapter discusses the following topics:

1.1. Goal of the AIA Development Guide

The Oracle Application Integration Architecture (AIA) Foundation Pack: Development Guide defines in detail how you can use the Oracle AIA Foundation Pack to conceptualize AIA projects and, using the AIA Project Lifecycle Management application, implement a solution conforming to the AIA in a structured fashion based on a functional design document. You can use this guide to implement additional functionalities in the form of new services extending the AIA Process Integration Packs (PIP) functionalities.

Following this guide is the key to ensuring that the AIA solution that you build and implement can be upgraded, supported, and maintained.

1.2. Types of Integrations Addressed by AIA

AIA addresses two types of integrations:

- Functional integration

  Functional integration weaves together the various functionalities of different participating applications, exposed as services, as processes to accomplish business tasks that span multiple applications in any enterprise.

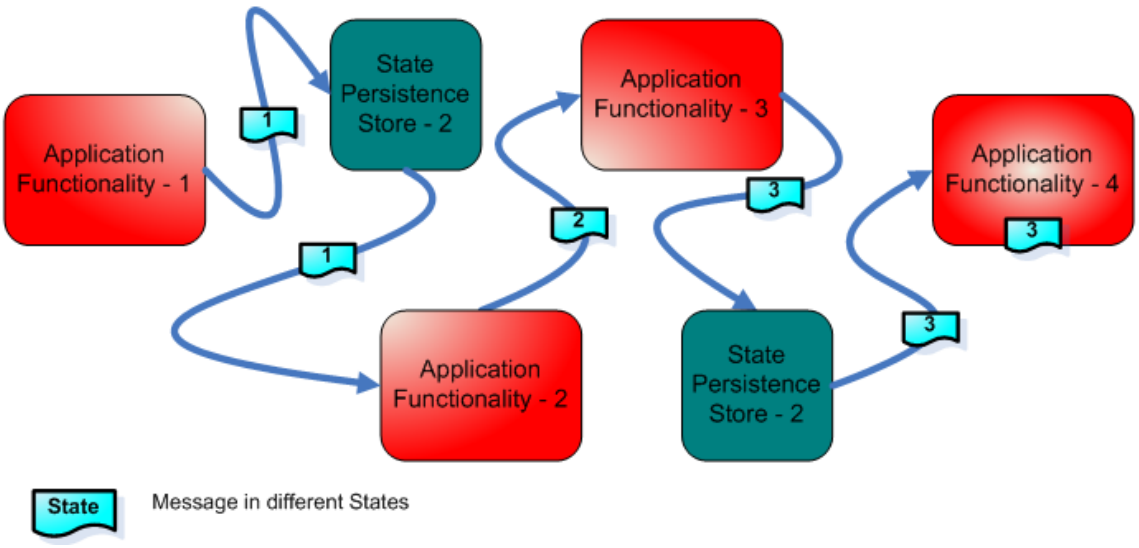
- Data integration

  Data integration connects applications at the data level and makes the same data available to more than one application. This type of integration relies on database technologies and is ideal when a minimum amount of business logic is reused and large amounts of data transactions are involved across applications. This type of integration is suitable for batch data uploads or bulk data sync requirements.

1.3. Integration Styles Addressed by AIA

AIA provides reference architecture for a variety of situations. Depending on the size and complexity of integration projects, the integration style adopted for implementing *integration flows* varies. The number of participating applications and their role in *integration flows* contribute to the integration style adopted.

The *integration flow* represents the journey of a message from a business event triggering source to one or more target milestones, after passing through possible intermediary milestones. At each milestone, the message is stored in a different state.



The integration flow represents the runtime path of a message. It is not a design time artifact.

AIA addresses the following integration styles:

- Integration flow with native application APIs
- Integration styles with integration framework
  - Integration Flow with native application services
  - Integration Flow leveraging provider services
  - Integration Flow leveraging provider services with virtualization
  - Integration Flow leveraging provider services with canonical model-based virtualization
- Integration styles for bulk data processing
  - Real-time data integration flow
  - Batch data integration flow

1.4. How to Use the AIA Development Guide

The sales process provides detailed information about the value of AIA offerings. The value presented is perceived in the context of a business problem for which a solution is being sought.

The detailed analysis of the business problem and documenting of related business requirements leads to a Functional Design Document (FDD), which provides:

- A detailed description of the business case
- Various use cases detailing the various usage scenarios including the exception cases with expected actions by various actors
- Details about all the participating applications – commercial, off-the-shelf with versions and homegrown
- Details about the triggering business events
- Details about the functional flow
- Details about business objects to be used
- Actions to be performed on the various business objects
- Details about performance and scalability requirements

The AIA Development Guide assumes:

- A Functional Design Document is available
- Access to AIA software
- Access to all AIA-provided documents
- You have read the AIA Concepts and Technologies Guide

The AIA Development Guide is logically divided as follows:

- Overview of all tasks for building the AIA integration flow
- Details of development of various AIA artifacts
- Activities around interaction between AIA artifacts and external artifacts
- Discussion of various design patterns, best practices, and tuning for runtime performance

Start with Building AIA Integration Flows and move to relevant chapters in the Development Guide as needed.

2. Building AIA Integration Flows

This chapter introduces Oracle Application Integration Architecture (AIA) integration flows and describes how to set up development and test environments. It discusses the role of the AIA Project Lifecycle Workbench and provides an overview of choosing of integration styles and AIA patterns. Finally, it provides a high-level overview of the development tasks for AIA artifacts.

This chapter discusses the following topics:

2.1. How to Set Up Development and Test Environments

For AIA development and testing, the setup of development and test environments consists of the following activities:

- Set up Oracle JDeveloper for AIA.

  JDeveloper is the integrated development tool of choice.

- Set up Oracle Fusion Middleware for AIA.

  The Oracle Fusion Middleware environment is for deploying the AIA service and artifacts and for running through all Quality Assurance test cases.

- Set up AIA Workstation.

  AIA Workstation is the designated machine where the AIA Foundation Pack is set up.

2.1.1. How to Set Up JDeveloper for AIA Development

To set up JDeveloper for AIA development:

1. Download JDeveloper 11.1.1.2.0 or above and install from http://www.oracle.com/technology/software/products/jdev/htdocs/soft11.html.
2. Update JDeveloper with the SOA Suite Composite Editor plug-in from the Update center.
   a. Go to Help > Check for Updates.

b. Select 'Oracle Fusion Middleware Products' and search.

c. Select 'SOA Composite Editor', and download and apply it.

3. Update JDeveloper with AIA Service Constructor plug-in from the Update center.

a. Go to Help > Check for Updates.

b. Select 'Oracle Fusion Middleware Products' and search.

c. Select 'AIA Service Constructor', and download and apply it.

4. Apply Freemarker 2.3.15 or higher needed by AIA Service Constructor.

a. Download 'Freemarker template engine" from http://www.freemarker.org.

b. Put "freemarker.jar" (extracted from the downloaded zip file) in the jdeveloper/jdev/lib folder.

5. Create a connection to SOA Suite server set up for AIA Development and Testing using these details after Oracle Fusion Middleware is set up. Refer to How to Set Up the Oracle Fusion Middleware Environment for AIA Development.

a. Connection name: <give a connection name for your application>.

b. Connection Type: use the default value - WebLogic 10.3.

c. Provide the username/password of your WebLogic server.

d. WebLogic Hostname: <your server hostname>.

e. Port: <your server hostname>.

f. SSl port : <your server ssl port>.

g. WLS Domain : <provide your domain name where SOA server is installed>.

6. Create a connection to SOA MDS set up after Oracle Fusion Middleware is set up. Refer to How to Set Up the Oracle Fusion Middleware Environment for AIA Development.

a. Create database connection for SOA-MDS connection.

7. From the Resource Palette, click **New**.

8. Select the **New Connections** and then select a **Database**.

9. Create a database connection using MDS DB credentials. Please contact your administrator for details.

a. Create the SOA-MDS connection.

10. From the Resource Palette, click **New**.

11. Select the **New Connections** and then select **SOA-MDS.**

12. Provide a connection name and select connection type as DB based MDS.

13. Select the DB connection you created in the previous step.

14. Select the MDS partition as SOA-Infra and Save.

15. Set up the Harvester utility:

a. Download AIAHarvester.zip from $AIA_HOME/ Infrastructure/LifeCycle.

b. Unzip to a local folder. You will use this to harvest the composites.

For more information about harvesting AIA content, see Harvesting Oracle AIA Content.

2.1.2. How to Set Up the Oracle Fusion Middleware Environment for AIA Development

The Oracle Fusion Middleware components used in the development environment depend on the topology of the development environment:

- Oracle SOA Suite

  Deploy and test AIA Services.

- Oracle Enterprise Repository (optional)

  Test harvesting of AIA services and ensure that all required service annotations are in place.

- Oracle Service Registry (optional)

  Test publishing of AIA services.

- Oracle Business Process Publisher (optional)

  Analyze the delivered AIA Reference Process Models.

2.1.2.1. Set Up Oracle SOA Suite

Download Oracle SOA Suite 11gR1PS1 and install from http://www.oracle.com/technology/products/soa/soasuite/collateral/downloads.html.

Deploy AIA Foundation Pack artifacts from AIA Workstation. Refer to Deploy AIA Foundation Pack Artifacts to Oracle SOA Suite Server.

2.1.2.2. Set Up Oracle Enterprise Repository

Download Oracle Enterprise Repository and install from http://www.oracle.com/technology/products/soa/repository/index.html.

Import AIA SOA portfolio Oracle Enterprise Repository Solution Pack. Refer to Configuring and Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

2.1.2.3. Set Up Oracle Service Registry

Download Oracle Service Registry and install from http://www.oracle.com/technology/products/soa/registry/index.html.

2.1.2.4. Set Up Oracle Business Process Publisher

Oracle Business Process Publisher is installed as part of the AIA Foundation Pack install.

2.1.3. How to Set Up AIA Workstation

AIA Workstation is a dedicated machine set up to drive AIA development. Install the AIA Foundation Pack on this machine and set up the following individual components from the AIA Foundation Pack:

- AIA Project Lifecycle Workbench

  Drives AIA development.

2.1.3.1. Prerequisites

- Install 11g WebLogic Server with Oracle Application Development Framework.
- Install 11g Database.
- Install JDeveloper.

Hardware should be at least 2 CPU and 4 GB of RAM with a supported Operating System.

2.1.3.2. How to Install AIA Foundation Pack

To install AIA Foundation Pack:

1. Install the AIA Foundation Pack

For more information, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide,* "Advanced Installation."

2. Select the "Copy AIA Software" option.
3. The system creates $AIA_HOME and copies all the software to it.

   When new artifacts are created as a part of development, you should copy them to a relevant folder in $AIA_HOME. If a separate source control is maintained for all development, then content from the builds generated is expected to be copied to $AIA_HOME.

   This enables content to take advantage of the features provided in AIA Project Lifecycle Workbench.

2.1.3.3. Updating SOA MDS with AIA MetaData

The content under $AIA_HOME/AIAMetaData provided as part of AIA Foundation Pack is uploaded to SOA-MDS. This content includes all the schemas, WSDLs, XSLs, domain value map (DVM) and Cross Reference meta information, default faultPolicies, AIAConfigurationProperties.xml, and AIAEHNotification.xml.

After any extensions or customizations on the artifacts in $AIA_HOME/AIAMetaData, copy back and upload the artifacts to SOA-MDS > apps/AIAMetaData.

When new artifacts similar to the ones in $AIA_HOME/AIAMetaData, are created as part of development, copy them to a relevant folder in $AIA_HOME/AIAMetaData to facilitate their upload to SOA-MDS > apps/AIAMetaData.

If a separate source control is maintained for all development, the content from the builds generated are expected to be copied to $AIA_HOME/AIAMetaData to facilitate uploading to SOA-MDS > apps/AIAMetaData.

2.1.3.4. Using MDS in AIA

Oracle Metadata Services (MDS) repository contains metadata for deployed J2EE applications, including SOA Suite on WLS.

Under a partition SOA-MDS created specifically for SOA, all SOA Composites (including AIA composites) are also stored upon deployment.

Under the same partition, the contents of $AIA_HOME/AIAMetaData are uploaded to SOA-MDS > apps/AIAMetaData.

The content and details of each set of metadata and how it is used by AIA is provided below. Also described is the process of creating new content or changing existing content.

Uploading the $AIA_HOME/AIAMetaData content to MDS is also described in Updating MDS.

2.1.3.5. Content of $AIA_HOME/AIAMetaData

AIA MetaData ($AIA_HOME/AIAMetaData) includes the following content:

- **AIAComponents** – Presents the various schemas and WSDLs referred to by various services. The structure is as follows:
  - **ApplicationConnectorServiceLibrary** – Abstract WSDLs of various Application Business Connector Services (ABCSs)
  - **ApplicationObjectLibrary** – WSDLs of services exposed by applications and schemas of application business objects
  - **B2BObjectLibrary** – Business-to-business (B2B) schemas
  - **B2BServiceLibrary** – Abstract WSDLs of various B2B Connector Services (B2BCSs) and B2B Infrastructure Services
  - **BusinessProcessServiceLibrary** – Abstract WSDLs of Composite Business Processes (CBPs) and Enterprise Business Flows (EBFs)
  - **EnterpriseBusinessServiceLibrary** – Abstract WSDLs of Enterprise Business Services (EBSs)
  - **EnterpriseObjectLibrary** – Schemas of the Oracle AIA Canonical Model
  - **ExtensionServiceLibrary** – Concrete WSDLs pointing to mirror servlet
  - **InfrastructureServiceLibrary** – Abstract WSDLs of infrastructure services
  - **Transformations** – XSLs shared among various services

  - **UtilityArtifacts** – Utility schemas and WSDLs
- **config** – AIAConfigurationProperties.xml and AIAEHNotification.xml
- **dvm** – Domain Value Maps
- **faultPolicies** – Default policies applicable to all the services
- **xref** – Metadata for Cross References

2.1.3.6. Working with AIA Components Content in $AIA_HOME/AIAMetaData

The AIA Components consist of Schemas, WSDLs, and XSLs shared among various AIA artifacts at runtime. Usage and purpose of each of these files is dealt with in detail in AIA artifact-specific chapters of the guide.

AIA Components Folder Structure

- All the abstract WSDLs of various application connector services and adapter services are stored here. The folder structure convention followed is: ApplicationConnectorServiceLibrary.

  AIAMetaData\AIAComponents\ApplicationConnectorServiceLibrary\<Application Name>\<Version Number>\<Service Type>

- Possible values for <Version Number> are V1, V2, and so on.
- Possible values for <Service Type> are:
  - RequesterABCS
  - ProviderABCS
  - AdapterServices
- Possible values for <Application Name> are:
  - AIA
  - PeopleSoft
  - BRM
  - UCM
  - SAP
  - PIM
  - OracleRetail
  - Logistics
  - JDEE1
  - CRMOD
  - Agile
  - Ebiz

- Siebel

Note: The <Application Name> specified here is used in AIA Project Lifecycle Workbench in the definition of the bill of materials for deployment. It should match the <productCode> list of values in the Workbench.

Examples:

AIAMetaData/AIAComponents/ApplicationConnectorServiceLibrary/Siebel/V1/RequestorABCS

AIAMetaData/AIAComponents/ApplicationConnectorServiceLibrary/Siebel/V1/ProviderABCS

- **ApplicationObjectLibrary**

  All the WSDLs of the services exposed by the participating applications and the referenced schemas are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/ApplicationObjectLibrary

  Applications consume AIA requester service WSDLs. To avoid any need for transformation in the participating applications, the AIA requester services' WSDLs are developed referencing the external facing business object schemas of the participating applications. These schemas are also stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/ApplicationObjectLibrary.

  The folder structure convention followed is:

  ApplicationObjectLibrary/<Application Name>/<Version Number>/schemas

  ApplicationObjectLibrary/<Application Name>/<Version Number>/wsdls

  The possible values for <Application Name> and <Version Number> are as described in the previous section.

Note: The <Application Name> specified here is used in AIA Project Lifecycle Workbench in the definition of the bill of materials for deployment.

Examples:

AIAMetaData/AIAComponents/ApplicationObjectLibrary/Siebel/V1/schemas

AIAMetaData/AIAComponents/ApplicationObjectLibrary/Siebel/V1/wsdls

- **B2BServiceLibrary**

  All of the abstract WSDLs of B2B Connector Services (B2BCSs) are stored in this location.

  Requester B2BCS WSDLs are stored under $AIA_HOME/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls.

  The folder structure convention followed is: B2BServiceLibrary/Connectors/wsdls/<B2BStandard>/RequesterB2BCS/<ConnectorVersion>/*.wsdl.

Provider B2BCS WSDLs are stored under $AIA_HOME/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls.

The folder structure convention followed is: B2BServiceLibrary/Connectors/wsdls/<B2BStandard>/ProviderB2BCS/<ConnectorVersion>/*.wsdl.

Other abstract WSDLs of reusable infrastructure services are stored under $AIA_HOME/AIAMetaData/AIAComponents/B2BServiceLibrary/Infrastructure/<ServiceVersion>/.

- **BusinessProcessServiceLibrary**

  All the abstract WSDLs of Composite Business Processes and Enterprise Business Flows are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/ BusinessProcessServiceLibrary

  The folder structure convention followed is:

  BusinessProcessServiceLibrary/<Service Type>

  The possible values for <Service Type> are CBP and EBF.

  Example:

  AIAMetaData/AIAComponents/BusinessProcessServiceLibrary/CBP

  AIAMetaData/AIAComponents/BusinessProcessServiceLibrary/EBF

- **EnterpriseBusinessServiceLibrary – Part of Oracle AIA Canonical Model**

  All the abstract WSDLs of Enterprise Business Services are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/EnterpriseBusinessServiceLibrary

- **EnterpriseObjectLibrary – Part of Oracle AIA Canonical Model**

  All the schema modules of the Enterprise Object Library are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/EnterpriseObjectLibrary

- **ExtensionServiceLibrary**

  All the concrete WSDLs pointing to mirror servlet are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/ExtensionServiceLibrary

  The folder structure convention followed is:

  ExtensionServiceLibrary/<Application Name>

  The possible values for <Application Name> are as described in the previous section.

Note: The <Application Name> specified here is used in AIA Project Lifecycle Workbench in the definition of the bill of materials for deployment.

Examples:

AIAMetaData/AIAComponents/ExtensionServiceLibrary/Siebel

- **InfrastructureServiceLibrary**

  All the abstract WSDLs of infrastructure services are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/InfrastructureServiceLibrary

  The folder structure convention followed is:

  InfrastructureServiceLibrary/<Version Number>

  Example:

  AIAMetaData/AIAComponents/InfrastructureServiceLibrary/V1

- **Transformations**

  All the XSLs shared among various AIA services are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/Transformations

  The folder structure convention followed is:

  Transformations/<Application Name>/<Version>

  The possible values for <Application Name> and <Version Number> are as described in the previous section.

Note: The <Application Name> specified here is used in AIA Project Lifecycle Workbench in the definition of the bill of materials for deployment.

Example:

AIAMetaData/AIAComponents/Transformations/Siebel/V1

- **UtilityArtifacts**

  All the Utility schemas and WSDLs are stored in:

  $AIA_HOME/AIAMetaData/AIAComponents/UtilityArtifacts

  The folder structure convention followed is:

  UtilityArtifacts/schemas

UtilityArtifacts/wsdls

2.1.3.7. How to Change an Existing File

To change an existing file:

1. From JDeveloper, open the relevant file by browsing to AIAWorkstation/$AIA_HOME/AIAMetaData/AIAComponents/<Path to file>
2. Make modifications. Review the upgrade safe extensibility guidelines provided in AIA artifact-specific chapters of the guide.
3. Save.
4. Upload to SOA-MDS > apps/AIAMetaData/AIAComponents. Refer to Updating MDS.

2.1.3.8. How to Create a New File

To create a new file:

1. In JDeveloper, create a new file following the design and development guidelines provided in AIA artifact-specific chapters of the guide.
2. Copy the file to AIAWorkstation/$AIA_HOME/AIAMetaData/AIAComponents/<Path to file>.

Note: Place the file in this folder.

3. Upload to SOA-MDS > apps/AIAMetaData/AIAComponents. Refer to Updating MDS.

Accessing the Files in the AIA Components Folder

Use the following protocol to access the AIA Components content from all the AIA service artifacts at design time and runtime:

oramds:/apps/AIAMetaData/AIAComponents/<Resource Path Name>

Example:

oramds:/apps/AIAMetaData/AIAComponents/ApplicationObjectLibrary/SampleSEBL/schemas/CmuAccsyncAccountIo.xsd

Note: All of the files in the AIA Components folder use relative paths to refer to other files in the AIA Components folder, if needed.

The WSDLs in the Enterprise Business Service Library use relative paths to refer to schemas in the Enterprise Object Library.

2.1.3.9. How to Work with AIAConfigurationProperties.xml in $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config

AIA provides external configuration properties to influence the runtime behavior of system, infrastructure components, and services. These properties are provided as name-value pairs at the system, module, and service levels in AIAConfigurationProperties.xml.

The AIAConfigurationProperties.xml supports two types of configurations:

- System level, including module level
  - Contains system-level configuration name-value pairs and module-level configuration name-value pairs within the system level.
- Service level
  - Contains service-specific configuration name-value pairs.

The following XPath functions are provided to access the configuration name-value pairs in the **AIAConfigurationProperties.xml**:

- ***aiacfg:getSystemProperty*** (propertyName as string, needAnException as boolean) returns propertyValue as string
- ***aiacfg:getSystemModuleProperty*** (moduleName as string, propertyName as string, needAnException as boolean) returns propertyValue as string
- ***aiacfg:getServiceProperty*** (EBOName as string, serviceName as string, propertyName as string, needAnException as boolean) returns propertyValue as string

"***getSystemModuleProperty()***" and "***getServiceProperty()***" functions first look for the appropriate module and service property and if it is not found, they then look for a system property with the same property name.

In all three functions, if a matching property is not found, the result will depend upon the value of the needAnException argument. If need AnException is true, then a PropertyNotFound Exception is thrown; otherwise, an empty string is returned.

2.1.3.10. How to Add a New Property to AIAConfigurationProperties.xml

To add a new property to AIAConfigurationProperties.xml:

1. From JDeveloper, open the file ***AIAConfigurationProperties.xml*** by browsing to AIAWorkstation/$AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config.
2. Make modifications, as needed in AIA artifact development.
3. Save.
4. Upload to SOA-MDS > apps/AIAMetaData/config. Refer to Updating MDS.
5. From the AIA Home Page, click Go in the Setup area. Select the Configuration tab to access the Configuration page. Click Reload to refresh the AIA Configuration cache.

2.1.3.11. How to Work with AIAEHNotification.xml in $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config

This file is the template of the email notification sent as a part of the Error Handling Framework.

To modify the AIAEHNotification.xml:

1. From JDeveloper, open the file ***AIAEHNotification.xml*** by browsing to AIAWorkstation/$AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config.
2. Modify as needed.
3. Save.
4. Upload to SOA-MDS > apps/AIAMetaData/config. Refer to Updating MDS.

2.1.3.12. How to Work with Domain Value Maps in $AIA_HOME/AIAMetaData/dvm

The Domain Value Maps utility is a feature of Oracle SOA Suite. It supports the creation of static value maps and provides the custom XPath function:

```
dvm:lookupValue("oramds:/apps/AIAMetaData/dvm/<DVM Map Name>",<Source
Column>,<Source Column Value>,<Target Column>,"")
```

For more information about DVMs, see Working with DVMs and Cross-References.

The DVMs are used by all the AIA PIPs and are shipped as part of AIA Foundation Pack. They are stored in $AIA_HOME/AIAMetaData/dvm.

To modify the Domain Value Maps:

1. From JDeveloper, open the DVM file by browsing to AIAWorkstation/$AIA_HOME/AIAMetaData/dvm.
2. Modify as needed.
3. Save.
4. Upload to SOA-MDS > apps/AIAMetaData/dvm. Refer to Updating MDS.

2.1.3.13. How to Work with Cross Reference (Xref) in $AIA_HOME/AIAMetaData/xref

The Cross Reference utility is a feature of Oracle SOA Suite. It supports the creation of dynamic values.

For more information about cross references, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g, "*Working with Cross References."

The Cross Reference meta information as used by all the AIA PIPs are shipped as part of AIA Foundation Pack and are stored in $AIA_HOME/AIAMetaData/xref.

To modify the Cross Reference metadata:

1. From JDeveloper, open the Cross Reference file by browsing to AIAWorkstation/$AIA_HOME/AIAMetaData/xref.
2. Modify as needed.
3. Save.
4. Upload to SOA-MDS > apps/AIAMetaData/xref. Refer to Updating MDS.

2.1.3.14. How to Work with Fault Policies in $AIA_HOME/AIAMetaData/faultPolicies/V1

The default fault policy file "fault-bindings.xml" is shipped as part of AIA Foundation Pack and is stored in $AIA_HOME/AIAMetaData/faultPolicies/V1.

To modify the "fault-bindings.xml":

1. From JDeveloper, open the fault-bindings.xml file by browsing to AIAWorkstation/$AIA_HOME/AIAMetaData/faultPolicies/V1.
2. Modify as needed.
3. Save.
4. Upload to SOA-MDS > apps/AIAMetaData/faultPolicies/V1. Refer to Updating MDS.

2.1.3.15. Updating MDS

You must repeat this procedure **every time** a file needs to be added to MDS.

To update SOA-MDS > apps/AIAMetaData:

1. Browse to the folder at $AIA_HOME/aia_instances/$INSTANCE_NAME/bin.
2. Source the file aiaenv.sh by executing the following command:

   ```
   source aiaenv.sh
   ```

3. Browse to the folder at $AIA_HOME/aia_instances/$INSTANCE_NAME/config and open the deployment plan file, UpdateMetaDataDP.xml.
4. Update the file UpdateMetaDataDP.xml by inserting include tags for each resource group that you want to add to the MDS:

   a. To upload all the files under "AIAMetaData", add the following:

   ```
   <include name ="AIAMetadata/*"/>
   ```

   b. To upload the files copied to "AIAComponents/ApplicationObjectLibrary/SEBL/schemas" folder, add the following:

   ```
   <include name ="AIAComponents/ApplicationObjectLibrary/SEBL/schemas/*"/>
   ```

Note: In the include tag, the folder path must be relative to the folder AIAMetaData.

5. Browse to AIA_HOME/Infrastructure/Install/scripts. Execute the script UpdateMetaData.xml by typing the command:

```
ant -f UpdateMetaData.xml
```

2.1.3.16. How to Set Up AIA Project Lifecycle Workbench

The AIA Project Lifecycle Workbench application is set up on the AIA Workstation. All the members of the AIA implementation team developing services use the AIA Project Lifecycle Workbench.

For more information about setting up AIA Project Lifecycle Workbench, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide*, "Post Install Configurations," Setting up AIA Roles.

2.1.3.17. How to Deploy AIA Foundation Pack Artifacts to Oracle SOA Suite Server

For more information about deploying AIA Foundation Pack artifacts to the Oracle Fusion Middleware-SOA server set up for AIA development, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide,* "Advanced Install."

2.1.3.18. How to Deploy AIA Service Artifacts to Oracle SOA Suite Server

You define an AIA project in the AIA Project Lifecycle Workbench and capture meta information for all of the AIA service artifacts to be developed. The system uses this information to generate a deployment plan specific to the AIA project.

For more information about deploying all the AIA Project artifacts using a deployment plan generated from AIA Project Lifecycle Workbench to the Oracle Fusion Middleware-SOA server set up for AIA development**,** see Deploying Composites.

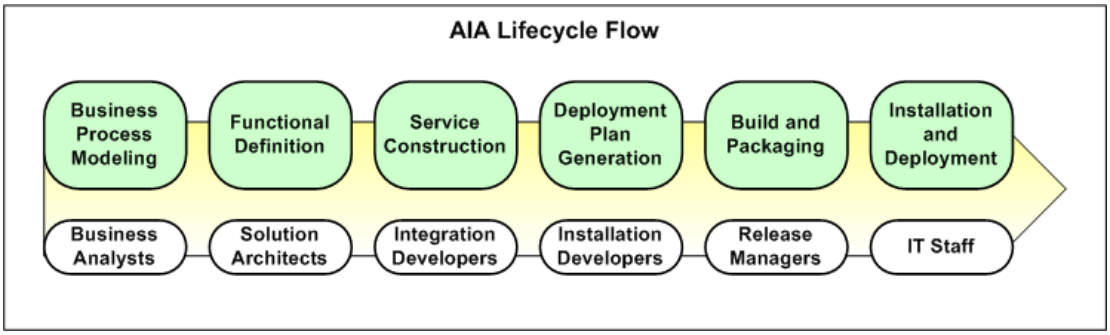
2.2. Role of AIA Project Lifecycle Workbench

An AIA project is about engineering service-oriented business processes. The outcome of business process analysis and reengineering is taken as input, leading to conceptualization of service, planning, development, deployment and support paradigms of a typical SOA project.

The AIA Project Lifecycle flow consists of the following phases:

- Business Process Modeling and Analysis
- Business Process Decomposition and Service Conception

- Service Design and Construction
- Installation and Deployment



AIA project lifecycle flow: phases and actors

2.2.1. Introduction to the Tools Used

The following tools support the entire lifecycle of the an AIA project:

- Oracle Business Process Publisher
- Oracle Enterprise Repository
- AIA Service Constructor plug-in in JDeveloper
- Oracle Enterprise Repository and AIA Harvester
- AIA Deployment Plan Generator
- AIA Project Lifecycle Workbench

Oracle Business Process Publisher

You use t Oracle Business Process Publisher to analyze the Reference Process Models delivered as part of Foundation Pack.

For more information about Reference Process Models, see *Oracle Application Integration Architecture Foundation Pack: Reference Process Model Guide.*

Oracle Enterprise Repository

Oracle Enterprise Repository is the design-time repository for governing design-time and runtime assets to achieve reuse and sharing across the distributed development community. Oracle Enterprise Repository provides:

- **Visibility –** From design time to runtime, captures and maintains metadata, relationships, categories, and so on.
- **Control –** Manages development lifecycle transition from concept, through implementation, to release.
- **Evolution –** Empowers customers to evolve their business and integration processes.

For more information about Oracle Enterprise Repository, see Configuring and Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

AIA Service Constructor

The AIA Service Constructor is an Oracle JDeveloper plug-in to generate composites conforming to AIA guidelines and naming standards. It also provides guidance for annotating the artifacts to support governance.

For more information about the AIA Service Constructor, see Working with Service Constructor.

AIA Harvester Tool

The AIA Harvester parses the AIA service artifacts and captures metadata into the AIA Project Lifecycle Workbench database and the Oracle Enterprise Repository, if used. The system uses this information to generate deployment plans.

AIA leverages Oracle Enterprise Repository to achieve SOA visibility. Oracle Enterprise Repository is an optional component to AIA installation and execution.

AIA Harvester is built on top of the Oracle Enterprise Repository Harvester Extension Framework. It introspects SOA artifacts and publishes their ensuing metadata into the Project Lifecycle Workbench backend or Oracle Enterprise Repository (optional), or both, to aid governance and downstream automation. In AIA, the AIA Harvester is provided in the form of command-line utility. Users may download and set up on their local development environment.

For more information about AIA Harvester, see Harvesting Oracle AIA Content.

AIA Project Lifecycle Workbench

The AIA Project Lifecycle Workbench is installed on the AIA Workstation and helps drive the AIA Project Lifecycle flow.

For more information about the AIA Project Lifecycle Workbench, see Working with Project Lifecycle Workbench.

Deployment Plan Generator

The deployment plan has all the details for the artifacts in an AIA project to be deployed. The AIA Install Driver takes the deployment plan as input and deploys all the artifacts on Oracle Fusion Middleware servers and updates the end point information back into Oracle Enterprise Repository.

It also facilitates publishing this information into Oracle Service Registry.

For more information about the Deployment Plan Generator, see Deploying Composites.

2.2.2. Introduction to the Business Process Modeling and Analysis Phase

Business Process Models are blueprints of the work accomplished in an enterprise to add value and deliver to customers. The models represent the ideal way work should be carried out with optimal cost at highest possible efficiencies.

The analysis of these models and categorizing them into business processes, business activities, and business tasks is done by ***Business Analysts***. The result of this analysis is a set of reusable business activities and business tasks, which can be woven into different business processes.

In this phase, ***Business Analysts*** identify and catalog the set of reusable business activities and business tasks for the business processes. Business Analysts also establish the Key Performance Indicators (KPIs) that are to be met at this time. They use the Oracle BPA Suite to analyze the AIA Reference Process Models and identify the business processes, business activities, and business tasks to be implemented.

Business Analysts define the project and provide details of solutions needed.

For more information about reference process models in Oracle AIA, see *Oracle Application Integration Architecture Foundation Pack: Reference Process Model Guide*.
For more information about the AIA Project Lifecycle Workbench, see Working with Project Lifecycle Workbench.

2.2.3. Introduction to the Business Process Decomposition and Service Conception Phase

Each of the business activities and business tasks can be described in terms of business entities involved and the action being performed with them. The origins of the service definition are in the categorization of reusable business activities and business tasks.

Examples of business entities are Customer, Product, Order, and so on.

Examples of business tasks are ‘Create Customer’, ‘Update Order’, ‘Enter Service Request’, ‘Request Account Balance’, and so on.

Examples of Business Activity are ‘Do Customer Credit Check’, ‘Fulfill Order’, ‘Process Trouble Ticket’, and so on.

The EBSs defined as AIA artifacts represent the business activities and business tasks. The metadata about the EBSs are available in Oracle Enterprise Repository after loading the AIA Solution Pack.

Various business activities and business tasks defined in AIA Reference Process Models provide links to the corresponding EBSs in the Oracle Enterprise Repository.

Solution Architects refine the projects defined by ***Business Analysts***, identify the services available, create definitions for new services to be developed, and engage with ***Developers*** to drive the design of new services.

For more information about the Project Lifecycle Workbench, see Working with Project Lifecycle Workbench.

2.2.4. Introduction to the Service Design and Construction Phase

During the service construction phase, ***Developers*** extend available AIA services, if needed, or design and develop new services.

The tasks of this phase are supported by the following tools:

- The service solution components defined in the Project Lifecycle Workbench provide guidance to ***Developers*** about the fine-grained services they need to create to fulfill the functionality of a business task.

  For more information about Project Lifecycle Workbench, see Working with Project Lifecycle Workbench.

- The Service Constructor enables developers to automatically generate AIA-compliant SCA composites for ABCSs.

  For more information about Service Constructor, see Working with Service Constructor.

- The Composite Application Validation System (CAVS) supports process and service testing.

  For more information about CAVS, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Working with the CAVS."

- The error handling framework augments SCA exception management and retries.

  For more information about error handling and logging, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up and Using Error Handling and Logging."

2.2.5. Introduction to the Deployment Plan Generation Phase

Once composites are constructed, installation developers select desired composites that collectively perform a required functionality. An AIA project is a collection of functionally related composites. Each composite is self-contained in that its deployment information (such as adapters, queues, schemas, and JDNI resources) is fully specified by its ***Developer*** during the preceding service construction stage.

The installation developer creates an AIA project specific deployment plan by aggregating deployment information from all composites that make up an AIA project. The ***Developer*** may choose to use the Deployment Plan Generator to automatically generate process deployment plans.

For more information about error handling and logging, see Deploying Composites.

2.2.6. Introduction to the Install and Deploy Phase

The AIA Installer helps to deploy an AIA project release into your development environment. The AIA Installer makes all AIA composites and other artifacts available to target environments. It deploys the composites and other artifacts specified in your selected deployment plan. It also publishes assets to a SOA repository and registry, respectively.

For more information about the AIA Installer, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide.*

2.3. AIA Artifacts in Various Integration Styles

AIA Architecture recommends variety of integration styles and AIA patterns to enable the flight of a message in an *Integration Flow*.

AIA implementation teams need to evaluate the following points to choose an integration style and methodology to be followed for creating various AIA artifacts.

- Business Scenario – The Functional Design Document (FDD) describes the Business Scenario and provides:
  - A detailed description of the business case.
  - Various use cases detailing the various usage scenarios, including exception cases with expected actions by various actors.
  - Details about all the participating applications – commercial, off-the-shelf with versions and homegrown.
  - Details about the triggering business events.
  - Details about the functional flow.
  - Details about performance and scalability requirements.
  - Details about business objects to be used.
  - Actions to be performed on the various business objects.
- Oracle tools and technologies to be leveraged

The AIA artifacts that are required for the collaboration between the applications or functions are dependent on the integration style adopted for an *Integration Flow*. These artifacts include ABCSs, EBSs, EBFs, CBPs, and various adapter services.

The AIA Project Lifecycle Workbench is used to define an AIA Project, which contains definitions of all the artifacts to be designed, developed, tested, packaged, and delivered.

2.3.1. Understanding Integration Flows with Native Application APIs

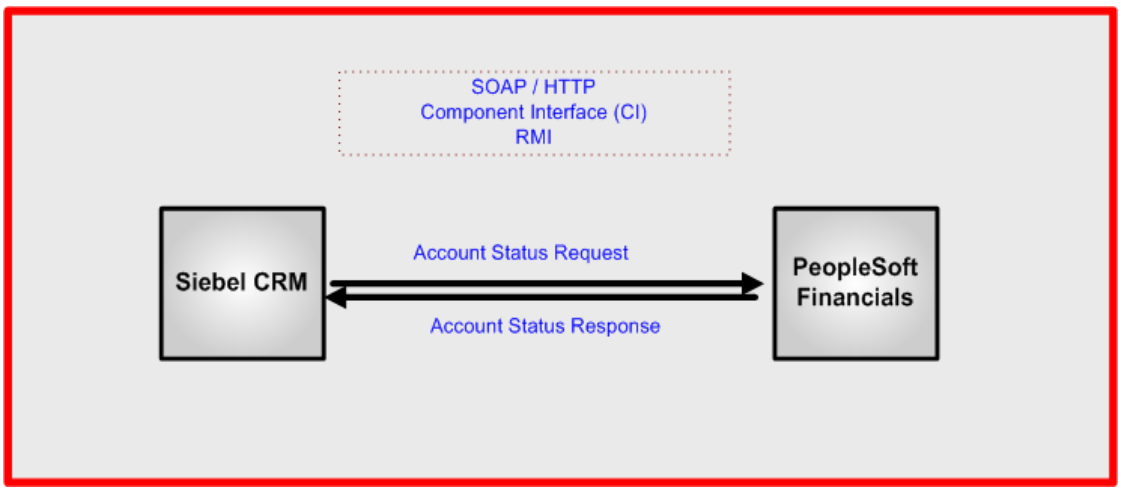
In this style, messages flow from the requester application to the providing application. The mode of connectivity could be SOAP/HTTP, queues, topics, or native adapters.

No middleware is involved in this integration.

The requester application needs to establish the connectivity with the provider applications. The requester application is responsible for sending the request in the format mandated by provider's API as well as interpreting the response sent by the provider. Requester and provider applications are responsible for the authentication and authorization of requests.

The integration flow consists of individual application functions interacting directly. All capabilities required to make this interaction possible need to be available or made available in the individual applications.

The following diagram illustrates how a requester application interacts directly with a provider application.



Example of a requester application interacting directly with a provider application

In more complex situations, when the integration flow consists of multiple steps involving interactions with multiple applications, you must leverage the workflow-like capability in one or more applications.

No AIA artifacts will be built in this case. You must establish direct connectivity between applications.

For more information about different modes of connectivity, see Establishing Resource Connectivity.

2.3.2. Understanding Integration Styles with Integration Framework

In all the integration styles with integration framework, middleware technologies are leveraged. The applications push the messages to the middleware, and the middleware pushes the messages to the target applications.

These integration styles have integration framework:

- Integration flow with native application services
- Integration flow leveraging provider services
- Integration flow leveraging provider services with virtualization
- Integration flow leveraging provider services with canonical model-based virtualization

The AIA service artifacts needed for implementing an integration flow in any of the integration styles with integration framework depends on:

- Complexity of data exchange
  - No processing logic
  - With processing logic
- Message exchange pattern
  - Synchronous request-response
  - Asynchronous one-way (fire-and-forget) – Need for guaranteed delivery assumed
  - Asynchronous request-delayed response – Need for guaranteed delivery and correlation of response assumed

These AIA service artifacts are defined in AIA Architecture:

- CBPs
- EBSs
- EBFs
- ABCSs
- Adapter Services
  - JMS Producer and JMS Consumer
  - JCA Adapter Service

For more information about different message exchange patterns, see Designing and Developing Enterprise Business Services and Working with AIA Design Patterns.
For more information about different AIA service artifacts and Oracle SOA Suite components used to implement them, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide,* "AIA Service Artifacts"

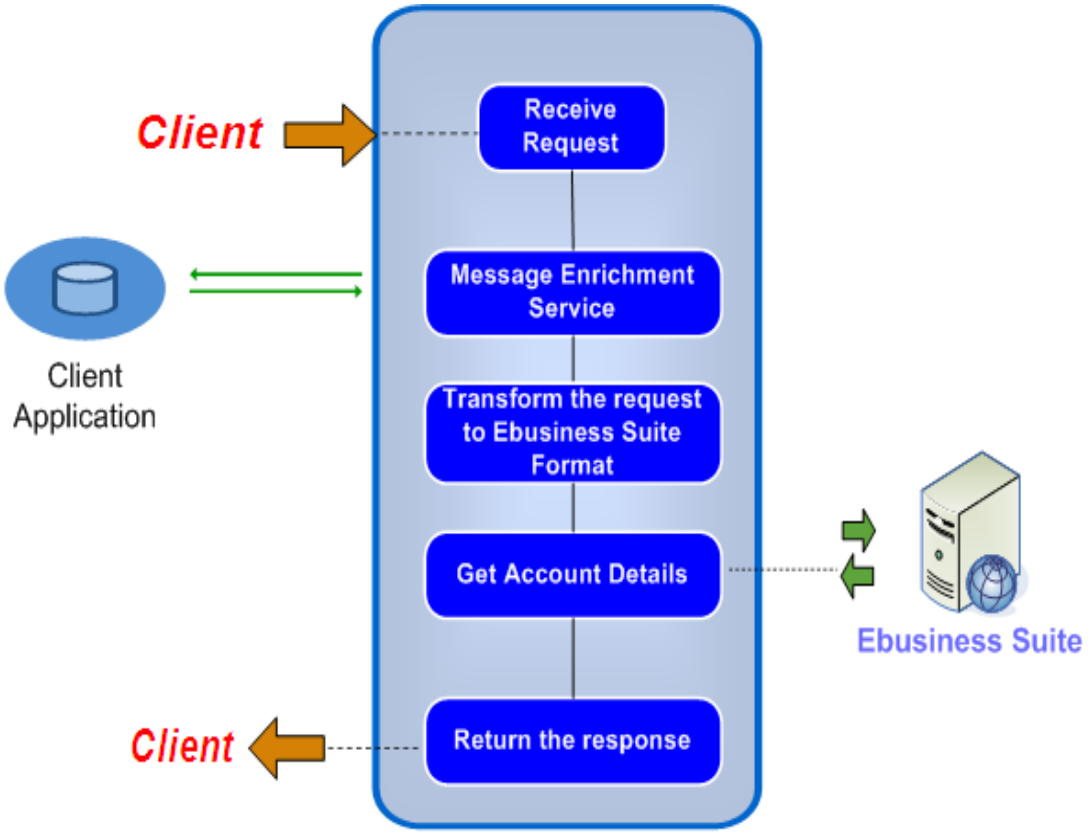
Note: In the following sections, for each integration style with integration framework, the AIA artifacts to be developed are recommended for a combination of situations.

2.3.2.1. Integration Flow with Requester Application Services

The requester application invokes a single AIA service on the middleware. The request presented by the requester application is fulfilled by the AIA service by invoking suitable APIs in the provider applications. The AIA service is capable of accepting a message in requester application format. The AIA service presents the request to the provider applications in the format mandated by the provider's API. The AIA service accepts the response in the provider application format, if needed. The AIA service is responsible for the authentication and authorization of the requests.

The integration flow would consist of this single AIA service artifact deployed on the middleware managing all interactions with all participating applications.

The following diagram illustrates how a service deployed on the middleware enables integration between the requester and the provider application:



Example of integration flow with native application services

In the case of more complex situations in which the integration flow consists of multiple steps involving interactions with multiple applications, the AIA service implements a workflow-like capability and manages all interactions with all the participating applications.

The AIA service artifacts to be developed depend on the complexity of data exchange and various message exchange patterns.

This table lists suitable AIA artifacts for a combination of situations:

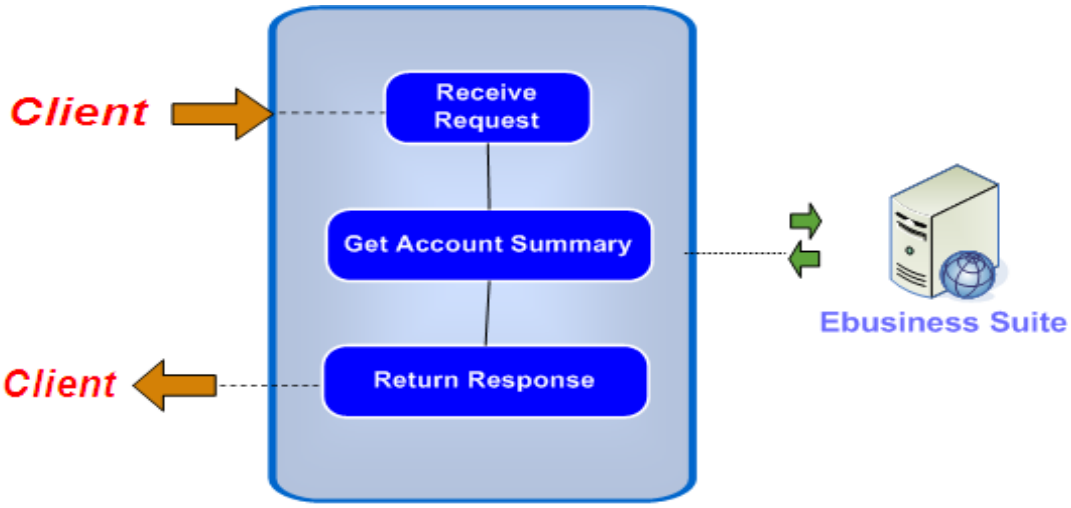
	No Processing Logic	With Processing Logic
Synchronous Request Response	EBS	CBP
Asynchronous One-Way	EBS	CBP
Asynchronous Request-Delayed Response	EBS – Request EBS – Response	CBP

2.3.2.2. Integration Flow Leveraging Provider Services

A provider application-specific AIA service, exposing a coarse-grained functionality of the provider application leveraging one or more APIs, is created with a suitable provider application-specific interface. Several business initiators can invoke this AIA service. If the business initiators cannot present the request in the format understood by the provider application-specific AIA service, a requester application-specific AIA service is used to transform the business initiator request to the provider application format. The requester application-specific AIA service is responsible for authenticating and authorizing the requests. The provider application-specific AIA service propagates the authentication and authorization information of the requests to the provider application.

The integration flow would consist of a requester application-specific AIA service artifact deployed on the middleware managing all interactions with all provider application-specific AIA services.

The following diagram illustrates how a service deployed on the middleware enables the integration between the requester and the provider application:



Example of integration flow leveraging provider services

In the case of more complex situations in which the integration flow involves interactions with multiple applications, the requester application-specific AIA service implements a workflow-like capability and manages all interactions with all the provider application-specific AIA services.

The AIA service artifacts to be developed depend on the complexity of data exchange and various message exchange patterns.

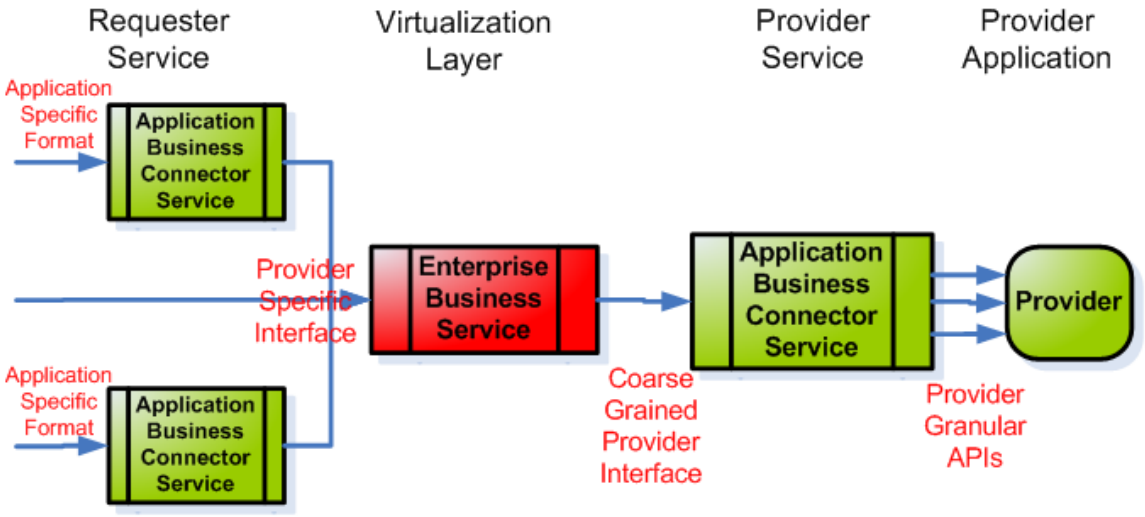
This table lists suitable AIA artifacts for a combination of situations:

	No Processing Logic	With Processing Logic
Synchronous Request Response	Requester ABCS Provider ABCS	Requester ABCS Provider ABCS
Asynchronous One-Way	Requester ABCS Provider ABCS	Requester ABCS Provider ABCS
Asynchronous Request-Delayed Response	Requester ABCS Provider ABCS	Requester ABCS Provider ABCS

2.3.2.3. Integration Flow Leveraging Provider Services with Virtualization

A provider application-specific AIA service, exposing a coarse-grained functionality of the target application leveraging one or more APIs, is created with a suitable provider application-specific interface. The provider application-specific AIA service is virtualized using a mediator AIA service. Several business initiators can invoke this mediator AIA service. If the business initiators cannot present the request in the format understood by the mediator AIA service, then a requester application-specific AIA service is used to transform the business initiator request to the mediator AIA service format. The requester application-specific AIA service is responsible for authenticating and authorizing the requests. The provider application-specific AIA service propagates the authentication and authorization information of the requests to the provider application.

The integration flow would consist of a requester application-specific AIA service artifact deployed on the middleware, presenting the request to the mediator AIA service. The mediator AIA service routes the request to suitable provider application-specific AIA services.



Integration flow leveraging provider services with virtualization

In the case of more complex situations in which the integration flow involves interactions with multiple applications, the requester application-specific AIA service presents its request to the mediator AIA service. The mediator AIA service triggers an AIA service, which implements a workflow-like capability and manages all interactions with all the provider application-specific AIA services through mediator AIA services. In this case, the mediator AIA service interface chosen is assumed to be accepted as a common interface. Thus, all requester application-specific AIA services invoke this mediator AIA service, and all the provider application-specific AIA services implement this common interface.

The AIA service artifacts to be developed depend on the complexity of data exchange and various message exchange patterns.

This table lists suitable AIA artifacts for a combination of situations:

	No Processing Logic	With Processing Logic
Synchronous Request Response	Requester ABCS EBS Provider ABCS	Requester ABCS EBS Provider ABCS
Asynchronous One-Way	Requester ABCS EBS	CBP Requester ABCS

	No Processing Logic	With Processing Logic
	Provider ABCS	EBS EBF Provider ABCS
Asynchronous Request-Delayed Response	Requester ABCS EBS Provider ABCS	CBP Requester ABCS EBS EBF Provider ABCS

2.3.2.4. Integration Flow Leveraging Provider Services with Canonical Model-Based Virtualization

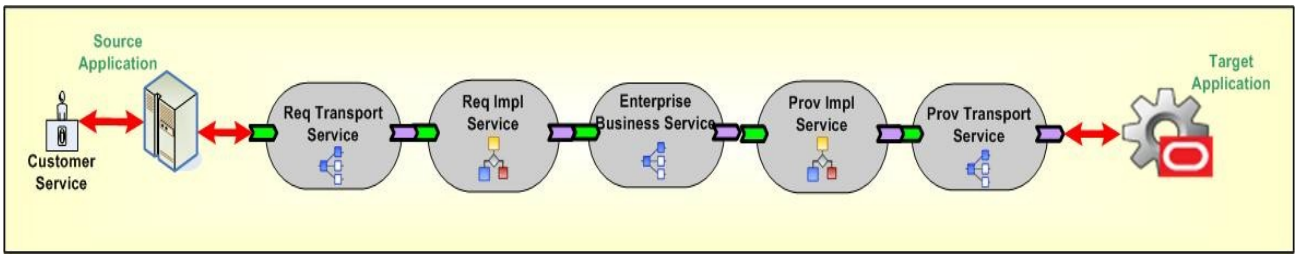
Loose coupling through a canonical (application-independent) model is a sign of a true SOA. Participating applications in loosely coupled integrations communicate through a virtualization layer. Instead of direct mappings between data models, transformations are used to map to the canonical data model. While this allows for greater reusability, the transformations both increase the message size and consume more computing resources. For functional integrations, this integration pattern is ideal since the reusability gained is worth the slight overhead cost.

In this case, an EBS based on the Enterprise Business Objects (EBOs) and Enterprise Business Messages (EBMs) is created as a mediator service.

A provider service, exposing a coarse-grained functionality of the provider application leveraging one or more APIs, is created with the same EBM interface as the EBS operation interface.

If the business initiators cannot present the request in the format understood by the EBS operation interface, a requester service is used to transform the business initiator request into the provider service format.

This diagram illustrates how the request sent by the source application is processed by the target application with the help of the EBS and a set of intermediary services. Note that the request as well as provider transport services are optional and will be needed only in case of non-SOAP-based transports.



Example using canonical model-based virtualization

In the case of more complex situations in which the integration flow involves interactions with multiple applications, the requester application-specific AIA service presents its request to the mediator AIA service. The mediator AIA service triggers an AIA service, which implements a workflow-like capability and manages all interactions with all the provider application-specific AIA services through mediator AIA services. In this case, the mediator AIA service interface chosen is assumed to be accepted as the common interface. Thus, all requester application-specific AIA services invoke this mediator AIA service, and all the provider application-specific AIA services implement this common interface. The AIA service artifacts to be developed depend on the complexity of data exchange and various message exchange patterns.

This table lists suitable AIA artifacts for a combination of situations:

	No Processing Logic	With Processing Logic
Synchronous Request Response	Requester ABCS EBS Provider ABCS	Requester ABCS EBS Provider ABCS
Asynchronous One-Way	Requester ABCS EBS Provider ABCS	CBP Requester ABCS EBS EBF Provider ABCS
Asynchronous Request-Delayed Response	Requester ABCS EBS Provider ABCS	CBP Requester ABCS EBS EBF Provider ABCS

2.3.3. Bulk Data Processing

Bulk data processing involves a large batch of discrete records or records with very large data. The methodology is point-to-point integration specializing in the high-performance movement of data with a trade-off of reusability.

Bulk data processing is about persistent data replicated across multiple applications. The integrations fall into four styles:

- Initial data loads
- High-volume transactions with Xref table
- Intermittent high-volume transactions
- High-volume transactions without Xref table

For complete details about using bulk data processing with AIA, see Using Oracle Data Integrator for Bulk Processing.

2.3.4. Integration Style Choice Matrix

In any AIA implementation, a variety of integration flows conforming to different integration styles will coexist. Integration flows represent processing of messages by AIA services deployed to deliver the business functionality desired.

The choice of an integration style influences the design of AIA services. Conversely, decisions about the design of AIA services lead to a particular integration style.

Various aspects of AIA service design are:

- **Service Granularity**

  You can decide upon the functionality to be implemented in a service in one of the two ways: either based on the business logic needed for a business activity or business task (the result of business process analysis) or based on the functions exposed by a provider application.

  Service granularity is **Coarse-Grained** if the business logic conforms to the requirements of a business activity or business task (result of business process analysis of AIA Reference Process Models). In this case, the service is implemented by invoking multiple low APIs of the provider application.

  Service granularity is **Granular** if the business logic conforms to the low-level functions exposed by the provider application.

- **Service Reusability**

  Service reuse is **High** for different Integration Flows if its design is modular and built for the requirements of various business use cases. Conformance to the requirements of a business activity or business task (the result of business process analysis of AIA Reference Process Models) leads to modular design.

  If the service is built to meet the requirements of a particular business use case, then the logic is monolithic and reuse will be **Low**.

- **Service Virtualization**

  This aspect provides for separation of concerns and independence of requester applications and provider applications from changes. The choices are **Yes** or **No**.

- **Service Interoperability**

  The capability of diverse service implementations to interoperate is dependent on their conformance to WS-I standards, a common message meta model, and a robust versioning strategy. The AIA EBS WSDLs and AIA EBOs and EBMs provide this capability as delivered. For others, special effort is needed to ensure interoperability.

Integration Styles	Granularity	Reusability	Virtualization	Interoperability
Integration Flow with Native Application APIs	No AIA services on middleware; direct Application to Application interaction			
Integration Flow with Requester Application Services	Coarse Grained with High Performance overhead	Low	No	Special Effort

Integration Styles	Granularity	Reusability	Virtualization	Interoperability
Integration Flow leveraging Provider Services	Granular	High	No	Special Effort
Integration Flow leveraging Provider Services with Virtualization	Coarse Grained	High	Yes	Special Effort
Integration Flow leveraging Provider Services with Canonical-Model based Virtualization	Coarse Grained	High	Yes	As Delivered

2.4. Development Tasks for AIA Artifacts

This section discusses the development tasks for AIA artifacts and describes how to:

- Identify the EBO
- Design an integration flow
- Identify and create the EBS
- Construct the ABCS
- Enable the participating applications
- Identify and create the EBF

2.4.1. Identifying the EBO

The FDD should discuss:

- The conceptual canonical model or EBOs to be used and the actions that need to be performed on this entity.
- Identification of the EBO from the Foundation Pack or construction of EBO. The EBO should incorporate all of the requirements needed by this integration.
- Identification of the EBM from the Foundation Pack or construction of EBM, if required.

For more information, see the *Enterprise Object Library Extensibility Guide* on My Oracle Support in note ID 983958.1.

2.4.2. Designing an Oracle AIA Integration Flow

The design of an Integration Flow is detailed in a technical design document (TDD). The criteria for completion of a TDD are dependent on the project and the accompanying deliverables.

The TDD lays out complete details on the flow logic, integration artifacts, object/element mapping, DVM types and values, error handling, and installation specifics. It also includes an outline of the unit test plans that the developer will use to validate runtime operation.

The Integration Flow is not a runtime executable artifact, so a message exchange pattern cannot be attributed to the Integration Flow. The design of the AIA service artifacts listed previously will need to include a careful analysis of the business scenario, which will lead to a decision on the message exchange patterns for each AIA service artifact.

For more information about message exchange pattern decisions, see Establishing the MEP of a New Process EBS, Identifying the MEP, or How to Identify the Message Pattern for an EBF.

The tasks needed to enable the Oracle AIA service artifacts to participate in various message exchange patterns are discussed in the chapters detailing the development of these artifacts.

To design an Integration Flow:

1. Analyze the participating Application Business Messages (ABMs) and map them to the EBM.

   For more information, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, "Understanding Enterprise Business Objects and Enterprise Business Messages."

2. Identify the EBSs.

   See Designing and Developing Enterprise Business Services.

3. Identify the EBFs.

   See Designing and Constructing Enterprise Business Flows.

4. Identify the ABCSs.

   See Designing Application Business Connector Services.

5. Identify and decide on the participating application connectivity methodology.

   See Designing and Developing Enterprise Business Services.

   For more information, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, "Understanding Interaction Patterns."

6. Identify and decide on the security model.

   See Working with Security.

   For more information, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide,* "Understanding Security"

7. Identify and decide on the performance and scalability needs.

8. Identify and decide on the deployment strategy.

An Oracle AIA Integrating Scenario is a logical collection of AIA service artifacts, including:

- EBSs
- EBFs
- ABCSs

Since an AIA service artifact can be part of multiple AIA integration flows, you must go through the Oracle Enterprise Repository and identify any service artifact that you could reuse. The AIA service artifacts are built with reusability in mind.

For each of the artifacts, follow these reusability guidelines:

- Reusability guidelines for EBSs
- Reusability guidelines for EBFs
- Reusability guidelines for ABCSs

To develop an AIA Integration Flow:

1. Identify and create the EBS, if needed.

   See Designing and Developing Enterprise Business Services.

2. Enable the participating applications.

   See Enabling the Participating Applications.

3. Construct the ABCS.

   See Constructing the ABCS.

4. Construct the EBF.

   See Designing and Constructing Enterprise Business Flows.

For more information about standard naming conventions, see Oracle AIA Naming Standards for AIA Development.

2.4.3. Identifying and Creating the EBS

Each EBO will have an EBS to expose the “Create, Read, Update, Delete” (CRUD) operations as well as any other supporting operations. Each action present in the associated EBM will be implemented as a service operation in EBS. Creation of the EBS and the implementation of all of the service operations will be one of the critical tasks in the implementation of the end-to-end integration flow.

Note: The operations in the entity EBS should only act on the relevant business object and not any other business object. Operations that act on more than one business object should reside in the process EBS.

When the EBS exists, check whether all of the actions necessary for acting on the EBO pertaining to this Integration Flow were implemented as service operations. If they were not, change the existing EBS to add the additional service operations.

This procedure lists the high-level tasks to construct an entity based EBS. Designing and Developing Enterprise Business Services provides complete information on how to complete each of these tasks:

To construct an entity-based EBS:

1. Define and create the contract for the EBS.
2. Construct the EBS.
3. Register relevant provider services for each of the operations.
4. Add routing rules for new or existing operations.
5. Enable each of the service operations for the CAVS.

For more information, see Designing and Developing Enterprise Business Services.

2.4.4. Constructing the ABCSs

For more information, see Constructing the ABCS and Completing ABCS Development.

2.4.5. Enabling the Participating Applications

To enable the participating applications:

1. Identify the service APIs that need to be invoked.
2. Provide the WSDL to the participating applications.
3. Construct adapter services, if required.

2.4.6. Identifying and Creating the EBF

Each identified EBF has a corresponding business process EBS. The operations within this EBS are the entry points to EBFs.

For more information, see Designing and Constructing Enterprise Business Flows.

2.5. Testing an Oracle AIA Integration Flow

The CAVS supports end-to-end testing by stubbing out the applications.

For more information about CAVS, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide*, “Working with the CAVS.”

3. Working with Project Lifecycle Workbench

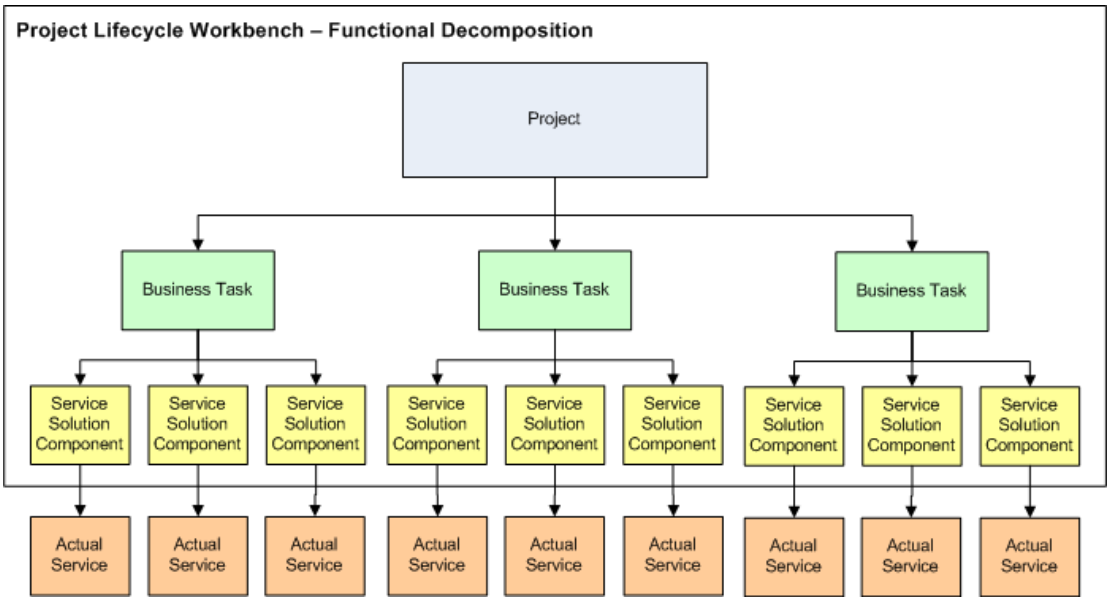
This chapter discusses the following topics:

- Introduction to Project Lifecycle Workbench
- Adding Project Lifecycle Workbench Lookup Values
- Working with Project Lifecycle Workbench Projects
- Working with Project Lifecycle Workbench Service Solution Components

3.1. Introduction to Project Lifecycle Workbench

As a part of the Oracle Application Integration Architecture (AIA) development methodology and lifecycle, functional designs are created to specify requirements and functionality that need to be implemented for an integration project.

Users, such as solution architects and functional product managers, can use the Project Lifecycle Workbench to perform functional decompositions to break down overall projects into business tasks, each of which will be implemented by a collection of composites and services. The Project Lifecycle Workbench complements any existing design and analysis process with its various modeling and functional analysis mechanisms. The functional decomposition, the final output of the design and analysis process, is captured and persisted in the Project Lifecycle Workbench.



Functional decomposition of a project into actual implemented services

The primary building blocks that enable functional decomposition in the Project Lifecycle Workbench are:

- Project

A project is a named effort to deliver a solution conforming to the AIA methodology and guidelines. The components of a project must be packaged and deployed on a middleware solution.

- Business Task

  A business task represents a reusable unit of work that is arrived at based on analysis of reference process models. These could be business processes, business activities, or business tasks and are loosely added to a project in the Project Lifecycle Workbench as business tasks.

- Service Solution Component

  A service solution component is a chunk of functionality within the scope of a business task that is implemented as an AIA service artifact. For example, a service solution component corresponds to an Application Business Connector Service (ABCS), Enterprise Business Service (EBS), or Enterprise Business Flow (EBF). A service solution component conveys the functionality that the AIA service artifact needs to fulfill.

For more information about the overall Oracle AIA Project Lifecycle, see Building AIA Integration Flows.

3.2. Adding Project Lifecycle Workbench Lookup Values

This section discusses How to Add Lookup Values.

3.2.1. How to Add Lookup Values

Objective

Project Lifecycle Workbench is delivered with the following sets of lookup values:

- Industry code, for use with projects
- Status, for use with projects
- Product code, for use with service solution components
- Service type, for use with service solution components

These lookup values are available for assignment to projects or service solution components.

For more information about working with projects, see Working with Project Lifecycle Workbench Projects.
For more information about working with service solution components, see Working with Project Lifecycle Workbench Service Solution Components.

If a required lookup value is not available, use this procedure to add it.

Prerequisites and Recommendations

Obtain confirmation from the Project Lifecycle Workbench user community that the lookup value to be added is necessary and valid.

Actor

System administrator

To add your own lookup values:

1. Run the following SQL statement to insert the required lookup value into the AIA_LOOKUPS_B table:

```
INSERT INTO AIA_LOOKUPS_B (LOOKUP_TYPE, LOOKUP_CODE, PARENT_LOOKUP_CODE,
CREATED_BY, CREATION_DATE, LAST_UPDATED_BY, LAST_UPDATE_DATE,
OBJECT_VERSION_NUMBER)
SELECT '<lookup value type>', '<lookup value code>', null,
SYS_CONTEXT('USERENV', 'AUTHENTICATED_IDENTITY'), sysdate,
SYS_CONTEXT('USERENV', 'AUTHENTICATED_IDENTITY'), sysdate, 1
FROM DUAL
WHERE NOT EXISTS (SELECT 1
FROM AIA_LOOKUPS_B
WHERE LOOKUP_TYPE = '<lookup value type>'
AND LOOKUP_CODE = '<lookup value code>');
```

   a. Replace the highlighted <lookup value type> variable with the type of lookup code that you want to enter: INDUSTRY, PROJECT_STATUS, SERVICE_TYPE, or PRODUCT_CODE.

   b. Replace the highlighted <lookup value code > variable with the lookup value code that you want to add. This value has a 30-character limit.

2. Run the following SQL statement to insert the required lookup value code, meaning, and description into the AIA_LOOKUPS_TL table. After running this SQL statement, a message appears to notify you of the number of rows that were created. If this is correct, enter ***commit***.

```
INSERT INTO AIA_LOOKUPS_TL (LOOKUP_TYPE, LOOKUP_CODE, MEANING,
DESCRIPTION, LANGUAGE, SOURCE_LANG, CREATED_BY, CREATION_DATE,
LAST_UPDATED_BY, LAST_UPDATE_DATE, OBJECT_VERSION_NUMBER)
SELECT '<lookup value type>', '<lookup value code>', '< lookup value in UI
>', '<lookup value description >', SYS_CONTEXT('USERENV', 'LANG'),
SYS_CONTEXT('USERENV', 'LANG'), SYS_CONTEXT('USERENV',
'AUTHENTICATED_IDENTITY'), sysdate, SYS_CONTEXT('USERENV',
'AUTHENTICATED_IDENTITY'), sysdate, 1
FROM DUAL
WHERE NOT EXISTS (SELECT 1
FROM AIA_LOOKUPS_TL
WHERE LOOKUP_TYPE = '<lookup value type>'
AND LOOKUP_CODE = '<lookup value code>');
```

   a. Replace the highlighted <lookup value type> variable with the type of lookup code that you used in step 1.

   b. Replace the highlighted <lookup value code> variable with the lookup value code that you added in step 1. This value has a 30-character limit.

   c. Replace the highlighted <lookup value in UI> variable with the actual lookup value that you want to appear in the UI. This value has an 80-character limit.

d. Replace the highlighted <lookup value description> variable with a description of the lookup value. This is optional. This value has a 240-character limit.

3. Project Lifecycle Workbench lookup values are configured with the following language settings: LANGUAGE = US and SOURCE_LANG = US. By default, an AIA Installer-based Foundation Pack installation will have the supporting US language installed.

If your implementation uses a value other than LANGUAGE = US, you must run the following SQL statement to populate the AIA_LOOKUPS_TL with the internationalized text for the lookup value that you added in step 2.

```
INSERT INTO AIA_LOOKUPS_TL (LOOKUP_TYPE, LOOKUP_CODE, MEANING,
DESCRIPTION, LANGUAGE, SOURCE_LANG, CREATED_BY, CREATION_DATE,
LAST_UPDATED_BY, LAST_UPDATE_DATE, OBJECT_VERSION_NUMBER)
SELECT <lookup value type>', '<industry code>', '<industry lookup value in
UI >', '<industry description >', <language code>, 'US',
SYS_CONTEXT('USERENV', 'AUTHENTICATED_IDENTITY'), sysdate,
SYS_CONTEXT('USERENV', 'AUTHENTICATED_IDENTITY'), sysdate, 1
FROM DUAL
WHERE NOT EXISTS (SELECT 1
FROM AIA_LOOKUPS_TL
WHERE LOOKUP_TYPE = '<lookup value type>'
AND LANGUAGE = '<language code>'
AND LOOKUP_CODE = '<industry code>');
```

a. Replace the highlighted <language code> values with the actual language code.

> **For more information,** see *Oracle Database Globalization Support Guide,* "Locale Data," Languages.

b. Replace the highlighted <lookup value type> variable with the type of lookup code that you used in step 1.

c. Replace the highlighted <industry code> variable with the lookup value code that you added in step 1. This value has a 30-character limit.

d. Replace the highlighted <industry lookup value in UI> variable with the internationalized industry value that you want to appear in the UI. This value has an 80-character limit.

e. Replace the highlighted <industry description> variable with an internationalized description of the industry. This is optional. This value has a 240-character limit.

3.3. Working with Project Lifecycle Workbench Projects

This section discusses the following topics:

- How to Define Project Lifecycle Workbench Projects
- How to Update Project Lifecycle Workbench Projects
- How to Access Project Lifecycle Workbench Projects

3.3.1. How to Define Project Lifecycle Workbench Projects

Objective

Define a project that you want to functionally decompose into business tasks and service solution components.

Prerequisites and Recommendations

Ensure that all required lookup values are available. If not, contact your system administrator to add required values.

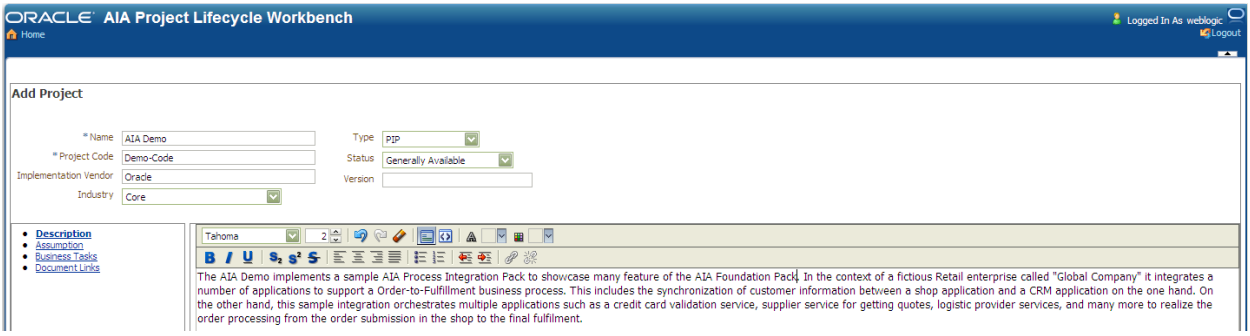
For more information, see How to Add Lookup Values.

Actors

- Functional product manager
- Solution architect

To define a project:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab.
2. Click the Add Project button to access the Add Project page.



Add Project page

a. In the **Name** field, enter a descriptive project name.

b. In the **Project Code** field, enter a code (one word with no spaces) for your project. The project code value appears as a root-level attribute of the bill of material generated for the project. Per Process Integration Pack (PIP) development best practices, this project code value must be used by development as the project file directory name in their source control system for downstream automation features, such as the Deployment Plan Generator, to work as designed.

c. In the **Implementation Vendor** field, enter the vendor that is responsible for implementing the project, whether it is Oracle or another vendor.

d. In the **Industry** drop-down list box, select the industry that is targeted by the project. If the required industry value is not available, users should be able to contact their system administrator to have an approved industry added.

For more information about adding industry codes lookup values, see How to Add Lookup Values.

e. In the **Type** field, select the type of project that you are defining.

f. In the **Status** field, select the project status.

g. In the **Version** field, enter the AIA release to which this project belongs.

3. Click Save to save your work and continue entering more information about the project on the Add Project page.

For more information about the Project page, see How to Access Project Lifecycle Workbench Projects.

4. To enter a project description, click the **Description** link. In the text field, enter information about the project, such as the features and requirements of the project. You may choose to copy-and-paste information from a functional design document.

5. To enter project assumptions, click the **Assumption** link. In the text field, describe any assumptions involved in implementing the project. You can choose to copy-and-paste information from a functional design document.

6. To define the business tasks into which you want to decompose the project, click the **Business Tasks** link.

   - To add a business task, click the Add Business Task button  . To delete a business task, click the Delete Business Task button  .
   - For each business task, enter a business task name and a description.
   - Use the In Scope and Out of Scope options to indicate whether the business task is in scope to be implemented as a part of the project. As development of this project progresses, a business task may move in and out of scope. Only business tasks with the **In Scope** option selected are included in a generated project bill of material (BOM).

For more information, Working with Project Lifecycle Workbench Bills of Material.

7. To provide links to supporting project documentation, click the Document Links link.

   - To add a document link, click the Add Document Link button  . To delete a document link, click the Delete Document Link button  .
   - For each document, enter a document name and URL location.

8. Click **Save and Return** to save your work and access the Project page.

For more information about the Project page, see How to Access Project Lifecycle Workbench Projects.

3.3.2. How to Update Project Lifecycle Workbench Projects

Objective

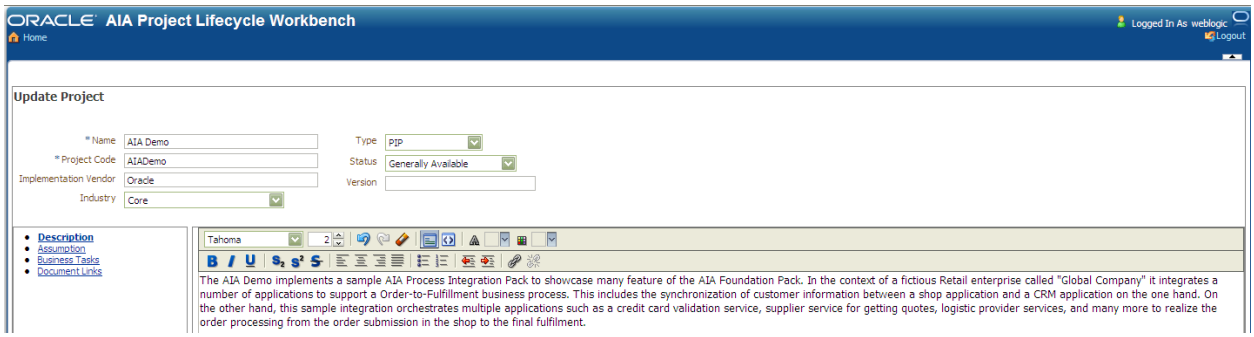
Update an existing project.

Actors

- Functional product manager
- Solution architect

To update a project:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab.
2. Locate the project that you want to update and click the Update Project button to access the Update Project page.



Update Project page

For more information about the elements available on the Update Project page, see How to Define Project Lifecycle Workbench Projects.

3.3.3. How to Access Project Lifecycle Workbench Projects

Objective

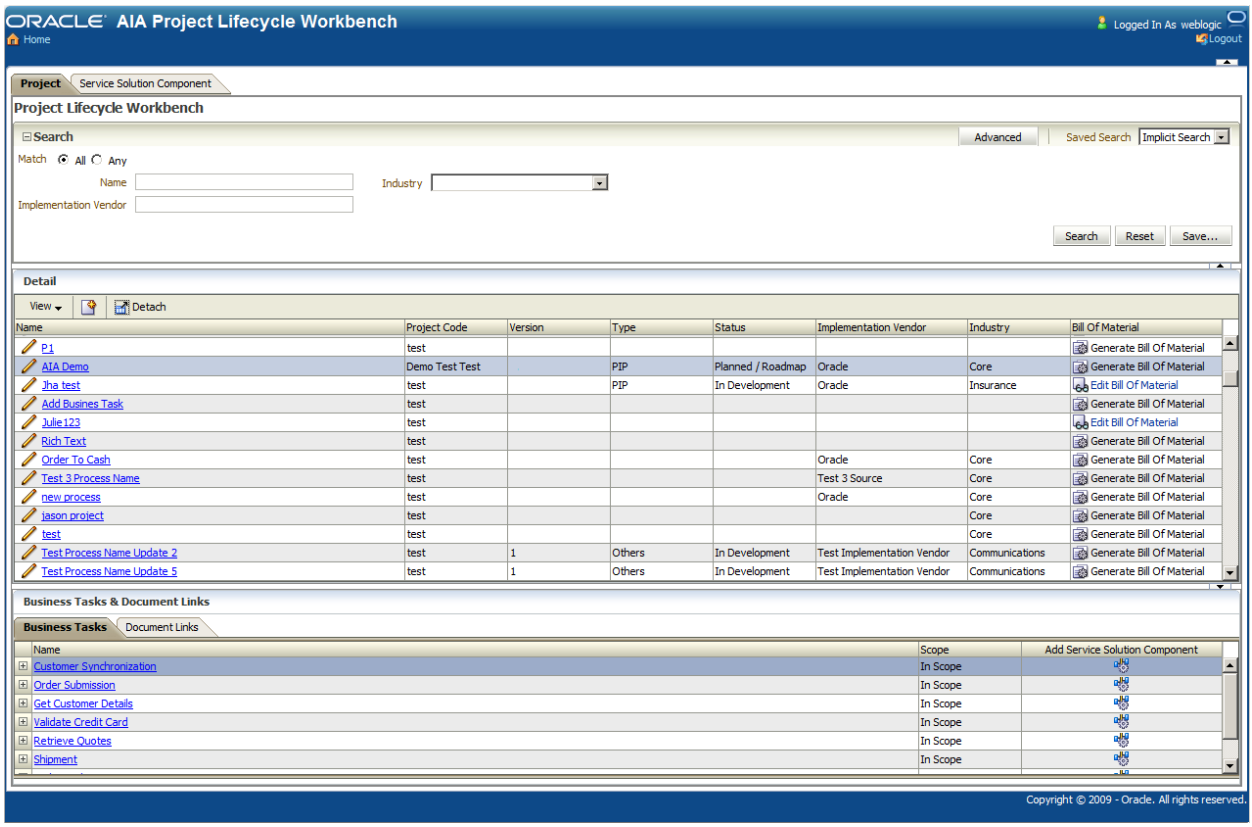
Access project summaries, access pages that enable you to create projects, update projects, and generate BOMs for projects.

Actors

Anyone

To access projects:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab.



Project page

2. Use the query criteria in the **Search** area to locate the project with which you want to work.
3. The **Detail** area displays project summaries and provides access to the following details and functionality.

- Click the Add Project button  to access the Add Project page, where you can define a project.

> **For more information,** see How to Define Project Lifecycle Workbench Projects.

- Click the Update Project  button to access the Update Project page, where you can update a project.

> **For more information,** see How to Update Project Lifecycle Workbench Projects.

- Hover over a project name link to display project details.
- The **Bill of Material** column provides access to controls that enable you to work with BOMs.

> **For information** about generating, editing, and viewing bills of material**,** see Working with Project Lifecycle Workbench Bills of Material.

4. The **Business Tasks & Document Links** area provides access to the following details and functionality.

   - Click the **Business Tasks** tab to expand a business task and display the task's description and associated service solution components.
   - Click the Add Service Solution Component button  to access the Create Service Solution Component page.

   For more information, see How to Define Project Lifecycle Workbench Service Solution Components.

   - Click the **Document Links** tab to access documents associated with the business task.

3.4. Working with Project Lifecycle Workbench Service Solution Components

This section discusses the following topics:

- How to Define Project Lifecycle Workbench Service Solution Components
- How to Update Project Lifecycle Workbench Service Solution Components
- How to Access Service Solution Components

3.4.1. How to Define Project Lifecycle Workbench Service Solution Components

Objective

Define the service solution components that make up a business task in a Project Lifecycle Workbench project. Each service solution component that you define should correspond to a single composite or service that will be built or reused. These composites and services collectively accomplish the functionality and logic that is required by their parent business task.

Prerequisites and Recommendations

- The project and business tasks to which you want to assign service solution components must already exist.

  For more information, Working with Project Lifecycle Workbench Projects.

- Ensure that all required lookup values are available. If not, contact your system administrator to add required values.

  For more information, see How to Add Lookup Values.

Actors

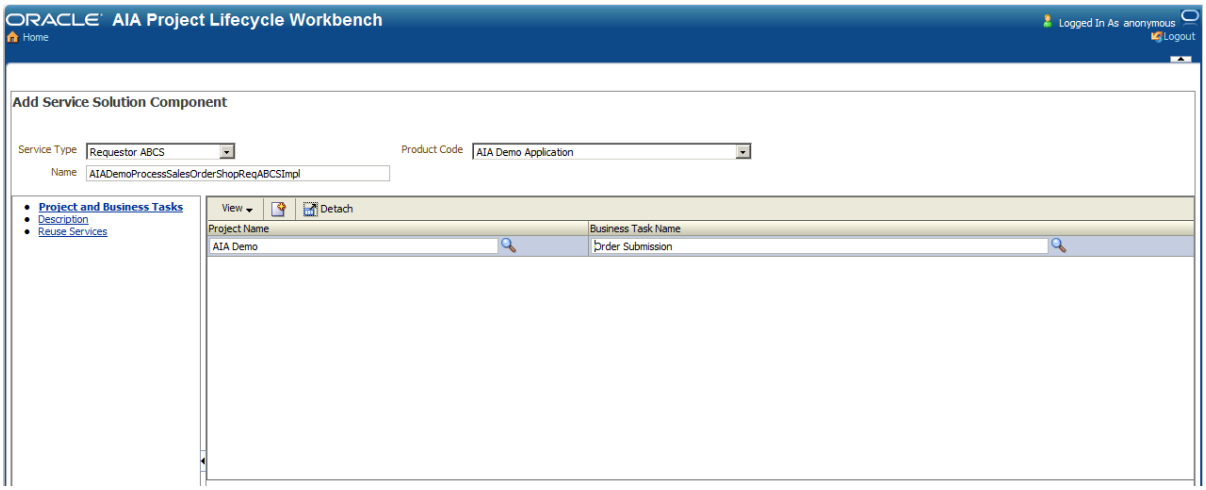
- Developers
- Functional product manager
- Solution architect

The developers work with functional product managers and solution architects to validate the project design and decomposition. The developers ultimately take on the task of implementing the service solution component as composites

To define service solution components for Project Lifecycle Workbench project business tasks:

1. Access the Create Service Solution Component page in one of two ways:

   - Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Service Solution Component tab. Click the Add Service Solution Component button  .
   - Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab. Click the project link for the project for which you want to define service solution components. Business tasks assigned to the selected project display on the Business Tasks tab. Locate the business task for which you want to define service solution components. Click the Add Service Solution Component button  .



Create Service Solution Component page

2. Select a **Service Type** value: ***Requestor ABCS, Provider ABCS, Enterprise Business Flow, Enterprise Business Service, Composite Business Process,*** or ***Others.***

   - The actual composite or service that is built from this service solution component definition will inherit the service type value. Developers can override this inherited attribute when working in Service Constructor.

For more information, see Working with Service Constructor.

- For example, selecting a ***Requestor ABCS*** service type will result in a requester Application Business Connector Service being queued for construction later in the AIA lifecycle flow. If you select ***Requestor ABCS*** or ***Provider ABCS,*** an autogenerated globally unique identifier (GUID) is assigned to the service solution component. The composite built for this service solution component is tagged with the GUID when it is created by the Service Constructor. When the implemented composite is harvested for display in the Oracle Enterprise Repository, the GUID on the composite is used to associate the composite back with its originating service solution component in the Project Lifecycle Workbench.
- The **Product Code** field appears. Select the product code that corresponds to the participating application for which the service solution composite is being defined. For example, if you are defining a requester service solution component, the product code that you select should correspond to the requesting participating application.

  The Deployment Plan Generator uses the product code value in carrying out its logic.

For more information about the Deployment Plan Generator, see Deploying Composites.

Available product code values are derived from the Application Object Library directory names in your source control system. If the required product code is not available, users should be able to contact their system administrator to have a product code added.

For more information about making product code values available to the Project Lifecycle Workbench, see How to Add Lookup Values.

Note: For service solution components with **Service Type** field values set to ***Provider ABCS*** or ***Requestor ABCS,*** the AIA Service Constructor can function based on the information captured on this page.

For more information, see Working with Service Constructor.

3. Enter a descriptive name for the service solution component. This is not meant to be the actual service implementation name.
4. To associate the service solution component with projects and business tasks, click the **Project and Business Tasks** link.
   - If you accessed this page from the Business Task tab, the business task that you selected to access this page will display relevant project and business task values.
   - If you accessed this page from the Service Solution Component page, you can associate the service solution component with one or more project and business task combinations.
5. To provide a description of the service solution component, click the **Description** link. In the text field, enter information about the service solution component, such as the functionality that it intends to provide and implementation assumptions.

6. To search for existing services that you may be qualified to reuse for your service solution component, click the **Reuse Services** link.

   a. If an Oracle Enterprise Repository instance has been defined as a part of your AIA Installer installation, the Search AIA Asset Instances button  appears. Click it to access the Oracle Enterprise Repository and search for existing AIA interface assets that could be reused for your integration project. If you find a match in Oracle Enterprise Repository, make a note of its Service Name and Namespace value.

      If an Oracle Enterprise Repository instance exists, but was not defined as a part of your AIA Installer installation, access it manually to perform this search.

      For more information about loading AIA interfaces into Oracle Enterprise Repository, see Introduction to Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

      If an Oracle Enterprise Repository instance does not exist, you will not be able to use it to browse for and research which existing services are available for reuse. However, your organization may have an alternate means of sharing information about existing services. If applicable, you can use these means to acquire the Service Name and Namespace values and proceed with the next step, 6b.

      If no service exists that is appropriate for reuse for your project, proceed to step 7.

   b. Click the Add Service button  to add a new row to the page. Click the Search button  to access the Search and Select: Service Name page, where you can use the Service Name and Namespace values that you obtained in step 6a to locate the service in the Project Lifecycle Workbench database. Select the existing service and click OK to add it to the service solution component.

7. Click **Save and Return** to save your work and access the Service Solution Component page.

For more information about the Service Solution Component page, see How to Access Service Solution Components.

3.4.2. How to Update Project Lifecycle Workbench Service Solution Components

Objective

Update service solution components.

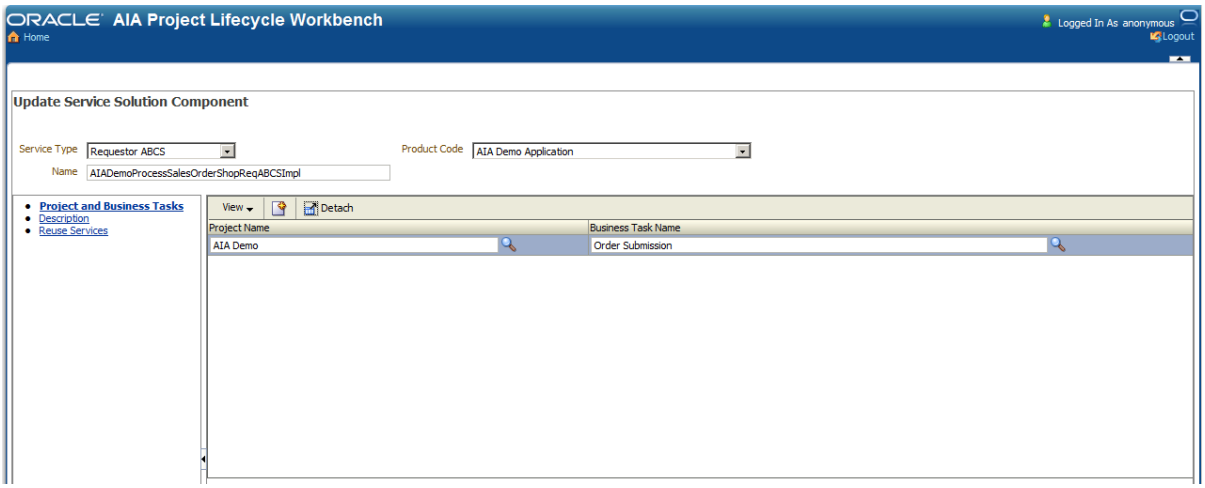
Actors

- Functional product manager
- Developers
- Solution architect

To update service solution components:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Service Solution Component tab.

2. Locate the service solution component that you want to update and click the button to access the Update Service Solution Component.



Update Service Solution Component page

For more information about the elements available on the Update Service Solution Component page, see How to Define Project Lifecycle Workbench Service Solution Components.

3.4.3. How to Access Service Solution Components

Objective

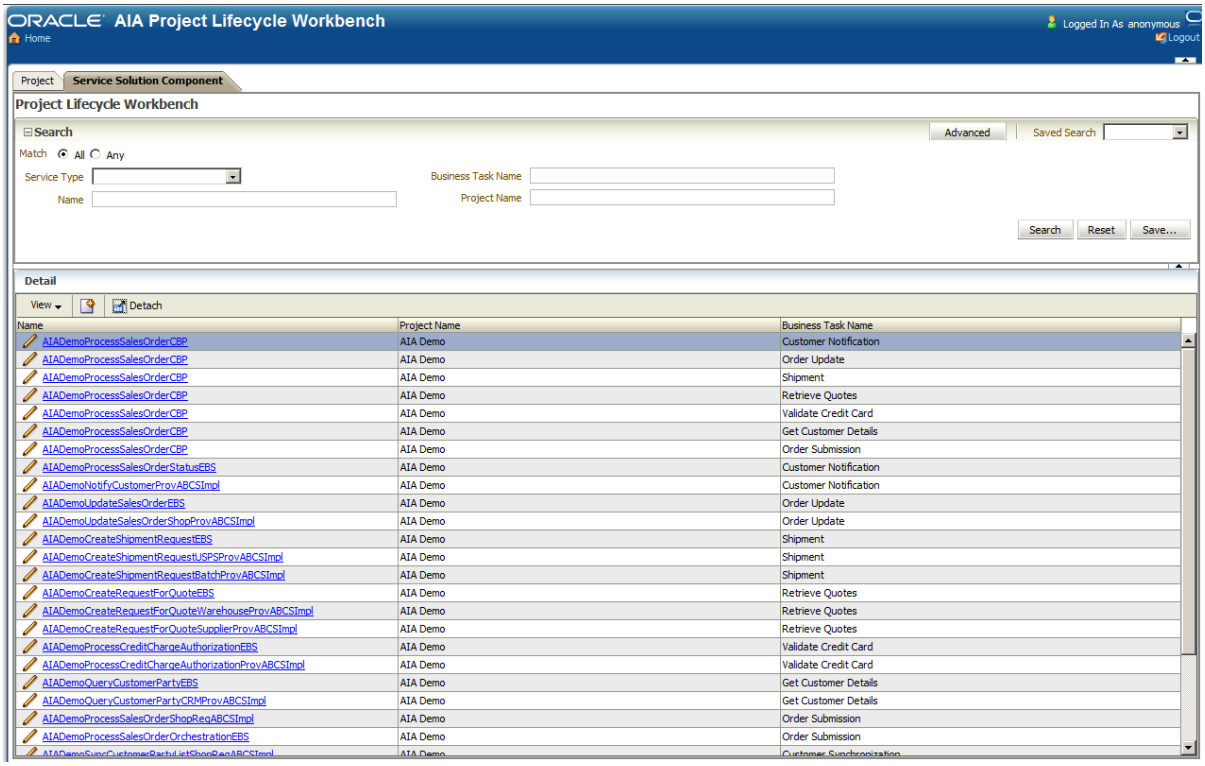
Access service solution component summaries. Access pages that enable you to create and update service solution components.

Actors

Anyone

To access service solution component summaries:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Service Solution Component tab.



Service Solution Component page

2. Use the query criteria in the **Search** area to locate the service solution component with which you want to work.

3. The **Detail** area displays service solution component summaries and provides access to the following details and functionality.

   - Click the Add Service Solution Component button to access the Add Service Solution Component page, where you can define service solution components.

     For more information, see How to Define Project Lifecycle Workbench Service Solution Components.

   - Click the Update Service Solution Component button to access the Update Service Solution Component page, where you can update a service solution component.

     For more information, see How to Update Project Lifecycle Workbench Service Solution Components.

   - Hover over a service solution component name link to display component details. Expand a service solution component to display further details.

4. Working with Service Constructor

This chapter discusses the following topics:

- Introducing the Service Constructor
- Creating New Service Solution Component Projects with AIA Service Constructor

4.1. Introducing the Service Constructor

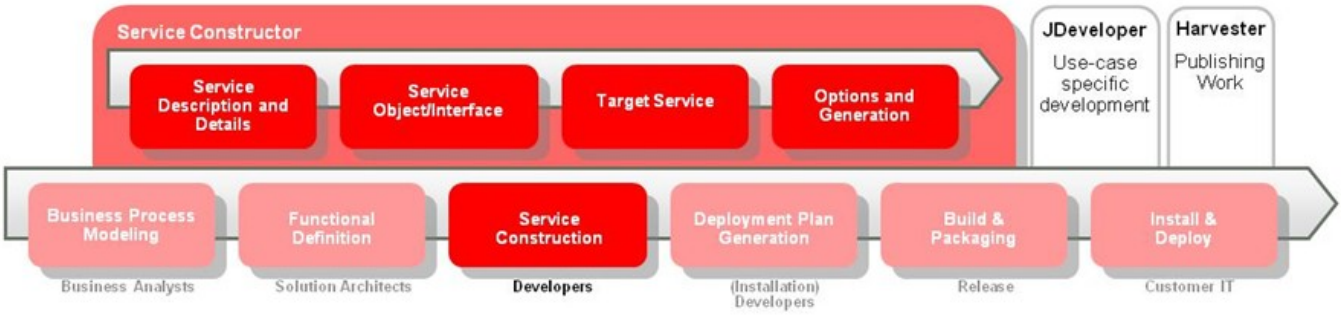
Through an extension to Oracle JDeveloper called the Service Constructor, developers can easily create new Oracle Application Integration Architecture (AIA) Service Component Projects that conform to the AIA programming models as well as naming and architectural recommendations. Presently, the Service Constructor supports the following service components:

- Requester Application Business Connector Service (ABCS)
- Provider ABCS

As a part of the AIA Project Lifecycle, the Service Constructor is used in the Service Construction phase. Service constructor guides the developer through four of the six subphases when developing an ABCS. The four subphases are:

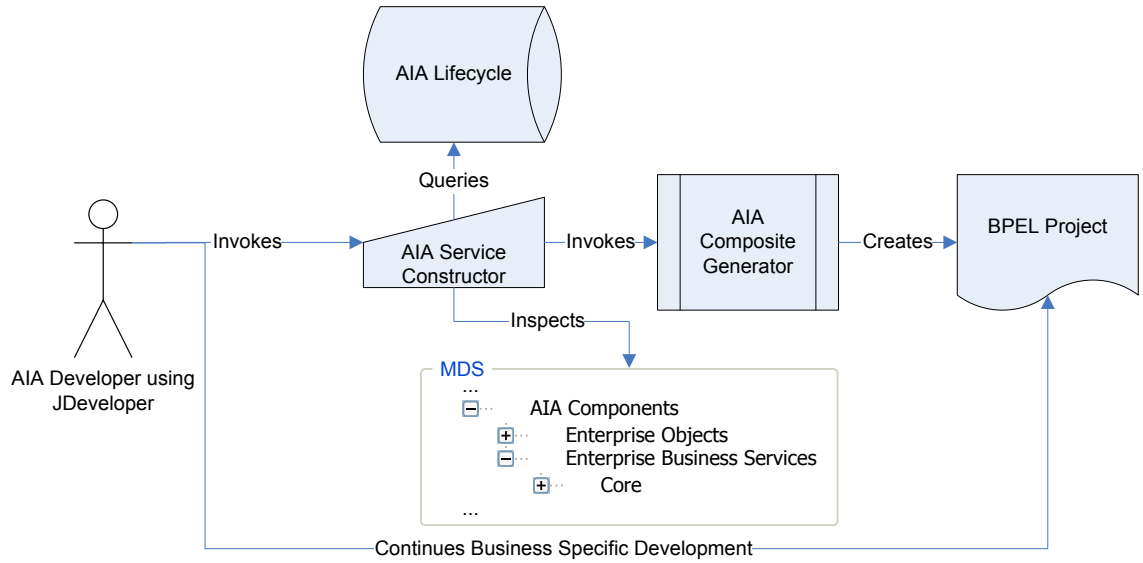
- Service Description and details: High-level information about the Service Solution Component and the Project/Business Activity to which it belongs.
- Service Object/Interface: The type of message that the ABCS will receive and if and how it will reply.
- Target Service: Services that will be invoked by the ABCS and the message it will pass to those services.
- Additional Options/Generation: Options such as error-handling and extension run-time location, as well as the launching point to generate a JDeveloper project for continued development.

Once the developer has completed the Service Constructor Interview, a complete JDeveloper project is produced that the developer will continue to develop, incorporating use-case specific requirements.



Overview of the AIA Project Lifecycle

AIA Service Constructor enhances developer productivity by providing a more user-friendly interface to the Composite Generator (formerly the Artifact Generator), auto-inspection of services and project selection from the AIA Project Lifecycle Workbench. Service Constructor relieves developers from the time involved performing repeatable mundane tasks, helping them focus more on value-added business scenario-specific tasks, reducing ABCS development time.



Flow of creating a new AIA Service Component

4.1.1. Required Software for Using Service Constructor

Service constructor requires certain Oracle and third-party components to be in place to operate successfully:

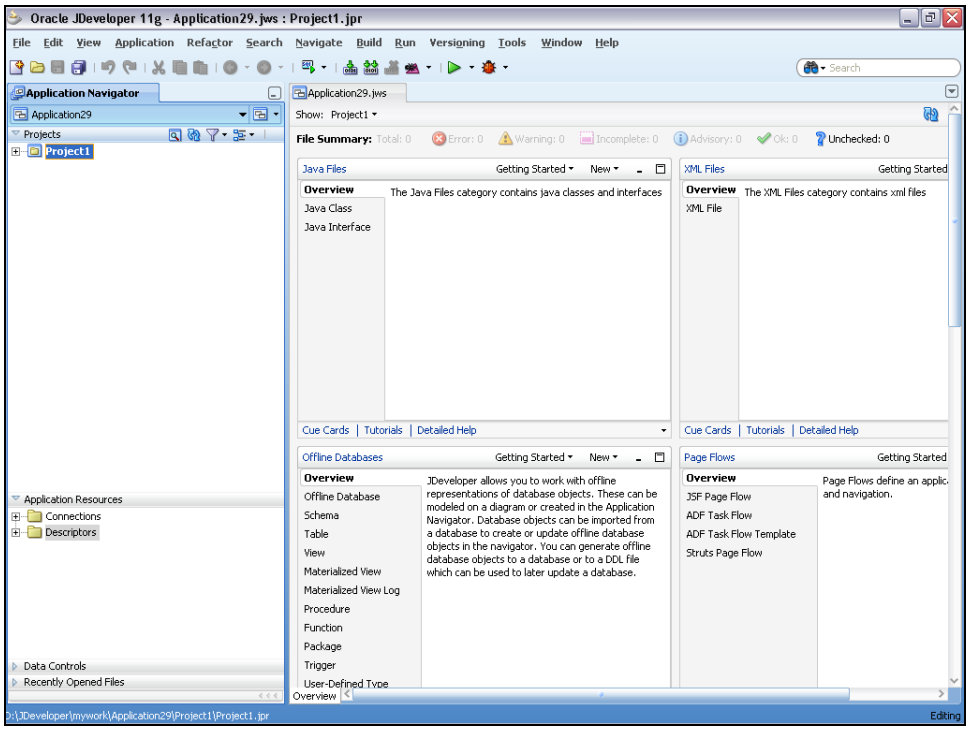
- Oracle JDeveloper 11g
- Oracle SOA Composite Editor and AIA Service Constructor, both available through the JDeveloper update center (Help->Check For Updates)
- Freemarker 2.3.15 or higher. Visit http://www.freemarker.org to obtain the Freemarker template engine. Place freemarker.jar (contained in the downloaded zip file) in your jdeveloper/jdev/lib folder found under your JDeveloper installation.

4.2. Creating New Service Solution Component Projects with AIA Service Constructor

Developers and solution architects regularly collaborate through multiple channels and use documents such as the Functional Design Document to define and communicate the services that need to be developed. To begin the development process, the developer will open an existing application workspace or create a new application workspace in JDeveloper.

To create a new service solution component project with AIA Service Constructor:

1. In JDeveloper, open an existing application workspace or create a new generic application.

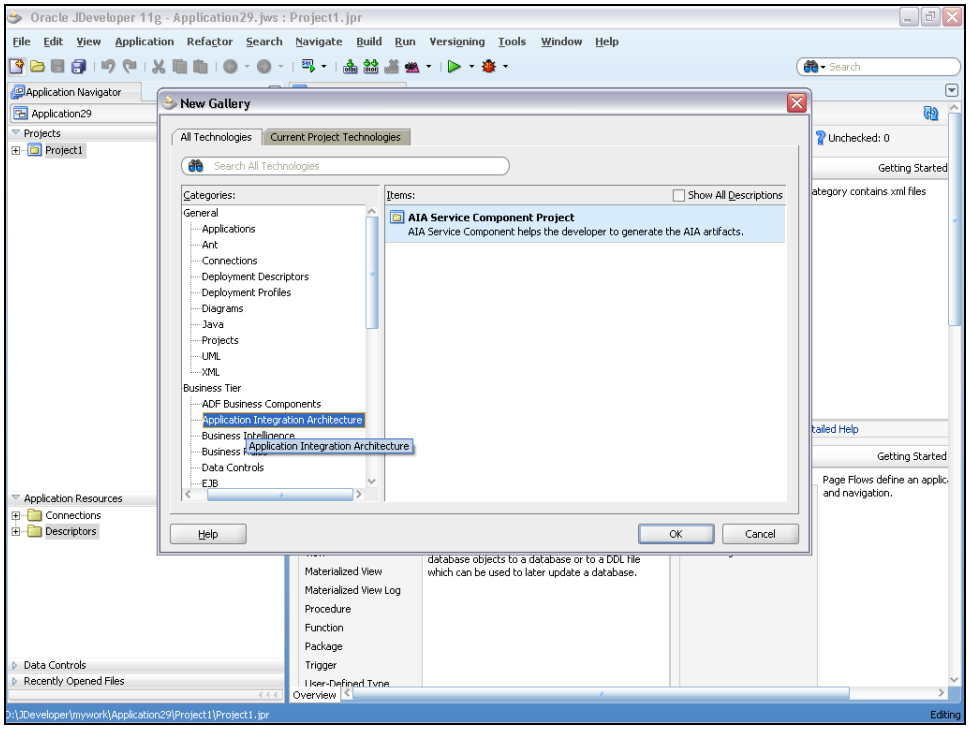


Typical Opening View of a Generic Application in JDeveloper

The Developer will then create a new project within the Workspace to develop an AIA Service Solution Component.

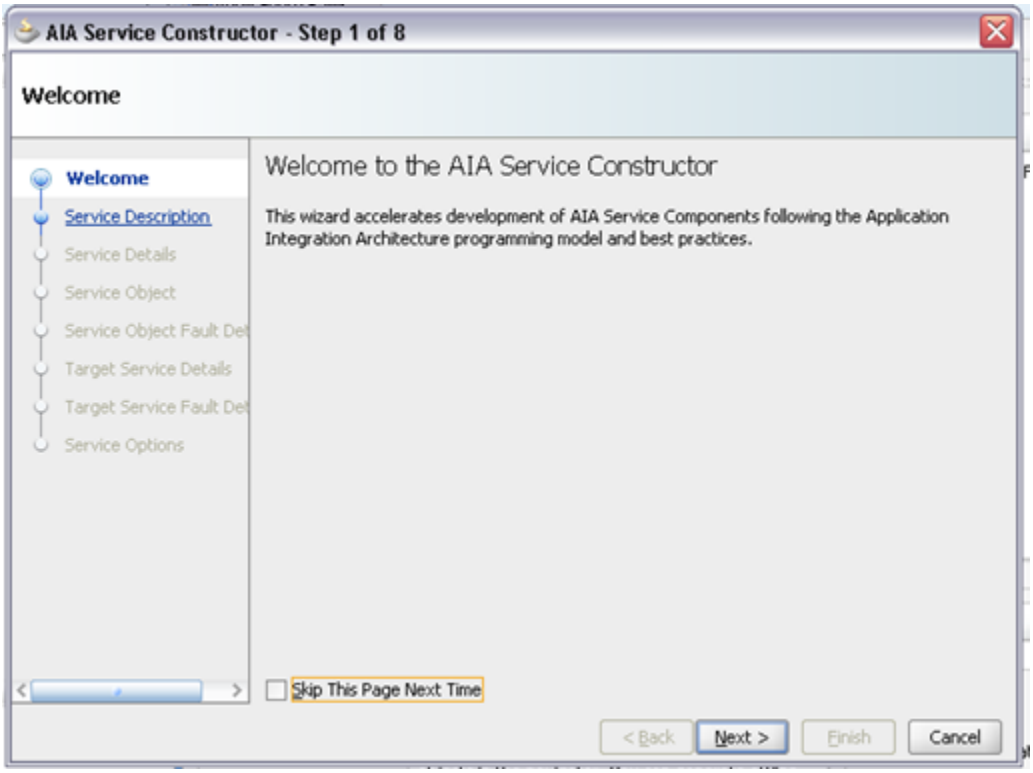
2. To begin the process of creating an AIA Service Component project, click the New  button.

3. In the **New Gallery** window, click the **Business Tier** -> **Application Integration Architecture** or **General** -> **Projects** tree item. Ensure that the **All Technologies** tab is selected.



4. Click the **AIA Service Component Project** list item.

5. Click **OK**.



The Welcome screen for the Service Constructor appears. You can choose to skip this page in subsequent visits by selecting the option at the bottom of the page.

6. Click **Next**.

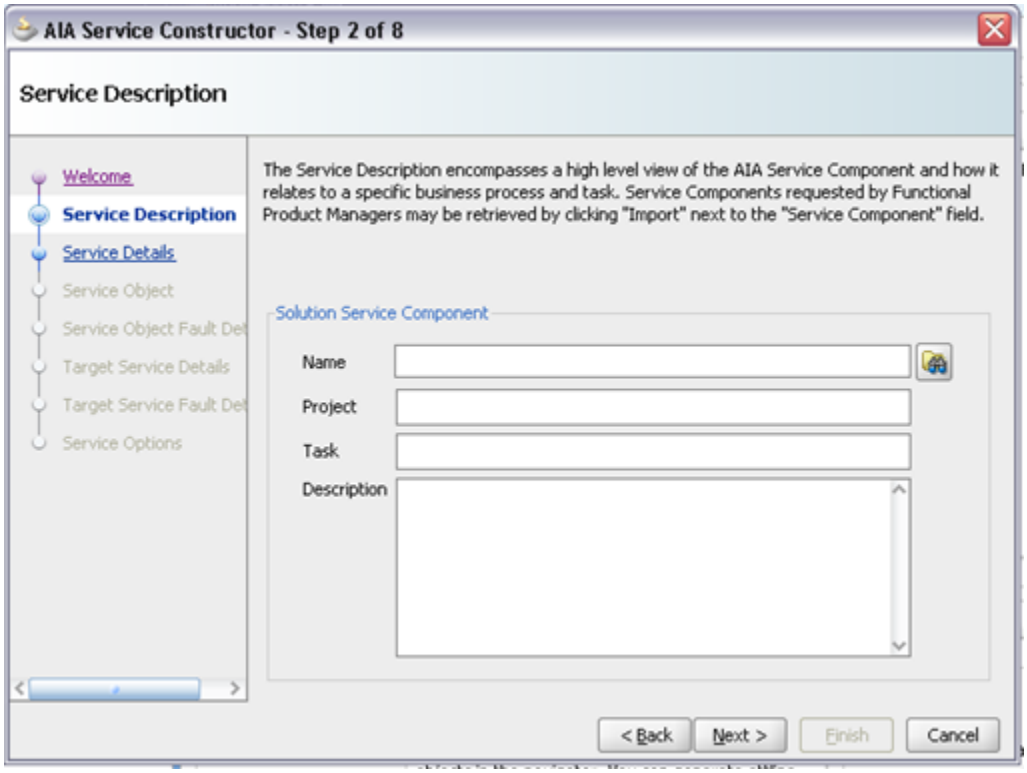
4.2.1. Defining the Service Description

To define the service description:

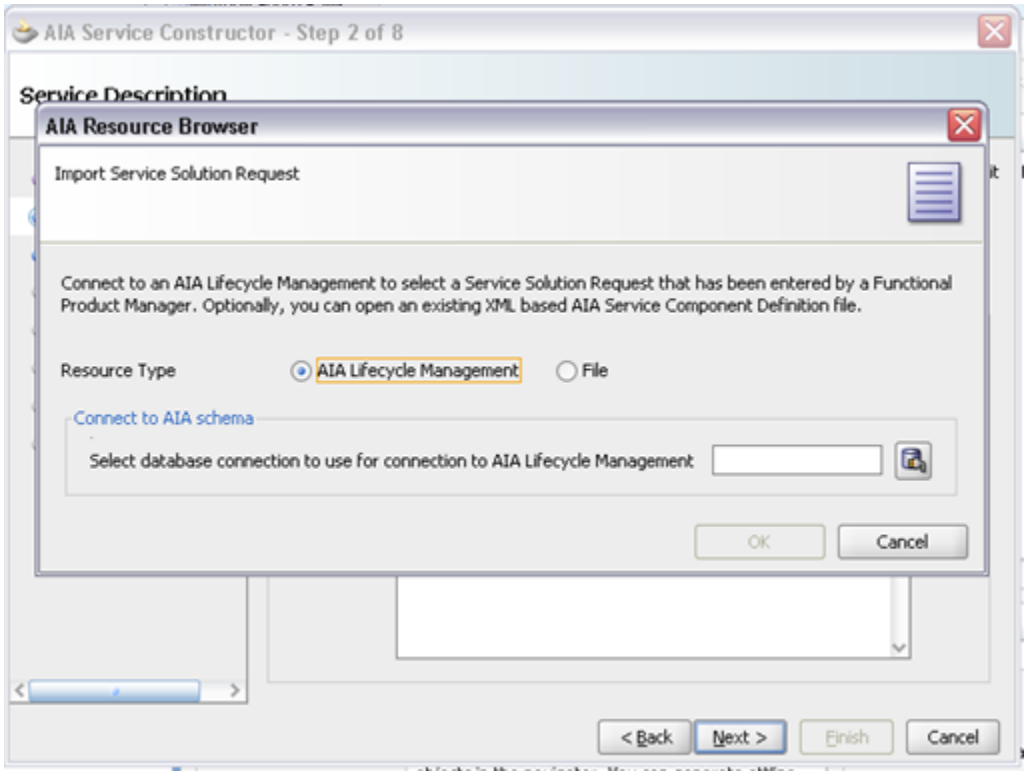
1. On the Service Description page, click the Import button  to select the name of an existing service solution request that has been entered into AIA Lifecycle by a Solution Architect or Functional Product Manager.

   Alternatively, you can enter the information here if it is not available in AIA Lifecycle; however, we strongly suggest that the functional definition be entered and available from AIA Lifecycle before you start the development of the Solution Service Component.

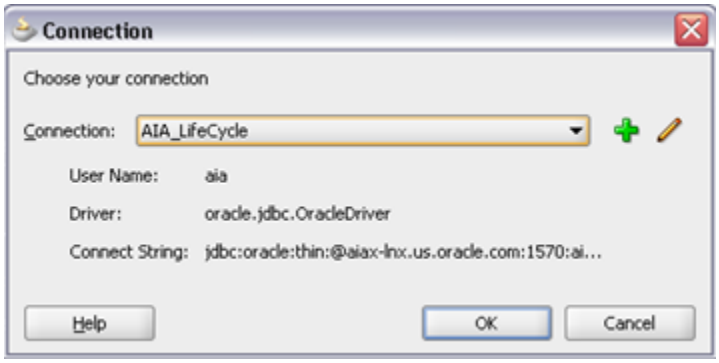
For more information about creating service solution requests, see Working with Project Lifecycle Workbench Service Solution Components.



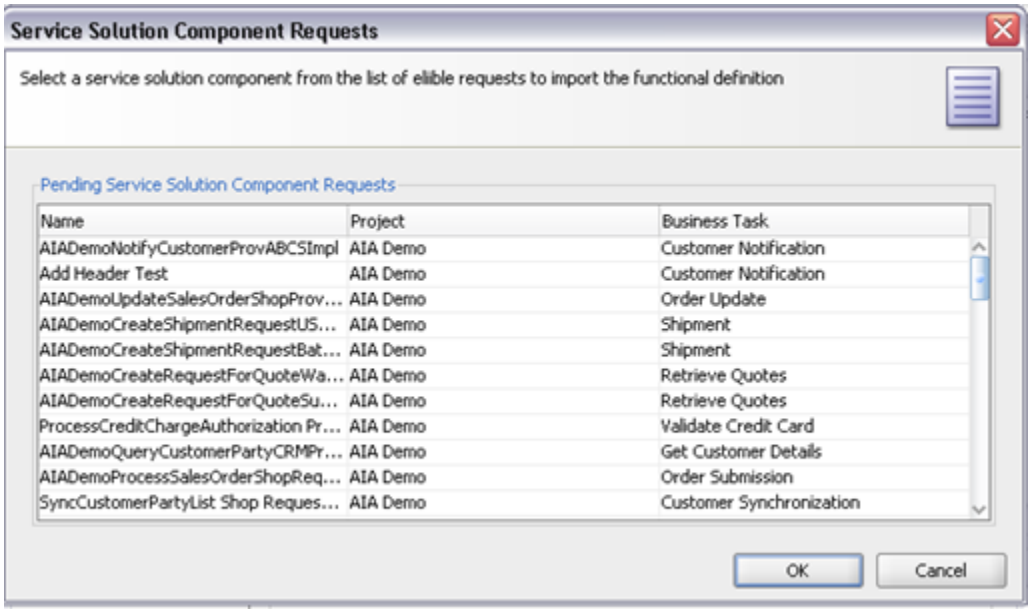
For more information about AIA Lifecycle Management, see Working with Project Lifecycle Workbench.



2. The resource browser provides two options for importing a Service Solution Request, **AIA Lifecycle Management** and **File**. Most users will connect to the AIA Lifecycle Management to retrieve the functional definition entered by a Solution Architect or Functional Product Manager.
3. The option to open from **File** is also available. This enables you to open a previously created XML input file either for the AIA 2.x Artifact Generator or the AIA Composite Generator.
4. This flow illustrates the retrieval of a Service Solution Request from AIA Lifecycle Management.
5. Click the Database Connection button  to select a connection to AIA Lifecycle Management.



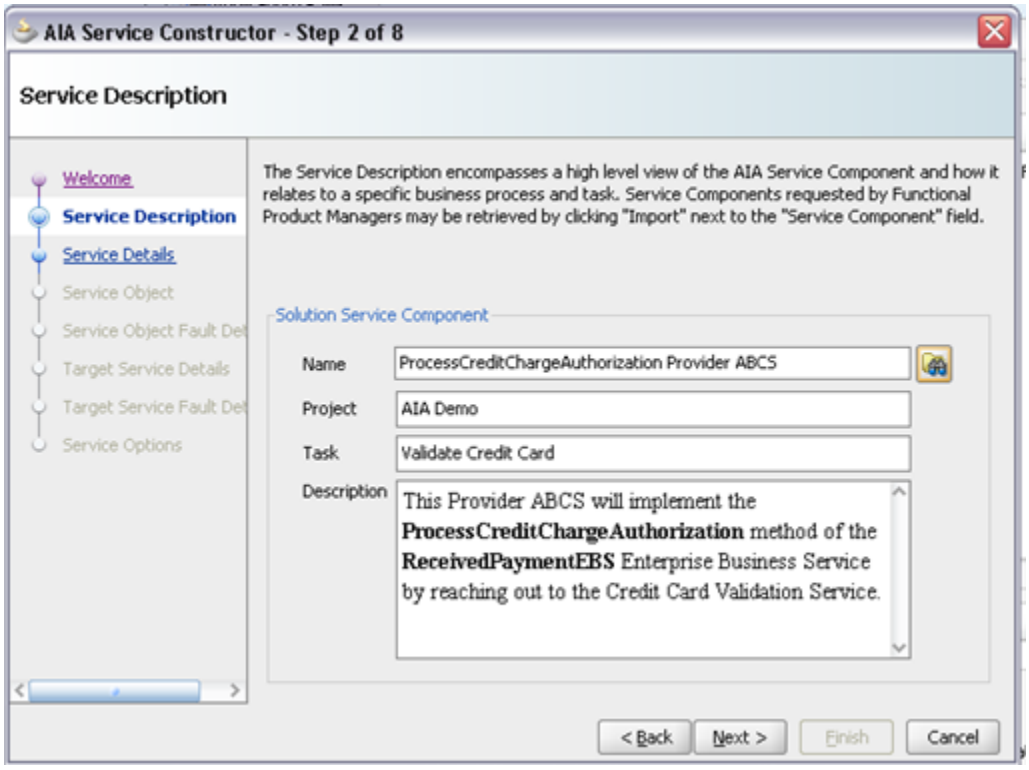
6. Click **OK**.
7. Select a service solution component from the list of eligible requests.



8. Click **OK**.

9. The Service Description page is populated with the name, project, task, and description of the service solution component. Following the AIA Lifecycle, a Solution Architect typically creates the functional decomposition and has defined these values.

10. The developer, if necessary, can add to, update, or create altogether the information contained in the Service Description, and any additions or changes will later be harvested into Oracle Enterprise Repository and AIA Lifecycle Management.



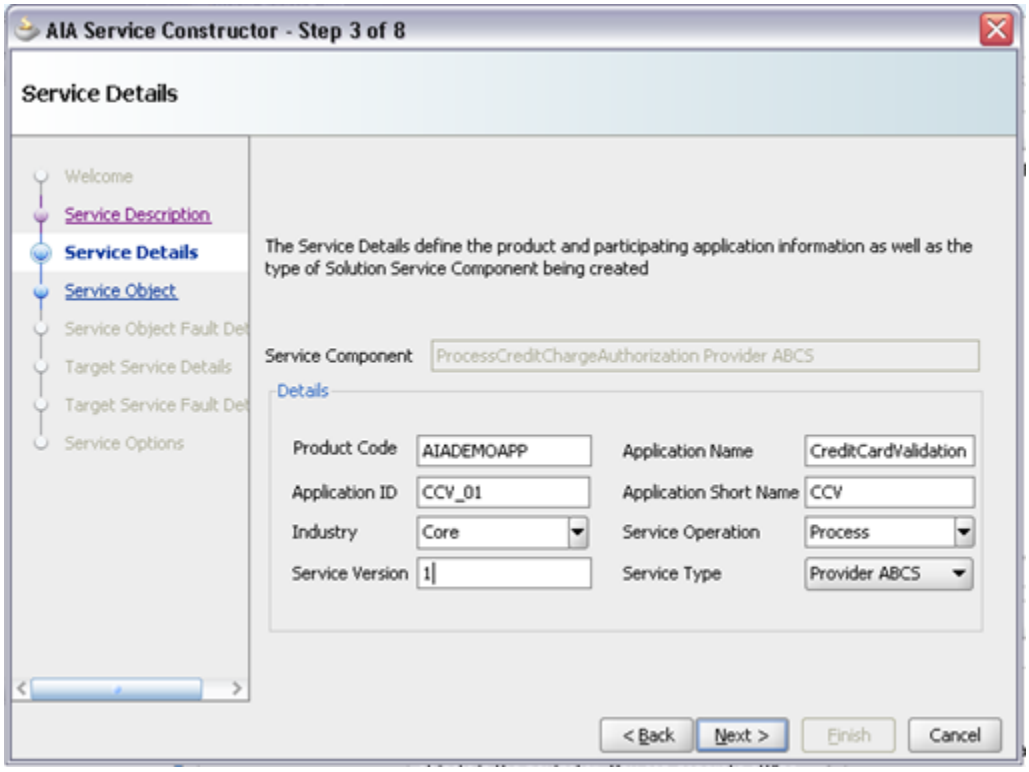
11. Click **Next**.

Name	Name of the Service Solution Request *Retrieved from AIA Lifecycle Management.*
Project	Name of the overall project that contains all of the business tasks *Retrieved from AIA Lifecycle Management.*
Task	Business task that contains this service solution request. *Retrieved from AIA Lifecycle Management.*
Description	Details about the Service Solution Request *Retrieved from AIA Lifecycle Management. Can be modified by the developer.*

12. The Service Details define information about the associated application, as well as the type of service that is being created.

    The values for **Product Code**, **Industry**, and **Service Type** typically come from the AIA Lifecycle Management (if an existing Service Solution Component request was selected).

13. The developer, if necessary, can add to, update, or create altogether the information contained in the Service Description, and any additions or changes will later be harvested into Oracle Enterprise Repository and AIA Lifecycle Management.



Service Component	Displays the selected service component for reference only.
Product Code	Defines the associated application. *Retrieved from AIA Lifecycle Management.*
Application Name	User-friendly name assigned to the application for which the connector service is being created. *Defined by the developer.*
Application ID	Internal code used in operations such as cross-referencing (XREF). *Defined by the developer.*
Application Short Name	Assigned application code that is also used in the naming of the connector services. *Defined by the developer.*
Industry	Industry Association (Insurance, Banking, Utilities, and so on) or Core, if not linked to a particular industry (horizontal). *Retrieved from AIA Lifecycle Management.*
Service Operation	Defines the verb of the service. Select from ***Create, Update, Delete, Sync, Validate, Process, Query.*** *Defined by the developer.*
Service Version	Version of the service *Defined by the developer.*
Service Type	Type of service that is being created. Select from ***Provider ABCS***

or ***Requester ABCS.***

Retrieved from AIA Lifecycle Management.

14. Click **Next.**

15. The Service Object page defines the inbound message that our service will receive, typically referred to as the Service Interface. Service Constructor leverages service inspection to learn about the message.

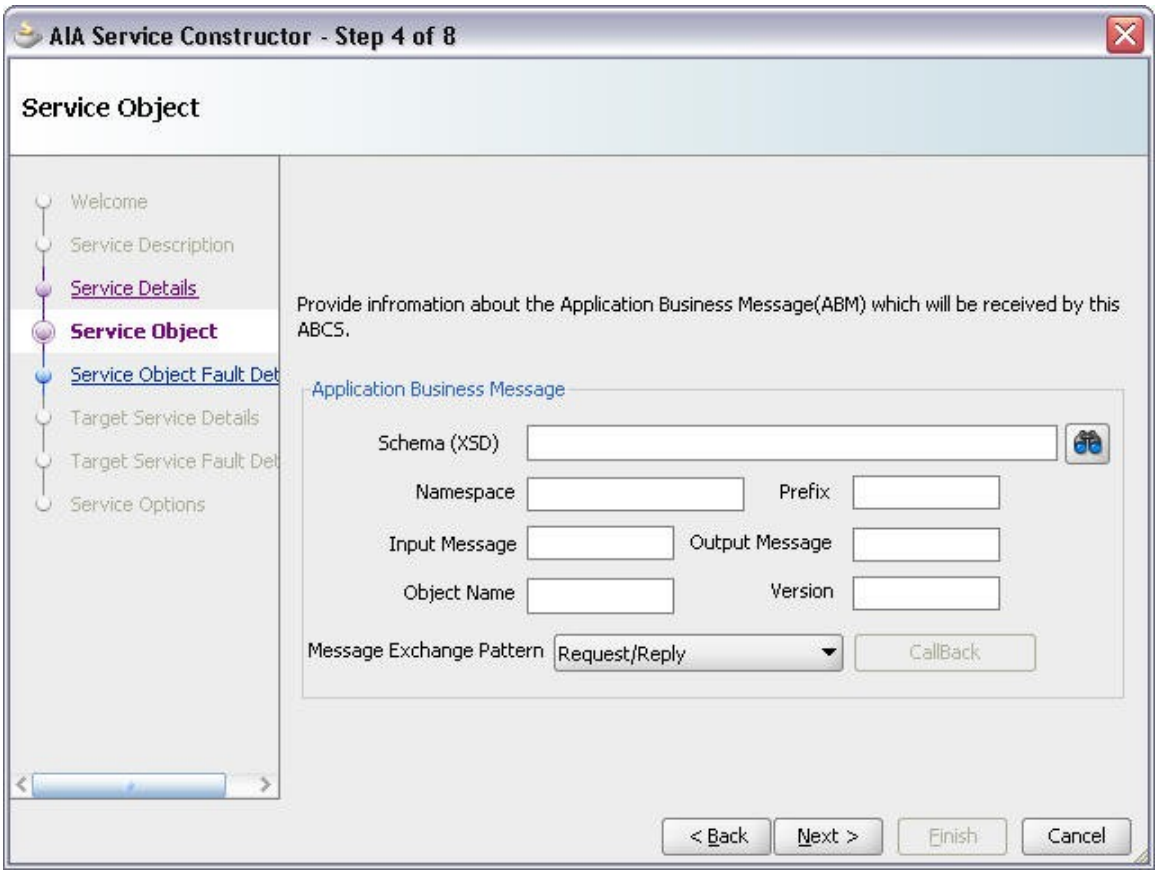
4.2.2. Defining the Service Object/Interface

After defining the description, the developer will define the Service Object/Interface to be handled by this ABCS. This is the information about what type of message will be received, which is different based on the type of ABCS.

Requester ABCSs connect participating applications to an Enterprise Business Service (EBS) to enable the application to invoke the EBS. These services receive an Application Business Message (ABM) and produce an Enterprise Business Message.

Provider ABCSs, on the other hand, connect applications to an EBS to enable the EBS to invoke a service provided by the participating applications.

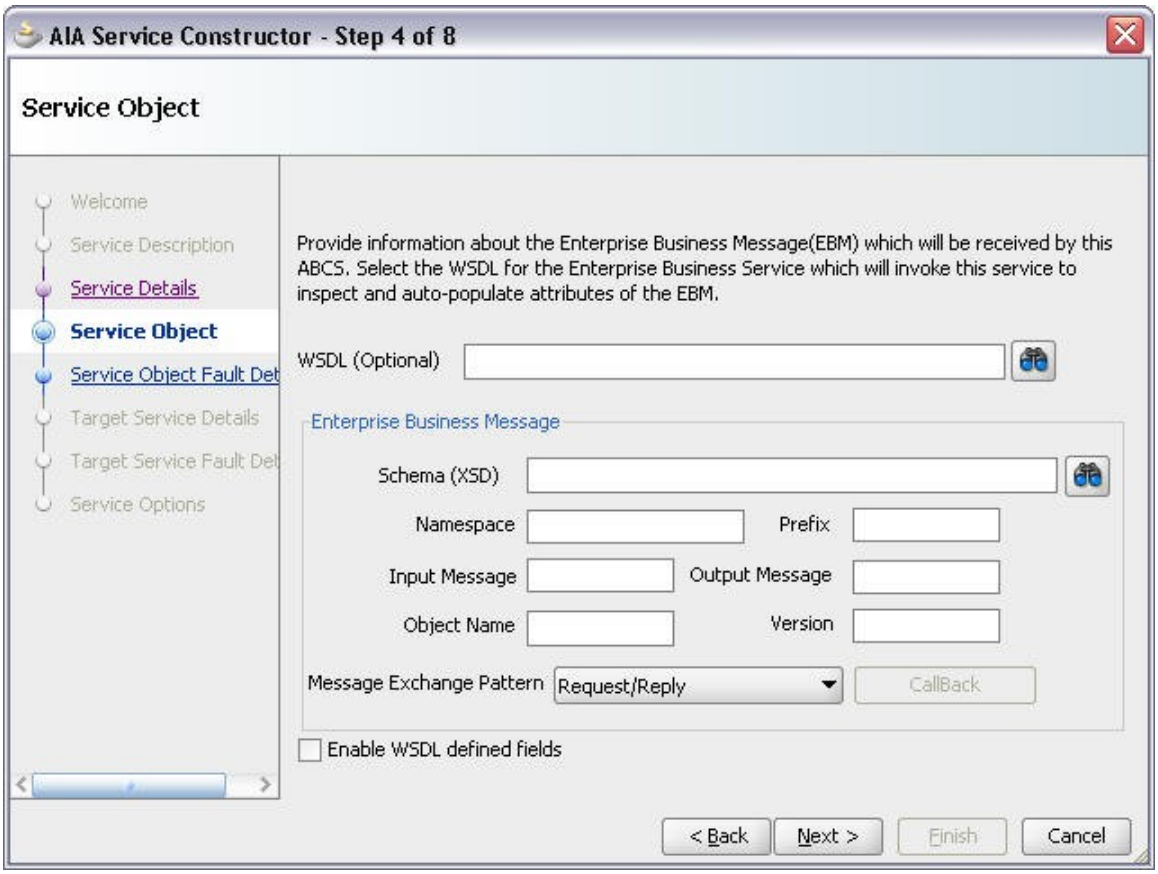
4.2.2.1. Defining the Service Object/Interface for a Requester ABCS



Schema (XSD) Path to the XML Schema Definition (XSD) for the message that will

	be received by this service.
Namespace	The reference in the form of a URL that uniquely identifies the attributes of the service object.
Prefix	Used to associate attributes with this service.
Input Message	Name of the message that will be received by this service.
Output Message	Name of message that will be returned by this service (typically used in Request/Reply pattern).
Object Name	Name of the object (noun) that is received by this service.
Version	The version of the object that is received by this service.
Message Exchange Pattern	Message Exchange Pattern being implemented by this service. Select from ***Request/Reply, Request/Delayed Response,*** or ***Fire and Forget.***
Callback (in some cases)	If you are implementing a Request/Delayed Response, the **Callback** button will become available.

4.2.2.2. Defining the Service Object/Interface for a Provider ABCS



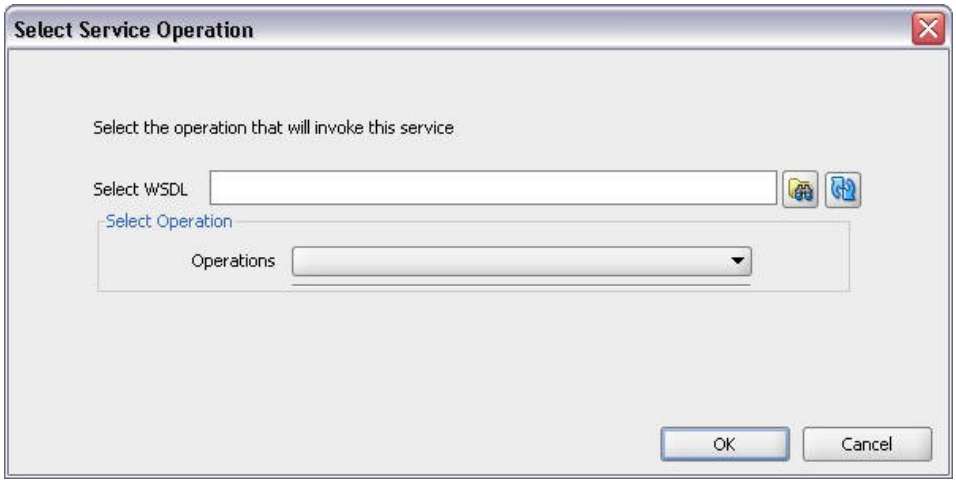
The Service Interface for a Provider ABCS contains the same type of attributes as a Requester ABCS, but the message being received is an Enterprise Business Message (EBM). Because all of the AIA Enterprise Business Services are available through Oracle Meta-Data Services (MDS), the WSDLs for the services are also available.

Service Constructor can inspect a service and learn about the corresponding message.

To use this feature, perform the following steps:

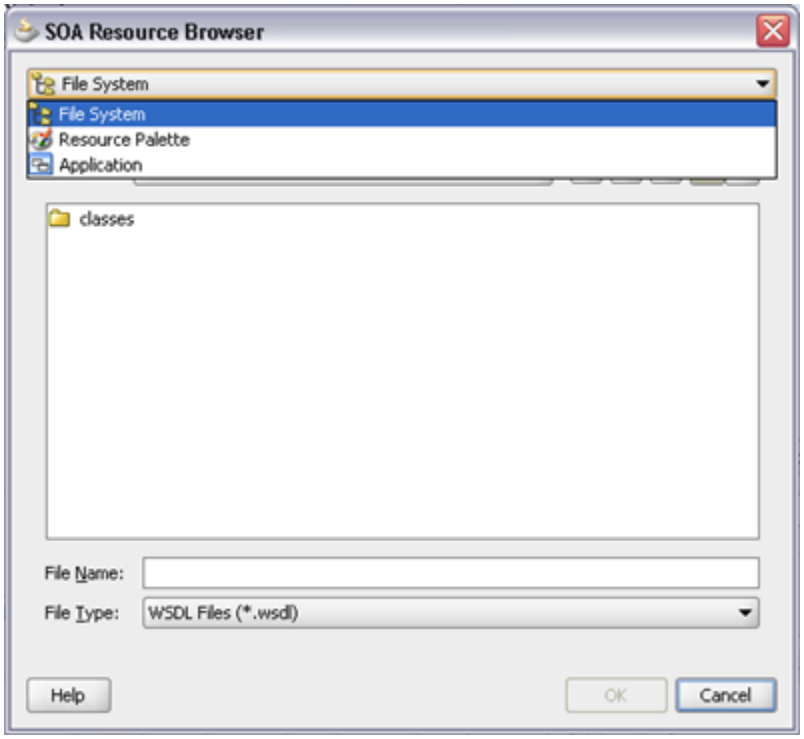
1. Click the Select Service Operation  button to select the operation that will invoke this service.
2. The Select Service Operation screen enables you to select the WSDL of the service to be inspected.

   With the services and schemas typically being served from MDS, normally the Resource Browser  is used to select the appropriate WSDL.
3. Alternatively, if the WSDL is external (accessible as a URL) such as a remote service provider, the URL can be pasted in the Select WSDL field and the Reload button  .can be used to inspect the WSDL.
4. In this flow, we will select the Resource Browser.



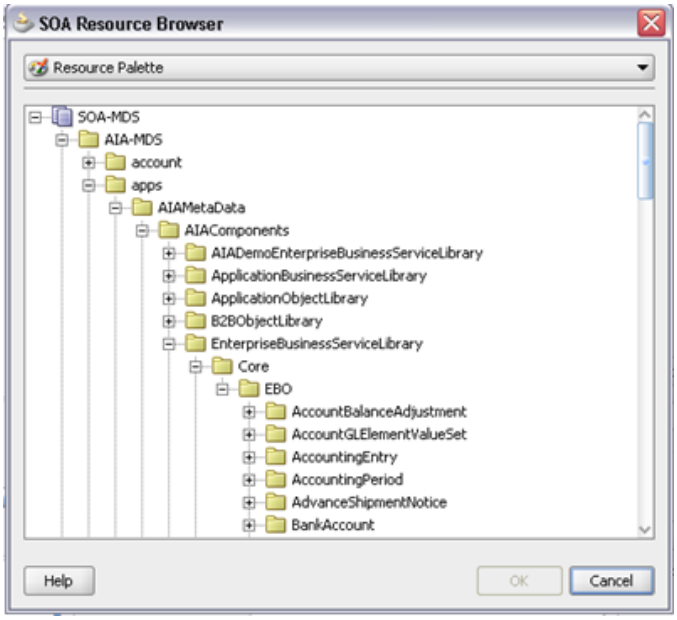
5. On the Select Service Operation pop-up window, click the Resource Browser button  to select the WSDL.

   The SOA Resource Browser window opens.



For more information about creating MDS connections, see How to Set Up JDeveloper for AIA Development.

6. Click the File System drop-down list box and select ***Resource Palette***.
7. Click the + button before the ***SOA-MDS*** tree item and navigate to the WSDL for the service that will invoke the service component that you are creating.

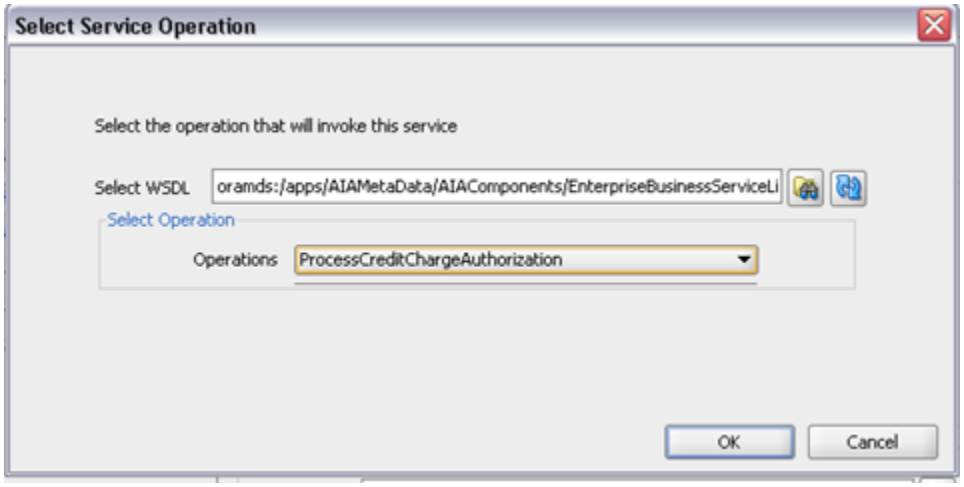


8. After selecting the WSDL, Click **OK**.

   Service Constructor will inspect the WSDL to retrieve the list of operations that the service supports.

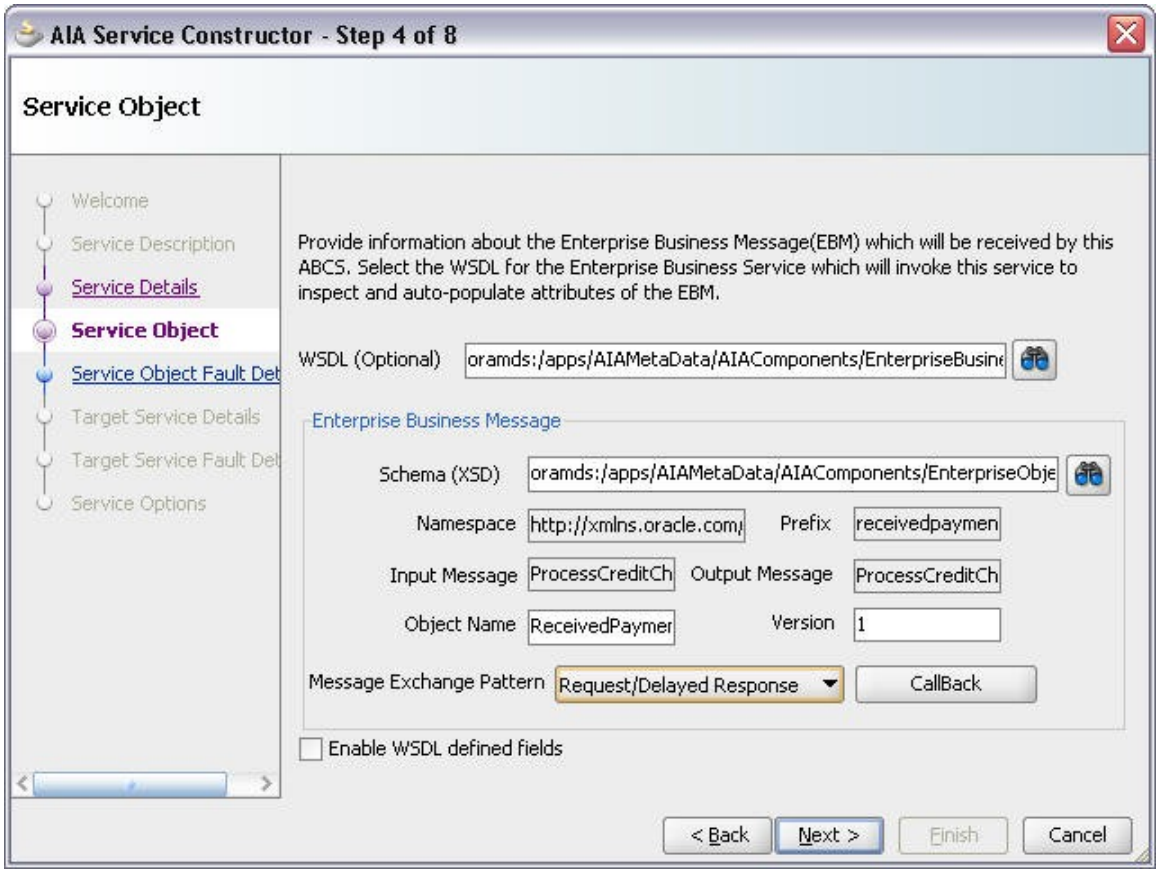
9. On the Select Service Operations page, click the Operations list.

   Select an operation and click **OK**.



10. Service Constructor will inspect the service and in most cases will be able to supply most of the attributes by default. In most cases, the developer will simply have to define the object name and version. Should the developer ever need to access any of the fields that were automatically populated, such as to make a correction, select the **Enable WSDL defined fields** option.

11. The Service Object page is populated with the WSDL information:



WSDL (optional) — Calling Service WSDL is used by the service constructor to inspect and automatically supply most of the values by default.

Schema (XSD) — Schema definition of the message type being used by the calling service to call the service interface. This value is typically supplied automatically by the service/operation inspection. The browser button is available in case the developer needs to browse for the appropriate object in MDS.

Namespace — Namespace of the underlying object. This value is typically supplied automatically by the service/operation inspection.

Prefix — Prefix to be used as a reference for the message that will be received from the calling service. This value is typically supplied automatically by the service/operation inspection.

Input Message — Message that will be received from the calling service. This value is typically supplied automatically by the service/operation inspection.

Output Message — Message with which this service may respond to the calling service. This value is typically supplied automatically by the service/operation inspection.

Object Name — Name of the underlying object used in the service invocation. This value is typically supplied automatically by the service/operation inspection.

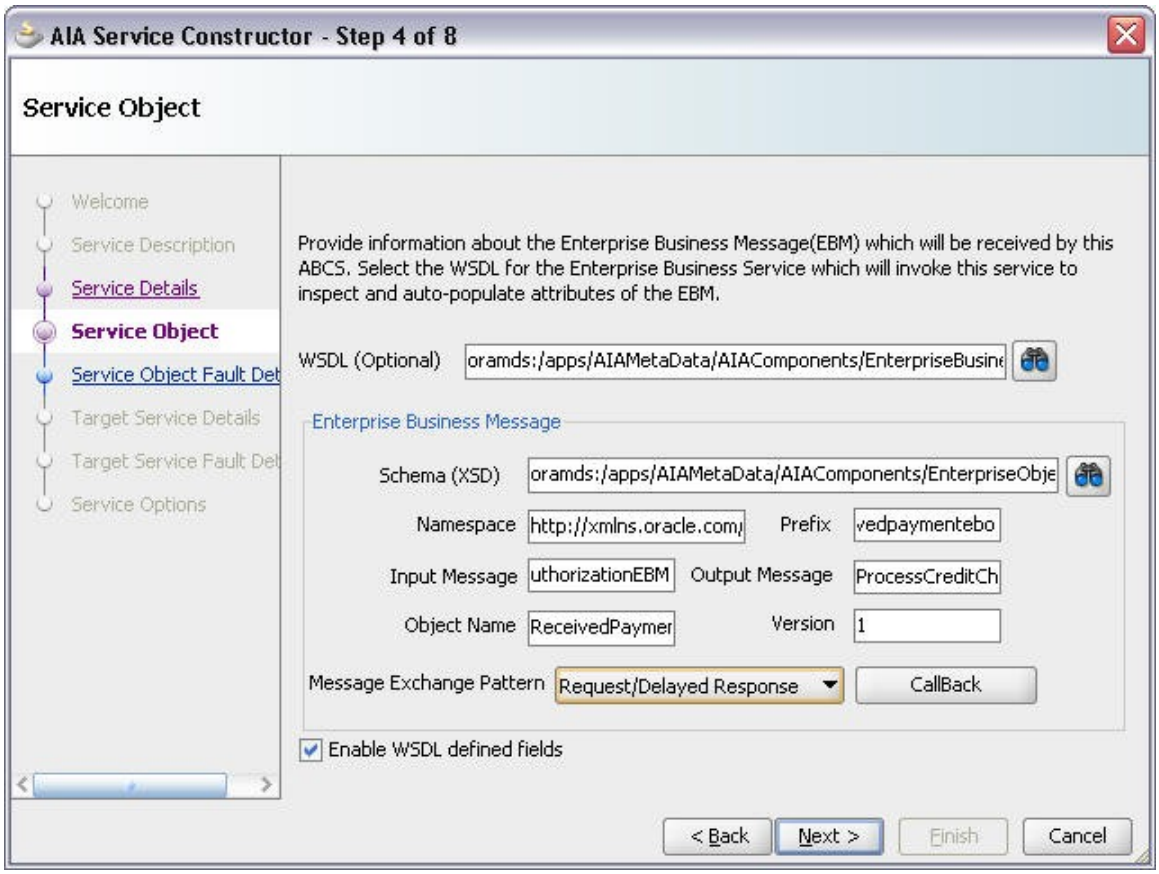
Version — Version of the underlying object. This value is typically supplied

automatically by the service/operation inspection.

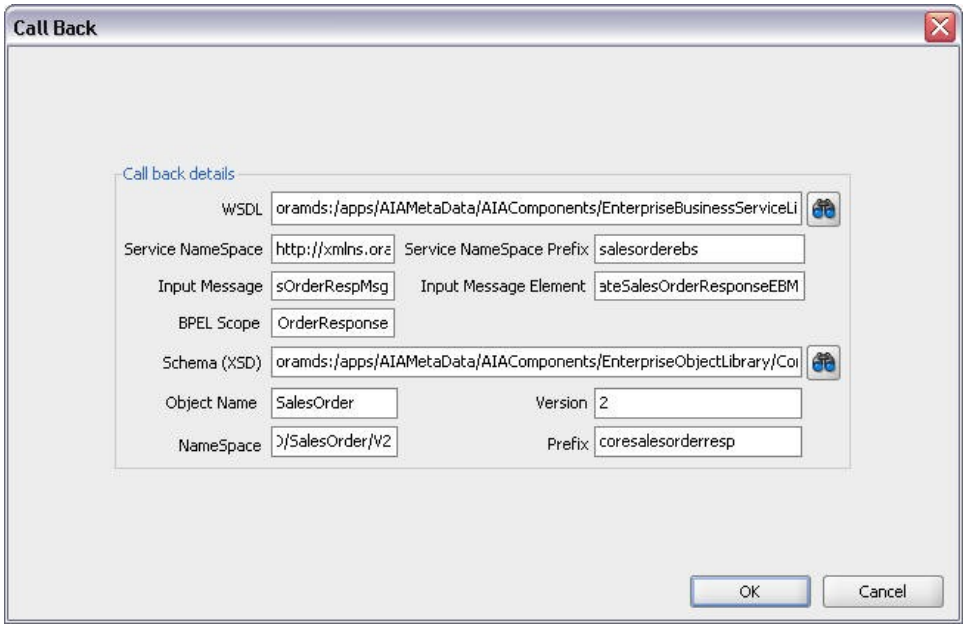
Message Exchange Pattern — Message Exchange Pattern. This value is typically supplied automatically by the service/operation inspection based on a series of rules.

Enable WSDL defined fields — In most cases, most or all of the attributes are supplied automatically by the service/operation inspection. If for any reason an attribute is not supplied automatically, is supplied incorrectly, or the developer deems it necessary to change any of the values, this option can be selected to make all of the fields editable to make any necessary changes.

If the service being created is following a Request/Delayed response, a **CallBack** details button appears on the Service Object page.



Click the **CallBack** button to access the Call Back screen, which enables you to define the target service that will be invoked by the service being created here as a delayed response.



WSDL

Click the WSDL Inspector button to view a list of the operations. Select the WSDL that will invoke the service.

You can also use services that are not in MDS or in the local file system but are accessible through a URL. If the URL to the service is in the buffer, you can paste it into the Select WSDL field. Once the WSDL is selected, click the Reload button.

Service NameSpace

Namespace of the service. This value is typically supplied automatically by the service/operation inspection.

Service NameSpace Prefix

Prefix used to reference the namespace. This value is typically supplied automatically by the service/operation inspection.

Input Message

Message this service receives. This value is typically supplied automatically by the service/operation inspection.

Input Message Element

Message element as a part of the message this service receives. This value is typically supplied automatically by the service/operation inspection.

BPEL Scope

Invocation scope defined in BPEL. This value is typically supplied automatically by the service/operation inspection.

Message Exchange Pattern

Message exchange pattern of this service. Service Constructor attempts to supply this value based on the input/output messages of the service. The choices are ***Request/Response, Request/Delayed Response,*** and ***FireAndForget***.

Target is an Application Interface or Target is an Enterprise Business Service

Defines whether invoking an application service or an Enterprise Business Service. Service Constructor attempts to supply this value based on the directory structure of the service.

Schema (XSD)

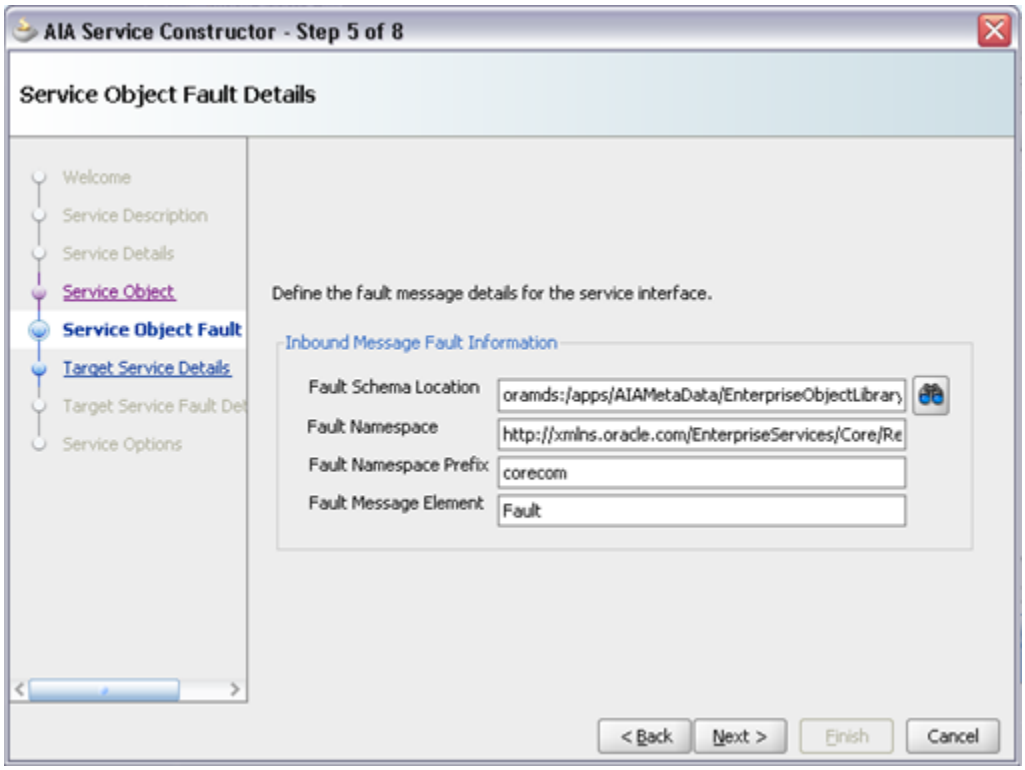
Underlying schema definition of the service. This value is typically supplied automatically by the service/operation inspection.

Object Name	Name of the object. This value is typically defined by the developer.
Version	Version of the schema definition. This value is typically defined by the developer.
NameSpace	Namespace of the underlying schema definition. This value is typically supplied automatically by the service/operation inspection.
Prefix	Prefix by which the namespace is referenced. This value is typically supplied automatically by the service/operation inspection.
Enable WSDL defined fields	This option is deselected by default. Most of the fields are supplied automatically so they are set to uneditable. If for some reason the developer needs to make a change to one of the preceding fields, selecting this option will make them editable.

12. Click **OK** on the Call Back screen.

13. Click **Next** on the Service Object page.

14. On the Service Object Fault Details page, define the fault details for the service interface.



Fault Schema Location	Schema definition for the fault message. This value is typically supplied automatically by the service/operation inspection based on common error definition.
Fault Namespace	Namespace for the fault message. This value is typically supplied automatically by the service/operation inspection.
Fault Namespace Prefix	Prefix to be used as a reference for the fault message. This value is typically supplied automatically by the service/operation inspection.
Fault Message Element	Element definition of the fault message. This value is typically

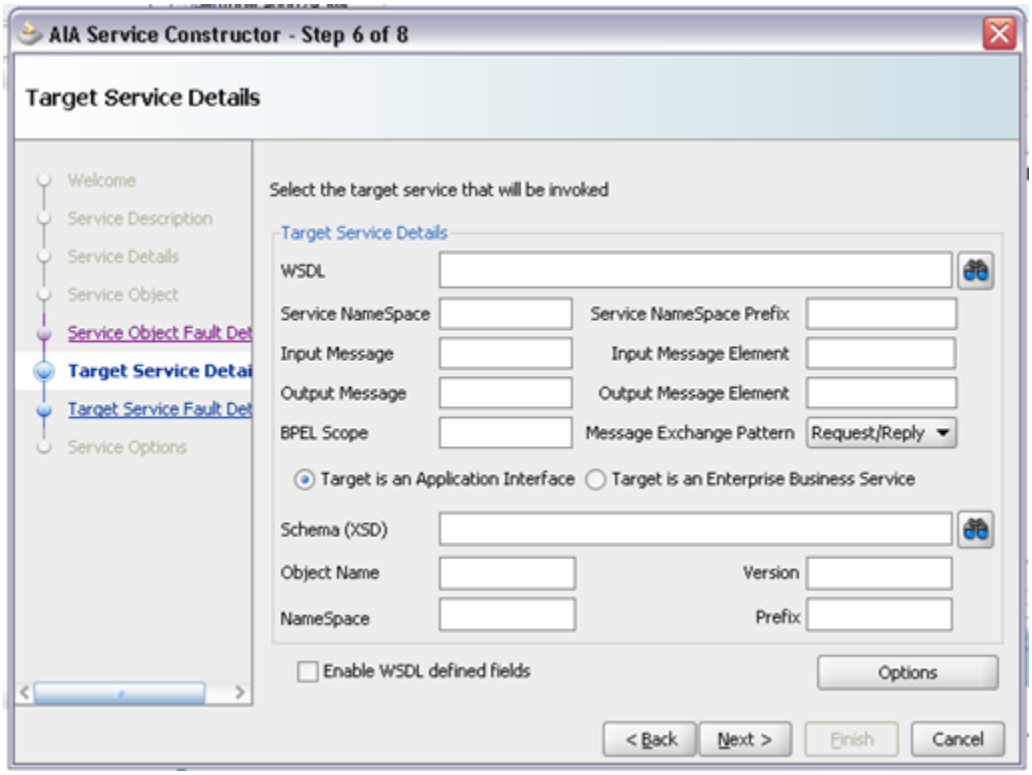
supplied automatically by the service/operation inspection.

4.2.3. Defining the Target Services

Once the Service Description and the Service Interface are complete, the Target Service Invocations are defined.

On the Target Service Details page, you will select the target services that will be invoked. Here the WSDL will be used not only to inspect and supply the underlying object attributes, but will also be included in part of the service definition.

Note: The Service Constructor supports only services that have an exposed interface and cannot yet directly invoke JCA adapters, such as the File or DB adapter.



WSDL

Click the WSDL Inspector button to view a list of the operations. Select the WSDL that will invoke the service.

You can also use services that are not in MDS or in the local file system but are accessible through a URL. If the URL to the service is in the buffer, you can paste it into the Select WSDL field. Once the WSDL is selected, click the Reload button.

Service NameSpace

Namespace of the service. This value is typically supplied automatically by the service/operation inspection.

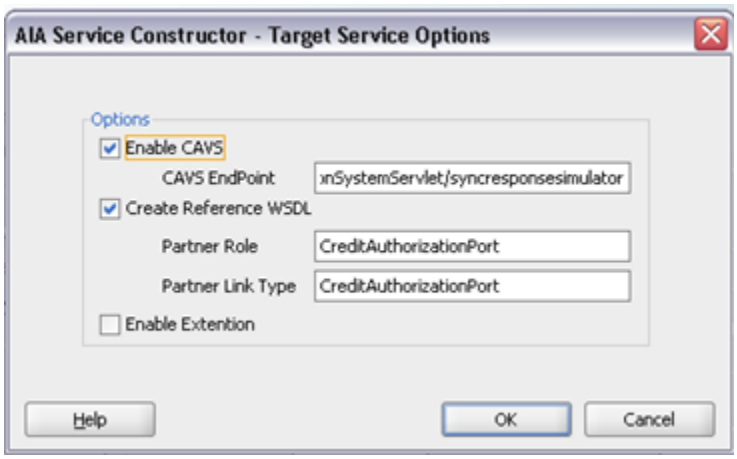
Service NameSpace Prefix

Prefix used to reference the namespace. This value is typically

	supplied automatically by the service/operation inspection.
Input Message	Message that this service receives. This value is typically supplied automatically by the service/operation inspection.
Input Message Element	Message element as a part of the message that this service receives. This value is typically supplied automatically by the service/operation inspection.
Output Message	Message that this service may return. This value is typically supplied automatically by the service/operation inspection.
Output Message Element	Message element as a part of the message that this service may return. This value is typically supplied automatically by the service/operation inspection.
BPEL Scope	Invocation scope that is defined in BPEL. This value is typically supplied automatically by the service/operation inspection.
MessageExchange Pattern	Message exchange pattern of this service. Service Constructor attempts to supply this value by default based on the input/output messages of the service. The choices are Request/Response, Request/Delayed Response, and FireAndForget.
Target is an Application Interface or Target is an Enterprise Business Service	Defines whether invoking an application service or an Enterprise Business Service. Service Constructor attempts to supply this value by default based on the directory structure of the service.
Schema (XSD)	Underlying schema definition of the service. This value is typically supplied automatically by the service/operation inspection.
Object Name	Name of the object. This value is typically defined by the developer.
Version	Version of the schema definition. This value is typically defined by the developer.
NameSpace	Namespace of the underlying schema definition. This value is typically supplied automatically by the service/operation inspection.
Prefix	Prefix by which the namespace is referenced. This value is typically supplied automatically by the service/operation inspection.
Enable WSDL defined fields	This option is deselected by default. Most of the fields are supplied automatically so they are set to uneditable. If for some reason the developer needs to make a change to one of the preceding fields, selecting this option will make them editable.

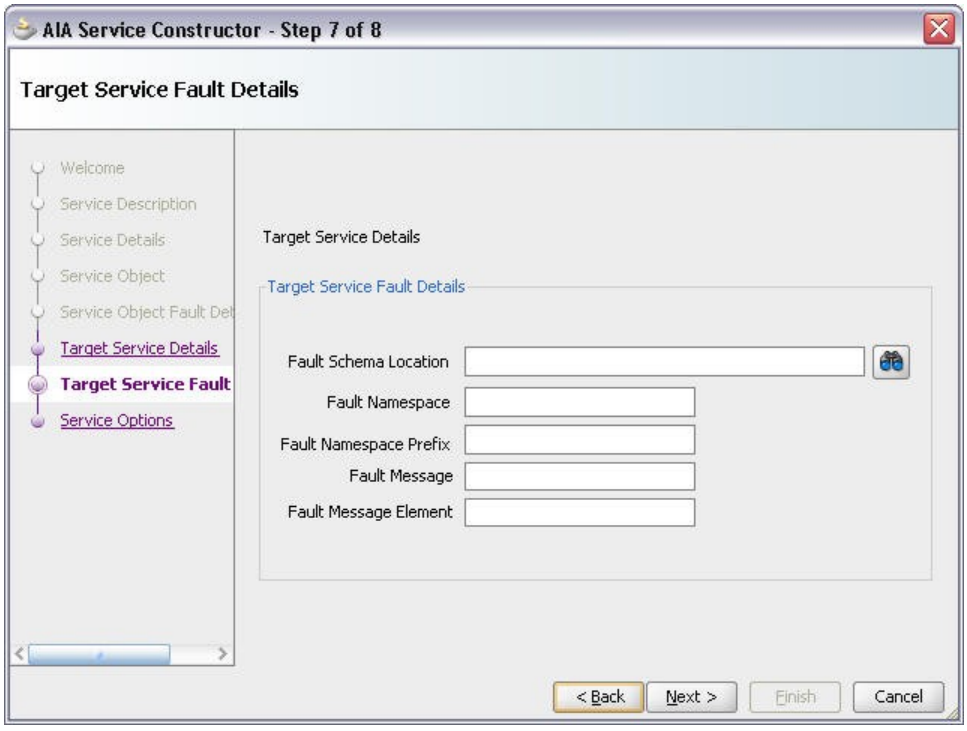
To define the target service s:

1. When defining a target, you can set additional options by clicking the Options button.



Options such as the Composite Application Validation System (CAVS) and the Reference WSDL are enabled by default. If an extension service is used, it can be enabled here.

2. Click **OK**.
3. On the Target Service Details page, click **Next**.
4. On the Target Service Fault Details page, define the fault details for the target service.



Fault Schema Location — Defines the schema of the fault message that may be returned. This value is typically supplied automatically by the service/operation inspection.

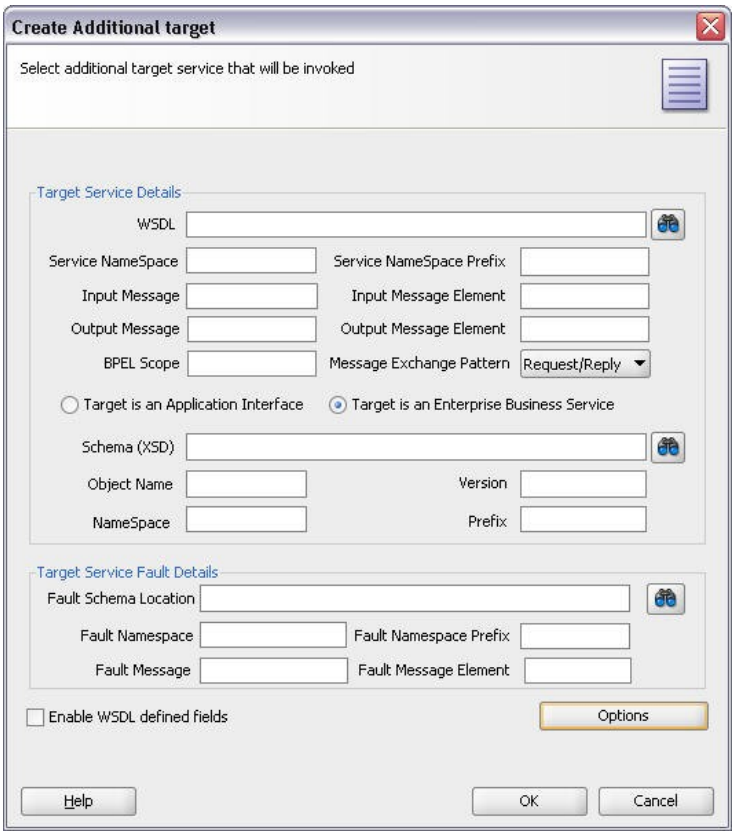
Fault Namespace — Defines the name space of the fault schema. This value is typically supplied automatically by the service/operation inspection.

Fault Namespace Prefix — Defines the prefix by which elements will be attributed to the namespace. This value is typically supplied automatically by the

	service/operation inspection.
Fault Message	Message that may be returned in a fault. This value is typically supplied automatically by the service/operation inspection.
Fault Message Element	Element within the message that may be returned in a fault. This value is typically supplied automatically by the service/operation inspection.

4.2.3.1. Defining an Additional Target

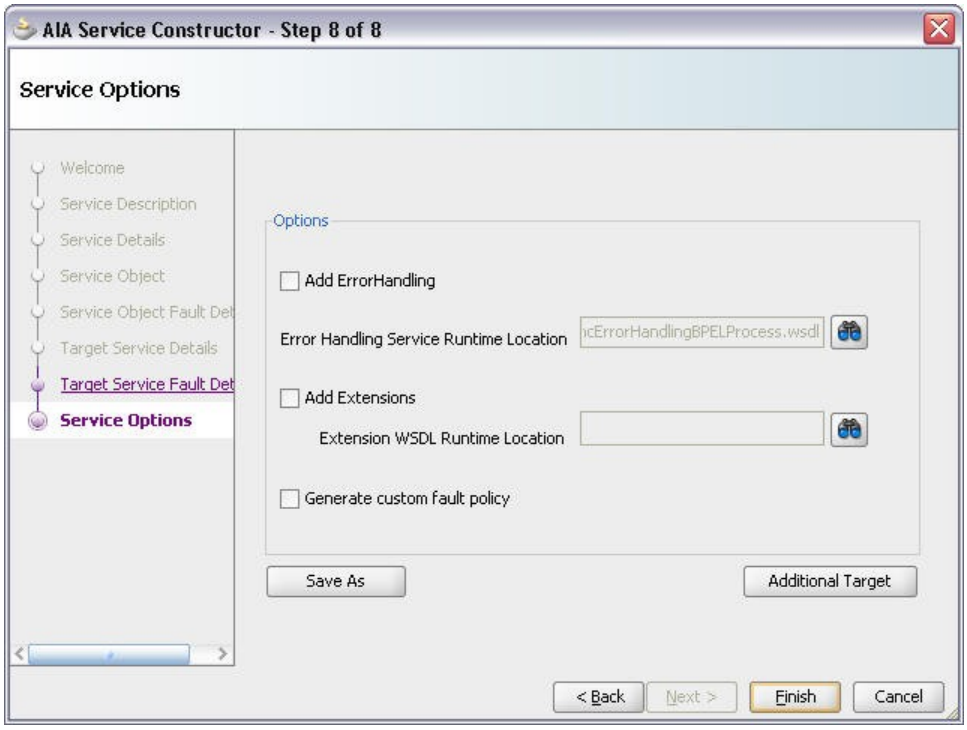
Use the Additional Target button to add another invocation for an application that cannot support the Enterprise Business Message through only one invocation. For example, updating a Person in a participating application may require an invocation to both a Person and an Address service. If an additional target is needed, click Additional Target to display the following screen:



This screen contains the same attributes and features as the primary target panel but consolidates the service and fault details as well as the options. The details for the additional target are completed in the same manner as for the Target Service Details screen. If an additional target is not needed, click Cancel.

To define an additional target:

1. From the Target Service Fault Details, Click **Next**.
2. On the Service Options page, enter details for the service options.



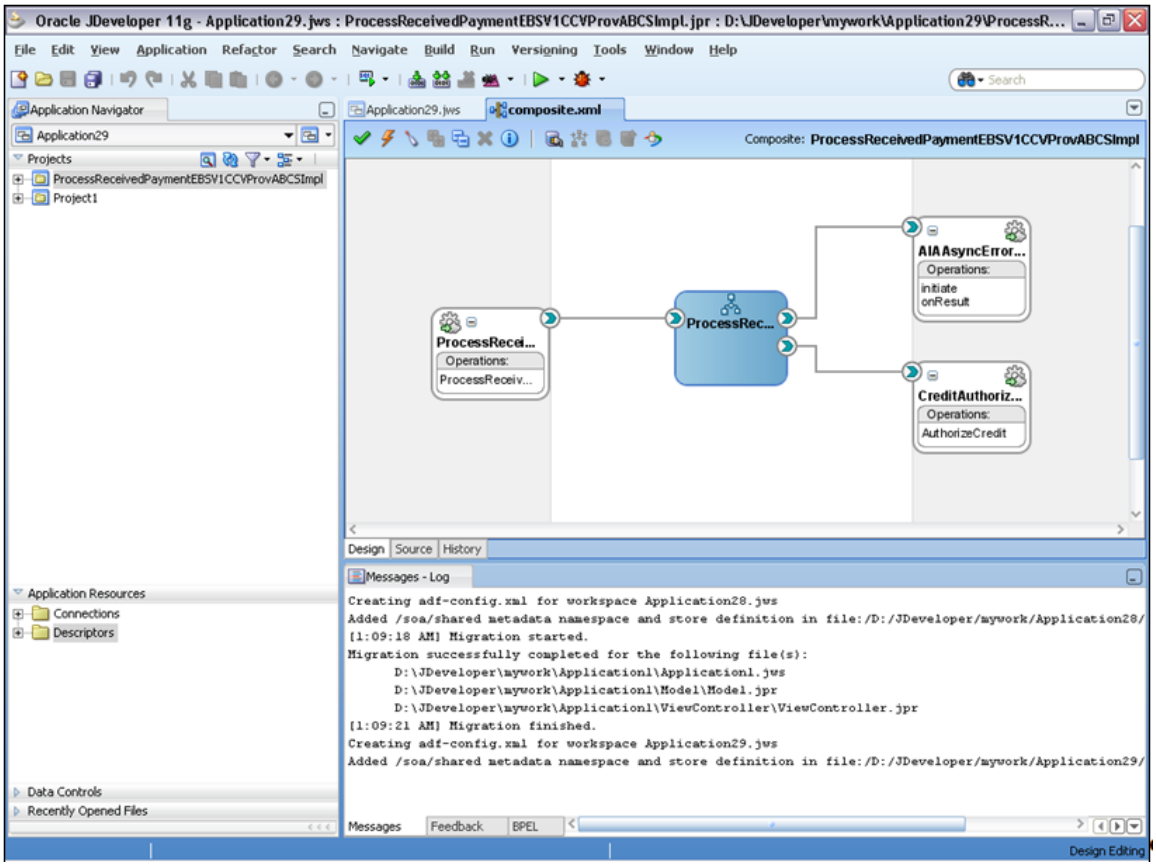
Service Options page

Add Error Handling	Option to add error handling. The default is TRUE.
Error Handling Service Runtime Location	Default is the common oramds:/ location. The resource browser is available to confirm the location.
Add Extensions	Option to add extensions. If the Enable Extension option is enabled under the Target Service options, then this option is selected by default and is required.
Extension WSDL Runtime Location	WSDL of extension service.
Generate custom fault policy	Select to be able to create a custom fault policy.
Additional Target	Click to add an additional target. Certain participating applications require calls to more than one service interface to complete the necessary steps for message transformation (message enrichment, and so on).

3. Optionally, click the **Save As** button to save a Service Solution Request input file. Saving the input file allows it to be used with the command line-based Composite generator if desired, or for troubleshooting of the Service Constructor.

4. Click **Finish**.

   The ABCS composite has been created and is ready for further development.



An example of the ABCS composite

Once service construction is complete, you can choose to perform harvesting of your design-time composites into the Project Lifecycle Workbench and optionally, to Oracle Enterprise Repository.

For more information, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository.

5. Harvesting Oracle AIA Content

This section discusses the following topics:

- How to Set Up Oracle AIA Content Harvesting
- Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository
- Harvesting Interfaces to Oracle Enterprise Repository in Bulk
- Harvesting Deployed Composites into Oracle Enterprise Repository

Note. All script execution examples provided in this chapter are Linux-specific. For Windows script execution, replace ".sh" with ".bat."

5.1. How to Set Up Oracle AIA Content Harvesting

Objective

Set up your environment to enable harvesting of Oracle Application Integration Architecture (AIA) content. This setup is a prerequisite to performing any Oracle Enterprise Repository harvesting covered in this chapter.

Actor

System administrator

To set up Oracle AIA content harvesting:

1. Import the Oracle Enterprise Repository solution pack file (<BEA_HOME>/repository111/core/tools/solutions /11.1.1.2.0-OER-Harvester-Solution-Pack.zip) from the Oracle Enterprise Repository installation home. This is a setup step required by Oracle Enterprise Repository.
2. Import the AIA asset definition file (AIAAssetTypeDef.zip) located in $AIA_HOME/Infrastructure/LifeCycle/config. You will need to import this file to the Oracle Enterprise Repository server. This is a setup step required by Oracle AIA.

For more information about performing these imports, see *Oracle Fusion Middleware User Guide for Oracle Enterprise Repository*, "Import Export Tool," Importing Items into Oracle Enterprise Repository.

5.2. Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository

This section discusses the following topics:

- Introduction to Harvesting Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository
- How to Set Up Environments to Enable Design-Time Harvesting
- How to Harvest Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository

5.2.1. Introduction to Harvesting Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository

Once you have unit-tested, source-controlled, and completed your composite implementation, you can harvest these design-time composites into the Project Lifecycle Workspace and, optionally, Oracle Enterprise Repository.

When you choose to harvest into the Project Lifecycle Workbench, annotations in composite XML files are published to Project Lifecycle Workbench. These annotations published to Project Lifecycle Workbench are instrumental in facilitating downstream automation, such as bill of material (BOM) generation and deployment plan generation. Annotations and harvesting are required to enable this downstream automation.

If downstream automation is not a requirement for you, you may or may not annotate and harvest. When you reach a point in the lifecycle flow at which the result of annotations and harvesting are used, such as BOM and deployment plan generation, you can manually complete the BOM via the Project Lifecycle Workbench UI or manually write your own ANT script to generate a deployment plan.

For more information about BOM generation, see Working with Project Lifecycle Workbench Bills of Material.
For more information about deployment plan generation, see Deploying Composites.

When you choose to harvest into Oracle Enterprise Repository, annotations on Application Business Connector Service (ABCS) WSDL files, Enterprise Business Service (EBS) WSDL files, Enterprise Business Object (EBO) XSD files, and Enterprise Business Message (EBM) XSD files are published to Oracle Enterprise Repository. Harvesting to Oracle Enterprise Repository is optional.

For more information about viewing harvested AIA artifacts in Oracle Enterprise Repository, see Configuring and Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

Harvested composites may be annotated based on AIA annotation specifications or may be generic, nonannotated composites provided straight out of Oracle JDeveloper. If composites are not annotated correctly, accuracy of downstream data, BOM generation, and deployment plan generation may suffer.

For more information about AIA annotation specifications, see Annotating Composites.

We recommend that you harvest your composite into both Project Lifecycle Workspace and Oracle Enterprise Repository. However, if an Oracle Enterprise Repository instance is not available for your implementation, you may choose not to harvest to Oracle Enterprise Repository.

We also recommend that you harvest composites upon completion of the composite implementation when the composite is in a stable and tested condition.

5.2.2. How to Set Up Environments to Enable Design-Time Harvesting

Objective

Set up environments so that design-time harvesting can be done via command line. Perform this setup in preparation for harvesting design-time composites into the Project Lifecycle Workspace and Oracle Enterprise Repository.

Prerequisites and Recommendations

Oracle Metadata Services (MDS) repository must be set up and populated with the prerequisite and dependent artifacts for the composites to be harvested, such as Enterprise Object Library and Application Object Library artifacts.

For more information about setting up and populating MDS, see Building AIA Integration Flows.

Actor

Individual developers

5.2.2.1. Setting Up for Design-Time Harvesting Using a Non-Foundation Pack Environment

To set up environments to enable design-time command line-based harvesting using a non-Foundation Pack environment:

1. Download AIAHarvester.zip.

   This is a self-contained zip file that contains all components necessary for a developer to perform a harvest against the Project Lifecycle Workspace and the Oracle Enterprise Repository.

2. Unzip the AIAHarvester.zip in any location; however, you must maintain the unzipped structure.

Note. The following steps assume that these tasks are being performed within the AIAHarvester directory.

3. Adjust the highlighted values in the ./jndi.properties file:

```
java.naming.factory.initial=weblogic.jndi.WLInitialContextFactory
java.naming.provider.url=t3://10.146.91.163:7001
java.naming.security.principal=weblogic
java.naming.security.credentials=welcome1
```

   - ***10.146.91.163:7001*** should be replaced with the actual SOA server:port value, or its MDS store, in which the composite to be harvested is deployed.
   - ***weblogic*** should be replaced with the actual username value for the SOA server.
   - ***welcome1*** should be replaced with the actual password value for the SOA server.

4. Ensure the accuracy of information in the ./META-INF/adf-config.xml file. Under normal circumstances, you should not have to update it.

   Specifically, ensure that the file includes the ***jdbc/mds/MDS_LocalTxDataSource*** value as highlighted in the following sample:

```
<?xml version="1.0" encoding="UTF-8" ?>
<adf-config xmlns="http://xmlns.oracle.com/adf/config"
            xmlns:adf="http://xmlns.oracle.com/adf/config/properties"
            xmlns:sec="http://xmlns.oracle.com/adf/security/config">
  <adf:adf-properties-child
xmlns="http://xmlns.oracle.com/adf/config/properties">
    <adf-property name="adfAppUID" value="OER.oracle.apps.aia.oer"/>
  </adf:adf-properties-child>

<adf-mds-config xmlns="http://xmlns.oracle.com/adf/mds/config">
    <mds-config xmlns="http://xmlns.oracle.com/mds/config">
 <persistence-config>
        <metadata-namespaces>
          <namespace path="/soa/b2b" metadata-store-usage="soa-infra-
store"/>
          <namespace path="/deployed-composites" metadata-store-
usage="soa-infra-store"/>
          <namespace path="/soa/shared" metadata-store-usage="soa-infra-
store"/>
          <namespace path="/apps" metadata-store-usage="soa-infra-store"/>
        </metadata-namespaces>
        <metadata-store-usages>
          <metadata-store-usage id="soa-infra-store" deploy-target="true">
            <metadata-store class-
name="oracle.mds.persistence.stores.db.DBMetadataStore">
              <property value="soa-infra" name="partition-name"/>
              <property value="jdbc/mds/MDS_LocalTxDataSource" name="jndi-
datasource"/>
            </metadata-store>
          </metadata-store-usage>
        </metadata-store-usages>

        <auto-purge seconds-to-live="300"/>
      </persistence-config>

  </mds-config>
  </adf-mds-config>
```

```
</adf-config>
```

5. Encode the password for the Project Lifecycle Workbench database by running AIALifeCycleEncode.sh.

   ```
   ./AIALifeCycleEncode.sh -user <username> -password <password>
   ```

   A jdbc/AIALifeCycleDS datasource should already be configured once you have installed Oracle AIA Foundation Pack. This should be configured automatically by the AIA Installer. This jdbc/AIALifeCycleDS datasource is used to connect to the Lifecycle database via a JDBC connection.

   - Replace <username> with the JDBC username value.
   - Replace <password> with the JDBC password value.

6. Decide upon the type of harvest that you want to perform.

   - Oracle Enterprise Repository and Project Lifecycle Workbench database harvesting
   - Project Lifecycle Workbench database harvesting only

7. Generate the HarvesterSettings.xml file. If you prefer to harvest using command-line options instead of the HarvesterSettings.xml file, you do not have to perform this step and can proceed to How to Harvest Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository Using Command Line Options.

   a. Adjust the harvesterSettings_prep.xml file based on the choice that you made in the previous step.

   b. Run an encryption script on the harvesterSettings_prep.xml to produce the final HarvesterSettings.xml file, which you will use as the input file to the harvester script that will harvest your composites.

      ```
      ./Harvester/encrypt.sh <source_file> <target_file>
      ```

      For example:

      ```
      ./Harvester/encrypt.sh harvesterSettings_prep.xml HarvesterSettings.xml
      ```

      The ***harvesterSettings_prep.xml*** and ***HarvesterSettings.xml*** file names are used for illustrative purposes only. The source and target file names can be set to any file name.

5.2.2.2. Setting Up for Design-Time Harvesting Using a Foundation Pack Environment

To set up environments to enable design-time command line-based harvesting using a Foundation Pack environment:

1. Run source $AIA_INSTANCE/bin/aiaenv.sh.

Note. The encrypted database access information is stored in $AIA_INSTANCE/Infrastructure/LifeCycle/AIAHarvester/config/Properties. If you subsequently change the database user name, for example, you may re-encrypt the database access information by running $AIA_HOME/Infrastructure/LifeCycle/AIAHarvester/AIALifeCycleEncode.sh.

2. Prepare harvesterSettings.xml, which contains the file system directory path to the newly completed composite.xml.
3. If you will be harvesting to Oracle Enterprise Repository, run the following encryption script to produce the final HarvesterSettings.xml file, which you will use as the input file to the harvester script that will harvest your composites.

```
$AIA_HOME/Infrastructure/LifeCycle/AIAHarvester/Harvester/encrypt.sh
<source> <target>
```

5.2.3. How to Harvest Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository

This section discusses:

- How to harvest design-time composites into Project Lifecycle Workspace and Oracle Enterprise Repository using HarvesterSettings.xml.
- How to harvest design-time composites into Project Lifecycle Workspace only using HarvesterSettings.xml.
- How to harvest design-time composites into Project Lifecycle Workspace and Oracle Enterprise Repository using command line options.

Objective

Harvest design-time composites into Project Lifecycle Workspace and Oracle Enterprise Repository. You can choose to perform the harvest using the harvester script and the HarvesterSettings.xml file or by using command-line options.

Prerequisites and Recommendations

- Complete the steps covered in How to Set Up Oracle AIA Content Harvesting.
- Complete the steps covered in How to Set Up Environments to Enable Design-Time Harvesting.
- Ideally, the composite to be harvested should be fully annotated according to AIA specifications. These annotations include those in ABCS WSDL files and composite XML files. AIA EBO and EBM XSD files are delivered with annotations. Annotations are not required; however, downstream automation features will not work as designed.

> **For more information** about AIA annotation specifications, see Annotating Composites.

Actor

Individual developers

5.2.3.1. How to Harvest Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository Using HarvesterSettings.xml

To harvest design-time composites into Project Lifecycle Workspace and Oracle Enterprise Repository using HarvesterSettings.xml:

1. Ensure that your HarvesterSettings.xml file is accurately configured. Sample file content is provided subsequently.

   In particular, note that the content shown:

   - Provides Oracle Enterprise Repository server information and credentials.
   - Uses <fileQuery>.
   - Specifies the file system path to the composite.xml for a given composite project.

```
<?xml version="1.0" encoding="UTF-8"?>
<tns:harvesterSettings
xmlns:tns="http://www.oracle.com/oer/integration/harvester"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.oracle.com/oer/integration/harvester
Harvester_Settings.xsd ">

  <!--Description to set on created Assets in OER.-->
  <harvesterDescription>Oracle Enterprise Repository
Harvester</harvesterDescription>

  <!--Registration status to set on created Assets in OER. The Valid
Registration states are 1) Unsubmitted 2)Submitted - Pending Review
3)Submitted - Under Review  4)Registered -->
  <registrationStatus>Registered</registrationStatus>

  <!--Namespace to set on created Assets in OER.  If left empty, this is
set based on information from SOA Suite and OSB projects when available.
That's generally the best practice, so override this with caution.-->
  <namespace/>


  <!--Connection info to OER-->
  <!—uri is the OER server →
  <!— admin is username to login OER in cleartext →
  <!—password is encrypted →
  <repository>
    <uri>http://ple-jgau.us.oracle.com:7101/oer</uri>
    <credentials>
      <user>admin</user>
      <password>v2_1.qRhDTl1LdPo=</password><!--run encrypt.bat to encrypt
this-->
    </credentials>
    <timeout>30000</timeout>
  </repository>
```

```
  <!--Query: the files to harvest-->
  <query>
    <!--To specify design-time files to harvest: Uncomment the section
below and specify the file(s) you want to harvest.  Or specify on the
command-line via the -file parameter.-->


    <!--To specify run-time files to harvest: Uncomment this and specify
the file(s) you want to harvest.  Or specify on the command-line via the -
file parameter. The serverType must be one of: SOASuite, OSB, or WLS. Run
encrypt.bat to encrypt the password.-->

    <fileQuery>

<files>/slot/ems3470/oracle/AIAHOME_1022/samples/AIASamples/BaseSample
      /SamplesCreateCustomerPartyPortalProvABCSImpl/composite.xml</files>
     <fileType>.xml</fileType>

    </fileQuery>

  </query>

  <!--Predefined Policy Location: If harvesting SOA Suite projects from
the command line,
      uncomment the section below and set it to point to your installation
of JDeveloper-->
  <introspection>
    <reader>com.oracle.oer.sync.plugin.reader.file.FileReader</reader>
    <writer>com.oracle.oer.sync.plugin.writer.oer.OERWriter</writer>
  </introspection>
</tns:harvesterSettings>
```

2. Access a command line utility and run the AIAHarvest.sh harvester script. We recommend using the –partial true option most of the time.

   - For example, for harvesting using a non-Foundation Pack environment:

     ```
     AIAHarvest.sh –partial true –settings HarvesterSettings.xml
     ```

   - For example, for harvesting using a Foundation Pack environment:

     ```
     $AIA_HOME/Infrastructure/LifeCycle/AIAHarvester/AIAHarvest.sh –partial
     true –settings <file path to destHarvesterSettings.xml>
     ```

5.2.3.2. How to Harvest Design-Time Composites into Project Lifecycle Workbench Only Using HarvesterSettings.xml

To harvest design-time composites into Project Lifecycle Workspace using HarvesterSettings.xml:

1. Ensure that your HarvesterSettings.xml file is accurately configured. Sample file content is provided subsequently.

   In particular, note that the following sample file content:

   - Uses <fileQuery>.

- Uses '-mode AIA' as a command-line parameter.
- Does not include Oracle Enterprise Repository server information.

```
<?xml version="1.0" encoding="UTF-8"?>
<tns:harvesterSettings
xmlns:tns="http://www.oracle.com/oer/integration/harvester"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.oracle.com/oer/integration/harvester
Harvester_Settings.xsd ">

  <!--Description to set on created Assets in OER.-->
  <harvesterDescription>Oracle Enterprise Repository
Harvester</harvesterDescription>

  <!--Registration status to set on created Assets in OER. The Valid
Registration states are 1) Unsubmitted 2)Submitted - Pending Review
3)Submitted - Under Review 4)Registered -->
  <registrationStatus>Registered</registrationStatus>

  <!--Namespace to set on created Assets in OER.  If left empty, this is
set based on information from SOA Suite and OSB projects when available.
That's generally the best practice, so override this with caution.-->
  <namespace/>

  <!--  comment out the OER server section since we don't perform OER
harvesting
  <repository>
    <uri>http://ple-jgau.us.oracle.com:7101/oer</uri>
    <credentials>
      <user>admin</user>
      <password>v2_1.qRhDTl1LdPo=</password><!--run encrypt.bat to encrypt
this-->
    </credentials>
    <timeout>30000</timeout>
  </repository>
   →

  <!--Query: the files to harvest-->
  <query>
    <fileQuery>
         <files> /slot/ems3470/oracle/AIAHOME_1022/samples/AIASamples/

BaseSample/SamplesCreateCustomerPartyPortalProvABCSImpl/composite.xml
</files>
          <fileType>.xml</fileType>
      </fileQuery>

  </query>

 <introspection>
    <reader>com.oracle.oer.sync.plugin.reader.file.FileReader</reader>
    <writer>com.oracle.oer.sync.plugin.writer.oer.OERWriter</writer>
  </introspection>
</tns:harvesterSettings>
```

2. Access a command line utility and run the AIAHarvest.sh -mode AIA harvester script.

- For example, for harvesting using a non-Foundation Pack environment:

```
AIAHarvest.sh –partial true –mode AIA –settings HarvesterSettings.xml
```

- For example, for harvesting using a Foundation Pack environment:

```
$AIA_HOME/Infrastructure/LifeCycle/AIAHarvester/AIAHarvest.sh –partial
true –settings <file path to harvesterSettings.xml> -mode AIA
```

5.2.3.3. How to Harvest Design-Time Composites into Project Lifecycle Workspace and Oracle Enterprise Repository Using Command Line Options

To harvest design-time composites into Project Lifecycle Workspace and Oracle Enterprise Repository using command line options:

1. Compose your AIAHarvest.sh script command statement using the following available command line options:

Harvester Command-Line Options	Description
-settings <file name>	Configuration settings XML file name
-url <URL>	Oracle Enterprise Repository URL
-user <OER user name>	Oracle Enterprise Repository user name
-password <OER password>	Oracle Enterprise Repository password
-partial <true | false>	Provides support for partial introspection. To continue harvesting even if encountering errors, enter *true*. The default value is *false*. In other words, if this option is set to *true*, processing will continue even if an imported/included file cannot be accessed. USE WITH CARE.
-artifact_store <store>	Name of Oracle Enterprise Repository Artifact Store to look in. If specified, the -file argument will be resolved relative to the artifact store URL
-file <filename or URL>	File or directory to be harvested. This can be a file name or URL to the file.
-file_type <type>	File type of the file to be harvested. If not specified, it will be derived from the file extension.
-remote_url <URL>	Running server from which to harvest the remote project, instead of from a file.
-remote_username <username>	Username to connect to the remote server
-remote_password <password>	Password to connect to the remote server
-remote_server_type <type>	Type of remote server. One of: {SOASuite, OSB, WLS}
-remote_project <type>	Name of remote project to harvest from the remote

Harvester Command-Line Options	Description
	server. If omitted, all of the projects on the server will be harvested.
-deployment_status <status>	Deployment status to set on created assets. Must be one of {design-time, run-time}.
-version <version>	Print version information.
-help	Lists Harvester command line options.
-mode < OER | AIA >	Enter AIA to run the Project Lifecycle Workbench harvest. Enter OER to run the Oracle Enterprise Repository harvest. Do not provide a value to run both the Project Lifecycle Workbench and Oracle Enterprise Repository harvests.

For example:

- AIAHarvest -settings <file name>

2. Access a command line utility and issue your harvester command.

5.3. Harvesting Interfaces to Oracle Enterprise Repository in Bulk

This section discusses the following topics:

- How to Set Up Environments to Harvest Interfaces to Oracle Enterprise Repository in Bulk
- How to Harvest Interfaces to Oracle Enterprise Repository in Bulk

5.3.1. How to Set Up Environments to Harvest Interfaces to Oracle Enterprise Repository in Bulk

Objective

Set up environments to be able to harvest release-time interfaces to Oracle Enterprise Repository.

Prerequisites and Recommendations

Oracle AIA Foundation Pack has been installed.

Actor

- Developer
- System administrator

5.3.1.1. Setting Up to Harvest Interfaces Using a Non-Foundation Pack Environment

If you are performing the interface harvest to Oracle Enterprise Repository using an environment other than the one on which Foundation Pack has been installed, perform the following procedure.

To set up to harvest interfaces using a non-Foundation Pack environment:

1. Download AIAHarvester.zip.
2. Unzip the AIAHarvester.zip in any location; however, you must maintain the unzipped structure.

Note. The following steps assume that these tasks are being performed within the AIAHarvester directory.

3. Adjust the highlighted values in the ./jndi.properties file:

```
java.naming.factory.initial=weblogic.jndi.WLInitialContextFactory
java.naming.provider.url=t3://10.146.91.163:7001
java.naming.security.principal=weblogic
java.naming.security.credentials=welcome1
```

   - ***10.146.91.163:7001*** should be replaced with the actual SOA server:port value, or its MDS store, in which the composite to be harvested is deployed.
   - ***weblogic*** should be replaced with the actual username value for the SOA server.
   - ***welcome1*** should be replaced with the actual password value for the SOA server.

4. Ensure the accuracy of information in the ./META-INF/adf-config.xml file. Under normal circumstances, you should not have to update it.

   Specifically, ensure that the file includes the ***jdbc/mds/MDS_LocalTxDataSource*** value as highlighted in the following sample:

```
<?xml version="1.0" encoding="UTF-8" ?>
<adf-config xmlns="http://xmlns.oracle.com/adf/config"
            xmlns:adf="http://xmlns.oracle.com/adf/config/properties"
            xmlns:sec="http://xmlns.oracle.com/adf/security/config">
  <adf:adf-properties-child
xmlns="http://xmlns.oracle.com/adf/config/properties">
    <adf-property name="adfAppUID" value="OER.oracle.apps.aia.oer"/>
  </adf:adf-properties-child>

<adf-mds-config xmlns="http://xmlns.oracle.com/adf/mds/config">
    <mds-config xmlns="http://xmlns.oracle.com/mds/config">
 <persistence-config>
        <metadata-namespaces>
          <namespace path="/soa/b2b" metadata-store-usage="soa-infra-
store"/>
          <namespace path="/deployed-composites" metadata-store-
usage="soa-infra-store"/>
          <namespace path="/soa/shared" metadata-store-usage="soa-infra-
store"/>
```

```
          <namespace path="/apps" metadata-store-usage="soa-infra-store"/>
        </metadata-namespaces>
        <metadata-store-usages>
          <metadata-store-usage id="soa-infra-store" deploy-target="true">
            <metadata-store class-
name="oracle.mds.persistence.stores.db.DBMetadataStore">
             <property value="soa-infra" name="partition-name"/>
             <property value="jdbc/mds/MDS_LocalTxDataSource" name="jndi-
datasource"/>
            </metadata-store>
          </metadata-store-usage>
        </metadata-store-usages>

        <auto-purge seconds-to-live="300"/>
      </persistence-config>

  </mds-config>
  </adf-mds-config>
  <sec:adf-security-child
xmlns="http://xmlns.oracle.com/adf/security/config">
    <CredentialStoreContext
credentialStoreClass="oracle.adf.share.security.providers.jps.CSFCredentia
lStore"
                            credentialStoreLocation="../../src/META-
INF/jps-config.xml"/>
  </sec:adf-security-child>
</adf-config>
```

5. Locate the encrypted HarvesterSettings_#.xml files in the Harvester directory. One file is provided for each delivered AIA prebuilt interface. Modify each of the HarvesterSettings_#.xml files to point to the Oracle Enterprise Repository server for your particular environment and to include relevant user name and password values.

   The HarvesterSettings_#.xml files always use the oramds:// protocol. For example:

```
<fileQuery>
     <files>oramds://apps/AIAMetaData/AIAComponents/EnterpriseBusiness
      ServiceLibrary/Industry/BankingAndWealthManagement/EBO/Specification

ValueSet/V1/BankingAndWealthManagementSpecificationValueSetEBSV1.wsdl
     </files>
     <fileType>.wsdl</fileType>
</fileQuery>
```

   If you want to publish your own interface artifacts (namely, WSDL and XSD files) in bulk, you can compose your own HarvesterSettings_#.xml files using the delivered files as samples. Specify your artifact paths and file types in the <fileQuery> element.

   We recommend using the MDS protocol (you must have already populated MDS with interface artifacts); however, you can also use the fileSystem protocol. Depending on whether you are using MDS or fileSystem, provide the file path or oramds path to the WSDL or XSD files.

For more information about populating MDS with interface artifacts, see Building AIA Integration Flows.

6. Run an encryption script on each HarvesterSettings_#.xml file to produce the final HarvesterSettings.xml files, which you will use as the input files to the harvester script that will harvest your interfaces in bulk to Oracle Enterprise Repository.

```
./Harvester/encrypt.sh <source_file> <target_file>
```

For example:

```
./Harvester/encrypt.sh harvesterSettings_prep.xml HarvesterSettings.xml
```

The ***harvesterSettings_prep.xml*** and ***HarvesterSettings.xml*** file names are used for illustrative purposes only. The source and target file names can be set to any file name.

5.3.1.2. Setting Up to Harvest Interfaces Using a Foundation Pack Environment

If you are performing the interface harvest to Oracle Enterprise Repository using the environment on which Foundation Pack has been installed, this set up has already been performed by the AIA Installer.

To set up to harvest interfaces using a Foundation Pack environment:

1. Run the following script:

```
source ${AIA_INSTANCE}/bin/aiaenv.sh
```

2. Ensure that the HarvesterSettings_#.xml files are located in the $AIA_INSTANCE/Infrastructure/LifeCycle/Install/FPHarvest directory. One file is provided for each delivered AIA prebuilt interface.
3. Modify each of the HarvesterSettings_#.xml files to point to the Oracle Enterprise Repository server for your particular environment and to include relevant user name and password values in clear text.
4. Encrypt the HarvesterSettings_#.xml files in the $AIA_INSTANCE/Infrastructure/LifeCycle/Install/FPHarvest directory.

```
${AIA_HOME}/Infrastructure/LifeCycle/AIAHarvester/Harvester/encrypt.sh
<source_file> <target_file>
```

5.3.2. How to Harvest Interfaces to Oracle Enterprise Repository in Bulk

Objective

Harvest interfaces to Oracle Enterprise Repository in bulk.

Prerequisites and Recommendations

- Complete the steps covered in How to Set Up Oracle AIA Content Harvesting.
- Complete the steps covered in How to Set Up Environments to Harvest Interfaces to Oracle Enterprise Repository in Bulk.

Actor

- Development
- System administrator

To harvest interfaces to Oracle Enterprise Repository in bulk:

1. Access a command line utility and run the AIAHarvest.sh harvester script located in ${AIA_HOME}/Infrastructure/LifeCycle/AIAHarvester/. We recommend using the –partial true option most of the time.

   For example:

   - AIAHarvest.sh –partial true –settings HarvesterSettings1.xml
   - AIAHarvest.sh –partial true –settings HarvesterSettings2.xml
   - AIAHarvest.sh –partial true –settings HarvesterSettings3.xml

2. Access Oracle Enterprise Repository to ensure that your interfaces are visible.

For more information, see Configuring and Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

5.4. Harvesting Deployed Composites into Oracle Enterprise Repository

This section discusses the following topics:

- How to Set Up Environments to Harvest Deployed Composites into Oracle Enterprise Repository
- How to Harvest Deployed Composites into Oracle Enterprise Repository

Run-time publishing to Oracle Service Registry is delegated to Oracle Enterprise Repository.

For more information about publishing to Oracle Service Registry from Oracle Enterprise Repository, see *Oracle Fusion Middleware Configuration Guide for Oracle Enterprise Repository*, Configuring Oracle Enterprise Repository to Exchange Metadata with the Oracle Service Registry.

5.4.1. How to Set Up Environments to Harvest Deployed Composites into Oracle Enterprise Repository

Objective

Set up environments to harvest deployed composites into Oracle Enterprise Repository.

Prerequisites and Recommendations

- The Oracle AIA Installer installation has been run and completed.
- The composites that you want to harvest into Oracle Enterprise Repository have been deployed into the run-time SOA engine.

Actors

- System administrator

  Specifically, this is the actor who installs and deploys the AIA Foundation Pack and Process Integration Packs (PIPs).

To set up environments to harvest deployed composites into Oracle Enterprise Repository:

1. Run an AIA command to set up the environment:

```
Source ${AIA_INSTANCE}/bin/aiaenv.sh
```

5.4.2. How to Harvest Deployed Composites into Oracle Enterprise Repository

Objective

As a part of your Oracle AIA installation, you have deployed composites into the Oracle SOA engine, whether they are AIA-delivered or custom built. Post installation, you can choose to publish these deployed composites to the Oracle Enterprise Repository by way of a command-line script.

Note. This post- installation harvest of deployed composites into Oracle Enterprise Repository is optional and is not performed by the AIA Installer.

Publishing your deployed composites to Oracle Enterprise Repository ensures that it accurately reflects your SOA run-time composite information, including end points and so forth.

Prerequisites and Recommendations

- Complete the steps covered in How to Set Up Oracle AIA Content Harvesting.
- Complete the steps covered in How to Set Up Environments to Harvest Deployed Composites into Oracle Enterprise Repository.

Actors

- System administrator

  Specifically, this is the actor who installs and deploys the AIA Foundation Pack and PIPs.

5.4.2.1. Harvesting PIP-Delivered Deployed Composites to Oracle Enterprise Repository

If you are harvesting deployed composites that were delivered as part of an AIA PIP, perform the following procedure to harvest them to Oracle Enterprise Repository.

To harvest PIP-delivered deployed composites into Oracle Enterprise Repository:

1. Navigate to $<AIA_HOME>/Infrastructure/LifeCycle/Install/PIPHarvest
2. Run the following command:

```
ant -f PIPCompositeHarvest.xml
```

3. Access Oracle Enterprise Repository to confirm that all expected composites are present.

For more information, see How to Access Oracle AIA Content in Oracle Enterprise Repository.

5.4.2.2. Harvesting Custom-Built Deployed Composites to Oracle Enterprise Repository

If you are harvesting custom-built deployed composites, perform the following procedure to harvest them to Oracle Enterprise Repository.

For example, if you have installed Foundation Pack and implemented and deployed your own composites, you can choose to harvest these deployed composites to Oracle Enterprise Repository.

To harvest custom-built deployed composites into Oracle Enterprise Repository:

1. Edit the following HarvesterSettings.xml file to provide highlighted content that is specific to your harvesting requirements.
   - Provide Oracle Enterprise Repository information.
   - Use <remoteQuery> and list all deployed composite names to be harvested.
   - As part of the <remoteQuery> syntax, provide and encrypt SOA server information.

```
<?xml version="1.0" encoding="UTF-8"?>
<tns:harvesterSettings
xmlns:tns="http://www.oracle.com/oer/integration/harvester"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.oracle.com/oer/integration/harvester
Harvester_Settings.xsd ">
  <!--Description to set on created Assets in OER.-->
```

```
                <harvesterDescription>Oracle Enterprise Repository
Harvester</harvesterDescription>
   <!--Registration status to set on created Assets in OER. The Valid
Registration states are 1) Unsubmitted 2)Submitted - Pending Review
3)Submitted - Under Review  4)Registered -->
   <registrationStatus>Registered</registrationStatus>
  <!--Namespace to set on created Assets in OER.  If left empty, this is
set based on information from SOA Suite and OSB projects when available.
That's generally the best practice, so override this with caution.-->
  <namespace/>


  <!--Connection info to OER-->
  <!—uri is the OER server-->
  <!— admin is username to login OER in cleartext -->
  <!—password is encrypted -->
  <repository>
    <uri>http://ple-jgau.us.oracle.com:7101/oer</uri>
    <credentials>
      <user>admin</user>
      <password>v2_1.qRhDTl1LdPo=</password><!--run encrypt.bat to encrypt
this-->
                  </credentials>
    <timeout>30000</timeout>
  </repository>
  <!--Query: the files to harvest-->
  <query>
    <!--To specify design-time files to harvest: Uncomment the section
below and specify the file(s) you want to harvest.  Or specify on the
command-line via the -file parameter.-->

    <!--To specify run-time files to harvest: Uncomment this and specify
the file(s) you want to harvest.  Or specify on the command-line via the -
file parameter. The serverType must be one of: SOASuite, OSB, or WLS. Run
encrypt.bat to encrypt the password.-->
    <remoteQuery>
      <serverType>SOASuite</serverType>

        <!—This is the composite project deployed into the SOA server →

<projectName>AIADemoQueryCustomerPartyCRMProvABCSImpl</projectName>
<!—another example below, we specifically give the deployment revision
number rev1.0. It is appended after the composite project name. User may
find out this revision number of browsing MDS via their jDev
<projectName>AIADemoQueryCustomerPartyCRMProvABCSImpl_rev1.0</projectName>
-->
      <!—uri is the SOA server information -->
      <!—user is the username to log into the SOA server -->
      <!—password is used to log into the SOA server, it is encrypted -->
      <uri>http://10.146.91.163:8001/</uri>
      <credentials>
        <user>weblogic</user>
        <password>v2_1.G+NTr3az8thaGGJBn0vwPg==</password>
      </credentials>
    </remoteQuery>

  </query>
```

```
  <!--Predefined Policy Location: If harvesting SOA Suite projects from
the command line,
      uncomment the section below and set it to point to your installation
of JDeveloper-->
  <introspection>
    <reader>com.oracle.oer.sync.plugin.reader.file.FileReader</reader>
    <writer>com.oracle.oer.sync.plugin.writer.oer.OERWriter</writer>
  </introspection>
</tns:harvesterSettings>
```

2. Access a command line utility and run the AIAHarvest.sh harvester script. We recommend using the –partial true option.

   For example: AIAHarvest.sh –partial true –mode OER –settings HarvesterSettings.xml

5.5. Introducing Oracle Enterprise Repository After AIA Installation

Oracle Enterprise Repository is a product separate from AIA and is an optional component in the context of AIA installation and execution. Therefore, Oracle Enterprise Repository possibly may not be present at the time of AIA installation.

If you want to adopt Oracle Enterprise Repository after AIA has been installed, perform the following procedure.

To introduce Oracle Enterprise Repository after AIA installation:

1. Install Oracle Enterprise Repository according to Oracle Enterprise Repository guidelines.
2. Import the Oracle Enterprise Repository solution pack and the AIA asset definition file.

   For more information about performing these imports, see How to Set Up Oracle AIA Content Harvesting.

3. Install the AIA solution pack for your release. This AIA solution pack is made available as a post-release patchset.

   For more information about the AIA solution pack, see *Oracle Application Integration Architecture Foundation Pack: Development Guide,* "Configuring and Using Oracle Enterprise Repository as the Oracle AIA SOA Repository," Introduction to Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

4. Deploy the AIALifeCycleArtifactsLink.war redirect servlet to facilitate the Business Publisher-to-Oracle Enterprise Repository redirect feature.

For more information, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide,* "Installing Reference Process Models," Configuring the AIA Redirect Servlet.

5. Run the following command line script to register Oracle Enterprise Repository with AIA.

```
source $AIA_INSTANCE/bin/aiaenv.sh
cd $AIA_HOME/Infrastructure/LifeCycle/AIAHarvester
@ AIAOerEncode.sh -url <OER Server URL> -user <OER Username> -password <OER
@ UserPassword>
```

6. Working with Project Lifecycle Workbench Bills of Material

This chapter discusses the following topics:

6.1. Introduction to Bills of Material

Following the Oracle Application Integration Architecture (AIA) development lifecycle, required functionality for a Process Integration Pack (PIP) is implemented as a series of composites.

For more information about using the Service Constructor to generate these composites, see Working with Service Constructor.

Once these design-time composites are complete, they are harvested into the Project Lifecycle Workbench.

For more information about harvesting design-time composites into the Project Lifecycle Workbench, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository.

At this point, you can use the Project Lifecycle Workbench to create a bill of material (BOM) for a PIP. The BOM specifies the inventory of composites that make up the PIP. Using this feature can help expedite deployment plan generation for a PIP project by enabling the automatic or semiautomatic generation of the PIP's BOM.

For more information about generating a deployment plan using the Deployment Plan Generator, see Deploying Composites.

The BOM options that appear for a user in the Project Lifecycle Workbench depend on the Project Lifecycle Workbench role assigned to their WebLogic user.

For more information about setting up Project Lifecycle Workbench roles, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide*, "Post Install Configurations," Setting up AIA Roles.

AIALifecycleUser and AIALifecycleDeveloper roles are provided with the following BOM options on the Project page:

- If the BOM has not yet been generated, the No Bill Of Material Exists message appears.
- If the BOM has been generated, the View Bill Of Material link appears. The user can click the link to view the BOM.

For more information about viewing BOMs, see How to View a Bill of Material for an AIA Lifecycle Project.

The AIALifecycleInstallDeveloper role is provided with the following BOM options on the Project page:

- If the BOM has not yet been generated, the Generate Bill Of Material link appears. The user can click the link to preview or generate the BOM.

For more information about generating BOMs, see How to Generate a Bill of Material for an AIA Lifecycle Project.

- If BOM has been generated, the Edit Bill Of Material link appears. The user can click the link to edit the BOM.

For more information about editing BOMs, see How to Edit a Bill of Material for an AIA Lifecycle Project.

Automatic generation of the BOM is possible if you have implemented AIA-recommended annotations when constructing composites and have harvested completed design-time composites to Project Lifecycle Workbench.

Generation of the BOM will be semiautomatic if you have not implemented AIA-recommended annotations when constructing composites and have not harvested completed design-time composites to Project Lifecycle Workbench. In this case, manual intervention will be necessary to generate the BOM.

For more information about AIA-recommended annotations, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository.

Along with prebuilt AIA PIPs, we deliver the BOMs for these PIPs. You can import this BOM seed data into your system so that you can use the Project Lifecycle Workbench to revise the BOMs in accordance with any modifications you make to the prebuilt PIPs.

For more information about importing BOM seed data, see How to Export and Import Bill of Material Seed Data.

6.2. How to Generate a Bill of Material for an AIA Lifecycle Project

Objective

Generate a BOM from an AIA Lifecycle project. The BOM captures all in-scope business tasks, as well as their ensuing composites and metadata.

The generated BOM output, an XML file, contains all composite information, which collectively makes up a project and is useful for configuring a deployment plan using the Deployment Plan Generator.

For more information about generating a deployment plan using the Deployment Plan Generator, see Deploying Composites.

Prerequisites and Recommendations

In the AIA development lifecycle, as with any software development cycle, deployment plan generation occurs near the end of the development cycle. As such, you should not approach BOM generation and the subsequent deployment plan generation based on the BOM until you are certain that you no longer need to alter the functional decomposition and project definition.

Likewise, the composites for the PIP should have been implemented and, ideally, harvested into the Project Lifecycle Workbench before approaching BOM generation.

For more information about using the Service Constructor to generate these composites, see Working with Service Constructor.
For more information about harvesting composites into the Project Lifecycle Workbench, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository.

Note. If you have not annotated composites and you have not performed harvesting, you can still use BOM generation functionality by generating the BOM for your project and manually building out your BOM with annotations using the instructions in this chapter.

Actors

Only users assigned the AIALifecycleInstallationDeveloper role can generate and modify a BOM for a PIP project. This user should be a developer who is responsible for producing the deployment plan for all executables in the project for which the BOM is being generated. This developer will therefore also have a solid overall picture of the project.

To generate a BOM for an AIA Lifecycle project:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab.
2. Click the Generate Bill-of-Material button  .

This option is available only if your user has the AIALifecycleInstallationDeveloper role assigned and the BOM has not already been generated.

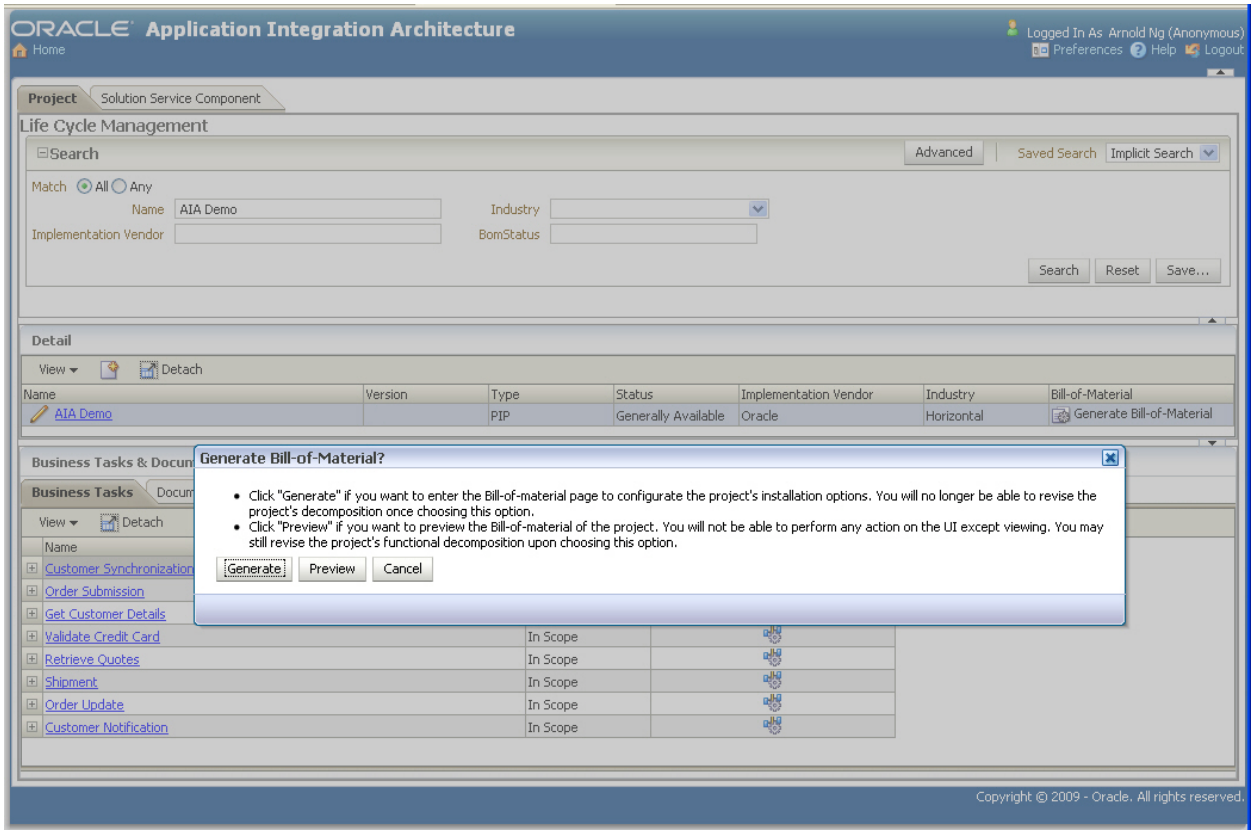
- If the BOM has already been generated and you have been assigned the AIALifecycleInstallationDeveloper role, you will see the Edit Bill of Material option. Click it to view and edit and generated BOM.

For more information about editing BOMs, see How to Edit a Bill of Material for an AIA Lifecycle Project.

- If the BOM has already been generated and you have not been assigned the AIALifecycleInstallationDeveloper role, you will see the View Bill-of-Material button  . Click it to view the BOM on the Bill Of Material page.

For more information about viewing BOMs, see How to View a Bill of Material for an AIA Lifecycle Project.

3. The application prompts you with two choices:



Generate Bill-of-Material? prompt

- Click **Generate** to generate the BOM for the PIP project and access it on the Bill of Material page.

  Click this option only if the functional decomposition and project definition have truly been completed.

Note. Once you generate the BOM for a project, the project and service solution components cannot be updated. From this point on, any changes that need to be made to the BOM on the Bill of Material page will not be reflected in the original project definition and decomposition in the Project Lifecycle Workbench.

- Click **Preview** to view the BOM. This option is available only before the BOM has been generated.

4. The generated BOM appears on the Bill of Material page. Edit the BOM as necessary and click Export XML to export the BOM as an XML file to be supplied as input to the Deployment Plan Generator to expedite deployment plan generation.

   - The recommended location for the saved BOM XML file is AIA_HOME/aia_instances/<instance_name>/config.
   - The recommended file name for the saved BOM XML file is <Custom_PIP_Name>BOM.xml.

For more information about supplying the BOM XML file to the Deployment Plan Generator, see Deploying Composites.
For more information about editing BOM, see How to Edit a Bill of Material for an AIA Lifecycle Project.
For more information about the supplying the BOM XML file to the Deployment Plan Generator, see Deploying Composites.

6.3. How to Edit a Bill of Material for an AIA Lifecycle Project

Objective

Edit a BOM for an AIA Lifecycle Project.

Prerequisites and Recommendations

The BOM must have been generated.

For more information about generating BOMs, see How to Generate a Bill of Material for an AIA Lifecycle Project.

Note. Any changes that you make to the BOM on the Bill of Material page will not be reflected in the original project definition and decomposition in the Project Lifecycle Workbench.

Actors

Only users assigned the AIALifecycleInstallationDeveloper role can edit a BOM for a PIP project. This user should be a developer who is responsible for producing the deployment plan for all executables in the project for which the BOM is being generated. This developer will therefore also have a solid overall picture of the project.

To edit a BOM for an AIA Lifecycle Project:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab.
2. Click the Edit Bill-of-Material button.

   This option is available only if your user has the AIALifecycleInstallationDeveloper role assigned and the BOM has already been generated.

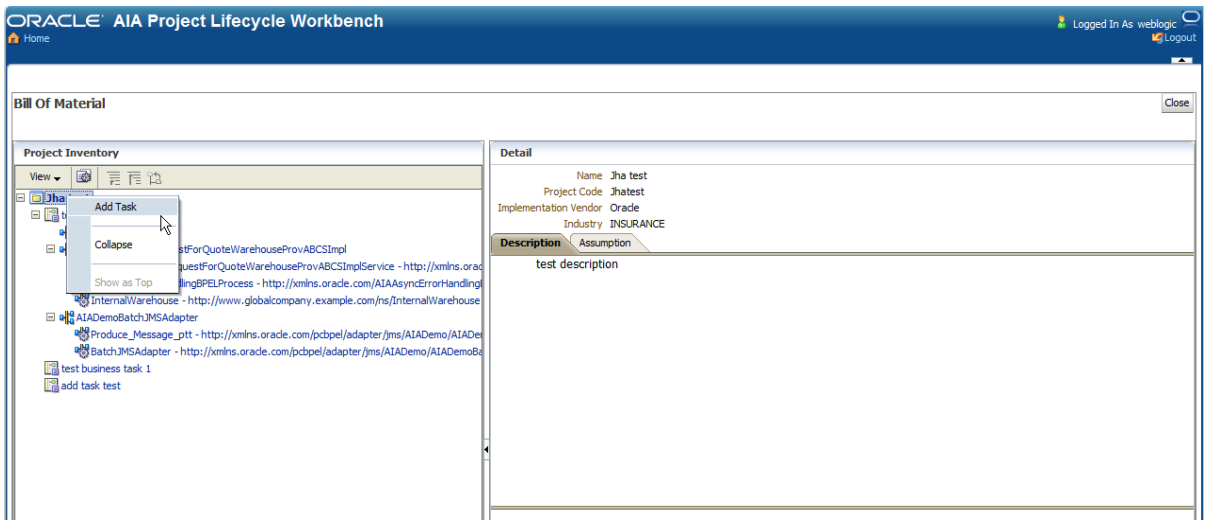
   - If the BOM has not already been generated and you have been assigned the AIALifecycleInstallationDeveloper role, you will see the Generate Bill of Material option.

     For more information about generating BOMs, see How to Generate a Bill of Material for an AIA Lifecycle Project.

   - If the BOM has already been generated and you have not been assigned the AIALifecycleInstallationDeveloper role, you will see the View Bill-of-Material button  . Click it to view the BOM on the Bill Of Material page.

     For more information about viewing BOMs, see How to View a Bill of Material for an AIA Lifecycle Project.

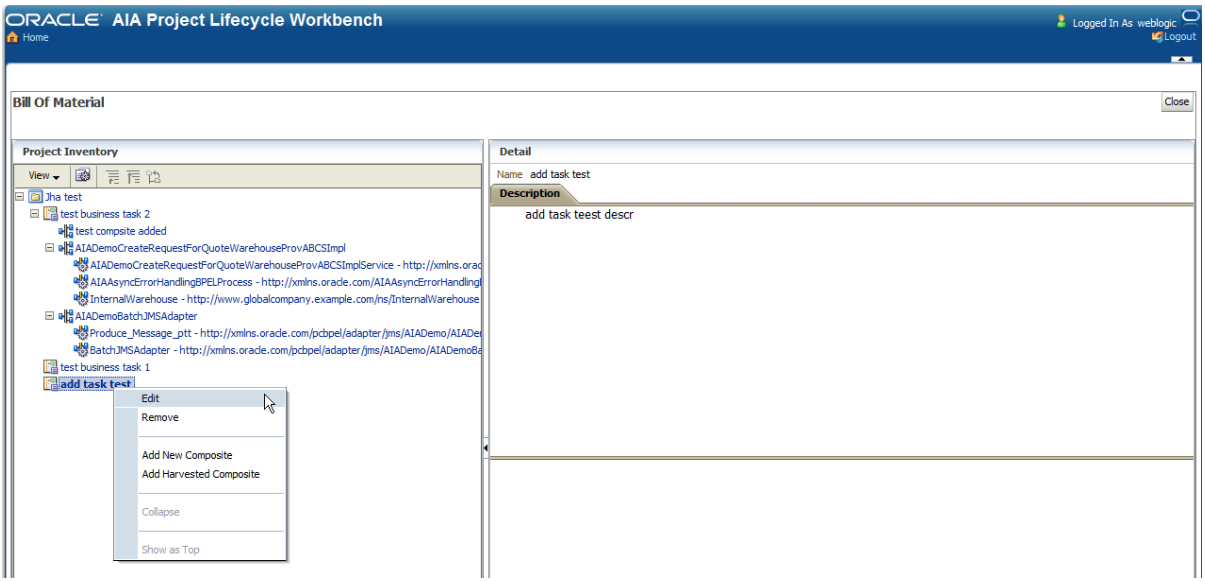
3. The BOM appears on the Bill of Material page.
4. Right-click the project root node to view permitted actions.



Project root node actions on the Bill Of Material page

- Select **Add Task** to add a new business task to the project. For example, you may need to add a business task that was missed as a part of the original functional decomposition performed by the functional product manager.

5. Right-click the business task branch node to view permitted actions.



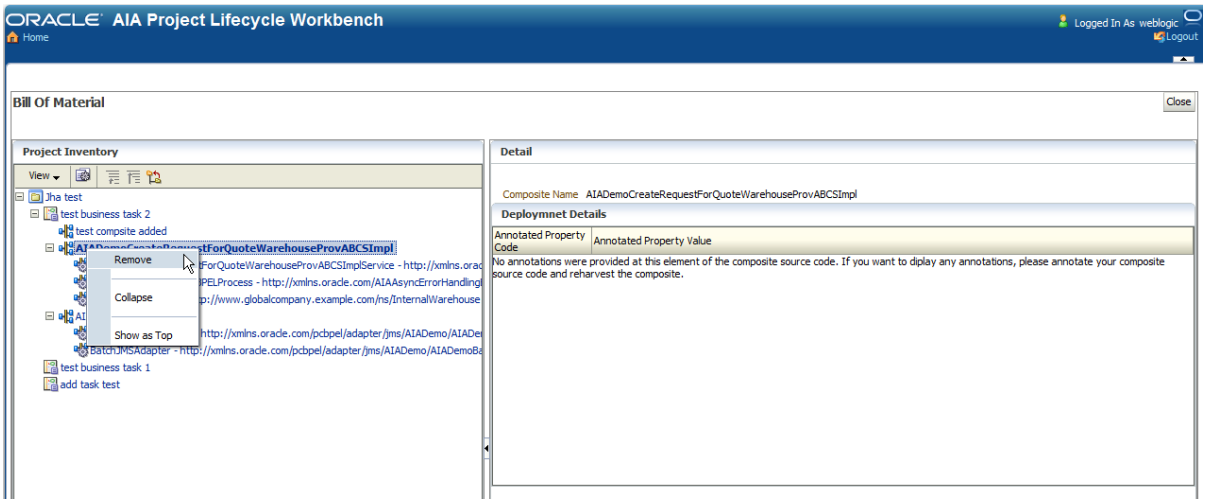
Business task branch node actions on the Bill Of Material page

A business task represents a chunk of functionality. The composites associated with a business task collectively realize the business logic embodied by the business task.

- The **Edit** option is available for a business task branch node if the business task was added to the project root node of the generated BOM. The **Edit** option is not available if the business task was added to the project prior to BOM generation via the functional decomposition pages.
- The **Remove** option is available for a business task branch node if the business task was added to the project root node of the generated BOM. The **Remove** option is not available if the business task was added to the project prior to BOM generation via the functional decomposition pages.
- Select **Add New Composite** to manually define a composite and its annotations and to associate it with the business task. Enter composite details in the Detail area that appears. The **Add New Composite** option is always available.
- Select **Add Harvested Composite** to locate an existing composite and associate it with the business task. For an existing composite to be available for selection, it must have already been harvested by running AIAHarvester.sh. Upon your selecting an existing composite, any available composite details and annotations appear in the Detail area that appears. The **Add Harvested Composite** option is always available.

For more information about running AIAHarvester.sh, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository.

6. Right-click the composite leaf node to view permitted actions.



Composite leaf node actions on the Bill Of Material page

Multiple composites collectively provide functionality encompassed by a business task. Two ways are available in which a composite can be defined and included in a BOM:

- Harvested composites

  A composite can be harvested upon completion of its implementation by running the AIAHarvester.sh command. A harvested composite can then be added to a generated BOM by selecting the Add Existing Composite option on the business task branch node.

> **For more information** about running AIAHarvester.sh, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository.

- Manually defined composites

  The composite was not harvested, but rather was manually defined as an associated composite by selecting the Add New Composites option on the business task branch node.

In the case of a manually defined composite, you can select the composite leaf node to display the Detail area, in which you can edit composite-level annotations by specifying a series of XPath values in the BOM. The internal structure of the composite (services and references, for example) is not shown in the BOM. All annotations are flat with respect to manually defined composites.

For both harvested and manually defined composites, you can select the **Remove** option to disassociate the composite from its parent business task branch node. This removes the composite definition and association from the BOM. For harvested composites, this does not remove the composite from the Project Lifecycle Workbench database or the Oracle Enterprise Repository. For manually defined composites, this does not remove the composite from the Project Lifecycle Workbench database.

7. Once you have finalized all details conveyed in the BOM, click Export XML to export the BOM as an XML file to be supplied as input to the Deployment Plan Generator to expedite deployment plan generation.

   - The recommended location for the saved BOM XML file is AIA_HOME/aia_instances/<instance_name>/config.

- The recommended file name for the saved BOM XML file is <Custom_PIP_Name>BOM.xml.

For more information about supplying the BOM XML file to the Deployment Plan Generator, see Deploying Composites.

6.4. How to View a Bill of Material for an AIA Lifecycle Project

Objective

View a BOM from an AIA Lifecycle project. The BOM captures project details, as well as the business tasks defined as being in-scope for the project.

Prerequisites and Recommendations

The BOM to be viewed must have been generated.

Actors

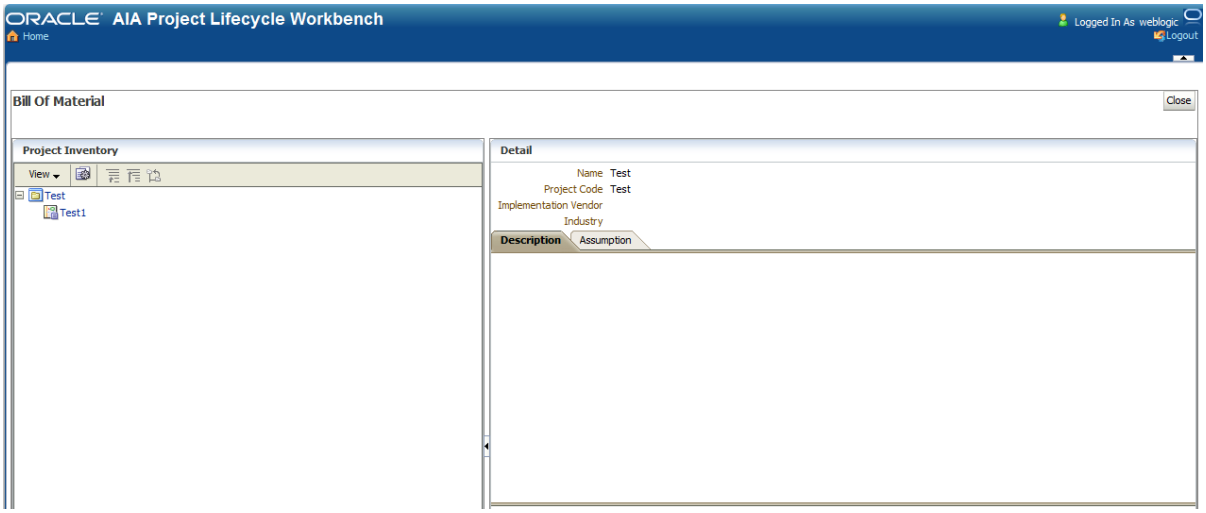
The ability to view a BOM using the View Bill-of-Material button is available only to a user with the AIALifeCycleUser or AIALifeCycleDeveloper role assigned.

Users with the AIALifeCycleInstallDeveloper role assigned will not see the View Bill-of-Material button. Instead, they will see the Generate Bill-of-Material button or Edit Bill-of-Material button. If the Generate Bill-of-Material button appears, a user can click the button and then select the Preview option to view the BOM. If the Edit Bill-of-Material button appears, the user can click it to view and edit the BOM.

For more information about generating and editing the BOM as a user with the AIALifeCycleInstallDeveloper role assigned, see How to Generate a Bill of Material for an AIA Lifecycle Project and How to Edit a Bill of Material for an AIA Lifecycle Project.

To view a BOM for an AIA Lifecycle project:

1. Access the AIA Home Page. Click Go in the Project Lifecycle Workbench area. Select the Project tab.
2. Click the View Bill-of-Material button  to view the BOM on the Bill Of Material page. The View Bill-of-Material button does not appear if the BOM has not yet been generated. The No Bill Of Material Exists message appears instead.



Bill of Material page

Depending on the lifecycle phase of the BOM, the Bill of Material page may or may not display information. For example, if the functional decomposition and service solution component definition are complete, but no composites have been implemented and nothing has been harvested, not much information will appear on the page. However, if functional decomposition, service solution component definition, actual composite implementation, and composite harvesting have been completed, the BOM tree will appear to enable you to click through and view the functional decomposition.

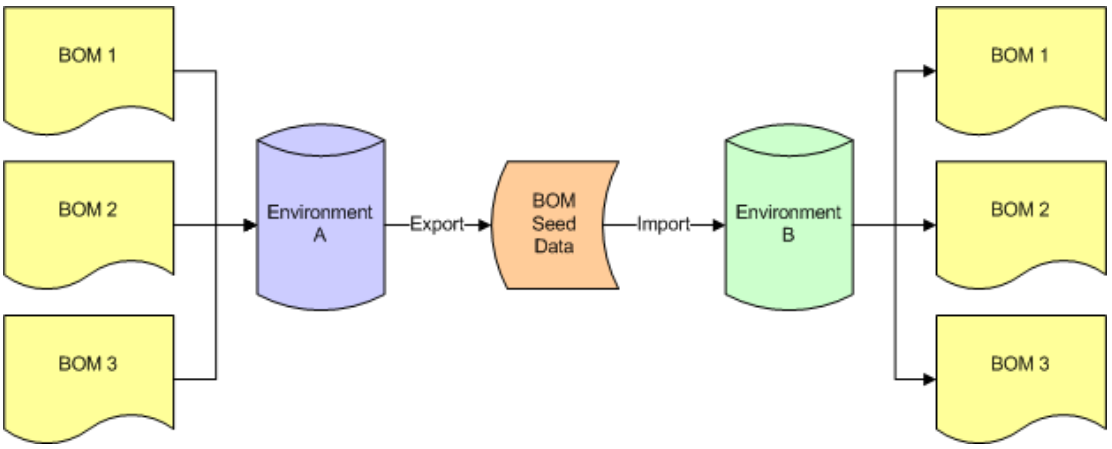
3. Select nodes in the tree to display any available details and annotations for the selected node.

   - Root node: Reflects the name of the project from which the BOM was generated.
   - Branch nodes: Reflect the business tasks that make up the project from which the BOM was generated.
   - Leaf nodes: Reflect the composites that collectively implement the functionality of the business tasks.

     A composite consists of child elements, such as services, references, and so forth. As such, leaf nodes will not display child elements if annotations are not present for its child elements.

6.5. How to Export and Import Bill of Material Seed Data

The following diagram illustrates a use case for exporting and importing BOM seed data.



Exporting and importing BOM seed data

This section discusses:

- How to Set Up Bill of Material Source Systems
- How to Export Bill of Material Seed Data
- How to Import Bill of Material Seed Data

6.5.1. How to Set Up Bill of Material Source Systems

Objective

Set up the bill of material source system to enable the export and import of seed data.

Actor

- System administrator
- Release engineer

6.5.1.1. Setting Up a Non-Foundation Pack Bill-of-Material Source System

If you are performing the export and import using a BOM source system on which Foundation Pack has not been installed, perform the following procedure.

To set up a non-Foundation Pack bill-of-material source system:

1. Download AIAHarvester.zip.

   This is a self-contained zip file that contains all components necessary for a developer to perform a harvest against the Project Lifecycle Workspace and the Oracle Enterprise Repository.

2. Unzip the AIAHarvester.zip in any location; however, you must maintain the unzipped structure.

Note. The following steps assume that these tasks are being performed within the AIAHarvester directory.

3. Adjust the highlighted values in the ./jndi.properties file:

```
java.naming.factory.initial=weblogic.jndi.WLInitialContextFactory
java.naming.provider.url=t3://10.146.91.163:7001
java.naming.security.principal=weblogic
java.naming.security.credentials=welcome1
```

   - ***10.146.91.163:7001*** should be replaced with the actual SOA server:port value, or its Oracle Metadata Services (MDS) store, in which the composite to be harvested is deployed.
   - ***weblogic*** should be replaced with the actual username value for the SOA server.
   - ***welcome1*** should be replaced with the actual password value for the SOA server.

4. Set up the JDBC password in an encoded format. For example:

```
./AIALifeCycleEncode.sh -user <username> -password <password>
```

   In the Weblogic server on which the composite is deployed, a jdbc/AIALifeCycleDS datasource should already be configured. This should be configured automatically by the AIA Installer. This jdbc/AIALifeCycleDS datasource is used to connect to the Lifecycle database via a JDBC connection.

   - Replace <username> with the JDBC user name value.
   - Replace <password> with the JDBC password value.

6.5.1.2. Setting Up a Foundation Pack Bill-of-Material Source System

If you are performing the export using a BOM= source system on which Foundation Pack has been installed, perform the following procedure.

To set up a Foundation Pack bill-of-material source system:

1. Access a command line and run the following script:

```
Source ${AIA_INSTANCE}/bin/aiaenv.sh
cd ${AIA_INSTANCE}/Infrastructure/LifeCycle/AIAHarvester
AIAExportBOM.sh <file>
```

6.5.2. How to Export Bill of Material Seed Data

Objective

Export BOM seed data for a given environment. Data for all projects defined in the Project Lifecycle Workbench will be exported.

Prerequisites and Recommendations

How to Set Up Bill of Material Source Systems

Actor

- System administrator
- Release engineer

To export bill of material seed data:

1. To export BOM seed data, run the following command:

   ```
   ./AIAExportBOM.sh <sql file name>
   ```

   The output of the completed command is an SQL file that contains many SQL statements.

6.5.3. How to Import Bill of Material Seed Data

Objective

Import the data into a target system.

Prerequisites and Recommendations

- How to Set Up Bill of Material Source Systems
- How to Export Bill of Material Seed Data

Actor

- System administrator
- Release engineer

To import bill of material seed data:

1. Run the exported BOM seed data SQL file on the target Project Lifecycle Workbench database.
2. Access the target system's Project Lifecycle Workbench database or UI to confirm that all expected BOM data has been loaded.

7. Deploying Composites

Deploying custom built services is a two step process:

1. Generate deployment plans and deploy using the AID (Application Integration Architecture Installation Driver).
2. Deploy custom-built services using Application Integration Architecture (AIA) Install driver.

Note: You can deploy custom-built services only after installing Foundation Pack.

For more information about installing Foundation Pack, see *Oracle Application Integration Architecture Foundation Pack: Installation Guide,* "Installing Foundation Pack" and "Advanced Installation."

7.1. How to Generate Deployment Plans

To generate the deployment plan:

1. Run <AIA_HOME>/aia_instances/<instance_name>/bin/aiaenv.sh command.
2. Change the directory to DeploymentPlanGenerator in Utils. For example:

```
cd <AIA_HOME>/utils/DeploymentPlanGenerator
```

3. Run the following command:

```
ant --noconfig -Dinput=<BOM file name along with absolute path of the
file> -DDeploymentPlan=<output path for the Deployment plan along with
file name> -DHarvesterSettings=<output path for the Harvester setting file
along with file name>
```

The output path is the file name and the location where the generated deployment plan will be stored. We recommend that this path be the same as the output path defined for the Harvester settings file. It is an absolute path to the file. The deployment plan file name format is <your_custom_PIP_name>DeploymentPlan.xml.

For more information about generating the BOM XML input file, see Working with Project Lifecycle Workbench Bills of Material.
For more information about the Harvester settings file, see Harvesting Oracle AIA Content.

7.2. How to Deploy Custom-Built Services

To deploy custom-built services:

1. Run <AIA_HOME>/aia_instances/<instance_name>/bin/aiaenv.sh command.
2. Run the following command:

```
ant  -DDeploymentPlan=<absolute path of the file> -
DPropertiesFile=<absolute path of the file>   -f
<AIA_HOME>/Infrastructure/Install/AID/AIAInstallDriver.xml    -l <
absolute path of the log file>
```

   - The DeploymentPlan is the file that was generated in the previous step.
   - The PropertiesFile, AIAInstallProperties.xml, contains the details of the AIA environment and is located here: <AIA_HOME>/aia_instances/<instance_name>/config.

8. Configuring and Using Oracle Enterprise Repository as the Oracle AIA SOA Repository

This chapter discusses the following topics:

8.1. Introduction to Using Oracle Enterprise Repository as the Oracle AIA SOA Repository

Oracle Application Integration Architecture (AIA) leverages Oracle Enterprise Repository as its SOA repository solution, providing a centrally managed user interface for discovering and learning about the SOA assets in your Oracle AIA ecosystem.

Specifically, all prebuilt AIA design-time interfaces, including Enterprise Business Service (EBS) WSDL files, Application Business Connector Service (ABCS) WSDL files, Enterprise Business Object (EBO) XSD files, Enterprise Business Message (EBM) XSD files, and their underlying artifacts, relationships, and metadata are delivered via Oracle Enterprise Repository.

Beyond this, you also can publish run-time, deployed composites into Oracle Enterprise Repository. As such, Oracle Enterprise Repository can provide visibility and coverage across the span of the SOA design-time and run-time lifecycles.

Solution Packs

Solution packs are an Oracle Enterprise Repository mechanism used to deliver content in bulk. The prebuilt AIA SOA portfolio is shipped as a solution pack. You can import the solution pack into your on-premise Oracle Enterprise Repository instances to view, access, and evaluate the AIA SOA portfolio.

The importing of an AIA solution pack to Oracle Enterprise Repository is a task that is independent of the installation of AIA. If you intend to use Oracle Enterprise Repository in your enterprise, you can import an AIA solution pack before or after your AIA installation. In fact, you can even import an AIA solution pack without purchasing or installing AIA.

The importing of an AIA solution pack does require that you perform the prerequisite steps documented in How to Set Up Oracle AIA Content Harvesting.

For more information about performing these imports, see *Oracle Fusion Middleware User Guide for Oracle Enterprise Repository*, “Import Export Tool,” Importing Items into Oracle Enterprise Repository.

Note: While the AIA solution pack import is in progress, ensure that no other activities occur on the target Oracle Enterprise Repository instance.

Once AIA design-time artifacts and deployed composites have been published into Oracle Enterprise Repository, your enterprise can search for, browse, and view them in Oracle Enterprise Repository. By keeping Oracle Enterprise Repository in sync with your AIA ecosystem, you ensure that it can serve as the system of record for your business services and their topologies.

Potential users of Oracle Enterprise Repository as a SOA repository are active across the span of the SOA development lifecycle and include functional and business analysts, architects, developers, system integrators, and system administrators.

For example, a business analyst working on requirements for building out a particular business process can use Oracle Enterprise Repository to determine which business capabilities are available in a particular integration area and then determine which additional capabilities may need to be built. The capabilities are delivered in the form of application-independent services and objects. Additionally, solution architects can use Oracle Enterprise Repository during their functional analysis (using the Project Lifecycle Workbench) to evaluate the potential for service reuse.

For more information about viewing Oracle AIA artifacts and composites in Oracle Enterprise Repository, see How to Access Oracle AIA Content in Oracle Enterprise Repository.

8.2. How to Provide EBO and EBM HTML Documentation Links in Oracle Enterprise Repository

Objective

AIA delivers HTML documentation for each EBO and EBM, which you can link to from respective EBO and EBM entry detail pages in Oracle Enterprise Repository.

To do this, you will set up an Oracle Enterprise Repository Artifact Store to enable Oracle Enterprise Repository to provide links to AIA EBO and EBM HTML documentation provided on an AIA web server.

If you do not perform this setup, the AIA Reference Doc link appears on EBO and EBM detail pages in the Oracle Enterprise Repository, but not lead anywhere.

Actor

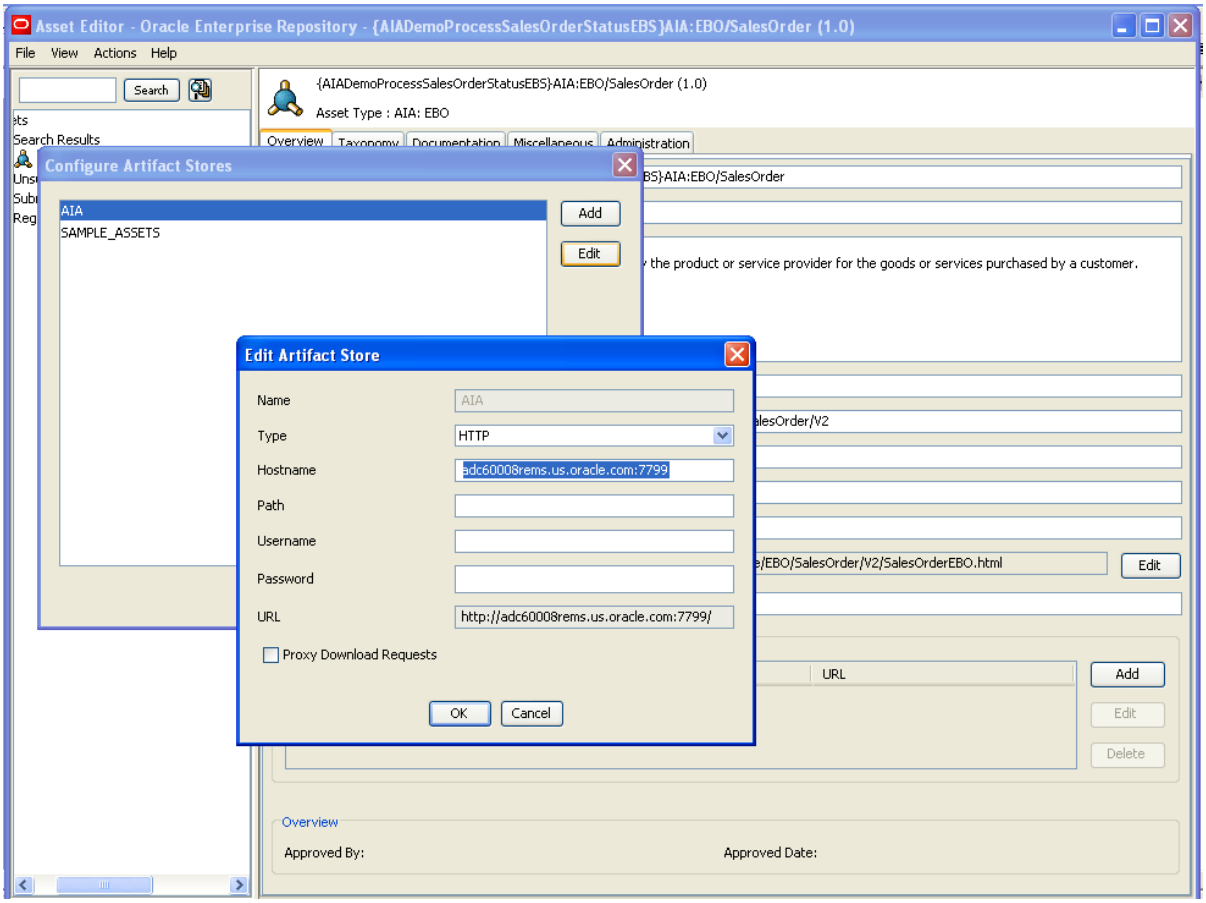
System administrator

How to provide EBO and EBM HTML documentation links in Oracle Enterprise Repository

1. Access the Oracle Enterprise Repository UI (http://<host>:<port>/oer). Click the Edit/Manage Assets link in the Assets menu to launch the Asset Editor.
2. In the Asset Editor, navigate to Actions, Configure Artifact Stores.

3. Click Edit to add a new AIA artifact store. The artifact store must be named ***AIA.*** You must manually add this artifact store when setting up the Oracle Enterprise Repository for the first time.

4. In the Edit Artifact Store dialog box, define the **Hostname** value for the AIA artifact store.



Edit Artifact Store dialog box

The host name value is the URL at which the AIA web server is installed. This is the AIA location in which EBO and EBM HTML documentation can be accessed via the HTTP protocol.

5. Click **OK**.

8.3. How to Access Oracle AIA Content in Oracle Enterprise Repository

Objective

Access AIA content in the Oracle Enterprise Repository.

Prerequisites and Recommendations

- Read relevant Oracle Enterprise Repository documentation and understand Oracle Enterprise

Repository asset models and graphs.

For more information, see Oracle Enterprise Repository documentation accessible from the Oracle Fusion Middleware documentation library.

- Complete the steps covered in How to Set Up Oracle AIA Content Harvesting.
- For prebuilt design-time interfaces delivered by AIA, import the solution pack into the Oracle Enterprise Repository.

For more information, see Introduction to Using Oracle Enterprise Repository as the Oracle AIA SOA Repository.

- For custom-built individual composites that have not been deployed, run the AIA Harvester to publish them into Oracle Enterprise Repository.

For more information, see Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository

- For custom-built interfaces, run the AIA Harvester to publish them into Oracle Enterprise Repository.

For more information, see Harvesting Interfaces to Oracle Enterprise Repository in Bulk.

- For deployed composites (part of deployed Process Integration Packs), run the AIA post-installation script to publish the run-time composite into Oracle Enterprise Repository.

For more information, see Harvesting Deployed Composites into Oracle Enterprise Repository.

- If you want to provide links to EBO and EBM HTML documentation from EBO and EBM detail pages, complete the steps in How to Provide EBO and EBM HTML Documentation Links in Oracle Enterprise Repository.

Actors

- Business analysts
- Solution architects
- Developers
- Functional analysts
- Integration architects
- Release engineers
- System administrators

- System integrators

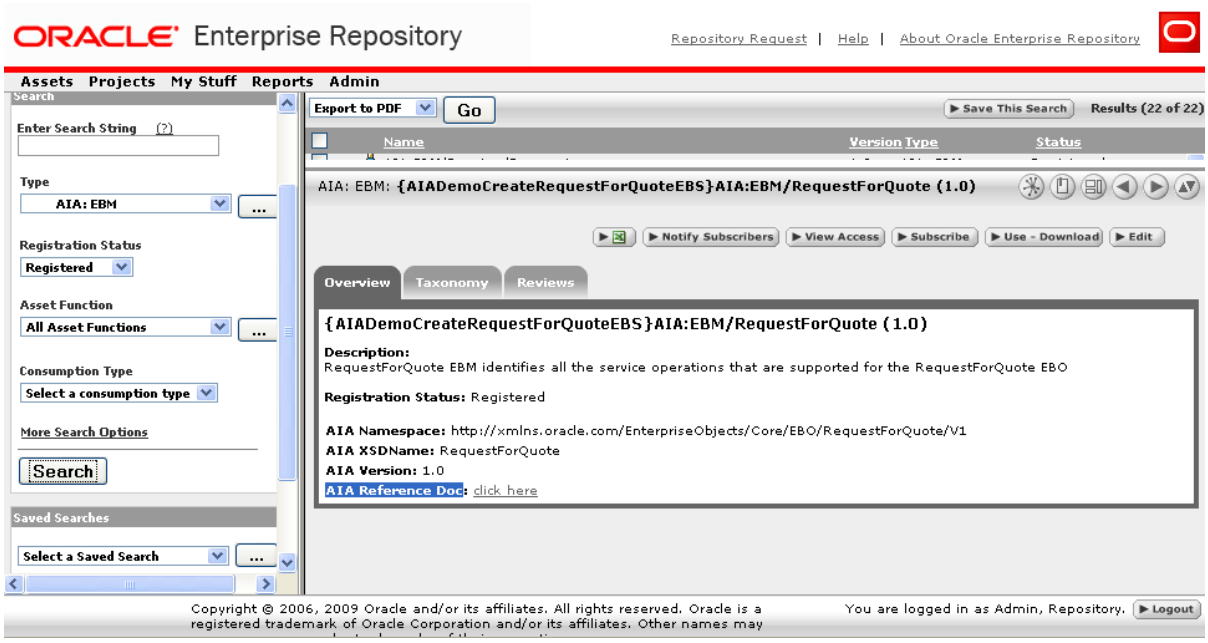
To access Oracle AIA design-time artifacts and deployed composites in Oracle Enterprise Repository:

1. Access the Oracle Enterprise Repository to which your AIA design-time artifacts and deployed composites have been published.

   Use Oracle Enterprise Repository search and browse functionality to locate AIA content.

For more information about using Oracle Enterprise Repository, see *Oracle Fusion Middleware User Guide for Oracle Enterprise Repository*.

2. In Search mode, you can narrow your search to AIA asset types only by selecting an AIA: <*XYZ*> value in the Type drop-down list box. For example, by selecting ***AIA: EBO***, you can narrow your search to AIA EBOs only.
3. When viewing EBOs and EBMs in Oracle Enterprise Repository, you can click the **AIA Reference Doc** link to access HTML documentation about the content.



AIA Reference Doc link

For more information about providing links to EBO and EBM HTML documentation from EBO and EBM detail pages in Oracle Enterprise Repository, see How to Provide EBO and EBM HTML Documentation Links in Oracle Enterprise Repository.

9. Annotating Composites

This chapter describes annotations and discusses how to annotate specific Oracle Application Integration Architecture (AIA) elements.

This chapter discusses the following topics:

9.1. Why Annotate a SOA Composite

AIA recommends annotations in the composite XML file to provide detailed information about:

- AIA artifacts and their relationships to other AIA artifacts.
- Composite-level descriptor properties that are used to configure the component at deployment and runtime.

AIA architecture categorizes SOA composites further as adapter services, requester services, provider services, and so on based on their usage. The meta information of these AIA services is used in maintaining Oracle Enterprise Repository assets of AIA asset types and linking them to Oracle Enterprise Repository assets with native asset types; this is accomplished with the help of AIA harvester, which harvests the SOA composites.

9.1.1. What Elements of a Composite Need to be Annotated

You must provide annotations in the composites for the exposed services and for the referenced services, as per AIA guidelines, and you must insert these comments at development time.

In line with SOA modeling and development practices, these composites are expected to be harvested multiple times during the development cycle, from conception till deployment to production environment.

Embed annotations in the ***<svcdoc:AIA>*** element and place the <svcdoc:AIA> element itself inside the xml comments tags <!-- and -- > as shown below.

The first annotation element that should occur in every annotated composite.xml file is <svcdoc:ServiceSolutionComponentAssociation>. This element describes the globally unique identifier (GUID) used for artifacts generation and should be placed under the root element <composite>. The value for this element is not provided by the composite developer and is left blank. The GUID is used to associate the PM-identified Solution Service Component with the implemented Application Business Connector Service (ABCS) Composite. This association enables autopopulation into the Bill Of Material user interface (UI). The GUID is first autogenerated in the Solution Service Component UI and it is persisted in the AIA Project Lifecycle Workbench database.

```
<composite name="SamplesCreateCustomerPartyPortalProvABCSImpl">
.....................
<!--<svcdoc:AIA>
            <svcdoc:ServiceSolutionComponentAssociation>
                        <svcdoc:GUID></svcdoc:GUID>
             </svcdoc:ServiceSolutionComponentAssociation>
 </svcdoc:AIA>-->
.....................................
</composite>
```

You must annotate the Service and Reference elements of the Composite.xml in the manner presented in the sections that follow.

A skeletal 'Service' element in a composite.xml, with annotations

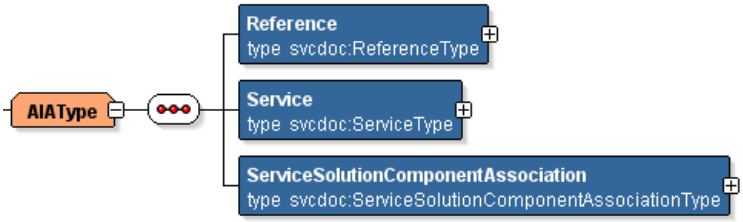
```
<service ui:wsdlLocation .......>
        <interface.wsdl ....... />
        <binding.ws ........... />
          <!-- <svcdoc:AIA>
                      <svcdoc:Service>
                       . . . . . . . . . . . . .
                    </svcdoc:Service>
          </svcdoc:AIA> -->
        </service>
```

A skeletal 'Reference' element in a composite.xml, with annotations

```
<reference ui:wsdlLocation ........">
            <interface.wsdl ............/>
            <binding.ws ................/>
            <!-- <svcdoc:AIA>
                        <svcdoc:Reference>
                           ..................
                        </svcdoc:Reference>
                    </svcdoc:AIA> -->

    </reference>
```

As shown in the code examples given above, the root of the annotation element of the composite is <svcdoc:AIA>. Provide annotations for the Service and Reference elements of the Composite under xml comment tags using the annotation elements ***<svcdoc:Service>*** and ***<svcdoc:Reference>***, respectively.



Example of annotations

9.1.2. Understanding the Service Annotation Element

The annotation element ***<svcdoc:Service>*** describes the details of the exposed service as denoted by the Service element of the Composite.xml. At a broader level, three annotation elements provide details about a service interface, its implementation, and the transport details (only if it is a transport adapter composite or if the composite contains as an adapter component).

These annotation elements are:

- ***InterfaceDetails***

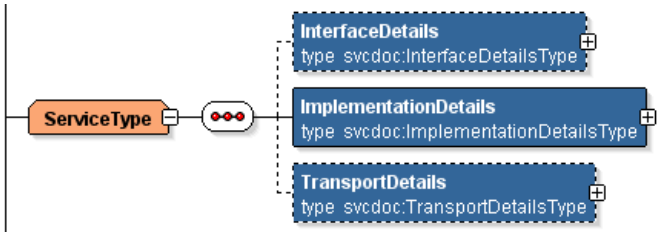
  This element provides information about the service interface, such as the name of the service, the name of the operation defined on the service, and the type of the service artifact.

- ***ImplementationsDetails***

  This element provides information about the application with which the ABCS is interacting.

- ***TransportDetails***

  This element provides information about the transport adapters and their details, if the composite has any transport adapters.



Example of annotation elements

Note: Only when the Composite is that of an Adapter service will the Transport details be provided.

For more information, see Understanding the TransportDetails Element.

9.1.2.1. InterfaceDetails

This element identifies the interface that is being implemented by the AIA service in consideration. The AIA Service that implements an interface definition will have these details annotated, in its composite.xml. This element should provide the details such as:

- The name of the service,
- The name of the Service operation
- The type of the service artifact.

The element ***InterfaceDetails*** is explained in detail below:

Element	Description
ServiceName	Identifies the name of the AIA service whose interface is being implemented by the composite under consideration. The Deployment Plan Generator uses this value.
Namespace	The namespace of the service whose interface is being implemented as defined in its WSDL.
ArtifactType	The type of service artifact, for example, an ABCS, and so on. The valid values are given here: Valid Values for Annotation Elements.
ServiceOperation/Name	The element that holds the complete service operation name in the format of verb + entity. The name of the operation of the AIA service whose interface is being implemented by the composite under consideration.

Example:

```
<svcdoc:InterfaceDetails>
<svcdoc:ServiceName>CustomerPartyEBS</svcdoc:ServiceName>

<svcdoc:Namespace>http://xmlns.oracle.com/EnterpriseServices/Core/Customer
Party/V2</svcdoc:Namespace>

   <svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
       <svcdoc:ServiceOperation>
       <svcdoc:Name>CreateCustomerPartyList</svcdoc:Name>
       </svcdoc:ServiceOperation>
</svcdoc:InterfaceDetails>
```

Service Interface details are optional. The AIA artifacts that implement an interface definition will have these details annotated. For example, a provider ABCS implements an interface defined by an Enterprise Business Service (EBS) operation, whereas a requester ABCS does not. So, annotations about the service interface will only be captured in the provider ABCS to identify which interface that particular ABCS is implementing.

Therefore, specify Service Interface details in the Composite.xml only if they are applicable.

9.1.2.2. ImplementationDetails

The annotation element ***ImplementationDetails*** describes the application for which the AIA service is being implemented and has the following elements:

Element	Description
ApplicationName	The name of the participating application with which the service is interacting.
B2BDocumentType	In the case of requester or provider B2B Connector Services, this element contains the name of the B2B document type that is supported by the B2B Connector Service. An example of a B2B document type is an 850 (EDI ORDER). The value in this field should also match the DocumentType name in Oracle B2B.
B2BDocumentVersion	Contains the version of the B2B document type that is supported by the B2B Connector Service, for example, 4010. The value in this field should also match the DocumentRevision in Oracle B2B.
B2BStandard	Contains the name of the B2B standard/protocol that is supported by the B2B Connector Service, for example, EDI_X12, OAG, or RosettaNet.
B2BStandardVersion	Contains the version of the B2B standard/protocol that is supported by the B2B Connector Service, for example, 1.0.
BaseVersion	The version of the participating application with which the service is interacting.
DevelopedBy	The name of the Business Unit that developed the service. A possible value is ABSG.
OracleCertified	Indicates whether it is tested by Oracle or not.
ArtifactType	Describes the type of the service artifact, for example, whether it is an ABCS, and so on. The valid values are given here: Valid Values for Annotation Elements.
ServiceOperation	Holds the complete service operation name in the format of verb + entity. The name of the operation defined in the WSDL of the AIA service that is being implemented.

Example:

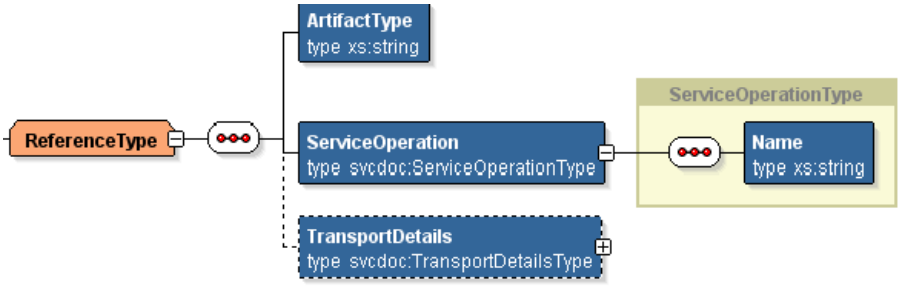
```
<svcdoc:ImplementationDetails>
                <svcdoc:ApplicationName>BRM</svcdoc:ApplicationName>
                 <svcdoc:BaseVersion>7.3</svcdoc:BaseVersion>
                  <svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>
                  <svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>

<svcdoc:ArtifactType>ProviderABCSImplementation</svcdoc:ArtifactType>
                   <svcdoc:ServiceOperation>
```

```
                    <svcdoc:Name>CreateCustomer</svcdoc:Name>
                    </svcdoc:ServiceOperation>
        </svcdoc:ImplementationDetails>
```

9.1.3. Understanding the Reference Annotation Element

The annotation element ***<svcdoc:reference>*** describes the Reference element of the composite. The child elements of this element and their purpose are described below:



Example of the Reference Annotation element

These annotation elements are:

- ***ArtifactType***

  Describes the type of AIA artifact used at the Reference service.

- ***ServiceOperation/Name***

  Holds the complete service operation name in the format of verb + entity, as defined on the Reference service.

- ***TransportDetails***

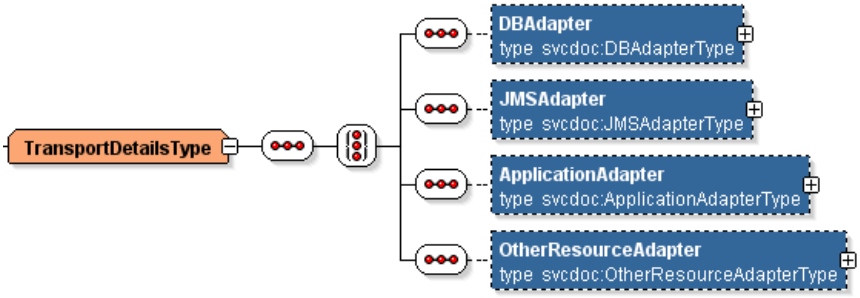
  Provides information about the transport adapters and their details, if the composite has any transport adapters. See the following section for details about the TransportDetails element.

Note: Only when the Composite is that of an Adapter service would TransportDetails be provided.

9.1.4. Understanding the TransportDetails Element

Use the annotation element ***TransportDetails*** to provide details about a transport adapter in a composite if a nonSOAP transport is used to interface with an application, either using inbound or outbound connectivity.

The structure of the element TransportDetails is shown below:



Example of the TransportDetails element

9.1.4.1. Annotating DBAdapter

This ***DBAdapter*** element has the following elements:

Element	Description
ResourceProvider	Holds data about the Database Provider name. Examples: Oracle 10g, Oracle 11g, MS-SQL 9, MySQL 9. Based on this tag, build scripts identify and generate the appropriate configurations for the database.
ConnectionFactory	Holds the name of the connection factory. Using this value, the installer scripts create data sources during deployment. The DB Adapter .rar file is updated during deployment. For example: eis/DB/AIASamplesDB
ApplicationName	The name of the source or target application, depending on whether it is an inbound or outbound adapter.
XAEnabled	Used by build scripts to decide if DataSource is to be configured using XA connection or not. Possible values are ***true*** and ***false***. Based on the whether the tag is true or /false, the build script selects the appropriate JDBC driver and other configurations.
ResourceTargetIdentifier	The value of the schema name. Build scripts use this element during deployment. Examples: EBIZ1, EBIZ2, JMSUSER1, JMSUSER2
ResourceName	Holds data about database table name. Deployment scripts use this element to create and configure data sources.
ResourceFileName	Holds data about SQL file name of the database table creation script. Deployment scripts use this element to create and configure data sources.

9.1.4.2. Annotating JMS Adapter

This ***JMSAdapter*** element has the following elements:

Element	Description

Element	Description
ResourceProvider	Holds data about JMS Provider name. Examples: WLSJMS, AQJMS, Tibco, MQ-Series, and SonicMQ. Based on this tag, build scripts identify whether it is AQJMS or WLSJMS and generate the appropriate configurations for AQ or WLS.
ConnectionFactory	Holds the name of the connection factory. Using this value, Installer scripts create JMS modules during deployment. The JMS Adapter .rar file is updated during deployment. Example: eis/jms/ <PIPName>_CF.
XAEnabled	Build scripts use this element to decide whether the DataSource should be configured using XA connection. Possible values are ***true*** and ***false***. Based on the whether this tag is true or false, the build script selects the appropriate JDBC driver and other configurations.
ResourceTargetIdentifier	The value of the application product code name. Build scripts use this element during deployment.
ResourceType	Identifies what type of the JMS resource needs to be configured. The value can be ***Queue*** or ***Topic***.
ResourceName	Holds data about the Queue or Topic name. Deployment scripts use this element to create and configure data sources.
ResourceFileName	Holds data about the SQL file name of the database table creation script. Deployment scripts use to create and configure data sources.

9.2. How to Annotate the Service Element in a Requester ABCS Composite

To annotate the service element in a requester ABCS composite:

1. The details of the source participating application have to be furnished in this element.

   Annotating the Service element in the composite is explained using the sample given below:

```
<service ui:wsdlLocation……..">
        <interface.wsdl ……./>
        <binding.ws ……./>
         <!--<svcdoc:AIA>
                  <svcdoc:Service>
                       <svcdoc:ImplementationDetails>

<svcdoc:ApplicationName>SampleSEBL</svcdoc:ApplicationName>
                            <svcdoc:BaseVersion>1.0</svcdoc:BaseVersion>

<svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>
```

```
<svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>

<svcdoc:ArtifactType>RequesterABCSImplementation</svcdoc:ArtifactType>
                            <svcdoc:ServiceOperation>
                                <svcdoc:Name>CreateCustomer</svcdoc:Name>
                            </svcdoc:ServiceOperation>
                        </svcdoc:ImplementationDetails>
                    </svcdoc:Service>

          </svcdoc:AIA>-->
    </service>
```

a. In this example, the value of the element, ***ArtifactType***, is provided as 'ReqesterABCSImplementation' as the composite represents a Requester ABCS.

b. The value of the element, ***ServiceOperation/Name***, should be same as the value defined for the operation in the WSDL of the ABCS.

9.3. How to Annotate the Reference Element in a Requester ABCS Composite

To annotate the reference element in a requester ABCS composite:

1. Annotate the Reference element in the composite, as shown in the following sample, providing the details of the Service being invoked:

```
<reference ui:wsdlLocation……..">
        <interface.wsdl ……../>
        <binding.ws……../>
        <!--<svcdoc:AIA>
                    <svcdoc:Reference>

<svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                        <svcdoc:ServiceOperation>
                        <svcdoc:Name>CreateCustomerPartyList</svcdoc:Name>
                        </svcdoc:ServiceOperation>
                    </svcdoc:Reference>
                </svcdoc:AIA>-->
</reference>
```

a. In the example, the value of the element, ***ArtifactType***, is provided as EnterpriseBusinessService because it references an external service in the composite.

b. In cases when the external service is an infrastructure utility, such as AIAAsyncErrorHandlingBPELProcess, then the value should be '***UtilityService***'.

c. The value of the element, ***ServiceOperation/Name***, should be the same as the value defined for the operation in the WSDL of the service being referenced.

9.4. How to Annotate the Service Element in a Provider ABCS Composite

To annotate the service element in a provider ABCS composite:

1. Furnish the details of the interface that this ABCS is implementing.
2. Match the values for elements ***ServiceName, Namespace,*** and ***ServiceOperation/name*** with the corresponding values defined in the interface service's WSDL target participating application as shown in this example:

```
<service ui:wsdlLocation=……>
        <interface……/>
        <binding.ws ……../>
        <!--<svcdoc:AIA>
                    <svcdoc:Service>
                      <svcdoc:InterfaceDetails>

<svcdoc:ServiceName>CustomerPartyEBS</svcdoc:ServiceName>

<svcdoc:Namespace>http://xmlns.oracle.com/EnterpriseServices/Core/Customer
Party/V2</svcdoc:Namespace>

<svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                          <svcdoc:ServiceOperation>

<svcdoc:Name>CreateCustomerPartyList</svcdoc:Name>
                          </svcdoc:ServiceOperation>
                        </svcdoc:InterfaceDetails>
                        <svcdoc:ImplementationDetails>

<svcdoc:ApplicationName>SamplePortal</svcdoc:ApplicationName>
                          <svcdoc:BaseVersion>1.0</svcdoc:BaseVersion>
                          <svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>

<svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>

<svcdoc:ArtifactType>ProviderABCSImplementation</svcdoc:ArtifactType>
                          <svcdoc:ServiceOperation>
                             <svcdoc:Name>CreateCustomer</svcdoc:Name>
                          </svcdoc:ServiceOperation>
                        </svcdoc:ImplementationDetails>
                    </svcdoc:Service>

          </svcdoc:AIA>-->
    </service>
```

   a. In this code sample, the value of the element, ***InterfaceDetails/ArtifactType***, is provided as 'EnterpriseBusinessService because it defines the interface that is being implemented by the Provider ABCS.

   b. ***ImplementationDetails/ArtifactType***, is provided as 'ProviderABCSImplementation' as the composite represents a provider ABCS.

c. The value of the element, ***ServiceOperation/Name***, should be same as the value defined for the operation in the WSDL of the ABCS.

9.5. How to Annotate the Reference Element in a Provider ABCS

Annotate the Reference element in the composite, as shown in the following samples, providing the details of the Service. The service being invoked can be a participating application, an adapter service, or a utility service.

Sample for Reference in Provider ABCS invoking Participating Application Web Service:

```
                        <!--<svcdoc:AIA> ;
                               <svcdoc:Reference>

<svcdoc:ArtifactType>UtilityService</svcdoc:ArtifactType>
                                    <svcdoc:ServiceOperation>
                                        <svcdoc:Name>initiate</svcdoc:Name>
                                    </svcdoc:ServiceOperation>
                               </svcdoc:Reference>
                    </svcdoc:AIA>-->
<!--<svcdoc:AIA>
                    <svcdoc:Reference>

<svcdoc:ArtifactType>ApplicationWebService</svcdoc:ArtifactType>
                           <svcdoc:ServiceOperation>
                               <svcdoc:Name>insert</svcdoc:Name>
                           </svcdoc:ServiceOperation>
                       </svcdoc:Reference>
              </svcdoc:AIA>-->
```

Sample for Reference in Provider ABCS invoking Utility Service (AIA Error Handler Process):

```
                        <!--<svcdoc:AIA>
                               <svcdoc:Reference>

<svcdoc:ArtifactType>UtilityService</svcdoc:ArtifactType>
                                    <svcdoc:ServiceOperation>
                                        <svcdoc:Name>initiate</svcdoc:Name>
                                    </svcdoc:ServiceOperation>
                               </svcdoc:Reference>
                        </svcdoc:AIA>-->
```

Sample for Reference in Provider ABCS invoking Non - SOAP Adapter Service:

```
                    <!--<svcdoc:AIA>
                                                  <svcdoc:Reference>

<svcdoc:ArtifactType>TransportAdapter</svcdoc:ArtifactType>

<svcdoc:ServiceOperation>

<svcdoc:Name>process</svcdoc:Name>
```

```
</svcdoc:ServiceOperation>
                                                    </svcdoc:Reference>
                    </svcdoc:AIA>-->
```

9.6. How to Annotate the Transport Adapter Composite

To annotate the transport adapter composite:

1. In the case of a Transport Adapter composite, populate the element, ***TransportDetails***, under:
   - '***Service'*** if nonSOAP transport is used to interface with this service.
   - '***Reference'*** if the service uses nonSOAP transport to interface with participating applications /external systems.
2. In both cases, the values for the element '***ArtifactType'*** are provided as ***'TransportAdapter'***.

   The artifact type ***'TransportAdapter'*** indicates that the service is responsible for transforming nonSOAP requests into SOAP requests and vice versa.

   This sample code illustrates how transport details are populated in the section '***service'***:

```
<!--<svcdoc:AIA>
                        <svcdoc:Service>
                                <svcdoc:ImplementationDetails>

<svcdoc:ApplicationName>SamplePortal</svcdoc:ApplicationName>

<svcdoc:BaseVersion>1.0</svcdoc:BaseVersion>

<svcdoc:DevelopedBy>ABSG</svcdoc:DevelopedBy>

<svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>

<svcdoc:ArtifactType>TransportAdapter</svcdoc:ArtifactType>
                                    <svcdoc:ServiceOperation>
                                        <svcdoc:Name>process</svcdoc:Name>
                                    </svcdoc:ServiceOperation>
                                </svcdoc:ImplementationDetails>
                    </svcdoc:Service>

          </svcdoc:AIA>-->
```

The following code sample depicts how transport details are populated in the section '***Reference'***:

```
<!--<svcdoc:AIA>
                <svcdoc:Reference>

<svcdoc:ArtifactType>TransportAdapter</svcdoc:ArtifactType>
                        <svcdoc:ServiceOperation>
                            <svcdoc:Name>insert</svcdoc:Name>
                        </svcdoc:ServiceOperation>
```

```
                        <svcdoc:TransportDetails>
                            <svcdoc:DBAdapter>

<svcdoc:ResourceProvider>OracleDB</svcdoc:ResourceProvider>

<svcdoc:ConnectionFactory>eis/db/AIASamplesDB</svcdoc:ConnectionFactory>

<svcdoc:ApplicationName>SamplePortal</svcdoc:ApplicationName>
                                <svcdoc:XAEnabled>True</svcdoc:XAEnabled>

<svcdoc:ResourceTargetIdentifier>AIASamplesDB</svcdoc:ResourceTargetIdenti
fier>

<svcdoc:ResourceName>AIAS_PORTAL_ACC_CONTACT</svcdoc:ResourceName>
 <svcdoc:ResourceName>AIAS_PORTAL_ACCOUNT</svcdoc:ResourceName>

<svcdoc:ResourceFileName>AIAS_PORTAL_ACCOUNT_CONTACT.sql</svcdoc:ResourceF
ileName>



                            </svcdoc:DBAdapter>
                        </svcdoc:TransportDetails>
                    </svcdoc:Reference>
            </svcdoc:AIA>-->
```

Note that in the previous example:

- The element ***<svcdoc:ResourceTargetIdentifier>*** denotes the database schema used for the project.
- The element ***<svcdoc:ResourceName>*** denotes the database table used. This element may be repeated for each database table when more than one table is used.
- The element ***<svcdoc:ResourceFileName>*** should have all the SQLs and sequences required included in the file. Also, it should provide the correct order for the SQLs, in which SQLs need to be executed.

This is an example when a JMS Adapter is used:

```
<!--<svcdoc:AIA>
                    <svcdoc:Reference>

<svcdoc:ArtifactType>TransportAdapter</svcdoc:ArtifactType>
                        <svcdoc:ServiceOperation>
                            <svcdoc:Name>Produce</svcdoc:Name>
                        </svcdoc:ServiceOperation>
                        <svcdoc:TransportDetails>
                            <svcdoc:JMSAdapter>

<svcdoc:ResourceProvider>WLSJMS</svcdoc:ResourceProvider>

<svcdoc:ConnectionFactory>eis/jms/AIASamplesCF</svcdoc:ConnectionFactory>
                                <svcdoc:XAEnabled>True</svcdoc:XAEnabled>

<svcdoc:ResourceTargetIdentifier>JMSUSER1</svcdoc:ResourceTargetIdentifier
>
```

```
<svcdoc:ResourceType>Queue</svcdoc:ResourceType>

<svcdoc:ResourceName>AIA_SiebelCustomerJMSQueue</svcdoc:ResourceName>

<svcdoc:ResourceFileName>AIA_SiebelCustomerJMSQueue.sql</svcdoc:ResourceFi
leName>
                              </svcdoc:JMSAdapter>
                         </svcdoc:TransportDetails>
                    </svcdoc:Reference>
               </svcdoc:AIA>-->
```

9.7. How to Annotate the Service Element in Enterprise Business Flow Composite

To annotate the service element in Enterprise Business Flow composite:

1. Furnish the details of the EBS interface that the Enterprise Business Flow (EBF) implements.
2. Match the values for elements – ***ServiceName, Namespace, ServiceOperation/name*** with the corresponding values defined in the interface service's WSDL as shown below.

   In this code sample, the value of the element:

   - ***InterfaceDetails/ArtifactType*** is provided as 'EnterpriseBusinessService because it defines the interface that is being implemented by the EBF.
   - ***ImplementationDetails/ArtifactType*** is provided as 'EnterpriseBusinessFlow' as the composite represents an EBF.
   - ***ImplementationDetails/ApplicationName*** is provided as 'AIA' as the composite is a participating application-agnostic.
3. The value of the element, ***ServiceOperation/Name***, should be same as the value defined for the operation in the EBS WSDL.

```
<service ui:wsdlLocation=……>
        <interface……/>
        <binding.ws ……../>
        <!--<svcdoc:AIA>
                    <svcdoc:Service>
                      <svcdoc:InterfaceDetails>

<svcdoc:ServiceName>DoCreditCheckCustomerPartyEBS</svcdoc:ServiceName>

<svcdoc:Namespace>http://xmlns.oracle.com/EnterpriseServices/Core/Customer
Party/V2</svcdoc:Namespace>

<svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                          <svcdoc:ServiceOperation>

<svcdoc:Name>DoCreditCheckCustomerParty</svcdoc:Name>
                          </svcdoc:ServiceOperation>
                       </svcdoc:InterfaceDetails>
```

```
                        <svcdoc:ImplementationDetails>

<svcdoc:ApplicationName>AIA</svcdoc:ApplicationName>
                           <svcdoc:BaseVersion>1.0</svcdoc:BaseVersion>
                           <svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>

<svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>

<svcdoc:ArtifactType>EnterpriseBusinessFlow</svcdoc:ArtifactType>
                           <svcdoc:ServiceOperation>
                              <svcdoc:Name>DoCreditCheck</svcdoc:Name>
                           </svcdoc:ServiceOperation>
                        </svcdoc:ImplementationDetails>
                     </svcdoc:Service>

            </svcdoc:AIA>-->
      </service>
```

9.8. How to Annotate the Reference Element in Enterprise Business Flow Composite

To annotate the reference element in an EBF composite:

1. Annotate the Reference element in the composite, as shown in the sample below, providing the details of the Service being invoked.

```
<reference ui:wsdlLocation……..">
        <interface.wsdl ……../>
        <binding.ws……../>
        <!--<svcdoc:AIA>
                     <svcdoc:Reference>

<svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                        <svcdoc:ServiceOperation>

<svcdoc:Name>GetCreditScoreCustomerPartyList</svcdoc:Name>
                        </svcdoc:ServiceOperation>
                     </svcdoc:Reference>
                  </svcdoc:AIA>-->
</reference>
```

   a. In this example, the value of the element, ***ArtifactType***, is provided as 'EnterpriseBusinessService because it is the referenced external service in the composite.

   b. When the external service is an infrastructure utility, such as, AIAAsyncErrorHandlingBPELProcess, then the value should be '***UtilityService***'.

   c. The value of the element, ***ServiceOperation/Name***, should be same as the value defined for the operation in the WSDL of the service to which it refers.

9.9. How to Annotate the Service Element in Composite Business Process Composite

To annotate the service element in a composite business process composite:

1. Furnish the details of the interface that the EBF is implementing.

   This could be an application specific interface, a UI service interface or canonical interface.

2. Match the values for elements ***ServiceName, Namespace,*** and ***ServiceOperation/name*** with the corresponding values defined in the WSDL of the interface service shown below.

   In this code sample, the value of the element:

   - ***InterfaceDetails/ArtifactType*** is provided as 'UIService' because it defines the interface that is being implemented by the Composite Business Process (CBP).
   - ***ImplementationDetails/ArtifactType*** is provided as 'CompositeBusinessProcess' because the composite represents a CBP.
   - ***ImplementationDetails/ApplicationName*** is provided as 'AIA' because the composite, in this case, is participating application-agnostic.

3. The value of the element, ***ServiceOperation/Name***, should be same as the value defined for the operation in the UI service WSDL.

```
<service ui:wsdlLocation=……>
        <interface……/>
        <binding.ws ……../>
        <!--<svcdoc:AIA>
                    <svcdoc:Service>
                      <svcdoc:InterfaceDetails>

<svcdoc:ServiceName>TelcoResolveCustomerComplaintCBP</svcdoc:ServiceName>

<svcdoc:Namespace>http://xmlns.oracle.com/UIServices/Industry/CustomerPart
y/V1</svcdoc:Namespace>

<svcdoc:ArtifactType>UIService</svcdoc:ArtifactType>
                         <svcdoc:ServiceOperation>

<svcdoc:Name>TelcoResolveCustomerComplaint</svcdoc:Name>
                         </svcdoc:ServiceOperation>
                       </svcdoc:InterfaceDetails>
                       <svcdoc:ImplementationDetails>

<svcdoc:ApplicationName>AIA</svcdoc:ApplicationName>
                         <svcdoc:BaseVersion>1.0</svcdoc:BaseVersion>
                         <svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>

<svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>

<svcdoc:ArtifactType>CompositeBusinessProcess</svcdoc:ArtifactType>
                         <svcdoc:ServiceOperation>
```

```
<svcdoc:Name>TelcoResolveCustomerComplaint</svcdoc:Name>
                          </svcdoc:ServiceOperation>
                       </svcdoc:ImplementationDetails>
                    </svcdoc:Service>

            </svcdoc:AIA>-->
    </service>
```

9.10. How to Annotate the Reference Element in Composite Business Process Composite

To annotate the reference element in a Composite Business Process composite:

1. Annotate the Reference element in the composite, as shown in the following sample, by providing the details of the Service being invoked.

```
<reference ui:wsdlLocation……..">
        <interface.wsdl ……../>
        <binding.ws……../>
        <!--<svcdoc:AIA>
                    <svcdoc:Reference>

<svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                        <svcdoc:ServiceOperation>
                        <svcdoc:Name>GetComplaintDetails</svcdoc:Name>
                        </svcdoc:ServiceOperation>
                    </svcdoc:Reference>
                </svcdoc:AIA>-->
</reference>
```

   a. In this example, the value of the element, ***ArtifactType***, is provided as 'EnterpriseBusinessService' because it is the referenced external service in the composite.

   b. When the external service is an infrastructure utility, such as, AIAAsyncErrorHandlingBPELProcess, then the value should be ***UtilityService***.

   c. The value of the element, ***ServiceOperation/Name***, should be same as the value defined for the operation in the WSDL of the service being referred to.

9.11. Valid Values for Annotation Elements

This section lists the valid values for the annotation elements:

- ArtifactType
- ApplicationName

9.11.1. Valid Values for the Element *ArtifactType*

- RequesterABCSImplementation

- RequesterABCSExtension
- ProviderABCSImplementation
- ProviderABCSExtension
- EnterpriseBusinessService
- EnterpriseBusinessFlow
- EnterpriseBusinessFlowExtension
- CompositeBusinessProcess
- CompositeBusinessProcessExtension
- ApplicationService
- ExternalService
- UtilityService
- TransportAdapter
- VersionAdapter
- Other

9.11.2. Valid Values for the Element *ApplicationName*

- AIA
- PeopleSoft
- BRM
- FAH
- UCM
- SAP
- PIM
- OracleRetail
- Logistics
- JDEE1
- CRMOD
- Agile
- Ebiz
- Siebel

- OUCCB - Oracle Utilities Customer Care & Billing
- OUWAM - Oracle Utilities Work and Asset Management
- OUMWM - Oracle Utilities Mobile Workforce Management

10. Designing and Developing Enterprise Business Services

This chapter describes how to design and develop Enterprise Business Services (EBSs).

This chapter discusses the following topics:

10.1. Introduction to Enterprise Business Services

EBSs are the foundation blocks in Oracle Application Integration Architecture (AIA). An EBS represents the application or implementation-independent Web service definition for performing a business task, and the architecture facilitates distributed processing using EBS. Since an EBS is self-contained, it can be used independently of any other services. In addition, it can be used within another EBS.

For more information about EBS, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide,* "Understanding EBS."

You will need to construct an EBS when the business process integration is between multiple source applications and target applications using the canonical model.

The purpose of the EBS is to:

- Provide the mediation between the requesting services and providing services.
- Provide different operations invoked from a requester Application Business Connector Service (ABCS), an EBS, or an Enterprise Business Flow (EBF).
- Route an operation to a suitable EBS, EBF, or provider ABCS based on the evaluation of the various routing rules for an operation.

Oracle AIA leverages Mediator technology available in Oracle SOA Suite to build the EBS.

The EBS is implemented as a Mediator routing service. A Mediator service has an elaborate mechanism to hold multiple operations of the EBS, create routing rules for each operation, perform XSLT transformation, and define endpoints for each routing rule.

For more information about using Mediator, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite,* "Using the Oracle Mediator Service Component."

You can model EBS operations either as synchronous or asynchronous message exchange patterns (MEPs).

10.1.1. Understanding EBS Types

The types of EBS are:

- Activity Services

  They represent an atomic business unit of work that has a set of steps involving system-to-system interaction. They are exposed as mediator services with implementations via ABCSs or EBFs.

- Data Services

  They provide an aggregated, real-time view of enterprise data. They are primarily Create, Read, Update, Delete (CRUD) operations acting on the Enterprise Business Object (EBO) and its business components. They are exposed as mediator services with implementations via ABCS. They eliminate point-to-point links at the data level and direct dependency on data models of data sources.

For more information about EBS types, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide,* "Understanding EBS," EBS Types.

10.1.2. Working with the Enterprise Business Service Library

AIA Foundation Pack is shipped with an EBS library. The EBS library consists of the service definitions delivered for the all of the EBOs present in the Enterprise Object Library. These are shipped as WSDL files. The service operations present in the EBS typically are the CRUD operations plus some of the operations specific to entities.

All the operations of the EBS WSDLs, of type Data Services, in the Enterprise Business Service Library are modeled as asynchronous one-way services. The only exceptions are the Query operations and Validate operations. These are modeled as synchronous request-response operations with a named fault.

- You can review the sample WSDLs provided in the AIA Foundation Pack under the AIAComponents/EnterpriseServiceLibrary folder.
- Review each of the WSDLs, the operation's description, and the metadata before deciding to create either a new service or an operation.
- Any new EBS that you create will be of type Activity Service, with operations put in to meet the requirements of integration solution being developed.
- The new EBS should be put in a different WSDL and not added to the entity EBS WSDLs.

10.2. Designing the EBS

This section discusses design guidelines and considerations.

10.2.1. Understanding Design Guidelines

The methodology for designing and implementing an EBS is a contract-first methodology, that is, the contract is defined and created before the EBS is implemented. The contract for an EBS is defined as a WSDL document.

For the business task EBS, use the WSDLs from the Enterprise Service Library of the Foundation Pack.

For the business activity EBS, use the TemplateEBS.wsdl available in the Foundation Pack and create a process EBS WSDL. Customers wanting to create a new EBS for an EBO that was not delivered as part of Enterprise Object Library can use TemplateEBS.wsdl as a model to create the new WSDL.

Service operations supporting the synchronous request-response MEP are defined in one port type. The operation should have input, output, and fault message defined.

Service operations supporting fire-and-forget MEP should be defined in one port type and the operation will have an input message defined.

Service operations supporting an asynchronous request-delayed response pattern should have two operations, one for sending the request message and another for processing the response message. Each of these two operations will have an input message. Two different portTypes exist, one for each operation. The service operation for processing the response message should reside in a port type that has ***Response*** as the suffix.

The EBS WSDLs should have two kinds of portTypes:

- A portType for all operations used for modeling synchronous request-response operations and request-only operations. The name will not specify the ***Request***.
- A portType for asynchronous response operations. The name will specify ***Response***.

You should create two Mediator routing services for each of the portTypes.

10.2.2. Understanding Design Considerations

When designing EBS, consider the following:

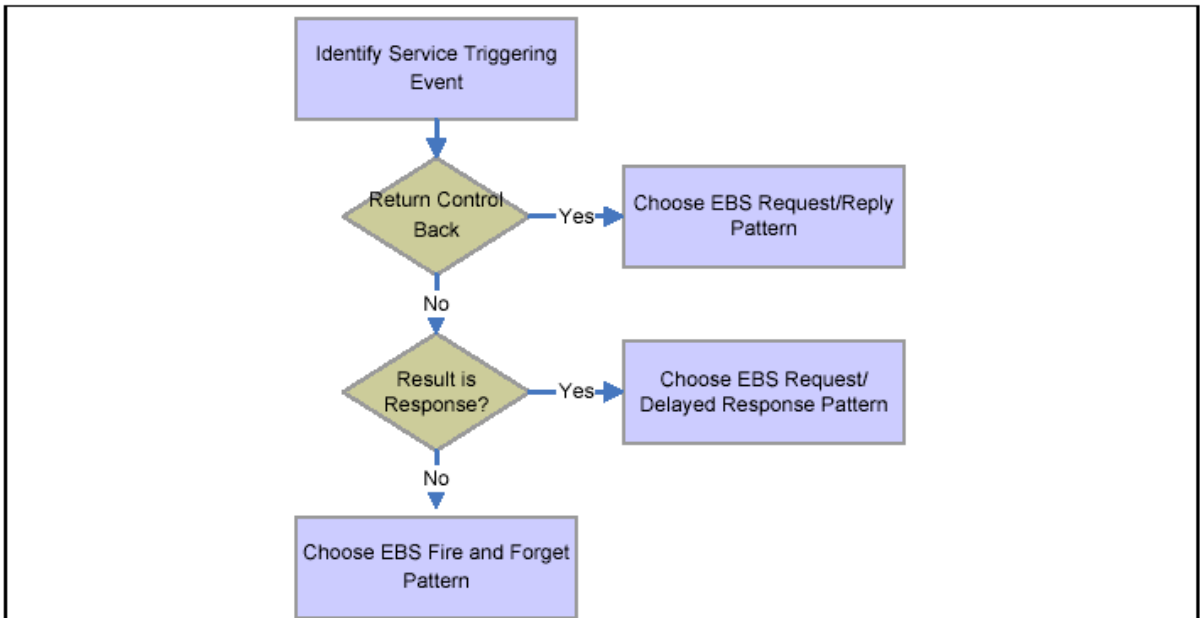
- What is the service for?
  - Your enterprise should have only one EBS for a particular business function, and it should be independent of any application.
  - The service can implement multiple business operations defined in EBS WSDL.
  - It should have implementations for all the business operations for a business object.
  - The service should also contain response operations, which are required for the asynchronous request-response pattern.
- How will the service be invoked?
  - The service will always be invoked using HTTP transport as a Web service.

  - When the calling client is co-located with this service, then the call can be configured to be a local invocation using optimized binding to improve performance and propagate transactions.
- What invokes the service?
  - The service can be invoked by an application if the application has the capability to send an Enterprise Business Message (EBM) and can perform all the functions of requester ABCS.
  - When the application does not have the capability to invoke this service directly, then the requester ABCS will invoke this service.
  - An EBF flow that orchestrates across multiple business objects can also invoke this service.
- How do you interact with the application?
  - If the application has the capability to receive the EBM message, the EBS can call the application using HTTP as Web service call.
  - If not, then you need to create and call a provider ABCS.
- What type of interaction is between client and EBS?
  - The client can call EBS using any of the three MEPs.

10.2.3. Establishing the MEP of a New Process EBS

Since the MEPs for the entity EBS WSDLs in the EBS library are predefined, you need to design the process EBS WSDLs. The EBS is modeled to have multiple operations. Each operation leads to the execution of the EBS for a particular business scenario requirement and is granular in nature. Thus, each operation can be modeled to support a different interaction style or pattern.

This diagram illustrates the decision points in establishing the EBS pattern.



Identifying the interaction pattern for EBS operations

For more information about EBS types, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide,* "Understanding EBS," EBS Types.

10.2.3.1. How to Establish the MEP for a New Process EBS

To establish the MEP for a new process EBS:

1. Identify the triggering event for the EBS operation based on the understanding of the business process requirement from the functional design.
2. If the control is to be blocked until a response is returned to the point of invocation, then choose the EBS request-reply pattern.

   This is a synchronous call. In this case, the EBS operation will have input and output messages with a named fault.
3. If, after the EBS is invoked, the triggering point does not wait for the response and continues, this invocation of the EBS would be an asynchronous call.
4. Next, check whether the execution of the EBS results in a response.

   Should the request and the response be correlated? If the answer is yes, then this is a delayed response. Use the EBS request-delayed response pattern. In this case, the EBS will have two portTypes, each of which accepts an input message only and each of them belongs to a different port.

   If the answer is no, then choose the EBS fire-and-forget pattern. In this case, the EBS operation will have an input message only.

10.2.4. How to Handle Errors

The EBS should be configured to rethrow the errors back to the invoking client. Ensure that the application error handling capabilities are in line with the integration platform error handling capabilities.

For more information about error handling, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

10.2.5. How to Secure the EBS

When the invoking client (requester ABCS or application) is remote, the EBS needs to be enabled with security as described in the security chapter.

For more information about security, see Working with Security and *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, "Understanding EBS."

10.2.6. How to Configure Transactions

Based on the SOA transaction semantics in Oracle Fusion Middleware, you can design and configure transactions across ABCS, EBS, and EBF.

For more information, see *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite 11g.*

10.2.7. How to Guarantee Delivery

For more information, see Guaranteed Message Delivery and Working with AIA Design Patterns.

10.2.8. How to Define the EBS Service Contract

To define the EBS service contract:

1. Identify the EBS and the operations it must support.
2. Identify the interaction patterns for each of the operations in EBS.
3. Identify the EBMs to be used for the requests and responses (if any) pertaining to each of the operations.

For more information, review the template and sample WSDLs in the *AIAServices-TemplateSampleWSDLs.zip* file located in *$AIA_HOME/samples*.

10.3. Constructing the WSDL for the Process EBS

This section provides an overview of the WSDL and discusses how to:

- Complete the <definitions> section
- Define message structures
- Check for WS-I Basic Profile conformance

These sections describe how to fill in sections of the WSDL. Please review the template and sample WSDLs ***'AIAServices-TemplateSampleWSDLs.zip***" under ***$AIA_HOME/samples***.

10.3.1. Introduction to WSDL Construction for the Activity Service EBS

When constructing the WSDL, consider that:

- Oracle's JDeveloper, as well as text editing tools, can be used to create the WSDL.

- The EBM schema module for the EBO must be referenced in the WSDL.
- The WSDL should reference the schema modules hosted on the central location.
- Annotations should be done based on the recommendations provided in Annotating Composites.
- You should adhere to the naming conventions for creating service, target namespace, messages, operations, port type, and so on as described in Oracle AIA Naming Standards for AIA Development.

10.3.2. How to Complete the <definitions> Section

To complete the <definitions> section:

1. Name

   The service contains operations related to creation and maintenance as well as actions to be performed on an EBO.

2. Namespace

   Mark this namespace as the target namespace.

3. Namespace prefixes

   Define a namespace prefix for the newly identified namespace:

   - ***wsdl*** is the namespace prefix for the default namespace.
   - ***xsd*** is the namespace prefix for XMLSchema.
   - ***soap*** is the namespace prefix for the SOAP namespace.

   A namespace prefix needs to be defined for the EBO. The namespace prefix should be the same as the EBS WSDL in the delivered EBOs.

10.3.3. How to Define Message Structures

To define message structures in the WSDL types section:

1. Import the appropriate schema that has all of the relevant EBMs defined.
2. Use ***xsd:import*** to import the elements from a schema.

   Make sure that the namespace attribute for the xsd:import element is the same as the target namespace for the schema document you import.

   Also, make sure that the namespace prefix is declared for that namespace so that the elements in the imported schema can be referenced using the namespace prefix.

3. The attribute targetNamespace for the xsd:schema element should be the same as the targetNamespace for this WSDL.

Message Definitions

For every operation, you need to create a message for sending requests and another message (optionally) for receiving responses, depending on the pattern you selected.

- The message for sending the requests should be the same as the operation followed by ReqMsg.
- The response message should be the same as the operation followed by RespMsg.

PortType Definition

You should define a portType name for each operation, and it should be the same as the service name. You defined the message names specified for input and output elements in the message definitions section based on the pattern. When services are deployed, Mediator appends ***Service*** to the port type to form the service name that goes under the service section in the concrete WSDL.

Annotating Service Interface

Sections of the WSDL allow documentation where the details of the sections can be annotated. WSDL authors must annotate the sections thoroughly, and in a manner similar to the way existing EBS WSDLs are annotated. The annotations serve as the source of truth for populating the metadata in the Oracle Enterprise Repository.

10.3.4. How to Check for WS-I Basic Profile Conformance

The WS-I Basic Profile consists of a set of nonproprietary Web services specifications, along with clarifications, refinements, interpretations, and amplifications of those specifications that promote interoperability.

Conformance to the Profile is defined by adherence to the set of requirements for a specific target, within the scope of the Profile.

The delivered WSDL templates ensure conformance, so you should follow them when developing Oracle AIA artifacts.

For more information about the WSDL templates, see the template and sample WSDLs in the *AIAServices-TemplateSampleWSDLs.zip* file located in *$AIA_HOME/samples*.

10.4. Working with Message Routing

This section discusses:

- Routing at the EBS.
- Identifying the target system.

10.4.1. Creating Routing Rules

The routing rules in the EBS routing service operations are used to decide to which target end point the incoming message should be routed.

Follow these guidelines when creating routing rules:

- Routing rules must first be defined functionally and always with a specific integration topology in mind.
- In almost all cases, routing logic should be performed in the routing rules of the EBS.

  However, all routing rules in the EBS should check for and respect existing target system IDs that are already stamped in the header. EBS rules should not assume the target system ID is already populated.
- Requester ABCS should not determine target systems or stamp target system IDs in the EBM header.
- For any EBS operation, each possible target application system instance requires a routing rule.

  For example, if two Siebel provider application system instances exist, SEBL_01 and SEBL_02, then each must have a routing rule even though both rules target the same Siebel provider ABCS. Alternatively, if functional requirements dictate that only a single instance of the application type can receive the message at runtime, then a single rule could be used and an XSLT would be invoked to stamp the ID of the one instance to be used at runtime.
  When an EBS operation has multiple provider application system instances of the same application type (such as SEBL_01 and SEBL_02), the routing rules for each instance must have an XSLT to stamp the appropriate system instance ID in the EBM header so that the provider ABCS that is shared between the multiple instances can identify which instance to invoke and cross-reference.
- If an EBS operation is a synchronous request-reply pattern or asynchronous request-delayed response pattern, then the routing rules must be mutually exclusive given the actual topology of the Oracle AIA system.
- Routing rules are delivered with Process Integration Packs (PIPs) as part of Mediator routing services.

  These rules are designed to work for the delivered topology. If you implement any changes to the delivered topology, such as adding an additional system instance, then you will need to implement your own complete set of routing rules.
  The standard routing rule clause structure is:
  (cavs_check) and (ruleset_check) and ((target_system_identified_check) or ((target_system_absent_check) and (topology_specific_clauses))

Clause	XPath expression
cavs_check) =	MessageProcessingInstruction/EnvironmentCode='PRODUCTION' or not(MessageProcessingInstruction/EnvironmentCode/text()))
ruleset_check) =	TBD
target_system_identified_check) =	EBMHeader/Target/ApplicationTypeCode='SIEBEL'
target_system_absent_check) =	not(EBMHeader/Target/ID/text())
O2C2 OOTB (topology_specific_clauses) =	aia:getSystemType(EBMHeader/Sender/ID)!='SIEBEL'

This table shows some of the routing rules delivered as part of Integrated Supply Chain Management PIP:

O2C2 Delivered Routing Rules for Create, Sync, Update, Get, Query, and so on		
1	*Target:*	Siebel provider ABCS
	XPath Filter:	`(MessageProcessingInstruction/EnvironmentCode='PRODUCTION' or not(MessageProcessingInstruction/EnvironmentCode/text())) and (EBMHeader/Target/ApplicationTypeCode='SIEBEL' or ( not(EBMHeader/Target/ID/text()) and aia:getSystemType(EBMHeader/Sender/ID)!='SIEBEL' ) )`
	Transformation:	None
	Explanation:	MessageProcessingInstruction/EnvironmentCode='PRODUCTION' or is missing entirely and either Target application type is already specified as Siebel, or else no Target is specified and the Sender application type is not Siebel.
2	*Target:*	Oracle EBusiness provider ABCS
	XPath Filter:	`(MessageProcessingInstruction/EnvironmentCode='PRODUCTION' or not(MessageProcessingInstruction/EnvironmentCode/text())) and ( EBMHeader/Target/ApplicationTypeCode='EBIZ' or ( not(EBMHeader/Target/ID/text()) and aia:getSystemType(EBMHeader/Sender/ID)!='EBIZ' ) )`
	Transformation:	None
	Explanation:	MessageProcessingInstruction/EnvironmentCode='PRODUCTION' or is missing entirely and either Target application type is already specified as EBiz, or else no Target is specified and the Sender application type is not EBiz.
3	*Target:*	CAVS
	XPath Filter:	`MessageProcessingInstruction/EnvironmentCode='CAVS'`
	Transformation:	None
	Explanation:	MessageProcessingInstruction/EnvironmentCode='CAVS'

10.4.2. Routing at the EBS

Routing rules are specified for each operation defined on EBS services. The system uses routing rules to determine where to route the incoming EBM, either to an EBF, EBS, ABCS, or the Composite Application Validation System (CAVS). Routing rules are specified as XPath expressions in the filter of the Mediator routing rule.

Routing rules must be mutually exclusive since all the rules will be evaluated and messages will be routed to an end point based on the rule evaluation.

10.4.2.1. Guidelines for EBS Routing Rules

At a minimum, each EBS operation should have these rules:

- One routing rule for CAVS enabling.

This rule should check whether the EBM Header > MessageProcessingInstruction > EnvironmentCode is set to ***CAVS***.

- One or more routing rules to connect to the provider ABCS or EBF.

  The filter expression specified in these routing rules must ensure that the message is not a test message. For each ABCS or EBF, one routing rule will exist. The conditions can be one of these:

  - Target system ABCS populated in the EBM header

    In this case, the filter will have an expression to check whether the target system ABCS in the EBM header was prepopulated and the Override Routing Indicator is set to ***False***.

    Example of a filter expression for a SalesOrderEBS routing rule for determining the target system ABCS:

    ```
    /sordebo:QuerySalesOrderEBM/ns5:EBMHeader/ns5:Target/ns5:ID =
    "SEBL78_01" and /sordebo: Query
    SalesOrderEBM/ns5:EBMHeader/ns5:Target/ns5: Override RoutingIndicator =
    "false"
    ```

  - Content-based routing

    In this case, the content of the EBM is evaluated to determine the target system ABCS. The filter expression should ensure that the target system information was not prepopulated in the EBM header.

    Example expression:

    ```
    starts-with(/sordebo: CreateSalesOrderEBM/sordebo: DataArea/sordebo:
    Create SalesOrder/sordebo:
    SalesOrderLine/sordebo:SalesOrderLineSchedule/ns5:ShipToPartyReference/
    ns5:LocationReference /ns5:Address/ns5:CountrySubDivisionCode,'9') and
    /sordebo:CreateSalesOrderEBM/ns5:EBMHeader /ns5:Target/ns5:ID = ""
    ```

  - Enable error handling and logging

    EBS should handle errors to allow clients or administrators to resubmit or retrigger processes through a central error handler.

For more information, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

10.4.3. How to Identify the Target System at EBS

The EBS can route the request from the Requester ABCS, an EBF, or another EBS to one of the many provider ABCS available. The target system needs to be identified only for ***Create*** operations. For all other operations, the Xref function ***lookupPopulatedColumns*** is used to identify the systems in which the data synchronization of entity has been done. A combination of steps listed below leads to the correct ABCS.

To identify the target system at EBS:

1. Using content-based routing.

   a. The routing rule in the EBS is based on the content of the message and is used to decide the target ABCS. This is used only for the ***Create*** operation. This is the case when the target system information in the EBM header is empty and has not been set as yet.

   b. After the target system is determined, it is set in the EBM header. This information is used for all subsequent services - like other EBS or ABCS.

2. Using the target system information in the EBM header.

   If the target system information is already set in the EBM, this is used for routing to the correct ABCS.

3. From the XREF for operations other than ***Create***.

   For all operations other than Create, the target system has been determined and the cross-reference IDs have been set. In this case, use the XREF function lookupPopulatedColumns to identify the systems in which the data synchronization of the entity has been done.

10.5. Building EBS Using Oracle Mediator

You can use the Oracle Mediator component to build a component in an EBS composite.

Although Oracle AIA allows any technology to be used for developing an EBS service, you will use Mediator in most situations.

10.5.1. How to Develop the Oracle Mediator Service

To develop the Oracle Mediator Service:

1. In JDeveloper, create a new SOA composite project.
2. Open the ***composite.xml*** in Design mode.
3. Add a Mediator component in the components swim lane.
4. Add a Web service as external reference service in the references swim lane.

   This reference service could represent a provider ABCS.

   You should use a concrete WSDL of the provider ABCS. That is, you should pre-deploy the service that is being referred to as an external reference.

5. Wire the Mediator component to the external reference component created in step 4.
6. Open the Mediator component and configure routing rules.

10.6. Implementing the Fire-and-Forget Message Exchange Pattern

To implement both asynchronous MEPs (fire-and-forget and request-delayed response), you must create EBS WSDLs and then create one or two Mediator routing services, depending upon the MEP. Next, implement the requester and provider services, adhering to the guidelines laid out for the respective MEPs.

The requesting service can be a requester ABCS (BPEL process), EBF (BPEL process), or a participating application.

The providing service can be a provider ABCS (BPEL Process), EBF (BPEL process), or a participating application.

This section discusses:

- Implementing the fire-and-forget patterns with one-way calls in EBSs.
- Implementing the request-delayed response pattern with one-way calls in EBS.

10.6.1. How to Implement Fire-and-Forget Pattern with EBS One-Way Calls

The initiator for a fire-and-forget pattern is a requesting service not waiting for or expecting a response. The requesting service can be a participating application, a requester ABCS Impl, or an EBF. In each of these cases, the request payload will be an EBM request.

For more information about enabling the ABCS (both requester and provider), see Designing Application Business Connector Services, Constructing the ABCS, and Completing ABCS Development. **For more information** about enabling the EBF, see Designing and Constructing Enterprise Business Flows.

To implement fire-and-forget pattern with EBS one-way calls:

1. Create EBS WSDLs.
2. Create a Mediator routing service for asynchronous fire-and-forget patterns with one-way call EBS.
3. Route the request from the requesting service to correct providing service in the routing service of the one-way call operation of the request EBS.
4. Implement error handling for logging and notification based on fault policies.

Note: These steps are in addition to the regular steps required for the requesting service and the providing service.

10.6.2. Creating EBS WSDLs

For the entity EBS, use the WSDLs from the Enterprise Service Library of the Foundation Pack.

For the process EBS, use the TemplateEBS.wsdl available in the Foundation Pack and create a Process EBS wsdl.

- Service operations supporting a synchronous request-response MEP will be defined in one port type and the operation will have input, output, and fault message defined.
- Service operations supporting a fire-and-forget MEP will be defined in one port type and the operation will have an input message.
- Service operations supporting asynchronous request-response pattern will have two operations, one operation for sending the request message and another operation for processing the response message.

  Each of these two operations will have an input message alone. You should have two different portTypes, one for each operation. The service operation for processing the response message will reside in a portType having '***Response'*** as the suffix.

- The EBS WSDLs will have two portTypes:
  - PortType for all operations used for modeling synchronous request, response operations and request-only operations. **The name will not specify '*Request'*.**
  - PortType for asynchronous response operations. **The name will specify '*Response'*.**
- Two Mediator routing services will be created for each of the portTypes.

10.6.3. Creating Mediator Routing Services for Asynchronous Fire-and-Forget Patterns with a One-Way Call EBS

To create Mediator routing services for asynchronous fire-and-forget patterns with a one-way call EBS:

1. Create Mediator projects.
2. Create routing services.
3. Create routing rules.
4. Implement error handling.

10.6.3.1. How to Create Mediator Projects for the Asynchronous Fire-and-Forget MEP

To create Mediator projects for the asynchronous fire-and-forget MEP:

1. Create two Mediator projects, one for each of the portTypes in the EBS WSDL.

a. If all of the service operations for an EBS have either a synchronous request-response or fire-and-forget pattern, then all of these operations will reside in only one portType so there would be only one Mediator routing service.

b. If the EBS has at least one asynchronous request-response operation, then there should be two port types – two Mediator Routing Services and two Mediator projects (one for each of the routing services).

2. Follow the naming conventions detailed in Appendix: Oracle AIA Naming Standards.

   Examples of typical names for the Mediator projects:

   - **CustomerPartyEBSV2** (This has a routing service with all operations for synchronous request-response and request-only.)
   - **CustomerPartyEBSResponseV2** (This has a routing service with all operations for asynchronous request-response.)

10.6.3.2. How to Create Routing Services for Asynchronous Fire-and-Forget MEP

To create routing services for asynchronous fire-and-forget MEP:

1. Put the EBS WSDL in the Mediator project folder.
2. Create a routing service and name as per the naming convention detailed in Appendix: Oracle AIA Naming Standards.
3. Select the WSDL.

   The WSDL will be parsed and the portType name filled in the portType field of the routing service.

4. Select the portType matching with the routing service. Save the routing service.

   The routing service created for a portType will have all the operations specified in that portType in the EBS WSDL.

10.6.3.3. How to Create Routing Rules for Asynchronous Fire-and-Forget MEP

The routing rules for the request EBS are the same as those for the sync request–response section.

For more information, see How to Create Routing Services for the Synchronous Request-Response MEP.

10.6.3.4. How to Implement Error Handling for Asynchronous Fire-and-Forget MEP

For more information, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

10.6.4. Asynchronous Fire-and-Forget MEP Error Handling Using Compensatory Operations

To offset the effects of errors in the provider services, operations can be added to the EBS to trigger compensation in the requesting services for one-way calls. This can be achieved by having compensatory operations in the EBS.

Compensatory operations, modeled as one-way calls are separate operations. For each request-only operation in the request portType, there will be an operation for triggering compensation.

For example: CompensateCreateCustomer, CompensateCreateOrder

Compensatory operations are invoked in cases where a business exception is likely to result in a fatal error. The conventional retry and resubmit is not possible and the correction is required to be made in the requesting service.

In this situation, you need to implement suitable compensatory taking advantage of the participating applications compensatory action web services or APIs.

10.6.5. How to Invoke the Compensate Operation of EBS

In Error Handling, you may need to ensure that compensatory actions are taken for some errors so the compensate operation of the EBS will be invoked from the providing service. The compensate operation of the EBS will route to the correct compensating service.

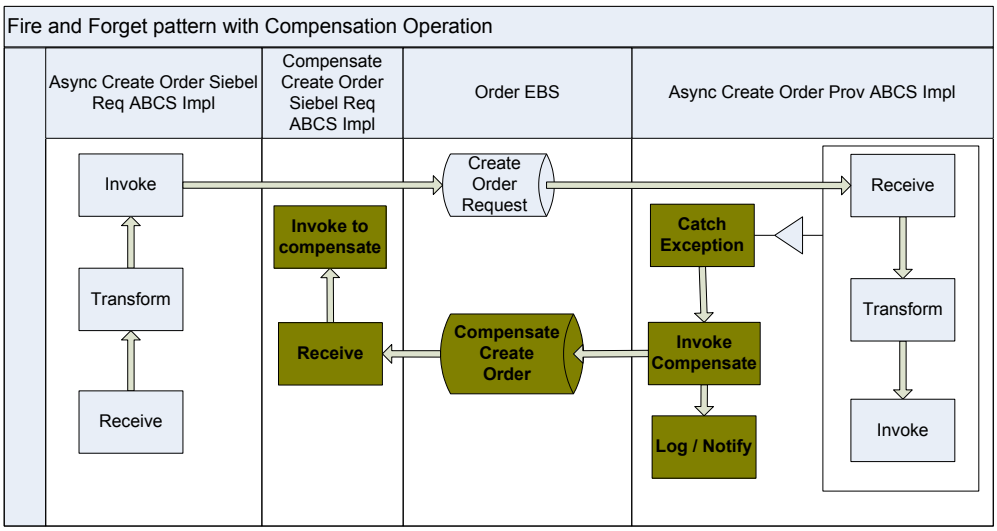
To invoke the compensate operation of the EBS:

1. For an error in the providing service, raise an exception and catch it in the catch block.
2. In the catch block, construct the request EBM along with the fault component in the EBM header.
3. Create a transform step and select the input variable representing the request EBM and the compensate variable, also representing the request EBM.
4. When an exception is generated, put the exception details in a variable and pass that as input to the compensation XSLT.
5. Map the following to the compensate variable:
   a. Standard EBM header content from the request EBM
   b. Data area from the request EBM
   c. Fault message

6. Set the 'InvokeCompensate' step to invoke the corresponding compensate operation in the request EBS routing service.

7. Route the compensate request to a suitable compensating service.

This diagram illustrates the fire-and-forget pattern with the compensation operation.



Fire-and-forget pattern with compensation operation

10.6.6. How to Enable Routing Rules in Compensate Operation Routing Service

There will be two routing rules.

To enable routing rules in compensate operation routing service:

1. Routing rule for the compensate operation of EBS.

   a. The information populated in the "**<EBO Name>ResponseEBM\corecom:EBMHeader\Sender\ WSAddress/ WSAddress/wsa:FaultTo/wsa:ServiceName"** in the requesting service is used to route the request for compensation to the correct compensating service in the compensate operation of the EBS.

   b. Put this routing rule in the compensate operation of the EBS:

```
<EBO Name>ResponseEBM\corecom:EBMHeader\Sender\ WSAddress/
WSAddress/wsa:FaultTo/wsa:ServiceName = <Compensating Service Name>
```

2. Routing rule for CAVS.

   If the test case created in CAVS is of type asynchronous delayed-response, then the response message can come to the CAVS endpoint and be correlated back to make the test pass/fail. For this to happen, an explicit invoke to the CAVS system endpoint must exist:
   http://host:port/AIAValidationSystemServlet/asyncresponserecipient

10.7. Implementing the Synchronous Request-Response Message Exchange Pattern

The initiator for a synchronous request-reply pattern is a requesting service waiting for and expecting a response. The requesting service can be a participating application, requester ABCS Impl, or an EBF. In each of these cases, the request payload would be an EBM request and the response payload would be an EBM response.

For more information about enabling the ABCS (both requester and provider) see Designing Application Business Connector Services, Constructing the ABCS, and Completing ABCS Development.
For more information about enabling the EBF, see Designing and Constructing Enterprise Business Flows.

10.7.1. How to Implement Synchronous Request-Reply Message Exchange Patterns in EBS

To implement synchronous request-reply MEP in EBS:

1. Create Mediator projects with routing services.
2. Create routing rules to route the request from the requesting service to the correct providing service in the routing service of the EBS.
3. Implement error handling for logging and notification based on fault policies.

10.7.2. How to Create Mediator Projects for the Synchronous Request-Response MEP

To create Mediator projects for the synchronous request-response MEP:

Follow these guidelines when creating Mediator projects:

1. Create two Mediator projects, one for each of the portTypes in the EBS WSDL.
   a. If all of the services operations for an EBS have either synchronous request-response or fire-and-forget pattern, then all of these operations will reside in only one portType, so only one Mediator Routing Service should exist.
   b. If the EBS has at least one asynchronous request-response operation, then two portTypes should exist, two Mediator routing services and two Mediator projects (one for each routing service).
2. Follow the naming convention detailed in Appendix: Oracle AIA Naming Standards.

   Examples of typical names for the Mediator projects are:

   - **CustomerPartyEBSV2** (This example has a routing service with all operations for synchronous

request-response and request-only.)

- **CustomerPartyEBSResponseV2** (This example has a routing service with all operations for asynchronous request-response.)

10.7.3. How to Create Routing Services for the Synchronous Request-Response MEP

To create routing services for the synchronous request-response MEP:

1. In JDeveloper, put the EBS WSDL in the Mediator project folder.
2. Create a routing service and name as per the naming convention detailed in *Appendix: Oracle AIA Naming Standards*.
3. Select the WSDL. The WSDL will be parsed and the portType name filled in the portType field of the routing service.
4. Select the portType matching with the routing service. Save the routing service.

   The routing service created for a portType will have all the operations specified in that portType in the EBS WSDL.

10.7.4. How to Implement Error Handling for the Synchronous Request-Response MEP

For more information, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

10.8. Implementing the Asynchronous Request-Delayed Response Message Exchange Pattern

The initiator of the request-delayed response pattern is a requesting service that invokes the request EBS and waits for a response. The requesting service can be a participating application, requester ABCS Impl, or an EBF. In each of these cases, the request payload is an EBM request and the response payload is an EBM response.

In the case of an error in the providing service, a response message with error information is constructed and returned to the requesting service for action.

For more information about enabling the ABCS (both requester and provider) see Designing Application Business Connector Services, Constructing the ABCS, and Completing ABCS Development.
For more information about enabling the EBF, see Designing and Constructing Enterprise Business Flows.

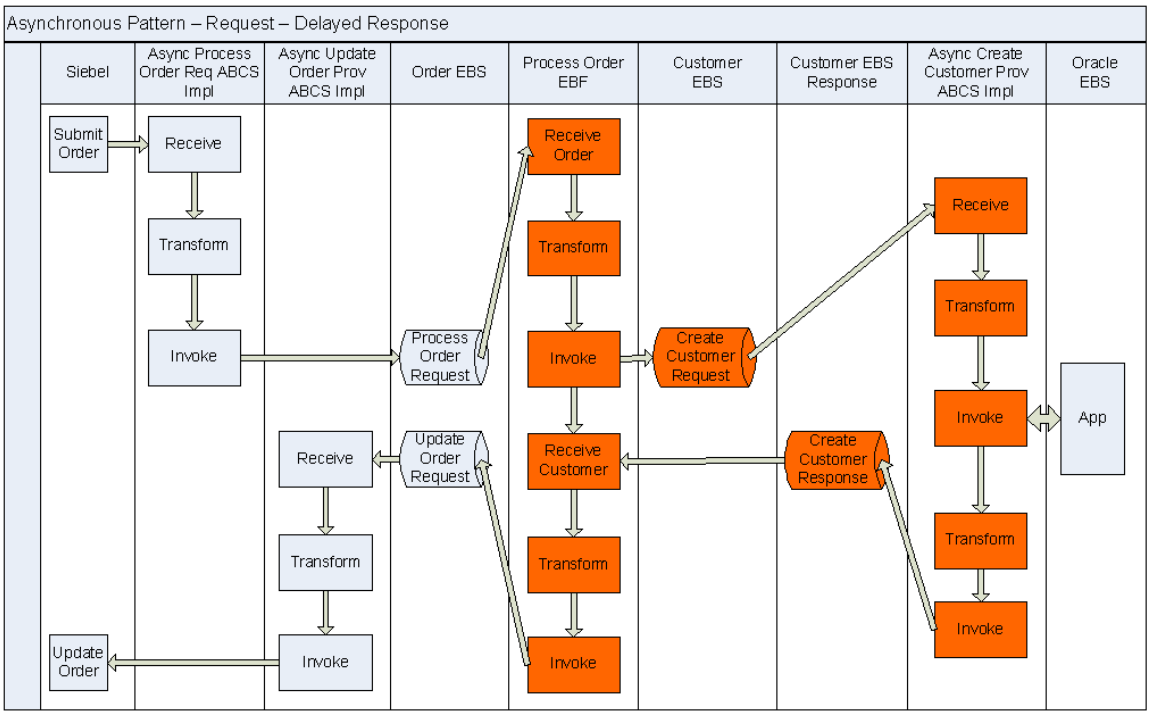
10.8.1. How to Implement the Request-Delayed Response Pattern with the Two One-Way Calls of the EBS

To implement the request-delayed response pattern with the two one-way calls of the EBS:

Note: Perform these steps in addition to the regular steps required for the requesting service and the providing service.

1. Create EBS WSDLs.
2. Create Mediator routing services for asynchronous request-delayed response patterns with two one-way call EBSs.
3. Route the request from the requesting service to the correct providing service in the routing service of the one-way call operation of the request EBS.
4. Implement error handling for logging and notification based on fault policies.
5. Route the response message in the EBS response to the correct requesting service.

This diagram illustrates the request-delayed response pattern:



Request-delayed response pattern

10.8.1.1. How to Create the EBS WSDLs for the Request-Delayed Response MEP

To create the EBS WSDLs for the request-delayed response MEP:

1. For the entity EBS, use the WSDLs from the Enterprise Service Library of the Foundation Pack.
2. For the process EBS, use the TemplateEBS.wsdl available in the Foundation Pack and create a Process EBS WSDL.
3. The EBS WSDLs will have two portTypes:
   a. PortType for all operations used for modeling synchronous request-response operations and request-only operations.

      The name will not specify the 'Request'. Service operations supporting the synchronous request-response MEP will be defined in one portType, and the operation will have input, output, and fault message defined.

   b. PortType for asynchronous response operations.

      The name will specify 'Response'. Service operations supporting asynchronous request-response pattern will have two operations, one operation for sending the request message and another for processing the response message.
4. Two Mediator routing services will be created for each of the portTypes.

10.8.2. Creating Mediator Routing Services for Asynchronous Request-Delayed Response Patterns with Two One-Way Call EBS

To create Mediator routing services:

1. Create Mediator projects.
2. Create routing services.
3. Create routing rules.

10.8.2.1. How to Create Mediator Projects for the Request-Delayed Response MEP

To create Mediator projects for the request-delayed response MEP:

1. Create two Mediator projects, one for each of the portTypes in the EBS WSDL.
   - If all of the services operations for an EBS have either synchronous request-response or fire-and-forget pattern, then all of these operations will reside in only one portType, so only one Mediator routing service will be used.

- If the EBS has at least one asynchronous request-response operation, then two portTypes will exist, two Mediator Routing Services and two Mediator Projects (one for each routing service).

2. Follow the naming convention detailed in Appendix: Oracle AIA Naming Standards.

   Examples of typical names for the Mediator projects are:

   - **CustomerPartyEBSV2** (This example has a routing service with all operations for synchronous request-response and request-only.)
   - **CustomerPartyEBSResponseV2** (This example has a routing service with all operations for asynchronous request-response.)

10.8.2.2. How to Create Routing Services

To create routing services for the request-delayed response MEP:

1. Put the EBS WSDL created into the Mediator project folder.
2. Create a routing service and name as per the naming convention detailed in Appendix: Oracle AIA Naming Standards.
3. Select the WSDL.

   The WSDL will be parsed and the portType name filled in the portType field of the routing service.

4. Select the portType matching with the routing service. Save the routing service.

   The routing service created for a portType will have all the operations, including compensate operations, specified in that portType in the EBS WSDL.

These guidelines are in addition to the implementation of asynchronous message exchanging patterns.

10.8.2.3. How to Create Routing Rules

For the asynchronous request-delayed response EBS, routing rules will be created for both request and response.

Routing Rules for Request EBS

The routing rules for request EBS will be same as those explained in the synchronous request-response section.

For more information, see How to Create Routing Services for the Synchronous Request-Response MEP.

Routing Rules for Response EBS

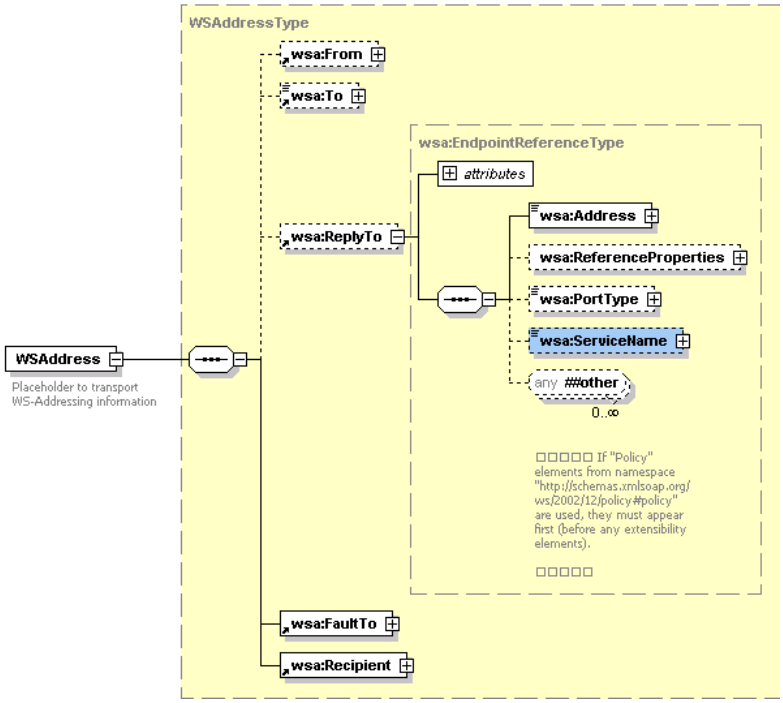
There will be two routing rules.

To create routing rules for the response EBS:

1. Routing to the correct requesting service.

When multiple requesting services from multiple participating applications are invoking a request EBS and are waiting for a delayed response, then you need to route the response to the correct requesting service.

Set the EBMHeader/Sender/WSAddress/wsa:ReplyTo/wsa:ServiceName to the name of the requesting service name in the requesting service—Application Business Message (ABM) to EBM transformation—before invoking the request EBS.



Structure of the WSAddressType element

In the providing service, this information is transferred from the request EBM to the response EBM. This information is used in the response EBS by putting a routing rule in the filter as:

```
<EBO Name>ResponseEBM\corecom:EBMHeader\Sender\
WSAddress/wsa:ReplyTo/wsa:ServiceName = <Requesting Service Name>
```

Example of the <Requesting Service Name> - CreateOrderSiebelReqABCSImplV2

The target endpoint for the evaluation of this rule should be set to the requesting service.

For every requesting service of the request EBS that is waiting for a response EBS to send back a response, a routing rule will be specified as above.

2. CAVS routing rule.

The CAVS routing rules are the same as that explained in the Sync Request-Response section.

For more information about enabling the ABCS (both requester and provider) see Designing Application Business Connector Services, Constructing the ABCS, and Completing ABCS Development.

Error Handling Implementation

For more information, see Implementing Error Handling and Recovery for the Asynchronous Message Exchange Pattern to Ensure Guaranteed Message Delivery.

10.8.3. Asynchronous Request-Delayed Response MEP Error Handling

In the asynchronous request-delayed response MEP, the requesting service is in a suspended mode, waiting for a response. If there is an error in the providing service, the response to the requesting service includes the details of the error.

To handle errors in the asynchronous request-delayed response MEP:

1. In case of an error in the providing service, raise an exception and catch it in the catch block.
2. In the catch block, construct the response EBM along with fault component in the EBM header.
3. Create a transform step and select the input variable representing the request EBM and the output variable representing the response EBM.
4. Pass the fault message generated from the exception as a variable into the 'input variable to fault variable' XSLT.
5. Map to the output variable:
   a. Standard EBM header content from the request EBM including the correlation information
   b. Fault message
6. Set the ***Invoke*** step to invoke the response operation in the response EBS routing service.
7. Route the response from the providing service to the correct requesting service.

For more information about enabling the ABCS (both requester and provider), see Designing Application Business Connector Services, Constructing the ABCS, and Completing ABCS Development.

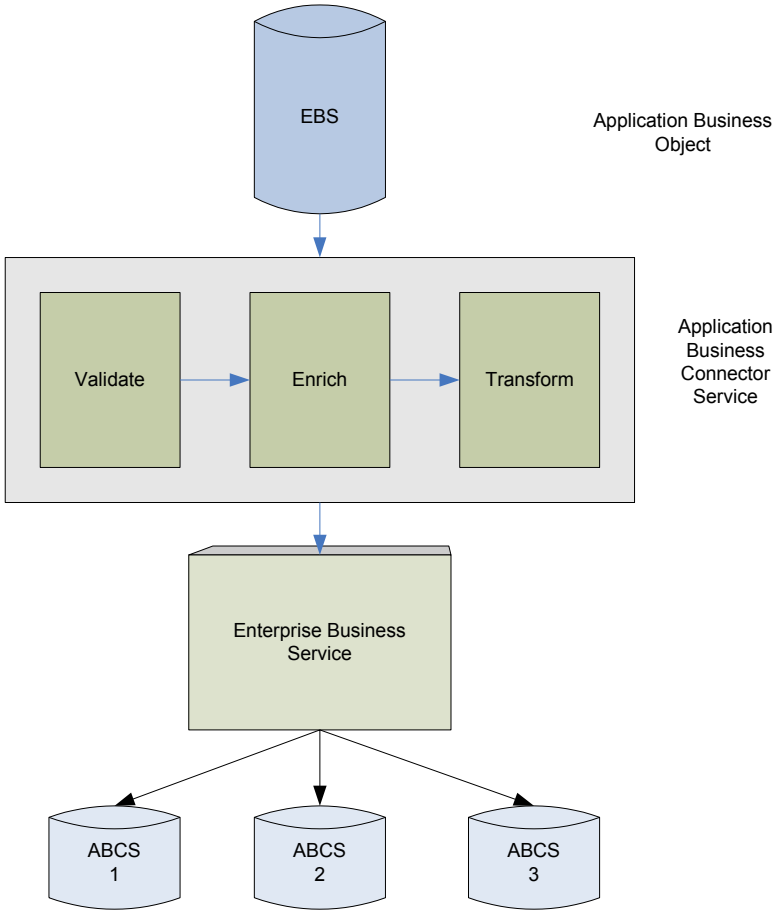
11. Designing Application Business Connector Services

This chapter describes how to make architectural decisions about Application Business Connector Services (ABCS) for your Oracle Application Integration Architecture (AIA) integrations.

This chapter discusses the following topics:

11.1. Introduction to ABCS

The role of the ABCS is to expose the business functions provided by the participating application in a representation that is agreeable to Enterprise Business Services (EBSs). It can also play another role in which it serves as a glue to allow the participating application to invoke the EBSs. The following diagram illustrates a scenario in which the E-Business Suite application is using an ABCS to invoke an EBS. In this scenario, the ABCS is playing a requester role. The same diagram also illustrates how the EBS invokes one of three ABCS to perform a specific task. Here, the three ABCS are playing provider roles.



ABCS in Oracle AIA architecture

The ABCS enables participating applications to become service providers as well as service consumers. It also enables applications having nonstandard connectivity to expose their functionality as web services.

For more information about ABCS, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, “Understanding ABCS.”

11.1.1. ABCS Types

The two types of ABCSs are:

- Requester ABCS
- Provider ABCS

11.1.1.1. Requester ABCS

The requester ABCS is provided by the requesting application to interface with an EBS for performing a single business task. The service interfaces between Requesting/Source application and EBS. The role of the requester ABCS is to enable the participating application to invoke the EBS either to access data or to perform a transactional task.

The requester ABCS is a service provided by the requesting application to invoke the EBS. It receives the Application Business Message (ABM) as payload and optionally returns the ABM as the response.

The ABM can be enriched by having additional conversations with the requester application. The ABM will be transformed into an Enterprise Business Message (EBM) using XSL. Responses received from the EBS (EBM) will be transformed into the ABM.

Non-SOAP payloads are handled by having transport adapters in between requester application and requester ABCS. Requester applications need to pass system information for the ABCS to have subsequent conversations.

11.1.1.2. Provider ABCS

The provider ABCS is supplied by the provider application to interface with an EBS for performing a single business task. The service interfaces between the EBS and provider or target application.

The provider ABCS:

- Is a service supplied by the provider application to interface with the provider application
- Receives EBM as payload
- Optionally returns the EBM as the response

The EBM is transformed into an ABM using XSL. The ABM can be enriched by having additional conversations with the provider application. Responses received from the application (ABM) will be transformed into the EBM.

Non-SOAP connectivity with the provider application will be handled by having transport adapters in between the provider ABCS and the provider application.

For more information about ABCSs, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide,* “Understanding ABCS.”

11.1.2. Designing ABCS – Key Tasks

An ABCS architect or developer needs to perform the following tasks as part of the design activity:

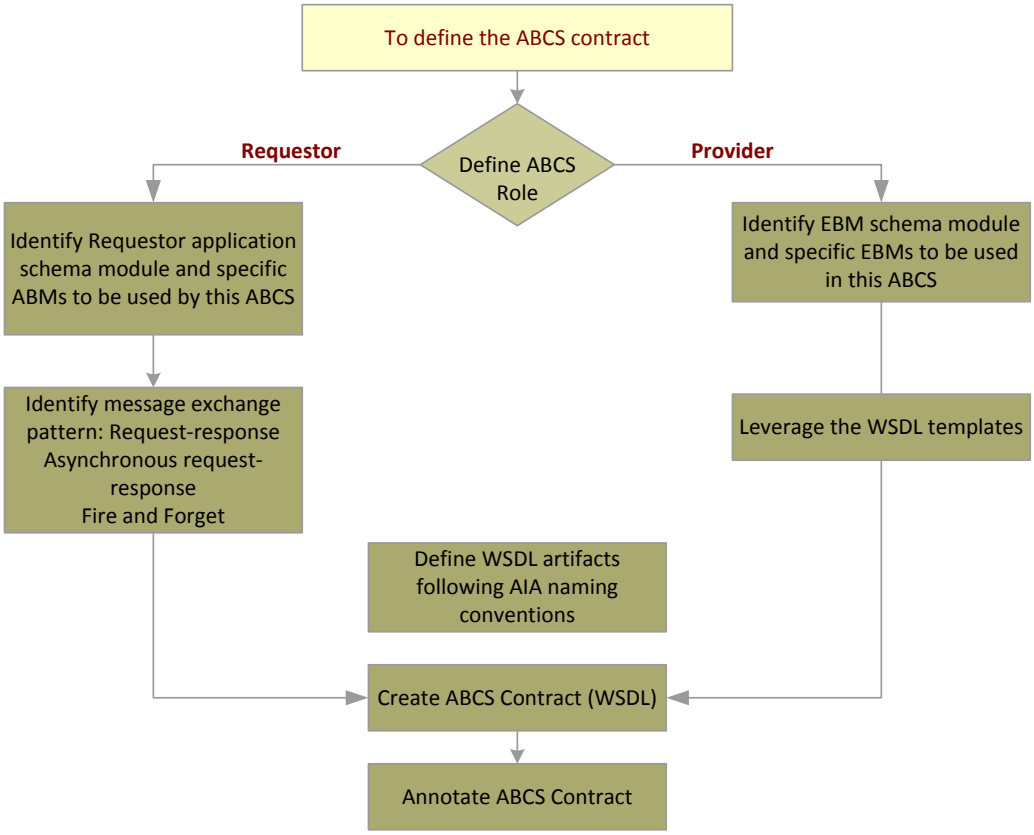
- Understand the ABCS role
- Identify the business events triggering the invocation of ABCS
- Identify the interactions between application and the ABCS and vice versa
- Identify the appropriate technologies to be used to facilitate the interaction
- Define the ABCS contract

The following sections discuss these tasks at length.

11.2. Defining the ABCS Contract

The ABCS contract (WSDL) specifies how a caller interacts with its Business Connector Service. The caller could either be a participating application or another service such as EBS.

This diagram illustrates the decision flow for defining the contract (WSDL) for the ABCS.



Decision flow for defining an ABCS contract

Note: Please refer to the ABCS template and sample WSDLs ***'AIAServices-TemplateSampleWSDLs.zip***" under ***$AIA_HOME/samples*** to understand the WSDL design.

11.2.1. Defining the Role of the ABCS

This section discusses design decisions that you will make to enable the ABCS to participate in either a requester or provider role.

11.2.1.1. Designing an ABCS to Participate in a Requester Role

To determine how to enable the ABCS to participate in a requester role:

1. Determine how the ABCS is invoked or triggered. This analysis tells you how the ABCS is invoked by the application. Determine:

a. Whether the application can make a SOAP-based invocation of ABCS

b. Whether the application service can invoke the ABCS via JCA adapter

c. Whether the ABCS must subscribe to messages published by the application due to occurrence of business events,

2. Determine what interaction pattern is needed.

   The following questions will help the architect in identifying the message exchange pattern that needs to be used.

   a. What business events will cause the invocation of requester ABCS?

   b. Is the application expecting a response from the requester ABCS?

   c. Does the application need to wait until the response is received for performing the next task?

   d. Does the application need to wait until the request is fully processed by the provider application?

For more information, see Using MDS in AIA.

3. Determine what Enterprise Business Services or operations need to be invoked.

4. Does the message sent by the requester application have all the information necessary for requester ABCS to construct the EBM?

   a. If not, does it have to reach out to applications to get the additional information?

   b. If yes, what technologies are available? What application interfaces are to be used to get the additional information?

For more information, see Technology Options.

5. Can the application possibly publish a message with incomplete information?

   a. Should the ABCS wait until the message with complete information is published?

      In such a scenario, an aggregator should collect and store individual messages until a complete set of related messages has been received

   b. If yes, what is the application service and how does it communicate with it?

11.2.1.2. Designing an ABCS to Participate in a Provider Role

To determine how to enable the ABCS to participate in a provider role:

1. Decide whether the application can directly consume the information sent by EBS.

2. Determine how the ABCS interacts with provider applications.

   See Establishing Resource Connectivity

3. Define the tasks that need to be done by this ABCS.

4. Determine what message exchange pattern (MEP) is used to communicate with the application.

5. Determine whether data validation needs to be done on the EBM sent by the EBS prior to sending the request to the provider application.
6. Decide whether you need guaranteed delivery of messages.
7. Determine whether it is a single message containing data for multiple instances.
8. Decide whether the entire message should be processed as a single unit of work.
9. Decide what needs to be done when a subset of instances present in that message encounter failure.

11.2.2. Constructing ABM Schemas

The ABM schemas are created by the participating applications. Consider the following points when defining the ABMs:

- Construct messages that are durable and long-lasting because frequent changing of the ABM definition will put duress on ABCS development.
- Ensure reusability of business components across multiple ABMs to promote reusability of transformation maps.
- Design ABMs to pass the following system data:
  - System Instance – connection information that helps identify the system ID registered in the system registry
  - Locale – language code in which the request is sent
  - Sender information – contextual details pertaining to the origination of the message
- Design ABMs that are extensible

11.2.3. Analyzing the Participating Application Integration Capabilities

To analyze the participating application integration capabilities:

After identifying the participating applications, you need to analyze the integration capabilities of each participating application and how each application exposes its data.

1. Work with the application providers (developers) to decide the best way to interact with the application to attain the needed functionality.

   The interactions can be inbound or outbound. The interaction mechanism can be one of these:

   - Web Service using SOAP/HTTP
   - Events/Queues
   - JCA Adapter

- Database Adapter

For more information about various types of connectivity to different resources, see Establishing Resource Connectivity.

2. Obtain relevant details from the applications in situations in which the interactions between the participating applications and the ABCS happen through a message queue adapter, database adapter, or JCA adapter.

   These details will be used in configuring the adapters. The configuration will result in the WSDL creation. Care must be taken to ensure that the environment-specific details are configured in relevant resource files on the server and not directly in the WSDLs.

3. Identify the available functionality within the participating applications as well as the mapping between EBMs and application business objects (map operations).

   A one-to-one, one-to-many, or many-to-one mapping between the two may exist.

4. Tabulate the mapping between the Enterprise Business Object (EBO) attributes/elements and the application objects attributes/elements in a spreadsheet.

   Remember these points when creating the transformation maps:

5. In the case of an ABM being mapped to an EBM, ensure that an attempt is made to populate all of the data elements present in the ABM to the relevant elements in the EBM.

   In situations in which the ABM does not have all of the content to supply all of the data elements in the EBM, you need to work with the respective requester application teams to identify the application services that could be used to enter the content in the EBM.

   For example, a Siebel application invoking the CreateOrder ABCs might supply only the Siebel Customer ID in the ABM that is being passed as the payload. However, the EBM to be passed as a payload to the CreateOrder EBS operation expects all the information regarding the Customer. So the CreateOrder ABCS is responsible for invoking a Siebel service to retrieve complete Customer details from the Siebel application and populate the EBM. Although the integration platform provides support for this pattern, we highly recommend that you work with the participating application to ensure that the payload being passed to the ABCS is as close to the shape of the EBM as possible to minimize the chattiness.

11.3. Identifying the MEP

The possible interaction types between an ABCS and its client are:

- Synchronous request-response
- Asynchronous request only
- Asynchronous request-delayed response

MEPs will vary in functionality and usage depending on the role of the ABCS.

For more information about MEPs, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, "Understanding Interaction Patterns."

11.3.1. Introduction to MEPs

Synchronous Request-Response Pattern

- A requester sends a request to a provider, who processes the request and sends back a response.
- The requester is in a suspended mode until the response is received from the provider.
- Results are in real-time response or error feedback.

Asynchronous Request Only

- The message exchange is one-way, with a requester sending a request to a provider. No response comes from provider to requester.
- The requester is free, after request submission, to resume normal execution.

Asynchronous Request - Delayed Response

- This involves two one-way invocations.
- First, a one-way message is sent from requester to provider. At a later time, another one-way message is returned from the provider to the original requester.
- Two distinct one-way messages are correlated.

For more information about MEPs, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, "Understanding Interaction Patterns."

11.3.2. Choosing the Appropriate MEP

- Identify how the participating applications interact with the ABCS for inbound as well as outbound interactions.
- Identify whether the requester application needs to be in a call-waiting state until it has received the response from the provider application.

  Waiting until the response is received from the provider application will necessitate the requester application to invoke the ABCS in a synchronous manner. For example, a CRM application submitting a request to retrieve account details from a billing application would fit this scenario. In this case, the requester cannot perform any task until the response is received.

  On the other hand, sending a request from the CRM application to create a customer in a billing application can be done in an asynchronous manner. After publishing an outbound request, the CRM application can move to the next activity without having to wait until the provider application has successfully created a customer. In this case, the CRM application invokes this outbound request in an asynchronous manner.

Applications can leverage different kinds of integration technologies for synchronous versus asynchronous invocations. You need to select the most appropriate technology based on the situation.

For more information about how AIA services interact with applications, see Establishing Resource Connectivity.

In a single flow, even though the requester ABCS MEP is influenced by the MEP for the EBS operation to be invoked, the requester application's interaction capabilities will also influence the MEP for requester ABCS. For provider ABCS, the MEP is predominantly influenced by the MEP of the EBS operation.

11.3.2.1. When to Use the Synchronous Request-Response MEP

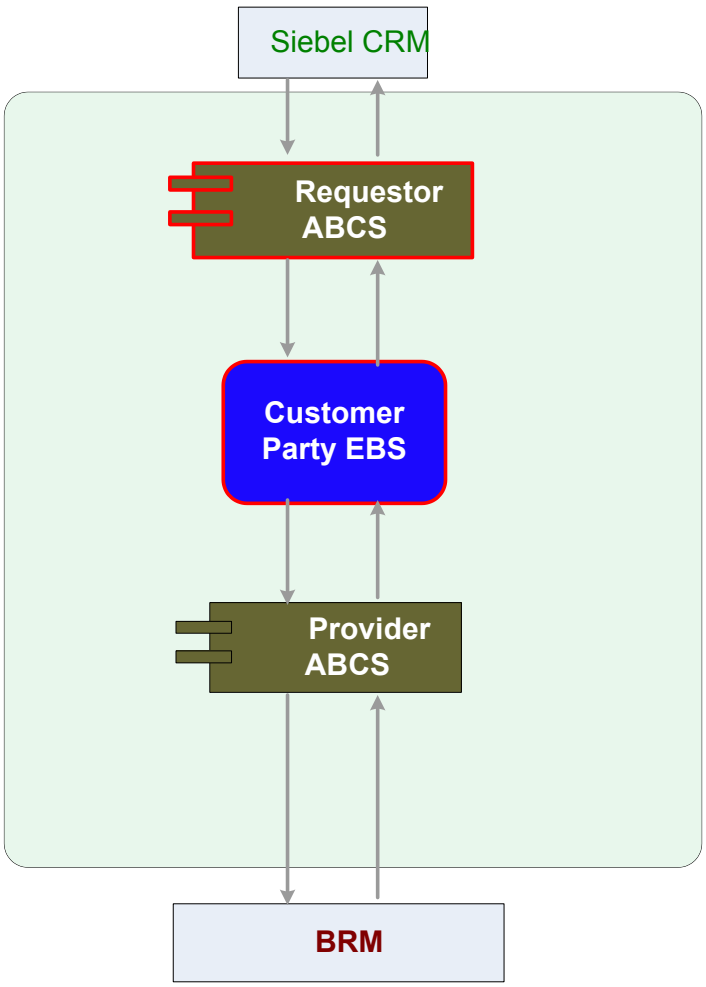
Most of the cases involving Query and Validate will need this pattern because the participating application that initiated the request is waiting for the response. For all the other cases, the suitability of this pattern is determined by the demands of the response time and possibility of meeting those requirements based on the amount of processing to be done.

The MEP between requester ABCS and EBS is synchronous. The MEP between provider ABCS and participating application servicing the request can be either synchronous or asynchronous.

Use Case

CRM Application requesting account details about a customer from the billing system

This diagram illustrates the two-way communication between AIA services, requester ABCS, and CustomerPartyEBS.



GetAccountBalance Summary integration scenario

11.3.2.2. When to Use the Asynchronous Request Only (Fire-and Forget) MEP

Use this pattern when:

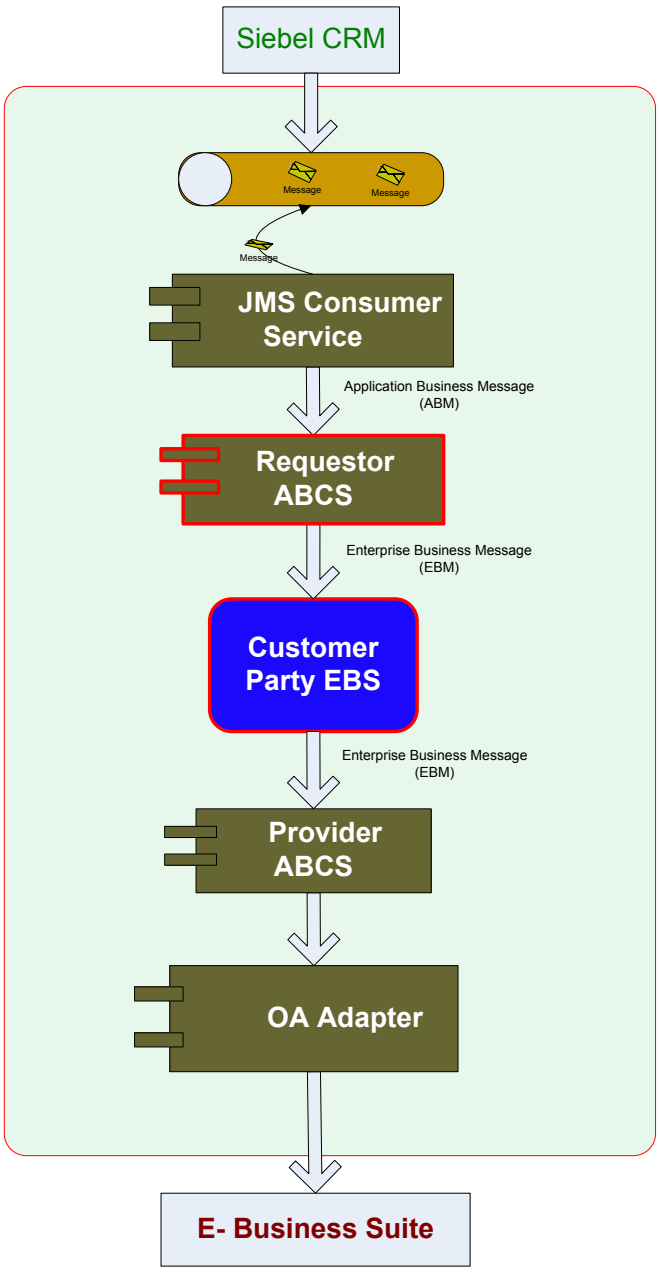
- The requester ABCS receives the request message from the participating application and ends with invoking of the EBS. In this case, no response comes from the EBS to the requester ABCS and no response is made to the participating application that initiated the request.
- The provider ABCS receives the request message from the EBS and ends with invoking the provider participating application API. No response is made to the EBS that initiated the request.

Use Case

A CRM application submitting a request to the BRM application to create CustomerParty

From the perspective of the participating application, Siebel, a request message to the BRM application to create a CustomerParty is enqueued for processing at a later time. The Siebel application is free to resume its processing immediately. The request message is dequeued from the queue and is processed in an asynchronous fashion.

This diagram illustrates the one-way invocation between AIA services, Requester ABCS, and CustomerPartyEBS.



Example of one-way invocation

11.3.2.3. When to Use the Asynchronous Request Delayed Response MEP

Use this pattern when:

- The requester ABCS receives the request message, processes the message, and finally updates the participating application that initiated the request by invoking an API exposed by the participating application. The participating application is not waiting for the response.
- The provider ABCS receives the request message from the EBS Request routing service, processes the message, and finally responds to the requesting service—requester ABCS or Enterprise Business Flow (EBF)—by invoking the response operation of the EBS Response routing service. The EBS

Request routing service is not waiting for the response.

The MEP between requester ABCS and EBS can be synchronous or asynchronous, and between the provider ABCS and the provider participating application can also be synchronous or asynchronous.

11.4. Technology Options

This section discusses technology options for:

- Outbound interaction with the application

  For inbound interactions see Invoking the ABCS.

- Using BPEL for building ABCSs

For more information about resource connectivity, see Establishing Resource Connectivity.

11.4.1. Outbound Interaction with the Application

Communication between ABCSs and the application is governed by the application capabilities.

Communication technologies include:

- JCA Adapters
- Standard web service interfaces
- Adapters
- JMS queues

11.4.1.1. When to Use JCA Adapters for Outbound Interactions

JCA Adapters, when available and authorized for use, should be the first choice for developers to connect to applications.

JCA Adapters:

- Natively invoke participating applications in a co-located fashion.
- Standardize the programming interface.
- Standardize the quality of services (QoS) implementation.
- Provide support for tasks associated with connection management, transaction management, and scalability in combination with the run-time environment.

For more information about establishing outbound connectivity, see Establishing Resource Connectivity.

11.4.1.2. When to Use Standard Web Service Interfaces (SOAP/HTTP, XML/HTTP) for Outbound Interactions

This is the most common means of communicating with participating applications.

Most applications expose functionality in the form of a web service. The most common transport used is SOAP over HTTP, however some applications may expose direct XML over HTTP.

11.4.1.3. When to Use Adapters, (Database, File, JMS, or AQJMS), for Outbound Interactions

In situations in which the message submission is decoupled from the processing of the message, usage of queues is suggested. When JMS queues are used, they have to be accessed using JMS Adapter. The message will be enqueued to the JMS queue by the ABCS and the application would dequeue the message.

Note: We highly recommend that participating applications making an outbound interaction in an asynchronous mode use message queues to publish the requests. We recommend this approach because it allows for high scalability as well as a better end-user experience. Similarly, the ABCS making an outbound interaction to the applications needs to assess the tasks to be performed by the application. Usage of message queues should be used to communicate with the applications in situations in which applications need longer periods to perform the tasks.

Participating applications making an outbound interaction in a synchronous mode alone should send the requests via SOAP/HTTP.

11.4.2. Using BPEL for Building ABCS

AIA recommends using a BPEL component to build an ABCS composite.

BPEL is the most effective solution when:

- You have a long-lived process

  In scenarios in which you have a long-lived process that may take hours or even days, BPEL is the best technology choice. In this case, BPEL will persist (dehydrate) the process at certain hook points and then bring the process to life when needed.

- You need complex orchestration capabilities

  In scenarios that require complex orchestration, parallel processing, and multiple conversations with participating applications, as well as with integrated services such as BPA, BAM, Workflow, and Rules Engine, BPEL is the most effective solution.

- You have content augmentation and validation that can't be done using XSLT

  In cases in which the decision-making and validation is not simple enough to perform using XSLT, other means are needed such as the standard BPEL procedural constructs or even calling out to the Rules Engine. BPEL enables you to easily perform fairly complicated decision trees and route the results to different partners.

- You need aggregation or disaggregation

In scenarios in which the ABCS needs to make multiple calls to the application to process a message or to collect data and then consolidate it in one message, BPEL is the suitable technology. BPEL constructs enable you to split or consolidate payloads and aggregate or disaggregate calls. The BPEL process is also responsible for maintaining the state and handling transactions in between invocations.

- You need to augment the participating application functionality

For more information, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g Release 1.*

12. Constructing the ABCS

This chapter describes how to construct an Application Business Connector Service (ABCS). It lists the prerequisites that are necessary before you set out to construct an ABCS and briefly introduces you to the concepts of SOA composite application. It provides information about constructing an ABCS using Oracle Application Integration Architecture (AIA) Service Constructor as well as constructing one entirely via Oracle JDeveloper and lists the tasks that a developer should manually complete after creating an ABCS composite using AIA Service Constructor.

Regardless of whether the ABCS is developed either using AIA Service Constructor or entirely via JDeveloper, you should review the relevant sections depending upon the capabilities to be implemented in the ABCS.

This chapter discusses the following topics:

12.1. Constructing an ABCS

This table lists some common tasks and provides links to detailed information:

If	Refer to
You are implementing the Fire-and-Forget Message Exchange Pattern (MEP)	When to Use the Asynchronous Request Only (Fire-and Forget) MEP Implementing the Fire-and-Forget Message Exchange Pattern Implementing the Fire-and-Forget MEP
You are implementing the Asynchronous Request Delayed Response MEP	When to Use the Asynchronous Request Delayed Response MEP Implementing the Asynchronous Request-Delayed Response Message Exchange Pattern Implementing the Asynchronous Request Delayed Response MEP
You are implementing the Synchronous Request -	When to Use the Synchronous Request-Response MEP

If	Refer to
Response MEP	Implementing the Synchronous Request-Response Message Exchange Pattern Implementing Synchronous Request-Response Message Exchange Scenario
Your ABCS is invoking an Enterprise Business Service (EBS) operation	Designing and Developing Enterprise Business Services for the guidelines for working with operations of an EBS
You need details about transforming a message from one format to another	Working with Message Transformations
You need information about how ABCS can be connected with the participating applications both inbound and outbound	Establishing Resource Connectivity
You need to know how clients such as applications and other services can invoke the ABCS you are developing	Invoking the ABCS
You are securing an ABCS	Securing the ABCS
You are enabling ABCS to handle errors and faults	Handling Errors and Faults
You want to allow ABCS to be extended by customers	Developing Extensible ABCS
You need guidelines on Composite Application Validation System (CAVS)-enabling the ABCS	Developing ABCS for CAVS Enablement
You need guidelines on how to annotate the SOA composites to facilitate the harvesting of metadata into Oracle Enterprise Repository as well as for deployment of the service	Annotating Composites
You want to harvest design-time composites into Oracle Enterprise Repository	Harvesting Design-Time Composites into Project Lifecycle Workbench and Oracle Enterprise Repository
You want to deploy the ABCS you are developing using AIA Installation Driver	Designing an Oracle AIA Integration Flow Working with Project Lifecycle Workbench
You want to access AIA Configuration Properties from within an ABCS	How to Work with AIAConfigurationProperties.xml in $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config

12.1.1. Prerequisites

Before you begin constructing an ABCS, ensure that:

- The relevant AIA Workstation with Oracle AIA Foundation Pack is installed and the development SOA server is up and running.

  Refer to How to Set Up AIA Workstation.

- The application entities' schemas (Application Business Message [ABM] schemas) are accessible from Metadata Service (MDS) repository. They should not be part of each ABCS project.

Refer to Using MDS in AIA.

- Enterprise Object Library containing Enterprise Business Objects (EBOs) and Enterprise Business Messages (EBMs) are accessible in the MDS Repository. EBOs and EBMs should not be part of each ABCS project.

  Refer to Using MDS in AIA.

- All the abstract WSDLs of EBS or participating applications should be accessible from the MDS Repository.

Note: The abstract WSDL of an ABCS that is being developed should be accessed from MDS. The exceptions to this rule are:

- The EBS references WSDLs that define PartnerLink types
- Participating applications reference WSDLs that define PartnerLink types
- The adapter WSDLs are generated by JDeveloper

When AIA Service Constructor is used for constructing ABCSs, abstract WSDLs of the ABCSs generated by AIA Service Constructor need to be pushed into MDS.

For more information, see Using MDS in AIA.

- Requester and provider participating applications have been identified.
- EBOs and EBMs have been identified.
- Functionality mapping between EBS and participating applications is complete. This mapping should include:
  - Data element spreadsheet mapping between the EBO and participating application messages.
  - Operations mapping between the EBS and participating applications.
- The style of interaction (MEP: request/response, fire and forget, asynchronous request, and delayed response) is defined.

  See Choosing the Appropriate MEP.

- The communication protocols with the participating applications are identified.

For more information about how an ABCS interacts with participating applications, see the sections in Establishing Resource Connectivity.

- Any participating application-specific requirements such as error handling or security have been identified.

12.1.2. What Is a Composite Application?

AIA services (ABCSs and EBSs) can be developed as a composite application built using SCA building blocks. Four SCA elements apply to these services:

- Service
  - Represents an entry point into the SCA component or a composite.
- Reference
  - Represents a pointer to an external service outside the scope of the given SCA component.
- Implementation type
  - Defines the type of implementation code for a given SCA component that is used for coding the business logic. Example implementation types include BPEL and Mediator.
- Wire
  - Represents the mechanism by which two components can be connected to each other. Usually a reference of one component is connected to a service exposed by another component.

An SCA component may expose one or more services, may use one or more references, may have one or more properties defining some specific characteristics, and may be connected to one or more components using SCA wiring.

The building blocks of SCA can be combined and assembled together to create composite applications. A composite application can be thought of as a composition of related SCA components that collectively provide a coarse-grained business function.

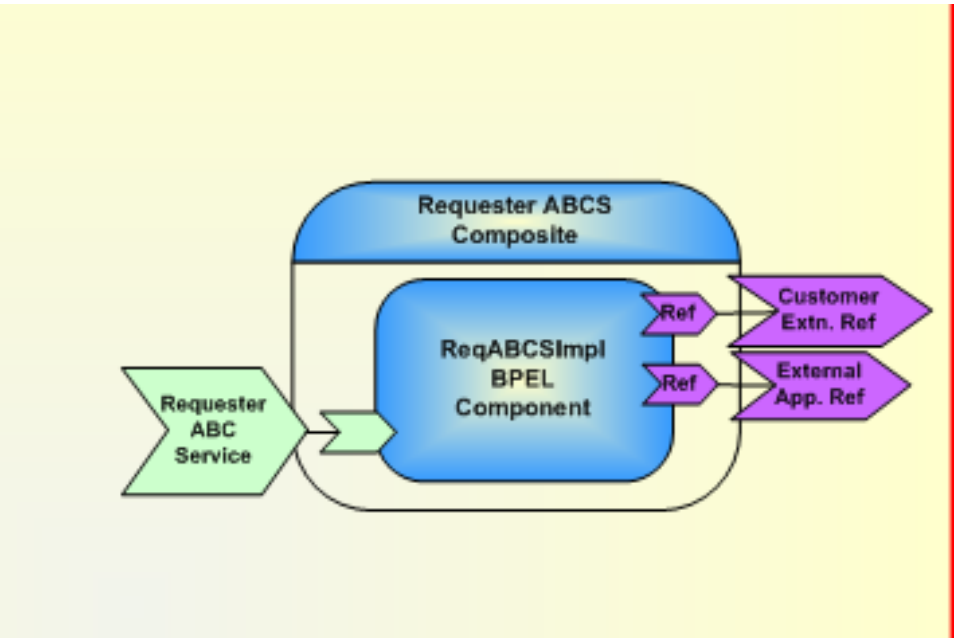
12.1.3. How Many Components Need to Be Built

A composite application can be thought of as a composition of related SCA components that collectively provide a coarse-grained business function. A composite may contain certain components that might be required only for the internal implementation of the composite and for which interfaces might not be required outside the scope of the composite in context.

Components may exist that can be used just for the internal implementation of the composite and are thus not required to expose services, references, or both.

A requester ABCS composite can be built using a single component that is exposed as service.

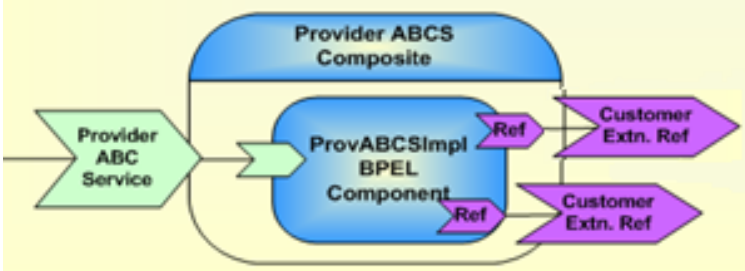
The component can use one reference representing an EBS or more references representing the outbound interactions with other applications.



An example of a requester ABCS composite

Similarly, a Provider ABCS composite can be built using a single component that is exposed as service.

The component can use one or more references representing the outbound interactions with the applications.



An example of a provider ABCS composite

12.2. Constructing an ABCS Using Service Constructor

AIA Service Generator is an application that helps jump-start ABCS development by pregenerating AIA artifacts complying with architectural recommendations. It generates artifacts according to the AIA architecture naming recommendations and relieves developers of performing repeatable mundane tasks, making them focus more on value-added business scenario-specific tasks.

For more information about the Service Constructor, see Working with Service Constructor.

This section describes:

- How to construct an ABCS using AIA Service Constructor

- How to complete the ABCS development
- How to create and deploy cross references (XREFs) and domain value maps (DVMs)

12.2.1. How to Create the ABCS in the Service Constructor

See Working with Service Constructor.

12.2.2. How to Complete ABCS Development for the AIA Service Constructor

After the ABCS is created in the Service Constructor, the following post-ABCS construction tasks need to be performed manually.

Complete the following manual post-ABCS construction tasks:

Note: Ensure that that the required AOL schemas are available in the MDS on the server.

1. Move abstract WSDLs of Application Business Service Connector to the MDS.

   Refer to Using MDS in AIA.

2. Configure the JDeveloper to access the MDS repository.

   Refer to Using MDS in AIA.

To complete ABCS development for the AIA Service Constructor:

1. Rearrange service invocations, if necessary.

   The AIA Service Constructor generates relevant definitions for all external service invocations in a sequence in the order that you specify while using the wizard. If your ABCS requires that the invocations be done either in parallel or based on certain other conditions, rearrange the services as needed using Oracle BPEL Designer.

2. Complete the business payload transformation.

   The AIA Service Constructor generates transformations only if the target document is an Enterprise Business Message and generates root element business transformations only. It generates the transformation mapping pertaining to most of the header elements, as well as the XSL code pertaining to the business payload that is common to all of the ABCSs.

   Use Oracle BPEL Designer to develop the transformation code for transforming remaining parts of the message document to complete the business payload and header transformation.

3. Configure correlation properties for asynchronous application service invocation.

   The AIA Service Constructor doesn't generate correlation properties for any application target service that is being invoked using an asynchronous request/response MEP.

Use Oracle BPEL Designer to configure the correlation upon the invoke activity and subsequent receive activity.

4. Create invocations for other operations when a service is called multiple times.

If a service is called multiple times, the AIA Service Constructor doesn't generate code for multiple invocations. Copy and paste the invocation code generated for the first service invocation from the same process and rename operations and variables.

5. Populate attributes of binding.ws element of the reference services in the composite.xml file.

In the composite.xml file, under the element <reference>, the AIA Service Constructor generates empty attributes, port, and location for the element <binding.ws>.

Populate the attributes with relevant values as specified in the following list.

- When the referenced service is BPEL-based, the binding.ws element should be populated as shown here.

```
<binding.ws port="[Namespace of the Service as defined in the
wsdl]#wsdl.endpoint([Name of the Service as given in the WSDL]/[ Name of
the Porttype as given in the WSDL>)"  location="< URL of the concrete
WSDL]"/>
```

Note: The name of the Service is the value of the attribute **definitions/name** in the abstract WSDL.

This follows from naming conventions for the Service name in the ABCS Composite. The name of the service is <name of the composite>, which in turn is the value of the attribute 'name', of the element 'definitions', in the WSDL.

The URL of the concrete WSDL uses this format:

http://{host}:{port}/soa-infra/services/default)/[Name of the Service as given in the attribute 'name' of the element 'definition' in the WSDL]/[Name of the Porttype element as given in the WSDL]?WSDL

Example:

```
<binding.ws
port="http://xmlns.oracle.com/SamplePortalApp#wsdl.endpoint(SamplesCreateC
ustomerPartyPortalProvider/SamplesCreateCustomerPartyPortalProvider)"
location="http://ap6014rems.us.oracle.com:8001/soa-
infra/services/default/SamplesCreateCustomerPartyPortalProvider/SamplesCre
ateCustomerPartyPortalProvider?WSDL"/>
```

When the referenced service is mediator-based, then the binding.ws element should be populated as shown here:

```
<binding.ws port="[Namespace of the Service as defined in the
wsdl]#wsdl.endpoint([Name of the Porttype element  as given in the
WSDL]_ep/[ Name of the Porttype element as given in the WSDL]_pt)"
location="[ URL of the concrete WSDL]"/>
```

The URL of the concrete WSDL uses this format:

http://{host}:{port}/soa-infra/services/default)/[Name of the Porttype element as given in the WSDL]/[Name of the Porttype element as given in the WSDL]_ep?WSDL

Example:

```
  <binding.ws
port="http://xmlns.oracle.com/EnterpriseServices/Core/CustomerParty/V2#wsd
l.endpoint(SamplesCustomerPartyEBS_ep/CustomerPartyEBS_pt)"
location="http://ap6014rems.us.oracle.com:8001/soa-
infra/services/default/SamplesCustomerPartyEBS/SamplesCustomerPartyEBS_ep?
WSDL"/>
```

6. Alter policies in the fault policy.

The AIA Service Constructor generates fault policies with default values. Modify these default values based on the service's requirements.

For details as to how to set up fault policies for AIA services, refer to Configuring Oracle AIA Processes for Error Handling and Trace Logging.

7. Alter properties in the service configuration properties file.

The AIA Service Constructor generates a configuration file snippet for service-specific properties. In case of the service configuration file of a provider ABCS, the developer needs to enter the value for the property `Routing .<PartnerLinkName>.< Target System ID>>.EndpointURI` as shown here:

```
<Property name="Routing. PartnerLinkName>.< Target System ID>.EndpointURI
">http://[hostname]:[portnum]/soa-infra/services/default/[name of the
service]/[name of the exposed endpoint of the service]?WSDL</Property>
```

Example:

```
<Property
name="Routing.SamplesCreateCustomerPartyPortalProvider.SamplePortal.Endpoi
ntURI">http://sdc68063crm.us.oracle.com:8024/soa-
infra/services/default/SamplesCreateCustomerPartyPortalProvider/SamplesCre
ateCustomerPartyPortalProvider?WSDL</Property>
```

Note: You must provide the preceding property in the service configuration file if the value for the property **Routing.<PartnerLink>.RouteToCAVS** is given as ***false'***

8. Change the componenttype file and composite.xml as detailed here:

You need to make changes to these files to make them point to the abstract WSDLs in the MDS.

Changes needed in the componenttype file

The attribute ui:wsdlLocation in Service element should point to abstract WSDLs in the MDS.

Example:

```
<service
ui:wsdlLocation="oramds:/apps/AIAMetaData/AIAComponents/ApplicationConnect
orServiceLibrary/SampleSEBL/RequesterABCS/SamplesCreateCustomerSiebelReqAB
```

```
CSImpl.wsdl" name="SamplesCreateCustomerSiebelReqABCSImpl">
```

If the composite has a reference, then the attribute ui:wsdlLocation in *reference* element should point to abstract WSDLs in the MDS:

```
<reference name="SamplesCreateCustomerPartyPortalProvider"
ui:wsdlLocation="oramds:/apps/AIAMetaData/AIAComponents/ApplicationConnect
orServiceLibrary/SamplePortal/V1/SamplesCreateCustomerPartyPortalProvider.
wsdl">
<interface.wsdl
interface="http://xmlns.oracle.com/SamplePortalApp#wsdl.interface(SamplesC
reateCustomerPartyPortalProvider? )"/>
</reference>
```

Changes needed in the composite.xml file

In the composite.xml, the attribute location of the element import should point to abstract WSDLs in the MDS.

Example:

```
<import
location="oramds:/apps/AIAMetaData/AIAComponents/ApplicationConnectorServi
ceLibrary/SampleSEBL/RequesterABCS/SamplesCreateCustomerSiebelReqABCSImpl.
wsdl" namespace=
"http://xmlns.oracle.com/ABCSImpl/Siebel/Samples/CreateCustomerSiebelReqAB
CSImpl/V1"/>
```

The attribute ui:wsdlLocation in Service and Reference elements should point to abstract WSDLs in the MDS.

Example:

```
<service
ui:wsdlLocation="oramds:/apps/AIAMetaData/AIAComponents/AIAServiceLibrary/
SampleSEBL/RequesterABCS/SamplesCreateCustomerSiebelReqABCSImpl.wsdl"
name="SamplesCreateCustomerSiebelReqABCSImpl">
```

For those referenced services in which the WSDLs do not have partnerLinkType elements in them, their corresponding reference WSDLs should also be changed to refer the abstract WSDLs from the MDS.

For instance, the composite of a requester ABCS has a mediator as a referenced service. Hence, change the location attribute of the element ‘import’ in the <EBS Reference WSDL> file as shown in this example.

```
<wsdl:import
namespace="http://xmlns.oracle.com/EnterpriseServices/Core/CustomerParty/V
2"
location="oramds:/apps/AIAMetaData/AIAComponents/EnterpriseBusinessService
Library/Core/EBO/CustomerParty/V2/CustomerPartyEBS.wsdl"/>
```

12.3. Constructing an ABCS Composite Using JDeveloper

An ABCS can be constructed using either AIA Service Constructor or JDeveloper.

While the previous section dealt with constructing an ABCS using Service Constructor, this section provides a high-level overview of constructing the ABCS composite in design mode, using JDeveloper.

The high-level tasks that need to be performed are:

- Configure JDeveloper to access MDS.

  See Using MDS in AIA.

- Develop abstract WSDL for the ABCS.

  See Designing Application Business Connector Services.

- Construct the ABCS composite using JDeveloper.

  See How to Construct the ABCS Composite Using JDeveloper.

- Develop the BPEL process.

  See Developing the BPEL Process.

12.3.1. How to Construct the ABCS Composite Using JDeveloper

To create an ABCS using JDeveloper:

1. In JDeveloper, create a new SOA composite project.
2. Open the composite.xml in design mode.
3. Add a BPEL component in the Components swim lane.
4. Add a web service as external reference service in the References swim lane.

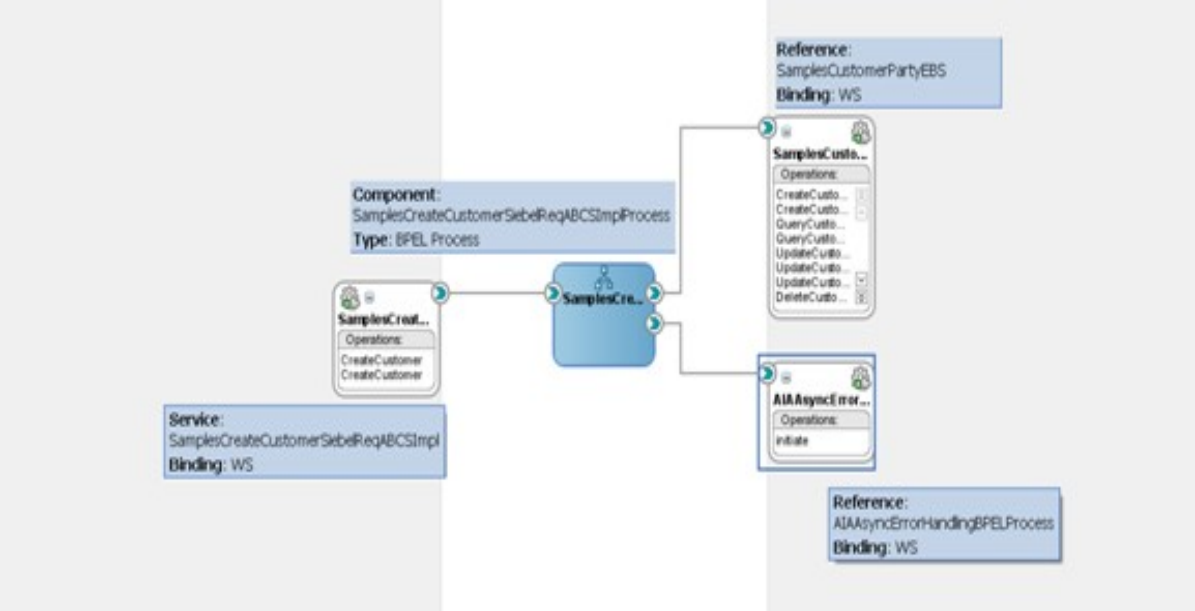
   This reference service could represent an EBS/Adapter Service/Participating application. An abstract WSDL of the EBS/Adapter Service/Participating application should be accessible from the MDS Repository.

   Note: In the composite.xml, populate the element 'binding.ws' as shown in step 5 of How to Complete ABCS Development for the AIA Service Constructor.

5. Wire the BPEL component to the external reference component created in step 4.
6. Complete the following for handling the faults.
   - Add a web service as external reference service in the References swim lane. Provide the reference to the abstract WSDL of the AIAAsyncErrorHandlingBPELProcess in the MDS repository.
   - Wire the BPEL component to the AIAAsyncErrorHandlingBPELProcess service.

For more information about fault handling in AIA services, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

The following diagram illustrates a Requester ABCS composite:



Example of a requester ABCS composite

12.3.2. Developing the BPEL Process

Once you have developed the composite in design mode using JDeveloper, the ABCS that is implemented as a BPEL process component should be constructed to its completion.

In the ABCS, the following tasks are accomplished:

- Message enrichment
- Message header population
- Message content transformation
- Error handling and logging
- Extensibility
- CAVS enablement
- Security context implementation

For more information about completing ABCS development, see Completing ABCS Development.

12.3.3. How to Create References, Services, and Components

- For each target, add a reference.
  - The target can be a web service or adapter.
  - In case the target service requires transformation, create a mediator component in between.

- For each interface, add a service.
  - The service can be a web service or adapter.

  In case the adapter interface requires transformation, create a mediator component in between.

12.3.4. Moving Abstract Service WSDLs in MDS

All the abstract WSDLs of all AIA services are put in MDS. This is to deploy a composite by having the reference refer to an abstract WSDL, No dependency exists on the order of deployment for composites.

For details of how MDS is used in AIA, refer to Using MDS in AIA.

Note: Abstract WSDLs need to be modified to access the required schemas from the MDS and then moved to MDS.

For ABCSs and Adapter services, the abstract WSDLs are to be located in MDS at:

AIAMetaData/AIAComponents/ApplicationConnectorServiceLibrary/<PRODUCT_CODE>/<Version Number>/<Service Type>

Possible values for <Service Type> are RequesterABCS, ProviderABCS, AdapterServices.

Possible values for <Version Number> - V1, V2, and so on.

The utility for moving artifacts to MDS is described in Using MDS in AIA.

Examples:

```
AIAMetaData/AIAComponents/ApplicationConnectorServiceLibrary/Siebel/V1/Req
uesterABCS
AIAMetaData/AIAComponents/ApplicationConnectorServiceLibrary/Siebel/V1/Pro
viderABCS
```

12.4. Implementing the Fire-and-Forget MEP

If you are implementing the fire-and-forget MEP, this section provides the necessary guidelines.

For more information about the scenarios for which this MEP is recommended, see When to Use the Asynchronous Request Only (Fire-and Forget) MEP.

In the fire-and-forget pattern, no response is made, so in situations in which the provider ABCS is not able to successfully complete the task, the retrying as well as notifications are done automatically.

See Configuring Oracle AIA Processes for Error Handling and Trace Logging.

12.4.1. When to Use Compensating Services

Sometimes an automatic correction of data or a reversal of what has been done in requester service will be needed. The typical scenario is one in which an error occurs in the transaction and the transactions cannot be rolled back.

In these situations, the requester application can implement the compensation service operation and pass the name of the service operation to the provider ABCS. The provider ABCS invokes this compensation service operation if there are errors. There may be a need to implement a compensating service for the requesting service.

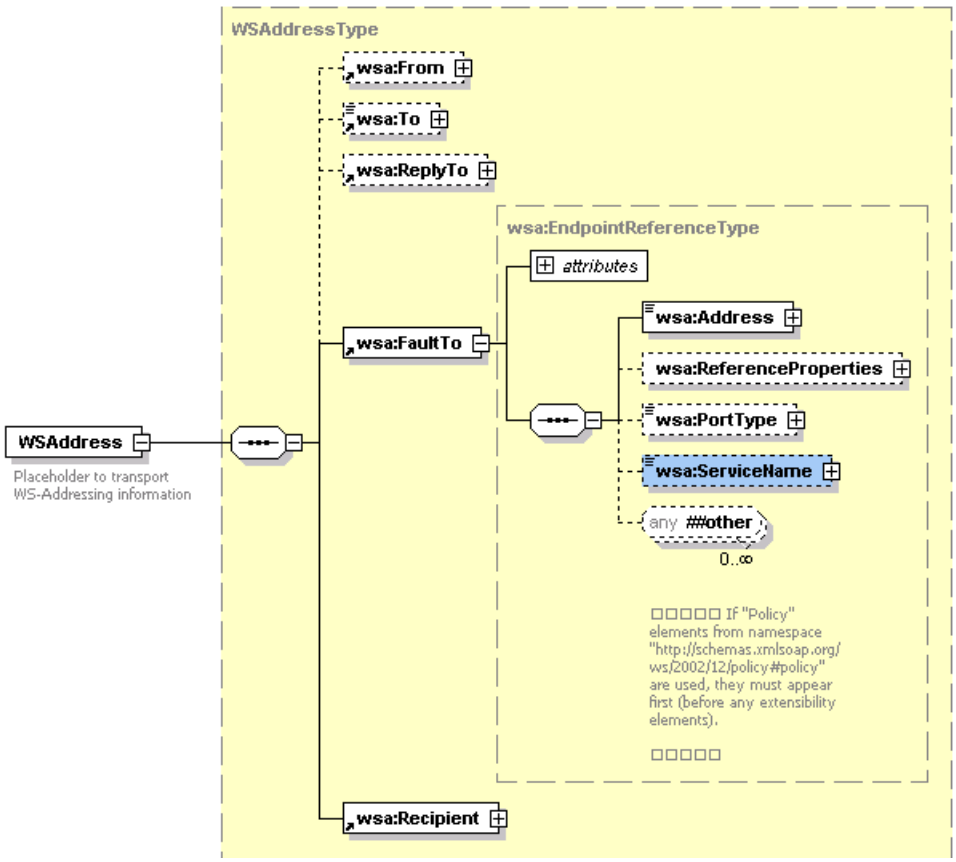
12.4.2. How to Invoke the Compensating Service

To invoke the correct compensating service from the providing service:

1. Populate the EBMHeader/Sender/WSAddress/wsa:FaultTo/wsa:ServiceName with the name of the compensating service in the transformation used for constructing the request EBM.

   Example of the name of the compensation service: CompensateCreateOrderSiebelReqABCSImpl

For more information about naming, see Oracle AIA Naming Standards for AIA Development.



Structure of the WSAddressType

This information will be used in the compensate operation of the EBS to route the request for compensation to the correct compensating service.

12.4.3. Additional Tasks Required in Provider ABCS to Implement This MEP

For more information about implementing this MEP, see Implementing Provider ABCS in an Asynchronous Message Exchange Scenario.

12.4.4. How to Ensure Transactions

For more information about ensuring transactions, see How to Ensure Transactions in AIA Services.

12.4.5. How to Handle Errors

For more information about error handling, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

12.5. Implementing the Asynchronous Request Delayed Response MEP

If you are implementing an asynchronous request-delayed response MEP, this section provides you the necessary guidelines.

For more information about the scenarios for which this MEP is recommended, see Implementing the Asynchronous Request-Delayed Response Message Exchange Pattern.

This section discusses how to implement the asynchronous request-delayed response MEP.

This section contains these topics:

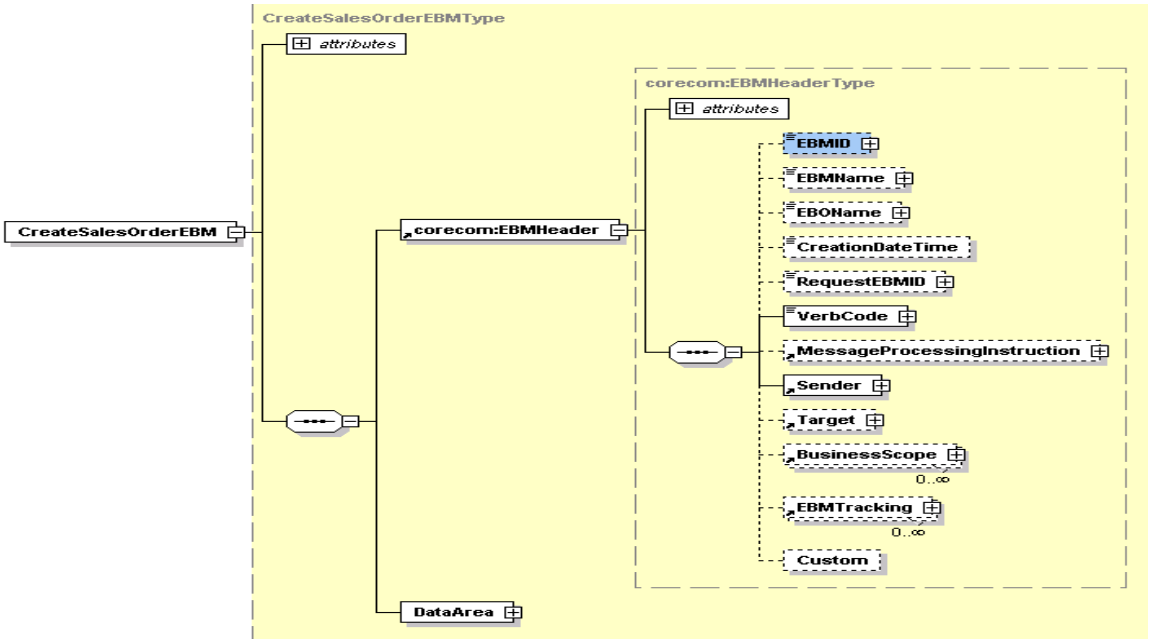
- How to populate the EBM header for asynchronous delayed response.
- Setting correlation for the asynchronous request-delayed response MEP.
- What tasks are required in provider ABCS to implement this MEP.

12.5.1. How to Populate the EBM Header for Asynchronous-Delayed Response

To populate the EBM header for asynchronous delayed response:

1. Populate the EBMID.

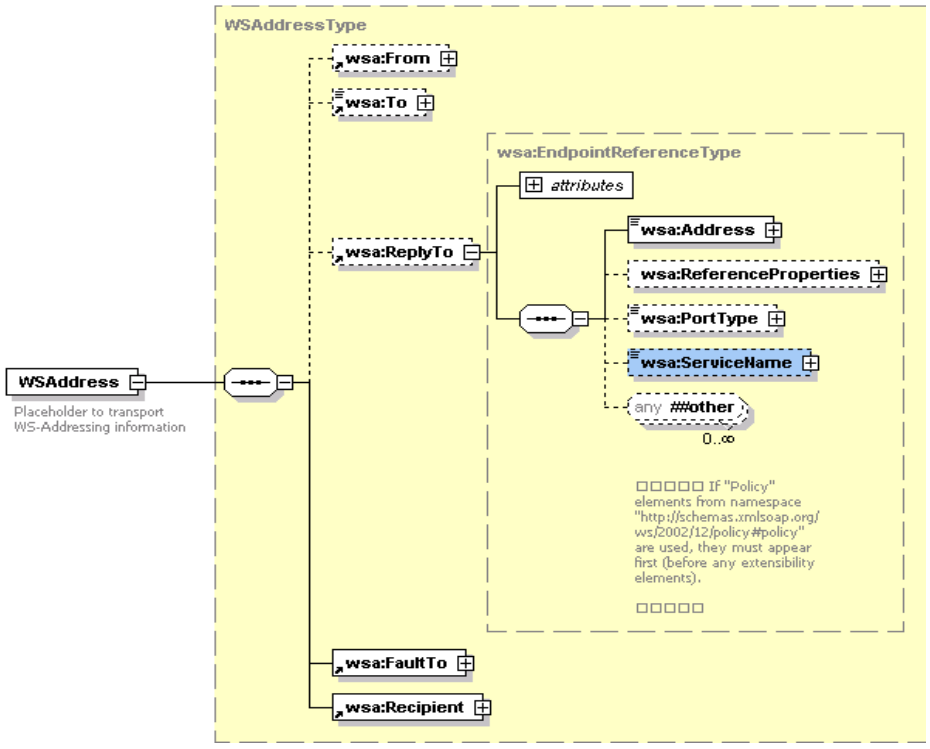
   This is used for correlation of the response to the correct requesting service instance.



Structure of the CreateSalesOrderEBMType

2. Set the **EBMHeader/Sender/WSAddress/wsa:ReplyTo/wsa:ServiceName** to the name of the requesting service name in ABM to EBM transformation.

   This is the name of the service that needs to be invoked by the EBS for processing the response message. In most of the situations, it will be the same requester ABCS that would also be responsible for processing the response message coming from provider ABCS.



Structure of the WSAddressType

This information will be used in the response operation of the EBS to route the response from the providing service to the correct requesting service.

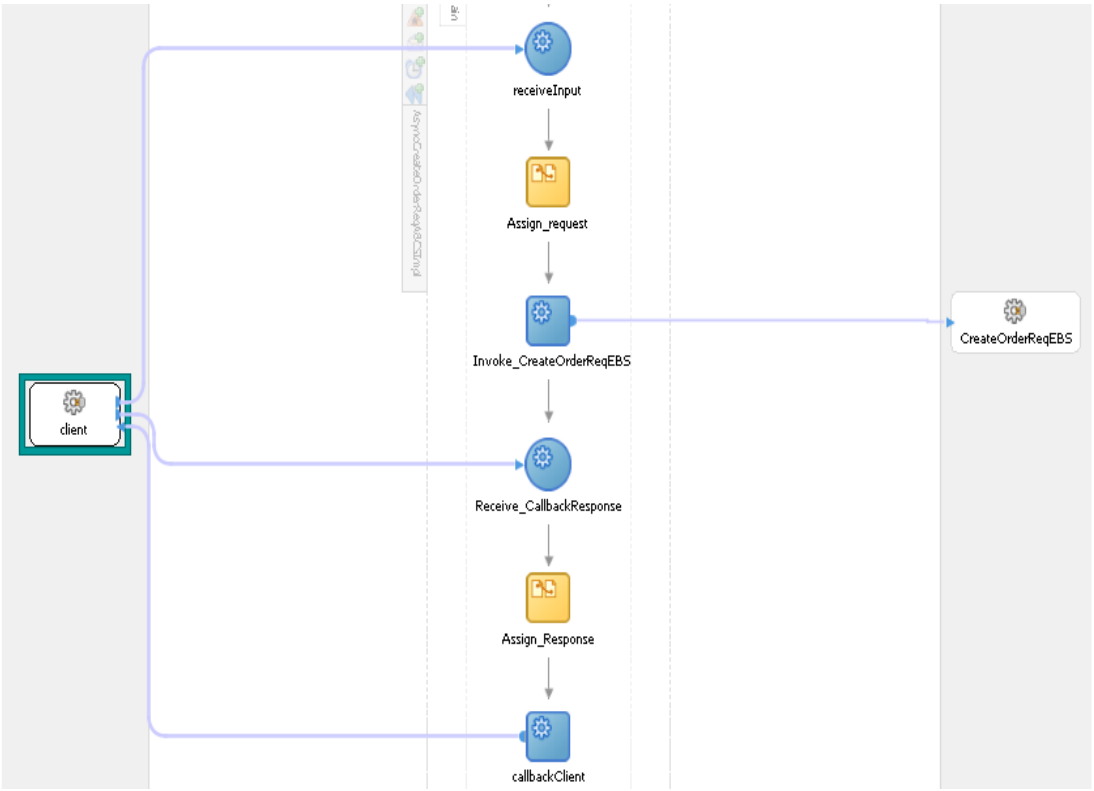
3. Set the “responseCode” attribute of the EBM verb.

The “responseCode” attribute of the EBM verb is set to indicate to the providing service that the requesting service is expecting a response. This is evaluated in the providing service to send back a response.

4. Set correlation information in the requesting service partner link.

The delayed response from the providing service routed by a response EBS would be received by a ***Receive*** activity. Once the ***Invoke*** step is performed in the requesting service and the process moves to the Receive step, the BPEL process instance is suspended and dehydrated. This will restart after the response is received. To facilitate this behavior, a correlation set has to be specified on the partnerLink for the Receive.

The requester ABCS process would look like this. This is the process for which you need to set the correlation IDs.



Example of Requester ABCS process

12.5.2. Setting Correlation for the Asynchronous Request-Delayed Response MEP

In the preceding process, you need to set the correlation in two places.

Correlation Set

Add a correlation ID and create a correlation set for the ***Invoke*** activity where the process would go into the dehydration store

Add a correlation ID and create a correlation set for the ***Receive*** activity where the process would be recalled from the dehydration store after getting a delayed response from the provider/edge application.

Correlation Property

Add a standard name-value pair for each partnerLink that is linked to the Invoke or Receive activities where the correlation sets are defined as mentioned previously. The property should always be defined as ***correlation = correlationSet***.

12.5.3. What Tasks Are Required in Provider ABCS to Implement This MEP

For more information, see Implementing Provider ABCS in an Asynchronous Message Exchange Scenario.

12.6. Implementing Provider ABCS in an Asynchronous Message Exchange Scenario

If you are implementing asynchronous MEP in the provider ABCS, this section provides the necessary guidelines.

For more information about the scenarios for which this MEP is recommended, see When to Use the Asynchronous Request Delayed Response MEP.

The provider ABCS is implemented to either behave as a one-way service call pattern or request-delayed response pattern.

In the request-delayed response pattern, the provider ABCS receives the request message from the EBS request routing service, processes the message, and finally responds to the requesting service (requester ABCS or Enterprise Business Flow [EBF]) by invoking the response operation of the EBS response routing service. The EBS request routing service is not waiting for the response.

All the provider ABCSs (and EBFs) should have the capability to invoke the callback operation, but should have a switch case to do it only if the requester wants a callback. Evaluate the responseCode attribute on the verb element of the EBM to determine whether the requesting service is expecting a response.

12.6.1. How to Implement the Asynchronous MEP

To implement the asynchronous MEP in the provider ABCS:

1. Populate the EBM header of the request message in the providing service with fault information.

   If an error occurs in the provider service before evaluation of the requirement of a response and an exception is issued, enter the fault information in the request message EBM header. This will facilitate passing the entire request EBM along with the fault message to the catch block for processing.

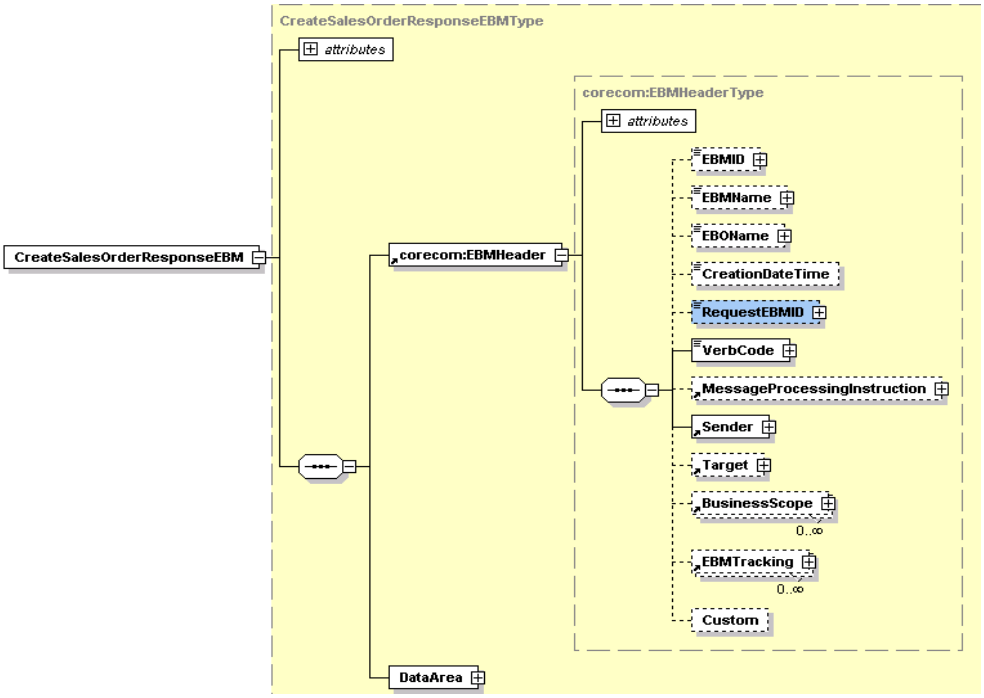
2. Implement Error Handling in the providing service.

   If a particular error needs compensation service to be invoked, then the compensate operation of the EBS is invoked for routing the request to the compensation service.

For more information, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

3. Enter the correlation information in the EBM header in the providing service.

Use the EBMID in the EBM header for correlation of the response message to the correct requesting service instance. To facilitate correlation, the EBMID in the EBM header of the request message must be copied to the RequestEBMID in the EBM header of the response message in the ABM to EBM transformation of the providing service.



Structure of CreateSalesOrderResponseEBMType element

For information about the technique of passing the EBMHeader of the request message in a variable into the ABM to EBM XSLT, see Working with Message Transformations.

This is required to copy the relevant information from the EBM header of the Request EBM to the EBM header of the Response EBM.

4. Populate EBM header of response message in the providing service with fault information.

If an error occurs in the provider service after evaluation of the requirement of a response, you need to populate the fault information in the response message EBM header fault component. This facilitates passing the response EBM along with fault message to the catch block for processing.

The requesting service receives a response with fault elements populated.

12.6.2. How to Ensure Transactions in Services

For more information about ensuring transactions, see How to Ensure Transactions in AIA Services.

12.6.3. How to Handle Errors in the Asynchronous Request-Delayed Response MEP

See Configuring Oracle AIA Processes for Error Handling and Trace Logging.

12.7. Implementing Synchronous Request-Response Message Exchange Scenario

If you are implementing synchronous request-response MEP, this section provides the necessary guidelines.

For more information about the scenarios for which this MEP is recommended, see When to Use the Synchronous Request-Response MEP.

In this scenario, requester ABCS synchronously invokes the EBS. The EBS invokes the Provider ABCS and waits for a response. Synchronicity should manifest in the WSDLs of requester ABCS, EBS, and provider ABCS. All of the WSDLs should have the operation defined with input and output message.

12.7.1. How to Ensure Transactions in Services

This MEP does not need to support transactions. No break points such as midprocess Receive, wait, Pick, onMessage activities should be in any of the BPEL processes participating in implementation of this MEP.

For more information about ensuring transactions, see How to Ensure Transactions in AIA Services.

12.7.2. How to Handle Errors in the Synchronous Request-Response MEP

See Configuring Oracle AIA Processes for Error Handling and Trace Logging.

12.7.3. How to Optimize the Services to Improve Response Time

Because this MEP involves implementation of transient services (no break point activities and hence, no dehydration in the middle), we highly recommend that the audit details for BPEL services are persisted only for faulted instances. This means that the service instances associated with the successfully completed integration flows will not be visible via Oracle Enterprise Manager. This approach will significantly improve the response time.

auditLevel property sets the audit trail logging level. This configuration property is applicable to both durable and transient processes. This property controls the amount of audit events that are logged by a process. Audit events result in more database inserts into the audit_level and audit_details tables, which may impact performance. Audit information is used only for viewing the state of the process from Oracle Enterprise Manager Console. Use the Off value if you do not want to store any audit information. Always choose the audit level according to your business requirements and use cases

For synchronous BPEL processes, AIA recommends nonpersistence of instance details for successfully completed instances. For this, set the auditLevel property to off at the service component level. This general guideline could be overridden for individual services based on use cases.

12.8. Invoking Enterprise Business Services

This section discusses the guidelines for invoking an EBS from an ABCS and for working with operations of an EBS. This content is provided from the perspective of invoking an EBS operation and also helps in understanding EBS operations from an implementation perspective.

The verbs used to define EBS operations are:

- Create
- Update
- Delete
- Sync
- Validate
- Process
- Query

In addition, the following sections present a detailed view of each of the verbs in the context of:

- When the verb should be used
- What should be the content payload when the verb is used
- What are the attributes of the verb, if any
- What is the corresponding response verb, if any
- What is the content payload for the response verb

12.8.1. Create

The *Create* verb indicates a request to create a business object using the information provided in the payload of the Create message. It is used in operations that are intended to create a new instance of a business object.

When to use the Create Verb

If both the service requester and service provider have the same object, then Sync would be a more appropriate verb to use. However, the usage of Sync is conditional on the service provider having an implementation of a Sync operation.

A typical use of a Create operation is a front-end customer management system that could take service requests from customers and based on the information provided, request a work order system to create a work order for servicing the customer.

The Create verb is not used for composite operations; it always involves the creation of one (or more in the case of List) instance of a business object.

What should be the Content Payload

The payload of an operation that uses a Create verb is typically a complete business object, and in general every business object will have only two messages with a Create operation (Single and List).

What are the Verb Attributes

The Create verb has an optional ResponseCode attribute that communicates the payload that is expected in the response message to the Create request. The possible values for the ResponseCode are restricted to either ***ID*** (response payload is expected to be the Identifier of the object that was created) or ***OBJECT*** (response payload is expected to be the entire object that was created).

What is the Corresponding Response Verb

The Create verb has a paired ***CreateResponse*** verb that is used in the response message for each Create EBM. The response is expected to be provided by the target application only if the original request message explicitly requests a response by setting the ResponseCode attribute in the Create message.

What is the Response Content Payload

The payload type of the response verb is always based on the payload type of the Create Request operation. It is implemented as a different type to support user customization if needed.

12.8.2. Update

The *Update* verb indicates a request to a service provider to update an object using the payload provided in the Update message. It is used in operations that are intended for updating one or more properties of a business object or array of business objects.

Operations that use the Update verb *must* create or update content and *should not* be an orchestration of other operations.

When to use the Update Verb

Similar to Create, a business process invokes an Update operation mainly in cases in which the source event that triggers the invocation is *not* the updating of the object in the requesting system. If both the service requester and service provider have the same object, then Sync would be a more appropriate verb to use. However, use of Sync would be conditional to the service provider having an implementation of a Sync operation.

An example of an Update operation is a receiving system updating a purchase order line with the quantity of items received, or an order capture system updating the customer record with customer address and other information.

The content included in the business payload of an EBM using the Update verb is assumed to be *only* the fields that have to be updated in the target application. The Update verb uses the ***ActionCode*** property of the business components and common components to communicate processing instructions to the target system. This is necessary in the case of hierarchical, multilevel objects when the update happens at a child level.

The ActionCode property exists in an EBO for all components that have a multiple cardinality relationship with its parent. The possible values for the ActionCode are *Create*, *Update*, and *Delete*. It is intended for use only in conjunction with the Update verb to communicate the processing action to be applied to that business component. Note that the ActionCode applies only if the object has child business components—if not, an ActionCode is not needed and the verb alone is sufficient to convey this information.

A use case for ActionCode is a case in which a requisition is updated in a self-service requisitioning system, and this updated information needs to be communicated to the Purchasing system, which also maintains a copy of the requisition.

Assume that a user updates a requisition and does the following actions (in a single transaction):

- Updates the description in the requisition header
- Adds a new requisition line (line number 4)
- Modifies the item on a requisition line (line number 3)
- Deletes a requisition line (line 2)
- Modifies the accounting distribution of a requisition line, and adds a new accounting distribution (line 1)

The content of the DataArea business payload in the instance XML document that communicates the preceding changes will be:

```
<UpdateRequisition actionCode="Update">   Root Action Code not processed
   <Description>New Description</Description>
   <RequisitionLine actionCode="Update"> Indicates that some property or
association of this line is being updated. In this example, the accounting
distribution Percentage has been updated for Line 1, and a new
AccountingDistribution line has been added
         <Identification>
               <ID>1</ID>
         </Identification>
         < RequisitionAccountingDistribution actionCode="UPDATE">
               <Identification>
                     <ID>1</ID>
               </Identification>
               <AccountingDistribution>
                     <Percentage>15</Percentage>
               </AccountingDistribution>
         < /RequisitionAccountingDistribution>
         < RequisitionAccountingDistribution actionCode="ADD">
               <Identification>
                     <ID>3</ID>
               </Identification>
               <AccountingDistribution>
                     <Percentage>15</Percentage>
               </AccountingDistribution>
         < /RequisitionAccountingDistribution>
   </RequisitionLine>
   <RequisitionLine actionCode="DELETE"> Indicates this line has been
deleted
         <Identification>
               <ID>2</ID>
         </Identification>
   </RequisitionLine>
```

```
   <RequisitionLine actionCode="UPDATE">
         <Identification>
               <ID>3</ID>
         </Identification>
<ItemReference>
<Identification>
                     <ID>1001</ID>
               </Identification>
</ItemReference>
   </RequisitionLine>
   </RequisitionLine>
   <RequisitionLine actionCode="ADD"> Indicates this line has been added
         <Identification>
               <ID>4</ID>
         </Identification>
<ItemReference>
<Identification>
                     <ID>1005</ID>
               </Identification>
</ItemReference>
   </RequisitionLine>
</UpdateRequisition>
```

What should be the Content Payload

The payload of an operation that uses an Update verb is typically the entire EBO and in general every business object will have only two messages with an Update operation (single and list).

Situations may occur in which subsets of an EBO need to be updated, in which case multiple update messages may possibly exist, each with a distinct payload. An example is a possible UpdateSalesOrderLineEBM message with a payload that contains only SalesOrderLine.

What are the Verb Attributes

The Update verb has an optional ***ResponseCode*** attribute that is intended to communicate the payload that is expected in the response message to the Update request. The possible values for the ResponseCode are restricted to either ***ID*** (response payload is expected to be the Identifier of the object that was created) or ***OBJECT*** (response payload is expected to be the entire object that was created).

What is the corresponding Response Verb

The Update verb has a paired "***UpdateResponse*** verb that is used in the response message for each Update EBM. The response is expected to be provided by the target application only if the original request message explicitly requests a response by setting the ResponseCode attribute in the Update message. The payload of the response is either the ID or the entire object that was updated, depending on the ResponseCode specified in the Update request.

What is the Response Content Payload

The payload type of the response verb is always based on the payload type of the Update Request operation. It is implemented as a different type to support user customization if needed.

12.8.3. Delete

The *Delete* verb is a request to a service provider to delete the business object identified using the object Identification provided in the payload of the Delete message.

When to use the Delete Verb

The Delete verb is used for operations that are intended to delete a business object.

Operations that use the Delete verb *must* delete content and *should not* be an orchestration of other operations.

Note. Currently, we do not support using Delete for components of a business object, that is, Delete Purchase Order Line is allowed.

What should be the Content Payload

The payload of the Delete verb must be only an identification element that uniquely identifies the business object to be deleted.

What are the Verb Attributes

The Delete verb has an optional ***ResponseCode*** attribute that is intended to communicate the payload that is expected in the response message to the Update request. The only possible value for the ResponseCode in the case of Delete is ***ID*** (response payload is expected to be the Identifier of the object that was created).

What is the corresponding Response Verb

The Delete verb has a paired ***DeleteResponse*** verb that is used in the response message for each Delete EBM. The Response is expected to be provided by the target application only if the original request message explicitly requests a response by setting the ResponseCode attribute in the Delete message. The only allowed value for the ResponseCode is ***ID***.

12.8.4. Sync

The *Sync* verb indicates a request to a service provider to synchronize information about an object using the payload provided in the Sync message.

When to use the Sync Verb

The Sync verb is used in situations in which applications provide operations that can accept the payload of the operation and create or update business objects as necessary.

Operations that use the Sync verb *must* create or update content and *should not* be an orchestration of other operations.

The primary usage scenario for Sync is generally batch transactions in which the current state of an object is known, but what has changed between the previous sync and the current sync is not known. Sync can also be used to synchronize individual instances of objects. The initiator of Sync is generally the system that owns the data to be synchronized.

Using the Sync operation implies that the object exists in both the source and the target system, and the end result of Sync is that both the source and target will have the same content. Sync is different from the other verbs in that it assumes a dual processing instruction—Sync can both create as well as update existing content.

The content of the Sync reflects the current state of the object in the system generating the message. In this mode, a single Sync message can contain multiple instances of nouns, with none of them having any specific change indicator. The source system generates the message, and all systems that subscribe to the message are expected to synchronize their data to reflect the message content.

Sync is probably the most practical approach for master data management scenarios in which change is not frequent, and it may not be practical or necessary from an operational point of view to synchronize data on a real-time basis.

The Sync verb has an optional ***syncActionCode*** attribute that can be used to further instruct the recipient of a Sync message about the expected processing behavior. The possible values for the syncActionCode are:

- ***CREATE_REPLACE***: This is the default behavior of Sync when no syncActionCode is specified. The target system that receives a Sync message with no syncActionCode attribute, or with a syncActionCode attribute value of NULL or CREATE_REPLACE, is expected to create the object if it does not exist in the target system, or if it does exist, the entire object is to be replaced with the definition that has been provided in the Sync message.
- ***CREATE_UPDATE***: A Sync message with the value of syncActionCode as CREATE_UPDATE is expected to be processed as follows: create the object if it does not exist in the target system, or if it does exist, update the object with the content that has been provided in the Sync message.

What should be the Content Payload

Generally speaking, there will be only one Sync message per EBO (with a single and list implementation) and the payload of the message will be the entire EBO.

Sync should always be used to synchronize the entire business object. Multiple Sync messages may exist in cases in which different named views of the business object exist, but never for synchronizing a specific component of a business object.

Note: Unlike the OAGIS implementation of Sync, we have opted not to have specific attributes in Sync to indicate Add, Change, Replace, and Delete. The Enterprise Object Library (EOL) implementation of Sync is a verb that is intended to change the target object to exactly what is specified in the message payload. Sync cannot be used for deleting content—an explicit delete operation must be used in this case.

What are the Verb Attributes

The Sync verb has an optional ***ResponseCode*** attribute that is intended to communicate the payload that is expected in the response message to the Sync request. The possible values for the ResponseCode for Sync is restricted to ***OBJECT*** (response payload is expected to be the entire object that was created or updated) and ***ID*** (response is only the ID of the object that was created or updated)

What is the corresponding Response Verb

The Sync verb has a paired ***SyncResponse*** verb that is used in the response message for each Sync EBM. The response is expected to be provided by the target application only if the original request message explicitly requests a response by setting the ResponseCode attribute in the Sync message.

Note: The design intent is to avoid having two verbs with the same objective. The Sync verb also supports the creation of an object, but is intended for use primarily in the scenario in which the object exists in both the source and the target systems. That is, the semantics of usage of Sync as a verb communicates to the recipient application the fact that the object being synchronized exists in both the source and target, whereas the usage of Create or Update is intended to communicate the fact that the object being created or updated does not exist in the source system.

What is the Response Verb Content Payload

The payload type of the response verb is always based on the payload type of the Sync Request operation. It is implemented as a different type to support user customization if needed.

12.8.5. Validate

The *Validate* verb is a request to a service provider to validate the content provided in the payload of the message. It is used for operations that are intended to verify the validity of data.

When to use the Validate Verb

Operations that use the Validate verb *do not* create or update business objects, and can internally be implemented as an orchestration of other operations. For example, validating a purchase order for approval may involve validating whether a budget is available, if the supplier is still active, if the requisitions that need the items on the line are still valid, and so on.

What should be the Content Payload

The payload of any operation that falls in the Validate category can be a business object, a business component of a business object, or any other user-defined payload.

What are the Verb Attributes

Not applicable.

What is the corresponding Response Verb

The Validate verb has a paired ***ValidateResponse*** verb that is used in the response message for each Validate EBM. The Validate verb is always implemented synchronously.

What is the Response Content Payload

The response payload of a Validate operation is user-definable.

12.8.6. Process

The *Process* verb is a request to a service provider to perform the corresponding operation on the business object associated with the service. It is generally used for operations that orchestrate multiple other operations, are intended to achieve a specific business end result, or both.

When to use the Process Verb

Process is used as a single verb to categorize all business operations that result in content updates but do not fall in the Create/Update/Delete category to avoid a proliferation of verbs for specific business object actions.

Operations that use the Process verb *must* always result in creation or updating of one or more business objects and may represent an orchestration of other operations.

The Process verb can also be used for operations that act on a single business object, but have specific business semantics that cannot be communicated using an Update operation. In general, such actions are implemented in applications with distinct access control, and specific business rules that are applicable when the action is performed. Examples of such actions are state changes, updating meter readings on equipment, and so on.

Because multiple operations can be performed by the Process verb, potentially multiple Process verbs can be used in any given EBS.

Note. Operations that implement the Process verb can be implemented as synchronous or asynchronous—this is a deviation from the other verbs for which a consistent implementation pattern applies across all operations that use them.

What should be the Content Payload

The nature of the operation performed by a Process verb may require properties and values that are not part of the business object on which the operation is being performed, but are required by the business rules that are implemented by the operation. For example, approval of a sales order can record a comment as part of the approval, but the comment in itself may not be a property of the sales order.

In general, the request and response payload of operations that use the Process verb need the ability to reflect the method signature of the application, without a restriction that the content that forms the payload *must* come from the business object to which the service operation is associated.

To support the preceding, the payload of each Process operation is not restricted to content from the EBO definition. This is unlike all the other EBOs for which the EBM business content must be the same as or a subset of the EBO content.

Note: Currently, we do not support assembling Process EBM payloads using content from other business components—so a Process operation for credit verification that is defined for a customer party cannot include content from Sales Order EBO to build its message payload.

The List pattern used in the other generic verbs is also applicable here, but does not apply generically; that is, in an EBS, both a single and List implementation of a Process operation may exist, or just one or the other. Unlike the other generic verbs for which single and list are both consistently created for all EBOs, in the case of Process this is driven by the requirements of the corresponding operation.

What are the Verb Attributes

Not applicable.

What is the corresponding Response Verb

The Process verb has a paired ***ProcessResponse*** verb that is used in the response message for each Process EBM.

What is the Response Verb Payload

The payload of the response verb is specific to each process operation and is determined by the objective of the operation. Similar to the Process verb payload, there is no restriction that the content of the response is restricted to the content of the EBO.

12.8.7. Query

The *Query* verb is a request to a service provider to perform a query on a business object using the content provided in the payload of the Query message, and return the query result using the corresponding response message associated with the query. The requester can optionally request a specific subset of the response payload.

When to use the Query Verb

Similar to the other verbs, the Single and the List pattern apply to queries also. The use of Query for each of these patterns has been listed separately subsequently.

Note: The same verb applies to both the patterns, but the implementation and attributes applicable are completely different.

- Single Object Query Intended to Return One and Only One Instance

The Single Object Query operation is a simple get by ID operation that enables callers to look up an EBO by its identifier. It is intended to request a single instance of a business object by specifying the ID of the object and optionally a QueryCode and ResponseCode with a set of parameters and their values. The identifier of the object is specified in the DataArea of the Query EBM.

The single object query does not support any other query criteria to minimize the possibility of the query returning more than one object, and the response payload for the simple query is restricted to a single instance of the object being queried.

The Single Object Query contains the following elements:

- QueryCode within the Query element (optional)

  The QueryCode in a single object Query is used mainly as a supplement to the Identification element provided in the DataArea of the Query. The Query Code can be used for a single object query in cases in which there is a need to communicate more than the ID to the query service provider to successfully run the query. The code could be used to either refine the query, or to select the object to be queried based on the Query Code.

Note: For this to happen, the service provider should implement the processing of such a code. Currently, we do not predefine any generic Query Codes as part of the EOL.

- ResponseCode within the Query Element (optional)

  The ResponseCode is a predefined code that instructs a query service provider to filter the response content of the EBO to a specific subset of the response object.

  The return payload for a generic Query is always the entire EBO; that is, by default, the response payload for a QuerySalesOrder operation is always the entire SalesOrder with lines, shipment, and so on. If the requester wants the service provider to provide only the SalesOrder header with none of the child components, then the ResponseCode can be used as an instruction to the service provider to build the response payload accordingly.

Note. For this to happen, the service provider should implement the processing of such a code. Currently, we do not predefine any generic Request or Response Codes as part of the EOL.

What should be the Content Payload

The payload of a single object query is always the ID of the object to be queried. This is specified within the Identification element of the DataArea.

```
<QueryAccountBalanceAdjustmentEBM>
   <corecom:EBMHeader>

   </corecom:EBMHeader>
   <DataArea>
         <Query>
         </Query>
         <QueryAccountBalanceAdjustment>
               <corecom:Identification>
                     <corecom:ID>1005</corecom:ID>
```

```
                </corecom:Identification>
                <Custom/>
            </QueryAccountBalanceAdjustment>
        </DataArea>
    </QueryAccountBalanceAdjustmentEBM>
```

What are the Verb Attributes

The simple Query can have an optional getAllTranslationsIndicator to indicate whether the service provider is expected to provide all translations to be populated in the response for all translatable elements. The default is to bring back data in the language of the request only.

Based on the preceding, there are ways in which in which a simple query can be constructed:

- **Simple Query with just ID:** An example of querying for a single object would be querying Purchase Order with ID=”3006”. No other code or parameters are needed in this example.
- **Simple Query with QueryCode:** As an example, consider an application that maintains a distinction between a person as a customer versus an organization as a customer. A single Customer Query service exists, but to successfully run the query, the service provider needs to be told whether the ID to be queried belongs to an organization or to a person. In this case, the QueryCode can be used to communicate the Person/Organization information.

List Query That Can Return Multiple Instances

The single object query does not support any search criteria beyond a simple search by identification, and can return only one instance of an object. All other queries are treated as List queries.

A List Query may return multiple records in response to the query and supports the ability to build complex queries.

The List Query is implemented using the following elements:

QueryCode within the Query element (optional)

The QueryCode in a List Query serves as a means for a service provider to limit the possible queries that can be built using a List Query. In the absence of a QueryCode, a service provider should be able to generically support all possible queries that can be communicated using the QueryCriteria element explained subsequently.

Note that for this to happen, the service provider should implement the processing of such a code. Currently, we do not predefine any generic Query Codes as part of the EOL.

ResponseCode within the Query Element (optional)

The ResponseCode is a predefined code that instructs a query service provider to filter the response content of the EBO to a specific subset of the response object. For list queries, this can serve as an alternate mechanism instead of specifying the ResponseFilter element of a Query.

The return payload for a generic Query is always the entire EBO. For example, by default, the response payload for a QuerySalesOrder operation is always the entire SalesOrder with lines, shipment, and so on. If the requester wants the service provider to provide only the SalesOrder header with none of the child components, then the ResponseCode can be used as an instruction to the service provider to build the response payload accordingly.

Note that for this to happen, the service provider should implement the processing of such a code. Currently, we do not predefine any generic Request or Response Codes as part of the EOL.

QueryCriteria (1 to n instances)

The QueryCriteria element enables a user to build a complex query statement *on a specific node* of the object being queried. At least one QueryCriteria element must be specified for a List Query.

More than one QueryCriteria element can be present in a Query *if the query spans multiple nodes* of the object being queried. Multiple Query criteria is similar to a subselect in that the result set of one Query Criteria is filtered by the second to arrive at a smaller subset of records.

Each QueryCriteria element consists of:

QualifiedElementPath (0 or 1 instance): This enables the user to specify the node on which the QueryCriteria applies. If the element is not included in the Query, or if it is included with no value or a NULL value, or if it has a value of /, the query criteria applies to the root element of the object.

QueryExpression (exactly 1 instance, with optional nesting of other QueryExpressions within it): This element is the container for the actual query. The QueryExpression is a nested construct that enables you to define complex queries. Each QueryExpression consists:

- A **logicalOperatorCode attribute** that can have a value of either AND or OR. These attributes can be specified to indicate the logical operation to be performed on the content (nested multiple QueryExpressions *or* list of ValueExpressions) within the QueryExpression.
- A choice of one or more QueryExpressions or one or more ValueExpressions.
  - A QueryExpression may contain other QueryExpressions when you need to combine multiple AND or OR operations in a query.
  - If the Query can be expressed with a single AND or OR operator, then it can be built using multiple ValueExpressions within an outer QueryExpression.

ValueExpression (1 or more instances): Each ValueExpression represents an assignment of a value to a specific node within the node represented by the QualifiedElementPath (or the root node if the QualifiedElementPath is not present). The ValueExpression is specified using:

- An **ElementPath** element that represents either a node (expressed as a simpleXPath expression) to which the query value is being assigned, or a Code in case the element cannot be found in the document. For example, /SalesOrderLine/Status/Code or just StatusCode. No explicit way is available to indicate whether the ElementPath contains a code or an Xpath expression.
- **Value** element that contains the value assigned to the ElementPath, for example, Approved.
- A **queryOperatorCode** attribute that specifies the operator applicable to the Value assigned to the ElementPath. The possible operators are EQUALS, NOT_EQUALS, GREATER_THAN, GREATER_THAN_EQUALS, LESS_THAN, LESS_THAN_EQUALS, CONTAINS, DOES_NOT_CONTAIN, LIKE, NOT_LIKE, LIKE_IGNORE_CASE, NOT_LIKE_IGNORE_CASE, IS_BLANK, IS_NOT_BLANK, BETWEEN, NOT_BETWEEN, IN, NOT_IN

SortElement (0 or more instances): Each QueryCriteria can have one or more SortElements defined. A SortElement is used to request the Query result set to be sorted using the criteria specified in the SortElement. Each SortElement has an optional sortDirectionCode attribute that identifies the order of sorting—ASC (ascending) or DESC (descending).

```
<QueryCriteria>
   <QueryExpression>
         <ValueExpression>

         </ValueExpression>
```

```
   </QueryExpression>
   <SortElement sortDirection=”DESC”>/OrderDateTime</SortElement>
   <SortElement sortDirection=”ASC”>/Description</SortElement>
</QueryCriteria>
```

In the preceding example, the result set of the QueryExpression is to be sorted in descending order of OrderDateTime and ascending order of Description.

If multiple QueryCriteria exist, then each can have its own SortElement—so the result set of one QueryCriteria is sorted, and then once the next QueryCriteria filter is applied, the resultant subset is sorted using the SortElement specified for that QueryCriteria.

```
<QueryCriteria>
   <QueryExpression>
         <ValueExpression>

         </ValueExpression>
   </QueryExpression>
   <SortElement sortDirection=”DESC”>/OrderDateTime</SortElement>
   <SortElement sortDirection=”ASC”>/Description</SortElement>
</QueryCriteria>
<QueryCriteria>
   <QualifiedElementPath>/SalesOrderLine/SalesOrderLineBase</QualifiedElem
entPath>
   <QueryExpression>
   ...
   </QueryExpression>
   <SortElement>/SalesOrderLine/SalesOrderLineBase/ListPrice</SortElement>
</QueryCriteria>
```

In the preceding example, the SalesOrder root query is sorted by OrderDateTime and Description, while the child node SalesOrderLine is sorted by price.

QueryCriteria Examples

Example 1: This is an example of a query with a single QueryCriteria element and a single QueryExpression element that contains only ValueExpression elements. The query to be run is Query SalesOrder, in which “SalesOrder/CurrencyCode **=** “USD” **AND** “SalesOrder/OrderDateTime **=** “2003-12-04”. The query expression is defined for the root node; hence, the QualifiedElementPath is not present (optional).

This is modeled as two ValueExpressions nested within a QueryExpression. The logicalOperatorCode on the QueryExpression indicates the operation **(AND)** to be performed across the two ValueExpressions.

```
<Query>
<QueryCriteria>
         <QueryExpression logicalOperatorCode="AND">
               <ValueExpression queryOperatorCode="EQUALS">

   <ElementPath>/SalesOrderBase/CurrencyCode</ElementPath>
                     <Value>USD</Value>
               </ValueExpression>
               <ValueExpression queryOperatorCode="GREATER_THAN_EQUALS">
```

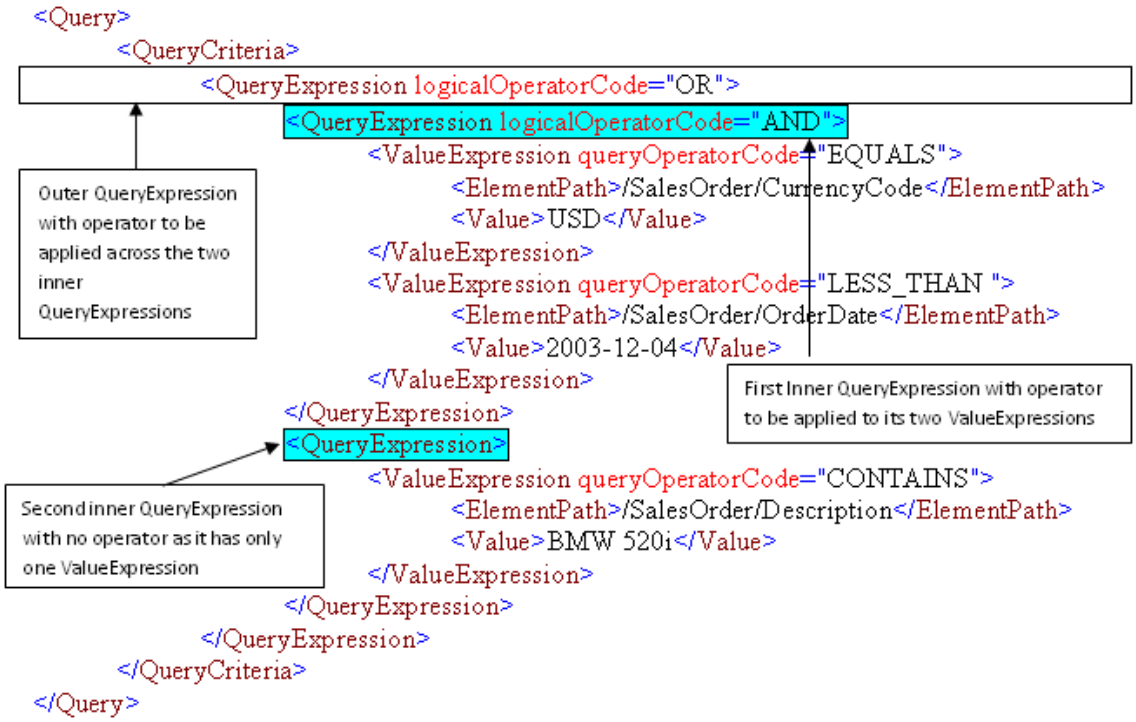
```
    <ElementPath>/SalesOrderBase/OrderDateTime</ElementPath>
                    <Value>2003-12-04</Value>
                </ValueExpression>
            </QueryExpression>
    </QueryCriteria>
</Query>
```

Example 2: This is an example of a Query with a single QueryCriteria but with nested QueryExpressions. The query to be run is Query SalesOrders, in which SalesOrder/CurrencyCode=USD **AND** SalesOrder/OrderDateTime<2003-12-04 **OR** SalesOrder/Description **CONTAINS** "BMW 520i". Both the query expressions are defined for the root node; hence, the QualifiedElementPath is not present (optional).

Note: When nested QueryExpressions exist, they are all on the same QualifiedElementPath.

This is modeled as two QueryExpressions nested within an outer QueryExpression.

- The outer QueryExpression identifies the operand to be applied to the two inner QueryExpressions (OR). The ValueExpressions contain the actual query data with the query operator to be applied to the data element



Example 3: This is an example of a Query with multiple QueryCriteria. Note that when multiple QueryCriteria exist, no logical operation is present that is applicable across them—they are the equivalent of running the query specified in the first QueryCriteria element, then applying the second QueryCriteria to the result of the first.

The query to be executed is: Query CustomerParty where Type = GOLD and filter the result set to only accounts whose status is "ACTIVE".

This is implemented as two QueryCriteria. The first is to query the CustomerParty and retrieve all Customers of TYPE-“GOLD”. This query is run on the CustomerParty root node.

The result set of this query is then filtered by applying the second Query Criteria. This will query the CustomerParty/Account node to get all CustomerParty Accounts that have STATUS = “ACTIVE”.

```
<Query>
   <QueryCriteria>
         <QueryExpression>
               <ValueExpression queryOperatorCode="EQUALS">
                     <ElementPath>/Type</ElementPath>
                     <Value>GOLD</Value>
               </ValueExpression>
         </QueryExpression>
         <SortElement>/LastName</SortElement>
   </QueryCriteria>
   <QueryCriteria>
         <QualifiedElementPath>/CustomerAccount</QualifiedElementPath>
         <QueryExpression>
               <ValueExpression queryOperatorCode="EQUALS">

   <ElementPath>/CustomerAccount/Status/Code</ElementPath>
                     <Value>ACTIVE</Value>
               </ValueExpression>
         </QueryExpression>
   </QueryCriteria>
</Query>
```

ResponseFilter (0 to 1 instance)

The ResponseFilter enables a requester to indicate which child nodes he or she is interested or not interested in. The excluded child nodes will not be populated by the application when the response to the query is being built. If supported by participating applications, this feature will improve performance by not querying the nodes that are excluded from the query.

Example 1: Requesting for only the InvoiceLine to be returned in response to a QueryInvoice message:

```
<Query>
   <QueryCriteria>

   </QueryCriteria>
         <ResponseFilter>
               <ChildComponentPath>InvoiceLine</ChildComponentPath>
         </ResponseFilter>
</Query>
```

Example 2: Returning all QueryInvoice message content except for Charge and PaymentTerm:

```
<Query>
   <QueryCriteria>

   </QueryCriteria>
   <ResponseFilter>
         <ExclusionIndicator>true</ExclusionIndicator>
         <ElementPath>Charge</ElementPath>
         <ElementPath>PaymentTerm</ElementPath>
   </ResponseFilter>
</Query>
```

Note: In the absence of a very comprehensive framework for processing queries, this option is difficult to implement practically, because in theory infinite ways are available by which the query can be built, and the service provider will not be able to process all possible ways in which the QueryCriteria is specified.

What should be the Content Payload

No content payload for a List Query is available—the query is defined entirely within the Verb element of the DataArea.

Verb Attributes

- **getAllTranslationsIndicator (optional):** A Query can have an optional getAllTranslationsIndicator to indicate whether the service provider is expected to provide all translations to be populated in the response for all translatable elements. The default is to bring back data in the language of the request only.
- **recordSetStart (optional):** This is an instruction to the query service provider to return a subset of records from a query result set, with the index of the first record being the number specified in this attribute.

  As an example, consider a query that will return 200 records in the result set. The requester can invoke the query with a recordSetStart parameter set to “101”, in which case the service provider is expected to process this value and build a result set that contains the 101st to the 200th record of the result set.
- **recordSetCount (optional):** The presence of this attribute is an instruction to the service provider to return the same attribute with the count of the number of records in the response to the Query. Absence of this attribute indicates that a record set count is not expected in the response to the query.
- **maxItems (optional):** This is an instruction to the query service provider that the maximum number of records returned in the query response should not exceed the value specified for this attribute.

  The result set of a query may result in multiple records that meet the query criteria, but the query service Requester may be able to process only a specific number of records at a time. For example, a query might result in a result set of a 1000 records, but the query Requester can process only 100 records at a time. The service Requester can use the maxItems attribute to instruct the service provider to return only 100 records in the response.

What is the Corresponding Response Verb

The Query Verb has a paired ***QueryResponse*** verb that is used in the response message for each Query EBM.

What is the Response Verb Payload

The payload of the response verb is typically the entire business object.

12.9. Invoking the ABCS

This section assumes that you have completed the ABCS construction. The different ways in which your ABCS can be invoked are discussed here.

An ABCS can be invoked by an application or by another service. The service, if it happens to be an AIA artifact, could be either a transport adapter or an EBS. This section describes what needs to be done in each of the three scenarios.

12.9.1. How to Invoke an ABCS Directly from an Application

For the inbound interactions of applications with the ABCS:

1. Start with identifying the participating applications.
2. Analyze the integration capabilities of each participating application.
3. Work with the application providers (developers) to decide the best way to interact with the application to achieve the needed functionality.

   The interaction mechanism can be one of the following:

   - SOAP WebService
   - Events/Queues
   - JCA

4. Obtain relevant details from the applications in situations in which the interactions between the participating applications and the ABCS happen through a message queue adapter or a JCA Adapter.

   These details will be used in configuring the adapters. The configuration will result in the WSDL creation. Care must be taken to ensure that the environment-specific details are configured in relevant resource files on the server and not directly in the WSDLs.

12.9.2. How to Invoke an ABCS Using Transport Adapters

When the Requester ABCS is invoked by the transport adapters, the interaction between ABCS and the transport adapters is using either SOAP Web Service or native binding.

More details are specified in the section Interfacing with Transport Adapters.

The details on establishing the inbound connectivity between adapters and the ABCS are given in Establishing Resource Connectivity.

12.9.3. When Does an Enterprise Business Service Invoke an ABCS

An EBS will invoke:

- A provider ABCS, which implements an EBS operation. This is true because an EBS provides the mediation between the requesting services and providing services.
- A requester ABCS to send the response to it. In scenarios in which a requesting service is waiting for a delayed response, the delayed response from the providing service can be routed by a Response EBS to the waiting Requester ABCS.

13. Completing ABCS Development

This chapter describes how to develop Application Business Connector Services (ABCSs) for extensibility, handle errors and faults, enable transactions, guarantee message delivery, enable Composite Application Validation System (CAVS), secure the ABCS, and version.

This chapter discusses the following topics:

13.1. Developing Extensible ABCS

An ABCS, regardless of whether it is requester or provider specific, has the ability to invoke custom code either two or four times during its execution. These will serve as extensibility points.

The ABCS supporting request/response pattern in either synchronous or asynchronous mode has four extensibility points. An ABCS supporting fire-and-forget patterns has two extensibility points. You can develop “add-ins” and have them hooked to these extensibility points. These “add-ins” - customer-developed services behave as an extension to the delivered ABCS. Each extension point will allow one hook so only a single customer extension can be plugged in.

This section describes the mechanism for creating ABCSs with extensible services, which allows you to have service implementations that require no modifications to the delivered ABCS.

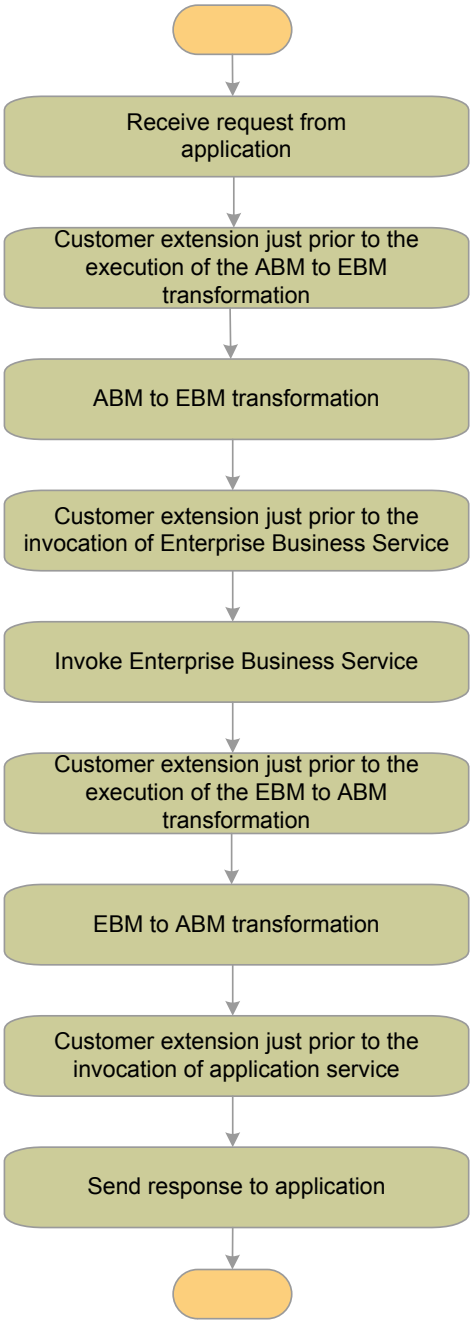
13.1.1. Introduction to Enabling Requester ABCS for Extension

You can hook your custom code to these four extensibility points:

- Just prior to the execution of transformation of Application Business Message (ABM) to Enterprise Business Message (EBM)
- Just prior to the invocation of the Enterprise Business Service (EBS)
- Just prior to the execution of transformation of EBM to ABM
- Just prior to the invocation of callback service or response return

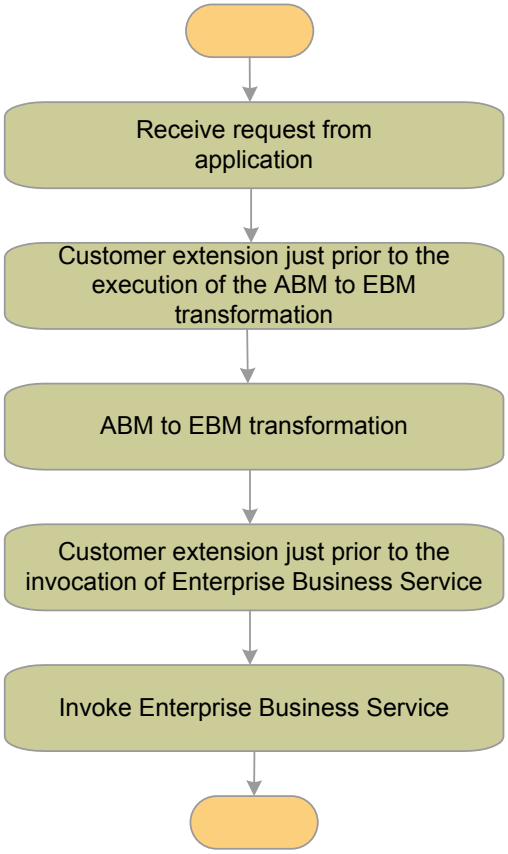
The third and fourth extension points are available only in ABCS implementing request/response pattern.

The following diagram depicts the high-level flow of activities in a requester-specific ABCS. The diagram assumes that the EBS with which it is interacting employs a request/response interaction style. Note that the steps for executing the customer extension to do additional tasks are optional.



Extending the request/response interaction style

The following diagram shows the high-level flow of activities in a requester-specific ABCS. The diagram assumes that the EBS with which it is interacting employs a fire-and-forget interaction style. Note that the steps for executing the customer extension to do additional tasks are optional.



Requester-specific ABCS using fire and forget interaction style

The first extensibility point made available to the implementers of the requester ABCS can be used to perform custom message inspection. This extensibility point can be used to inject code to perform tasks such as custom validation, message alteration, message filtering etc. The custom code will have access to the ABM that is about to be transformed and can return either an enhanced ABM or raise a fault.

The second extensibility point can be used to perform custom message augmentation. The extensibility point can be used to inject code to perform tasks such as EBM enhancement, custom validation etc. The custom code will have access to EBM that is about to be used for invocation of EBS and can return either an enhanced EBM or raise a fault.

The third extensibility point can be used to inject code to perform tasks such as custom validation, message alteration, message filtering etc. The custom code will have access to EBM that is about to be transformed to ABM. The custom code can return either an altered EBM or raise a fault.

The fourth extensibility point can be used to inject code to perform tasks such as ABM enhancement, custom validation etc. The custom code will have access to ABM that is about to be used for invocation of callback services. The custom code can return either an altered ABM or raise a fault

13.1.2. Introduction to Enabling Provider ABCS for Extension

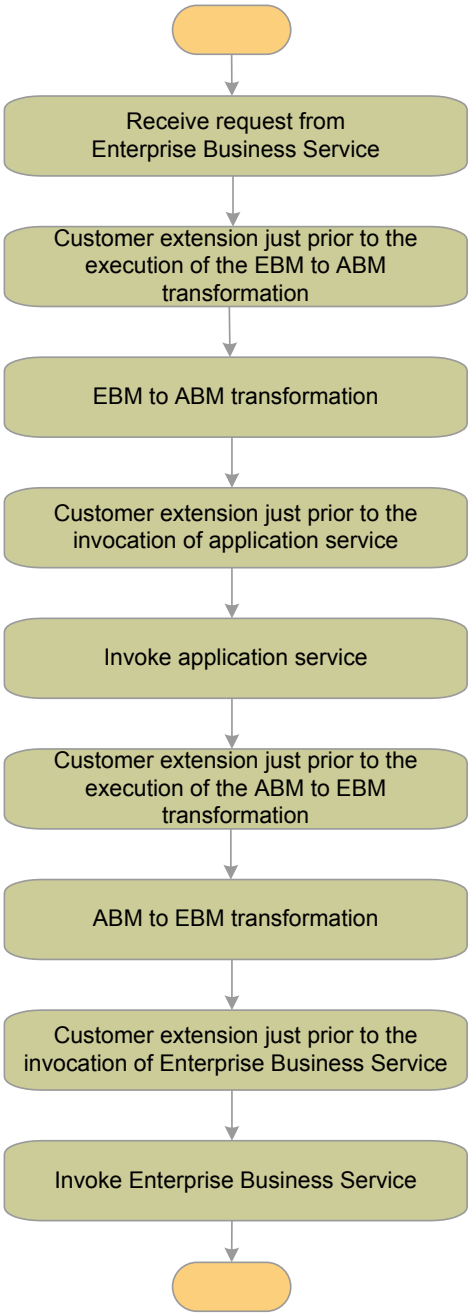
Provider ABCSs provide the following four extensibility points to allow customers to hook their custom code to them:

- Just prior to the execution of transformation of EBM to ABM
- Just prior to the invocation of Application Service

- Just prior to the execution of transformation of ABM to EBM
- Just prior to the invocation of callback EBS or return of response message

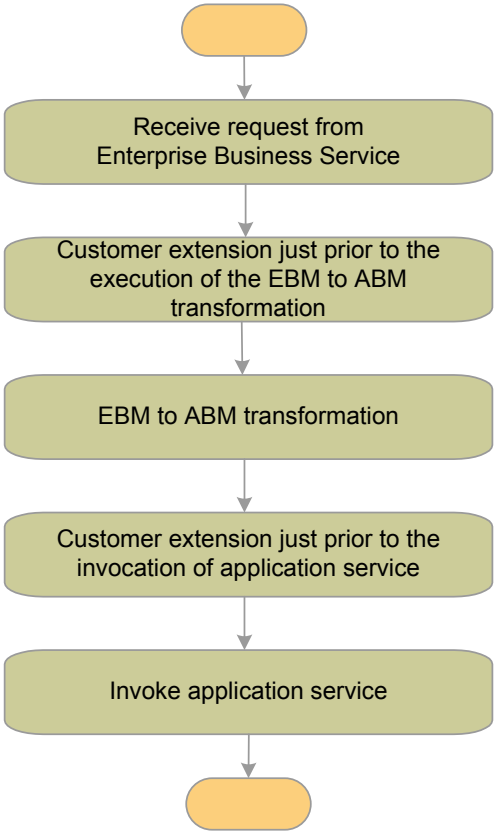
The third and fourth extension points will be available only in the ABCS implementing request/response pattern.

The following activity diagram depicts the high-level flow of activities in a provider-specific ABCS. The diagram assumes that the EBS with which it is interacting employs a request/response interaction style.



Provider-specific ABCS using request/response interaction style

The following activity diagram depicts the high-level flow of activities in a provider-specific ABCS. The diagram assumes that the EBS with which it is interacting employs a fire-and-forget interaction style.



Provider-specific ABCS using fire-and-forget interaction style

The first extensibility point made available to the implementers of the Provider ABCS can be used to inject code to perform tasks such as custom validation, message alteration, message filtering etc. The custom code will have access to EBM that is about to be transformed. The custom code can return either an enhanced EBM or raise a fault.

The second extensibility point can be used to perform custom message augmentation. The extensibility point can be used to inject code to perform tasks such as ABM enhancement, custom validation etc. The custom code will have access to ABM that is about to be used for invocation of application service. The custom code can return either an enhanced ABM or raise a fault.

The third extensibility point can be used to inject code to perform tasks such as custom validation, message alteration, message filtering etc. The custom code will have access to ABM that is about to be transformed to EBM. The custom code can return either an altered ABM or raise a fault.

The fourth extensibility point can be used to perform custom message augmentation. The extensibility point can be used to inject code to perform tasks such as EBM enhancement, custom validation etc. The custom code will have access to EBM that is about to be used for invocation of callback services. The custom code can return either an altered EBM or raise a fault.

13.1.3. How to Design Extensions-Aware ABCS

Each of the extensibility points is modeled as a service operation having a well-defined interface. ABCS authors define these interfaces. The ABCS implementers at the customer site have the option to implement the interfaces to instill the specialized behavior. The extensibility interfaces consist of service operations that the ABCS invokes to execute the custom message enrichment or transformation or validations specific code implemented by the customer.

Each ABCS will be accompanied by a corresponding customer extension service. A request/response ABCS will have four extensibility points, therefore, the ABCS extension service will have four service operations. For a fire-and-forget ABCS, the corresponding ABCS extension service will have two service operations. For the WSDL to be created for the customer extension ABCS, the architecture team will provide the WSDL template. The extension service-specific annotation capabilities are not available at this time.

As delivered, the implementation of these service operations for all of the ABCS extension services will be to invoke the same piece of code that will always return the same message. This piece of code has been implemented as a servlet.

The ABCS will be developed to invoke the appropriate service operation at each of the extensibility points. To minimize the overheads, a check will be made to ensure that the customer has implemented the service for the relevant extensibility interface. Oracle AIA Configuration properties will have one property for each extensibility point. Setting the property to 'Yes' indicate that there is a custom implementation for the extensibility point. The default value for these properties is No, therefore, the ABCS will never invoke the implementations of these extensions as they were delivered.

The following table lists the service operations for the requester ABCS-specific extensibility points:

Extensibility Point	Service Operation Name
Just prior to the execution of transformation of ABM to EBM	Pre-ProcessABM
Just prior to the invocation of the EBS	Pre-ProcessEBM
Just prior to the execution of transformation of EBM to ABM	Post-ProcessEBM
Just prior to the invocation of callback service or response return	Post-ProcessEBM

The following table lists the service operations for the provider ABCS-specific extensibility points:

Extensibility Point	Service Operation Name
Just prior to the execution of transformation of EBM to ABM	Pre-ProcessEBM
Just prior to the invocation of Application Service	Pre-ProcessABM
Just prior to the execution of transformation of ABM to EBM	Post-ProcessABM
Just prior to the invocation of callback EBS or response return	Post-ProcessEBM

AIA recommends that the ABCS and that the customer extension services be co-located. In SOA 11g, when the services are deployed on the same server, the SOA 11g runtime uses native invocation.

AIA recommends that the ABCS should set the transaction property appropriately to enlist the extension service as part of its own transaction.

For more information, see How to Ensure Transactions in AIA Services.

13.1.3.1. Configuration Parameters

Operations at the extension points are invoked based on the values of the specific parameters in the file AIAConfigurationProperties.xml. Each service configuration section specific to an ABCS requires that these parameters be specified. The parameters for each of the four extension points are:

- ABCSExtension.PreProcessABM
- ABCSExtension.PreProcessEBM
- ABCSExtension.PostProcessEBM
- ABCSExtension.PostProcessABM

These parameters must be configured with value '***true'*** for a service invocation. When these parameters are not specified in the configuration section for an ABCS, the value considered by default is '***false'***.

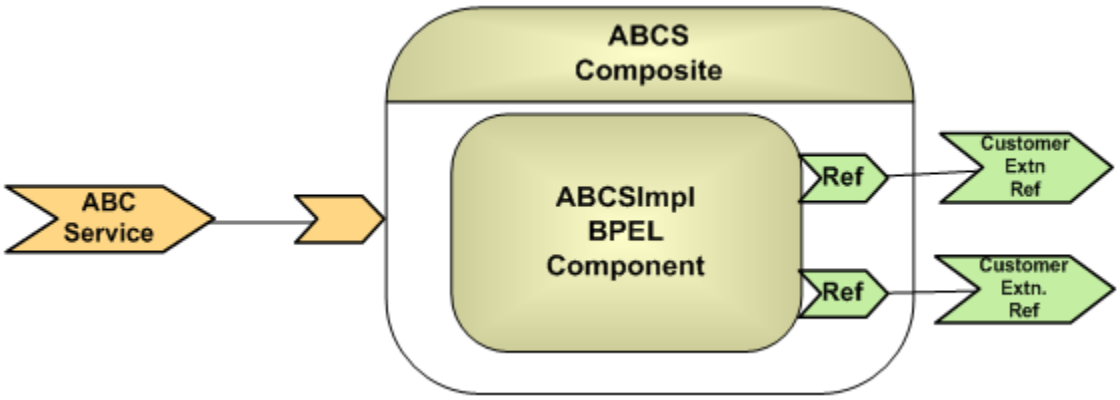
13.1.4. Designing an ABCS Composite with Extension

When an ABCS composite is developed as an extension-enabled service:

- The ABCS is implemented as a component (using BPEL technology) in the composite.
- The extension service is referred to by the ABCS composite as an external Web service.

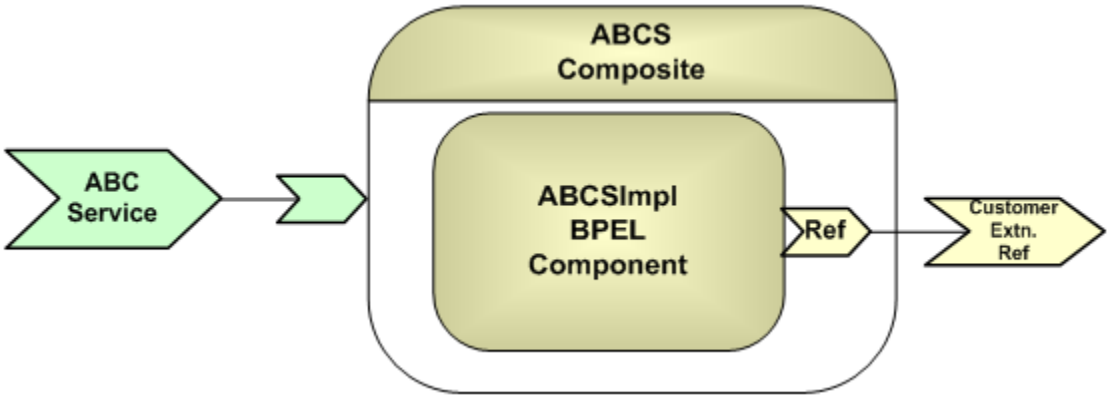
  The service at the extension point is developed in a separate composite if it is developed over an Oracle Fusion Middleware platform.

When different external extension services are referred to by the ABCS composite, more than one hook exists from the ABCS composite to the External Service. That is, when an ABCS invokes two different services at two of its extension points, the composite must be designed to have two distinct external references, as shown in this example:



Example of composite with two distinct external references

However, when an ABCS composite invokes two distinct operations that are exposed on the **same** external service, then the ABCS composite will have only one external reference, as shown in the following example:



Example of composite with one external reference

13.1.5. Defining Service at Extension Points

At the extension points, partner links are defined to set up the conversational relationship between two services by specifying the roles played by each service in the conversation and specifying the port type provided by each service to receive messages within the context of the conversation.

This is accomplished with the help of a Web Services Description Language (WSDL) file that describes the services the partner link offers. The WSDL is an XML document that describes all the Service Provider contracts to the service consumers.

The WSDL separates the service contract into two distinct parts, the Abstract WSDL and the Concrete WSDL:

- The **Abstract WSDL** includes elements such as types, messages that define the structure of the parameters (input and output types), fault types, and the port type, which is known as the interface.
- The **Concrete WSD**L includes bindings to protocols, concrete address locations, and service elements.

13.1.6. Defining a Service Using an Abstract WSDL

An abstract WSDL defines the external reference service at design time. This WSDL provides interfaces to the operations to be invoked at the extension points. It should also include or import the schemas for the application business object (ABO) and Enterprise Business Object (EBO). It is devoid of communication transport protocols, network address locations, and so on.

The abstract WSDL used to define the extension point service should be placed in the project folder. Do not push this into MDS, unlike other abstract WSDLs of the AIA services.

Note: An abstract WSDL may be used temporarily for design-time modeling only. At the time the composite is deployed, the binding should be specified.

When AIA Service Constructor is used to construct ABCS, it creates the extension service references in the composite.xml file.

When you use JDeveloper, follow these high-level steps to design the composite:

To design the composite to extension-enable ABCS:

1. In JDeveloper, open a SOA composite project.
2. Open the composite.xml in design mode.
3. To reference an extension point service, add a Web service as an external reference service in the References swim lane. Use the Abstract WSDL for design time modeling.

Note: This abstract WDSL will not be in the MDS. It is associated with the project and will be in the project folder.

4. Wire the BPEL component to the external reference component created in the previous step.

   When the composite is opened in the source mode, you will see code similar to the following example.

   This code example was reproduced from the composite.xml, where the extension service is defined using an abstract WSDL:

```
<reference name="SamplesCreateCustomerSiebelReqABCSImplExtExtension"

ui:wsdlLocation="SamplesCreateCustomerSiebelReqABCSImplExtExtensionAbstrac
t.wsdl">
        <interface.wsdl
interface="http://xmlns.oracle.com/ABCSImpl/Siebel/Samples/CreateCustomerS
iebelReqABCSImplExtExtension/V1#wsdl.interface(SamplesCreateCustomerSiebel
ReqABCSImplExtExtensionService)"/>
        <binding.ws port="" location=""/>
    </reference>
```

13.1.7. How to Specify a Concrete WSDL at Deployment Time

A concrete WSDL is a copy of the abstract WSDL used for defining the extension service. The concrete WSDL also defines the binding element that provides information about the transport protocol and the service element that combines all ports and provides an endpoint for the consumer to interact with the service provider.

Initially, at the time of development, the concrete WSDL points to the sample extension service that is shipped with the Foundation Pack.

You should push the concrete WSDL into the MDS repository to the folder ‘ExtensionServiceLibrary’.

13.1.7.1. Populating the binding.ws Element in the composite.xml

To invoke the external reference service, a runtime WSDL with concrete bindings must be specified in the composite.xml. The Port type in the WSDL should have a concrete binding. That is, in the composite, the attributes of the element, *binding.ws*, cannot be empty.

To deploy the composite that references an external Web service, which is defined using an abstract WSDL, the attributes of the element *binding.ws* must be populated, as shown below:

<binding.ws port="[namespace of the extension service as defined in the WSDL]/V1#wsdl.endpoint(<Name of the Service as given in the WSDL>/<Name of the Porttypeas given in the WSDL>" location="[location of the concrete WSDL in the MDS]" xmlns:ns="http://xmlns.oracle.com/sca/1.0"/>

The name of the Service is the value of the attribute definitions/name in the abstract WSDL.

This follows from naming conventions for the Service name in the ABCS composite. According to naming conventions, the name of the service is <name of the composite>, which in turn is the value of the attribute 'name' of the 'definitions' element in the WSDL.

At the time when the service at the extension point is developed and deployed by the customer, you should replace your concrete WSDL in the MDS with the file that is developed by the customer.

For more information, see Using MDS in AIA.

13.1.8. Designing Extension Points in the ABCS BPEL Process

The following section details the steps to be completed to provide extension points in a Requester ABCS with a one-way invocation call.

In a Requester ABCS with a request-only call to a service, two possible extension points exist. The first extension point is just prior to the transformation from ABM to the EBM, and second extension point is just prior to the invocation of the service. The service operations at these extension points are defined as Pre-ProcessABM and Pre-ProcessEBM, respectively. The service operation at the extension points is an invocation to Servlet that merely returns the payload.

13.1.9. How to Set Up the Extension Point Pre-ProcessABM

When AIA Service Constructor is used to construct ABCS, the extension point is already set up by the tool.

The Requester ABCS requires the following process activities in the order specified:

1. Switch

   The Switch activity determines if the service invocation at the extension point is to be made or not. This is achieved by checking the value of the property variable in the file AIAConfigurationProperties.xml. The name of the configuration parameter is ‘ABCSExtension.PreProcessABM ‘. Check this parameter for a value of ‘true’. This is achieved by using an appropriate ‘AIAXPathFunction’ in the switch expression.

2. Assign-Invoke-Assign

   The Assign-Invoke-Assign subsequence of process activities is embedded in the Switch activity.

   - Assign

     The Assign activity assigns the value of the input variable of the ‘receive’ step to the input variable of the ‘invoke’ step that follows.

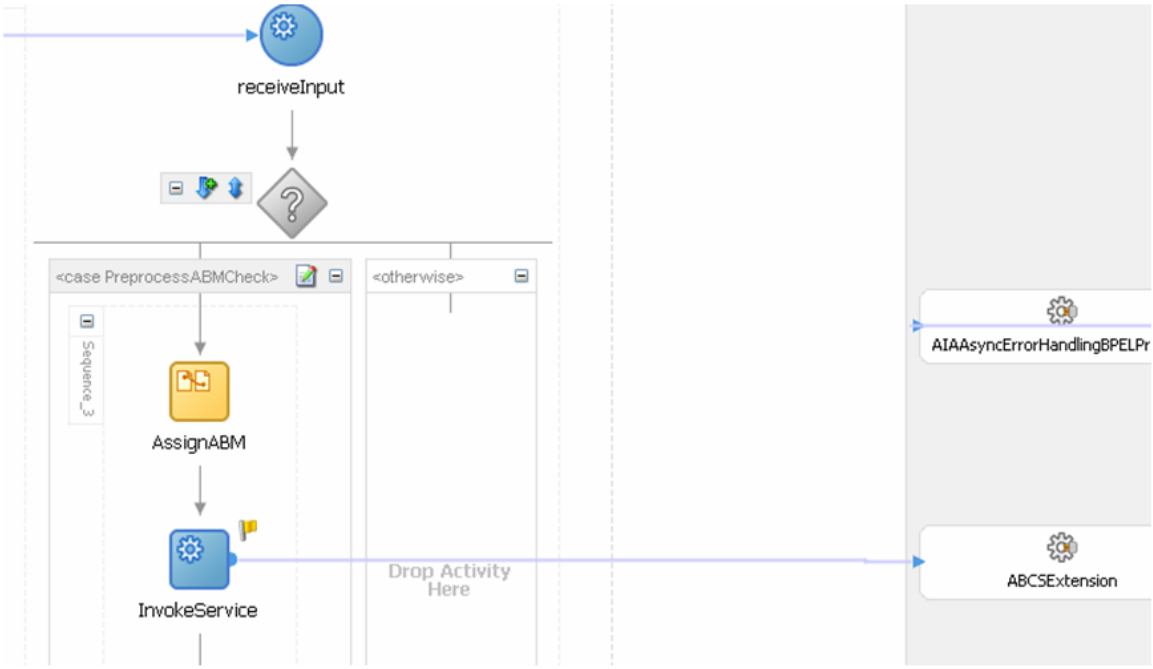
   - Invoke

The Invoke activity makes the service-call on the partner-link. The programming model for the ABCS extension points sets up a contract on the service to return the same payload that it receives.

- Assign

  The Assign activity assigns the value of the response payload from the service invocation to the variable of the process activity that follows.

This diagram illustrates the sequence:



Setting up the extension point Pre-ProcessABM

13.1.10. How to Set Up the Extension Point Pre-ProcessEBM

When AIA Service Constructor is used to construct ABCS, the extension point is already set up by the tool.

The Requester ABCS requires the following process activities in the order specified:

1. Switch

   The Switch activity determines if the service invocation at the extension point is to be made or not. This is achieved by checking the value of the property variable in the file AIAConfigurationProperties.xml. The name of the configuration parameter is 'ABCSExtension.PreProcessEBM'. Check the parameter for a value of 'true'. This is achieved by using an appropriate 'AIAXPathFunction' in the switch expression.

2. Assign-Invoke-Assign

   The Assign-Invoke-Assign subsequence of process activities is embedded in the Switch activity.

   - Assign

The Assign activity assigns the value of EBM to the input variable of the ‘invoke’ step that follows.

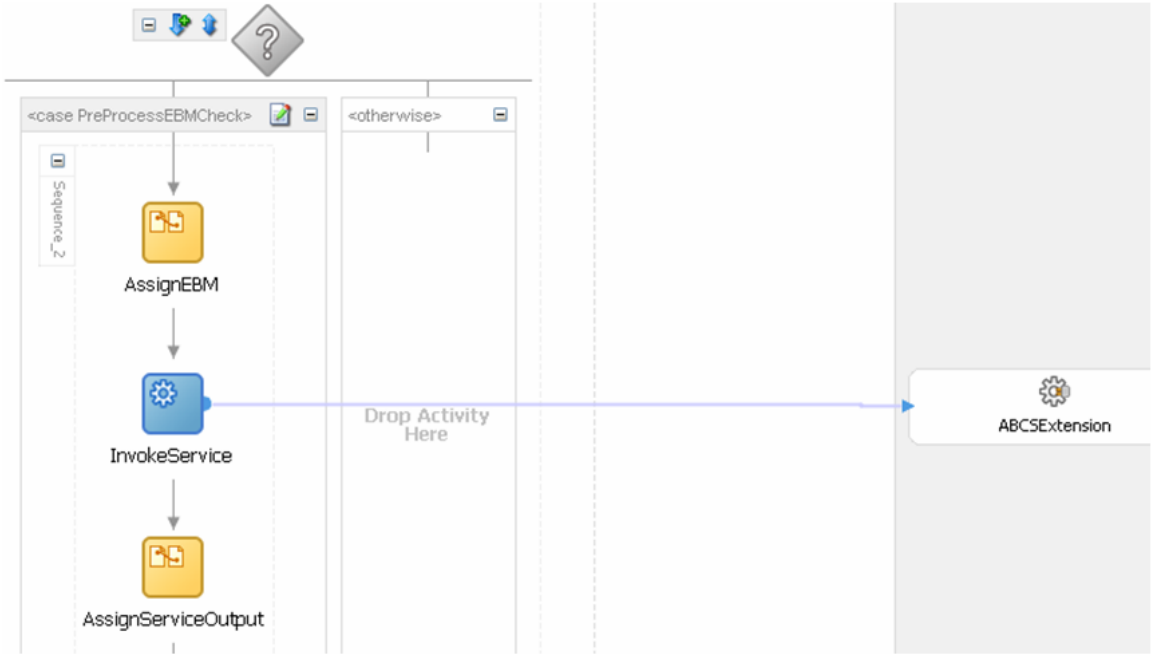
- Invoke

  The Invoke activity makes the service-call on the partner-link. The programming model for the ABCS extension points sets up a contract on the service to return the same payload that it receives.

- Assign

  The Assign activity assigns the value of the response payload from the service invocation to variable of the process activity that follows.

This diagram illustrates the sequence:



Setting up the extension point pre-process EBM

13.1.11. How to Test the Extensibility with Servlet as Sample Extension Service

The sample extension service used in the document is a java servlet that just will mirror the input payload back. The Servlet as the endpoint has the advantage that it can be used as partner-link service to test any extension. This is useful when the development teams have to test any extension-aware ABCS that have PartnerLink services defined using Abstract WSDL.

This example is from the WSDL:

```
<service name="mirrorAnyService">
          <port name="CreateCustomerSiebelReqABCSImplExt"
binding="tns:CreateCustomerSiebelReqABCSImplExt_Binding">
              <soap:address
location="http://{host}:{port}/MirrorServlet/mirror"/>
          </port>
```

```
</service>
```

The implementations for the methods PreProcessABM are not required; the SOAP request is treated as the servlet payload, and the servlet outputs back the entire payload. The SOAPAction element is also rendered a dummy since it is not used at the servlet-side.

The test servlet is a java file with name Mirror.java. When deployed, it is accessible at: http://[hostname].com:[portno]/MirrorServlet/mirror

13.2. Handling Errors and Faults

To determine how faults are handled and passed by a participating application, you need to make sure the application error handling capabilities are in line with the integration platform error handling capabilities.

13.2.1. How to Handle Errors and Faults

- In synchronous request-response message exchange patterns (MEPs), the requesting services are waiting for response.

  Whenever an error occurs in the provider services, an exception is raised and the fault message is propagated back to the requesting service.

- In asynchronous fire-and-forget MEPs, the requesting service does not expect a response.

  If an error occurs in the providing service, compensation may be needed. In such situations, the compensatory operations in EBS need to be used for triggering compensations.

- In asynchronous request-delayed response MEPs, the requesting service is in a suspended mode, waiting for a response.

  If an error occurs in the providing service, the response to the requesting service includes details about the error.

For more information about implementing error handling in each of the MEPs, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

- In an asynchronous MEP, the message initiated from a sender is persisted until it is successfully delivered to and acknowledged by the receiver, if an acknowledgement is expected.

  The sender and receiver are not necessarily the participating applications. Rather, they can be logical milestones in an Oracle AIA integration scenario. Each persistence store represents a milestone and may be a database, file system, or JMS persistence. Multiple milestones may be configured in an integration scenario to ensure the movement of messages from one persistence point to another.

For more information about configuring milestones for Guaranteed Message Delivery in an Integration flow, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

13.3. Working with Adapters

This section discusses working with transport and version adapters.

13.3.1. Interfacing with Transport Adapters

Use transport adapters to interface with the ABCS in these scenarios:

- For packaged applications, such as Siebel, PeopleSoft, J.D. Edwards, and SAP, the preferred route is to use the respective packaged-application adapters. These adapters can be deployed as JCA resource adapters. This solution is better than using the conventional SOAP interface.
- In situations for which the participating applications do not expose their business logic as Web services, interactions with these applications need to occur using technology adapters such as database adapters, JMS adapters, and so forth.

Transport adapters allow connectivity to the systems/applications that were not originally developed using Web services technologies. Some examples of applications that can use adapters are:

- Systems that use non-xml for communication
- Packaged software
- Database systems
- Data sources or persistent stores such as JMS, and so on

Investigate whether or not the services exposed by the participating applications provide support for proprietary message formats, technologies, and standards. If the applications that implement the functionality don't have inherent support for standards and technologies such as XML, SOAP, and JMS, then the transformations need to happen in the ABCS.

For example, the application might be able to receive and send messages only via files, and EDI is the only format it recognizes. In this case, the ABCS is responsible for integrating with the application using a file adapter, translating the EDI-based message into XML format, exposing the message as a SOAP message.

When to Use Adapters for Message Aggregation

In some situations, you will need to combine responses to a request that originated from multiple sources. For example, in the case of convergent billing in the telecommunication solution, the Application Business Connector Service for the getBillDetails EBS might have to retrieve details from multiple participating applications.

For more information about the Message Aggregation design pattern, see Working with AIA Design Patterns.

When to Use Adapters for Event Aggregation

The Event Aggregation model provides a comprehensive methodology for the business use case in which events, entity, or message aggregation is needed. In such scenarios, multiple events are raised before the completion of a business message, and all such fine-grained message events are consolidated into a single coarse-grained event.

In such use cases, a requester ABCS is invoked by an event consumer adapter service, which feeds the requester ABCS with an aggregated event message.

For more information about the event aggregation design pattern, see Working with AIA Design Patterns.

13.3.2. How to Develop Transport Adapters

Here are the high-level steps from the ABCS perspective.

To develop JMS Consumer Adapter:

1. Add JMS adapter in the Exposed Services swim lane.
2. Configure the JMS adapter service with the help of Adapter Configuration wizard.
3. Add a BPEL component in the Components swim lane.
4. Wire the BPEL component to the JMS adapter service.
5. Wire the BPEL component to the Referenced Service.
6. Open the BPEL component in design mode and add 'invoke activity' to invoke the JMS adapter partner link.
7. Complete the coding for the BPEL process.

To develop Portal DB Adapter:

1. Add a BPEL component in the Components swim lane.
2. Add DB adapter as external reference service in the References swim lane.
3. Configure the adapter service with the help of Adapter Configuration wizard.
4. Wire the BPEL component to the db adapter service.
5. Open the BPEL component in design mode and add 'invoke activity' to invoke the db adapter partner link.
6. Complete the coding for the BPEL process.

13.3.3. When to Put Adapters in a Single Composite

In principle, an ABCS composite is a component implemented along with other components and wires between those components. For example, you can implement a Requester ABCS composite using:

- A BPEL process component representing the ABCS process flow.
- BPEL or Mediator-based adapter components representing the adapters used or required by the process component.

- Both the process component and the adapter components promoted as ***Services*** of the composite in which they are defined.

An ABCS and a TransportAdapter service can be in the same composite and when they are, the composite name will be same as that of the ABCS. Alternatively, you can develop an ABCS service and a TransportAdapter service as separate composites.

AIA recommends that you put adapters that are interfaced with ABCS in a different composite from that of ABCS when the same transport adapter service could be used with multiple ABCSs.

13.3.4. Planning Version Adapters

When service providers release a new version of an application service, you may need to have multiple versions of it running concurrently when the consumer code is migrated.

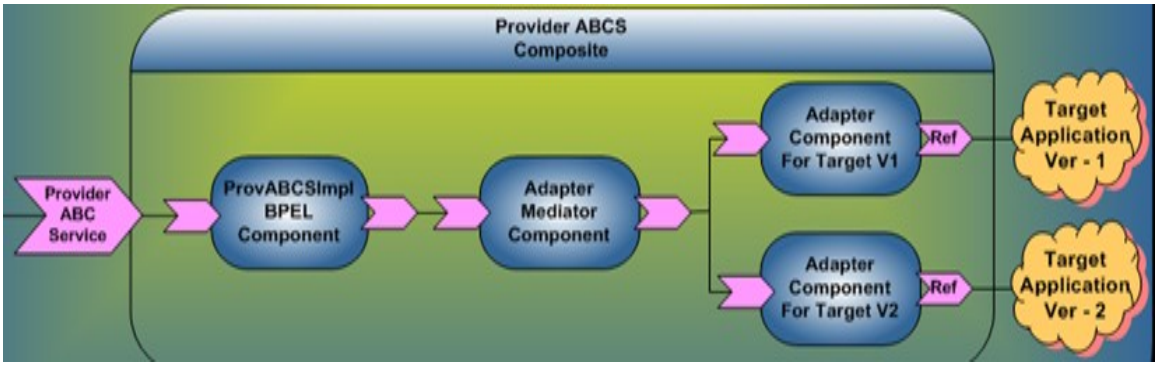
The version adapter allows the client request and response to consume a different release of a service and routes requests to the appropriate service endpoint based on the content.

Examples:

- For assets, the view definition being used in integration is different between Oracle 11.5.10 and R12.
- For payment authorization, the API name is different in Oracle 11.5.10 and R12.

Changes such as these between different versions of applications require a new adapter service to be created for each application version.

When the changes between different versions of applications are minor, introduce a version adapter, based on a Mediator component, between the existing connector service and the provider application, as shown in this diagram:



Using a version adapter

This approach ensures that the connector service remains agnostic of the version of the applications. This option should be considered when no transformations are needed or when input and output transformations in the version adapter are simple and do not involve extensive logic affecting the performance.

13.3.5. How to Configure a Version Adapter

To configure a version adapter:

The version adapter service is a mediator-based component that sits between the provider ABCS implementation service and the actual participating applications.

The mediator-based version adapter service should have references to all the application adapters:

1. Configure the routing rules in the version adapter to route to corresponding adapter services of the applications.
2. For each of the connecting application's adapters, two routing rules should exist to enable both content-based routing and property-based (from AIAConfiguration file) routing.
3. When the changes between different application versions are minor with regard to the content to be passed and the content is already available in the transformed ABM, use a transformation map to transform the input of the version adapter to the corresponding adapter service of the provider application.
4. Map the response from the different adapters to the schema that the connector service is expecting.

13.4. Developing ABCS for CAVS Enablement

This section provides instructions on how to develop Oracle AIA services that are ready to work with the Composite Application Validation System (CAVS). Specifically, this section discusses how to:

- Develop provider application business connector (ABC) services to be CAVS-enabled.
- Develop requester ABCSs to be CAVS-enabled.

Note: CAVS configurations are only required when simulators are a part of the testing scenario. These configurations lay the foundation for allowing services to route messages to simulators.

This section also provides the following supporting discussions:

- Describing CAVSEndpointURL value designation
- Purging CAVS-related cross-reference entries to enable rerunning of test scenarios

For more information about using the CAVS, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Working with the CAVS."

13.4.1. How to CAVS Enable Provider ABCS

Provider ABCSs that are asynchronous and invoke a callback to a ResponseEBS service must also CAVS-enable that invocation.

Developers must populate a value for the property:
Routing.<PartnerLinkName>.<TargetSystemID>.EndpointURI as shown below.

You must provide the above property in the service configuration file if the value for the property **Routing.<PartnerLink>.RouteToCAVS** is given as '***false'***.

To code a provider ABCS for dynamic CAVS-enabled PartnerLinks for invoking target participating application Web services:

1. Define the following service-level configuration properties for the provider ABCS:

```
<Property name="Default.SystemID">[DefaultTargetSystemID]</Property>
<Property
name="Routing.[PartnerlinkName].RouteToCAVS">[true|false]</Property>
<Property
name="Routing.[PartnerlinkName].[TargetSystemID].EndpointURI">[AppEndpoint
URL]</Property>
<Property
name="Routing.[PartnerlinkName].CAVS.EndpointURI">[CAVSEndpointURL]</Prope
rty>
```

   The CAVSEndPointURL value will be set at design time.

   For more information about the design-time designation of the CAVSEndPointURL, see Describing CAVSEndpointURL Value Designation.

2. Ensure the you have the following namespace prefixes defined in your BPEL process:

```
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:wsa=http://schemas.xmlsoap.org/ws/2003/03/addressing
xmlns:corecom=http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V2
```

3. Add this variable to your global variables section:

```
<variable name="SystemID" type="xsd:string"/>
```

4. Add an attachment named ***AddTargetSystemID.xsl*** to your BPEL project in the 'xsl' directory. Be sure to replace the **[ABCServiceNamespace]** and **[ABCServiceName]** tokens in the file appropriately.

5. Add the following assignment as the first step in the BPEL process. Be sure to replace the tokens appropriately:

```
<assign name="GetTargetSystemID">
    <copy>
        <from expression="ora:processXSLT('AddTargetSystemID.xsl',
bpws:getVariableData('[RequestEBMVariableName]',
'[RequestEBMPartName]'))"/>
        <to variable="[RequestEBMVariableName]"
            part="[RequestEBMPartName]"/>
    </copy>
    <copy>
        <from variable="[RequestEBMVariableName]"
              part="[RequestEBMPartName]"

query="/[NamespacePrefixedEBMName]/corecom:EBMHeader/corecom:
               Target/corecom:ID"/>
        <to variable="SystemID"/>
    </copy>
</assign>
```

6. Add the following `<scope>` once for each PartnerLink prior to its invoke activity:

   a. Replace the tokens in the `AssignDynamicPartnerlinkVariables` assignment activity to set the variables appropriately.

b. Update the PartnerLink name token in the `AssignPartnerlinkEndpointReference` assignment activity.

c. Updating the embedded Java code should not be necessary.

```
<scope name="SetDynamicPartnerlinkScope">
    <variables>
        <variable name="TargetEndpointLocation" type="xsd:string"/>
        <variable name="EndpointReference"
element="wsa:EndpointReference"/>
        <variable name="ServiceName" type="xsd:string"/>
        <variable name="PartnerLinkName" type="xsd:string"/>
        <variable name="EBMMsgBpelVariableName" type="xsd:string"/>
        <variable name="EBMMsgPartName" type="xsd:string"/>
    </variables>
    <sequence name="SetDynamicPartnerlinkSequence">
        <assign name="AssignDynamicPartnerlinkVariables">
            <copy>
                <from expression="'{[ABCServiceNamespace]}[ABCServiceName]
                 '"/>
                <to variable="ServiceName"/>
            </copy>
            <copy>
                <from expression="'[PartnerlinkName]'"/>
                <to variable="PartnerLinkName"/>
            </copy>
            <copy>
                <from expression="'[RequestEBMVariableName]'"/>
                <to variable="EBMMsgBpelVariableName"/>
            </copy>
            <copy>
                <from expression="'[RequestEBMPartName]'"/>
                <to variable="EBMMsgPartName"/>
            </copy>
        </assign>
        <bpelx:exec name="GetTargetEndpointLocation" language="java"
                    version="1.5">
            <![CDATA[/*-----------------------------------------------------
---
This code snippet will derive the dynamic endpoint URI for a partnerlink.
-----------------------------------------------------------------*/

java.lang.String serviceName =
(java.lang.String)getVariableData("ServiceName");
java.lang.String partnerLinkName =
(java.lang.String)getVariableData("PartnerLinkName");
java.lang.String cavsEndpointPropertyName =
"Routing."+partnerLinkName+".CAVS.EndpointURI";
java.lang.String ebmMsgBpelVariableName =
(java.lang.String)getVariableData("EBMMsgBpelVariableName");
java.lang.String ebmMsgPartName =
(java.lang.String)getVariableData("EBMMsgPartName");
java.lang.String systemIdBpelVariableName = "SystemID";
java.lang.String targetEndpointLocationBpelVariableName =
"TargetEndpointLocation";
java.lang.String routeToCavsPropertyName =
"Routing."+partnerLinkName+".RouteToCAVS";
```

```
java.lang.String defaultSystemIdPropertyName = "Default.SystemID";
java.lang.String targetEndpointLocation = null;
java.lang.String targetID = null;
boolean addAudits = false;

if (addAudits) addAuditTrailEntry("Partnerlink = " + partnerLinkName);

// check configuration for CAVS routing flag
try {
    boolean routeToCAVS =
java.lang.Boolean.parseBoolean(oracle.apps.aia.core.config.Configuration.g
etServiceProperty(serviceName, routeToCavsPropertyName));
    if (addAudits) addAuditTrailEntry("RouteToCAVS = " + routeToCAVS);
    if (routeToCAVS) {
        targetEndpointLocation =
oracle.apps.aia.core.config.Configuration.
         getServiceProperty(serviceName, cavsEndpointPropertyName);
        if (addAudits) addAuditTrailEntry("Endpoint = '" + targetEndpoint
         Location + "' selected from configuration property " +
cavsEndpointPropertyName);
    }
}
catch (oracle.apps.aia.core.config.PropertyNotFoundException e) {
    if (addAudits) addAuditTrailEntry("Configuration property " + cavs
EndpointPropertyName + " not found!");
}

if (targetEndpointLocation==null || targetEndpointLocation=="") {

    // check bpel variable for already retrieved target system Id
    try {
        targetID = (java.lang.String)getVariableData(systemIdBpel
         VariableName);
        if (addAudits && targetID!=null) addAuditTrailEntry("Using
previously stored Target System ID = '" + targetID + "'");
    }
    catch (com.oracle.bpel.client.BPELFault e) {
    }

    if (targetID==null || targetID=="") {
        // try to get Target system ID from EBM Header
        try {
            oracle.xml.parser.v2.XMLElement targetIdElement =
(oracle.xml.parser.v2.XMLElement)getVariableData(ebmMsgBpelVariableName,
ebmMsgPartName, "/*/corecom:EBMHeader[1]/corecom:Target/corecom:ID
[text()!='']");
            targetID = targetIdElement.getText();
            if (addAudits) addAuditTrailEntry("Target System ID = '" +
targetID + "', selected from EBM header");
        }
        catch (com.oracle.bpel.client.BPELFault e) {
            if (addAudits) addAuditTrailEntry("Unable to retrieve Target
System ID from message header");
        }
        try {
            if (targetID!=null && targetID!="")
setVariableData(systemIdBpelVariableName, targetID);
```

```
        }
        catch (com.oracle.bpel.client.BPELFault e) {
        }
    }

    if (targetID==null || targetID=="") {
        // try to get Target system ID from configuration
        try {
            targetID =
oracle.apps.aia.core.config.Configuration.getService
             Property(serviceName, defaultSystemIdPropertyName);
            if (addAudits) addAuditTrailEntry("Target System ID = '" +
targetID + "', selected from configuration property " +
defaultSystemIdPropertyName);
        }
        catch (oracle.apps.aia.core.config.PropertyNotFoundException e) {
            if (addAudits) addAuditTrailEntry("Configuration property " +
defaultSystemIdPropertyName + " not found!");
        }
        try {
            if (targetID!=null && targetID!="")
setVariableData(systemIdBpel
             VariableName, targetID);
        }
        catch (com.oracle.bpel.client.BPELFault e) {
        }
    }

    if (targetID!=null || targetID!="") {
        // try to get EndpointLocation from Configuration
        java.lang.String endpointPropertyName =
"Routing."+partnerLinkName+
         "."+targetID+".EndpointURI";
        try {
            targetEndpointLocation =
oracle.apps.aia.core.config.Configuration.getServiceProperty(serviceName,
endpointPropertyName);
            if (addAudits) addAuditTrailEntry("Endpoint = '" +
targetEndpointLocation + "' selected from configuration property " +
endpointPropertyName);
        }
        catch (oracle.apps.aia.core.config.PropertyNotFoundException e) {
            if (addAudits) addAuditTrailEntry("Configuration property " +
endpointPropertyName + " not found!");
        }
    }
}

try {
    setVariableData(targetEndpointLocationBpelVariableName, targetEndpoint
     Location);
}
catch (com.oracle.bpel.client.BPELFault e) {
}]]>
        </bpelx:exec>
        <switch name="Switch_SetEndpoint">
            <case condition="string-length(bpws:getVariableData('Target
```

```
                EndpointLocation'))>0">
                   <assign name="AssignPartnerlinkEndpointReference">
                       <copy>
                           <from>
                               <wsa:EndpointReference
xmlns:wsa="http://schemas.
                                xmlsoap.org/ws/2003/03/addressing">
                                  <wsa:Address/>
                               </wsa:EndpointReference>
                           </from>
                           <to variable="EndpointReference"/>
                       </copy>
                       <copy>
                           <from variable="TargetEndpointLocation"/>
                           <to variable="EndpointReference"
                               query="/wsa:EndpointReference/wsa:Address"/>
                       </copy>
                       <copy>
                           <from variable="EndpointReference"/>
                           <to partnerLink="[PartnerlinkName]"/>
                       </copy>
                   </assign>
               </case>
               <otherwise>
                   <empty name="Empty_NoSetEndpoint"/>
               </otherwise>
           </switch>
       </sequence>
</scope>
```

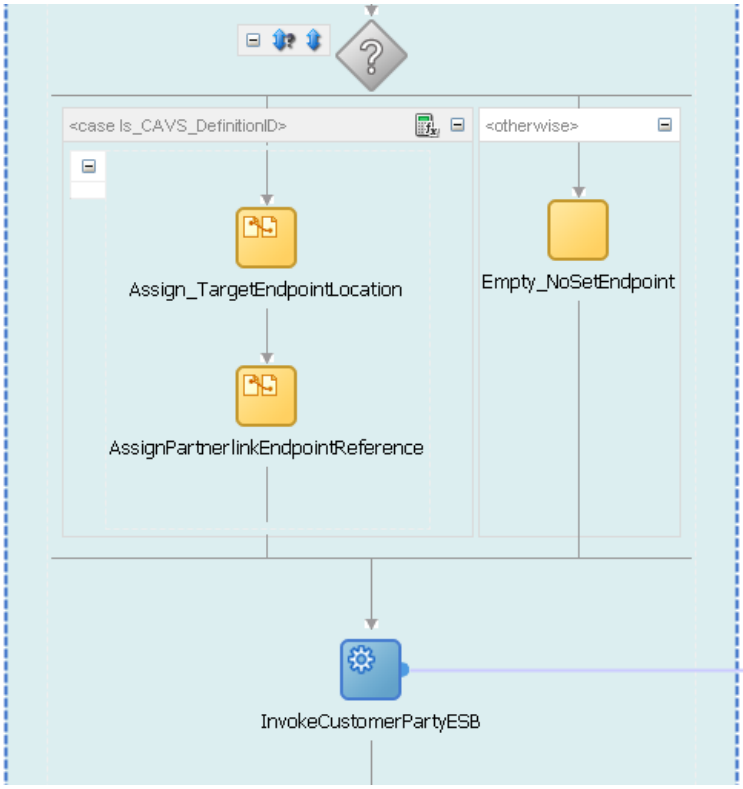
13.4.2. How to CAVS Enable the Requester ABCS

The general programming model concept is similar to how the endpoint URI is dynamically computed in the provider ABCS to achieve dynamic target invocation.

Note: Ensure that in the XSL used for transforming the ABM into EBM, the element <DefinitionID> is injected as a child of element <MessageProcessingInstruction>.

To code a requester ABCS for CAVS-enabled invocation of an Enterprise Business Service that is implemented as mediator service:

1. In the BPEL artifact, add a switch activity.
2. The condition expression in the 'case' would test for the non-zero value in the element EBMHeader/MessageProcessingInstruction/DefinitionID.
3. Populate the wsa:EndpointReference element with the value of the element EBMHeader/MessageProcessingInstruction/DefinitionID.




```
<switch name="Switch_CAVSEnablement">
            <case condition="string-
length(bpws:getVariableData('CreateCustomerPartyList_InputVariable','Creat
eCustomerPartyListEBM','/custpartyebo:CreateCustomerPartyListEBM/corecom:E
BMHeader/corecom:MessageProcessingInstruction/corecom:DefinitionID'))>0">
                <bpelx:annotation>
                    <bpelx:pattern>Is_CAVS_DefinitionID</bpelx:pattern>
                </bpelx:annotation>
                <sequence>
                    <assign name="Assign_TargetEndpointLocation">
                        <copy>
                            <from
variable="CreateCustomerPartyList_InputVariable"
                                  part="CreateCustomerPartyListEBM"
                                  query="/
corepartyebo:CreateCustomerPartyListEBM/corecom:EBMHeader/corecom:MessageP
rocessingInstruction/corecom:DefinitionID"/>
                            <to variable="TargetEndpointLocation"/>
                        </copy>
                    </assign>
                    <assign name="AssignPartnerlinkEndpointReference">
                        <copy>
                            <from>
                                <wsa:EndpointReference>
                                    <wsa:Address/>
                                </wsa:EndpointReference>
                            </from>
                            <to variable="EndpointReference"/>
                        </copy>
                        <copy>
```

```
                                <from variable="TargetEndpointLocation"/>
                                <to variable="EndpointReference"

query="/wsa:EndpointReference/wsa:Address"/>
                            </copy>
                            <copy>
                                <from variable="EndpointReference"/>
                                <to partnerLink="SamplesCustomerPartyEBS"/>
                            </copy>
                        </assign>
                    </sequence>
                </case>
                <otherwise> <empty name="Empty_NoSetEndpoint"/> </otherwise>
            </switch>
```

Note: Some requester ABCSs will need to communicate back directly with the calling participating application. For this type of partnerlink, the requester ABCS acts similarly to a provider ABCS in that it is invoking a participating application Web service.

13.4.3. Describing CAVSEndpointURL Value Designation

The CAVSEndPointURL value will be set at design time as follows:

- If the ABCS or Enterprise Business Flow (EBF) is invoking a synchronous service, then the CAVSEndPointURL value in the AIAConfigurationProperties.xml file will be set to a default value of: http://<host>:<port>/AIAValidationSystemServlet/syncresponsesimulator
- If the ABCS or EBF is invoking an asynchronous one-way service, then the CAVSEndPointURL value in the AIAConfigurationProperties.xml file will be set to a default value of: http://<host>:<port>/AIAValidationSystemServlet/asyncrequestrecipient
- If the ABCS or EBF is invoking an asynchronous request-delayed response service, then the CAVSEndPointURL value in the AIAConfigurationProperties.xml file will be set to a default value of: http://<host>:<port>/AIAValidationSystemServlet/asyncresponsesimulator
- If the ABCS or EBF is invoking a Response EBS, then the CAVSEndPointURL value in the AIAConfigurationProperties.xml file will be set to a default value of: http://<host>:<port>/AIAValidationSystemServlet/asyncresponserecipient

13.4.4. Purging CAVS-Related Cross-Reference Entries to Enable Rerunning of Test Scenarios

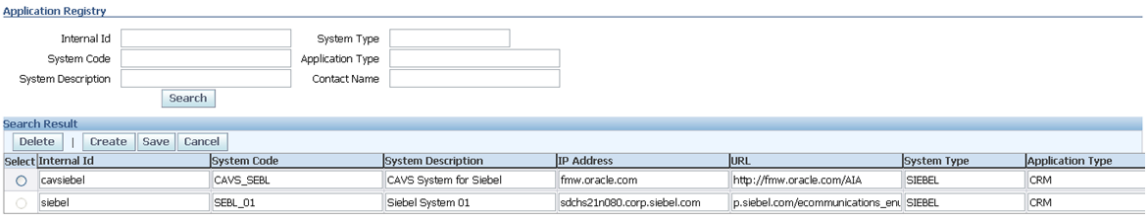
When a participating application is involved in a CAVS testing flow, execution of tests can potentially modify data in a participating application. Therefore, consecutive running of the same test may not generate the same results. The CAVS is not designed to prevent this kind of data tampering because it supports the user's intention to include a real participating application in the flow. The CAVS has no control over modifications that are performed in participating applications.

However, this issue does not apply if your CAVS test scenario uses test definitions and simulator definitions to replace all participating applications and other dependencies. In this case, all cross-reference data is purged once the test scenario has been executed. This enables rerunning of the test scenario.

This purge is accomplished as follows:

1. Process integration packs (PIPs) that are delivered to work with Oracle AIA Foundation Packs are delivered with cross-reference systems in place. They are named *CAVS_<XYZ>,* where *<XYZ>* is the participating application system. For example, for systems EBIZ and SEBL, the PIP is delivered with cross-reference systems *CAVS_EBIZ* and *CAVS_SEBL.*

2. For every system type defined on the System - Application Registry page for which you want to make test scenarios rerunnable (*<XYZ>*), create a related CAVS system (*CAVS_<XYZ>*). The System Type field value for the CAVS-related entry should match the name of the system for which it is created. To access the System – Application Registry page, access the AIA Home Page, click Go in the Setup area, and select the System tab.



System and CAVS-related system entries on the System - Application Registry page

3. When testing a provider ABCS in isolation, the EBM will be passed from the CAVS to the provider ABCS with the NamespacePrefixedEBMName/EBMHeader/Target/ID element set as *CAVS_<XYZ>*.

4. When testing a requester ABCS in isolation, the element in the Application Business Message (ABM) that normally contains the Internal ID value will now contain the CAVS-specific Internal ID value set for the system on the System - Application Registry page.

5. When testing an entire flow (requester ABCS-to-EBS-to-provider ABCS), you must set the Default.SystemID property of the provider ABCS to *CAVS_<XYZ>,* where *<XYZ>* is the system.

    a. To do this, edit the Default.SystemID property value in the AIAConfigurationProperties.xml file in the $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config directory.

    b. Access the Configuration page and click Reload to load the edit.

    c. You can now commence testing the entire flow.

Note: If the test scenario is an entire flow that includes multiple instances of the same system, then the approach described previously will not work. In this case, data created in the cross-reference will remain, making the same test case incapable of being rerun.

13.5. Securing the ABCS

The participating applications are developed during different times with different concepts and implementation of authentication and authorization. When applications are integrated, you must pass authentication and authorization information between applications.

The information related to security is exchanged between participating applications and ABCS. The AIA application security context standardizes the exchange of participating applications' authentication and authorization information between various applications so that any application can be integrated with any other application.

13.5.1. How to Secure the ABCS

You should answer the following questions:

- Does the application need the security credentials to authenticate?

  If yes, can you use a generic account or should you use the requester's credentials, as specified in the message?

- How are these credentials transmitted? Are they adopting a WS-Security scheme or a custom mechanism?

  If a custom mechanism, is it via the header or as part of the payload?

Refer to Working with Security for details about how to:

- Transform application security context into standard format in ABCS.
- Propagate the standard security context from ABCS to ABCS through EBS and EBF.
- Transform standard security context to application security context.

13.5.2. Implementing Security Context

Work with participating applications so that the application can send and receive authorization information in XACML format:

```
<soap:Envelope xmlns:soap='http://www.w3.org/2003/05/soap-envelope'
xmlns:rep='http://www.w3.org/2004/08/representation'
xmlns:xmlmime='http://www.w3.org/2004/11/xmlmime'>
  <soap:Header>
   <Request xmlns="urn:oasis:names:tc:xacml:2.0:context:schema:cd:04"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="
urn:oasis:names:tc:xacml:2.0:context:schema:cd:04 http://docs.oasis-
open.org/xacml/access_control-xacml-2.0-context-schema-cd-04.xsd">
          <Subject>
<Attribute AttributeId="siebel:user" DataType="xs:string">
   <AttributeValue>SAdmin</AttributeValue>
</Attribute>
<Attribute AttributeId="siebel:org" DataType="xs:string">
   <AttributeValue>siebl1</AttributeValue>
</Attribute>
</Subject>
<Resource>
</Resource>
              <Action>
              </Action>
              <Environment/>
</Request>
```

```
    </soap:Header>
    <soap:Body>
    </soap:Body>
</soap:Envelope>
```

Determine the implementation strategy for transforming appcontext service and implementing the service for all the applications involved in a scenario.

For more information about security, see Working with Security.

13.5.3. How to Implement Security in the Requester ABCS

To implement security in the requester ABCS:

1. Map the application authorization info in XACML format if it is not received in XACML format from the participating application.
2. Call the security service with application info in XACML format and receive the standard authorization information in XACML format.

   The response XACML is represented using Application neutral attributes, as described in Using Attribute Names.
3. Insert the standard authorization information in an EBM header and provide a sample XSL snippet that will include a request element in the EBM header.

13.5.4. How to Implement Security in the Provider ABCS

To implement security in the provider ABCS:

1. Call the security service with standard authorization info in XACML format and receive application authorization info in XACML format.
2. Send the authorization info in XACML format if the participating application supports else set the application security context using XACML structure.

   In addition, some typical activities need to be done in the ABCS for some of the patterns. Depending on the type of pattern used for ABCS, refer to the appropriate sections that follow.

13.6. Enabling Transactions

When SOA is used to encapsulate and integrate cross-enterprise workflows, multiple services may take part in transactions spanning system boundaries. End-to-end business transactions that cross application boundaries involve multiple applications. Creating robust integration solutions requires more than simply exchanging messages.

An important consideration is that the Web services participating in an end-end message flow are often asynchronous, stateless, distributed, and opaque. You must understand the mechanics of transaction management.

13.6.1. How to Ensure Transactions in AIA Services

Business requirements drive transactional requirements. Transaction considerations must start along with design time. You cannot postpone them until construction time. You must:

- Identify all the ABCS services and the EBFs that make up a business activity.
- Organize these activities into meaningful groups to have an overall unifying purpose.
- Indicate transaction demarcation points.

The grouping of activities provides the starting point for transaction demarcation so that the relevant business operations are performed in the context of a transaction.

In the asynchronous fire-and-forget pattern, where no milestones are configured, the requester, EBS, and provider ABCS must participate in the same global transaction, including cross-references in Oracle XA.

In an asynchronous MEP, where JMS queues are set up and the participating applications interact with the queues, the JMS consumer adapters must also participate in the global transaction, as do the requester ABCS, EBS, and provider ABCS.

In such a case, when an undergoing transaction is aborted before the message is persisted at a milestone, the message is rolled back into the JMS queue.

In other words, the transaction demarcation begins with the JMS consumer adapter picking up the message from the queue and ends when the message is delivered to the consumer application or when the message is persisted at a configured milestone.

In a SOA-based integration, long-running business transactions often involve incompatible trust domains, asynchrony, and periods of inactivity, which present challenges to traditional ACID-style transaction processing. You may need to predefine the transaction boundaries based on technical or business criteria. PIP designers/architects should divide the whole transaction into parts by setting transaction boundaries using JMS interface at logical points.

Non-retryable application services need to have corresponding compensatory services.

ABCS invoking non-retryable application services should invoke compensatory services in case of roll-back.

Application services implemented via JCA adapters can leverage session management to facilitate transaction coordination.

13.6.2. Transactions in Oracle Mediator

If a transaction is present, Oracle Mediator participates in that existing transaction. If a transaction is not present, Oracle Mediator starts a transaction. In the case of sequential routing rules, all rules are executed in the same transaction and, if an error occurs, a rollback is issued.

13.6.3. Transactions in BPEL

The BPEL component, by default, creates a new transaction on the basis of a request. That is, when a BPEL process is invoked, a new transaction begins by default. If a transaction already exists, then it will be suspended and a new one created. To chain an execution into a single global transaction, you need to set the transaction flag on the consuming process (cal lee BPEL component).

13.6.3.1. Impact of BPEL Activities on Transaction Scope

BPEL engine ends its local transaction when it reaches the end of flow or hits a breakpoint activity, for example, receive, onMessage, onWait, and Alarm.

Transaction design considerations are also governed by:

- Invocation patterns employed across the AIA integration

  ABCS -- EBS – ABCS

- Technology pattern: BPEL -- MEDIATOR—BPEL

  ABCS – EBS – EBF – EBS -- ABCS

- Technology Pattern: BPEL – MEDIATOR– BPEL – MEDIATOR– BPEL

  Based on the transaction semantics in FMW, you need to design and configure transactions across ABCS, EBS and Enterprise Business Flows.

- Participating applications

  Participating applications should be able to support transactions via their application services. However, the reality is that many application services are able to do this, so compensatory services are needed in case of rollback (orchestrated by AIA layer).

  Design integration logic and transaction boundaries in the AIA layer to account specifically for the peculiarities of the participating application services, SCA Composite transaction semantics, and business requirements.

13.6.4. Developing ABCS to Participate in a Global Transaction

In SOA 11g, you do not need to set up any configuration properties on the calling (consuming) process to chain an execution into a single global transaction.

You only need to set the appropriate transaction flag on the **Callee** BPEL component. You can do this in the composite editor's source by adding **bpel.config.transaction** into a BPEL component, with value as '**required**' as shown below:

```
<component name="SamplesCreateCustomerSiebelReqABCSImplProcess">
    <implementation.bpel src="SamplesCreateCustomerSiebelReqABCSImplProcess.bpel"/>
     <property name="bpel.config.transaction">required</property>

</component>
```

With the transaction flag set as shown, BPEL inherits the transaction that is already there, started by the parent process. If the parent process has not started a transaction, BPEL will create a new one. In the case of a global transaction, the transaction will be committed when the initiator commits.

If BPEL has an inbound interface with an adapter, you need to set the appropriate transaction flag in the composite of the adapter.

This example shows how transaction properties should be set on the BPEL adapter interface:

```
<component name="SamplesCreateCustomerSiebelJMSConsumerProcess">
    <implementation.bpel src="SamplesCreateCustomerSiebelJMSConsumerProcess.bpel"/>
     <property name="bpel.config.transaction">required</property>

</component>
```

In the case of BPEL invoking Mediator, the Mediator participates in the existing transaction if a transaction is present. If a transaction is not present, then Mediator starts a transaction.

13.6.5. How to Transaction-Enable AIA Services

You can transaction-enable AIA services for:

- Synchronous request-response scenarios.
- Asynchronous MEP scenarios.
- Asynchronous operation from an ABCS in the same thread, but in a different transaction.

13.6.5.1. Synchronous Request-Response Scenarios

Invoking a synchronous BPEL process will result in creation of BPEL instance within its local transaction by default. This transaction can be enlisted to a global transaction given proper configurations.

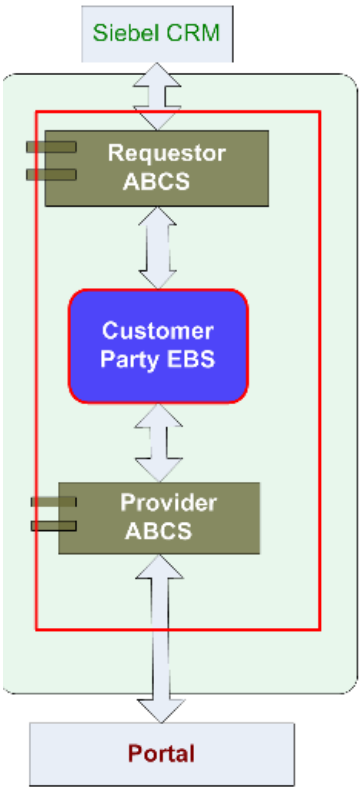
Hence, the transaction settings in the ABCS services should be as given under

```
<component name="SamplesCreateCustomerSiebelReqABCSImplProcess">
    <implementation.bpel src="SamplesCreateCustomerSiebelReqABCSImplProcess.bpel"/>
     <property name="bpel.config.transaction">required</property>

</component>
```

The EBS inherits the transaction initiated by the ABCS.

The following diagram illustrates the transaction boundary:



13.6.5.2. AIA Services in Asynchronous MEP

Invoking an asynchronous BPEL process results in persistence of invocation message in invoke message table within part of the caller's transaction. The Caller's transaction ends. The asynchronous BPEL executes in its own local transaction. For the Callee to be executed within the Caller's transaction, the transaction flag must be set to 'required', as shown below, for the BPEL component, in the Callee's composite.

bpel.config.transaction=required

To ensure a single threaded execution of the Callee, a case of a one-way operation, you need to have a sync-type call. Set the property for the BPEL component in the Callee's composite as shown below:

bpel.config.oneWayDeliveryPolicy=sync

Therefore, the transaction settings in the ABCS services should be as given under:

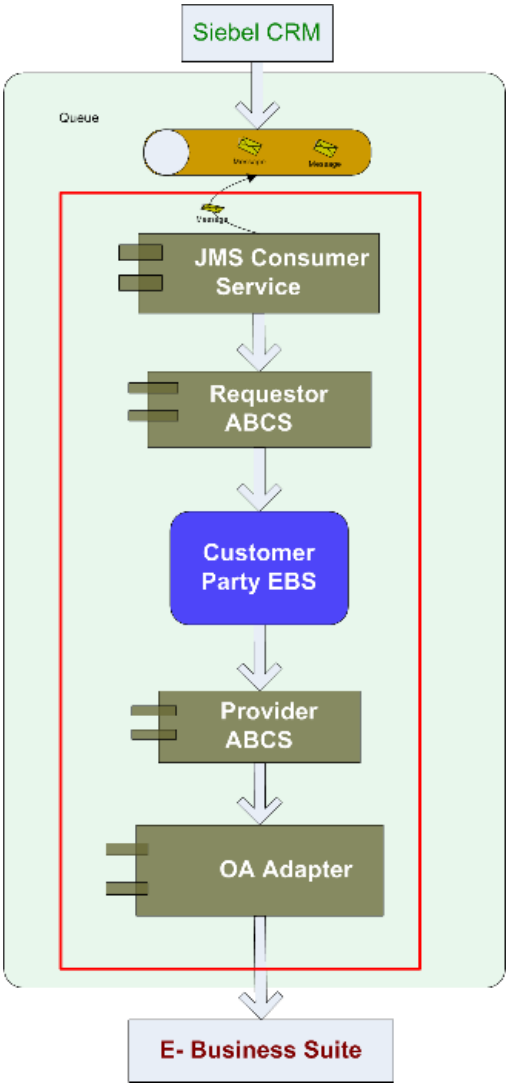
```
<component name="SamplesCreateCustomerSiebelReqABCSImplProcess">
    <implementation.bpel src="SamplesCreateCustomerSiebelReqABCSImplProcess.bpel"/>
     <property name="bpel.config.transaction">required</property>
    <property name="bpel.config.oneWayDeliveryPolicy">sync</property>
```

If the Requester ABCS has an inbound interface with an adapter, then in the adapter's composite, set the property at the BPEL component level, that is, ""**bpel.config.oneWayDeliveryPolicy=sync.**

The following example shows how transaction properties need to set on adapter component:

```
<component name="SamplesCreateCustomerSiebelJMSConsumerProcess">
    <implementation.bpel src="SamplesCreateCustomerSiebelJMSConsumerProcess.bpel"/>
     <property name="bpel.config.transaction">required</property>
    <property name="bpel.config.oneWayDeliveryPolicy">sync</property>
</component>
```

The following diagram illustrates the transaction boundary:



13.6.5.3. Asynchronous Operation from an ABCS in the Same Thread but In a Different Transaction

When an ABCS has to invoke an asynchronous operation on a process, which must be executed in the same thread as that of ABCS but in a different transaction, set the following configuration in the called BPEL composite:

```
<property name="bpel.config.oneWayDeliveryPolicy">sync</property>
```

Note that, in this case, the transaction configuration, **bpel.config.transaction,** need *not* be set in the called BPEL composite because the called BPEL should be executed in a transaction different from that of the Caller.

13.7. Guaranteed Message Delivery

Guaranteed message delivery means that a message being sent from a producer to a consumer will not be lost in the event of an error.

AIA uses queues for asynchronous and reliable delivery of messages. For example,

- CRM on Demand, upon occurrence of a business event, can either push the message directly into a queue or send a SOAP message over HTTP to a JMS message producer (a JMS transport adapter) that will be responsible for entering the message in the queue.

CRM on Demand can consider the message as sent as soon as the message is dropped into the queue. With this mechanism, the CRM on Demand application can keep sending new messages regardless of whether the CRM on Premises is available or not.

- A JMS consumer (another JMS transport adapter) is responsible for dequeuing the messages and invoking CRM on demand ABCSs.

Having the CRM on Demand ABCSs, the EBS, the CRM on Premises ABCS and the Web services as part of the transaction initiated by JMS message producer ensures that the message is removed from the queue only after the successful completion of the task in the CRM on-premise application.

13.8. Versioning ABCS

Versioning of a service means:

- A new service with Version suffix in the name of the Composite and name of the Service Component.
- The target namespace of the WSDL of the Service Component indicates a new version.

For more information about AIA naming standards, see Oracle AIA Naming Standards for AIA Development.

13.8.1. Guidelines for Versioning

During the preparatory phase, be aware of the following guidelines:

- An ABCS is used across multiple PIPs. It is not PIP-specific.

  For example, EBizRequesterCreateItemABCS is used by ISCM PIP as well as Agile PLM - Ebiz Integration PIP.

- Use the Oracle Enterprise Repository to discover the existence of a service.

Service definition annotations are persisted in Oracle Enterprise Repository. Oracle Enterprise Repository documents the various conceptual and physical assets depicting the PIP and constituting services.

- Inline changes made to ABCS without changing the version suffix should be backward compatible.
- Multiple versions for a service with semantically and technically incompatible contracts among versions are not acceptable.

  It is not permissible to version an existing ABCS when the contract is totally different, even though the operation to be performed or the verb is same.

- ABCS is versioned independently of an application version.

  ABCS is not bound to a specific application version. So, when an application undergoes a version change, it is not binding on ABCS to undergo a similar version change. Thus, ABCS is designed to be agnostic of version changes of the application.

- Avoid concurrent multiple versions of an ABCS.

  For example, Team A owns Version 1; Team B doesn't like the contract and creates Version 2 with a different MEP/Contract. Now Team A is creating Version 3 with a contract that contradicts the previous one.

- The system does not allow more than one service for an application to perform a single business activity via a specific role (Requester/Provider).
- Do not have more than one service with same logic but different names, either a different name for composite, for service, or having a different portType in the WSDL.
- Do not have more than one service with different logic but the same names.

The operation defined on the EBS determines the implementing ABCS.

The operation defined on an EBS is dictated by the business activity/business task.

Variations of business activity, business task, or both are possible. These will be passed in the form of context; implemented by different ABCSs.

Multiple teams involved in producing, consuming, or both an ABCS for a specific application and a business activity need to reach consensus regarding the contracts.

14. Designing and Constructing Composite Business Processes

This chapter discusses the following Composite Business Process (CBP) topics:

14.1. Introduction to CBPs

CBPs are the implementation of process services. Process Services orchestrate a series of human and automated steps, including enterprise-wide policies captured in business rules. These services run the implementations of the business processes in the Oracle Application Integration Architecture (AIA) Reference Process Models.

AIA recommends using BPEL for implementing CBPs. CBPs are long-running processes that may run from few seconds to days. A CBP will have an interface and message structure that is detailed enough to capture all of the information about the source of the triggering event. In most cases, the event is triggered by customer-facing applications.

For more information about detailed definition and high-level design and development guidelines, see *Oracle Application Integration Architecture Foundation Pack: Concepts and Technologies Guide*, "Describing the AIA Shared Service Inventory."

14.2. How to Define the Contract for a CBP

The AIA methodology for designing and implementing a CBP is *contract first* methodology. Therefore, the contract needs to be defined and created before the CBP is implemented.

To define the contract for a CBP:

1. Identify the CBP.
2. Identify the pattern for the CBP.

14.2.1. How to Identify the CBP

The first task involved in designing a new service is to verify whether it is necessary. Once the need for the CBP is established, review each of the services as well as the description of the operation and any metadata in the Oracle Enterprise Repository before deciding to create a new service or an operation.

A CBP may be needed when an enterprise-wide business process is needed for a business event. This process is described in the Reference Process Model and spans multiple operational units for enterprises.

To identify a CBP:

1. From the BPA Reference Process Model, identify the Business Process to implement.
2. Click the link to Oracle Enterprise Repository, and review the details in the Oracle Enterprise Repository.
3. If no link is available, create a definition for the CBP as part of the relevant AIA Project in the AIA Project Lifecycle Workbench application.

14.2.2. How to Identify the Message Pattern for an CBP

The CBP is always modeled to implement a single operation with one-way patterns. No responses to the client will be made. Any error situation or response will be modeled as an update operation back to the client.

14.3. How to Create the Contract for a CBP

To create the contract for a CBP:

1. Identify the message structure.
2. Construct the WSDL for the CBP.
3. Annotate the service interface.

   See Annotating Composites.
4. Ensure WS-1 basic profile conformance.

14.3.1. How to Identify the Message Structure

To identify the message structure:

1. A CBP is implemented by orchestrating calls to external services. The event triggering the CBP indicates the business object with which the CBP will be dealing.

2. Depending on the integration style, the message structure will be decided as described below:

   a. If the business object is available in the existing Enterprise Business Message (EBM), use it.

   b. If the business object is not available in the existing EBM but can be assembled from the existing Enterprise Business Object (EBO) Library, construct it.

   c. If the business object is not available in the EBO Library, identify a payload suitable for capturing all relevant information and processing in the CBP.

14.3.2. How to Construct the WSDL for the CBP

The CBP development starts with constructing a WSDL, and the end result of the technical design process is a CBP WSDL.

Use the Template Enterprise Business Flow (EBF) WSDL and Sample EBF WSDL from "AIAServices-TemplateSampleWSDLs" to create a WSDL.

14.4. How to Implement the CBP as a BPEL Service

To implement the CBP:

1. Create a new WSDL.

   Create a WSDL for the CBP following the CBP naming standards and the WSDL templates provided.

2. Implement the CBP as a one-way BPEL process.

   For more information about the details of creating BPEL projects in Oracle JDeveloper, see the *Oracle BPEL Process Manager Developer's Guide*.

   Follow Constructing the ABCS for details about implementing a one-way pattern

3. Enable error handling and logging.

   Enterprise Business Services (EBSs) should handle errors to allow clients or administrators to resubmit or re-trigger processes. This is accomplished using a central error handler.

   For more information, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

4. Enable extensibility points in CBP.

   For more information, see Developing Extensible ABCS.

15. Designing and Constructing Enterprise Business Flows

This chapter describes how to define and implement Enterprise Business Flows (EBFs).

This chapter discusses the following topics:

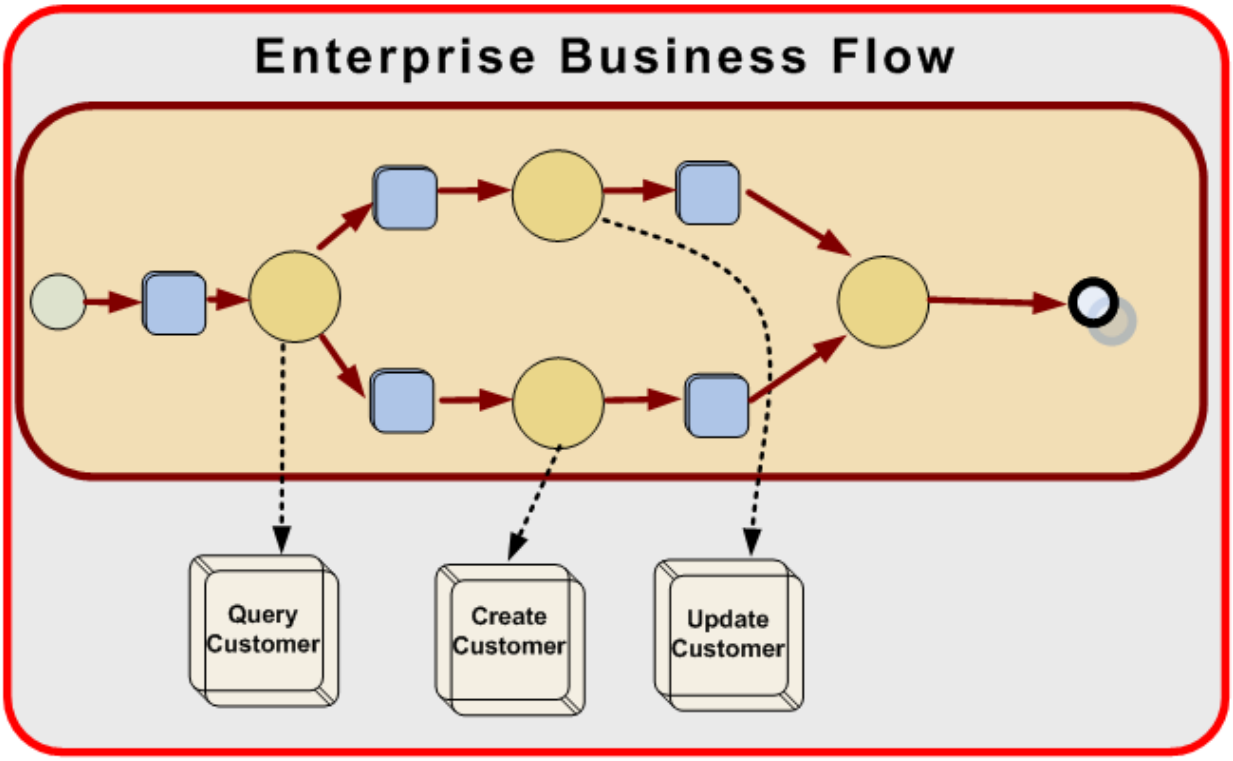
15.1. Introduction to Enterprise Business Flows

The EBF is used for implementing a business activity or a task that involves leveraging capabilities available in multiple applications. The EBF is about stringing together a set of capabilities available in applications to implement a coarse-grained business activity or task and composing a new service leveraging existing capabilities. The EBF involves only system-to-system or service-to-service interaction. The EBF will have no activity that needs human intervention.

In a canonical integration, the EBF is an implementation of an Enterprise Business Service (EBS) operation and calls other EBSs. It will never call an Application Business Connector Service (ABCS) or the applications directly. In other integration styles, the caller invoking the EBF can be either an application or any other service.

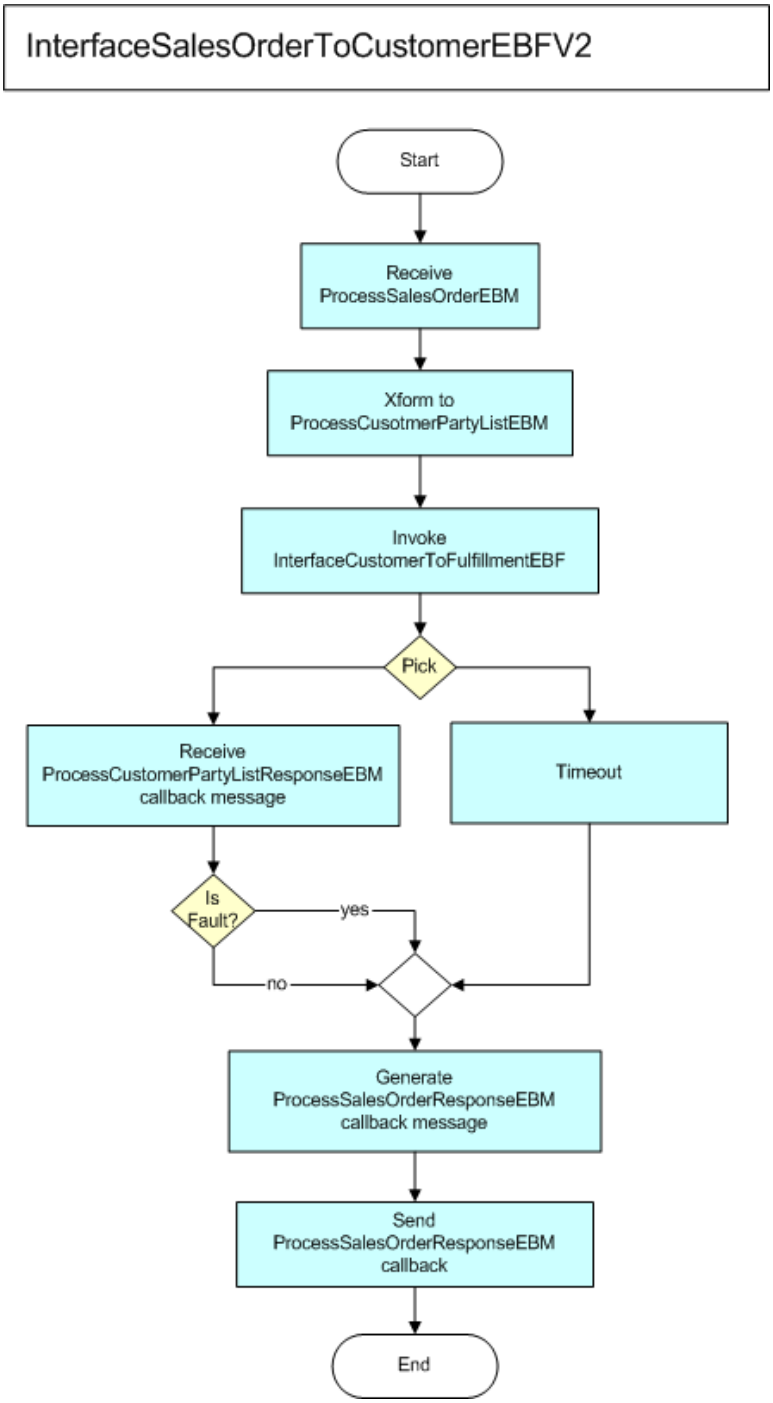
An EBF can be implemented using Oracle Service Bus for stateless coordination of synchronous business or one-way business activities in which BPEL is used for coordinating asynchronous activities.

The following activity diagrams illustrate how some of the EBFs in the Order to Cash Process Integration Pack (PIP) are implemented to leverage existing capabilities.



Example of EBF orchestrating a flow from source to target

This diagram shows that the EBF is orchestrating a flow for syncing customers between the source application and the target application. When the sync operation is invoked from the source application, the EBF will first check whether the customer already exists in the target application. If so, it updates the customer in the target application; otherwise, it creates the customer in the target application.



Example of Sales Order flow

This diagram demonstrates a flow that is receiving the sales order and orchestrating across customer creation, fulfillment, and update back in the source application with response.

15.2. How to Define the Contract for an EBF

The Oracle Application Integration Architecture (AIA) methodology for designing and implementing an EBF is *contract first* methodology. Hence, the contract needs to be defined and created prior to the implementation of the EBF.

To define the contract:

1. Identify the EBF.
2. Identify the pattern for the EBF.
3. Identify Enterprise Business Messages (EBMs) to be used for the requests and responses (if any).

15.2.1. How to Identify the Need for an EBF

The first task involved in designing a new service is to verify whether it is necessary.

- Situations may occur in which other services exist that are already providing some or all of the features identified. Each of the services as well as the operation's description and any metadata should be reviewed before you decide to create either a new service or an operation.
- An EBF is needed when an EBS operation needs to be implemented with a set of tasks and involves invoking of multiple services.
- An EBF can invoke only another EBS. In no situation should an EBF invoke an ABCS directly.

15.2.2. How to Identify the Message Pattern for an EBF

The Enterprise Business Flow is modeled to implement a single operation.

To identify the message exchange pattern (MEP) for an EBF:

1. Based on the understanding of the business process requirement from the Functional Design Document (FDD), identify the triggering event for the EBF.

```
<operation name="InterfaceSalesOrderToCustomer">
            <documentation>
                <svcdoc:Operation>
                    <svcdoc:Description>This operation is used to
interface
                                          sales order to
customer</svcdoc:Description>
                    <svcdoc:MEP>ASYNC_REQ_RESPONSE</svcdoc:MEP>

<svcdoc:DisplayName>InterfaceSalesOrderToCustomer</svcdoc:DisplayName>

<svcdoc:LifecycleStatus>Active</svcdoc:LifecycleStatus>
                    <svcdoc:Scope>Public</svcdoc:Scope>
                </svcdoc:Operation>
```

```
            </documentation>
            <input message="client:InterfaceSalesOrderToCustomerReqMsg"/>
    </operation>
```

a. If the control is to be blocked until a response is returned to the point of invocation, choose EBF Request - Reply pattern. This would be a *synchronous* call.

b. If after the EBF is invoked the triggering point does not wait for the response and continues on, this invocation of the EBF would be an *asynchronous* call.

2. Check whether the processing of the EBF results in a response.

Is there a need to correlate the request and the response?

a. If the answer is yes, this is a case of delayed response. Use the EBF request-delayed response pattern. If the answer is no, then choose the EBF fire-and-forget pattern.

b. Any EBF operation invoked as a result of a subscription to a publish event should use the EBS subscribe pattern.

15.3. How to Create the Contract for an EBF

To create the contract for an EBF:

1. Identify the EBM.
2. Construct the WSDL for the EBF.
3. Annotate the service interface.
4. Ensure WS-1 basic profile conformance.

15.3.1. Constructing the WSDL for the EBF

Because the EBF development starts with constructing a WSDL, the end result of the technical design process is an EBF WSDL.

Note: Please refer to the template and sample WSDLs ***AIAServices-TemplateSampleWSDLs.zip*** under ***$AIA_HOME/samples*** for creating a WSDL.

15.4. How to Implement the EBF as a BPEL Service

To implement the EBF:

1. Create a new WSDL.

   Create a WSDL for the EBF following the EBF naming standards and the WSDL templates provided.

2. Implement the EBF as a synchronous or asynchronous BPEL process.

For more information about the details of creating BPEL projects in Oracle JDeveloper, see the *Oracle BPEL Process Manager Developer's Guide*.

Follow Implementing the Asynchronous Request Delayed Response MEP for details on how to use BPEL to implement asynchronous request-delayed response pattern. The difference is that the EBF deals with EBMs.

3. Enable error handling and logging.

EBSs should handle errors to enable clients or administrators to resubmit or retrigger processes. This is done through a central error handler.

For more information, see Configuring Oracle AIA Processes for Error Handling and Trace Logging.

4. Enable extensibility points in EBF.

16. Introduction to B2B Integration Using AIA

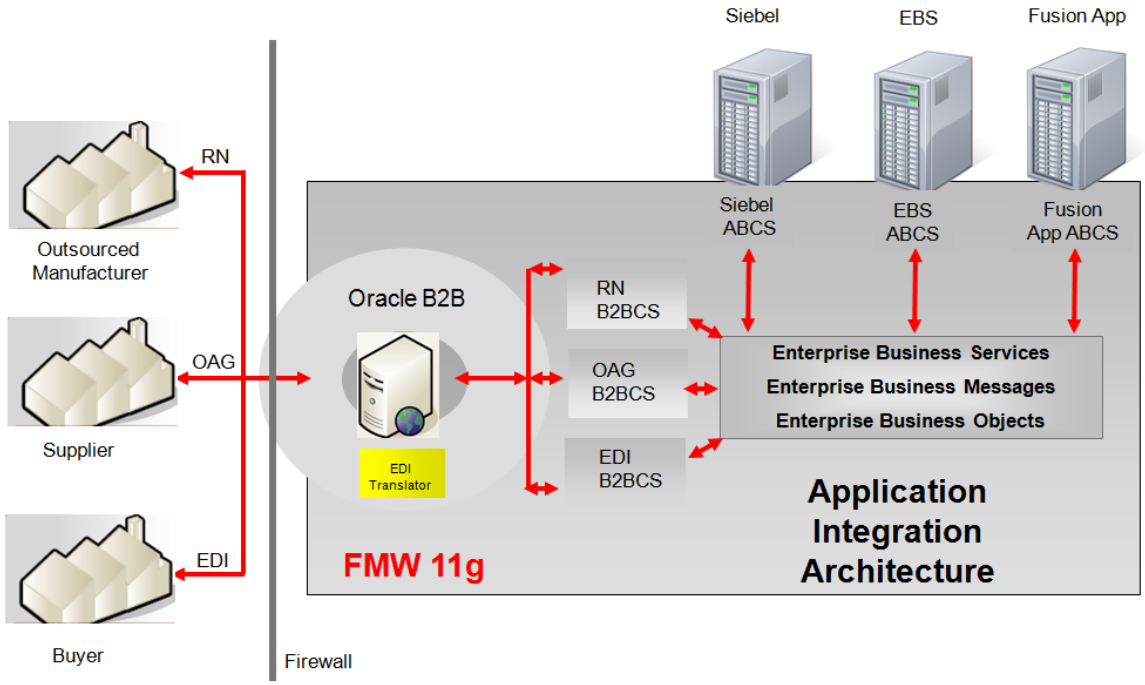
This chapter discusses the following topics:

16.1. Overview of B2B Integration Using AIA

Business-to-business (B2B) integration requires the ability to exchange business information with trading partners using a choice of B2B document protocols. The Oracle Application Integration Architecture (AIA) B2B solution consists of the following key features:

- A flexible integration architecture that can be used to rapidly build support for new B2B document protocols.
- Infrastructure components that can be used to build end-to-end B2B flows using AIA and Oracle Fusion Middleware.
- Prebuilt support for popular B2B document protocols.
- Support for customization of shipped B2B integration artifacts.

The following diagram illustrates how the canonical-based integration architecture of AIA can be applied to meet the B2B integration needs of large enterprises.



Schematic overview of the B2B architecture of AIA

Following are some of the key benefits of using AIA for B2B integrations:

- AIA decouples participating applications from the B2B integration layer. Participating applications no longer need to track the varying B2B integration needs of trading partners. In addition, customers can add support for new B2B protocols and trading partner requirements without any impact to participating application code.
- B2B document flows are often a subset of tasks that make up complex business processes, such as Order Capture. By building B2B functionality as a layer on top of Foundation Pack, the functionality is made available for reuse by multiple applications and business processes.
- Existing AIA Enterprise Business Objects (EBOs) such as Customer, Supplier, Item, Purchase Order, Shipment, Invoice, and Catalog Address map to most of the commonly used B2B documents. Usage of these readily available EBOs, along with prebuilt B2B connector services (B2BCSs) for these EBOs, result in significant time and cost savings for B2B integrations.

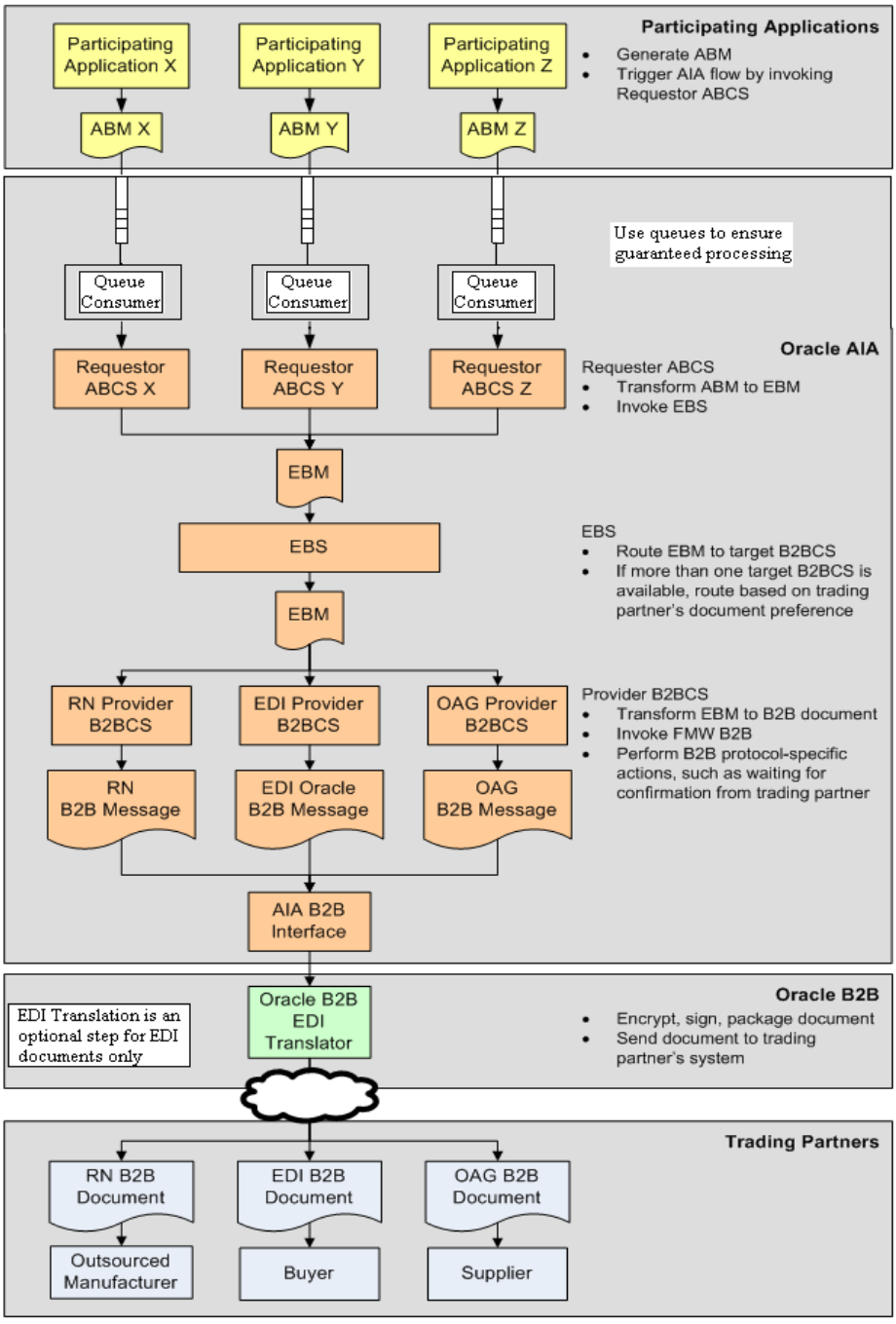
16.2. Understanding B2B Document Flows

This section discusses the following topics:

- Describing Outbound B2B Document Flows Built Using AIA
- Describing Inbound B2B Document Flows Built Using AIA

16.2.1. Describing Outbound B2B Document Flows Built Using AIA

The following diagram shows a sample outbound B2B flow implemented using AIA:



Outbound B2B document flow

Following are the key steps in an outbound B2B document flow:

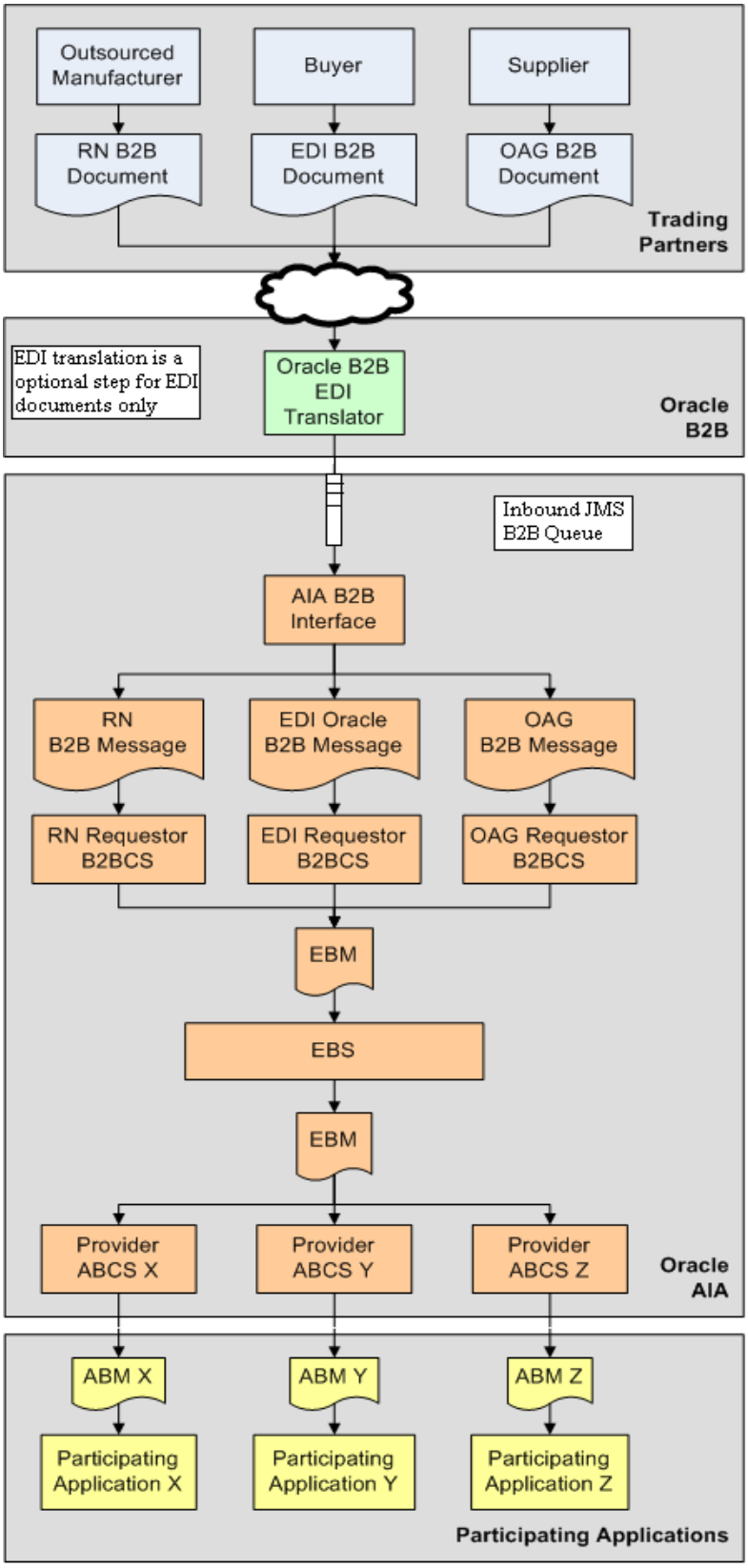
1. Participating applications trigger requester Application Business Connector Services (ABCS) with Application Business Messages (ABMs) as their payloads.
    - A best-practice recommendation is to use queue-based communication between the application

and the requester ABCS while modeling fire-and-forget flows. This ensures that request messages are persisted, thereby guaranteeing their processing.

2. Requester ABCSs transform ABMs into Enterprise Business Messages (EBMs) and then invoke the Enterprise Business Service (EBS) implementation.
3. The EBS introspects the EBM and routes it to the correct provider B2BCS based on the trading partner's B2B document preference.
4. Provider B2BCSs transform the EBM into an industry-standard B2B format and invoke the AIA B2B interface service.
5. The AIA B2B interface service populates the required header parameters and invokes the Oracle Fusion Middleware B2B component, passing the B2B payload as input.
6. Oracle B2B looks up the trading partner agreement corresponding to the trading partners and document type and securely transports the B2B document to the remote trading partner
7. In case of non-XML format-based protocols such as Electronic Data Interchange (EDI), the translation feature in Oracle B2B can be used to transform the intermediate XML generated by AIA layer to the non-XML B2B document format.

16.2.2. Describing Inbound B2B Document Flows Built Using AIA

The following diagram shows a sample inbound B2B flow implemented using AIA:



Inbound B2B document flow

Following are the key steps in an inbound B2B document flow:

1. Oracle B2B receives B2B documents from trading partners and identifies the sending trading partner and B2B document type.
2. In case of EDI other non-XML formats, Oracle B2B translates the inbound payload into an intermediate XML format.
3. The message is queued into a JMS B2B inbound queue. Along with the B2B document payload, the following key metadata about the B2B document are also passed along to the AIA and SOA composite layer:
    a. From Trading Partner
    b. To Trading Partner
    c. Document Type
    d. Document Type Revision
4. The AIA B2B interface receives the B2B document and header information from Oracle B2B and routes it to the correct requester B2BCS based on the Document Type parameter.
5. The requester B2BCS transforms the B2B document to the EBM and invokes the EBS.
6. The EBS introspects the EBM and routes it to the correct provider ABCSs.
7. The provider ABCSs transform the EBM to ABM formats and invoke participating application APIs or web services.

16.3. Understanding the Oracle B2B Component of Oracle Fusion Middleware

Oracle B2B is an e-commerce gateway that enables the secure and reliable exchange of business documents between an enterprise and its trading partners. Oracle B2B supports B2B document standards, security, transports, messaging services, and trading partner management. The Oracle SOA Suite platform, of which Oracle B2B is a binding component, enables the implementation of e-commerce business processes.

16.3.1. How AIA Complements Oracle Fusion Middleware Oracle B2B

As described in the previous section, AIA leverages the capabilities of the Oracle B2B component to build end-to-end B2B integration solutions. Note especially the key distinctions between the capabilities of Oracle B2B and AIA in the area of B2B integration.

At a high level, Oracle B2B provides B2B support by contributing the following functionality:

- Transport of B2B document payloads to remote trading partner systems.
- Support of secure integrations via encryption, digital signatures, and nonrepudiation.
- Support of industry-standard message-packaging protocols, such as Applicability Statement 2 (AS2) and RosettaNet Implementation Framework (RNIF).
- Transparent, configuration-based translation between non-XML formats, such as EDI and positional or delimiter-separated flat files, and XML.

- Support of a single, enterprise B2B information gateway, including auditing and reporting.

At a high level, AIA provides B2B support by contributing the following functionality:

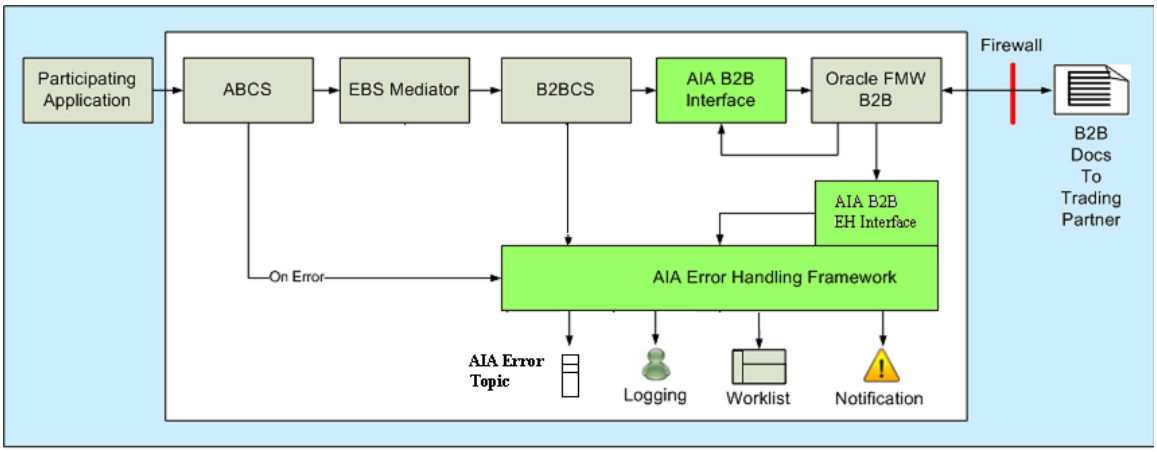
- Prebuilt transformation between AIA canonical objects and B2B standard document formats.
- Canonical enterprise object library and services, reference architecture, infrastructure, and developer tools that can be used to build custom B2B integrations.
- Business process orchestration of B2B flows using SOA integration best practices.

For more information about Oracle B2B, see Oracle Fusion Middleware User's Guide for Oracle B2B.

16.4. Understanding the Foundation Pack Infrastructure for B2B

Along with the architecture and programming model, additional infrastructure components are delivered with Foundation Pack in support of B2B integrations.

This section provides a high-level description of the B2B infrastructure delivered with Foundation Pack. Chapters Developing and Implementing Outbound B2B Integration Flows and Developing and Implementing Inbound B2B Integration Flows provide more details on how to use these infrastructure components when you develop and implement B2B flows using AIA.



Foundation Pack B2B infrastructure components (in green)

16.4.1. B2B Support in AIA Error Handling Framework

The AIA Error Handling Framework includes support for error scenarios in B2B integration flows.

1. The AIA B2B Error Handling Interface composite listens for errors that occur in the Oracle Fusion Middleware B2B component.
2. Errors that occur in Oracle B2B are dequeued from the B2B queues and transformed into the canonical AIA fault structure.
3. The AIA Error Handling Framework is then triggered with this fault message as input.

4. Once the AIA Error Handling Framework has been triggered, its delivered error-handling capabilities can be leveraged for error resolution.

Some of the key capabilities of the AIA Error Handling Framework include:

- Transformation of all errors to a canonical fault message and queuing of the error to the AIA Error Topic.
- Logging of error information.
- Option to use the Oracle BPM Worklist application to track error resolution tasks.
- Option to issue error notifications to preconfigured roles.
- Launch custom error handling and compensation processes.

These ready-to-use error-handling capabilities reduce the need to duplicate error-handling code across integration code.

For more information about the functionality and uptake of the Error Handling Framework, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up and Using Error Handling and Logging."

16.4.2. AIA B2B Interface

The AIA B2B interface is a reusable mediator-based SOA composite that acts as an abstraction layer between B2BCSs and the Oracle B2B component in Oracle Fusion Middleware. The AIA B2B interface shields B2BCSs from the choice of internal delivery channel employed to connect to Oracle B2B.

Upon installation, the Oracle AIA Installer configures the AIA B2B interface to connect to Oracle B2B using JMS-based queues. However, based on specific integration needs, an implementation may require the use of any of the other available internal delivery channels, such as Oracle Advanced Queuing, File Delivery Channel, and B2B adapter to integrate AIA with Oracle B2B. The AIA B2B interface composite can be modified to replace the use of JMS with any of these internal delivery channels without having to modify every B2BCS.

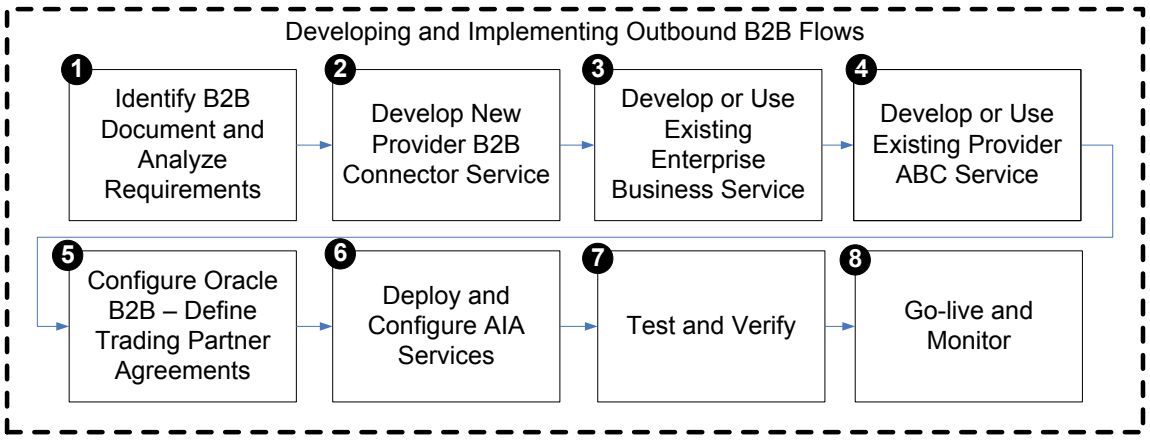
For more information about the B2B adaptor, see *Oracle Fusion Middleware User's Guide for Oracle B2B,* "Getting Started with Oracle B2B."

17. Developing and Implementing Outbound B2B Integration Flows

This chapter discusses the following topics:

17.1. Introduction to Developing and Implementing Outbound B2B Integration Flows

The following diagram shows the high-level steps involved in developing a simple outbound business-to-business (B2B) flow from an application to trading partners using Oracle Application Integration Architecture (AIA).

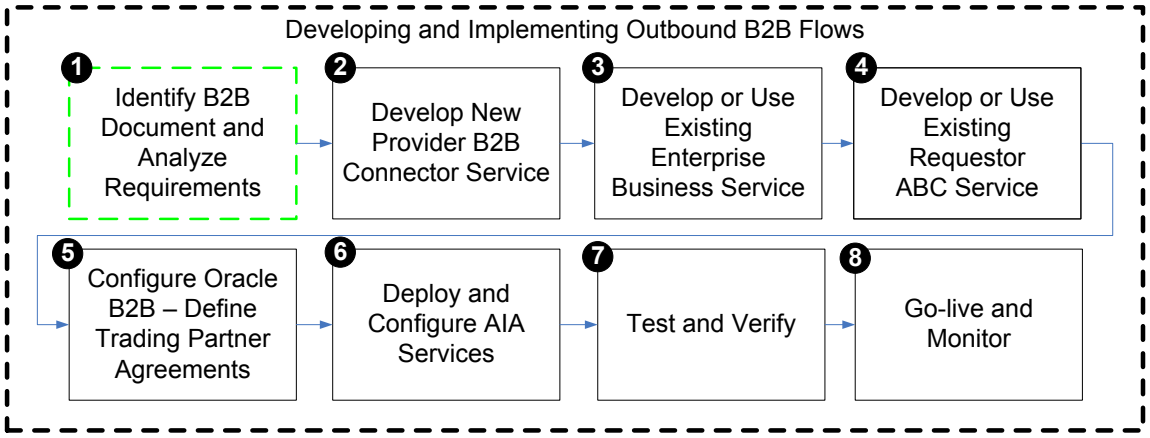


High-level steps to develop and implement a simple outbound B2B flow

Each of the steps listed in this diagram are described in detail in the following sections.

17.2. Step 1: Identifying the B2B Document and Analyzing Requirements

The first step in building an outbound B2B flow is to identify the B2B document that needs to be generated by the flow. As a part of this step, you must also analyze the requirements for the AIA services that need to be built or extended to support the flow.



Step 1: Identifying B2B document and analyzing service requirements

As a part of this step, the integration development team performs the following tasks:

- Identify the B2B document protocol to be used.
- Identify the B2B document type to be used.
- Define the B2B document in Oracle B2B.
- Define the B2B document in AIA.
- Identify the AIA Enterprise Business Object (EBO), Enterprise Business Message (EBM), and Enterprise Business Service (EBS) to be used.
- Identify the message exchange pattern.
- Map the EBM, B2B document, and Application Business Message (ABM).
- Document and publish the mapping.

17.2.1. How to Identify the B2B Document Protocol

To develop a B2B flow, you first identify the B2B document to be used. Often, the choice of B2B document is influenced by the capabilities of the trading partners or e-commerce hub that needs to be integrated with your applications.

However, if you have the choice to choose a B2B document definition to be used for a particular integration use case, several industry-standard e-commerce standards exist today that vary in popularity in different geographies and industries.

Examples of B2B document protocols are Open Applications Group Integration Specification (OAGIS), Electronic Data Interchange (EDI) X12, Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT), Health Insurance Portability and Accountability Act (HIPAA), EANCOM, RosettaNet, Universal Business Language (UBL), Health Level 7 (HL7), and 1SYNC.

Consider the following questions when choosing a B2B document protocol to integrate with your trading partners:

- Does the document protocol have the list of documents to support your integration needs?
- Does the document protocol have adequate support for your industry?
- Is the document protocol supported by your key trading partners?
- Is the document protocol popular in your geography?
- Is the document protocol based on open standards such as XML and XML Schema?
- Is the protocol support by your vendor, for example, Oracle?

Along with the B2B document protocol, the version of the B2B document must also be determined. Similar considerations as listed previously can be used to determine the B2B document protocol version.

17.2.2. How to Identify the B2B Document Type and Definition

Once you have selected the B2B document protocol, the next task is to identify the B2B document that meets the specific B2B integration need. Each document protocol supports a list of B2B documents or document types. Refer to the protocol documentation and document usage guidelines to identify the specific document that is best-suited to support your specific business flow. Document usage can vary by industry and geography.

For example, assume that you need to implement a B2B flow to send purchase orders electronically to your supplier as part of your procurement business flow. Assume that the EDI X12 is chosen as the B2B document protocol based on your integration needs. The EDI X12 document protocol recommends that the 850 (Order) document be used for this integration requirement.

After the B2B protocol, document, and version are identified, you must obtain official versions of the following artifacts related to the document:

- Documentation and usage guidelines, which describe the B2B document in detail, including individual elements.
- Sample XML instances, which illustrate the usage of the B2B document.
- XML Schema definition of the B2B document.

For XML-based B2B document protocols, internet resources pertaining to the standard can be used as the source for downloads of the official user documentation, XML schemas, and sample document instances. For example, the OAGIS website (www.oagi.org) provides all of this information for every major release of the OAG document standards.

You can also obtain the official artifacts listed previously as a part of the B2B Document Editor software, which is part of Oracle Fusion Middleware.

For more information about creating guideline files, see *Oracle Fusion Middleware User's Guide for Oracle B2B,* "Creating Guideline Files."

For non-XML protocols such as EDI and flat-file, Oracle B2B provides translation capabilities to convert the documents from non-XML formats to XML. However, this XML is an intermediate XML definition of the B2B document, which still needs to be transformed to the AIA EBM. You can export the B2B document in Oracle B2B Integration format using the B2B Document Editor to obtain the XML schema representation of this intermediate XML for use with the AIA B2B Connector Service (B2BCS).

17.2.2.1. Supporting Document Variations

As an integration best practice, we recommend that the standard B2B document definition be used as-is for B2B integration. Frequently, however, the B2B document definition must be modified to accommodate additional elements to meet custom integration requirements.

If such variations to the published standard are required, then the B2B document guideline and schemas obtained in the previous step must be modified to include these additional details.

17.2.3. How to Define the Document in Oracle B2B

Once you have identified the B2B document type and definition, you must define the document in Oracle B2B. This is a prerequisite to using these documents in trading partner agreements.

For more information about creating document definitions, see *Oracle Fusion Middleware User's Guide for Oracle B2B*, "Creating Document Definitions."

17.2.4. How to Define the Document in AIA

Per AIA integration best-practice recommendations, all reusable SOA artifacts, such as XML Schema and WSDL files, are hosted centrally in the SOA metadata store. Centrally hosting reusable artifacts and referencing them from the AIA services helps improve the performance and ease-of-maintenance of AIA services. The SOA metadata store provides caching and clustering capabilities that are also leveraged when we use it as the central store.

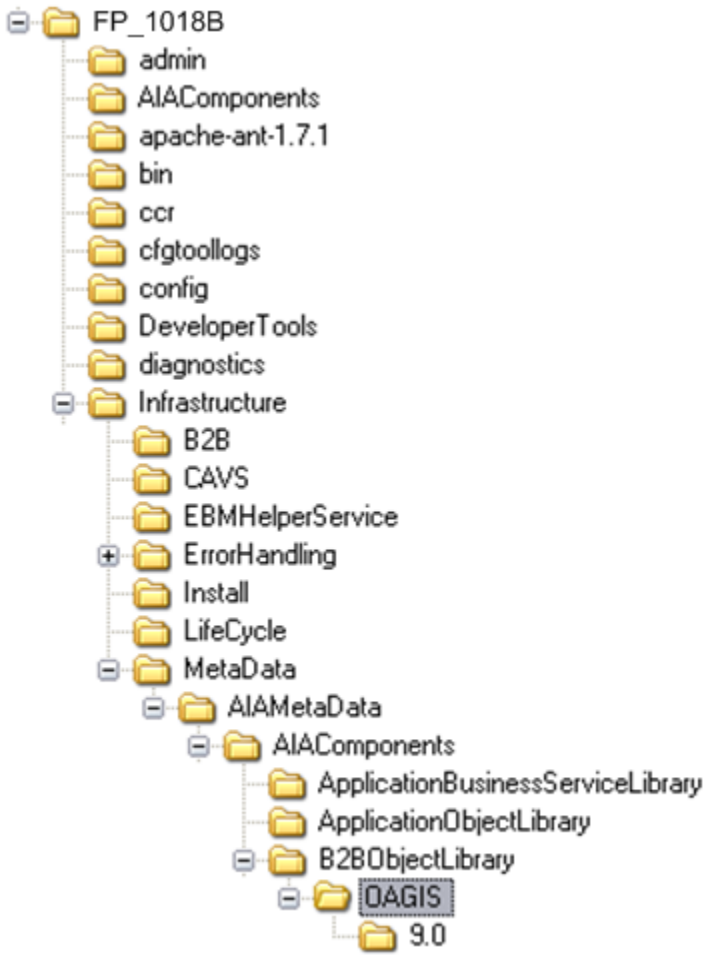
The XML schema definitions of B2B documents that are used by the B2B connector services are also hosted in the metadata store.

To deploy the B2B documents to the metadata store:

1. Create a directory that corresponds to the B2B standard in the B2BObjectLibrary.
2. Copy the XML schema files and directories that define the B2B document types to this location.

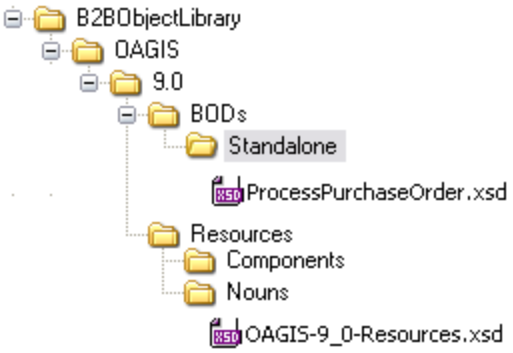
   The B2BObjectLibrary directory is a child directory of $AIA_HOME/MetaData/ AIAMetaData/ AIAComponents.

   For example, create directory OAGIS to copy OAG business object definitions.



3. Copy the XML schema files that correspond to the B2B document type under this folder.

   For example, copy the OAGIS ProcessPurchaseOrder.xsd file and all of its supporting schemas to this folder location, while also preserving the relative directory structure.



4. Deploy the new contents of the B2B Object Library to the SOA metadata store. To do this:

   a. Edit the file $AIA_HOME/config/UpdateMetaDataDeploymentPlan.xml to specify that the directory B2BObjectLibrary has to be updated in the metadata store.

```
<?xml version="1.0" standalone="yes"?>
<DeploymentPlan component="MetaData" version="3.0">
 <Configurations>
       <UpdateMetadata wlserver="fp" >
              <fileset dir="${AIA_HOME}/Infrastructure/MetaData/AIAMetaData">
                     <include name="AIAComponents/B2BObjectLibrary" />
              </fileset>
       </UpdateMetadata>
 </Configurations>
</DeploymentPlan>
```

b. Source the file aiaenv.sh located under $AIA_HOME/bin. For example:

```
$source /slot/ems5813/oracle/AIA3_HOME/bin/aiaenv.sh
```

c. Change the directory to $AIA_HOME/Infrastructure/Install/scripts. For example:

```
$cd $AIA_HOME/Infrastructure/Install/scripts
```

d. Issue the AIA command to deploy the metadata. For example:

```
$ant –f UpdateMetadata.xml
```

e. Verify that the command was successful and that no errors occurred.

17.2.5. How to Identify the EBO, EBS, and EBM to Be Used

To be able to integrate the B2B documents using AIA, the next step is to identify the AIA EBO, EBM, and EBS to be used. Select the AIA EBO and EBM for which the description most closely matches the B2B document to which you need to integrate.

For example, to develop an outbound B2B integration flow in which EDI 850 (Order) documents need to be communicated to a supplier by a procurement application, you can use the following EBO, EBM, and EBS:

- EBO: PurchaseOrderEBO
- EBM: CreatePurchaseOrderEBM
- EBS operation: CreatePurchaseOrder

17.2.6. How to Design Mappings for the B2B Document

The next step is to analyze your business requirements and map the ABM to the EBM and the EBM to the B2B document.

Consider the following guidelines while developing mappings for B2B documents:

- Identify and clearly list the subset of target B2B document elements to which you need to map based on your integration needs.
- Document and publish the list of B2B elements being mapped. For each element being mapped, document the following information:
  - Data type

- Cardinality
- Example value
- Description
- DVM name and columns used
- Mandatory indicator

Consider the following guidelines while mapping identification and reference components in the B2B documents:

- Map universal identifiers if available and supported by your application. For example, map UPC codes for identifying Items and UDEX codes for identifying Item Categories.
- Map all available external identifiers used by your trading partners. For example, map the Vendor Part Number in outbound B2B documents that need to be sent to your vendors.
- Map free-form attributes such as Description, Notes, Attachments, and so forth to enable users to communicate and provide more information to trading partners.
- While mapping reference components, map content from the referenced entity and not just the identification. For example, if a Ship To Location has to be mapped in an outbound Purchase Order document being sent to a supplier, in addition to the location identifiers, map the actual postal address and contact details of the Ship To Location.
- While mapping Identification type components, you can directly map the actual application IDs to the B2B document. This is unlike the application-to-application (A2A) use case in which an XREF is used to store the mapping between the participating application identifiers and the AIA identifiers.

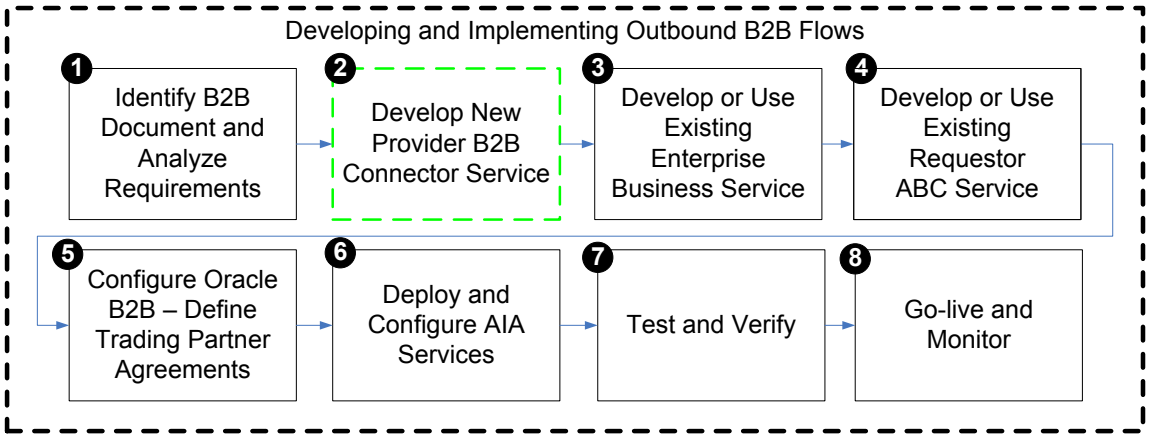
  For example, assume that you are working with a SyncItem from an Inventory system to a trading partner. Assume that ITEM_001 is the item identifier in the source ABM. This value can be directly mapped as-is to the Identification element. Using an XREF has little additional value because the ID generated in the trading partner application as a result of the sync flow will not be captured in the XREF. A direct mapping is preferable instead.

- Map ahead of current requirements. Even if your current integration use case may require that only a few elements be mapped, a best-practice recommendation is to map all the available fields that can be processed by your application. This allows the connectors to be reused for multiple use cases.
- Extend EBOs, if required. If the target B2B document contains attributes that need to be mapped, but that are not available in the EBO, extend the EBO to include the target elements and map them.
- Capture the mapping in an easy-to-understand spreadsheet and keep it current when any changes need to be made.

17.2.7. How to Publish Mapping to Trading Partners

The next step is to share the mapping document with trading partners. This enables your trading partners to make any changes needed in their internal system to process outbound B2B documents received from you. Also, any feedback received from your trading partners can be used to revise the mapping design.

17.3. Step 2: Developing a New Provider B2B Connector Service



Step 2: Developing a new provider B2B Connector Service

The next step is to develop the provider B2BCS to support the outbound B2B integration flow.

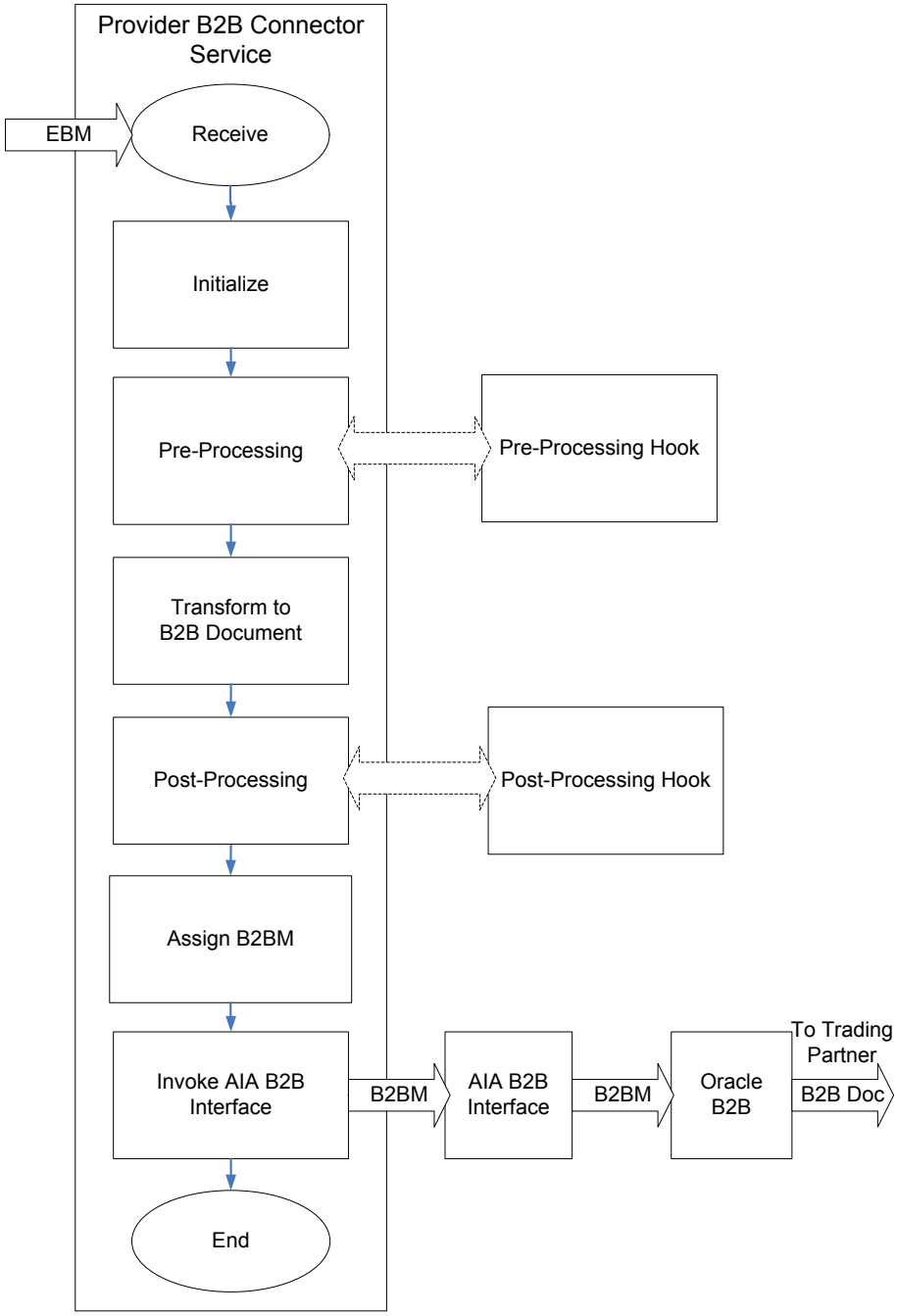
The provider B2BCS is very similar to a provider Application Business Connector Service (ABCS), with the only difference being that it integrates with trading partners via Oracle B2B instead of integrating with an application. Hence, we recommend that you familiarize yourself with the design and development of ABCS (requester and provider) as well.

17.3.1. Introduction to a Provider B2B Connector Service

The key functionality provided by a provider B2BCS is to enable outbound B2B document integration by performing the following tasks:

- Transforming AIA EBMs into B2B documents.
- Invoking Oracle B2B to send these B2B documents to trading partners.

The following diagram illustrates the processing that takes place in a simple fire-and-forget message exchange pattern-based provider B2BCS.



Processing flow for a fire-and-forget provider B2BCS

Step-by-step instructions for developing B2BCSs are provided in the following sections.

17.3.2. How to Identify the Message Exchange Pattern

Most B2B document flows can be modeled as asynchronous one-way calls.

For example, consider a use case in which a purchase order created in a Procurement application needs to be sent to a supplier using an outbound B2B document flow. Upon receipt of this Purchase Order document, the supplier processes it and sends back a Purchase Order Acknowledgement B2B document.

In this use case, even if a response is expected from the supplier in the form of the Purchase Order Acknowledgement document, the Procurement application can continue with its processing, which involves the purchase order being communicated to and processed by the vendor.

The Procurement application also generally can correlate the Purchase Order Acknowledgement document to the original purchase order because the Vendor is expected to provide the same purchase order identification used in the request in the Acknowledgement message. In this way, the request and response can be modeled as two asynchronous one-way flows.

However, a similar analysis must be performed for each B2B document flow being designed.

For more information about identifying message exchange patterns, see Identifying the MEP.

17.3.3. How to Develop a B2BCS Service Contract

First, define the service contract (WSDL) of the provider B2BCS. The service contract of the provider B2BCS specifies how it is invoked by an AIA flow. The service contract specifies the EBS operation being implemented, the input request type, and the message exchange pattern supported by the B2BCS.

For more information about creating WSDLs for ABCSs, see Defining the ABCS Contract.

The following naming conventions are recommended for use in the B2BCS WSDL definition.

Definition Element	Naming Guideline	Example
WSDL File Name	<B2BStandard><Verb><EBO> ProvB2BCSImpl.wsdl	X12UpdateSalesOrderProvB2BCSImpl. wsdl
Service Namespace	http://xmlns.oracle.com/B2BCSImpl/ {Core|Industry/<IndustryName>}/<B2BStandard><Verb><EBO>ProvB2BCSImpl / <ABCSVersion>	http://xmlns.oracle.com/B2BCSImpl/Core/X12UpdateSalesOrderProvB2BCSImpl/ V1 Please note that the ABCS Service version is independent of the B2B document/standard version. **For more information** about recommendations on versioning AIA services, see Versioning ABCS.
Service Name	<B2BStandard><Verb><EBO> ProvB2BCSImpl	X12UpdateSalesOrderProvB2BCSImpl
Port Type Name	<B2BStandard><Verb><EBO> ProvB2BCSImplService	X12UpdateSalesOrderProvB2BCSImpl Service
Operation Name	<Verb><EBO>	UpdateSalesOrder
Request Message Name	<Verb><EBO>ReqMsg	UpdateSalesOrderReqMsg
Request Message WSDL part element	<EBM>	<wsdl:part name="UpdateSalesOrderEBM

Definition Element	Naming Guideline	Example
		element=" salesordebo:UpdateSalesOrderEBM"/>
Imported Schemas	oramds:/apps/AIAMetaData/AIAComponents /EnterpriseObjectLibrary/ Core/Common/V2/Meta.xsd oramds:/apps/AIAMetaData/AIAComponents /B2BObjectLibrary/<B2BMessageSchema> oramds:/apps/AIAMetaData/AIAComponents /EnterpriseObjectLibrary/ <EBM Schema>	oramds:/apps/AIAMetaData/ AIAComponents/ EnterpriseObjectLibrary/Core/ Common/V2/Meta.xsd oramds:/apps/AIAMetaData/ AIAComponents/ EnterpriseObjectLibrary/Core/ EBO/SalesOrder/V2/SalesOrderEBM.xsd oramds:/apps/AIAMetaData/ AIAComponents/B2BObjectLibrary/ X12/4010/Oracle/855_4010.xsd
Imported WSDLs	oramds:/apps/AIAMetaData/AIAComponents/ UtilityArtifacts/RuntimeFault.wsdl	oramds:/apps/AIAMetaData/ AIAComponents/UtilityArtifacts/ RuntimeFault.wsdl

An example provider B2BCS WSDL file can be found in the project directory of B2BCS X12UpdateSalesOrderProvB2BCSImpl, which is shipped with AIA Foundation Pack. The service contract of this connector service can be found at $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/EDI_X12/ProviderB2BCS/V1/X12UpdateSalesOrderProvB2BCSImpl.wsdl.

17.3.4. How to Store a WSDL in the Oracle Metadata Repository

As a SOA best practice, we recommend that all shared service artifacts, such as WSDL and XSD files, be stored in a central location that can be accessed by multiple services.

All of the AIA-shared artifacts are stored in the Oracle Fusion Middleware Metadata Repository. Storage of shared artifacts in the Metadata Repository not only makes them globally accessible, but also enables AIA to leverage features in Metadata Repository that support caching and clustering.

Provider B2BCS WSDLs are stored at the following location in the Metadata Repository: /apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/<B2B_STANDARD>/ProviderB2BCS/<VERSION>/<B2B_STANADRD><VERB><OBJECT>ReqB2BCSImpl.wsdl

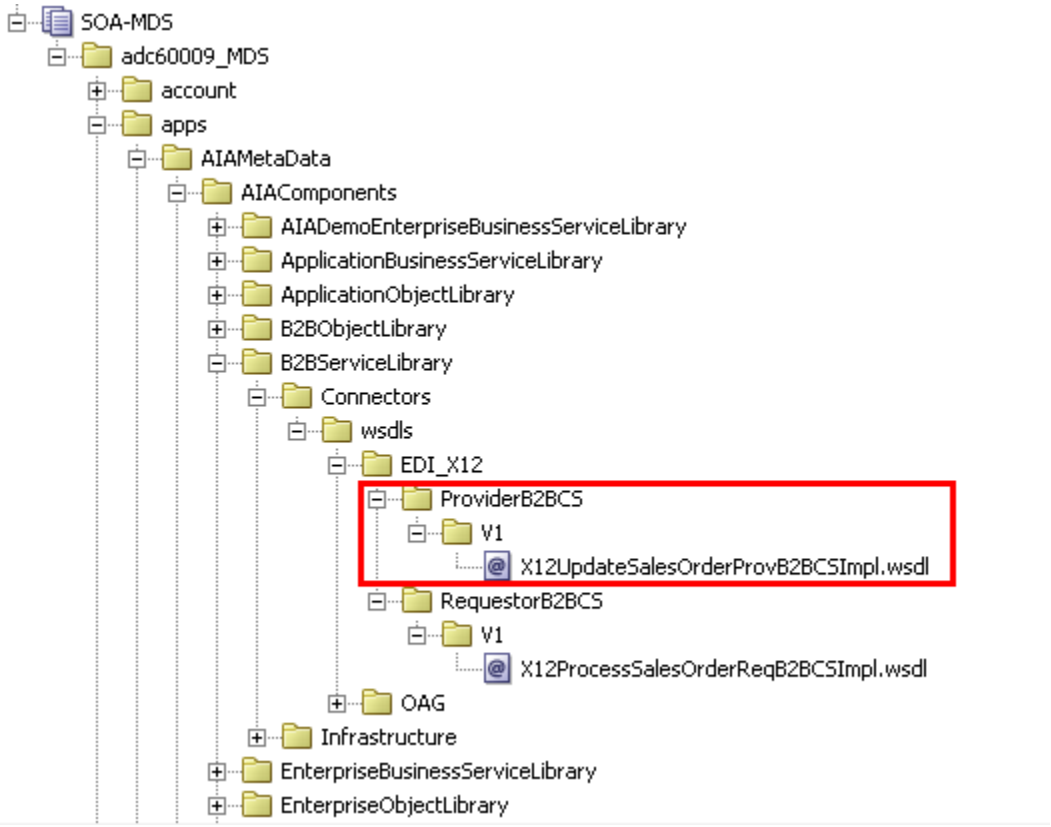
To store a WSDL in Metadata Repository:

1. Copy the handcrafted WSDL to the following location under AIA_HOME:

   $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/<B2B_STANDARD>/ProviderB2BCS/<VERSION>/<wsdl file>.wsdl

2. Run the UpdateMetaDataDP.xml present at $AIA_HOME/config/UpdateMetaDataDP.xml.

3. Using a SOA-MDS server connection to the Metadata Repository, verify that the AIAMetadata has been populated.



4. You can now access the WSDL using a URL similar to the following:

   oramds:/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/EDI_X12/ProviderB2BCS/V1/X12UpdateSalesOrderProvB2BCSImpl.wsdl

17.3.5. How to Develop a B2B Connector Service

The next step in the process is to develop the B2BCS. The provider B2BCS WSDL created in the previous step is used as the interface while you are developing the concrete B2BCS.

Because the Service Constructor does not support the autogeneration of B2B services, use Oracle JDeveloper to develop the B2BCS. Develop a composite with a BPEL process based on the abstract WSDL created in the previous step.

Following are the key activities that need to be developed in the B2BCS implementation BPEL.

To develop a B2BCS:

1. Define variable <EBM>_Var.

   This is the input variable to the BPEL process and is used in the receive activity.

2. Define variable EBM_HEADER of type corecom:EBMHeader.

   This variable is used to store the AIA process context information and is used by the fault handling mechanism.

3. Define variable B2BM_HEADER of type corecom:B2BMHeader.

   This variable is used to store the B2B-specific AIA process context information and is used by the fault handling mechanism.

4. Define variable <B2BDoc>B2BM_Var of type corecom:B2BM.

   This variable is used as input to the AIAB2BInterface to send the outbound B2B document to Oracle B2B.

5. Define variable <B2BDoc>_Var using the external B2BDocument definition.

   This is used as the target of the transformation from EBM. This variable is then assigned to the <B2BDoc>B2BM_Var/Payload.

6. Define partner link to the AIAB2BInterface.

   This service is invoked to send the B2B document to trading partners via Oracle B2B. The abstract WSDL to the AIAB2BInterface can be referenced from oramds:/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Infrastructure/wsdls/V1/B2BInterfaceV1.wsdl.

7. Assign EBM_HEADER variable.

   Assign values of the EBM_HEADER local variable by copying all the values from the <input>EBM/EBMHeader element.

8. Assign B2BM_HEADER variable.

   Assign the values as follows:

Element	Value	Example
B2BMHeader/B2BMID	Map value from the EBMHeader/EBMID to the field.	“111A1CD2121”
B2BMHeader/B2BDocumentType/TypeCode	Populate with the B2B document type as defined in Oracle B2B.	‘X12_850’
B2BMHeader/B2BDocumentType/Version	Populate with the B2B document revision configured in Oracle B2B.	‘4010’
B2BMHeader/SenderTradingPartner/TradingPartnerID	Populate with value from the input EBM.	‘Acme’

Element	Value	Example
	/<XXX>EBM/EBMHeader/B2BProfile/SenderTradingPartner/TradingPartnerID	
B2BMHeader/ReceiverTradingPartner/TradingPartnerID	Populate with value from input EBM. /<XXX>EBM/EBMHeader/B2BProfile/ReceiverTradingPartner/TradingPartnerID	'GlobalChips'

9. Transform the EBM into the B2B document.

Use a transform activity to transform the EBM into the B2B Document format. Invoke an XSLT developed per the mapping created in the previous step.

10. Assign <B2BDoc>B2BM_Var.

Assign values to the <B2BDoc>B2BM_Var as follows

Element	Value
<B2BDoc>B2BM_Var//B2BMHeader	Contents of B2BM_HEADER variable
<B2BDoc>B2BM_Var//Payload	Contents of B2B Document variable: <B2BDoc>_Var

11. Invoke AIAB2BInterface.

Invoke the AIAB2BInterface to send the document to trading partners. Use the <B2BDoc>B2BM_Var assigned in the previous step as input to the AIAB2BInterface.

Invoke activity parameters as follows:

Activity Name	InvokeAIAB2BInterface
Input	<B2BDoc>_B2BMVar
Partner Link	AIAB2BInterface
Port Type	B2BInterface
Operation	SendB2BMessage

12. Compile the BPEL process and ensure that no errors occur. You can use JDeveloper to deploy the BPEL process to a development server that is installed with AIA Foundation Pack.

13. Test the service by using sample EBM payloads as input.

17.3.6. How to Customize the AIA B2B Interface

As described previously in this document, the AIA B2B Interface is a reusable composite that can be used to integrate the B2B Connector Services with Oracle B2B. The AIA B2B Interface uses JMS-based internal delivery channels to integrate with Oracle B2B.

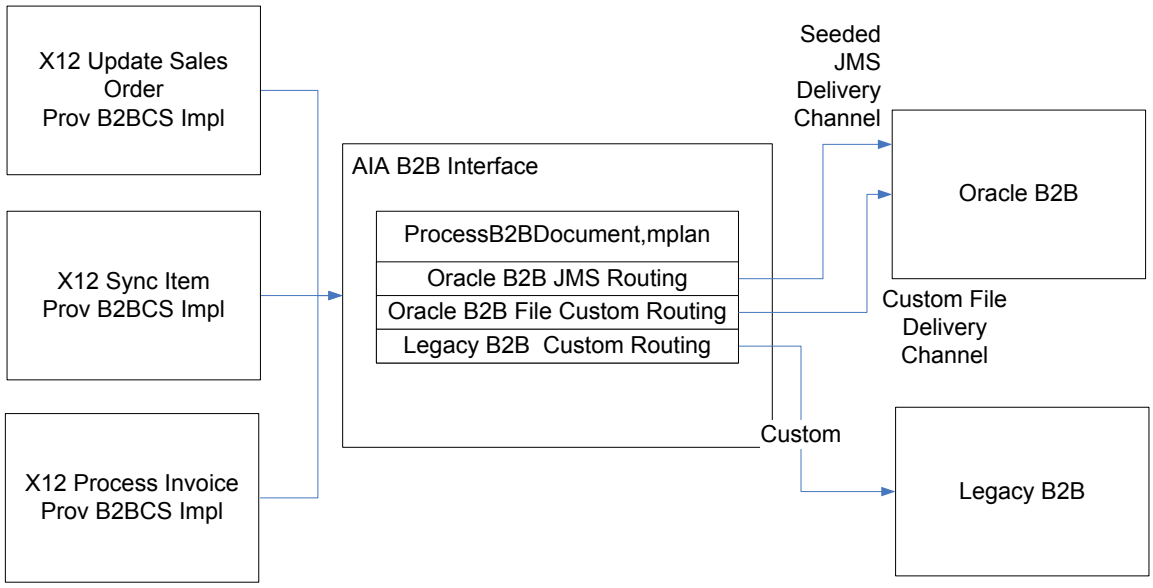
The AIA B2B Interface is a unified interface between the AIA and Oracle B2B layers for all B2BCSs. It supports operations to send B2B documents to Oracle B2B and receive B2B documents from Oracle B2B. The benefits of using the AIA B2B Interface to integrate with Oracle B2B are as follows.

If the choice of internal delivery channel to be used for communication between B2B and AIA/SOA has to be changed at a later stage in the implementation, the B2BCS code need not be modified.

If you are using legacy or third-party B2B software, the AIA B2B Interface can be customized to add routing rules to send B2B documents to this legacy software. The B2BM_Var//B2BMHeader/GatewayID can be used as a filter expression to choose between Oracle B2B and third-party B2B software as the target for outbound documents. This allows the B2BCS to be shielded from change irrespective of the choice of B2B software.

Because this service is invoked by all outbound B2B document flows, you can customize this composite to support any common outbound functionality, such as audit logging, Oracle Business Activity Monitoring (BAM) instrumentation, and so forth.

The following diagram illustrates the use of the AIA B2B Interface to support custom internal delivery channels (file) and legacy B2B connectivity.

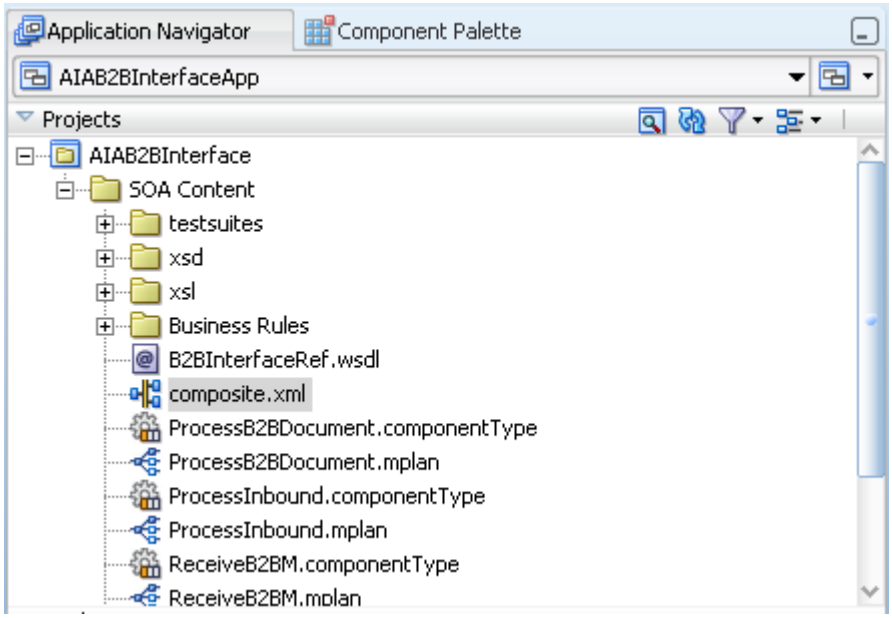


For example, you might have outbound Order documents being routed to a Fusion Middleware Oracle B2B component, and outbound Invoice documents being routed to an older B2B instance. To support this use case, define two routing rules: one for JMS invocation of Oracle B2B and another for Oracle Advanced Queuing invocation of the older B2B instance.

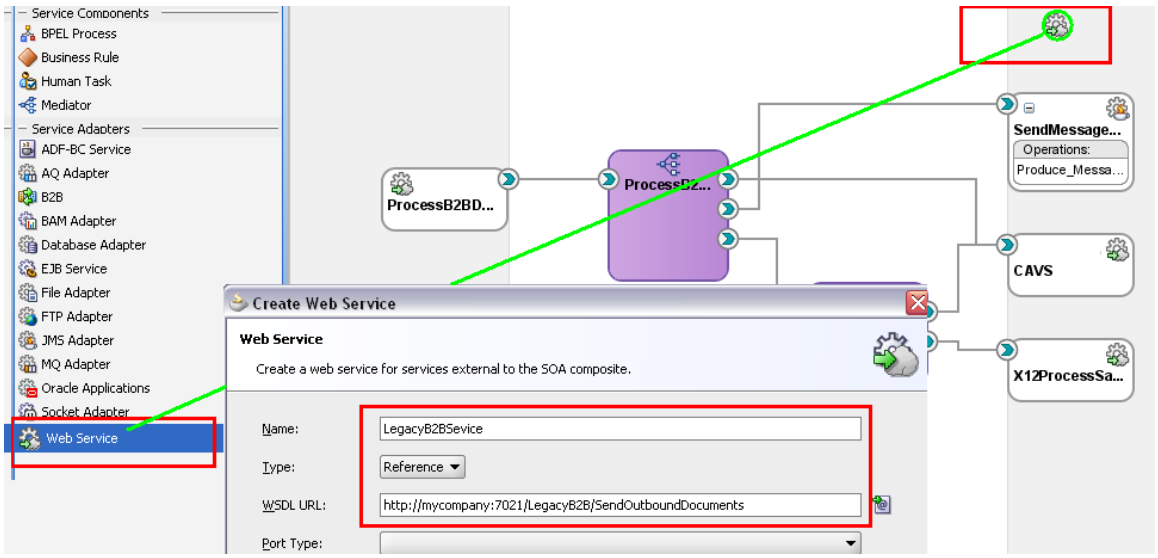
Note that a given B2B document instance is likely to be routed to B2B using one of the multiple routing rules in the ProcessB2BDocument.mplan. In the highly unlikely event that a B2B document generated by the AIA layer needs to be routed to multiple B2B software instances, the routing rules in the ProcessB2BDocument.mplan mediator should be configured for sequential invocation.

To make customizations to the AIA B2B Interface:

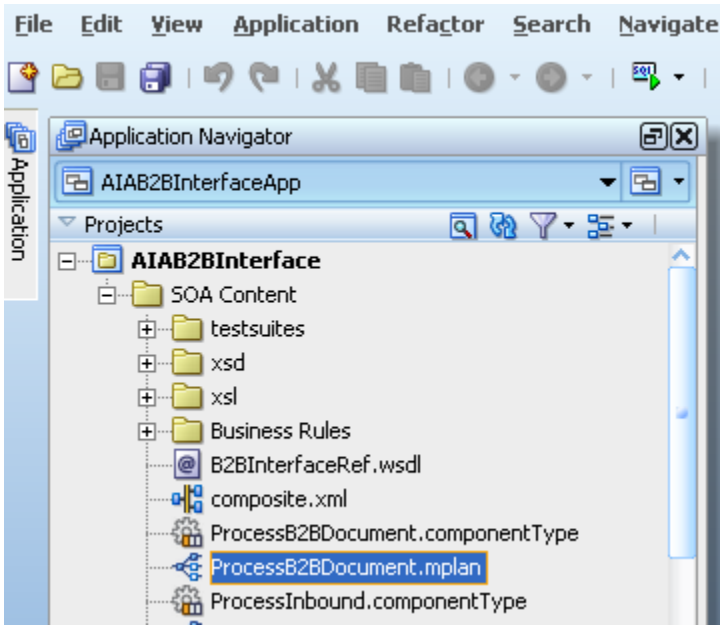
1. Open the SOA application $AIA_HOME/Infrastructure/B2B/src/AIAB2BInterfaceApp using JDeveloper.
2. Edit the file AIAB2BInterface/composite.xml using the Composite Editor.



3. Add a new adapter or web-service call required to interface to the third-party B2B software.

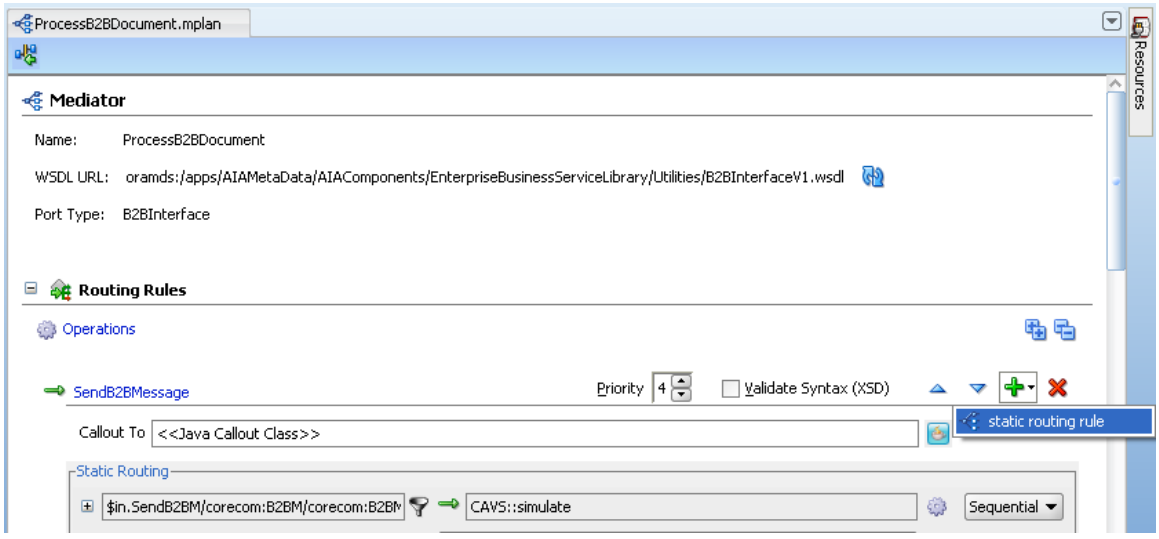


4. Modify the file AIAB2BInterface/ProcessB2BDocument.mplan to add custom routing rules to route outbound B2B documents to third-party B2B software.

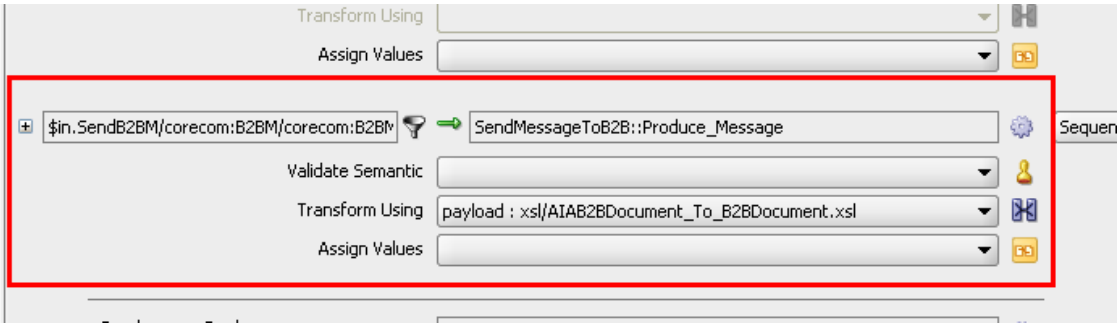


5. Use a condition expression on the GatewayID element to identify which B2B documents need to be routed to the third-party B2B software.

```
<condition language="xpath">
<expression>$in.SendB2BM/corecom:B2BM/corecom:
B2BMHeader/corecom:GatewayID = 'MyB2BSoftware'</expression>
</condition>
```



6. Use a transformation step, assign step, or both as required to provide inputs to the B2B software based on the input B2BM variable. ($in). Note that support for Oracle B2B is prebuilt and does not require any modifications.



7. The input B2BM variable is received from the provider B2BCSs. The following information from the B2BM variable can be used to provide inputs to the B2B software.

Input Element	Description	Usage While Integrating with Oracle B2B
$in.B2BM/B2BMHeader/SenderTradingPartner/TradingPartnerID	Sending trading partner in outbound flow	Map to JMSProperty.FROM_PARTY
$in.B2BM/B2BMHeader/ReceiverTradingPartner/TradingPartnerID	Receiving trading partner in outbound flow	Map to JMSProperty.TO_PARTY
$in.B2BM/B2BMHeader/B2BDocumentType/TypeCode	B2B Document Type used in the outbound flow, for example, 850	Map to JMSProperty. DOCTYPE_NAME
$in.B2BM/B2BMHeader/B2BDocumentType/Version	B2B Document Type version used in the outbound flow, for example, 4010	Map to JMSProperty. DOCTYPE_REVISION
$in.B2BM/B2BMHeader/B2BDocumentType/TypeCode/listAgencyID	B2B standard used in the outbound flow, for example, X12	Not used
$in.B2BM/B2BMHeader/B2BMID	Unique B2B document identifier. Unique across all trading partners.	JMSProperty. MSG_ID
$in.B2BM/B2BMHeader/Payload	Actual payload being sent to trading partners	JMS text payload

8. The B2BCS is responsible for supplying the value of the GatewayID element to ensure that the desired value of the GatewayID is supplied before the AIAB2B Interface is invoked.

9. Save changes, compile, test, and redeploy the AIA B2B Interface.

17.3.7. How to Annotate B2B Connector Services

To make key metadata about the B2BCS available to the Project Lifecycle Workbench and Oracle Enterprise Repository, the composite.xml file of the B2BCS Implementation SOA composite must be annotated in a specific manner.

For more information about the Project Lifecycle Workbench, see Working with Project Lifecycle Workbench.
For more information about annotating B2B services, see Annotating Composites.

To annotate B2B Connector Services:

1. The following annotation elements must be added to the service element composite.xml, as described subsequently. The XML snippet from the X12ProcessSalesOrderReqB2BCSImpl composite.xml is an example of an annotated B2BCS.

```
    <interface.wsdl interface="http://xmlns.oracle.com/B2BCSImpl/Core/X12UpdateSalesOrderProvB2BCSImpl/V1#wsdl.
    <binding.ws port="http://xmlns.oracle.com/B2BCSImpl/Core/X12UpdateSalesOrderProvB2BCSImpl/V1#wsdl.endpoint(
<!--
                <svcdoc:AIA>
                    <svcdoc:Service>
                      <svcdoc:InterfaceDetails>
                         <svcdoc:ServiceName>SalesOrderEBS</svcdoc:ServiceName>
                         <svcdoc:Namespace>http://xmlns.oracle.com/EnterpriseServices/Core/SalesOrder/V2</svcdc
                         <svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                         <svcdoc:ServiceOperation>
                            <svcdoc:Name>UpdateSalesOrder</svcdoc:Name>
                         </svcdoc:ServiceOperation>
                      </svcdoc:InterfaceDetails>
                      <svcdoc:ImplementationDetails>
                         <svcdoc:ApplicationName></svcdoc:ApplicationName>
                         <svcdoc:BaseVersion></svcdoc:BaseVersion>
                         <svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>
                         <svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>
                         <svcdoc:ArtifactType>ProviderB2BCSImplementation</svcdoc:ArtifactType>
                         <svcdoc:ServiceOperation>
                            <svcdoc:Name>UpdateSalesOrder</svcdoc:Name>
                         </svcdoc:ServiceOperation>
                         <svcdoc:B2BDocument>855</svcdoc:B2BDocument>
                         <svcdoc:B2BDocumentVersion>4010</svcdoc:B2BDocumentVersion>
                         <svcdoc:B2BStandard>EDI_X12</svcdoc:B2BStandard>
                         <svcdoc:B2BStandardVersion>4010</svcdoc:B2BStandardVersion>
                      </svcdoc:ImplementationDetails>
                   </svcdoc:Service>
                </svcdoc:AIA>
-->
  </service>
```

Annotation Element	Description	Example
AIA/Service/InterfaceDetails/ServiceName	Name of EBS implemented by this provider B2BCS Impl	SalesOrdeEBS
AIA/Service/InterfaceDetails/Namespace	Namespace of EBS implemented by this provider B2BCS Impl	http://xmlns.oracle.com/EnterpriseServices /Core/SalesOrder/V2
AIA/Service/InterfaceDetails/ArtifactType	EnterpriseBusinessService	EnterpriseBusinessService
AIA/Service/InterfaceDetails/ServiceOperation	<Verb><EBOName>	UpdateSalesOrder
AIA/Service/ImplementationDetails/ArtifactType	ProviderB2BCSImplementation	ProviderB2BCSImplementation
AIA/Service/ImplementationDetails/ServiceOperation/Name	<Verb><EBOName>	UpdateSalesOrder

Annotation Element	Description	Example
AIA/Service/ImplementationDetails/B2BDocument	Target B2B Document Type of this B2BCS	855
AIA/Service/ImplementationDetails/B2BDocumentVersion	Target B2B Document Version of this B2BCS	4010
AIA/Service/ImplementationDetails/B2BStandard	Target B2B Standard of this B2BCS	X12
AIA/Service/ImplementationDetails/B2BStandardVersion	Target B2B Standard Version of this B2BCS	4010

2. The reference to the AIA B2B Interface utility service should also be annotated in the composite.xml.

```
<reference name="AIAB2BInterfaceService"
           ui:wsdlLocation="oramds:/apps/AIAMetaData/AIAComponents/Enterprise
  <interface.wsdl interface="http://xmlns.oracle.com/EnterpriseObjects/Core/C
  <binding.ws port="http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V2
              location="http://ap6060fems.us.oracle.com:8001/soa-infra/servic
      <xs:annotation>
          <xs:documentation xml:lang="en">Details about invocation of AIAB2B
              <xs:appInfo>
                      <svcdoc:AIA>
                          <svcdoc:Reference>
                              <svcdoc:ArtifactType>UtilityService</svcdoc:Art
                              <svcdoc:ServiceOperation>
                                  <svcdoc:Name>ProcessB2BDocument</svcdoc:Nam
                              </svcdoc:ServiceOperation>
                          </svcdoc:Reference>
                      </svcdoc:AIA>
              </xs:appInfo>
      </xs:annotation>
</reference>
```

Annotation Element	Description	Example
AIA/Reference/ArtifactType	Enter value “UtilityService”	UtilityService
AIA/Reference/ServiceOperation/Name	Enter value “ProcessB2BDocument”	ProcessB2BDocument

3. The file $AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12Update SalesOrder ProvB2BCSImpl/composite.xml has sample provider B2BCS Impl annotations for your reference.

17.3.8. How to Support Trading Partner-Specific Variants

Frequently, in B2B implementations different trading partners need to support different versions or mapping guidelines for the same B2B document. If a given B2B document needs to be sent to multiple trading partners, based on the version and mapping guideline determined for that trading partner, the B2BCS of the document can be built to support this trading partner-specific transformation logic. Multiple ways are available by which this can be achieved, as described in the following section.

17.3.8.1. Supporting Trading Partner-Specific Custom Extensions

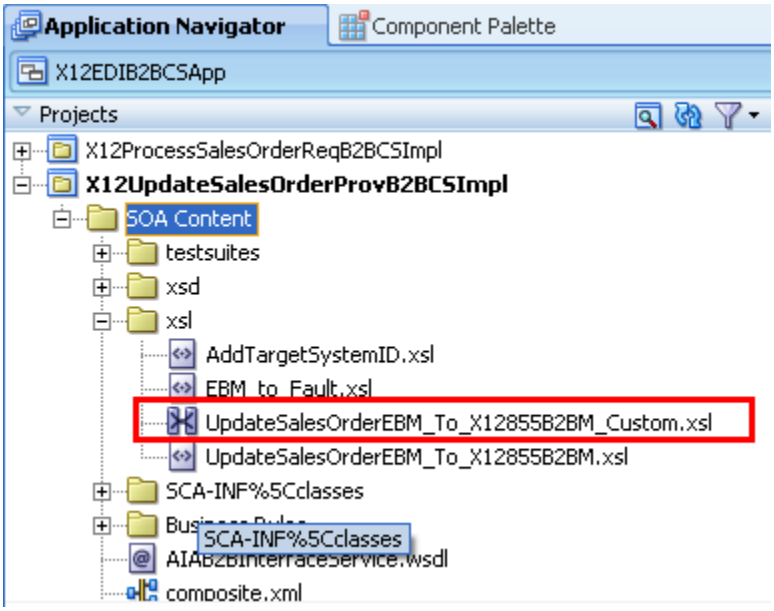
If the trading partner-specific mappings are an addition to a common core mapping that remains unchanged, explore the possibility of using the custom XSLT template calls to have partner-specific mappings.

For more information about support for XSLT extension using callouts to custom XSLT templates, see Developing Extensible ABCS.

In short, at the end of every business component mapped in the XSLT file, an invocation to a custom XSLT template is made from the shipped B2BCSs.

```
<edix12855:Element-143>
  <xsl:text disable-output-escaping="no">855</xsl:text>
</edix12855:Element-143>
<edix12855:Element-329>
  <xsl:value-of select="/salesordebo:UpdateSalesOrderEBM/corecom:EBMHeader/corecom:EBMID"/>
</edix12855:Element-329>
  <xsl:call-template name="Segment-ST_ext">
  <xsl:with-param name="currentNode"
   select="/salesordebo:UpdateSalesOrderEBM/corecom:EBMHeader"/>
  <xsl:with-param name="TradingPartnerID"
   select="/salesordebo:UpdateSalesOrderEBM/corecom:EBMHeader/corecom:B2BProfile/SenderTradingPartnerID"/>
</xsl:call-template>
</edix12855:Segment-ST>
```

The custom XSLT templates are defined in a custom XSLT file, which is included in the main XSLT.



During implementation, you can add additional mappings to this custom XSLT file.

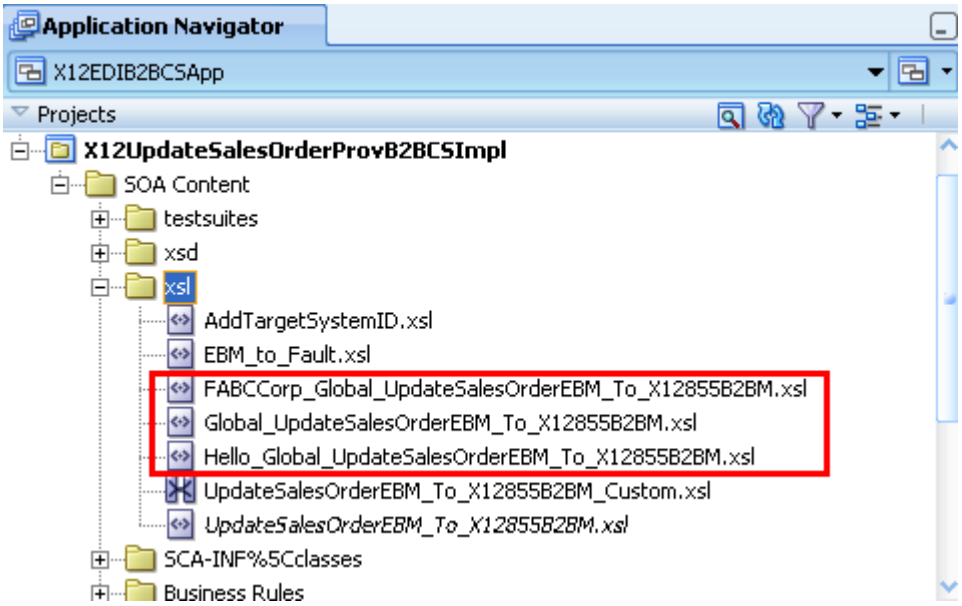
The trading partner ID can be passed as an input to the custom XSLT template call and can be used to conditionally map to target B2B elements.

```
<xsl:template name="Segment-ST_ext">
    <xsl:param name="currentNode">
    <xsl:param name="$TradingPartnerID">
    <xsl:if test='$TradingPartnerID= "ABCCorp"'>
       <!-- Add custom mappings to Segement-ST for trading partner "ABC Corp" here.
    </xsl:if>
    <xsl:if test='$TradingPartnerID= "Hello Inc"'>
       <!-- Add custom mappings to Segement-ST for trading partner "Hello Inc" here.
    </xsl:if>
    <xsl:if test='$TradingPartnerID= "Global"'>
       <!-- Add custom mappings to Segement-ST for trading partner "Global" here.
    </xsl:if>
</xsl:template>
```

17.3.8.2. Supporting Trading Partner-Specific XSLTs

If the trading partner-specific mappings conflict with each other or if the partner-specific mappings need to be added at arbitrary locations in the XML document and not just at the end of each mapping template, the previous approach of using the custom XSLT templates to define partner-specific mappings will not meet requirements.

To meet such requirements, you can decide to develop one XSLT file for each trading partner that needs custom mappings. You can make a copy of a shipped XSLT file, edit it to include partner-specific mapping logic, and save it by using a partner prefix in the filename.



Next, you can define a configuration file that contains information about which XSLT file has to be used for each trading partner. For example, you can use a domain value mapping (DVM) file to store this configuration information.

Domain Value Map(DVM)

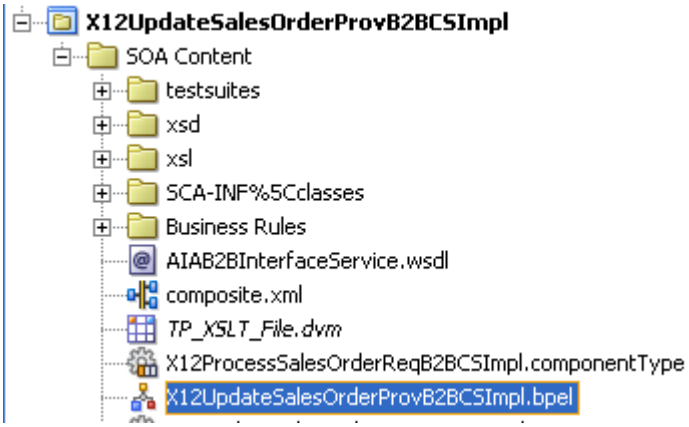
Name: TP_XSLT_File

Description: Configuration file which contains the XSLT file to be used by the X12UpdateSalesOrderB2BCSImpl for generating the 855 B2B document for each trading partner.

Map Table:

Trading_Partner	XSLT_File
ABCCorp	xsl/FABC_UpdateSalesOrderEBM_To_X12855B2BM.xsl
Hello	xsl/Hello_UpdateSalesOrderEBM_To_X12855B2BM.xsl
Global	xsl/Global_UpdateSalesOrderEBM_To_X12855B2BM.xsl

In the provider B2BCS Impl BPEL process, you can do a lookup on this DVM file to obtain the XSLT filename.




```
<assign name="GetXSLTFileName">
  <copy>
    <from expression='dvm:lookupValue("TP_XSLT_File.dvm","TradingPartner",
    <to variable="xslt_file_name"/>
  </copy>
</assign>
```

The return value of the DVM lookup can be used as the input XSLT file-name argument of the ora:processXSLT function call.

```
<assign name="XformUpdateSalesOrderEBMToX12Transaction855">
  <bpelx:annotation>
    <bpelx:pattern>transformation</bpelx:pattern>
  </bpelx:annotation>
  <copy>
    <from expression="ora:processXSLT(bpws:getVariableData('xslt_file_name' ,bp
    <to variable="EDIX12Transaction_855Variable"/>
  </copy>
</assign>
```

17.3.8.3. Supporting Trading Partner-Specific Document Types and Versions

Along with the need for trading partner-specific XSLTs, a different Document Type may possibly need to be used in Oracle B2B for defining the trading partner agreements for the same external B2B document.

For example, trading partner Global might need the 5010 version of the X12 855 B2B document and trading partner ABC Corp might need the 4010 version of the same document.

Using the approach described in the previous section, you can use the same provider B2BCS Implementation to generate B2B documents for both the trading partners.

However, while the AIA B2B Interface is being invoked based on the trading partner involved for the specific instance of the service, the corresponding B2B document version must be specified, 4010 for Global and 5010 for ABC Corp, for example.

To support, use a DVM file similar to the one used in the previous approach to store the B2B Document Type and Document Revision information for each trading partner. This information can be looked up by the BPEL process to populate the /B2BMHeader/B2BDocumentType/TypeCode and /B2BMHeader/B2BDocumentType/Version attributes.

Domain Value Map(DVM)

Name: TP_B2B_PARAMS_CONFIG

Description: Capture trading parnter specific B2B configuration

Map Table:

TRADING_PARTNER	B2B_DOCTYPE_NAME	B2B_DOCTYPE_REVISION
ABC Corp	850	5010
Global	850	4010

While the configuration files described previously can be created and stored locally within the JDeveloper project, a best-practice recommendation is to externalize these files, store them in the Metadata Repository, and refer to them from your B2BCS Implementation BPEL project using oramds lookup.

Note that though this approach of using DVM files to store the B2B document preference and trading partner-specific transformation information works, the Trading Partner information between the application and these DVM files must be kept synchronized.

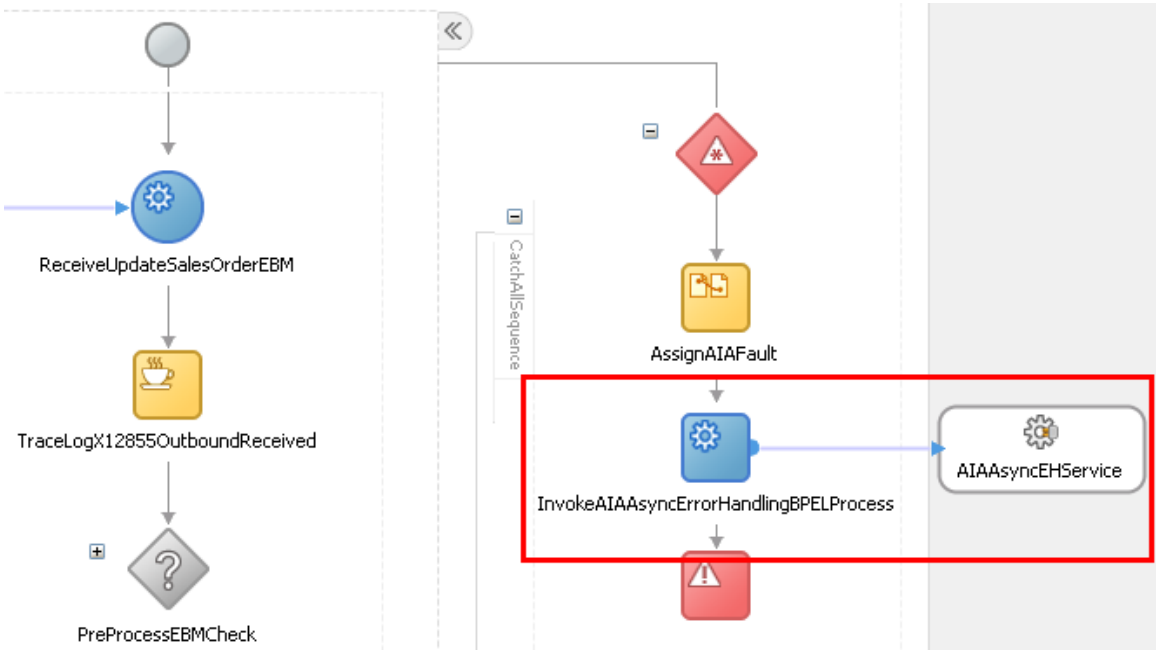
Each time a new trading partner is defined in the application, a corresponding record should be created in this DVM to store the B2B document preference of the trading partner. A well-established administrative process to manage these changes should be available.

17.3.9. How to Enable Error Handling

For more information about how to enable AIA services for error handling and recovery, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up and Using Error Handling and Logging."

In short, the following steps must be taken:

- Associate a fault-policy.xml with the B2BCS composite.
- Invoke the AIAAsyncErrorHandlingBPELProcess for business faults.



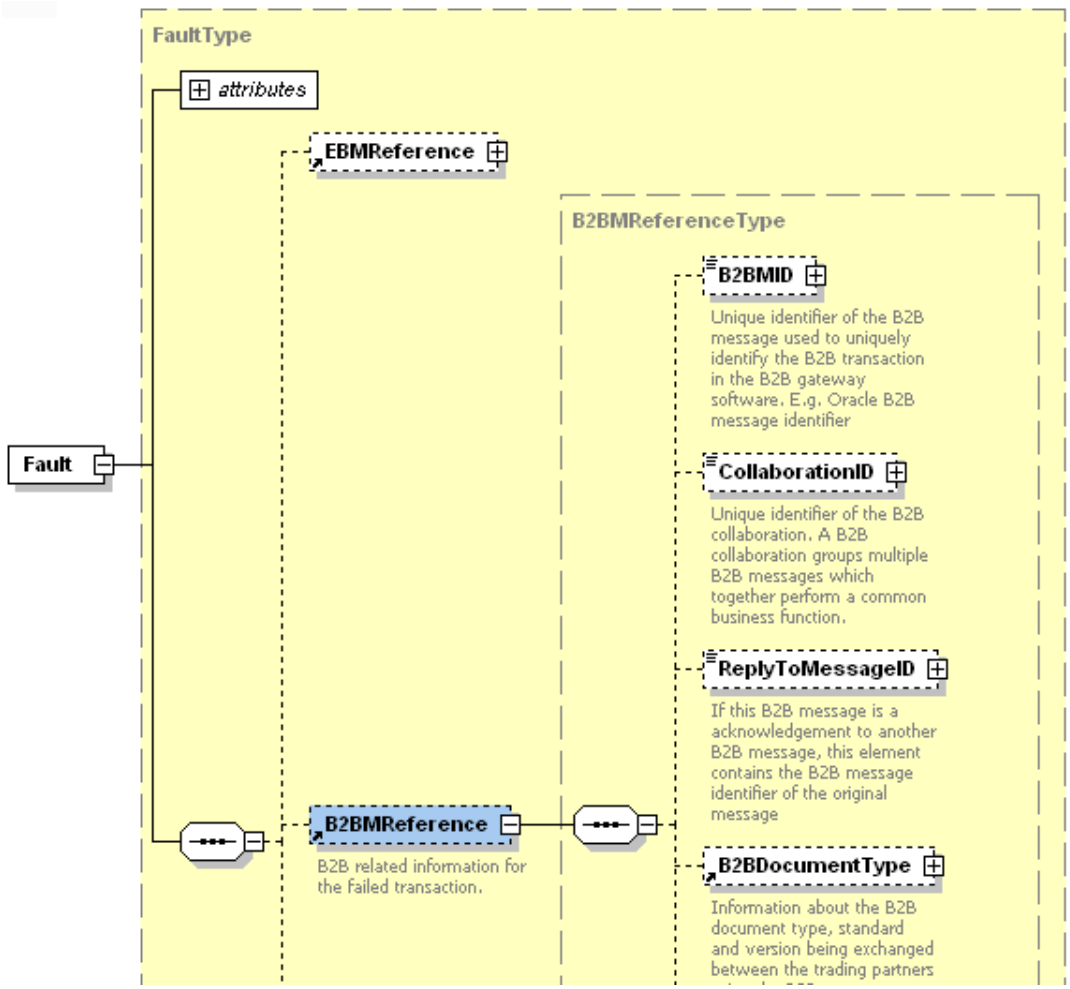

```
</assign>
        <invoke name="InvokeAIAAsyncErrorHandlingBPELProcess"
                portType="aiaasynceh:AIAAsyncErrorHandlingBPELProcess" inputVariable="AIAA
                partnerLink="AIAAsyncEHService"
                operation="initiate"/>
        <throw name="ThrowAIAFault" faultName="corecom:Fault" faultVariable="AIAFaultMessa
    </sequence>
  </catchAll>
</faultHandlers>
```

While invoking the AIAAsyncErrorHandlingBPELProcess, the following B2B-specific elements in the fault schema can be populated as described here.

Fault Element Schema	Description	Example
Fault/B2BMReference/B2BMID	Unique identifier of the B2B document	13232325

Fault Element Schema	Description	Example
Fault/B2BMReference/B2BDocumentType/TypeCode	Document type of the B2B document being generated by the provider B2BCS	“855”
Fault/B2BMReference/B2BDocumentType/Version	Document version of the B2B document being generated by the provider B2BCS	“4010”
Fault/B2BMReference/B2BDocumentType/TypeCode/@listAgencyID	Standard of the B2B document being generated by the provider B2BCS	“X12”
Fault/B2BMReference/GatewayID	Name of the B2B software being used	“Oracle B2B”
Fault/B2BMReference/SenderTradingPartner/*TradingPartner*ID	Sender trading partner, mapped from the EBMHeader	“MyCompany”
Fault/B2BMReference/ReceiverTradingPartner/*TradingPartner*ID	Receiver trading partner, mapped from the EBMHeader	“Global”

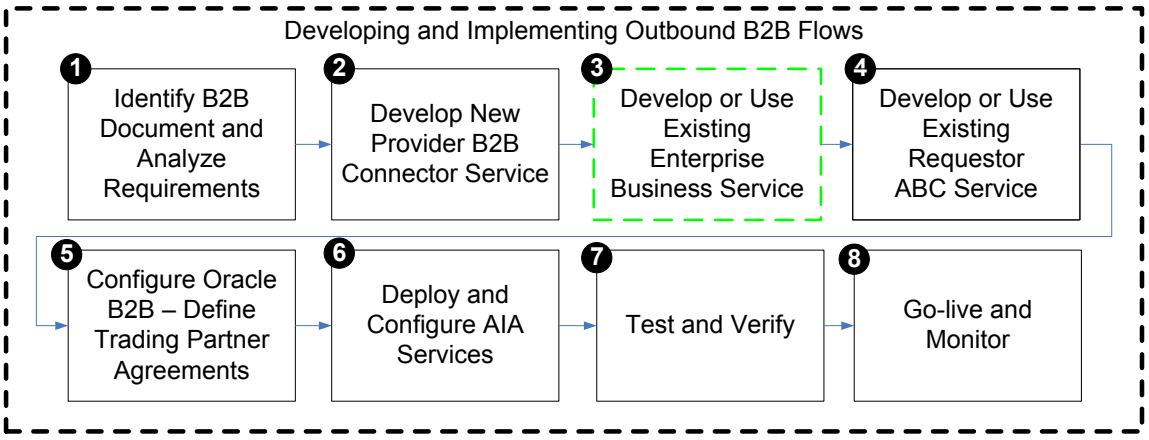
The following diagram provides the B2B-specific elements in the corecom:Fault:



The B2B details of the failed AIA service now available in the fault instance will be logged and available for debugging the failed flow.

Refer to the $AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12Process SalesOrder ReqB2BCSImpl/X12ProcessSalesOrderReqB2BCSImpl.bpel for a sample of a BPEL process that has been enabled for B2B fault handling.

17.4. Step 3: Developing or Extending an Existing Enterprise Business Service



The next step is to develop a new EBS or extend an existing EBS to invoke the provider B2BCS developed in the previous step. For example, the UpdateSalesOrderEBS has to be developed or modified to invoke the X12UpdateSalesOrderProvB2BCSImpl process.

For more information about creating a new EBS, see Designing and Developing Enterprise Business Services.

17.4.1. How to Route Based on Trading Partner B2B Preferences

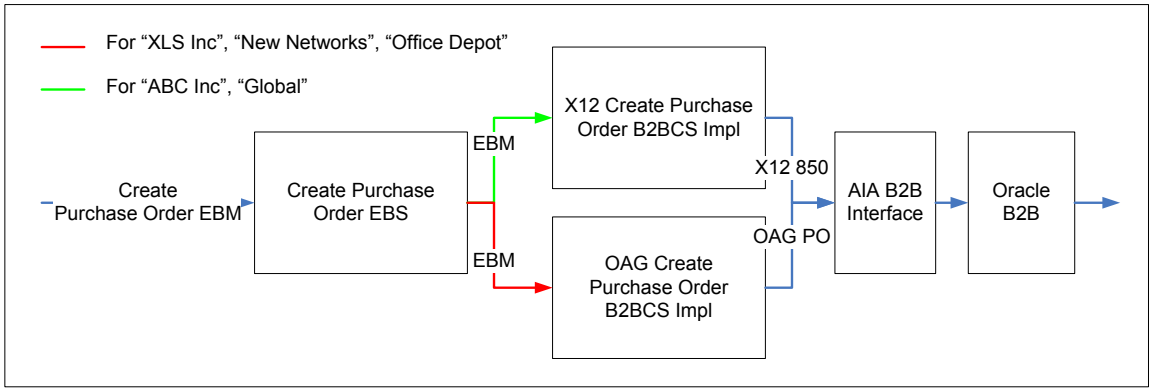
A B2B implementation may possibly exist in which different trading partners may require that the same EBM information be sent using different B2B document protocols.

For example, suppliers XLS Inc, New Networks, and Office Systems may require that new purchase orders be sent using the OAG Process Purchase Order document format, while suppliers ABC Inc and Global may require that new purchase orders be sent using the X12 850 document format.

To support the needs of this implementation, two B2BCSs must be developed:

- OAGCreatePurchaseOrderB2BCSImpl, which transforms the CreatePurchaseOrderEBM into an OAG Process PurchaseOrder B2B document.
- X12CreatePurchaseOrderB2BCSImpl, which transforms the CreatePurchaseOrderEBM into an X12 850 B2B document.

The CreatePurchaseOrderEBS implementation must include routing rules to invoke both of these B2BCSs.



If a small number of trading partners are involved, the filter expression in the EBS routing rules to each of the B2BCSs can be used to route the EBM based on the trading partner involved.

```
<operation name="CreatePurchaseOrder" deliveryPolicy="AllOrNothing" priority="4" validateSchema="false">
   <switch>
      <case executionType="direct"
            name="OAGCreatePurchaseOrderProvB2BCS.CreatePurchaseOrder">
         <condition language="xpath">
            <expression>(($in.CreatePurchaseOrderEBM/EBMHeader/B2BProfile/ReceiverTradingPartnerID='XLS Inc') or
                        ($in.CreatePurchaseOrderEBM/EBMHeader/B2BProfile/ReceiverTradingPartnerID='New Networks') or
                        ($in.CreatePurchaseOrderEBM/EBMHeader/B2BProfile/ReceiverTradingPartnerID='Office Deport'))
            </expression>
         </condition>
         <action>
            <transform/>
            <invoke reference="OAGCreateSalesOrderProvB2BCSImpl"
                    operation="CreatePurchaseOrder"/>
         </action>
      </case>
      <case executionType="direct"
            name="X12CreatePurchaseOrderProvB2BCS.CreatePurchaseOrder">
         <condition language="xpath">
            <expression>(($in.CreatePurchaseOrderEBM/EBMHeader/B2BProfile/ReceiverTradingPartnerID='ABC Inc') or
                        ($in.CreatePurchaseOrderEBM/EBMHeader/B2BProfile/ReceiverTradingPartnerID='Global'))
            </expression>
         </condition>
         <action>
            <invoke reference="X12CreateSalesOrderProvB2BCSImpl"
                    operation="CreatePurchaseOrder"/>
         </action>
      </case>
   </switch>
</operation>
```

However, if a large number of trading partners are involved, the trading partner’s B2B preferences can be stored in an external configuration file, for example, in a DVM file.

Domain Value Map(DVM)

Name: CreatePurchaseOrder_TP_B2BConfig_DVM

Description: This DVM file contains the B2B document format supported by different trading partners to receive new Purchase Orders.

Map Table:

TRADING_PARTNER	B2B_DOC_TYPE
Global	X12_850
XLS Inc	OAG_PROCESS_PO
New Networks	OAG_PROCESS_PO
Office Depot	OAG_PROCESS_PO
ABC Inc	X12_850

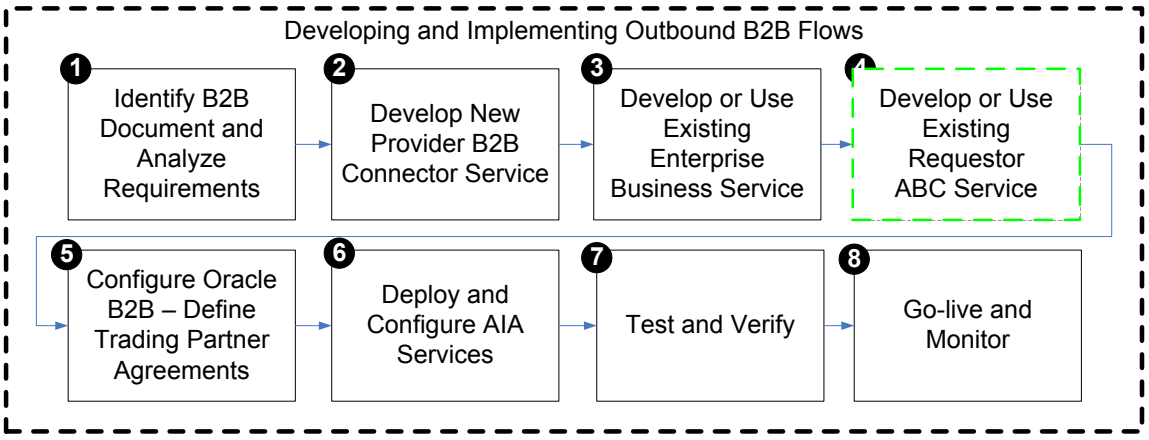
This configuration can be looked up during run time by the EBS implementation to determine the target provider B2BCS to be invoked.

```
<operation name="CreatePurchaseOrder" deliveryPolicy="AllOrNothing" priority="4" validateSchema="fal
   <switch>
      <case executionType="direct"
            name="X12CreatePurchaseOrderProvB2BCSImpl.CreatePurchaseOrder">
         <condition language="xpath">
            <expression>dvm:lookupValue("CreatePurchaseOrder_TP_B2BConfig.dvm",
              "TRADING_PARTNER","$in.UpdateSalesOrderEBM/UpdateSalesOrderEBM/EBMHeader
                   /B2BProfile/ReceiverTradingPartnerID","B2B_DOC_TYPE","NOT_FOUND")="X12_850"
            </expression>
         </condition>
         <action>
            <transform/>
            <invoke reference="X12CreatePurchaseOrderB2BCSImpl" operation="CreatePurchaseOrder"/>
         </action>
      </case>
      <case executionType="direct"
            name="OAGCreatePurchaseOrderProvB2BCSImpl.CreatePurchaseOrder">
         <condition language="xpath">
            <expression>dvm:lookupValue("CreatePurchaseOrder_TP_B2BConfig.dvm",
              "TRADING_PARTNER","$in.UpdateSalesOrderEBM/UpdateSalesOrderEBM/EBMHeader
                   /B2BProfile/ReceiverTradingPartnerID","B2B_DOC_TYPE","NOT_FOUND")="OAG_PROCESS_PO
            </expression>
         </condition>
         <action>
            <transform/>
            <invoke reference="OAGCreatePurchaseOrderB2BCSImpl" operation="CreatePurchaseOrder"/>
         </action>
      </case>
      </switch>
</operation>
```

Note that though this approach works, a need exists to keep the trading partner information between the application and these DVM files synchronized.

Each time a new trading partner is defined in the application, a corresponding record should be created in this DVM to store the B2B document preference of the trading partner. A well-established administrative process to manage these changes should exist.

17.5. Step 4: Developing or Extending an Existing Requester ABCS



The requester ABCS is the AIA service that is triggered from an application UI action or business event and is the first step in the outbound B2B flow. The requester ABCS acts on behalf of the triggering application in the AIA layer and invokes the AIA EBS.

For more information about how to design and construct a requester ABCS, see Designing Application Business Connector Services and Constructing the ABCS.

The requester ABCS always invokes an EBS implementation and hence can be used in both A2A and B2B integration scenarios. It is a best-practice recommendation to anticipate that the requester ABCSs can be potentially used both in A2A and B2B integration scenarios.

Consider the following information when developing requester ABCSs to be used in B2B integration flows.

17.5.1. What You Need to Know About Message Exchange Patterns

B2B integration flows are primarily processed asynchronously. Thus, while evaluating the message exchange pattern for developing new requester ABCSs, you should consider the possibility of their being used in B2B flows.

17.5.2. What You Need to Know About Transformations

One of the key tasks of the requester ABCS is to transform the ABM into the canonical EBM and use the EBM as input to invoke the AIA EBS.

While developing this transformation from ABM to EBM, remember that the transformation should support the generation of an EBM payload that can be routed to and used by a B2BCS. The B2B mapping guidelines described in Step 1: Identifying the B2B Document and Analyzing Requirements should be considered to identify the fields in the EBM that are required by the B2BCS to create the B2B documents.

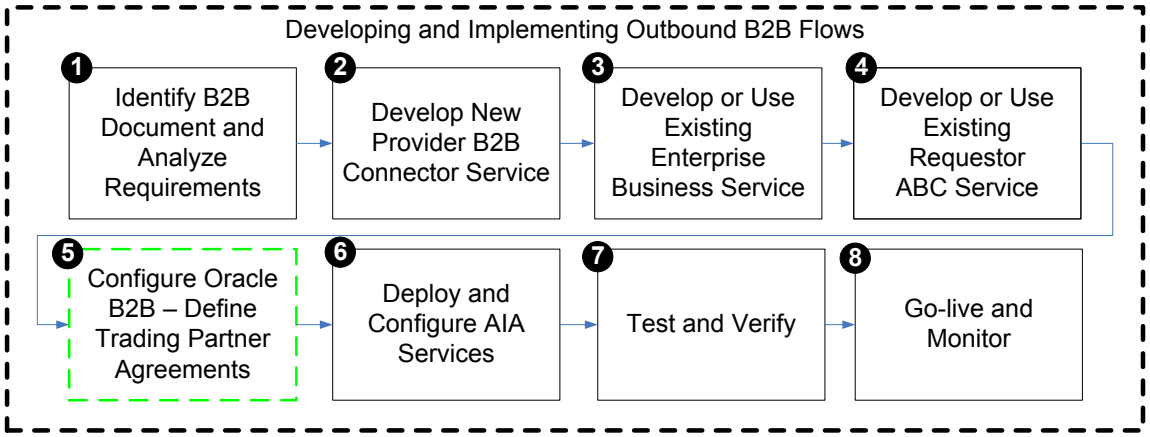
A few other considerations include the following points:

- Follow the AIA recommendation to always map all available fields, instead of just a subset of fields required for a specific integration scenario.
- External global identifiers such as UPC Product Codes and DUNS should be mapped along with application internal identifiers.
- Reference components in the EBM should be fully mapped. For example, you should map not just a Location Identifier, but also the actual address details, because a remote trading partner may not be able to resolve the location identifier to an actual location.
- The following fields in the EBM header must be mapped so that they can be used to perform trading partner-specific routing in the EBS layer, as described in the previous section.

EBM Header Element	Description	Example Value
/EBMHeader/B2BProfile/SenderTradingPartner/TradingPartnerID	ID of the sending trading partner as defined in Oracle B2B. For outbound flows, this is the host" trading partner.	"MyCompany"
/EBMHeader/B2BProfile/ReceiverTradingPartner/TradingPartnerID	ID of the receiving trading partner as defined in Oracle B2B. For outbound flows, this is the remote trading partner.	"Globe Inc"

At the end of this step, all of the required AIA services for developing an outbound B2B integration flow are ready.

17.6. Step 5: Configuring Oracle B2B and Defining Trading Partner Agreements



The next step is to create trading partner agreements in Oracle B2B.

For more information about how to define trading partners and associate B2B capabilities with them, see *Oracle Fusion Middleware User's Guide for Oracle B2B*, "Configuring Trading Partners."

In addition, for EDI-based outbound B2B flows, Oracle B2B can be configured for batching outbound documents. Parameters such as the batch size and time-out can be configured in Oracle B2B without any changes to the AIA layer.

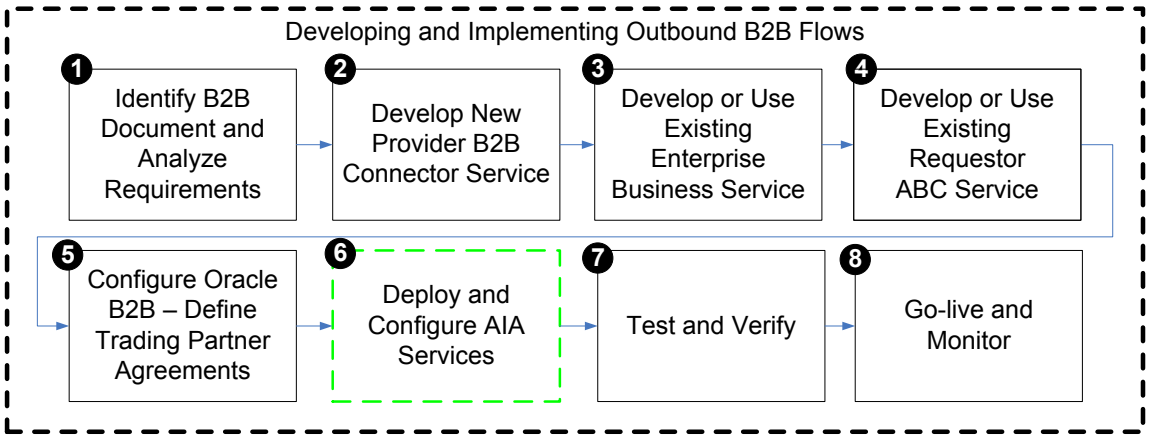
The values used for naming trading partners in Oracle B2B should match the values that are sent from the requester ABCS using the following fields:

- /EBMHeader/B2BProfile/SenderTradingPartner/TradingPartnerID (for Host Trading Partner Name)
- /EBMHeader/B2BProfile/ReceiverTradingPartner/TradingPartnerID (for Remote Trading Partner Name)

If the values provided by the source application for these fields and the trading partner names in Oracle B2B do not match, you can maintain a DVM file that contains the mapping between the source application's trading partner IDs and trading partner names of Oracle B2B.

This DVM can be looked up during the transform from the ABM to the EBM in the requester ABCS to populate the SenderTradingPartner/TradingPartnerID and ReceiverTradingPartner/TradingPartnerID fields.

17.7. Step 6: Deploying and Configuring AIA Services



Next, deploy the AIA services. You can deploy the services to a target Oracle SOA server using JDeveloper.

If any DVM and configuration files are used by the AIA services required for the outbound integration, you must enter data corresponding to your B2B configuration.

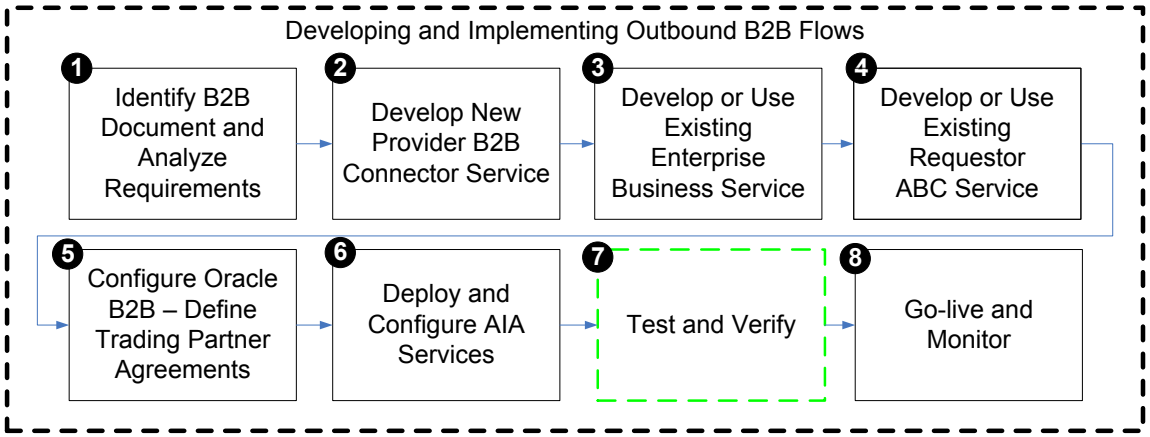
You can also use the Project Lifecycle Workbench application to create a bill of material XML file for the AIA project, which can be used to autogenerate a deployment plan. This deployment plan can be used to deploy all of the AIA services and resources that make up the integration project in multiple development, test, and production environments.

For more information about generating bills of material, see Working with Project Lifecycle Workbench Bills of Material.
For more information about generating deployment plans, see Deploying Composites.

In addition, configure the AIA Error Handling framework and set up appropriate roles to be notified of errors in AIA flows.

For more information about error handling, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up and Using Error Handling and Logging."

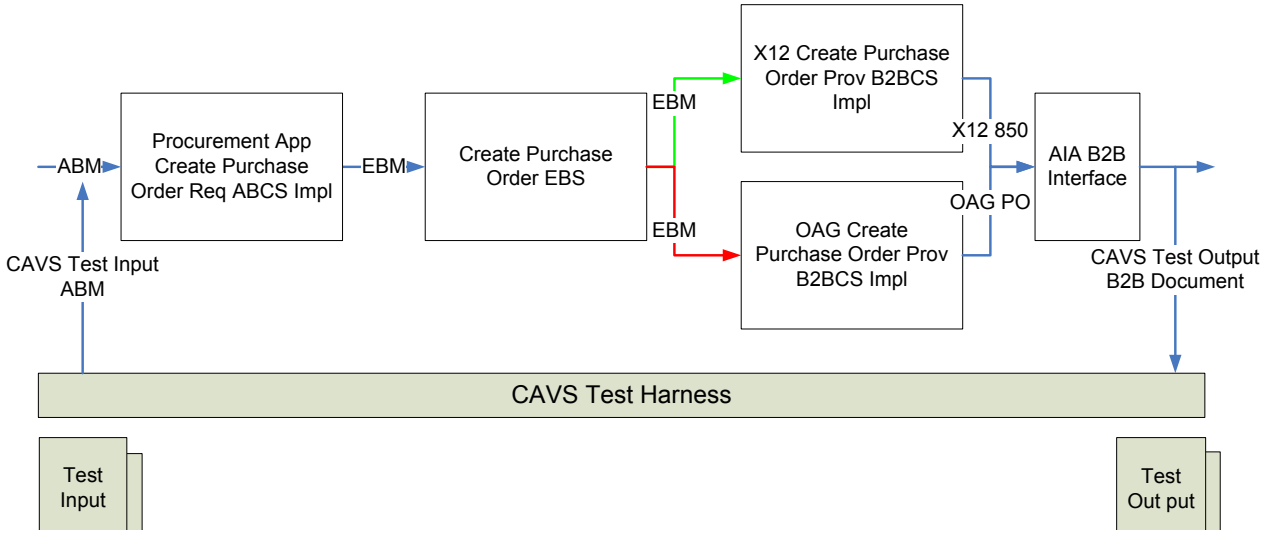
17.8. Step 7: Testing and Verifying



Before you go live with your B2B integration flows with your trading partners, we recommend that you complete the following sequence of tests for your newly developed or deployed AIA services, which make up the B2B integration flow.

17.8.1. How to Test Using CAVS

If your AIA services are Composite Application Validation System (CAVS)-enabled, you can test your AIA services using a test simulator. Using a CAVS simulator, you can simulate the behavior of your trading partners by sending messages to and receiving messages from a test harness, instead of your actual trading partners.

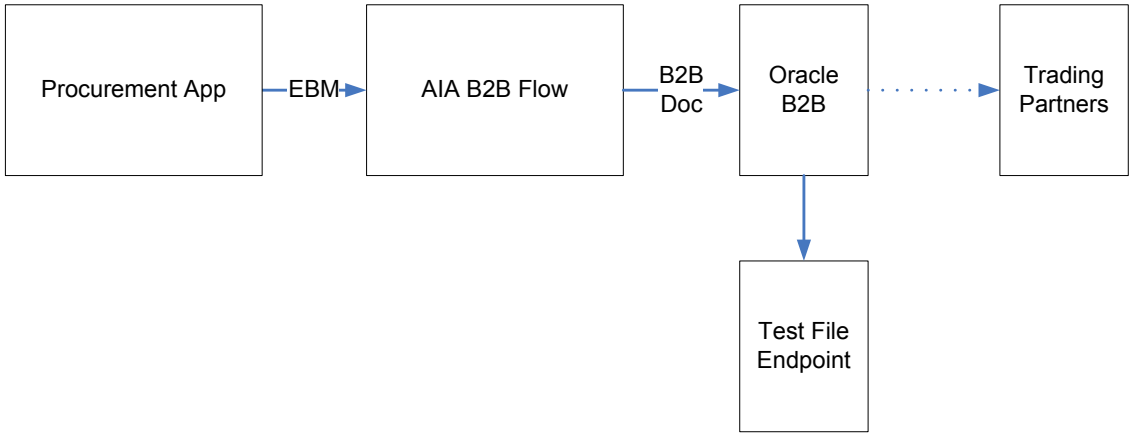


The objective of this testing is to verify that the AIA services are properly developed, deployed, and configured.

This testing can take place without any knowledge of your trading partners.

17.8.2. How to Test Using Dummy Trading Partner Endpoints

Another common approach to testing is to create dummy delivery channels in your trading partner setup. For example, instead of configuring your trading partner agreement to send outbound documents to the remote trading partner's server, you can configure the agreement to create the outbound B2B files in a temporary B2B file location on the server.



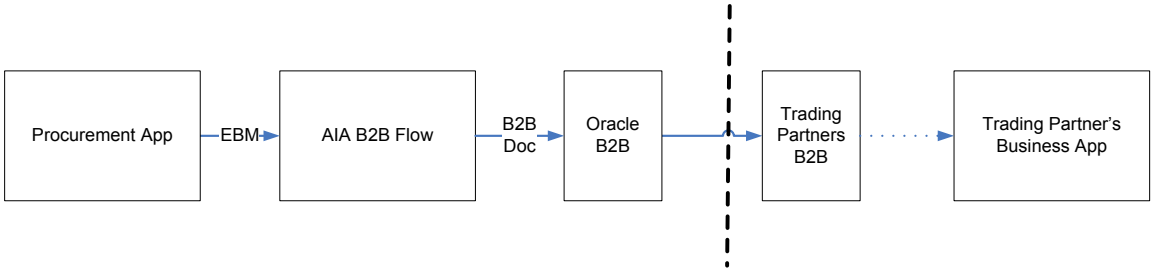
In this case, if you test an outbound B2B flow, all of the components involved in the flow are invoked, but the generated B2B document is copied to a temporary file directory. You can review the B2B document for completeness and correctness and also share it for review with your trading partners.

The objective of this testing is to verify the integration between AIA services, the application, and B2B and to verify that the configuration across these layers is consistent.

This testing can also take place without any knowledge of your trading partners.

17.8.3. How to Test Using the Production Code Value Set to "Test"

Certain B2B document protocols support a protocol envelope-level flag that can be used to specify whether the B2B document is being sent in test or production mode. The trading partner agreements in Oracle B2B can be configured to set this indicator to ***Test*** mode.



Now when you trigger an outbound B2B flow, the document is sent across to your trading partners, but the trading partner system recognizes the inbound document as a test instance and does not pass it on to the backend application.

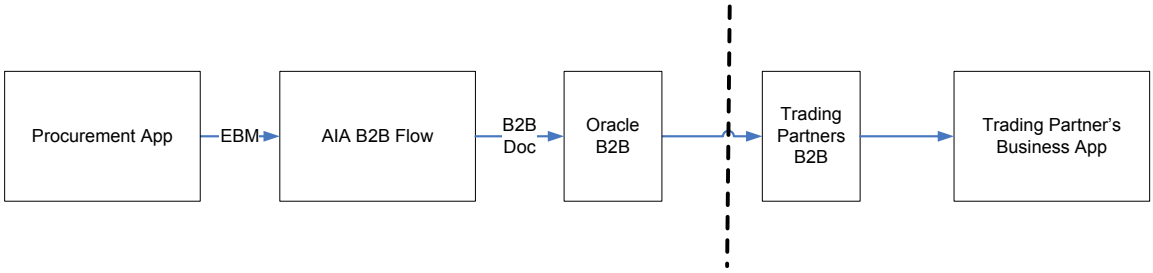
The objective of this testing is to verify the handshake between your B2B server and the trading partner's B2B server. Setup of transport and messaging features such as acknowledgement, encryption, packaging, partner and document identification, and so forth are verified.

This approach requires that this test mechanism be discussed and agreed upon with each of your trading partners.

17.8.4. How to Test Using Dummy Business Data

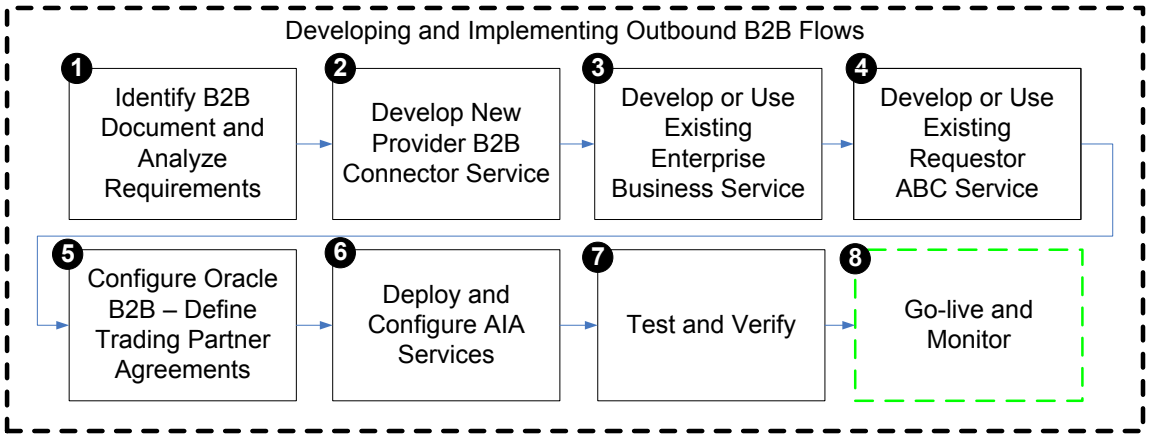
Finally, you can test integration from your production systems to your remote trading partner's production systems by using dummy business data in the B2B documents being exchanged. For example, if you need to test end-to-end outbound Purchase Order integration from your (buyer) system to your trading partner's (vendor) system, which are integrated by an outbound EDI X12 850 B2B flow, you can place orders either using an EDI test item created for the trading partner or using a price of one cent for the items being ordered.

The order request is received and processed successfully by the trading partner's business application; however, the trading partner's business users or rules discard the order request.



This approach also requires that the test mechanism be discussed and agreed upon with each of your trading partners.

17.9. Step 8: Going Live and Monitoring



The final step is to go live with your trading partner for the outbound B2B document flow. The AIA and Oracle B2B deployments are duplicated in the product servers and rolled out to the end users.

17.9.1.1. Monitoring Using Oracle B2B Reports

Oracle B2B's built-in reporting allows for the creation of the following types of reports. These reports query the run-time transactions in Oracle B2B and can be used to monitor individual transactions with trading partners.

Oracle B2B allows reports to be created and saved as report definitions, which can be used to generate reports for specific criteria, such as View Purchase Orders exchanged with trading partner Global, for example. You can also create ad hoc reports.

Report Type	Description	Example Report
Business Message Report	These reports provide business messages based on specified search criteria.	View all "Purchase Order" documents received from trading partner "Global"
Wire Message Status Report	These reports enable you to query for wire messages in the native data formats sent to and received from trading partners. Wire message reports contain transport and protocol-related information in addition to the business data.	View all messages sent to trading partner ABC Corp including the HTTP headers.
Collaboration Status Reports	These reports help you group related individual transactions that together perform a business task. This report is supported only for the RosettaNet document protocol.	View all RosettaNet 3A4 collaborations.
Error Reports	These reports help you monitor all failed transactions in Oracle B2B	View all messages received from trading partner Global that failed in

Report Type	Description	Example Report
		Oracle B2B due to any error.

For more information about how to use the reporting functionality in B2B, see *Oracle Fusion Middleware User's Guide for Oracle B2B*, "Creating Reports."

17.9.2. Monitoring Using Oracle Enterprise Manager Console

Oracle Enterprise Manager Console can be used to monitor the AIA flows. To monitor the outbound B2B integration flows, you can log in to the Oracle Enterprise Manager Console and look for instances of the requester ABCS that triggered the B2B flows.

The status of the ABCS instance, payload, and child processes can all be monitored from the Oracle Enterprise Manager Console.

By looking up the instances of the composite AIAB2BInterface[1.0], for example, you can view the JMS payload being passed to Oracle B2B, including the various B2B header parameters.

17.9.3. Monitoring Using Error Notifications

In the case of failures in either the AIA layer or Oracle B2B, the AIA Error Handler gets triggered. The AIA Fault Message contains the error text and description. In addition, B2B information pertaining to the failed transaction, such as Sender, Receiver Trading Partner, Document Type, and so forth, are also supplied in the AIA Fault.

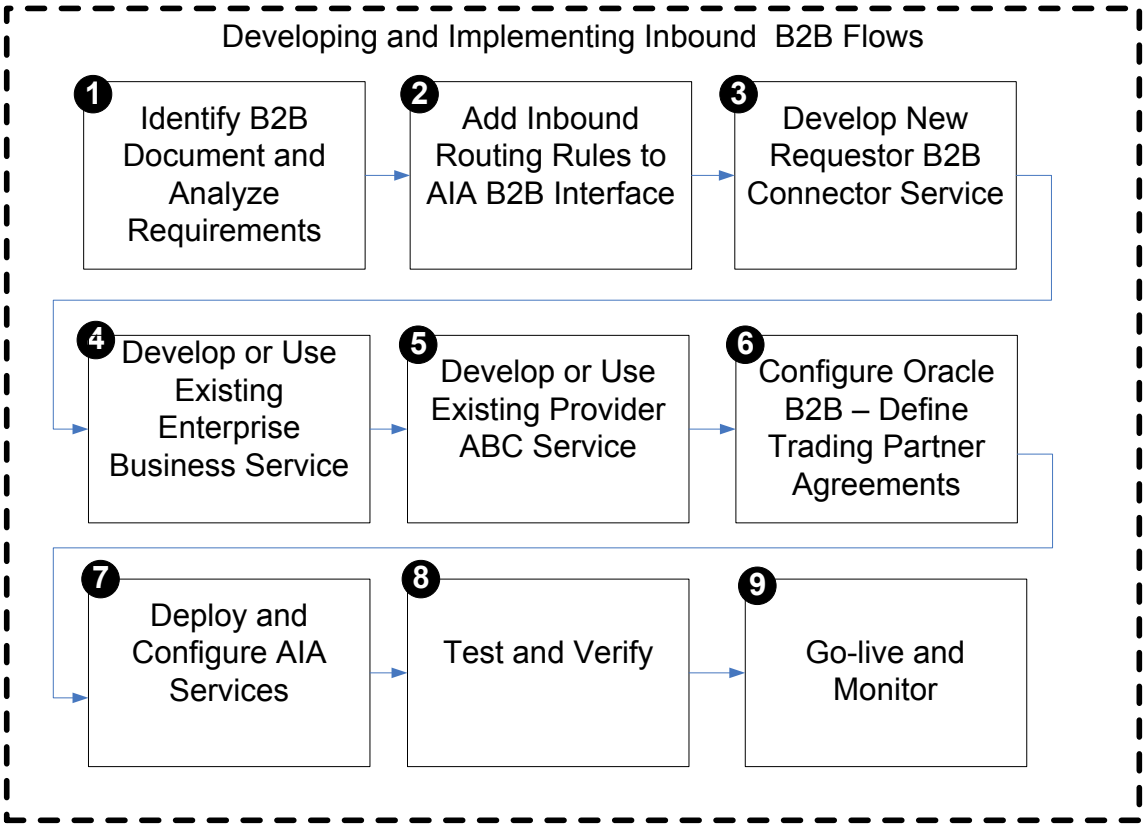
For more information about error notifications, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Working with Error Handling and Logging," Using Error Notifications.

18. Developing and Implementing Inbound B2B Integration Flows

This chapter discusses the following topics:

18.1. Introduction to Developing and Implementing Inbound B2B Integration Flows

The following diagram shows the high-level steps involved in developing a simple inbound business-to-business (B2B) flow from an application to trading partners using Oracle Application Integration Architecture (AIA).

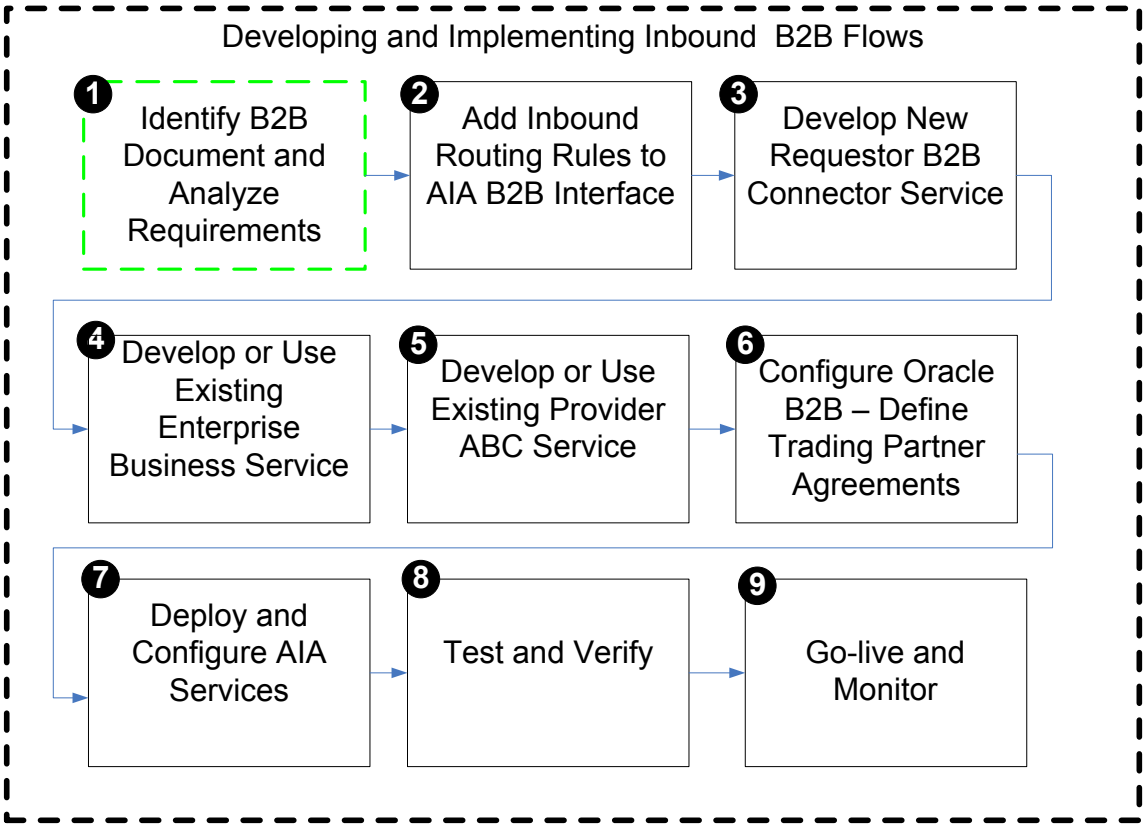


High-level steps to develop and implement a simple inbound B2B flow

Most of the preceding steps are already described in Developing and Implementing Outbound B2B Integration Flows. This chapter will be referred to whenever applicable.

18.2. Step 1: Identifying the B2B Document and Analyzing Requirements

The first step in building an inbound B2B flow is to identify the B2B document that needs to be generated by the flow. As a part of this step, you must also analyze the requirements for the AIA services that need to be built or extended to support the flow.



Step 1: Identifying B2B document and analyzing service requirements

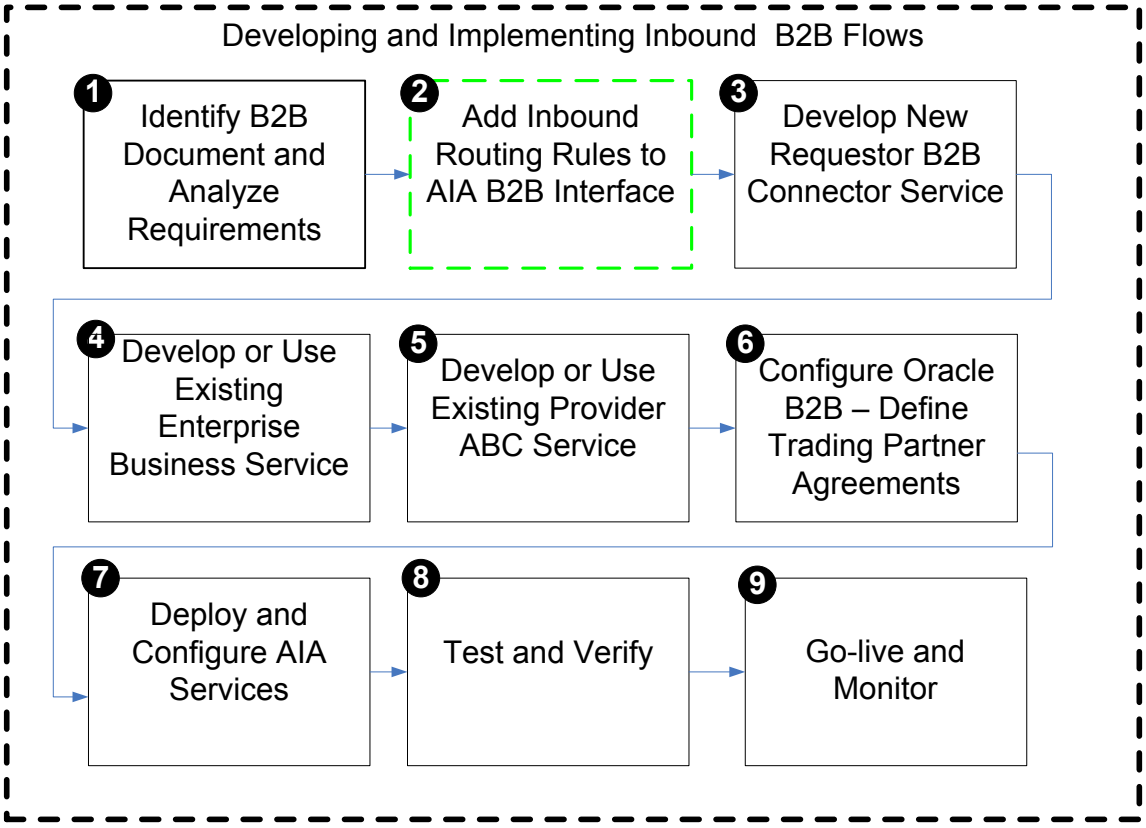
The only differences in this step for the outbound B2B document flows and the steps for the inbound B2B document flows are as follows:

1. The source and targets in the mapping are reversed. The B2B document received from trading partners is the source of the mapping. The AIA Enterprise Business Message (EBM) is the target of the mapping.
2. At the end of this step:
    a. The B2B document is defined in Oracle B2B.
    b. The XML schema of the B2B document is uploaded in the AIA Metadata Repository.
    c. The Enterprise Business Object (EBO) and the EBM to be used in the integration are identified.
    d. Functional mapping between the B2B document and the AIA EBM is complete.

For more information about identifying the B2B document and analyzing requirements, see Step 1: Identifying the B2B Document and Analyzing Requirements.

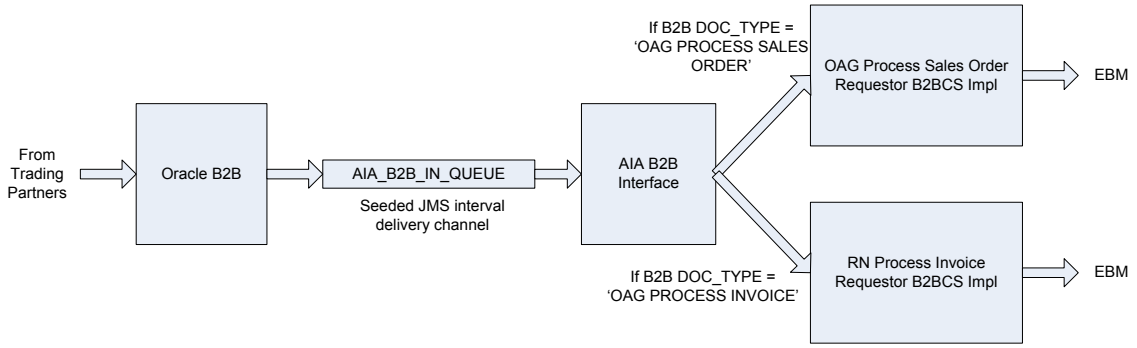
18.3. Step 2: Adding Inbound Routing Rules to an AIA B2B Interface

The next step in building an inbound B2B flow is to add routing rules to the AIAB2BInterface Infrastructure service.



Step 2: Developing and implementing inbound B2B flows

In inbound B2B document flows, the AIAB2BInterface service listens for new B2B documents received by Oracle B2B and routes them to the requester B2B services.



Oracle B2B routing new B2B documents to requester B2B services

The AIA B2B Interface composite has a JMS adapter to listen for new inbound B2B documents processed by Oracle B2B. The trading partner agreement in Oracle B2B is configured to route inbound B2B documents to the AIA_B2B_IN_QUEUE JMS queue.

The AIA B2B Interface identifies the B2B document type of the inbound B2B document and routes the document to the requester B2B Connector Service (B2BCS) Implementation that is responsible for processing the B2B document.

For example, if the B2B document type is OAG_Process Invoice, then the AIA B2B Interface will route the document to the OAGProcessInvoiceRequesterB2BCSImpl service.

The input to the requester B2BCS Implementation is the B2BM element. The B2BM element is defined in the file AIAComponents/EnterpriseObjectLibrary/Infrastructure/V1/Meta.xsd.

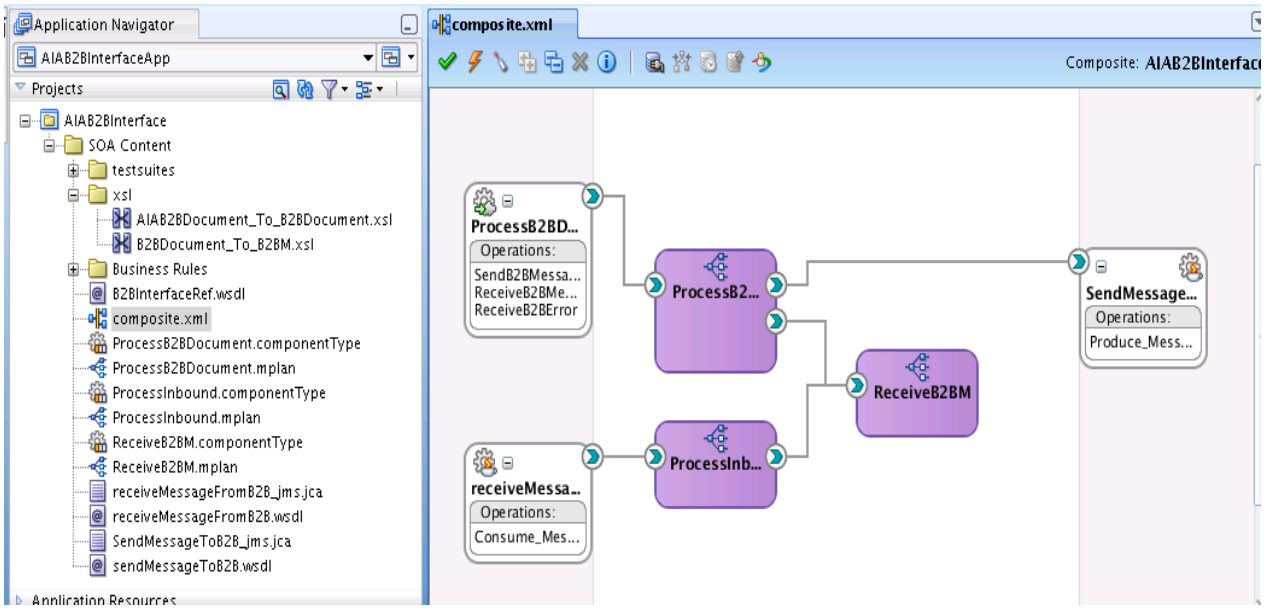
The AIA B2B Interface constructs the B2BM element from the B2B document received from Oracle B2B as follows:

B2BM element	Mapped From	Description	Example
/corecom:B2BM /corecom:B2BMHeader /corecom:B2BMID	B2B document JMS header property MSG_ID	The unique identifier generated by Oracle B2B for the inbound B2B document. This field is to correlate the AIA flow with the corresponding transaction in Oracle B2B.	5602359000000
/corecom:B2BM /corecom:B2BMHeader /corecom:B2BDocumentType /corecom:TypeCode	DOCTYPE_NAME	The document type of the inbound document as identified by Oracle B2B.	'OAG_PROCESS_INVOICE'
/corecom:B2BM /corecom:B2BMHeader /corecom:B2BDocumentType /corecom:Version	DOCTYPE_REVISION	The document revision of the inbound document as identified by Oracle B2B.	'9.0'
/corecom:B2BM /corecom:B2BMHeader /corecom:SenderTradingPartner /corecom:TradingPartnerID	FROM_PARTY	The source (from) trading partner of the B2B document. The value is the trading partner name as defined in Oracle B2B.	'GlobalChips'
/corecom:B2BM /corecom:B2BMHeader /corecom:ReceiverTradingPartner /corecom:TradingPartnerID	TO_PARTY	The destination (to) trading partner to whom the inbound B2B document was sent. The value is the trading partner name as defined in Oracle B2B.	'Acme'
/corecom:B2BM /corecom:Payload	JMS payload	The actual JMS text payload that contains the B2B document sent by the trading partner.	<?xml version="1.0"?> <PROCESS_INVOICE_002> <CONTROLAREA> …

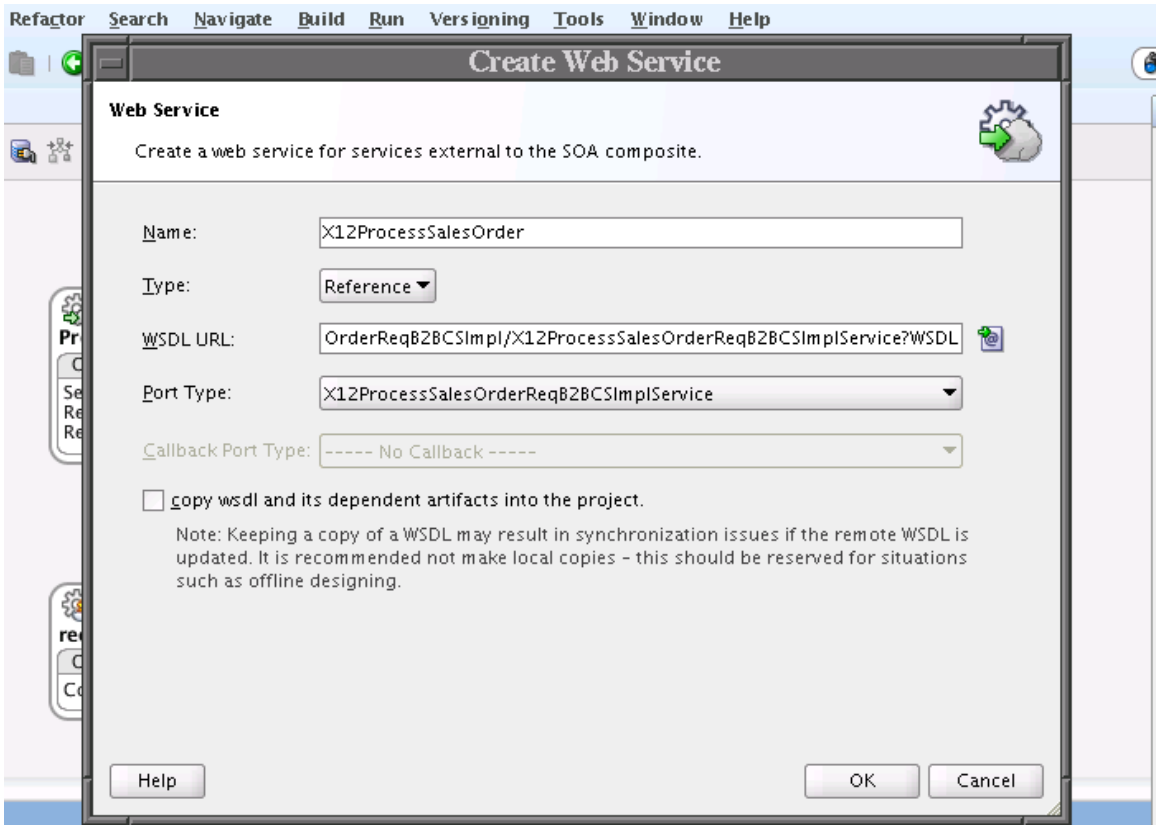
18.3.1. How to Add a New Routing Rule to the AIA B2B Interface

To add a new routing rule to the AIA B2B Interface:

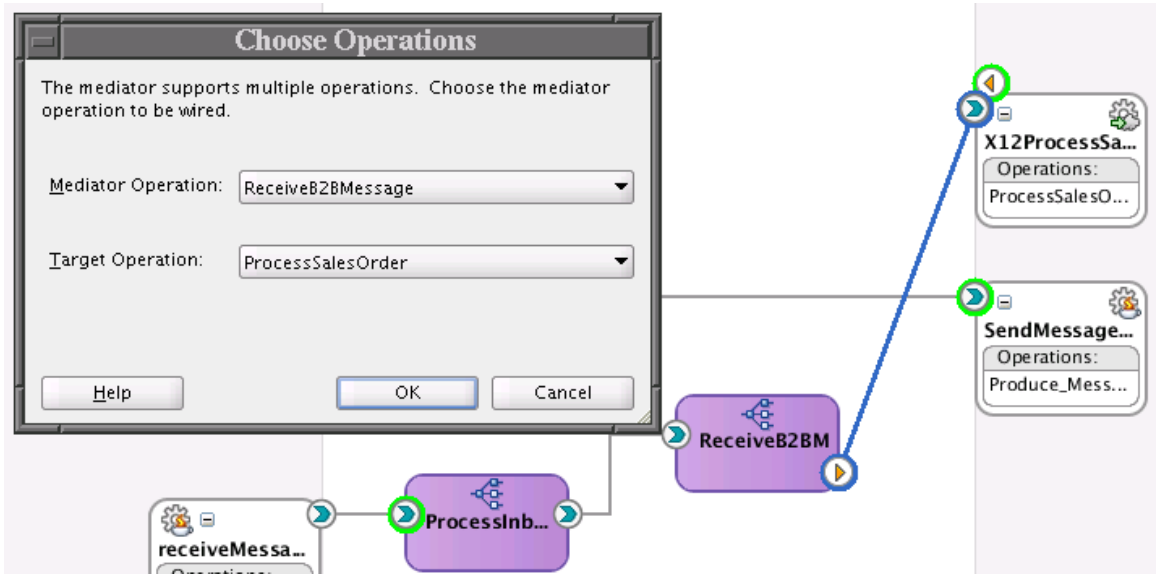
1. Open the application $AIA_HOME/Infrastructure/B2B/AIAB2BInterfaceApp/AIAB2BInterfaceApp.jws using JDeveloper.
2. Open the file composite.xml using JDeveloper.



3. Add a new service reference to the requester B2BCS that processes the new inbound B2B document type. The next section of this document explains how to develop requester B2BCSs.

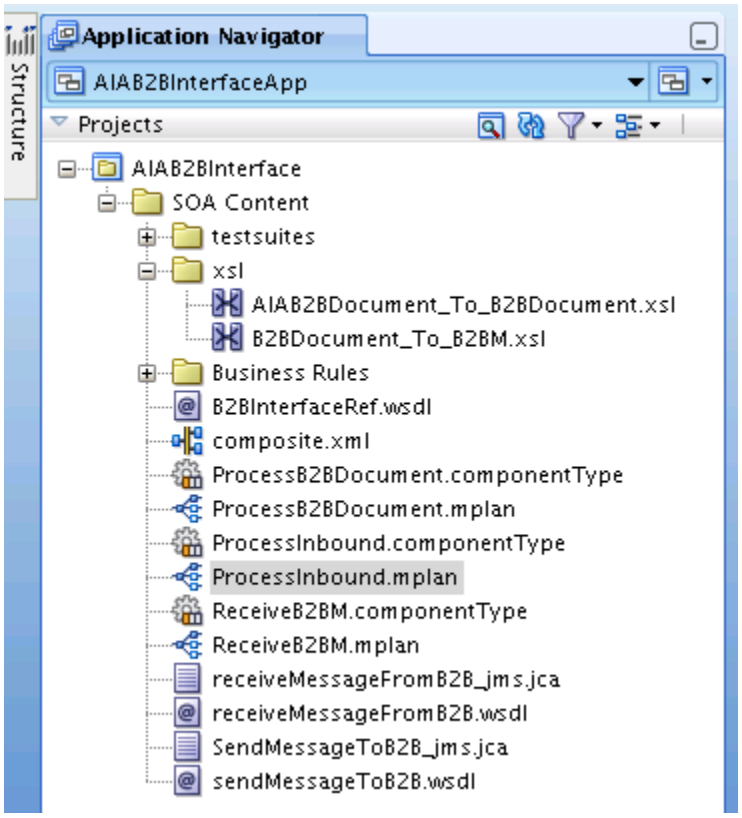


4. Add a wiring to the newly added service from the Receive B2BM mediator component in the composite.

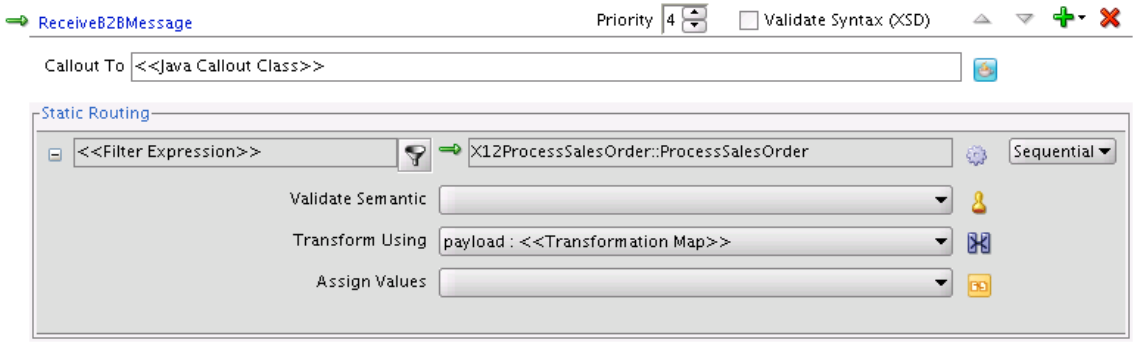


5. Choose the Mediator operation ReceiveB2BMessage as the source of the wiring and the target as the operation exposed by the target requester B2BCS. Save your changes.

6. Open the file ProcessInbound.mplan.

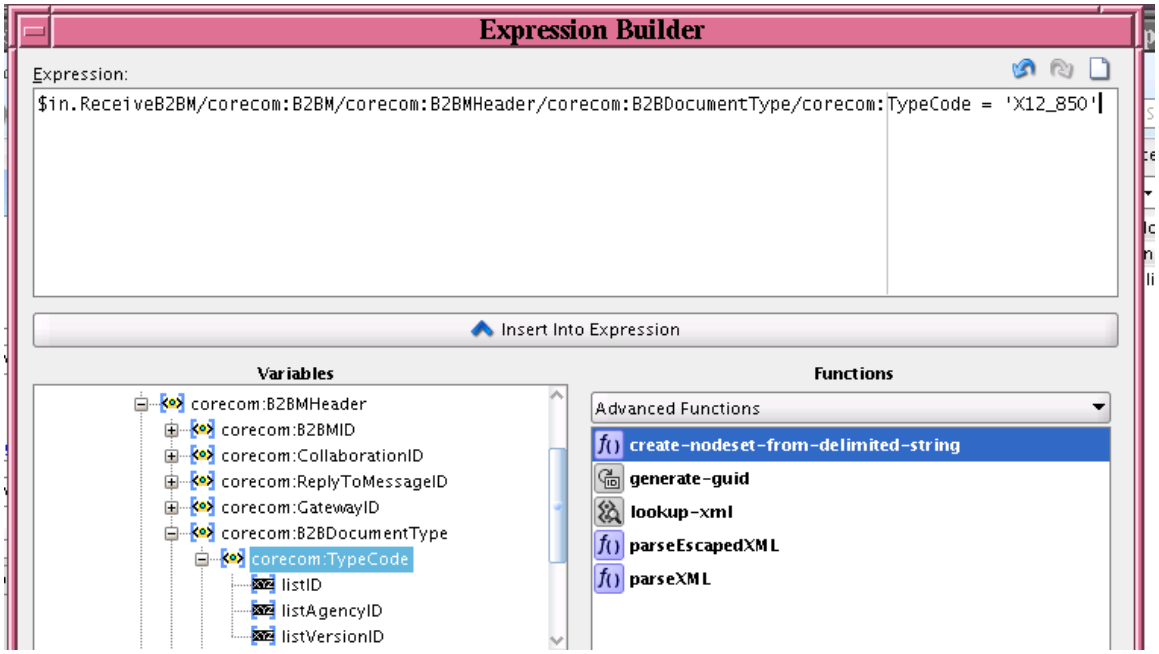


7. Add a new routing rule to invoke the requester B2BCS using the service reference added to the file composite.xml.



8. Add a new routing rule to the ReceiveB2BMessage operation.

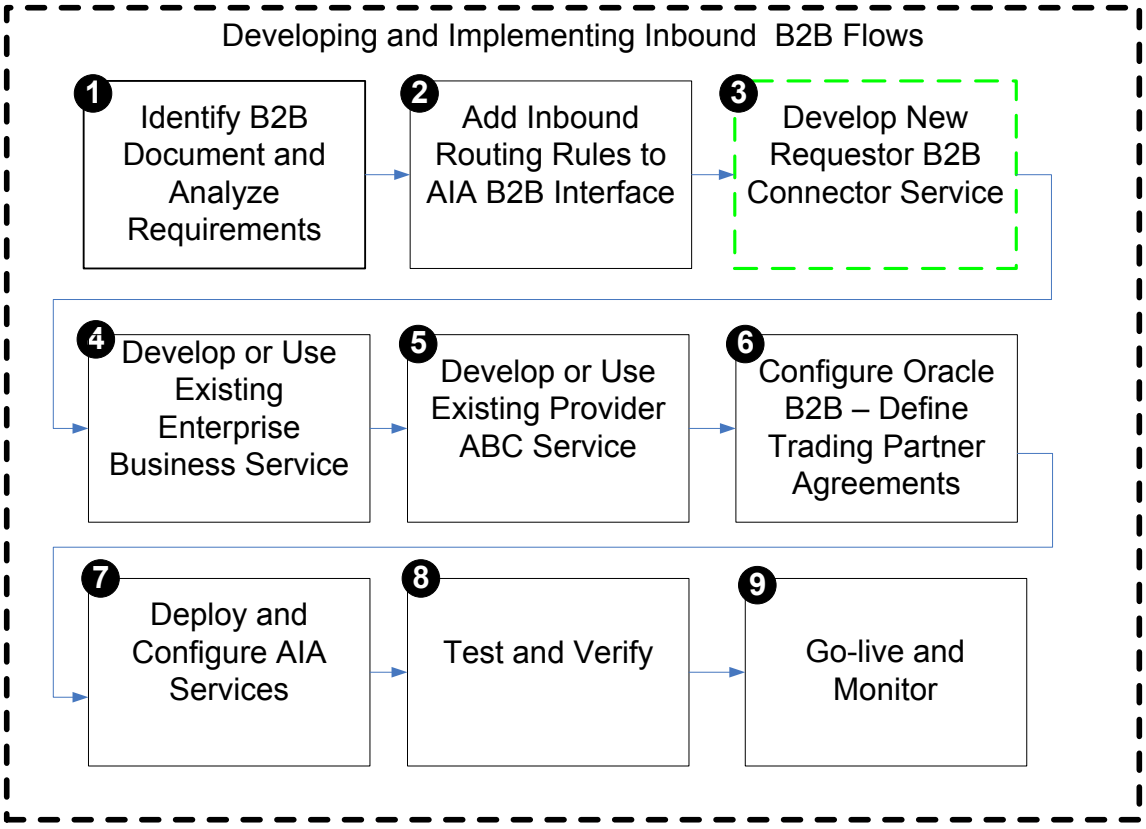
9. Edit the filter operation for the newly added routing rule. Define the filter based on the B2B document type. For example, the following routing filter ensures that the EDI X12 Process Sales Order documents are routed to the X12 ProcessSalesOrder B2BCS Implementation.



10. Save your changes.

11. Deploy the modified SOA composite application.

18.4. Step 3: Developing a New Requester B2B Connector Service



Step 2: Developing a new requester B2BCS

The next step is to develop the requester B2BCS to support the outbound B2B integration flow.

The requester B2BCS is very similar to a requester Application Business Connector Service (ABCS), with the only difference being that it integrates with trading partners via Oracle B2B instead of integrating with an application. Hence, we recommend that you familiarize yourself with the design and development of ABCSs (requester and provider).

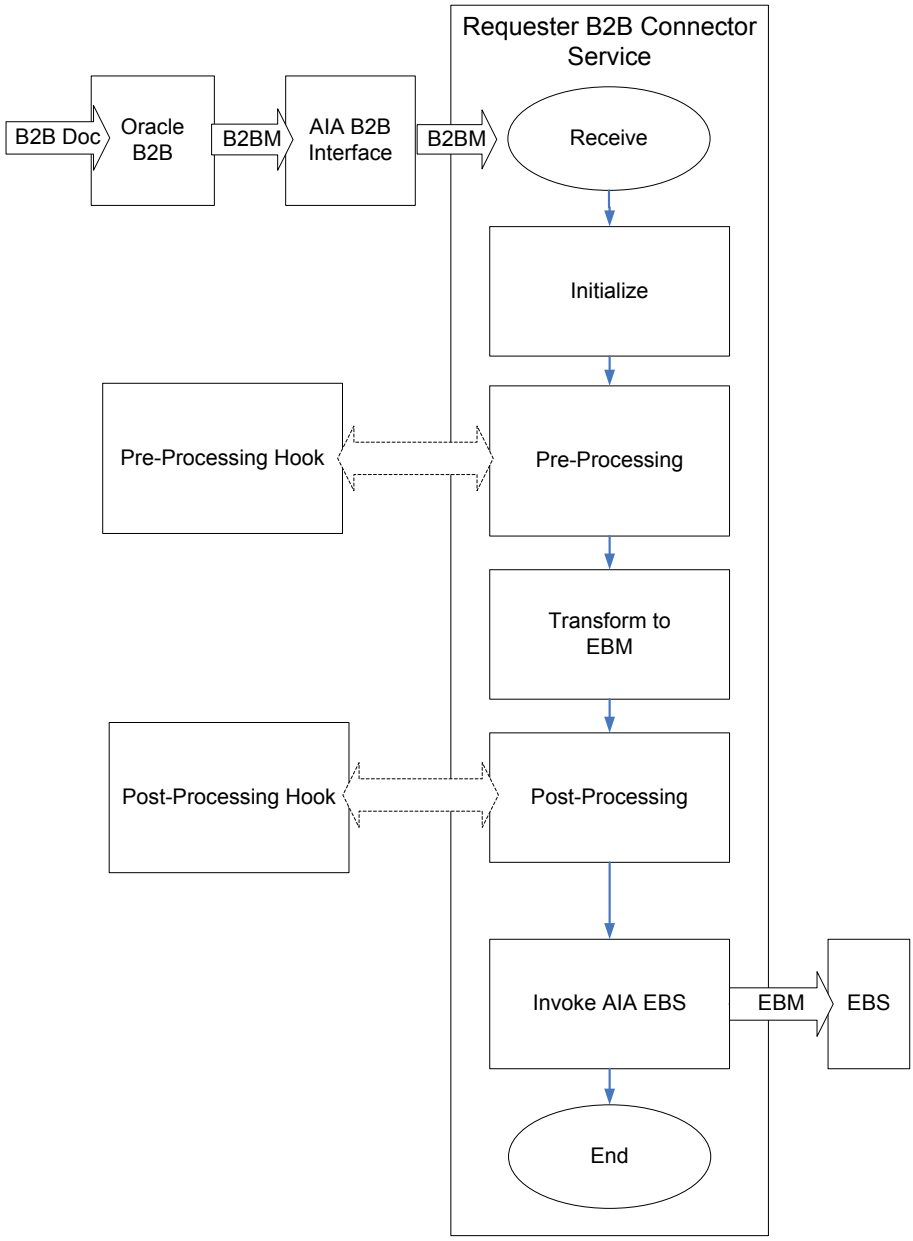
For more information about developing ABCSs, see Constructing the ABCS.

18.4.1. Introduction to Requester B2B Connector Services

The key function provided by a requester B2BCS is to enable inbound B2B document integration by performing the following tasks:

- Receive B2B documents sent by trading partners from Oracle B2B.
- Transform B2B documents into AIA EBMs.
- Use EBMs as request payloads to invoke AIA Enterprise Business Services (EBSs).

The following diagram illustrates the processing that takes place in a simple fire-and-forget message exchange pattern-based provider B2BCS.



Processing flow for a fire-and-forget requester B2BCS

Step-by-step instructions for developing B2BCSs are provided in the following sections.

18.4.2. How to Identify the Message Exchange Pattern

Similar to outbound B2B flows, most inbound B2B flows can be modeled using the fire-and-forget message exchange pattern.

Responses to be sent to trading partners can be modeled using separate outbound fire-and-forget flows.

Also, depending on the protocol involved, Oracle B2B can be configured to automatically send a confirmation or acknowledgement message to trading partners.

For more information, see How to Identify the Message Exchange Pattern.
For more information about identifying message exchange patterns, see Identifying the MEP.

18.4.3. How to Develop a B2BCS Service Contract

First, define the service contract (WSDL) of the requester B2BCS. The service contract of the provider B2BCS specifies how it is invoked by an AIA flow. The service contract specifies the B2B operation being implemented and the B2B document type that it is capable of processing as the input request message.

For more information about creating WSDLs for ABCSs, see Defining the ABCS Contract.

The following naming conventions are recommended for use in the B2BCS WSDL definition.

Definition Element	Naming Guideline	Example
WSDL File Name	<B2BStandard><Verb><EBO> ReqB2BCSImpl.wsdl	X12ProcessSalesOrderReqB2BCSImpl. wsdl
Service Namespace	http://xmlns.oracle.com/B2BCSImpl/ {Core|Industry/<IndustryName>}/<B2BStandard><Verb><EBO>ReqB2BCSImpl/ <ABCSVersion>	http://xmlns.oracle.com/B2BCSImpl/Core/X12ProcessSalesOrderProvB2BCSImpl/ V1 Please note that the ABCS Service version is independent of the B2B document/standard version. **For more information** about recommendations on versioning AIA services, see Versioning ABCS.
Service Name	<B2BStandard><Verb><EBO> ReqB2BCSImpl	X12ProcessSalesOrderProvB2BCSImpl
Port Type Name	<B2BStandard><Verb><EBO> ReqB2BCSImplService	X12ProcessSalesOrderProvB2BCSImpl Service
Operation Name	<Verb><EBO>	ProcessSalesOrder
Request Message Name	<Verb><EBO>ReqMsg	ProcessSalesOrderReqMsg
Request Message WSDL part element	corecom:B2BM	<wsdl:part name="ProcessSalesOrderEBM element=" salesordebo:ProcessSalesOrderEBM"/>
Imported Schemas	oramds:/apps/AIAMetaData/AIACompon	oramds:/apps/AIAMetaData/

Definition Element	Naming Guideline	Example
	ents /EnterpriseObjectLibrary/ Core/Common/V2/Meta.xsd oramds:/apps/AIAMetaData/AIAComponents /B2BObjectLibrary/<B2BMessageSchema> oramds:/apps/AIAMetaData/AIAComponents /EnterpriseObjectLibrary/ <EBM Schema>	AIAComponents/ EnterpriseObjectLibrary/Core/ Common/V2/Meta.xsd oramds:/apps/AIAMetaData/ AIAComponents/ EnterpriseObjectLibrary/Core/ EBO/SalesOrder/V2/SalesOrderEBM.xsd oramds:/apps/AIAMetaData/ AIAComponents/B2BObjectLibrary/ X12/4010/Oracle/850_4010.xsd
Imported WSDLs	oramds:/apps/AIAMetaData/AIAComponents/ UtilityArtifacts/RuntimeFault.wsdl	oramds:/apps/AIAMetaData/ AIAComponents/UtilityArtifacts/ RuntimeFault.wsdl

An example provider B2BCS WSDL file can be found in the following location of AIA_HOME directory:
$AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/EDI_X12/RequesterB2BCS/V1/X12ProcessSalesOrderReqB2BCSImpl.wsdl

18.4.4. How to Store a WSDL in the Metadata Repository

As a SOA best practice, we recommend that all shared service artifacts, such as WSDL and XSD files, be stored in a central location that can be accessed by multiple services.

All of the AIA-shared artifacts are stored in the Oracle Fusion Middleware Metadata Repository. Storage of shared artifacts in the Metadata Repository not only makes them globally accessible, but also enables AIA to leverage features in Metadata Repository that support caching and clustering.

Provider B2BCS WSDLs are stored at the following location in the Metadata Repository:
/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/<B2B_STANDARD>/ProviderB2BCS/<VERSION>/<B2B_STANADRD><VERB><OBJECT>ReqB2BCSImpl.wsdl

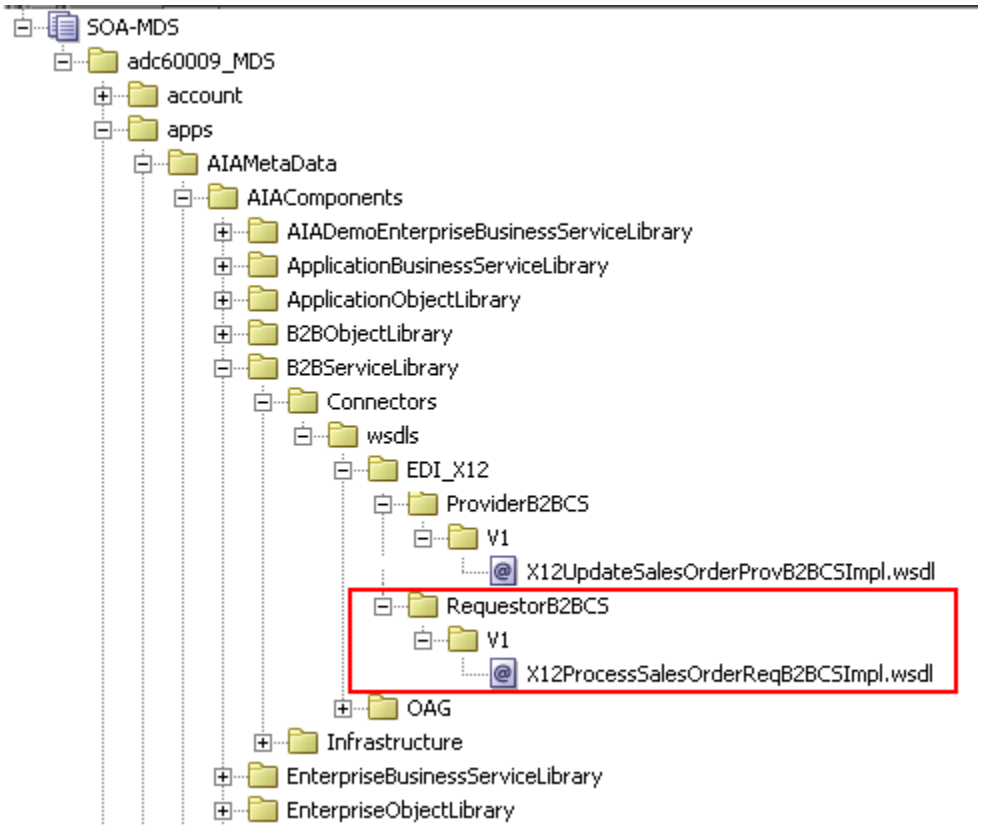
To store a WSDL in Metadata Repository:

1. Copy the handcrafted WSDL to the following location under AIA_HOME:

   $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/<B2B_STANDARD>/RequesterB2BCS/<VERSION>/<wsdl file>.wsdl

2. Run the UpdateMetaDataDP.xml present at $AIA_HOME/config/UpdateMetaDataDP.xml.

3. Using a SOA-MDS server connection to the Meta Data Repository, verify that AIAMetaData has been supplied.



4. The WSDL can now be accessed using a URL similar to the following:

   oramds:/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/EDI_X12/RequesterB2BCS/V1/X12ProcessSalesOrderProvB2BCSImpl.wsdl

18.4.5. How to Develop a B2B Connector Service

The next step in the process is to develop the B2BCS. The requester B2BCS WSDL created in the previous step is used as the interface while you are developing the concrete B2BCS.

Because the Service Constructor does not support the autogeneration of B2B services, use Oracle JDeveloper to develop the B2BCS. Develop a composite with a BPEL process based on the abstract WSDL created in the previous step.

Following are the key activities that need to be developed in the B2BCS implementation BPEL.

To develop a B2B connector service:

1. Create a SOA Composite application containing a SOA project with a BPEL component.
2. Choose the WSDL created in the previous step as the interface for the SOA composite.

   The values to be used for creating the SOA application and project are as follows:

Application Name	<B2BStandard><Verb><EBO>ReqB2BCSApp
Project Name	<B2BStandard><Verb><EBO>ReqB2BCSImpl
Project Namespace	http://xmlns.oracle.com/B2BCSImpl/Core/<Standard><Verb><Object>ReqB2BCSImpl/V1 (Same as B2BCS wsdl namespace)
Composite Name	<B2BStandard><Verb><EBO>ReqB2BCSImpl
Composite Template	"Composite with BPEL"
BPEL Process Name	<B2BStandard><Verb><EBO>ReqB2BCSImpl
Namespace	http://xmlns.oracle.com/B2BCSImpl/Core/<Standard><Verb><Object>ReqB2BCSImpl/V1 (Same as B2BCS wsdl namespace)
Template	"Base on WSDL"
WSDL URL	URL of B2BCS service WSDL referred from MDS

3. Define variable <B2BM>_Var.

   This is the input variable to the BPEL process and is used in the receive activity.

   Define the variable based on the corecom:B2BM global element defined in the Meta.xsd.

4. Define variable EBM_HEADER of type corecom:EBMHeader.

   This variable is used to store the AIA process context information and is used by the fault-handling mechanism.

   Define the variable based on the corecom:B2BM global element defined in the Meta.xsd.

5. Define variable B2BM_HEADER of type corecom:B2BMHeader.

   This variable is used to store the B2B-specific AIA process context information and is used by the fault-handling mechanism.

   Define the variable based on the corecom:B2BMHeader global element defined in the Meta.xsd.

6. Define variable <B2BDoc>_Var using the external B2BDocument definition.

   This is used as the source of the transformation from EBM. This variable is then assigned to the <B2BDoc>B2BM_Var/Payload.

7. Define a partner link to the EBS.

   This is the AIA EBS that is invoked by the requester B2BCS.

   The abstract EBS WSDL can be referenced from: oramds:/apps/AIAMetaData/AIAComponents/EnterpriseBusinessServiceLibrary/Core/<EBO>/V<x>/<EBOName>.wsdl.

8. Transform the EBM to the B2B Document.

Use a transform activity to transform the EBM to the B2B Document format. Invoke an XSLT developed per the mapping created in the previous step.

9. Assign B2B-specific EBMHeader variables.

Element	Source B2BM XPATH
corecom:EBMHeader/corecom:B2BProfile/corecom:SenderTradingPartner/corecom:TradingPartnerID	corecom:B2BM/corecom:B2BMHeader/corecom:SenderTradingPartner/corecom:TradingPartnerID
corecom:EBMHeader/corecom:B2BProfile/corecom:ReceiverTradingPartner/corecom:TradingPartnerID	corecom:B2BM/corecom:B2BMHeader/corecom:ReceiverTradingPartner/corecom:TradingPartnerID

This way, the sender and receiver trading-partner information identified by Oracle B2B is passed on to the EBM.

10. Invoke the EBS.

Invoke the AIA EBS to process the EBM.

11. Compile the BPEL process and ensure that no errors occurred. You can use JDeveloper to deploy the BPEL process to a development server that has AIA Foundation Pack installed.

18.4.6. How to Annotate B2B Connector Services

To make key metadata about the B2BCS available to the Project Lifecycle Workbench and Oracle Enterprise Repository, the composite.xml file of the B2BCS Implementation SOA composite must be annotated in a specific manner.

For more information about the Project Lifecycle Workbench, see Working with Project Lifecycle Workbench.
For more information about annotating B2B services, see Annotating Composites.

To annotate requester B2B Connector Services:

1. The following annotation elements must be added to the service element composite.xml, as described subsequently. The XML snippet from the X12ProcessSalesOrderReqB2BCSImpl composite.xml is an example of an annotated B2BCS.

```
<service name="X12ProcessSalesOrderReqB2BCSImplService"
         ui:wsdlLocation="oramds:/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/wsdls/EDI_X12/Requ
  <interface.wsdl interface="http://xmlns.oracle.com/B2BCSImpl/Core/X12ProcessSalesOrderReqB2BCSImpl/
  <binding.ws port="http://xmlns.oracle.com/B2BCSImpl/Core/X12ProcessSalesOrderReqB2BCSImpl/V1#wsdl.e
    <!--<svcdoc:AIA>
                <svcdoc:Service>
                     <svcdoc:ImplementationDetails>
                         <svcdoc:ApplicationName></svcdoc:ApplicationName>
                         <svcdoc:BaseVersion></svcdoc:BaseVersion>
                         <svcdoc:DevelopedBy>Oracle</svcdoc:DevelopedBy>
                         <svcdoc:OracleCertified>Yes</svcdoc:OracleCertified>
                         <svcdoc:ArtifactType>RequesterB2BCSImplementation</svcdoc:ArtifactType>
                         <svcdoc:ServiceOperation>
                             <svcdoc:Name>ProcessSalesOrder</svcdoc:Name>
                         </svcdoc:ServiceOperation>
                       <svcdoc:B2BDocument>850</svcdoc:B2BDocument>
                       <svcdoc:B2BDocumentVersion>4010</svcdoc:B2BDocumentVersion>
                       <svcdoc:B2BStandard>EDI_X12</svcdoc:B2BStandard>
                       <svcdoc:B2BStandardVersion>4010</svcdoc:B2BStandardVersion>
                     </svcdoc:ImplementationDetails>
                </svcdoc:Service>
          </svcdoc:AIA>-->
</service>
```

Annotation Element	Description	Example
AIA/Service/InterfaceDetails/Service Operation	<Verb><EBOName>	ProcessSalesOrder
AIA/Service/ImplementationDetails/ArtifactType	RequesterB2BCSImplementation	RequesterB2BCSImplementation
AIA/Service/ImplementationDetails/ServiceOperation/Name	<Verb><EBOName>	ProcessSalesOrder
AIA/Service/ImplementationDetails/B2BDocument	B2B Document Type processed by this B2BCS	850
AIA/Service/ImplementationDetails/B2BDocumentVersion	B2B Document Version processed by this B2BCS	4010
AIA/Service/ImplementationDetails/B2BStandard	B2B Standard processed by this B2BCS	X12
AIA/Service/ImplementationDetails/B2BStandardVersion	B2B Standard Version processed by this B2BCS	4010

2. The reference to the AIA EBS invoked by this B2BCS should also be annotated in the composite.xml.

```
<reference name="SalesOrderEBSV2"
          ui:wsdlLocation="oramds:/apps/AIAMetaData/AIAComponents/EnterpriseBusinessServiceLibrary/
  <interface.wsdl interface="http://xmlns.oracle.com/EnterpriseServices/Core/SalesOrder/V2#wsdl.inte
  <binding.ws port="http://xmlns.oracle.com/EnterpriseServices/Core/SalesOrder/V2#wsdl.endpoint(AIAD
              location="http://sdc68063crm.us.oracle.com:8024/soa-infra/services/default/AIADemoProc
<!--
                    <svcdoc:AIA>
                          <svcdoc:Reference>
                              <svcdoc:ArtifactType>EnterpriseBusinessService</svcdoc:ArtifactType>
                              <svcdoc:ServiceOperation>
                                  <svcdoc:Name>ProcessSalesOrder</svcdoc:Name>
                              </svcdoc:ServiceOperation>
                          </svcdoc:Reference>
                    </svcdoc:AIA>
-->
```

Annotation Element	Description	Example
AIA/Reference/ArtifactType	Enter value "EnterpriseBusinessService"	EnterpriseBusinessService
AIA/Reference/ServiceOperation/Name	EBS operation name	ProcessSalesOrder

3. For your reference, the file $AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12ProcessSalesOrder ReqB2BCSImpl/composite.xml contains sample Requester B2BCS Impl annotations.

18.4.7. How to Support Trading Partner-Specific Variants

Support for Trading Partner-specific processing can be built into the requester B2BCS in a manner similar to the way they are built into the provider B2BCS.

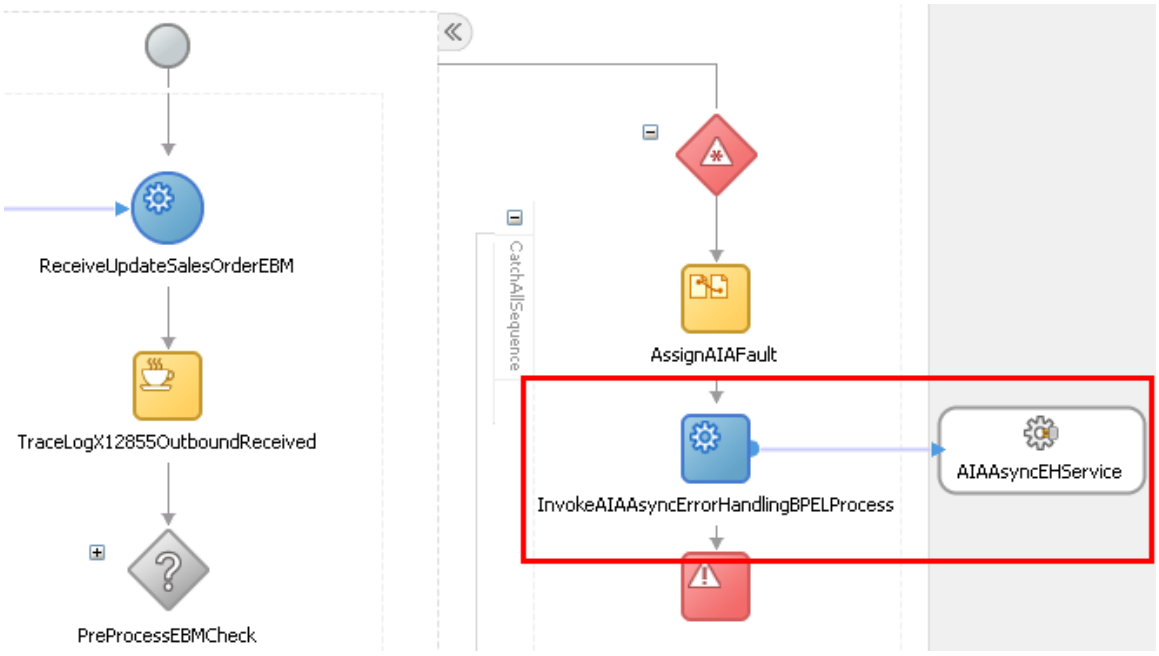
For more information about how to build trading partner-specific support in B2BCSs, see How to Support Trading Partner-Specific Variants.

18.4.8. How to Enable Error Handling

For more information about how to enable AIA services for error handling and recovery, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up and Using Error Handling and Logging."

In short, the following steps must be taken:

- Associate a fault-policy.xml with the B2BCS composite.
- Invoke the AIAAsyncErrorHandlingBPELProcess for business faults.

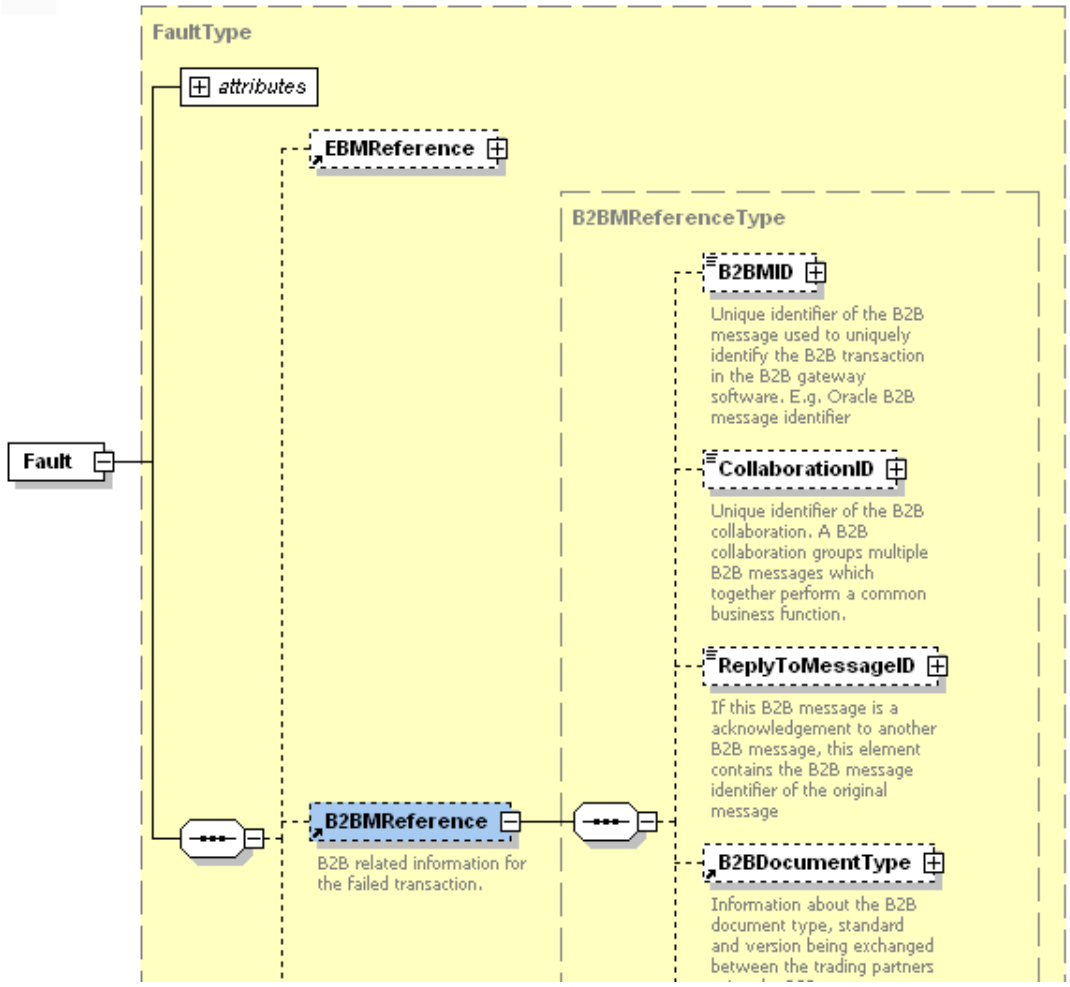



```
</assign>
        <invoke name="InvokeAIAAsyncErrorHandlingBPELProcess"
                portType="aiaasynceh:AIAAsyncErrorHandlingBPELProcess" inputVariable="AIAA
                partnerLink="AIAAsyncEHService"
                operation="initiate"/>
        <throw name="ThrowAIAFault" faultName="corecom:Fault" faultVariable="AIAFaultMessa
    </sequence>
  </catchAll>
</faultHandlers>
```

While invoking the AIAAsyncErrorHandlingBPELProcess, the following B2B-specific elements in the fault schema can be populated as described below.

Fault Element Schema	Description	Example
Fault/B2BMReference/B2BMID	Unique identifier of the B2B document	13232325
Fault/B2BMReference/B2BDocumentType/TypeCode	Document type of the B2B document being processed by the requester B2BCS	“855”
Fault/B2BMReference/B2BDocumentType/Version	Document version of the B2B document being processed by the Requester B2BCS	“4010”
Fault/B2BMReference/B2BDocumentType/TypeCode/@listAgencyID	Standard of the B2B document being processed by the Requester B2BCS	“X12”
Fault/B2BMReference/GatewayID	Name of the B2B software being used.	“Oracle B2B”
Fault/B2BMReference/SenderTradingPartner/*TradingPartner*ID	Sender trading partner, mapped from the B2BM	“MyCompany”
Fault/B2BMReference/ReceiverTradingPartner/*TradingPartner*ID	Receiver trading partner, mapped from the B2BM	“Global”

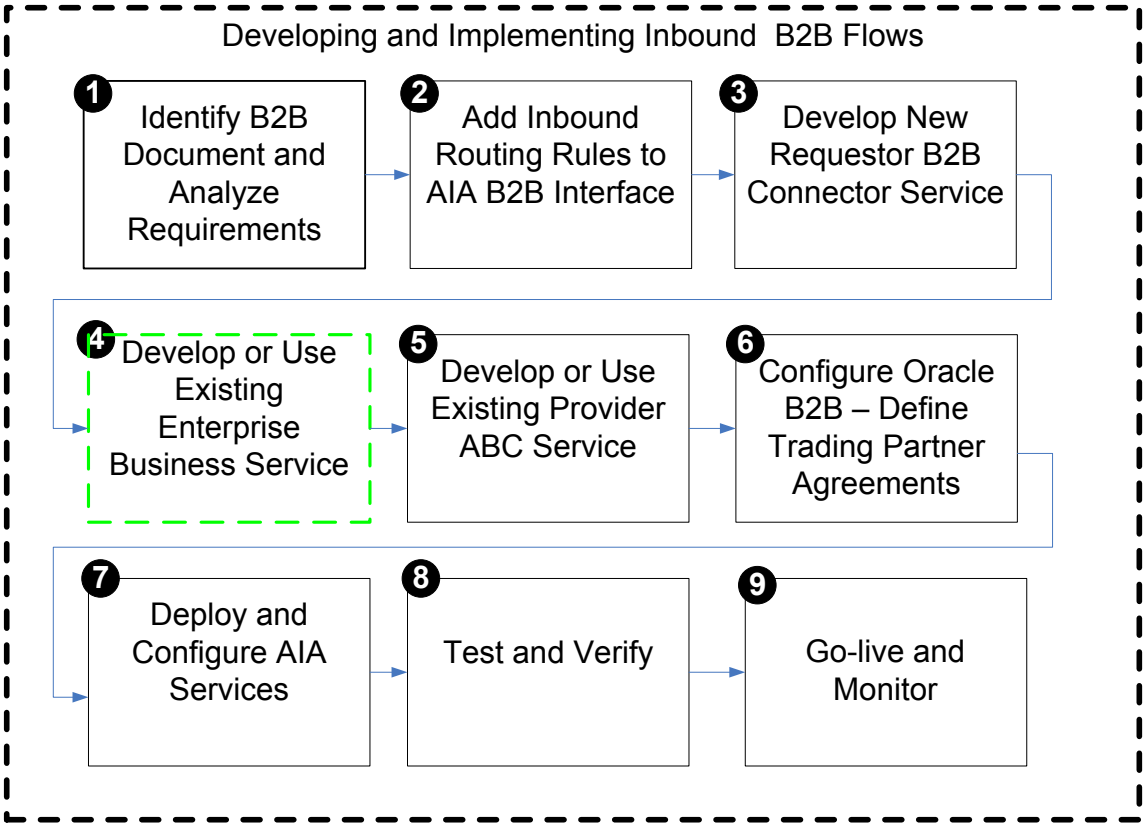
The following diagram provides the B2B-specific elements in the corecom:Fault:



The B2B details of the failed AIA service now available in the fault instance will be logged and available for debugging the failed flow.

Refer to the $AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12Process SalesOrder ReqB2BCSImpl/X12ProcessSalesOrderReqB2BCSImpl.bpel for a sample of a Provider process that has been enabled for B2B fault handling.

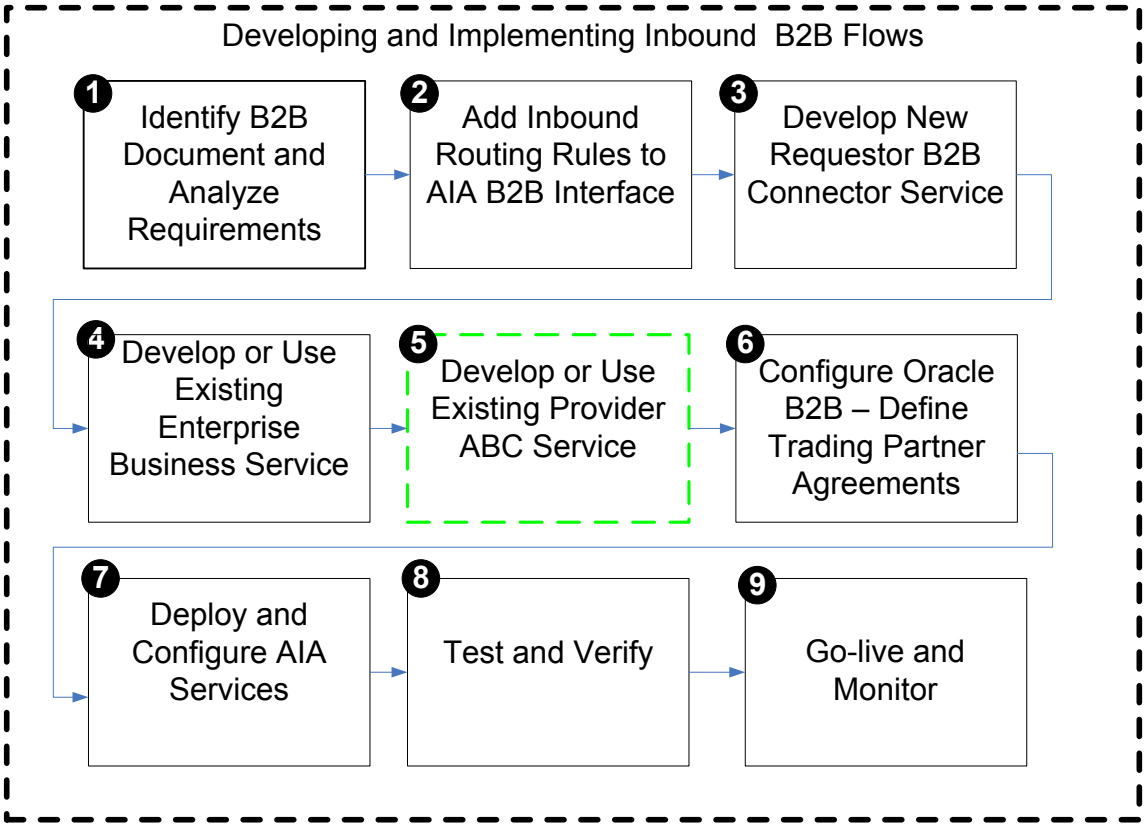
18.5. Step 4: Developing or Extending an Existing Enterprise Business Service



The next step is to develop a new EBS or use an existing EBS that is invoked by the requester B2BCS.

For more information about creating a new EBS, see Designing and Developing Enterprise Business Services.

18.6. Step 5: Developing or Extending an Existing Provider ABCS



The provider ABCS processes the AIA EBM by invoking application APIs or web-services.

For more information about how to design and construct a provider ABCS, see Designing Application Business Connector Services and Constructing the ABCS.

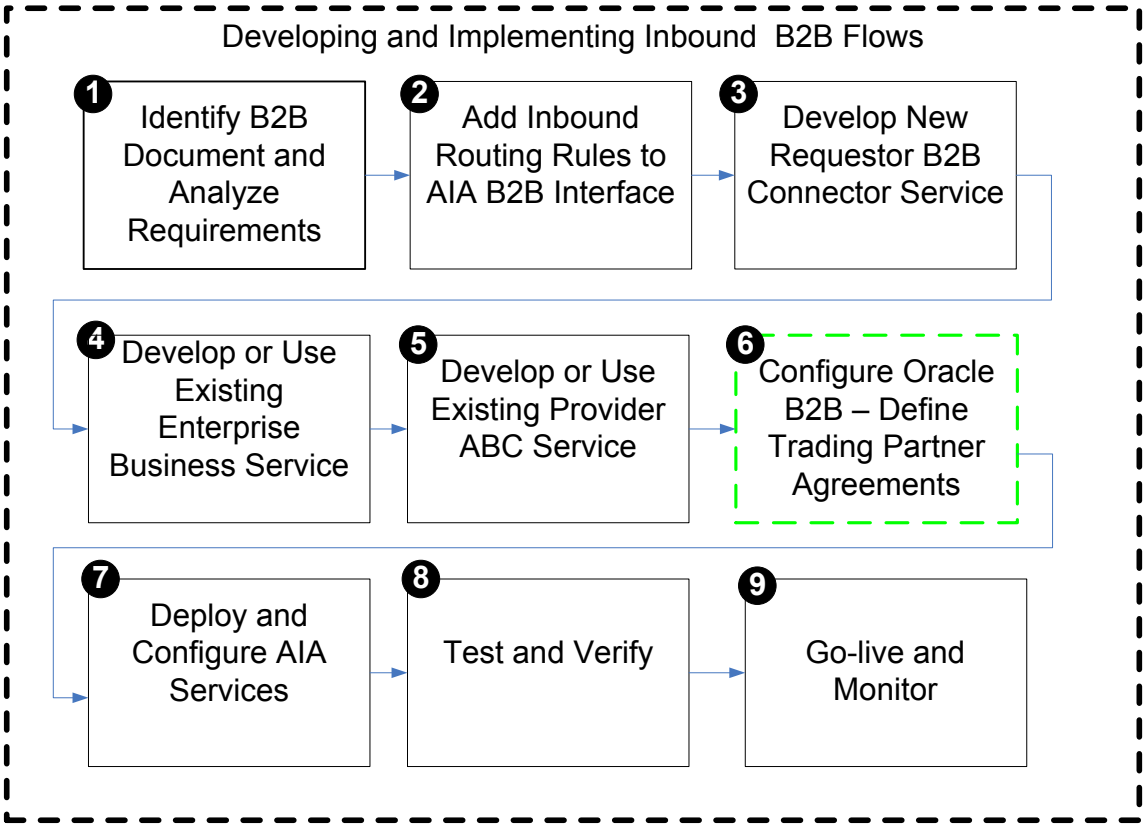
18.6.1. What You Need to Know About Transformations

While you are developing this transformation from EBM to ABM, the Sender and Receiver Trading Partner information can be mapped to appropriate fields in the ABM to capture the source and target of the B2B message.

EBM Header Element	Description	Example Value
/EBMHeader/B2BProfile/SenderTradingPartner/TradingPartnerID	ID of the sending trading partner as defined in Oracle B2B. For inbound flows, this is the remote trading partner.	“GlobalChips”
/EBMHeader/B2BProfile/ReceiverTradingPartner/TradingPartnerID	ID of the receiving trading partner as defined in Oracle B2B. For inbound flows, this is the host trading partner.	“Acme”

At the end of this step, all of the required AIA services for developing an outbound B2B integration flow are ready.

18.7. Step 6: Configuring Oracle B2B and Defining Trading Partner Agreements

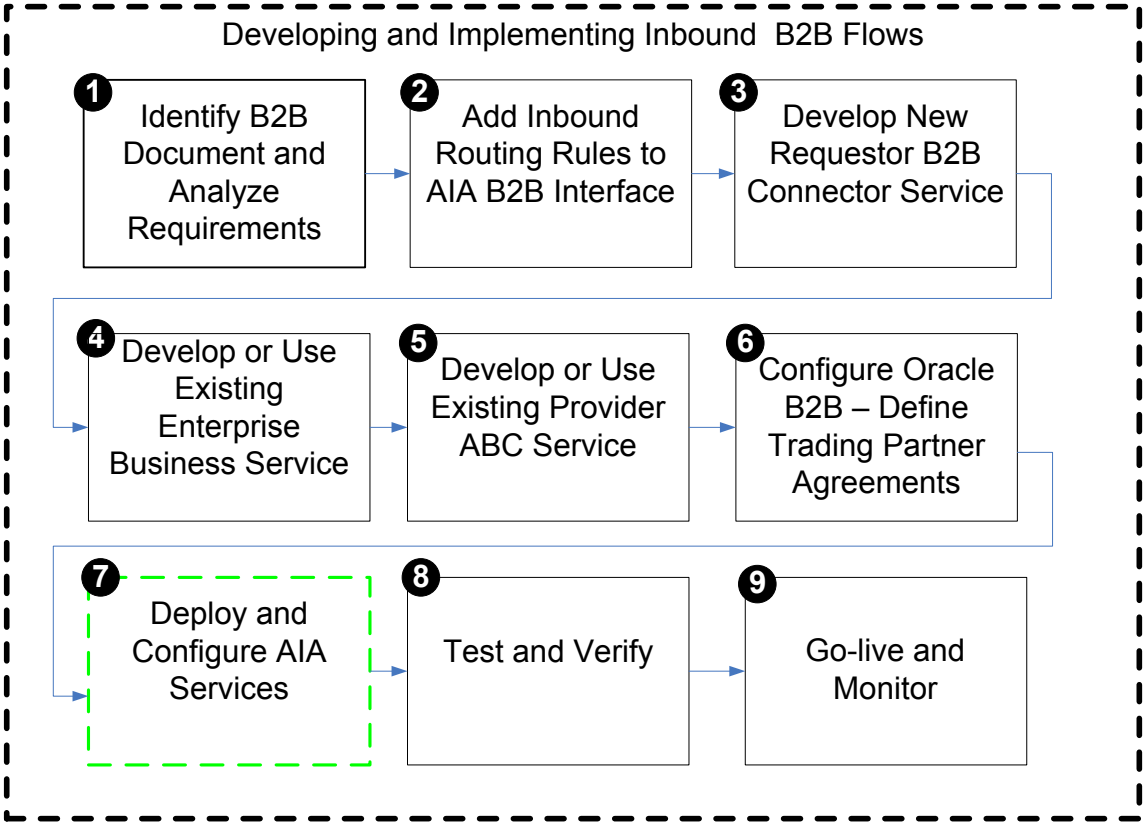


The next step is to create trading partner agreements in Oracle B2B.

For more information about how to define trading partners and associate B2B capabilities with them, see *Oracle Fusion Middleware User's Guide for Oracle B2B*, "Configuring Trading Partners."

In addition, for EDI-based outbound B2B flows, Oracle B2B can be configured for batch processing of outbound documents. Parameters such as the batch size and time-out can be configured in Oracle B2B without having to make any changes to the AIA layer.

18.8. Step 7: Deploying and Configuring AIA Services



Next, deploy the AIA services. You can deploy the services to a target Oracle SOA server using JDeveloper.

If any domain value mapping (DVM) and configuration files are used by the AIA services required for the outbound integration, you must enter data corresponding to your B2B configuration.

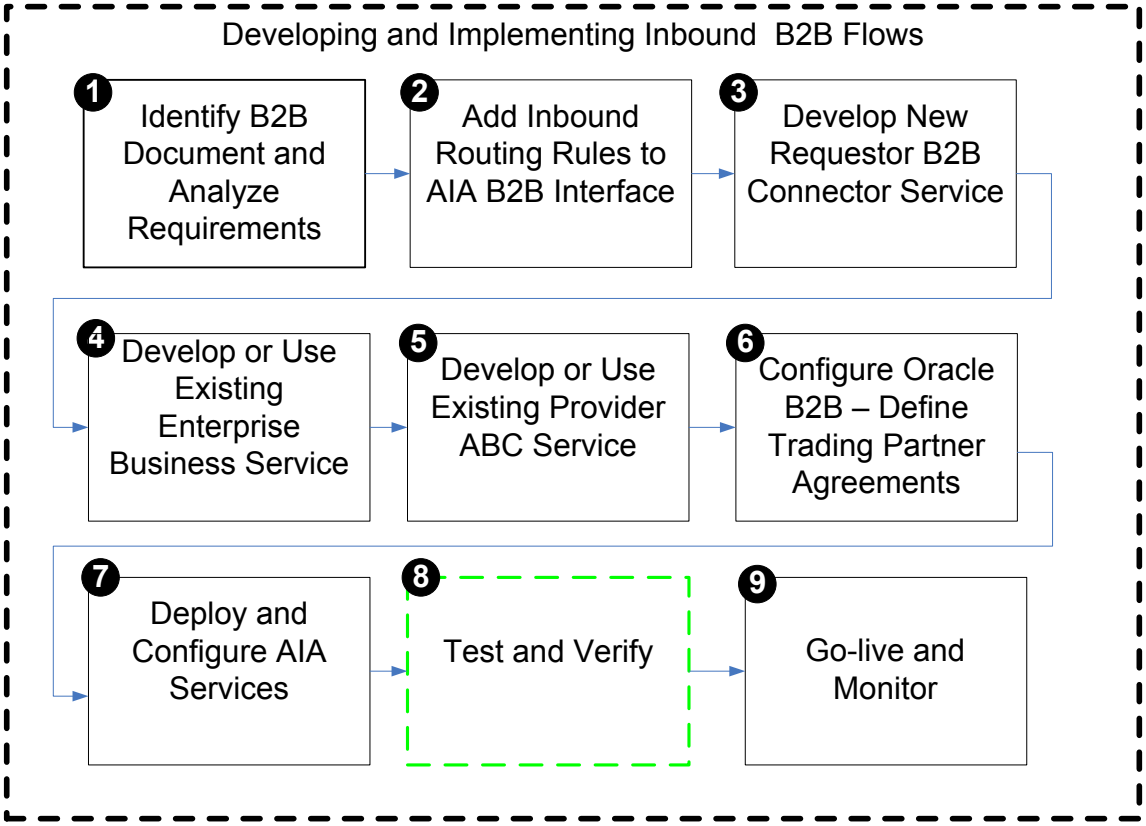
You can also use the Project Lifecycle Workbench application to create a bill of material XML file for the AIA project, which can be used to autogenerate a deployment plan. This deployment plan can be used to deploy all of the AIA services and resources that make up the integration project in multiple development, test, and production environments.

For more information about generating bills of material, see Working with Project Lifecycle Workbench Bills of Material.
For more information about generating deployment plans, see Deploying Composites.

In addition, configure the AIA Error Handling framework and set up appropriate roles to be notified of errors in AIA flows.

For more information about error handling, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Working with Error Handling and Logging."

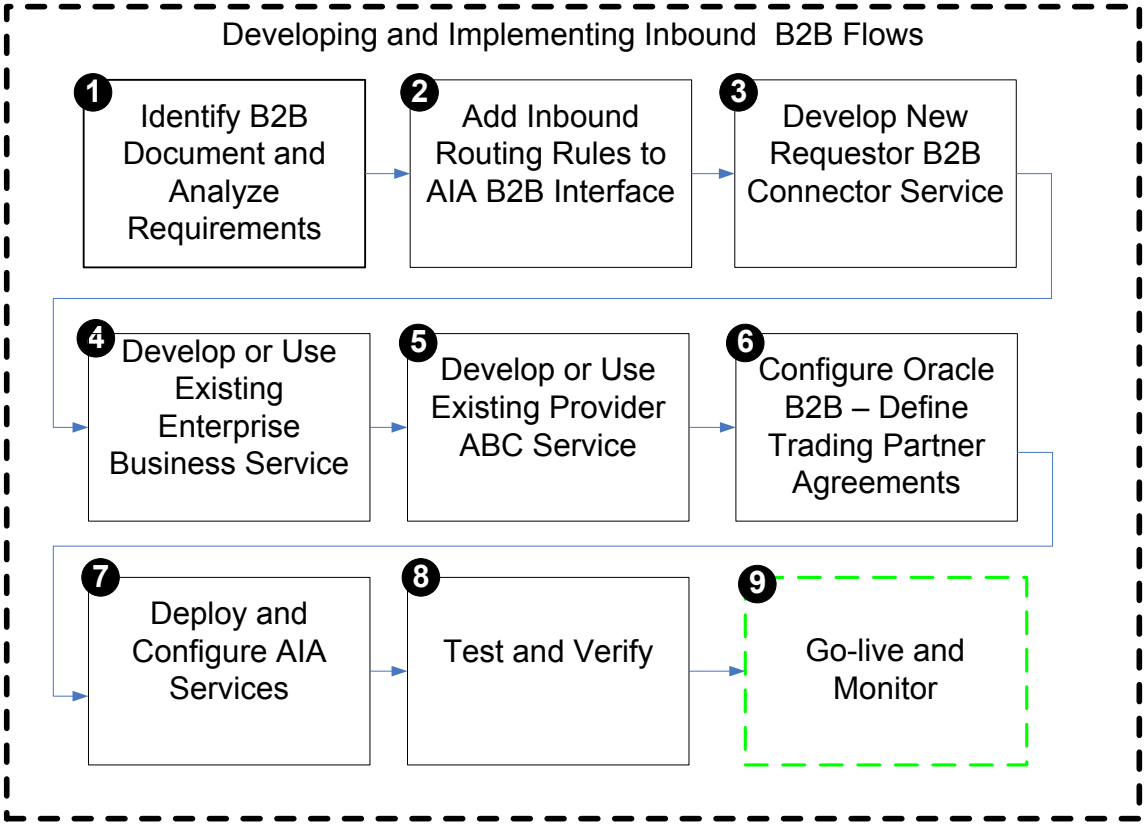
18.9. Step 8: Testing and Verifying



Before you go live with your B2B integration flows with your trading partners, we recommend that you complete the following sequence of tests for your newly developed or deployed AIA services, which make up the B2B integration flow.

For more information, see Step 7: Testing and Verifying

18.10. Step 9: Going Live and Monitoring



The final step is to go live with your trading partner for the outbound B2B document flow. The AIA and Oracle B2B deployments are duplicated in the product servers and rolled out to the end users.

For more information, see Step 8: Going Live and Monitoring.

19. Establishing Resource Connectivity

This chapter describes how Oracle Application Integration Architecture (AIA) services interact with external resources and discusses inbound and outbound connectivity. The final sections describe specific guidelines for establishing connectivity with Siebel applications as well as Oracle E-Business Suite.

This chapter discusses the following sections:

19.1. Introduction to Resource Connectivity

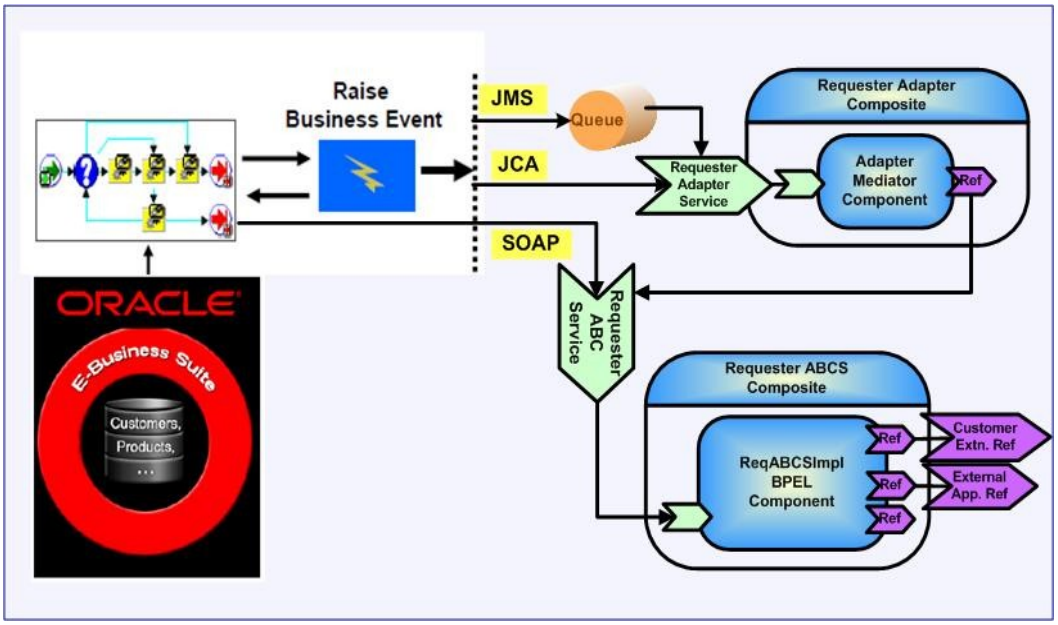
Participating applications drive the business processes. They are either initiators of the business process or play roles in one or more steps in the business process. The interactions of the participating applications with business process can be either outbound or inbound from the AIA layer perspective.

A business process is a combination of outbound and inbound interactions with various participating applications. The following example illustrates how an inbound interaction to the business process is made by a participating application. Clicking on a submit button in the order capture module within a CRM application results in the initiation of the Order Fulfillment business process. This example illustrates how an outbound interaction is made by the business process. A step within that business process could result in invocation of CRM Order Capture application to send the order status updates.

19.1.1. Inbound Connectivity

Inbound means inbound into the AIA layer.

- Services exposed by AIA services are invoked by proxies created by applications. Inbound interactions with AIA might occur due to the notification or broadcast of an event by the participating application or for retrieval of information from external sources. For example - clicking of the 'Get Account Balance' button in a CRM application module could result in invocation of an AIA service by sending a SOAP message over HTTP.
- Applications push messages to JMS queues and topics. JMS servers trigger registered JMS adapter agents and JMS adapter agents trigger AIA services. For example, creation of a customer or submission of an order within CRM modules could trigger the broadcast of these events to AIA in the form of messages to JMS queues and topics.

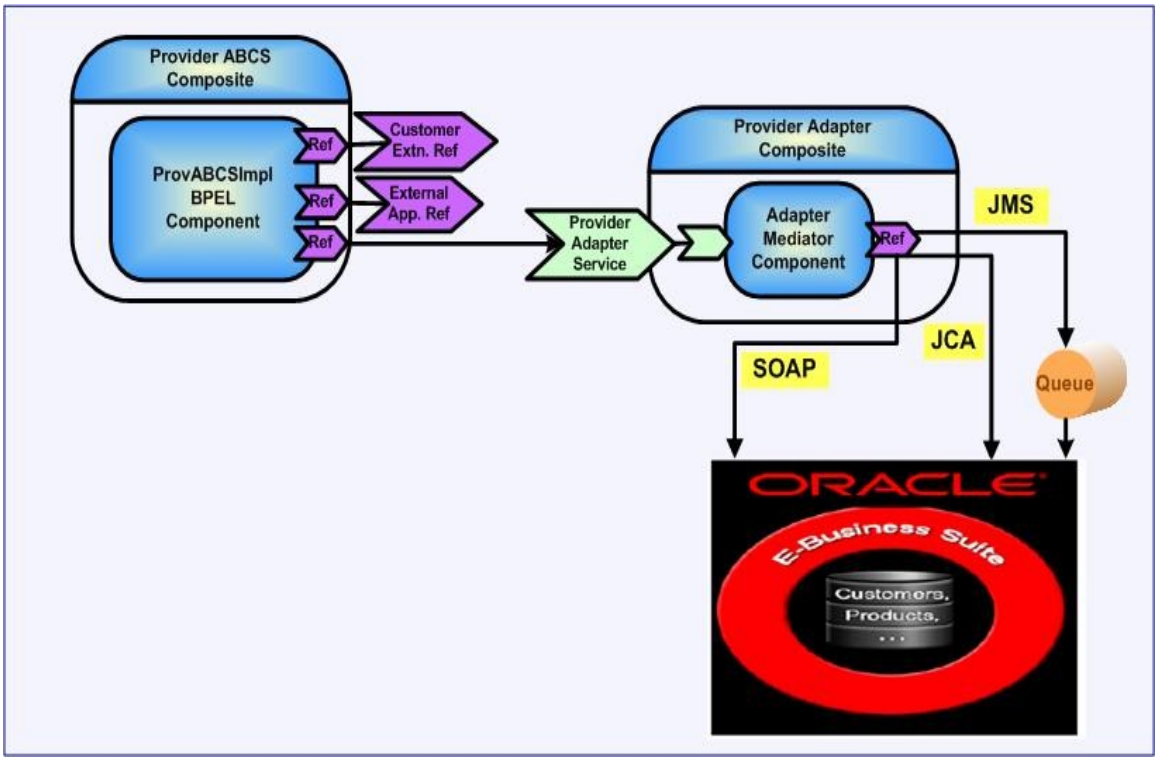


Example of inbound connectivity

19.1.2. Outbound Connectivity

Outbound means outbound from the AIA layer.

- AIA services invoke services exposed by applications. AIA services could invoke the application services or the external services to retrieve additional information, to send business events, or to request a task be done. An example is the creation of a customer in billing application when an order is created in the CRM module or an order is submitted for an existing customer in CRM module, but that customer profile is not available in the billing application. Most manufacturing systems publish an event when an item is added however these events contain minimal information about the item. The AIA service consuming the event needs to invoke an application service to get complete information about the item.
- AIA services interact with applications using JCA adapters and push messages to JMS queues / topics. JMS servers trigger JMS adapter agents registered by applications.



Example of outbound connectivity

19.2. Modes of Connectivity

Participating applications use different types of mechanisms for inbound and outbound interactions.

For each of the following mechanisms, participating applications are expected to follow certain guidelines for interacting with the AIA architecture.

The contents of this section are general guidelines and recommendations only. Programming methodologies for AIA services can vary based on a participating application's capabilities and at present, some of the participating applications may not have the capabilities discussed in this section. Please refer to the relevant application-specific guides for the facilities provided.

19.2.1. Web Services with SOAP / HTTP

For inbound interaction, the participating application invokes the Application Business Connector Services (ABCS) provided by AIA as Web services. The participating application uses the ABCS WSDL for invoking the ABCS Web services. The ABCS WSDLs are consumed by the participating application to create stubs or proxies. These are internally invoked in the participating application leading to the invocation of the ABCS.

We recommend that participating applications leverage Web services transport for invoking AIA services only to fetch information residing in external systems. For example, querying the account balance details of a customer from billing application using CRM application by a CSR or a self-service application screen.

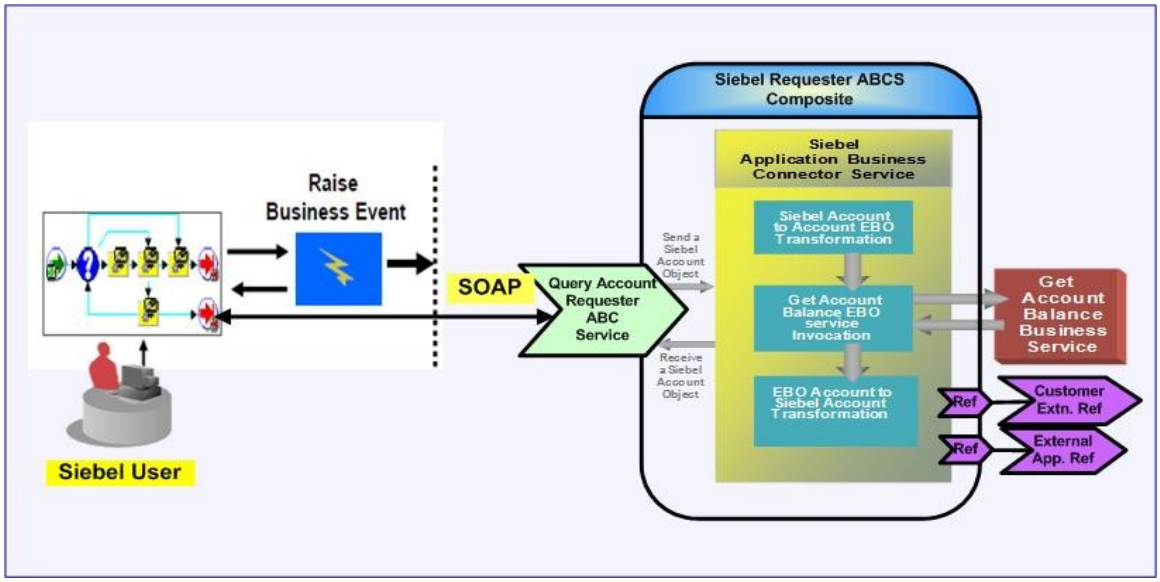


Illustration of using Web services with SOAP / HTTP

In other types of interactions, like create customer, submit order, and so on, we recommend that you use either JCA or JMS transports to ensure the interaction is reliable and transactional. If the participating application doesn't have the capability to use either JMS or JCA transports to publish events to the AIA layer, then you can use the Web services transport, which can help in publishing the events to a queue in the AIA layer for further processing.

Since the ABCS is developed using the schemas from the participating applications, the outbound message format and the ABCS message format are the same.

Inbound Interaction

Inbound messages should have the following attributes:

- Message ID

  The Message ID is the unique identifier for a message generated by the application and stamped on the message. For example, a customer ID or an order ID would be unique in the payload.

- Message payload name

  The name of the business object should be passed.

- Participating application instance

  A unique identifier for the application instance is needed to set the cross reference for the entity IDs, so this is also expected in the payload.

- Event session locale

  The locale information from the client session provides context to the request being made by the application. This helps in ensuring the response is in the same locale context. The locale specific headers should be negotiated with the application teams to decide upon the ABM header attributes. Setting and retrieving the locale specific information is a factor in the ABCS implementation during the request and response transformation steps done on ABM.

Outbound Interaction

For outbound interactions, the ABCS invokes the participating application APIs exposed as Web services. The WSDLs of the participating application Web services are consumed by the ABCS.

19.2.2. When to Use Web Services with SOAP/HTTP

You can leverage Web services with SOAP/HTTP to fetch information from the applications and provide it to the requesters. They are useful when the requirement for interaction reliability is low and operations are limited to querying the information stores.

The message format is XML (Extensible Markup Language).

This mode of connectivity is used in AIA for:

- Request-response
- Request only

19.2.2.1. Request-Response

The SOAP client uses an HTTP *GET* method to request a representation of a specified resource. The SOAP server triggers the executable and responds back with the output. This is an idempotent action, meaning that multiple identical requests should have the same effect as a single request.

For example, a Customer Sales Representative queries the Customer Master Data Management system for existence of a customer record before creating a new customer in the system.

19.2.2.2. Request Only

The SOAP client uses a HTTP *POST* to submit data to be processed (for example, from an HTML form) to the identified resource. The data is included in the body of the request. This may result in the creation of a new resource or the updates of existing resources or both. This is a non idempotent action; therefore sending an identical POST request multiple times may further affect state or cause further side effects.

For example, a Customer submits an order for processing from a Composite Application UI.

19.2.2.3. Advantages of Using Web Services with SOAP/HTTP

Web services with SOAP/HTTP are:

- Platform independent
- Language independent

19.2.2.4. Disadvantages of Using Web Services with SOAP/HTTP

XML format of message processing is slower; therefore, messages need to be smaller or need to leverage compression techniques.

Inherently, HTTP is stateless (retains no data between invocations); therefore, it needs an explicit login for every call, leading to performance overhead.

The notion of atomic transactions with state management is not supported; workarounds are session state management, where a connection can be reused for more than one request (as discussed below).

19.2.2.5. Important Considerations for Using Web Services with SOAP/HTTP

AIA demands that the developed and deployed Web services conform to published WS-I profiles to foster interoperability.

Leverage WS-Security to secure message exchanges using XML Encryption and XML Signature in SOAP; alternative is using secure HTTP (HTTPS).

Leverage WS-Addressing to insert address in the SOAP header.

Leverage WS-ReliableMessaging to reliably deliver messages between distributed applications in the presence of software component, system, or network failures.

19.2.3. Session Management for Web Services with SOAP/HTTP

To overcome the disadvantage of HTTP being stateless and unable to support atomic transaction, session management is needed. The following sections discuss:

- Session types
- Session tokens
- Session pool manager

19.2.3.1. Session Types

The three types of sessions are:

- **None**

  A new session is opened for each request and then closed after a response is sent out.

- **Stateless**

  A new session is opened for an initial request, and the session remains open for subsequent requests. Re-login occurs automatically (transparent to the user) if the session is closed. UsernameToken and PasswordText must be included as SOAP headers in the initial request to open a stateless session.

- **Stateful**

  A new session is opened for an initial request, and the session remains open for subsequent requests. Re-login does not occur automatically if the session is closed. UsernameToken and PasswordText must be included as SOAP headers in the initial request to open a stateful session.

For **Stateless** or **Stateful** modes, Web services are expected to return a SessionToken in the SOAP: HEADER. This depends on the application implementation.

19.2.3.2. SessionToken

A SessionToken is the *encryption* of the Session ID, UserToken, plus PasswordText.

- For each Stateless or Stateful call, an updated SessionToken is returned. This is as a safety measure against replay attacks.

The process of updating the SessionToken does not close the session. Therefore, for the next call with the updated session token there is no re-login. The session remains open. The Session is closed when a call is posted with a Session Type set to ***None*** or a timeout occurs. After a second call you have two Session Tokens: the one returned on first call and the updated one from the second call. At this point either of these SessionTokens can be sent for a third call (which will return a third SessionToken). Posting a call with Session Type set to ***None*** terminates the Session ID, so all these Session Tokens become invalid.

URL and SOAP HEADER for the Siebel Application Examples

The URL for calling the Siebel application and passing the login info in the soap header looks like:

http://sdcp1952i028.corp.siebel.com/eai_enu/start.swe?SWEExtSource=SecureWebService&SWEExtCmd=Execute&WSSOAP=1

The SOAP header looks like this:

```
<soapenv:Header>
<UsernameToken
xmlns="http://siebel.com/webservices">rreddy</UsernameToken>
<PasswordText xmlns="http://siebel.com/webservices">rreddy</PasswordText>
<SessionType xmlns="http://siebel.com/webservices">Stateless</SessionType>
</soapenv:Header>
```

And the response looks like this:

```
<SOAP-ENV:Header>
<siebel-header:SessionToken xmlns:siebel-
header="http://siebel.com/webservices">0f2cnvf0Ii5qsp-zk-SEyjl2p0JD-
QdYLt1LYvARXQMZfAL9YL.THekJHI1cVjZbBGQckQN.cIfOGPKWKwUd6E0D4LD.VS.CKWsXw..
.</siebel-header:SessionToken>
</SOAP-ENV:Header>
```

19.2.3.3. Session Pool Manager

For business integration flows that require a high number of concurrent request/response calls to applications, we recommend that you send and receive session token information rather than sending user credentials on each call.

- The Session Pool Manager is a service that manages a pool of session tokens to be reused for subsequent requests.
- The sessions are persisted either in memory or in a database.
- The login credentials and URLs are configured by an administrator in the Session Pool Manager.

The implementation of the Session Pool Manager is application-specific, taking into consideration the Web service framework implementations.

19.2.4. Error Handling for Web Services with SOAP/HTTP

This section discusses error handling for Web services with SOAP/HTTP:

- For inbound connectivity
- For outbound connectivity

19.2.4.1. For Inbound Connectivity

Participating applications should have the capability to consume WSDLs with fault messages defined.

The WSDLs provided to participating applications are generated for the coarse-grained request-response services created using BPEL (ABCS). The input and output payloads for these services are schemas provided by the participating applications. Fault schemas provided by applications will aid in incorporating them in the definitions of the services (WSDLs).

19.2.4.2. For Outbound Connectivity

The WSDLs of the participating application services are consumed by the AIA services. The error handling depends on the message exchange pattern.

The following link is valuable to understand the various HTTP status codes:
http://en.wikipedia.org/wiki/List_of_HTTP_status_codes

19.2.4.3. Request-Response and Request-Only System Errors

- Call from the participating application not successful

  The AIA layer returns HTTP 4xx Client Error and the participating applications need to have the mechanism to resubmit manually or automatically.

  Example: FMW is down and AIA service is not accessible.

- Call from the participating application successful but system resource not accessible

  The AIA layer returns 5xx Server Error and the participating applications need to have the mechanism to resubmit manually or automatically.

  Example: From the AIA service execution, the cross-reference database is not accessible.

19.2.4.4. Request-Response Business Errors

- WSDL of the participation application service has named fault

  In this case, the WSDL has a named fault with a specified fault message format. The AIA service, on encountering a business error, puts the error information in the fault message and reply back to the calling service. The participating application takes action accordingly.

Example: An order with invalid options is pushed by CRM application to ERP application and fails validation in the ERP application. Upon receiving the fault, the AIA service constructs an appropriate error message, transforms it to the fault schema of the CRM application, and sends it back as a named fault.

- WSDL of the participation application service has no named fault

  This case has two possibilities:

  - WSDL response message has component and elements for specifying error

    In this case, the AIA service, on encountering a business error, would put the error information in the response message fault component and elements and reply back to the calling service. The participating application takes action accordingly.

  - WSDL specifies no valid way for receiving fault information

    Two options:

    - Send back the fault as a SOAP fault if the FMW component used for the AIA service supports it.
    - Model the interaction as ***Request-Only*** and make provisions for a separate participating application Web service to receive the result.

19.2.5. Security for Web Services with SOAP/HTTP

The participating application should receive authentication information in WS Security username token profile format. They should be able to de-sign and decrypt the request and sign and encrypt the response. They should preferably receive authorization information in xacml format inside SOAP headers.

19.2.6. Message Propagation Using Queues/Topics

Participating applications have capabilities to enqueue messages to queues (JMS/ AQ / MQ / MSMQ etc) for inbound interactions. Participating applications construct messages for various events raised and enqueue the messages into named queues. The AIA services subscribing to these queues are triggered. These are essentially asynchronous in nature. Publishing of message into a queue should be part of same transaction that occurred within the application.

Participating applications also have capabilities to dequeue messages from queues (JMS/ AQ / MQ / MSMQ etc) for outbound interactions. AIA services construct messages for various events raised and enqueue the messages into named queues. The Participating applications subscribing to these queues de-queue and process the messages. These are essentially asynchronous in nature. Publishing of message into a queue should be part of same transaction that occurred within the AIA service.

The queuing mechanisms are asynchronous in nature. They consist of one-way calls.

19.2.6.1. Event Notification Without Payloads

For event notifications without payloads, the ABCS adapter that is subscribing to or polling the events pulls out the message from the participating application. A series of events are triggered, but there is no guarantee that the snapshot of the updated entity pulled from the participating application corresponds to the event. We suggest that events be user triggered so that the data integrity is not compromised. Message sequencing is not possible in this case.

To ensure the guaranteed delivery of the event notifications, these notifications should be able to receive an acknowledgement from AIA layer and also the participating applications should be able to resend or do proper error handling of these event notifications. All these events should be preserved and aggregated based on the ID or timestamp in the AIA layer and that further processing should be done at regular intervals to ensure the data integrity.

19.2.6.2. Events Leading to Message Queuing

When messages are queued as a result of events raised, the messages capture the snapshot of entity state. In case there are a series of operations on an entity in close succession, a series of messages for the same entity with different states, arrive at the queue. Due to network latencies or errors in messages being processed, the ordering of messages in such a situation cannot be guaranteed.

AIA services can process the messages in the correct sequence if some requirements are fulfilled.

- Requirements for sequencing of messages

  For the messages to be sequenced, there should be a defined set of messages that need to be sequenced. In addition, every message should be identifiable as a part of a sequence.

- Identifier for the set of messages to be sequenced

  A named parameter like a ‘Group ID’ is defined. All the messages having a common value are part of the same group or set of messages to be sequenced.

- Identifier for the message to be sequenced

  A named parameter like a ‘Sequence ID’ is defined. The possible value for this parameter can be of a number or date-time. This value determines the position of each message in a sequence.

19.2.6.3. When to Use Message Propagation Using Queues/Topics

Either of the two criteria suggested below will lead to using message propagation using Queues/Topics:

- Need to break processes into atomic transactions
- Event triggering system cannot wait till the message is processed

19.2.6.4. Types of Queues

The two types are:

- Queues
- Topics

Queues

A persistent storing mechanism designed for holding elements before processing.

Points to note:

- Queues are point-to-point.
- Only one consumer will get the message.
- The producer does not have to be running at the time the consumer consumes the message, nor does the consumer need to be running at the time the message is sent.
- Every message successfully processed is acknowledged by the consumer.

Topics

A persistent storing mechanism designed for holding elements before processing. For processing, messages are delivered to multiple subscribers.

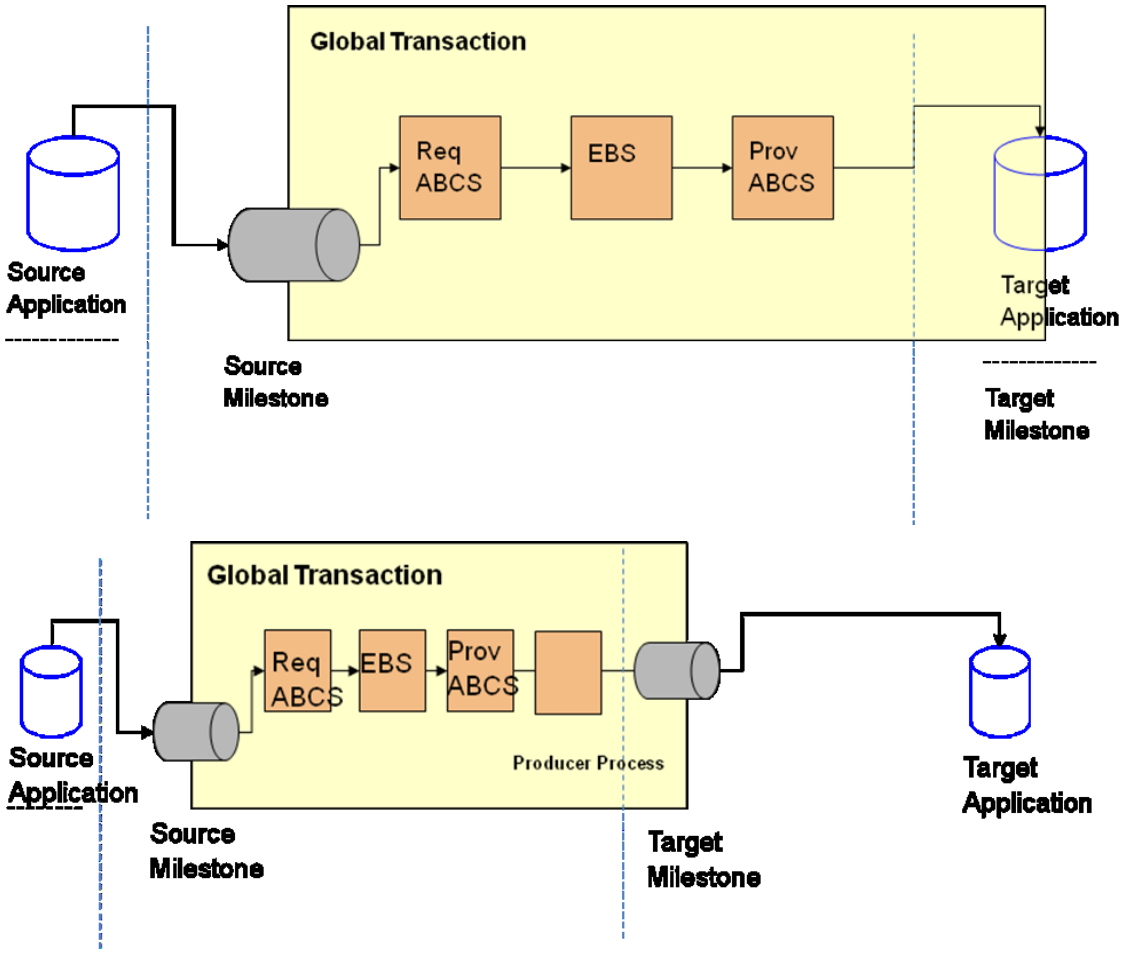
Points to note:

- Multiple consumers can get the message.
- A timing dependency exists between publishers and subscribers. The publisher has to create a subscription in order for clients to be able to subscribe. The subscriber has to remain continuously active to receive messages, unless it has established a durable subscription. In that case, messages published while the subscriber is not connected will be redistributed whenever it reconnects.

19.2.7. Ensuring Guaranteed Message Delivery

Guaranteed message delivery means a message initiated from the sender system is persisted until it is successfully delivered to and acknowledged by the receiver, if acknowledgement is expected. This delivery method ensures that messages are not lost under any circumstance.

The sender and receiver are not necessarily the participating applications. Rather, they are logical milestones in a business process. Multiple milestones may exist, as illustrated in the following diagrams:



- Temporary unavailability of any hardware or software service does not result in a lost message or a delivery failure, ensuring that the message is delivered.
- The Error Handling framework provides a way for the message to be persisted until the hardware or software service becomes available for retry, and to reprocess the message after correction or initiate a new message after discarding the existing message.
- Message delivery is ensured by treating the message processing between any two integration milestones as a unit of work and binding it in a single global transaction.

19.2.7.1. When to Use Transaction Boundaries

Use transaction boundaries when:

- Different components are involved in the processing of messages. They can be JMS consumer adapter services, BPEL processes, Mediator services, Cross Reference calls, and JMS Producer adapter services.
- Global transactions are enabled across all the components, and the transaction boundary is established between the integration milestones, which ensures that the messages are persisted in the source milestone until delivered to the target milestone.

19.2.8. When to Use JCA Adapters

Use JCA adapters when the application has the implementation of an adapter based on the Oracle FMW-supported JCA specifications. These adapters can be purchased from Oracle certified third-party vendors if they support the required JCA specifications.

JCA adapters should be transactions enabled. So, to ensure the guaranteed delivery and also to get the participating application to enlist in the XA transactions, the JCA adapter and the application should build their capabilities which are required for building the AIA composite business processes.

JCA adapter could be a queue/topic adapter for AQ or JMS. Also, the JCA adapter could be exposing the business object API's of a particular application. The granularity of the API would demand chatty conversations with the participating application. So, we recommend that an application should expose the coarse-grained API (though it might call multiple fine-grained APIs in the application's implementation). This exposure would avoid chatty conversations and improve the overall performance for a business transaction.

19.3. Siebel Application-Specific Connectivity Guidelines

The following sections discuss how to establish inbound and outbound connectivity with Siebel applications.

19.3.1. Inbound: Siebel Application Interaction with AIA Services

Siebel applications present requests to AIA services when the Siebel application is a driving application initiating business processes, business activities, and business tasks. The Siebel application can either invoke AIA services exposed as Web services or push messages directly to JMS queues triggering AIA JMS consumers.

The format of the requesting messages can either be native to Siebel or conform to the AIA Enterprise Business Objects (EBO).

If the format is native, Siebel Tools generates schemas for the Siebel Integration Objects and provides for creating AIA services.

For more information, see Integration Platform Technologies: Siebel Enterprise Application Integration.

19.3.2. Web Services with SOAP/HTTP

Siebel Tools (Siebel IDE) needs AIA service WSDLs. Siebel Tools introspects the WSDLs and generates proxies in order to invoke AIA services at runtime. Siebel Tools generates schemas for the Siebel Integration Objects, and these are used to develop AIA requester ABCS.

Perform the following tasks as part of the AIA Project Management Lifecycle for the Service Conception and Definition phase and the Service Design and Construction phase.

For more information about these AIA lifecycle phases, see Introduction to the Business Process Decomposition and Service Conception Phase and Introduction to the Service Design and Construction Phase.

Tasks for Solution Architects in Service Conception and Definition phase:

1. Identify the requester ABCS for Siebel application and add them to the AIA project definition.
2. For new services, work with business analysts to capture the requirements in detail.
3. For existing services, work with business analysts to capture details of changes to be carried out.
4. Engage with developers and drive the design of the services.
5. Finalize the format of the message.
6. Finalize the WSDL of the AIA requester ABCS.
7. Ensure the metadata of the service is captured in the Oracle Enterprise Repository.
8. Add the service to the deployment plan of the AIA project definition.

Tasks for Developers in Service Design and Construction phase:

1. Analyze the Siebel requester Application Business Service definition provided by the Solution Architect.
2. Engage with Siebel Application development and discuss the possible design.
3. Finalize the content of the message from Siebel.
4. Get the schema of the message from Siebel and ensure the following:

   a. TargetNameSpace - If higher than version 0, must have suffix V<N> where V is abbreviation for version and N is the version number. If there is no version number, it is considered to be version 0.Here is an example of version 1

```
<xsd:schema xmlns:xsd=http://www.w3.org/2001/XMLSchema
targetNamespace=" http://siebel.com/asi/V1"
xmlns:xsd=http://www.siebel.com/xml/SWICustomerPartyIO
```

   b. Custom Attributes - Following are required:

```
<xsd:attribute name="Language" type="xsd:string"/>
<xsd:attribute name="Locale" type="xsd:string"/>
<xsd:attribute name="MessageId" type="xsd:string"/>
<xsd:attribute name="EnterpriseServerName" type="xsd:string"/>
```

   Here is a sample:

```
<xsd:complexType name="ListOfSwicustomerpartyio">
   <xsd:sequence> <xsd:element name="Contact" type="xsdLocal:Contact"
minOccurs="0"  maxOccurs="unbounded"/></xsd:sequence>
      <xsd:attribute name="Language" type="xsd:string"/>
      <xsd:attribute name="Locale" type="xsd:string"/>
      <xsd:attribute name="MessageId" type="xsd:string"/>
```

```
        <xsd:attribute name="EnterpriseServerName" type="xsd:string"/
    </xsd:complexType>
```

5. Construct a requester ABCS using the AIA Service Constructor.
6. Provide the WSDL from this service to the Siebel Application development team.

19.3.3. Creating JMS Consumers to Consume Siebel Messages from JMS Queues/Topics

Siebel Tools generates schemas for the Siebel Integration Objects, and these are used to develop AIA requester ABCS.

Perform the following tasks as part of the AIA Project Management Lifecycle, for the Service Conception and Definition phase and the Service Design and Construction phase.

For more information about these AIA lifecycle phases, see Introduction to the Business Process Decomposition and Service Conception Phase and Introduction to the Service Design and Construction Phase.

Tasks for Solution Architects in Service Conception and Definition phase:

1. Analyze the message to be pushed by Siebel application.

   Since the Siebel application pushes the message using the Siebel Web Service framework, it is wrapped in the <SiebelMessage/> envelope. This needs to be stripped off in the JMS consumer.

2. Create the definition of JMS consumer solution component in the AIA Lifecycle Workbench and mark it as of suitable asset type.

Tasks for Developers in Service Design and Outline Construction phase:

1. Create a JMS Consumer Service Composite to be triggered by the message in the JMS queue and invoke the above ABCS.
2. Identify the name of the Queue.
3. Use the SOA Mediator component to create the adapter composite.
4. Annotate the composite.xml.

   For more information about annotations, see How to Annotate the Transport Adapter Composite.

5. Harvest to Oracle Enterprise Repository.

   For more information about harvesting AIA content to Oracle Enterprise Repository, see Harvesting Oracle AIA Content.

19.3.4. Outbound - Siebel Application Interaction with AIA Services

Siebel applications will accept requests from AIA services when an action or event in the Siebel application is part of business processes, business activities, or business tasks. AIA services can either invoke the Siebel application exposed Web services or push messages directly to JMS queues triggering Siebel JMS consumers.

The format of the accepting messages can either be native to Siebel or conform to the AIA Enterprise Business Objects (EBO). If the format is native, Siebel Tools generates WSDLs for the Siebel Web services and provides for consumption by AIA services.

19.3.5. Web Services with SOAP / HTTP

Siebel Tools (Siebel IDE) generates Web Service WSDLs that are used to develop AIA Provider ABCS.

Perform the following tasks as part of the AIA Project Management Lifecycle for the Service Design and Construction phase:

Tasks for Developers in Service Design and Construction phase:

1. Analyze the Siebel Provider ABCS definition provided by Solution Architect.
2. Engage with Siebel Application development and discuss the possible design of the needed Web services.
3. Finalize the content of the message to Siebel.
4. Get the WSDL of the Web Service and the accompanying schema from Siebel application team.
5. Put them in relevant folders in the MDS under AIAMetaData/ApplicationObjectLibrary.
6. Complete development of the Siebel provider ABCS.

19.3.5.1. Session Management

Siebel Web Service Framework supports Non/Stateless Session. In order to have a different session type, you need to add SessionType in SOAP Header.

Siebel Authentication and Session Management SOAP headers can be used to send and receive user credentials and session information. Username and password can be sent for login that invokes one of the following sessions:

- One that closes after the outbound response is sent.
- One that remains open after the response is sent.

Please go to these links for details:

- http://supportweb.siebel.com/support/private/content/Bookshelf/80Siebel/books/EAI2/EAI2_WebServices25.html
- http://supportweb.siebel.com/support/private/content/Bookshelf/80Siebel/books/PDF/EAI2.pdf, page 99
- http://supportweb.siebel.com/support/private/content/Bookshelf/80Siebel/books/EAI2/EAI2_WebServi

ces24.html

- http://globaldc.oracle.com/perl/twiki/view/AppIntegrationArchPIPDev/SessionPoolManager
- Use the "**Stateless**" type for session management. "Stateless" is the type you need to use to keep the Siebel session persistent.
- Siebel Web Service Framework Stateless Session is independent of the Web server.

Every response will have a new SessionToken that needs to be used in the next request.

19.4. Oracle E-Business Suite Application-Specific Connectivity Guidelines

The following sections discuss how you can establish inbound and outbound connectivity with Oracle E-Business Suite (E-Business Suite) applications.

19.4.1. Inbound: E-Business Suite Application Interaction with AIA Services

The E-Business Suite application will send requests to AIA services when E-Business Suite is a driving application initiating business processes, business activities, or business tasks. E-Business Suite can either invoke AIA services exposed as Web services with the help of concurrent program executable or raise business events to the AIA layer through JCA Adapter (Oracle Apps Adapter). JCA Adapter should be configured to subscribe for a particular business event.

The format of the requesting messages can either be native to E-Business Suite Application Business Message (ABM) or conform to the AIA Enterprise Business Message (EBM).

19.4.2. Concurrent Program Executable

E-Business Suite needs AIA service WSDLs. E-Business Suite should generate proxies and use them in the concurrent program executable in order to invoke AIA Services at runtime. E-Business Suite should generate the schemas (ABMs) which are used to define the contracts (WSDLs) between AIA and E-Business Suite which further would be used to develop AIA requester ABCS.

Perform the following tasks as part of the AIA Project Management Lifecycle for the Service Conception and Definition phase and the Service Design and Construction phase:

Tasks for Solution Architects in Service Conception and Definition phase:

1. Identify the requester ABCS for E-Business Suite and add them to the AIA project definition.
2. For new ABCS, work with business analysts to capture the requirements in detail.
3. For existing ABCS, work with business analysts to capture details of extensions to be carried out.
4. Engage with developers and drive the design of the ABCS.

5. Choose the right connectivity based on the E-Business Suite capability to communicate the required ABM to AIA based on the business requirements: Select Concurrent Program Executable or Business Event Subscription.
6. Finalize the format of the message (E-Business Suite ABM).
7. Finalize the contract between E-Business Suite and AIA, i.e., define the WSDL of the AIA requester ABCS.
8. Define and finalize the error/fault handling message format between E-Business Suite and AIA.
9. Define the error handling mechanism and the style of AIA errors to be displayed and logged for the E-Business Suite application user.
10. Finalize on the MEP between E-Business Suite and AIA.

    Follow best practices and design asynchronous patterns to avoid long running transactions.
11. Finalize on the type of acknowledgement for asynchronous operations.
12. Ensure the metadata of the service is captured in the Oracle Enterprise Repository.
13. Add the service to the deployment plan of the AIA project definition.

Tasks for Developers in Service Design and Construction phase:

1. Analyze the E-Business Suite requester ABS definition provided by solution architect.
2. Engage with E-Business Suite development and discuss the possible design.
3. Finalize the content of the message from E-Business Suite.
4. Get the schema of the message from E-Business Suite and ensure the following:
   - TargetNameSpace - If higher than version 0, must have suffix V<N> where V is abbreviation for version and N is the version number. If there is no version number, it is considered to be version 0.Here is an example of version 1

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://xmlns.oracle.com/ebiz/CurrencyExchange"
xmlns:db="http://xmlns.oracle.com/ebiz/CurrencyExchange"
elementFormDefault="qualified">

<xsd:schema xmlns:xsd=http://www.w3.org/2001/XMLSchema
targetNamespace="http://xmlns.oracle.com/pcbpel/adapter/db/top/CreatePayab
leInvoiceListEbizDBAdapterV1"
xmlns=http://xmlns.oracle.com/pcbpel/adapter/db/top/CreatePayableInvoiceLi
stEbizDBAdapterV1
```

5. Construct a requester ABCS using AIA Service Constructor.

   Provide the WSDL from this service to the E-Business Suite development team.

19.4.3. Business Event Subscription (JCA Connectivity using OAPPS Adapter)

Subscription for Enterprise Business Service (EBS) Workflow business events can be achieved by having the Business Event Adapter (OAPPS adapter) available in Oracle JDeveloper as a plug-in which can be used to invoke any service to raise a business event in E-Business Suite. A WF_BPEL_Q queue gets created as a subscription to the event and the adapter reads the events from the WF_BPEL_Q as and when a message arrives in the queue triggers the adapter service.

E-Business Suite should generate the schemas (ABMs) which are used to define the contracts (WSDLs) between AIA and E-Business Suite which then are used to develop AIA requester ABCS.

For some of the business objects, the ABMs generated have only event information. In such situations, the business object ID is extracted from the event information published and E-Business Suite is queried to get the whole object.

Perform the following tasks as part of the AIA Project Management Lifecycle for the Service Conception and Definition phase and the Service Design and Construction phase:

Tasks for Solution Architects in Service Conception and Definition phase:

1. Identify the requester ABCS for E-Business Suite and add them to the AIA project definition.
2. For new ABCS, work with business analysts to capture the requirements in detail.
3. For existing ABCS, work with business analysts to capture details of extensions to be carried out.
4. Engage with developers and drive the design of the ABCS.
    a. Choose the best connectivity based on the E-Business Suite capability to communicate the required ABM to AIA based on the business requirements: Select Concurrent Program Executable or Business Event Subscription.
    b. Finalize the format of the message (ABM).
    c. Finalize the contract between E-Business Suite and AIA. Define the WSDL of the AIA requester ABCS.
    d. Define and finalize the error/fault handling message format between E-Business Suite and AIA.
    e. Define the error handling mechanism and the style of AIA errors to be displayed/logged/alert mechanism to E-Business Suite user.
    f. Finalize on the MEP between E-Business Suite and AIA.
    g. Follow the best practices and design asynchronous patterns to avoid the long running transactions.
    h. Finalize on the type of acknowledgement for asynchronous operations.
5. Ensure the metadata of the service is captured in the Oracle Enterprise Repository.
6. Add the service to the deployment plan of the AIA project definition.

Tasks for Developers in Service Design and Construction phase:

1. Analyze the E-Business Suite requester ABCS definition provided by the solution architect.

2. Engage with E-Business Suite development and discuss the possible design.
3. Finalize the content of the message from E-Business Suite.
4. Get the schema of the message from E-Business Suite and ensure the following:

   TargetNameSpace - If higher than version 0, must have suffix V<N> where V is abbreviation for version and N is the version number. If there is no version number, it is considered to be version 0.Here is an example of version 1:

   ```
   <xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   targetNamespace="http://xmlns.oracle.com/ebiz/CurrencyExchange"
   xmlns:db="http://xmlns.oracle.com/ebiz/CurrencyExchange"
   elementFormDefault="qualified">

   <xsd:schema xmlns:xsd=http://www.w3.org/2001/XMLSchema
   targetNamespace="http://xmlns.oracle.com/pcbpel/adapter/db/top/CreatePayab
   leInvoiceListEbizDBAdapterV1"
   xmlns=http://xmlns.oracle.com/pcbpel/adapter/db/top/CreatePayableInvoiceLi
   stEbizDBAdapterV1
   ```

5. Construct a requester ABCS using AIA Service Constructor.
6. Provide the WSDL from this service to the E-Business Suite development team.
7. Create an E-Business Suite Adapter Service Composite to be triggered by the business event in E-Business Suite and invoke the JMS producer service.
8. Identify the connection factory name and the JNDI reference.
9. Identify the business event to be subscribed.
10. Identify the schema to be confirmed for the incoming message/business event.
11. Use the SOA Mediator component to create the adapter composite.
12. Identify the target queue name, connection factory name and the JNDI reference.
13. Annotate the composite.xml.

For more information about annotations, see How to Annotate the Transport Adapter Composite.

14. Harvest to Oracle Enterprise Repository.

For more information about harvesting AIA content to Oracle Enterprise Repository, see Harvesting Oracle AIA Content.

19.4.4. Outbound: Oracle E-Business Suite Application Interaction with AIA Services

The E-Business Suite application accepts requests from AIA services when AIA service, composite business process, or Enterprise Business Flow is initiating a request to E-Business Suite. AIA can invoke E-Business Suite in one of the following ways:

- A PL/SQL procedure or function can be invoked using database or Oracle Apps Adapter. These adapters are available as plug-ins in Oracle JDeveloper. Oracle Apps Adapter is a wrapper over DB Adapter where it sets the FND Apps context before invoking the PL/SQL procedure/function.
- Invoke a JAVA based Web Service exposed using Business Service Objects (BSO).In Oracle- E-Business Suite, there is no direct way to expose a JAVA API as a service hosted on Oracle- E-Business Suite application server. However, it is possible to expose OA Framework Application Modules as services using the Business Service Object feature provided by Oracle Applications tech-stack. These services come up in Integration Repository (IRep) and can be invoked as service from remote applications.

> **For more information** about BSO, see the *Oracle Application Framework Developer's Guide Release 12.1.1* available in My Oracle Support note ID 744832.1.

- Loading data into Interface tables and calling a concurrent program to process the data. AIA can populate data into EBS interface tables using DB/Apps adapter and then call a concurrent program or post-processing APIs using DB/Apps adapter to process this data.
- A DB adapter can be made to poll from Oracle- E-Business Suite tables to initiate integration services thereof. A DB adapter needs to be configured with the help of JDeveloper wizard by selecting the appropriate BusinessEvents/ API, JDeveloper will create .sql files, These SQL files need to be executed on Ebiz database for creating subscriptions to listen to the events.

The format of the outgoing messages should be in the native format to E-Business Application Business Message (ABM).

The development and design tasks are similar to the inbound connectivity as discussed above. The architect or designer should identify how the business functionality is exposed in E-Business and identify the available path from the four ways listed above to connect to E-Business. Based on the general guidelines for each transport, the architect or designer should decide which transport would be suitable for the given business requirement.

19.5. Design Guidelines

AIA services are leveraged to implement business tasks, business activities, and business processes.

These common design and development guidelines are applicable to all interactions using different resources and are applicable to both inbound and outbound interactions.

The following points should be considered depending on the type of pattern:

- Push event notifications without message
  - Event notification with guaranteed delivery requirement – leverage JCA Adapter, if available, otherwise use queues

  - Event notification for non-critical situations – use Web services

- Push Events with message
  - Request event soliciting information and waiting for information – leverage JCA Adapter, if available, or use Web services
  - Request event propagating state change – leverage JCA Adapter, if available, otherwise use queues

For more information about patterns, see Working with AIA Design Patterns.

20. Using Oracle Data Integrator for Bulk Processing

Bulk data processing is the processing of a batch of discrete records between participating applications. Oracle Application Integration Architecture (AIA) uses Oracle Data Integrator, a component of Oracle Fusion Middleware SOA Suite to perform bulk data integrations.

This chapter describes how to build projects and use Oracle Data Integrator for point-to-point integrations.

This chapter discusses the following topics:

For complete information about using Oracle Data Integrator, see *Oracle Data Integrator Reference Manual and Oracle Data Integrator User's Guide*.

20.1. Introduction to Design Patterns for AIA-Oracle Data Integrator Architecture

Because Oracle Data Integrator data transfer is always point-to-point, a prerequisite for using this architecture is that the source and target systems should be capable of processing batch loads of data. An integration project should not adopt Oracle Data Integrator as a solution if there is a limitation in the number of rows that can be processed either on the source side or on the target-side application. Oracle Data Integrator solution should not be used when either the source or target application is not capable of handling bulk data

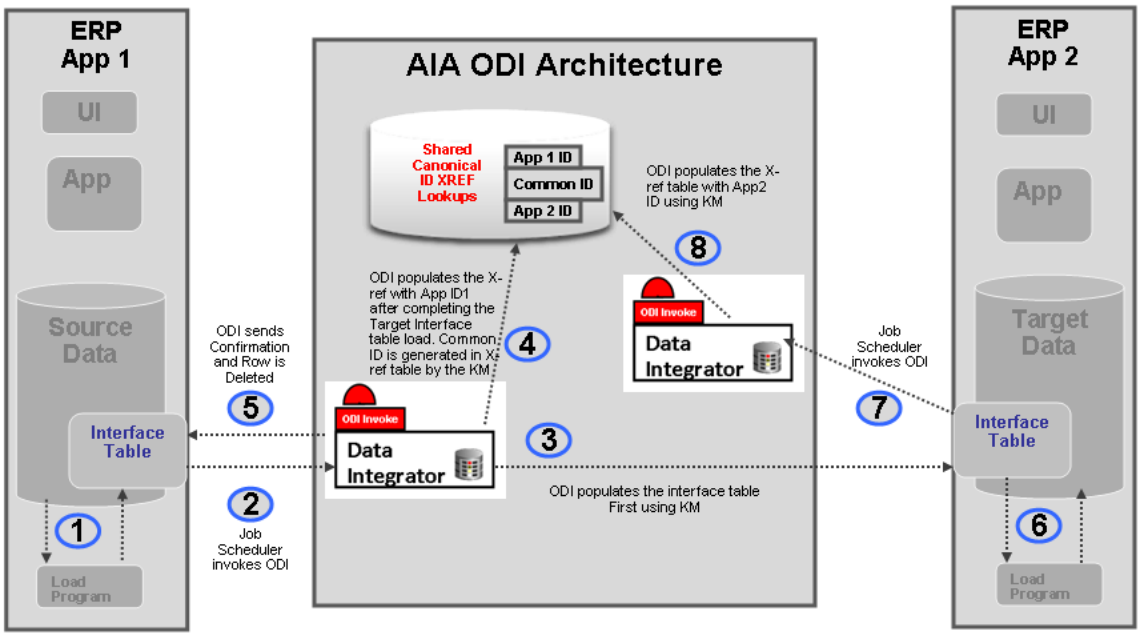
This section describes AIA-approved design patterns for using Oracle Data Integrator with AIA architecture. Design patterns approved by AIA are:

- Initial Data Loads
- High Volume Transactions with Xref table
- Intermittent High Volume Transactions

- High Volume Transactions without Xref.

20.1.1. Initial Data Loads

In this design pattern, the initial set of data of a particular object is loaded from the source database to the target database, for example, loading Customer Account information or loading Invoice information into a new application database from an existing source application database. In the process, Xref data may or may not get established per the integration requirement. The Oracle Data Integrator package that is developed for a specific integration cannot be reused for loading data onto another participating application.



Initial data loads

20.1.2. How to Perform the Oracle Data Integrator Data Load

To perform the Oracle Data Integrator Data load:

Note: The following sample steps illustrate how you could perform the initial data load from ERP Application 1 to ERP Application 2 as shown in the diagram.

1. The source application ERP APP1 populates the interface table using its native technology.

   Some applications can choose other strategies such as views or base tables as opposed to interface tables.

2. A job scheduler invokes the source side Oracle Data Integrator package.

3. Oracle Data Integrator then extracts the data from Source Interface table and populates the Target Interface table.

4. After populating the Target interface table, the implementer can choose to have Oracle Data Integrator populate the Xref table with ***App 1 ID*** and generate ***common ID***.

   This step is optional.

5. Oracle Data Integrator either deletes or updates the rows that were processed from the Source interface table to indicate the rows are processed.

6. On the target application ERP APP2, the native application extracts data from the target interface table and populates the target database, thereby generating ERP ***Application 2 ID***.

7. A job scheduler on the target application invokes the Oracle Data Integrator package to populate the ***Application 2 ID*** onto the Xref table matching on the ***Common ID***.

For more information about Oracle Data Integrator, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g Release 1*.

20.1.3. High Volume Transactions with Xref Table

Whenever a need exists for a high-volume data transfer, AIA recommends using Oracle Data Integrator solution for data transfer between applications. This is a point-to-point solution. In this approach, the Oracle Data Integrator package transfers data from source to target system on a regular basis.

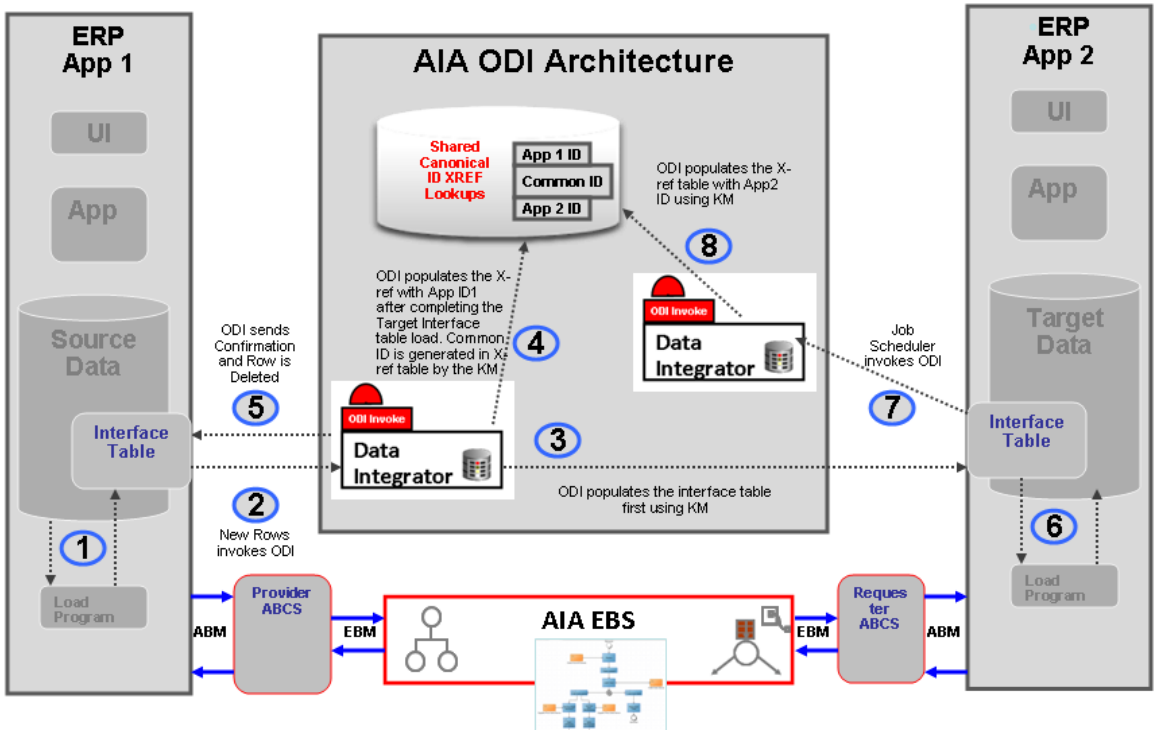
To load data, see How to Perform the Oracle Data Integrator Data Load.

AIA recommends that the interface tables on the source side have a mechanism to indicate processed rows.

20.1.4. Intermittent High Volume Transactions

If you have a requirement that batch loading co-exist with regular online transactions, AIA recommends the approach illustrated in the following diagram.

In this scenario, two different flows send data from the source to the target application, one using the AIA Oracle Data Integrator approach and the other using the standard AIA approach. Note that responsibility for ensuring data integrity lies with the participating application. AIA recommends that only the *new records* should be loaded using the AIA Oracle Data Integrator architecture approach.



Intermittent high-volume transactions

To send data from source to target using AIA-Oracle Data Integrator architecture, follow the steps in How to Perform the Oracle Data Integrator Data Load.

Create operations should be performed using the AIA Oracle Data Integrator approach while all other operations should be performed using the AIA.

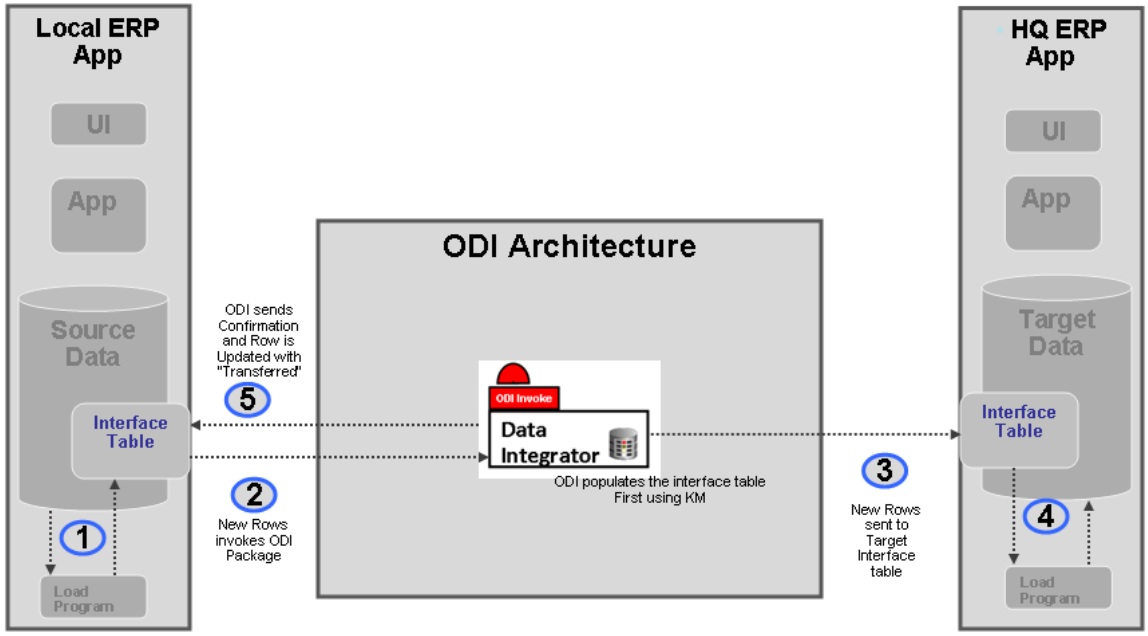
In this design pattern, do not use AIA Oracle Data Integrator approach as an alternate route to send data when Oracle Fusion Middleware is unavailable. Instead, such messages should be queued using an appropriate message queuing technology such as JMSQ and handled using guaranteed message technology recommended by AIA.

For more information about guaranteed messages, see Guaranteed Message Delivery.

20.1.5. High-Volume Transactions with Xref Table

For situations in which storing Xref data for high-volume transactions does not make sense, AIA recommends using point-to-point integration using Oracle Data Integrator.

An example use case is the headquarters of a retail store chain receiving data from individual retail stores every day at the end of business transaction. Every store in the US sends its business transaction data to HQ at the end of the day after the business closes. Depending on the time zone where the store is located, they start sending their day's worth of business transactions to HQ. In this scenario, no need exists to store Xref data between each individual local store with HQ because there will not be any DML operations on such data sets.



High-volume transactions

To load data, follow the steps in How to Perform the Oracle Data Integrator Data Load. No AIA component is in this architecture. Local ERP applications load their interface table and invoke an Oracle Data Integrator package to send data to the HQ Interface table. Once the data is processed, Oracle Data Integrator updates the local ERP application's Interface table with ***Transferred*** or ***Processed*** for each row.

20.2. Building Oracle Data Integrator Projects

The Bulk Data processing strategy for AIA using Oracle Data Integrator is about building point-to-point solutions, taking into account the need to set up data in the XREF, using DVM, and ensuring that the data processed can participate in AIA services at run time.

20.2.1. How to Build Oracle Data Integrator Projects

To build Oracle Data Integrator projects:

1. Define data servers.

   The source and target data server that is defined is a logical entity referring to the physical database schema chosen for bulk data processing.

   For each data server defined, link it to the physical data base schemas.

For more information, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g Release 1*.

2. Reverse engineer data servers.

   Reverse engineer the data server to generate the various models along with the data stores.

3. Define interfaces.

   For each of the data stores, create interfaces as required.

   In the process of creating interfaces, the mapping between the source and target fields will be specified.

4. Define packages.

   The packages are the steps in which the interfaces created are run along with some intermediate steps involving the XREF and also usage of DVM. If the package chooses to implement XREF, it must use a special integration knowledge module (IKM).

   The package also has steps to clean up the source tables if the implementer chooses to do so.

20.3. Using the XREF Knowledge Module

In Oracle Data Integrator, the creation of XREF data is a two-step process. Each step is an interface.

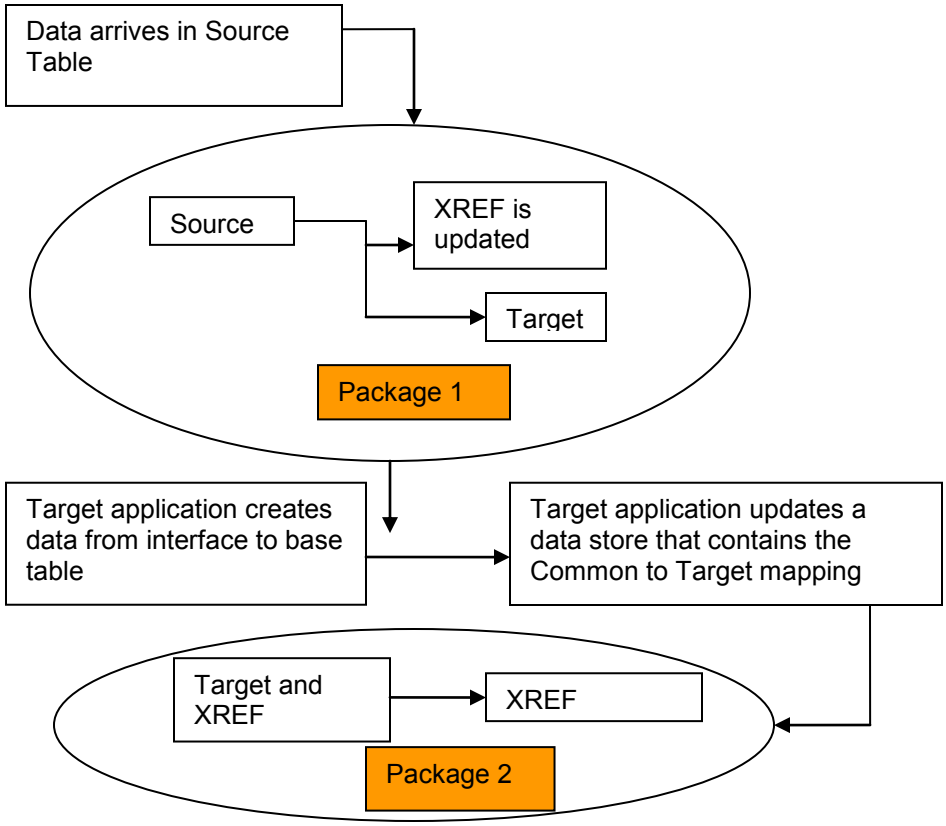
- In the first interface, the user's source table is the source in Oracle Data Integrator and the user's target table is the target in Oracle Data Integrator.

  While transporting data from source to target table, you create XREF data for the source and common rows. In this process, if you want to populate any column of the target with the COMMON identifier, the Oracle Data Integrator knowledge module takes care of that too.

Note: In case the target interface table doesn't contain the placeholder for common data, you may have to either populate the source identifier or ask the application to identify a placeholder for the common value for each source row.

- In the final step, after data is posted from the interface table to the base table, the target application needs to identify a data store where the mapping between target identifier and common (or source) identifier that you have sent during previous interface processing is available.

  A second interface must be run in which this data store is the source in Oracle Data Integrator and the XREF table is the target. This will create the appropriate target columns in the XREF table.



Using the XREF Knowledge Module

20.3.1. What You Need to Know About Cross-Referencing

Cross-referencing is an Oracle Fusion Middleware function, available through the Mediator component, and leveraged typically by any loosely coupled integration that is built on the Service Oriented Architecture principles. It is used to manage the run-time correlation between the various participating applications of the integration.

While loading data from source tables to a target table, you need to establish the cross-reference data in the SOA database just as it is done in the trickle feed architecture. This document assumes that the user of this document has basic knowledge of the cross-reference scheme in the SOA suite. While standard APIs are available in the SOA suite to populate the cross-reference tables, those APIs can't be used in Oracle Data Integrator because that may lead to row-by-row processing as opposed to set-based processing. The following sections describe how to load source table data to the target table and at the same time populate the cross-reference.

For more information about cross-referencing, see Using Cross-Referencing.

20.4. Working with Oracle Data Integrator

Before working with Oracle Data Integrator, complete these prerequisites:

1. Define the master and work repository.
2. Define all topology parameters.
   a. Physical architecture (for source, target, and XREF_DATA)
   b. Logical architecture
   c. Contexts
3. Define your data models.
4. Create a project.
5. Import the following Knowledge Modules in your project.
   a. KM_LKM SQL to SQL (Mediator XREF) or KM_LKM SQL to Oracle (Mediator XREF)
   b. CKM Oracle (delivered)
   c. KM_IKM SQL Control Append (Mediator XREF)

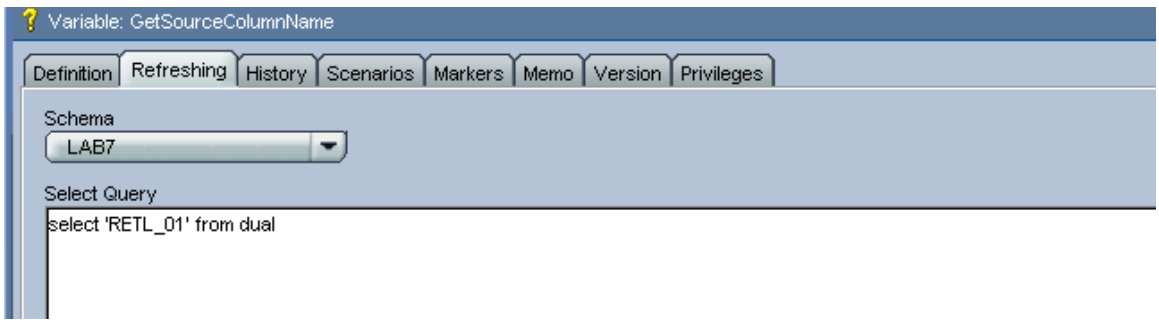
20.4.1. How to Define Variables (Source and Target Column Names)

Because XREF column names can't be hardcoded, two variables need to be defined to hold the source and target column names. Normally, these column names will be derived from the AIAConfiguration file. This document does not describe how to get that from the XML but rather it describes how to refresh this from a SQL select statement.

To define the source and target column names:

1. Create a variable GetSourceColumnName.

   This variable will be used to determine the column name of the XREF_DATA table. The refreshing tab will have the appropriate SQL to get the value from the source depending on the implementation.



Variable: GetSourceColumnName page

2. Create a variable GetTargetColumnName:

This variable will be used to determine the column name of the XREF_DATA table. The refreshing tab will have the appropriate SQL to get the value from the source depending on the implementation.

20.4.2. How to Create the First Interface (Source to Target)

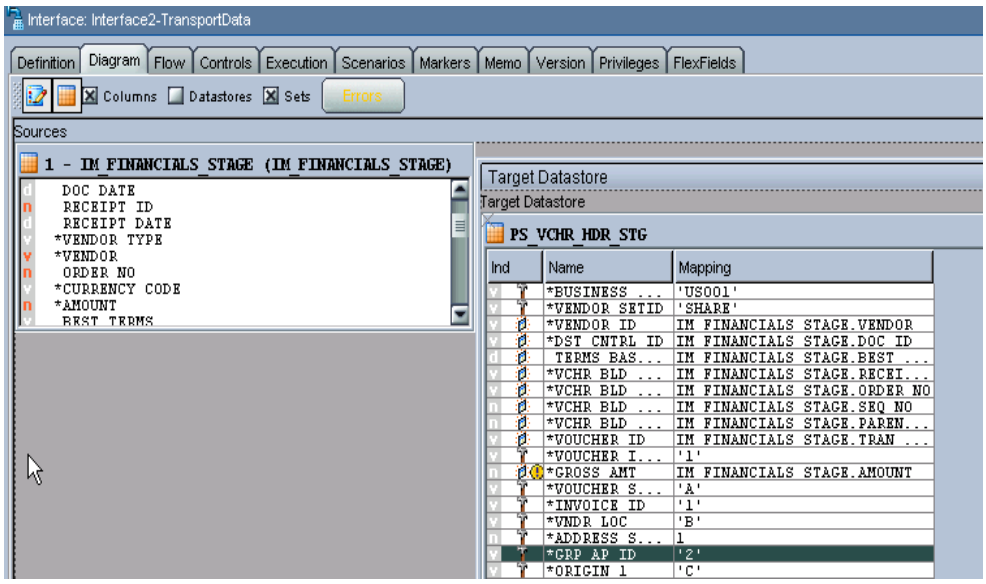
To create the first interface:

1. Create an interface.

   a. The source table in your data model should be dropped in sources (in this example, IM_FINANCIALS_STAGE)

   b. The target table (in this example, PS_VCHR_HDR_STG) in the target data store.

2. Provide mapping for each field.



Interface Diagram page

3. Go to the **Flow** tab.

4. Select ***LKM*** as the customized KM_LKM SQL to SQL (Mediator XREF).

   This has an option called SOURCE_PK_EXPRESSION. You need to pass the expression that will represent the source key value that you want to store in the XREF table in this option. If the source table has just one column defined as key, simply mention that column name (in this example SEQ_NO) for this option. If the source key has multiple columns, then use the expression to be used to derive the key value. For example, if two key columns are in the table and you want to store the concatenated value of those columns as your source value in XREF table, then put this expression, SEQ_NO|DOC_DATE, in the options value. This option is a mandatory one. If you are using update/delete along with XREF, then update the other options in the LKM. If you are not using update/delete, then just set the option SRC_UPDATE_DELETE_ACTION as None.

5. In the IKM, choose the customized knowledge module IKM SQL to SQL (Mediator Xref).

In this module you need to define these options:

Term	Description
XREF_TABLE_NAME	Name of your XREF table.
XREF_COLUMN_NAME	Name of the source column in the XREF table. Enter the variable name that you defined earlier (#GetSourceColumnName) in this option.
XREF_SYS_GUID_EXPRESSION	Whether you want to use GUID or a sequence for the common identifier. For GUID, use SYS_GUID. For sequence, use the sequence name in this option value.
XREF_ROWNUMBER_EXPRESSION	The value that goes into the ROWNUMBER column of the XREF_DATA table. Use the default value of GUID unless you need to change it to a sequence.

6. Choose CKM Oracle on the Controls tab when you check Knowledge Module.

   If you have no need to send the common value to the target table, then you can ignore this step.

   If the target table doesn't have any placeholder for the common identifier and you are planning to supply the *source* identifier in one of the target table columns, then you must use the standard mapping rules of Oracle Data Integrator to indicate what source identifier to populate in which column. This integration knowledge module wouldn't do any work for you in that case.

   If the target column that you want to hold the common identifier is a unique key of the target table, then you must put a dummy mapping on that column. This is due to an Oracle Data Integrator limitation; otherwise, the key will not be shown next time you open the interface. At run time, this dummy mapping will be overwritten with the generated common identifier by the integration knowledge module. Mark the UD1 column to indicate which target column the column value will go in.

7. Validate and save the interface.

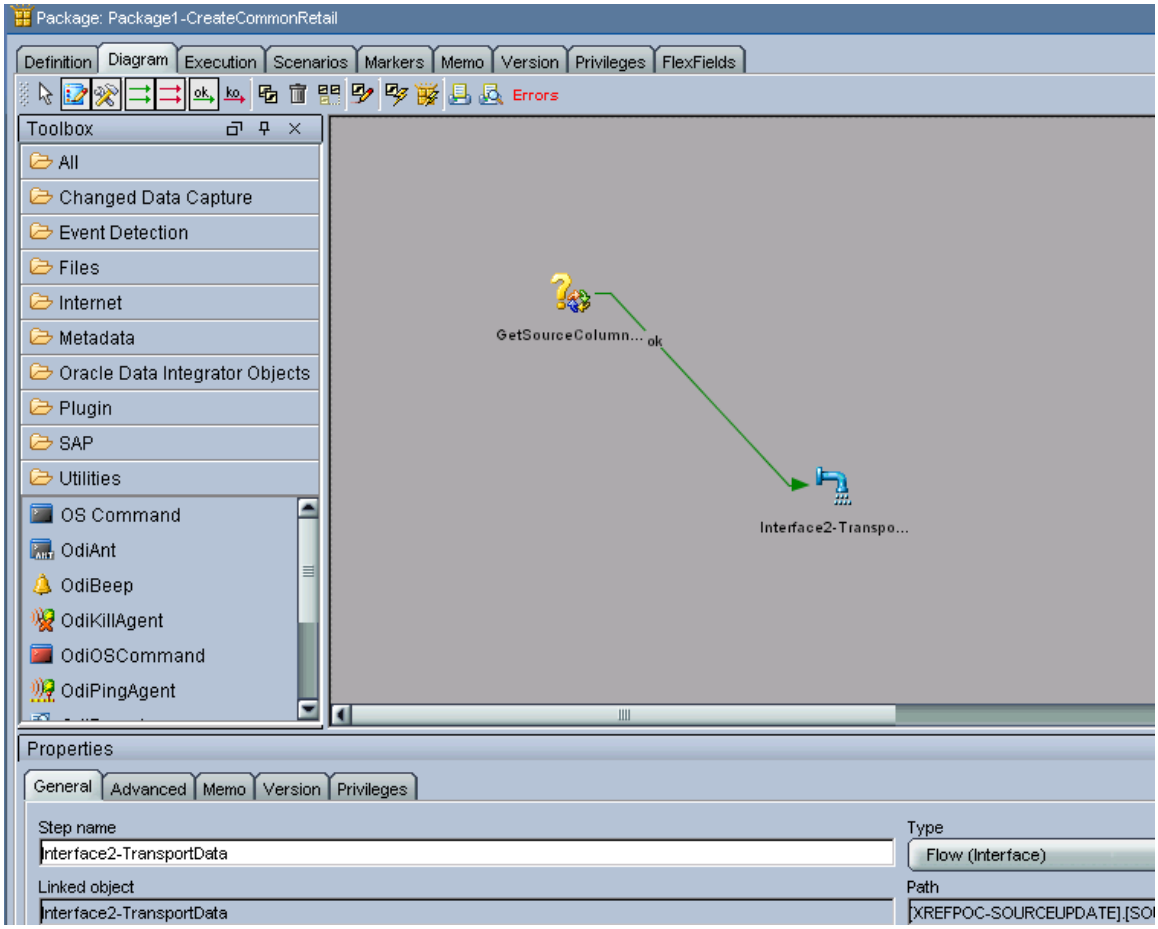
To create a package for the first interface:

1. Create a package to run the interfaces.

   This should contain at least two steps.

   a. Refresh the variable that holds the source column name.

   b. Run the interface.



Note: Every implementation will add its own error-handling steps in the package.

2. Validate and save the package.

3. Run the package.

   Most likely, this package will be run as soon as the data arrives in the source table. You can achieve this by using the Oracle Data Integrator changed data capture. How to run a package when the data arrives in a source table is described in the following sections.

20.4.3. How to Define the XREF View in SOA

To define the XREF view in SOA:

1. Create an XREF View in the XREF Database

```
  CREATE OR REPLACE FORCE VIEW "ORAESB"."INVOICE_XREF_VW" ("ROW_NUMBER",
"XREF_TABLE_NAME", "RETL_01", "COMMON", "PSFT_01") AS
  select row_number, XREF_TABLE_NAME,
  max(decode(XREF_COLUMN_NAME, 'RETL_01', VALUE,null)) RETL_01,
  max(decode(XREF_COLUMN_NAME, 'COMMON', VALUE,null)) COMMON,
  max(decode(XREF_COLUMN_NAME, 'PSFT_01', VALUE,null)) PSFT_01
```

```
  from XREF_DATA
GROUP BY row_number, XREF_TABLE_NAME;
```

Note: Construct this view for each implementation.

20.4.4. How to Create the Second Interface (update target identifier in XREF)

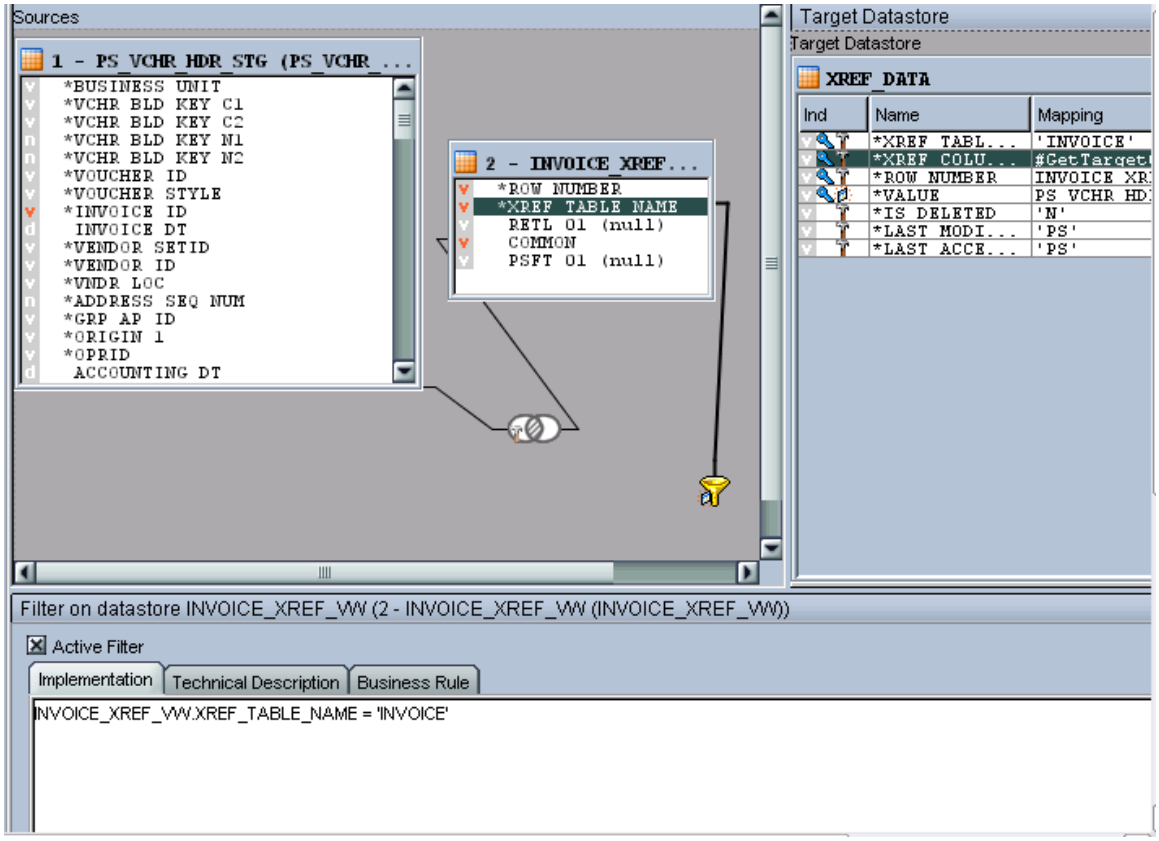
Once the data is moved to target base tables and the target identifier is created, it needs to get back to the XREF database corresponding to the source identifier to complete the loop. In the previous step, the common (or source) identifier was passed to the target system. Now the target system must provide a map between that common (or source) identifier and the target base identifier. This may come in the same interface table or it may come in a separate table. This mapping data store will be used in this interface in the source. This interface will be packaged and finally a separate process from target system will run that package.

To create the second interface:

1. Create an interface for data transport.

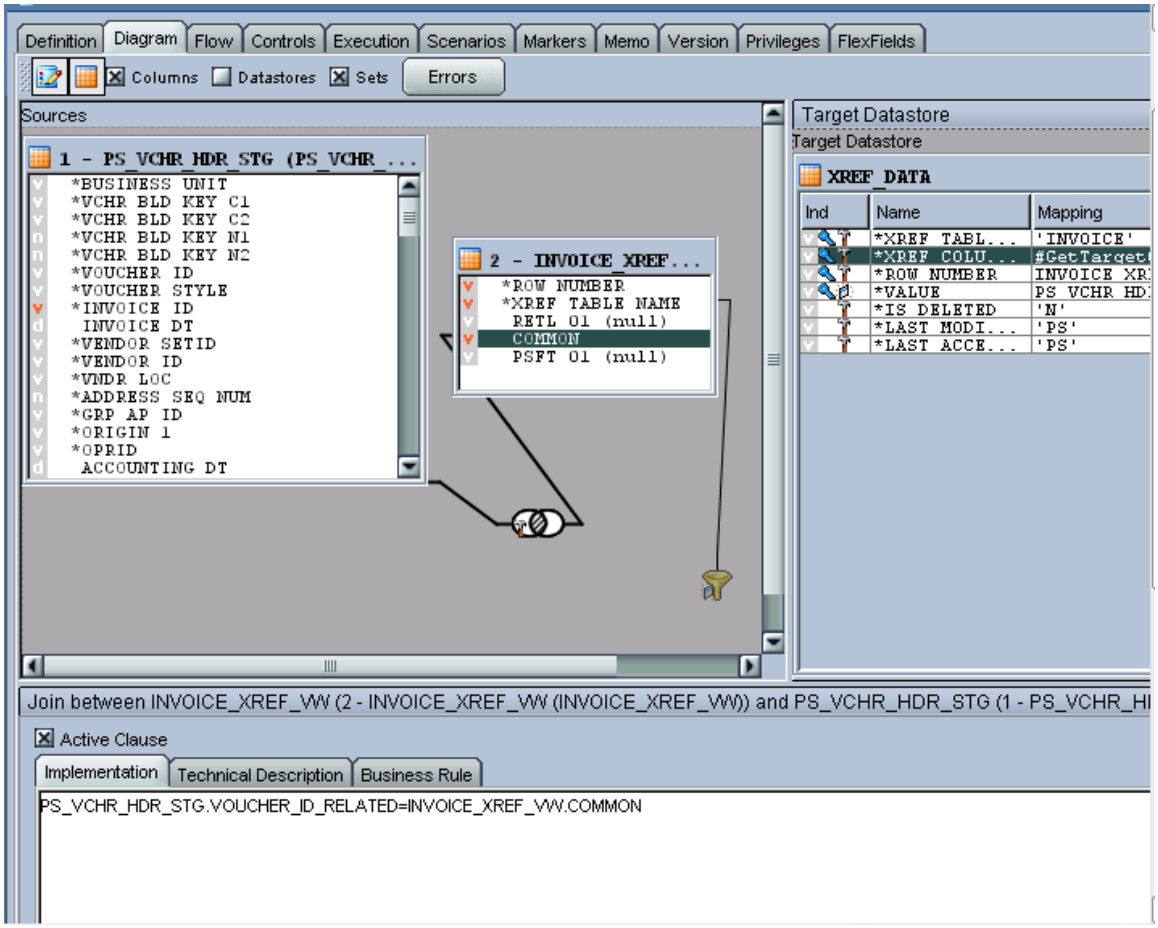
   In the sources section, drop the XREF_VW view and the mapping data store (in this example, the same interface table in PeopleSoft PS_VCHR_HDR_STG). In the target data section, select the XREF_DATA table.

2. Apply a filter for XREF_VW with a WHERE clause to filter data from your table name only, for example, XREF_VW.XREF_TABLE_NAME='INVOICE," if you are using this for INVOICE.

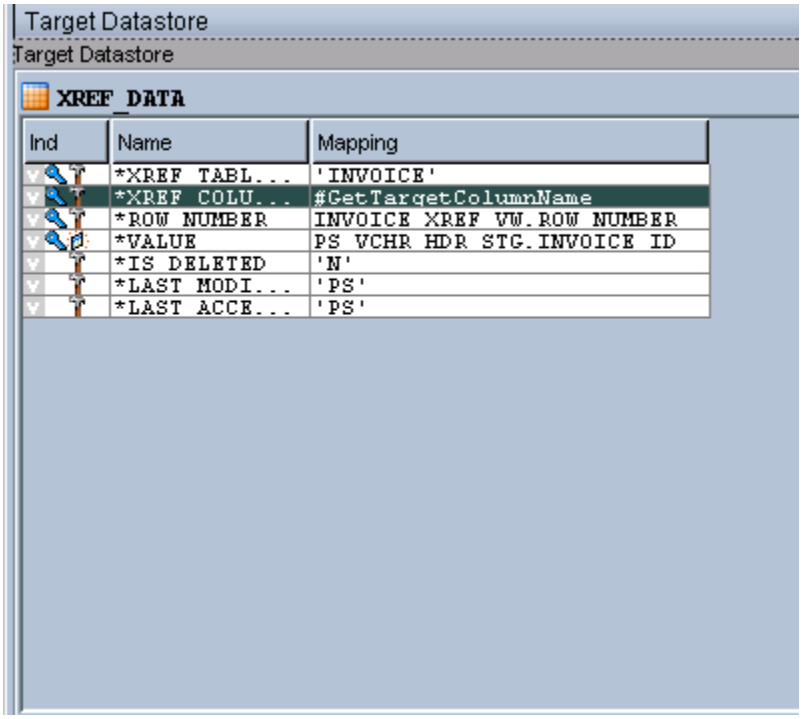


3. Join the mapping data store and XREF_VW with the columns that store the common (or source) identifier.

   In this example, the column of the PeopleSoft interface table that stores common data is ***VOUCHER_ID_RELATED***.



4. The XREF_TABLE_NAME map should be the XREF_TABLE name of the implementation.
5. XREF_COLUMN_NAME map should be ***#GetTargetColumnName*** (pointing to the variable that was created earlier).
6. Map ROW_NUMBER to the ROW_NUMBER of the XREF_VW.
7. The map for the VALUE field will be the column that stores the target identifier in the mapping data store (in this example, the INVOICE_ID column of the PS_VCHR_HDR_STG).
8. The map for IS_DELETED is set to ***N.***
9. The map for LAST_MODIFIED and LAST_ACCESSED will be different for each implementation.
10. Mark XREF_TABLE_NAME, XREF_COLUMN_NAME and VALUE as ***Key.***



11. On the flow tab, use the load knowledge module, ***LKM SQL to Oracle***.
12. Use the integration knowledge module, ***IKM Oracle incremental update.***
13. On the controls tab, use the check knowledge module, ***CKM Oracle.***
14. Validate and save the interface.

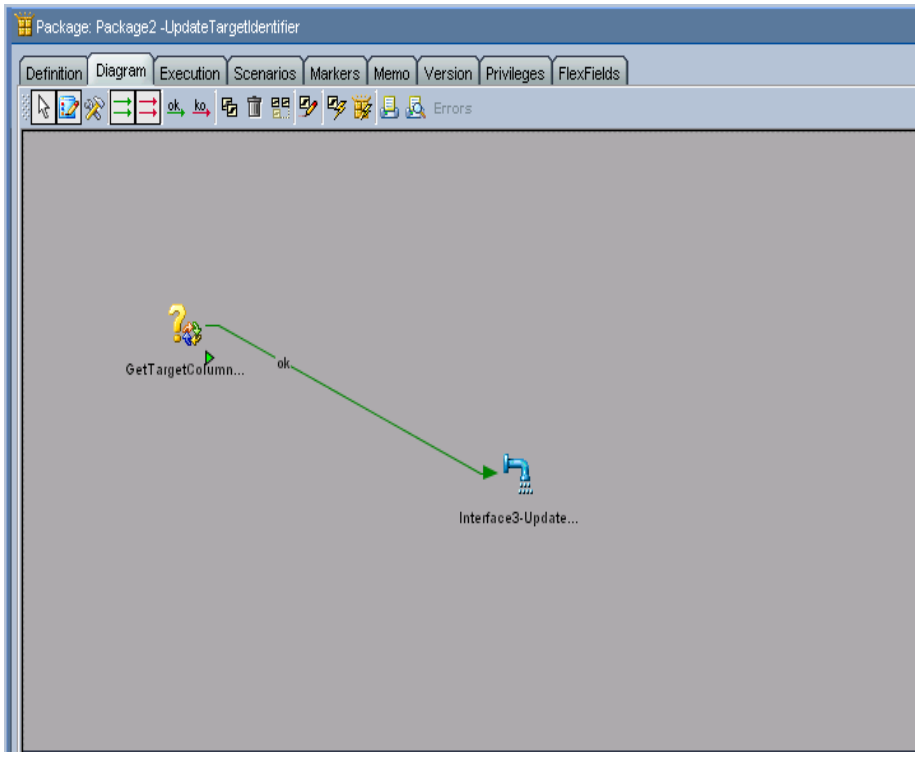
20.4.4.1. How to Create a Package for the Second Interface

To create a package for the second interface:

1. Create a package to run the interface.

   This should contain at least two steps:

   a. Refresh the variable that holds the target column name.
   b. Run the first interface.



Note: Every implementation will add its own error-handling steps in the package.

2. Validate and save the package.

3. Run the package.

   Most likely, this package will be run as soon as the data arrives in the target mapping data store. This can be achieved by using the Oracle Data Integrator changed data capture. How to run a package when the data arrives in a table will be described in a separate document.

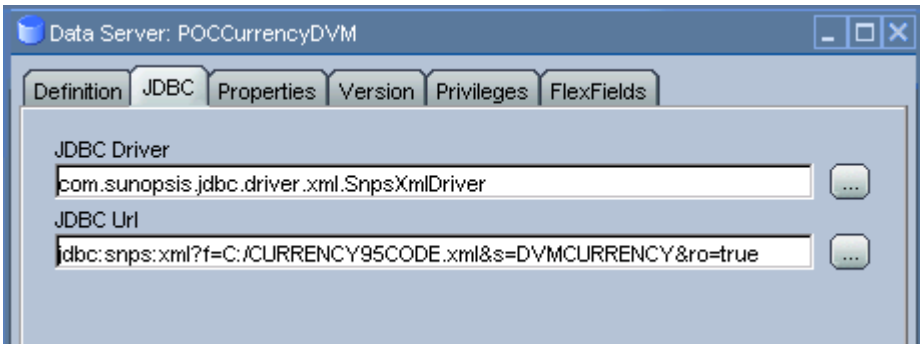
20.5. Working with Domain Value Maps

The Domain Value Maps (DVM) are available as XML files and can be used as delivered.

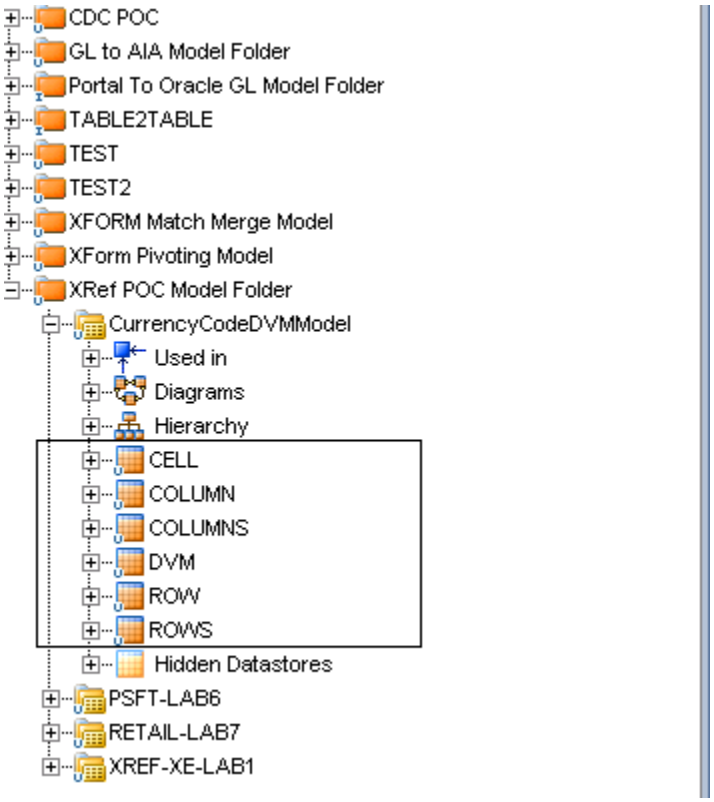
To use the DVM:

1. Reverse-engineer the DVM and it results into multiple relational tables.

   Here is how the DVM XML will be converted after reverse-engineering. We have used the XML itself in the JDBC description for the data server and not any schema for reverse engineering.

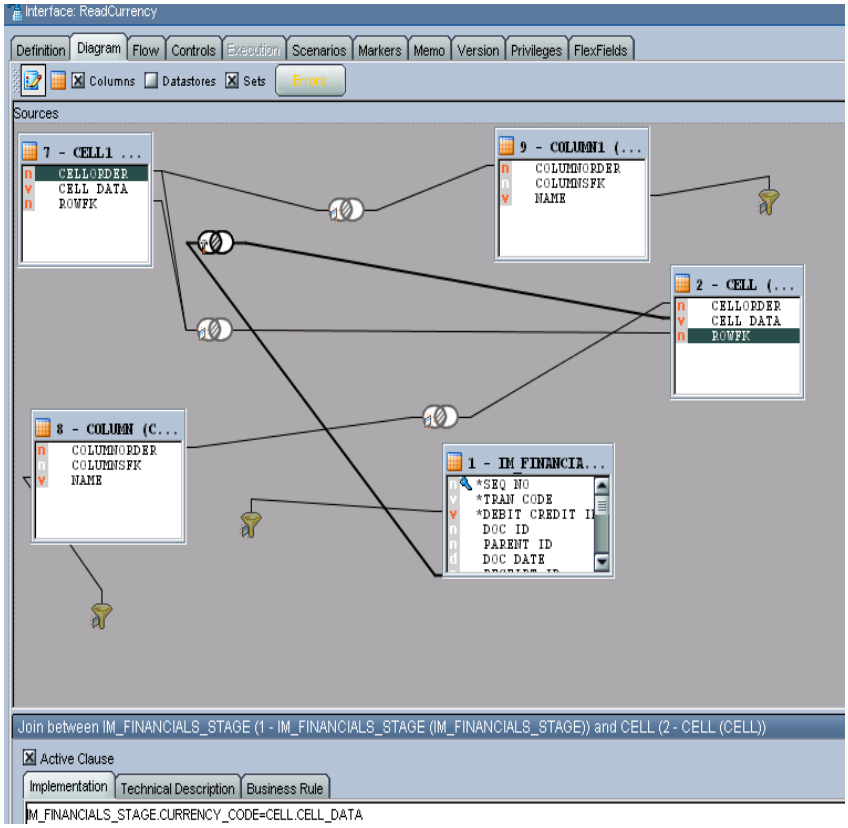


The DVM XML turns into six tables after the reverse–engineering, as shown in the following diagram.

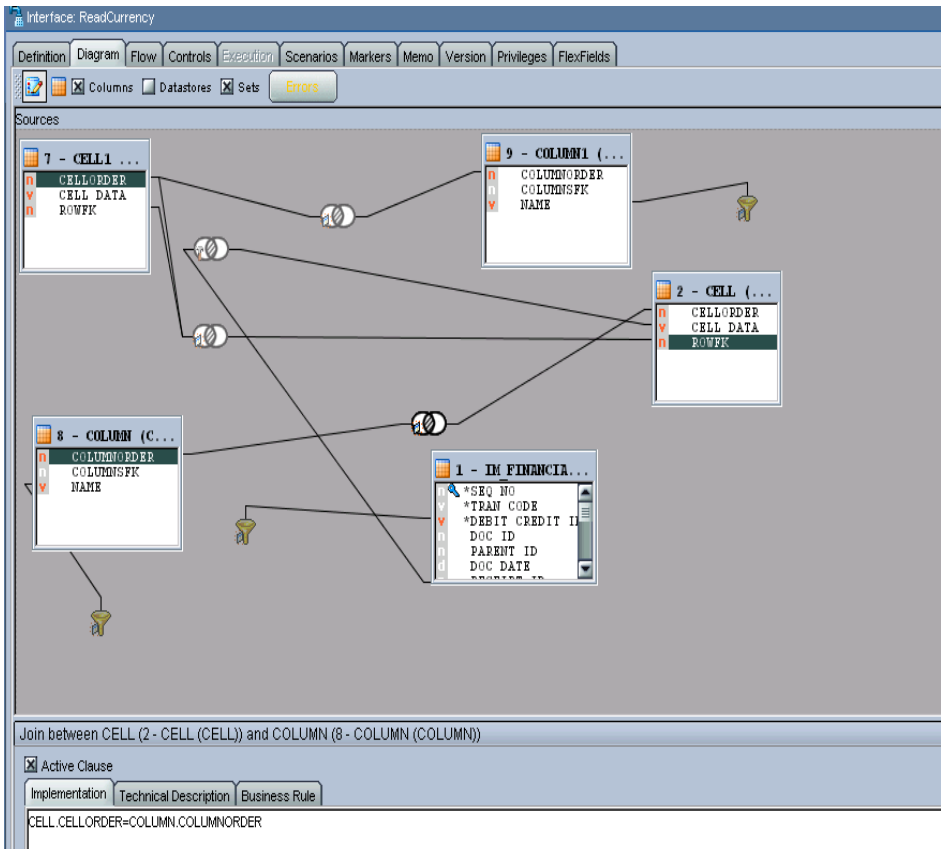


2. Join those multiple tables to derive the corresponding mapping in the interface.
3. Join IM_FINANCIALS_STGAE with the CELL table.

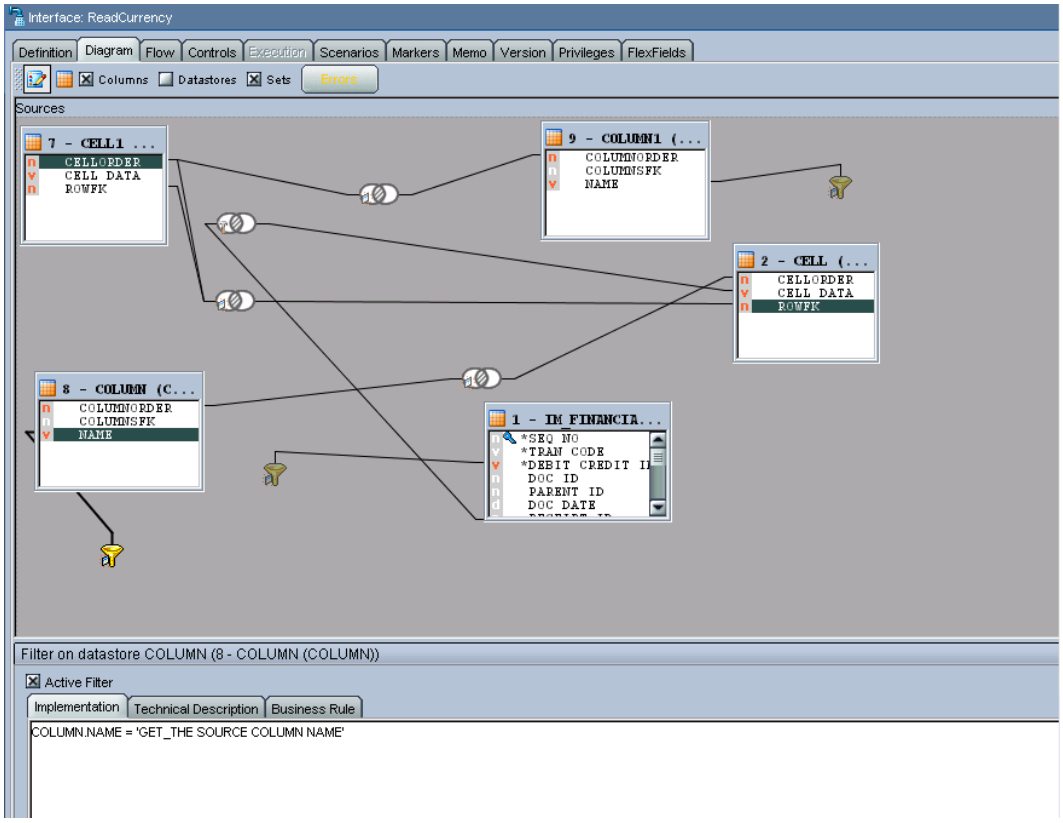
   Use the column in your main source table that you want for DVM in the join.



4. Join the CELL table with COLUMN table.

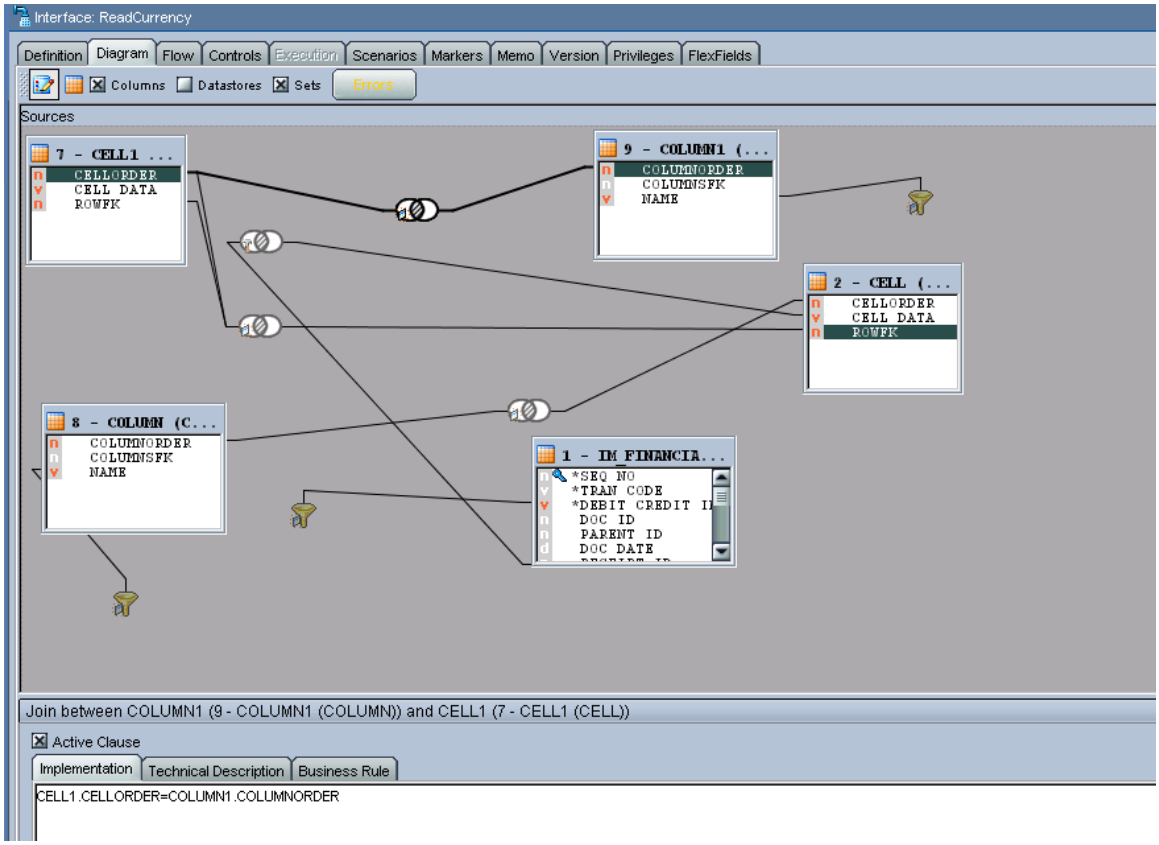


5. Add a filter for the COLUMN table (to determine the source column name). This filter can use a variable that holds the source column name.



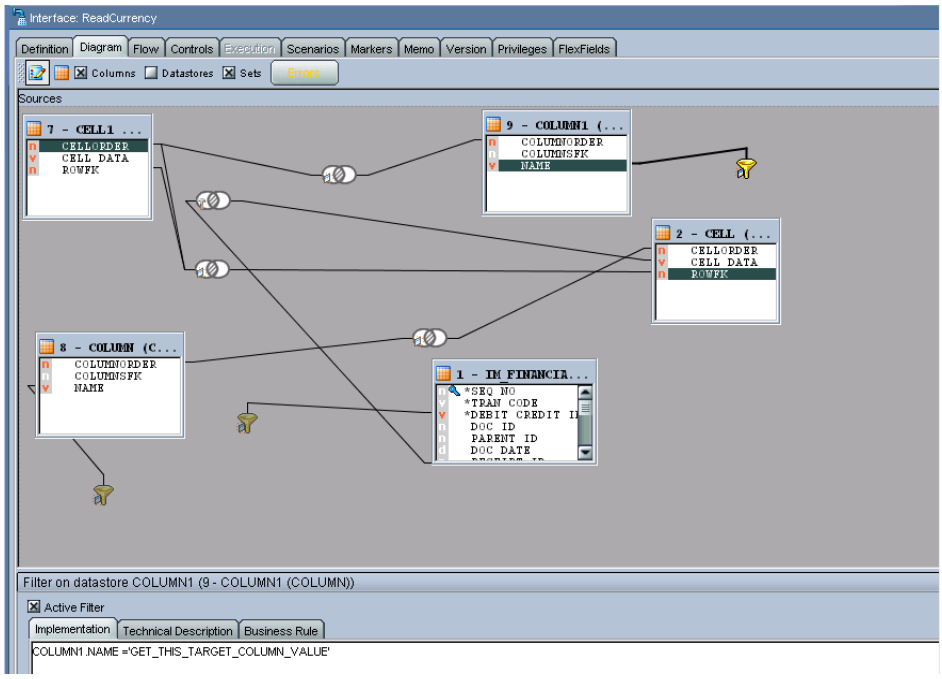
6. Drop the CELL table and COLUMN table once more in the interface. They can be renamed, but for now settle with CELL1 and COLUMN1. These duplicate sets will fetch the target values.

7. Join CELL1 with COLUMN1 table.

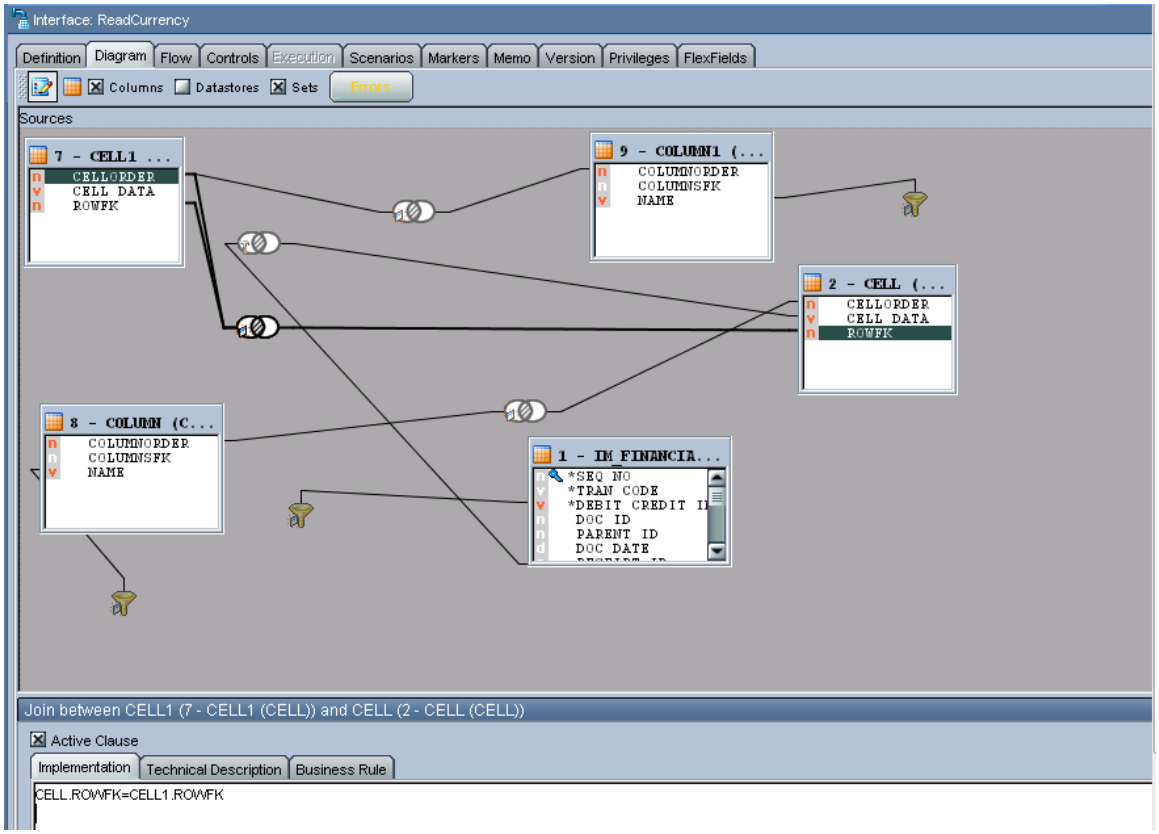


8. Add a filter on the COLUMN1 table (to determine the target column name).

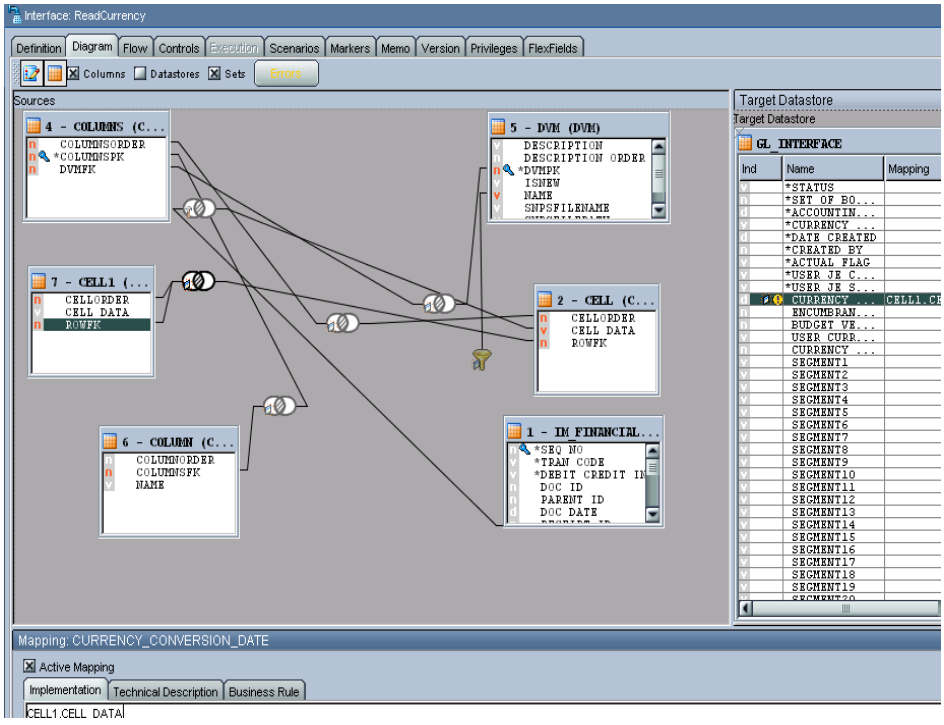
This filter can use a variable that holds the source column name.



9. Finally, self-join the CELL table with another CELL (CELL1) table.



10. Use this second CELL data (CELL1 table's data) in the target interface mapping.

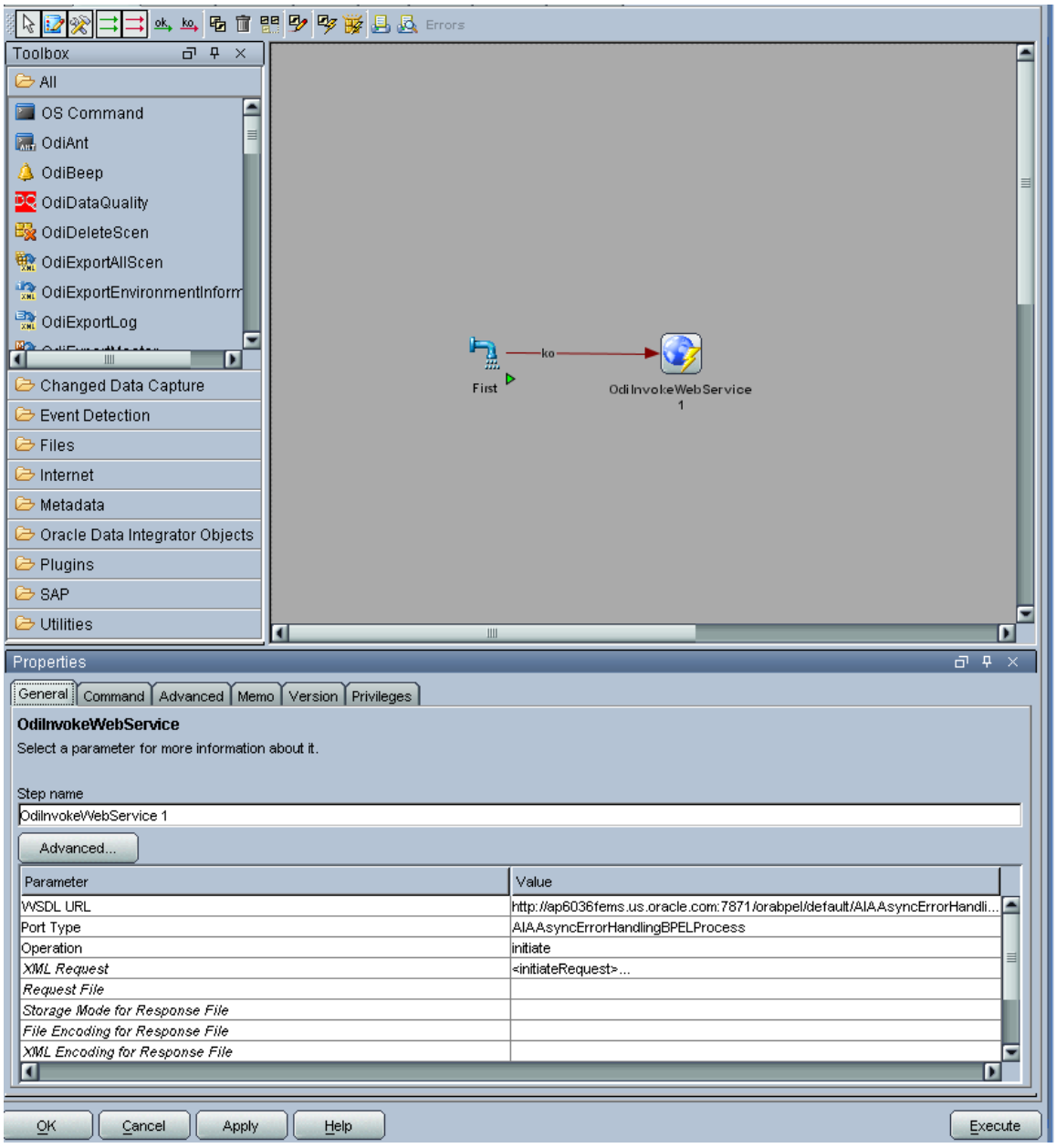


Note: You must repeat all joins for each DVM-centric column.

20.6. Using Error Handling

To use error handling for the Oracle Data Integrator flows:

1. In the following package, this is a sample interface that invokes the AIAAsyncErrorHandlingBPELProcess when it ends in error.



The XML Request Input for this process is:

```
<initiateRequest>
<Fault>
<EBMReference>
<EBMID/>
```

```
<EBMName/>
<EBOName/>
<VerbCode/>
<BusinessScopeReference>
<ID/>
<InstanceID>[End to End Process Name, Hard code, every developer must know
this process name]</InstanceID>
<EnterpriseServiceName/>
<EnterpriseServiceOperationName/>
</BusinessScopeReference>
<SenderReference>
<ID>[Sender Reference ID - Hard code the system id of the source
system]</ID>
<SenderMessageID/>
<TransactionCode/>
<ObjectCrossReference>
<SenderObjectIdentification>
<BusinessComponentID/>
<ID/>
<ContextID/>
<ApplicationObjectKey>
<ID/>
<ContextID/>
</ApplicationObjectKey>
<AlternateObjectKey>
<ID/>
<ContextID/>
</AlternateObjectKey>
</SenderObjectIdentification>
<EBOID/>
</ObjectCrossReference>
<Application>
<ID/>
<Version/>
</Application>
</SenderReference>
</EBMReference>
<FaultNotification>
<ReportingDateTime><%=odiRef.getPrevStepLog("BEGIN")%></ReportingDateTime>
<CorrectiveAction>[ODI doesn't have it, leave this element null]</
CorrectiveAction >
<FaultMessage>
<Code>[ODI Error return code to be passed here. Need to find the ODI
system variable to get the return code]</Code>
<Text><%=odiRef.getPrevStepLog("CONTEXT_NAME" )%>/<%=odiRef.getSession(
"SESS_NAME"
)%>/<%=odiRef.getPrevStepLog("STEP_NAME")%>:<![CDATA[<%=odiRef.getPrevStep
Log("MESSAGE")%>]]></Text>
<Severity>[ODI doesn't have it, hard code it to 1]</Severity>
<Stack/>
</FaultMessage>
<FaultingService>
<ID>[Hard code a meaningful name of the Process, e.g. CustomerInitialLoad
(this could be same as package name)] </ID>
<ImplementationCode>ODI</ImplementationCode>
<InstanceID><%=odiRef.getPrevStepLog("SESS_NO")%></InstanceID>
</FaultingService>
```

```
</FaultNotification>
</Fault>
</initiateRequest>
```

20.7. Oracle Data Integrator Ref Functions

Ref Function	Description
<%=odiRef.getPrevStepLog("BEGIN")%>	The date and time when the step that ended in error began
<%=odiRef.getPrevStepLog("MESSAGE")%>	The error message returned by the previous step, if any. It is a blank string if no error occurred.
<%=odiRef.getPrevStepLog("SESS_NO")%>	The number of the session
<%=odiRef.getPrevStepLog("CONTEXT_NAME")%>	The name of the context in which the step was performed.
<%=odiRef.getSession("SESS_NAME")%>	The name of the session.
<%=odiRef.getPrevStepLog("STEP_NAME")%>	The name of the step.

20.8. How to Publish the Package and Data Model as Web Service

To publish the package and data model as a Web service:

1. Install Axis2 as a standalone server.

   a. Set an environment variable JAVA_HOME to the path name of the directory in which you installed the JDK release.

   b. Download Apache Axis2 Version 1.2 and unpack the Axis2 Standard Binary Distribution into a convenient location so that the distribution resides in its own directory. Set an environment variable AXIS2_HOME to the path name of the extracted directory of Axis2 (for example, /opt/axis2-1.2).

   c. Start the Standalone Axis2 server by running the following command: $AXIS2_HOME\bin\axis2server.bat (Windows)

      After startup, the default web services that are included with Axis2 will be available by visiting http://localhost:8080/axis2/services/

   d. Download the axis2.war from http://ws.apache.org/axis2/download/1_2/download.cgi.

2. Deploy axis2.war on the OC4J Application Server.

   a. Deploy the axis2.war on the OC4J Application Server (Download) or OC4J Server of the SOA Suite can also be used. Go to http://<Host:port> and launch the application server that takes you to OC4J home. Click the application tab and then click the deploy tab. It asks you the location of the file. Browse and point to the Axis2.war file and then deploy.

b. Once the WAR is successfully deployed, test it by pointing the web browser to http://<host :port>/axis2. It should produce the following page, which is the Axis2 Web Application Home Page.

c. Click **Validate** to ensure that the procedure ended successfully.

3. Install the Oracle Data Integrator Public Web Services on Axis2.

In Axis2, go to the ***Administration*** page.

a. Select the ***Upload Service*** link.

b. Browse for the Oracle Data Integrator Web Services .aar file.

It is located in the /tools/web_services/ subdirectory in the

Oracle Data Integrator installation directory.

c. Click the ***Upload*** button.

Axis2 uploads the Oracle Data Integrator Web Services. You can now see Data Integrator Public Web Services in the Axis2 services list.

d. The services and the operations of successfully installed services will appear on the available services page (http://<Host>:<HTTP port>/axis2/services/listServices), where you can see OdiInvoke

4. Environment setup for Data Services

a. The database drivers (Download) must be installed in the appropriate directory.

ORACLE_HOME/j2ee/home/applib for OC4J.

b. Create the JDBC Datasource pointing to the data server that you want to access:

- Connect to OC4J administration interface.
- On the Administration tab, in Services | JDBC Resources, click Go to task.
- Click the Create button in the Connection Pools section.
- Select the Axis2 application, select New Connection Pool, then Continue.
- Fill in the fields for the JDBC datasource and click Finish.
- Click the Create button in the Data Sources section.
- Select the Axis2 application, select Managed Datasource, then Continue.

c. META-INF/context.xml and WEB-INF/web.xml is updated in the iAxis directories

Update application.xml in the given folder ORACLE_HOME\j2ee\home\applications\axis2\META-INF as follows:

<Context >

<Resource

name="***jdbc/TestDS***"

type="***javax.sql.DataSource***"

driverClassName="***oracle.jdbc.OracleDriver***"

url="***jdbc:oracle:thin:@abijayku-idc:1522:orcl1***"

username="***master***"

password="***master***"

maxIdle="***2***"

maxWait="***-1***"

maxActive="***4***"/>

</Context>

(Resource name will be reused in the web.xml file and in the Model in Designer.)

(driverClassName, url, username and password will explicitly point to the data source.)

Update the web.xml file with the resource name of the context.xml file (here res-ref-name) in the given folder ORACLE_HOME\j2ee\home\applications\axis2\axis2\WEB-INF as follows:

<resource-ref>

<description>Data Integrator Data Services on

Oracle_SRV1</description>

<res-ref-name>**jdbc/TestDS**</res-ref-name>

<res-type>javax.sql.DataSource</res-type>

<res-auth>Container</res-auth>

</resource-ref>

d. Set an environment variable ODI_JAVA_HOME to the path name of the directory into which you installed the JDK release.

5. Configure the topology.

a. In Topology Manager's Physical Architecture view, select the Axis2 technology. Right-click and select Insert Dataserver. If you are using a different Web Services container, then choose the appropriate technology instead.

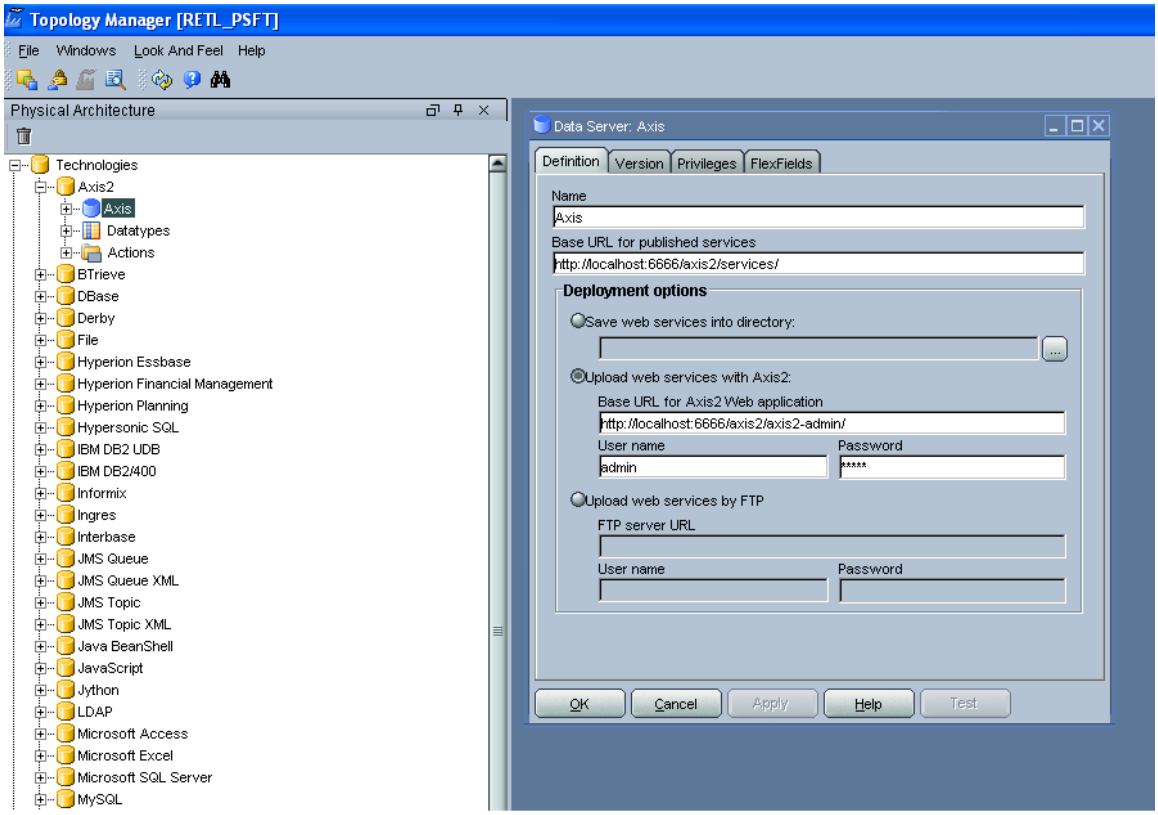
b. Complete the following fields on the Definition tab:

- Name: Name of the dataserver as it will appear in Oracle Data Integrator.
- Base URL for published services: http://<Host>:<HTTP port>/axis2/services
- Select the option corresponding to the chosen method of deployment.
- Web Service Upload: Specify the root URL for the Axis2 application, typically http://<Host>:<HTTP port>/axis2/axis2-admin/, as well as the user name(admin) and password(axis2) of the Axis2 administrator.

c. Click OK. A window opens to enable you to create a physical schema.

d. Go to the Context tab, and define one logical schema for each context in which you will deploy the Data Services.

e. Click OK.



6. Setting up Data Model to access the data of the table using web service.

   a. Open the model and go to the Services tab.

   b. On the Application Server tab, select the Web Services container that you set up earlier.

   c. Set the Namespace, which will be used in the generated WSDL

   d. Specify the Package name used to name the generated Java package that contains your Web Service. Generally, this is of the form com.<company name>.<project name>

   e. In the Datasource name field, copy and paste the name of the datasource that you defined for the server when setting up the datasources. (Provide the JNDI location of the data source.)

   f. Define the Data Service Name.

   g. Select a service knowledge module (SKM Oracle) from the list, and set its options.

   h. Go to the Deployed Datastores tab.

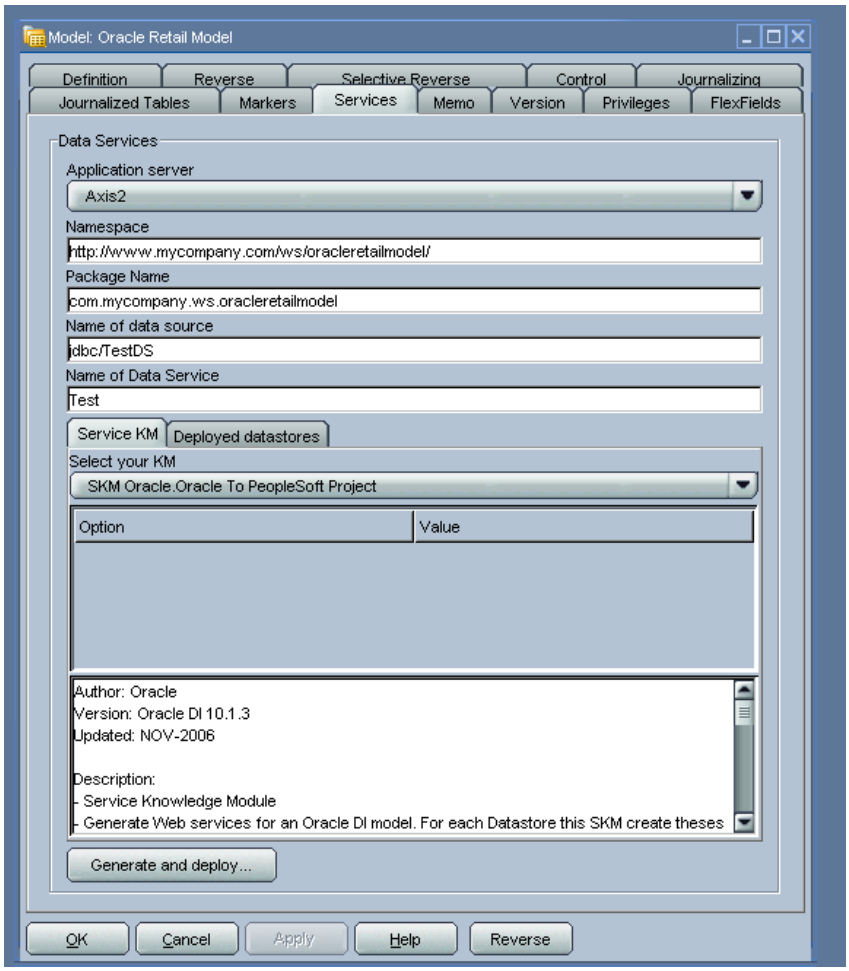
   i. Select every datastore that you want to expose as a Web Service. For each one, specify a Data Service Name and the name of the Published Entity.

   j. Click OK to save your changes.

   k. Click the generate and deploy tab to deploy it on the OC4J server.

   l. The deployed data store can be viewed at http://<Host>:<HTTP port>/axis2/services/listServices along with all the available operations.

   m. The generated data service can be tested using OdiInvokeWebService tool provided in the package.



Services – Data Services page

7. Run a scenario using a Web Service.

OdiInvoke web service is used to run a scenario using a web service. The wsdl is http://<Host>:<HTTP port>/axis2/services/OdiInvoke?wsdl. The port to use is called invokeScenario.

This web service commands an agent to connect a given work repository and to start a specific scenario. Parameters are similar to the ones used when running a scenario from an OS command. A sample SOAP request for this web service is provided here.

```
<invokeScenarioRequest>
<invokeScenarioRequest>
<RepositoryConnection>
<JdbcDriver>oracle.jdbc.driver.OracleDriver</JdbcDriver>
<JdbcUrl>jdbc:oracle:thin:@sbijayku-idc:1522:orcl1</JdbcUrl>
<JdbcUser>MASTER_FINPROJ</JdbcUser>
<JdbcPassword>master</JdbcPassword>
<OdiUser>SUPERVISOR</OdiUser>
<OdiPassword>SUNOPSIS</OdiPassword>
<WorkRepository>WORK</WorkRepository>
</RepositoryConnection>
<Command>
<ScenName>ABC</ScenName>
<ScenVersion>001</ScenVersion>
```

```
<Context>RETL_TO_PSFT</Context>
<LogLevel>5</LogLevel>
<SyncMode>1</SyncMode>
</Command>
<Agent>
<Host>sbijayku-idc</Host>
<Port>20910</Port>
</Agent>
</invokeScenarioRequest>
</invokeScenarioRequest>
```

The scenario execution returns a SOAP response as shown here:

```
<odi:invokeScenarioResponse xmlns:odi="xmlns.oracle.com/odi/OdiInvoke">
<odi:CommandResultType>
<odi:Ok>true</odi:Ok>
<odi:SessionNumber>1148001</odi:SessionNumber>
</odi:CommandResultType>
</odi:invokeScenarioResponse>
```

21. Working with Message Transformations

This chapter describes how to create transformation maps, work with domain value maps (DVMs) and cross-references, and populate Enterprise Business Message (EBM) headers.

This chapter discusses the following topics:

21.1. Introduction to Transformation Maps

Use transformation maps when the document expected by a source or target application varies from the document generated by a source or target application in terms of data shape and semantics. Transformation maps resolve these structural and semantic differences.

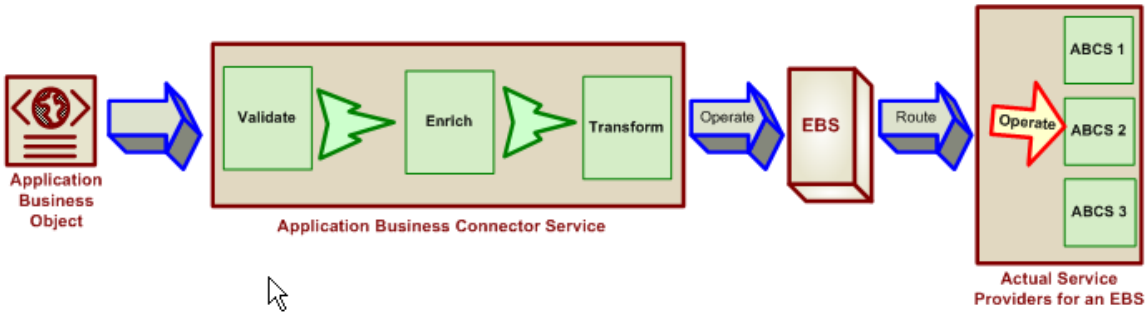
21.1.1. Connecting Applications to Implement Business Processes

Application Integration Architecture (AIA) leverages canonical patterns as well as direct patterns to connect applications for implementing business processes.

21.1.1.1. Canonical Patterns

Oracle Application Integration Architecture introduces a set of generic data structures called Enterprise Business Objects (EBOs). An EBO represents a common object definition for business concepts such as Account, Sales Order, Item and so on. The business integration processes work only on messages that are either a complete EBO or a subset of an EBO. This approach allows the cross-industry application processes to be independent of participating applications. EBOs contain components that satisfy the requirements of business objects from the target application data models. Transformations map the application business specific message to the Enterprise Business Message which is AIA canonical data model.

The following diagram illustrates how a canonical pattern is implemented in AIA:



Implementing a canonical pattern in AIA

21.1.1.2. X.1.1.2 When to Use Direct Integrations

When data integration involves either a large batch of records, or very large data, you can choose to implement a direct integration specializing on the movement of data with high performance with a trade-off of reusability. Direct integrations can encompass bulk processing as well as trickle feeds which focus only on implementation decoupling and not data decoupling.

For bulk processing, the ETL tool is used and transformations are done at the data layer using the tool. Although application agnostic objects are not used in trickle feed implementations, the requester application still needs to transform the content that is produced into the data shape expected by the provider application.

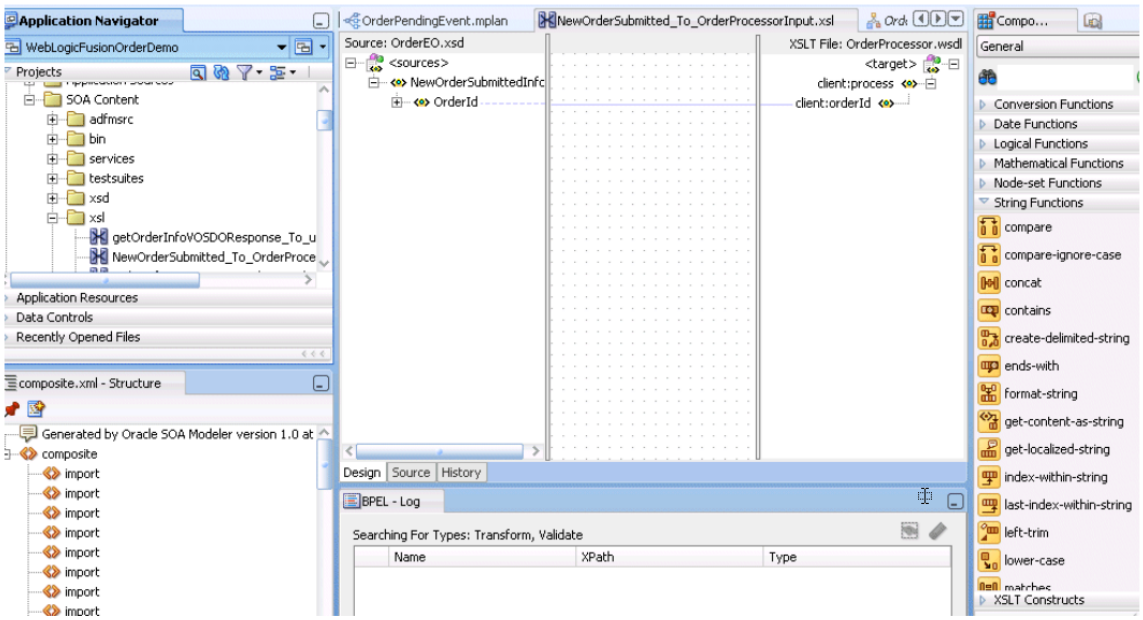
For more information, see Using Oracle Data Integrator for Bulk Processing.

21.1.2. Using Tools and Technologies to Perform Message Transformations

AIA recommends the use of XSLT vocabulary for constructing the transformation maps.

The XSLT Mapper in JDeveloper allows you to create data transformations between source schema elements and target schema elements within the context of services developed using either Oracle BPEL Process Manager or Oracle Mediator.

You will use the XSLT Mapper transformation tool to create the contents of a map file. The following diagram shows the layout of the XSLT Mapper:



Layout of the XSLT Mapper

For more information about the XSLT Mapper, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g* "Creating Transformations with the XSLT Mapper."

21.2. Creating Transformation Maps

One of the steps in configuring the integration objects for your integration process is to map the components and fields in your internal integration object to the message elements in the external integration object. You will use these maps to move the data from one integration object to another.

21.2.1. Considerations for Creating Transformation Maps

When creating transformation maps, review the following guidelines:

- Don't make unnecessary or redundant AIAConfigurationProperties.xml lookup calls.

  Retrieve static configuration properties once in the very beginning of transformation.

  To externalize configuration for deployment time using AIAConfigurationProperties.xml, please refer to section "Working with AIAConfigurationProperties.xml in $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData" in Building AIA Integration Flows.

- Ensure that your design does not include infinite loops.
- Develop transformation maps for each component.

  You should build reusable component-specific transformation maps that can be used across applications.

- Create transformation templates for every custom element.
- Keep the transformation maps clutter free.
- Use domain value maps only for static lookups, not for storing configuration or setup data. This code illustrates the domain value map lookup call to fetch Currency Codes. The domain value maps should be used only for the static lookup calls such as Currency Codes, Location Codes, and so on.

```
<corecom:PreferredFunctionalCurrencyCode>

<xsl:value-of
select="dvm:lookupValue('oramds:/apps/AIAMetaData/dvm/CURRENCY_CODE.dvm',$
SenderSystemId,/xsdLocal:ListOfCmuAccsyncAccountIo/xsdLocal:Account/xsdLoc
al:CurrencyCode,$TargetSystemId,'')"/>

</corecom:PreferredFunctionalCurrencyCode>
```

21.2.2. Handling Missing or Empty Elements

Transformation logic and xpath should be designed with the possibility of missing or empty elements. Here is the code sample:

```
<xsl:iftest="normalize-
space="/xsdLocal:ListOfCmuAccsyncAccountIo/xsdLocal:Account/xsdLocal:Accou
ntId/text() )">
<corecom:ApplicationObjectKey>
     <corecom:ID>
          <xsl:value-of
select="/xsdLocal:ListOfCmuAccsyncAccountIo/xsdLocal:Account/xsdLocal:Acco
untId"/>
     </corecom:ID>
</corecom:ApplicationObjectKey>
  </xsl:if>
```

In the above code, an *if* condition exists to check the empty elements. You should adopt such transformation logic to avoid transporting empty elements across the wire.

21.2.3. How to Map an Optional Source Node to an Optional Target Node

When mapping an optional source node to an optional target node, you should surround the mapping with an ***xsl:if*** statement that tests for the existence of the source node. If you do not do this and the source node does not exist in the input document, then an empty node is created in the target document.

Statement Without xsl:If:

```
          <portal:PHONE>
             <xsl:value-of
select="corecom:Contact/corecom:ContactPhoneCommunication[1]/corecom:Phone
Communication/corecom: WorkContactNumber"/>
           </portal:PHONE>
```

If the "PHONE" field is optional in both the source and target and the "WorkContactNumber" does not exist in the source document, then an empty "PHONE" element is created in the target document. To

avoid this situation, add an ***if*** statement to test for the existence of the source node before the target node is created, as shown below:

Statement With xsl:If:

```
<xsl:if
test="corecom:Contact/corecom:ContactPhoneCommunication[1]/corecom:PhoneCo
mmunication/corecom:WorkContactNumber">
        <portal:PHONE>
            <xsl:value-of
select="corecom:Contact/corecom:ContactPhoneCommunication[1]/corecom:Phone
Communication/corecom:WorkContactNumber"/>
         </portal:PHONE>
  </xsl:if>
```

21.2.4. How to Load System IDs Dynamically

ABCS and XSL scripts should not be hard-coded to work against one specific logical application instance. No hard-coded system IDs should exist in XSL Scripts and ABCS. The recommended approach is to load the system IDs dynamically.

Sample code showing hard-coded system IDs - not recommended:

```
<corecom:PreferredFunctionalCurrencyCode>
              <xsl:value-of
select="dvm:lookupValue('oramds:/apps/AIAMetaData/dvm/CURRENCY_CODES.dvm',
'SEBL_01',/xsdLocal:ListOfCmuAccsyncAccountIo/xsdLocal:Account/xsdLocal:Cu
rrencyCode,'COMMON','")"/>
</corecom:PreferredFunctionalCurrencyCode>
```

Sample code showing use of variables instead of hard-coded system IDs – recommended:

```
<corecom:PreferredFunctionalCurrencyCode>
              <xsl:value-of
select="dvm:lookupValue('oramds:/apps/AIAMetaData/dvm/CURRENCY_CODES.dvm',
$SenderSystemId,/xsdLocal:ListOfCmuAccsyncAccountIo/xsdLocal:Account/xsdLo
cal:CurrencyCode,$TargetSystemId'")"/>
</corecom:PreferredFunctionalCurrencyCode>
```

21.2.5. Using XSLT Transformations on Large Payloads

(For BPEL and Mediator) Oracle recommends that you not apply the XSLT Transformation on large payloads as it will result in out-of-memory errors when XSLT must traverse the entire document.

21.2.6. When to Populate the LanguageCode Attribute

Every EBM should populate the *languagecode* element, which specifies the locale in which the request has to be sent. Language sensitive data elements need to have the *languageCode* attribute populated if it is different from the one set at EBM root element. The *languageCode* specified in the *DataArea* takes precedence.

21.2.7. How to Name Transformations

Place each transformation type in a separate core XSL file.

The file name should follow this convention:

```
<Source Schema Type>_to_<Destination Schema Type>.xsl
```

Example: CreateOrderEBM_to_CreateOrderSiebelABO.xsl

21.3. Making Transformation Maps Extension Aware

Every component in the Enterprise Business Message (EBM), including the EBM header, contains a custom area that can be configured to add the necessary elements. You should develop the core transformation XSL file to provide extension capabilities using the following guidelines.

For more information about the EBM header, see Introducing EBM Header Concepts.

21.3.1. How to Make Transformation Maps Extension Aware

To make transformation maps extension aware:

1. Create an extension XSL file for every transformation.

   An example of a core transformation XSL file:

   PurchaseOrder_to_PurchaseOrder.xsl

   Every core XSL file name will have one extension XSL file, for example:

   PurchaseOrder_to_PurchaseOrder_Custom.xsl.

2. Define empty named templates in the extension file for every component in the message.
3. Include the extension file in the core transformation file.
4. Add call-template for each component in core transformation.
5. Enable the transformation to accommodate transformations for custom element.

```
<!—XSL template to transform Address-->
<xsl: template name=”Core_AddressTemplate”>
<xsl:param name = “context” select =”.”/>
<xsl:param name = “contextType” select =”’CORE’”/>
<address1><xsl:value-of select=”$context/address1”><address1>
<address2><xsl:value-of select=”$context/address1”></address2>
<city><xsl:value-of select=”$context/city”></city>
<state><xsl:value-of select=”$context/state”></state>
<zip><xsl:value-of select=”$context/zip”></zip>
```

```
   <xsl:if test="$contextType!='CORE'">
<xsl:call-template name="Vertical_AddressTemplate">
<xsl:with-param name="context" select="$context"/>
<xsl:with-param name="contextType" select="$contextType">
      </xsl:call-template>
</xsl:if>
</xsl: template>
```

21.3.2. How to Make the Transformation Template Industry Extensible

Mapping rules pertaining to customer-specific schema extensions are defined in these xsl extension templates.

To make the transformation template industry extensible:

1. Put the extension templates into a separate transformation file.
2. Import from the main transformation file.

```
<xsl: template name="Core_AddressTemplate">
<xsl:param name = "context" select =".">/>
<xsl:param name = "contextType" select ="'CORE'"/>
<address1><xsl:value-of select="$context/address1"><address1>
<address2><xsl:value-of select="$context/address1"></address2>
<city><xsl:value-of select="$context/city"></city>
<state><xsl:value-of select="$context/state"></state>
<zip><xsl:value-of select="$context/zip"></zip>
   <xsl:if test="$contextType!='CORE'">
         <xsl:call-template name="Vertical_AddressTemplate">
<xsl:with-param name="context" select="$context"/>
<xsl:with-param name="contextType" select="$contextType">
</xsl:call-template>
</xsl:if>
</xsl: template>
```

21.4. Working with DVMs and Cross-References

This section discusses the DVMs, cross-references, and naming standards and when to use them.

21.4.1. Introduction to DVMs

Use domain values only for static lookups. Do not use them to store configuration or setup data. A separate facility is provided to store and retrieve parameterized configuration information.

To access the DVM at runtime, use the lookup-dvm XSL function found in the JDeveloper XSL Mapper.

DVMs are stored in the MDS repository, which uses the database persistence, and are managed using tools provided by JDeveloper or Foundation Pack.

For more information about naming standards, see Oracle AIA Naming Standards for AIA Development.

21.4.2. When to Use DVMs

DVMs can be categorized into three groups:

- 100 percent of the possible values are seeded, and you are not permitted to define any more.

  Since logic is added to these values and they are defined by the participating applications, you cannot add values.

- All or a few samples are seeded based on the seeded values found in the participating applications.

  You can add more to the participating applications and can add more to the DVMs in the middle to accommodate.

  Typically, logic is not added to these values; a match gets the value and passes it on to the receiving application. You must enhance the list to include all possible values that you have defined in your participating applications.

- Customized.

  A naming convention is provided for you to define your own DVM types and values in case you have added a column that depends on it. These types or values are not affected during an upgrade.

When creating cross-reference virtual tables in the cross-reference tables, follow the naming standards described in the following section.

21.4.3. Using Cross-Referencing

One of the core design tasks of ABCS is maintaining cross references for unique identifiers from the loosely coupled applications.

AIA does not support hierarchical cross-references. Child object common keys are unique on their own without being under the parent's context. This means that child objects will have their own entry within the cross-references table with a GUID used for the common ID.

The Cross References API does not support multi-part keys. In cases where the application does not have a single unique key, we recommend key concatenation :

{Key1}::{Key2}::Key3

Most requester ABCSs will need to use the following logic in the transformations:

Look up in Xref for an existing common ID corresponding to the application ID.

If common ID is not found, then generate a new ID and populate the Xref table with the new ID.

Use the found or new common ID in the transformation.

Cross Referencing is achieved through the use of EBM Object identification elements and the Cross Referencing APIs (Populate Xref, Lookup Xref, Delete Xref) provided by Mediator.

Example: This table lists a Cross Referencing configuration implemented in the Product synchronization scenario between the Portal BRM and Siebel CRM systems:

Entity	Siebel CRM ID	Common ID	Oracle BRM ID
Item ID	Product ID	Auto Generated GUID	Product ID
Price Line ID	Price Line ID	Auto Generated GUID	Product ID

ITEM_ID: cross-references the BRM (Portal) ProductID and the Siebel ProductID.

PRICELINE _ID: cross-references the BRM (Portal) Product ID to Siebel PriceLineID.

21.4.4. How to Set Up Cross References

Oracle SOA Suite provides a cross-reference infrastructure that consists of these components:

- A single Xref database table that contains virtual tables for the different cross-reference object types as well as command line utilities to import/export data.
- XPath functions to query, add, and delete cross-references.

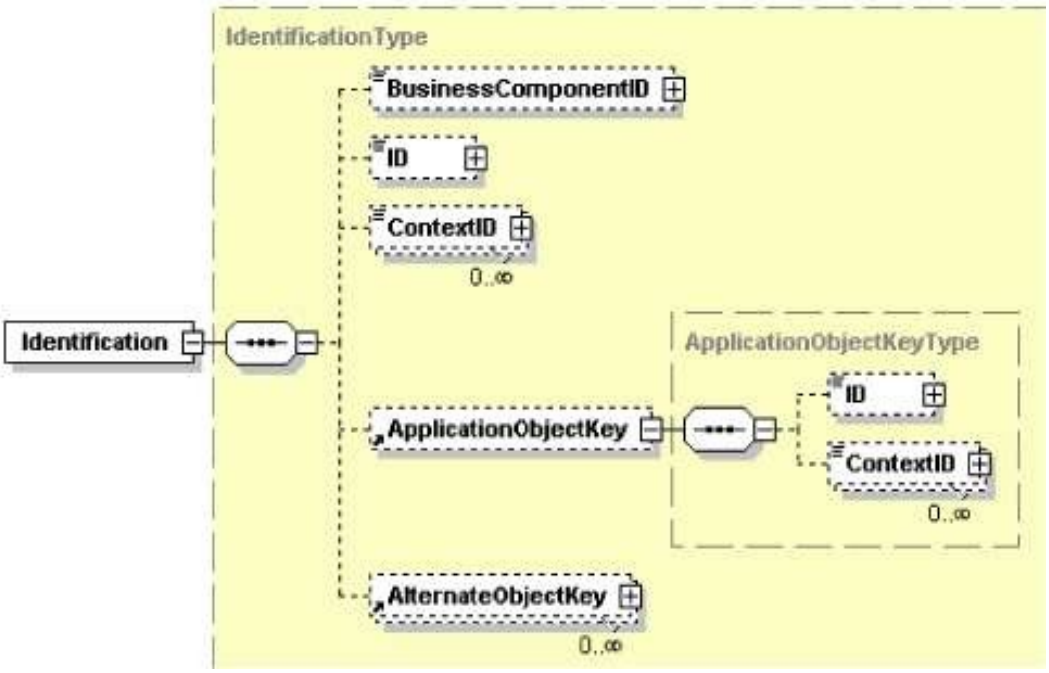
For more information about naming standards, see Oracle AIA Naming Standards for AIA Development.
For more information about cross-references, see the *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g, "*Working with Cross References."

21.5. Mapping and Populating the Identification Type

Each of the EBMs will have at least one element to hold an object's instance identifying information. An EBM containing details about multiple objects might have elements dedicated for holding object instance identifying details for each one of them. In the EBM, there is a scheme to uniquely identify the top-level object's instance as well as the child and the grandchild instances of the business components embedded within the overall object. The identification scheme is the same regardless of whether the identification is for that of the top-level instance (for example - Order Instance Identification) or for that of a grandchild instance (for example - Schedule Line Item Identification).

The commonly practice is to adopt the identification theme as defined in the data type *Identification Type* that is made available in the Common Components schema module. Each of the objects can have representations in various applications as well as at the integration layer. Each of the representations will be uniquely identified using identifying keys. For example, Order Number can uniquely identify either an Order ID or an Order instance in Siebel application; whereas in a PeopleSoft application, the order instance will be uniquely identified with the combination of Business Unit and Order ID.

As you can see in the example, the identifying keys of these representations found across various applications as well as the systems are quite different. The Identification Type allows you to capture the identifying keys of these representations for a single object instance. This diagram illustrates the schema definition for Identification Type:



Structure of the Identification Type element

The Identification Type structure allows you to capture three specific identifiers plus one more general identifier for a single object. The following table describes each of the identifiers:

Name	Purpose	Details
BusinessComponentID	Unique Key for the application-agnostic representation of the object instance	Business documents generated by Oracle AIA applications have the BusinessComponentID populated. The BusinessComponentID is generated using the API provided by Oracle AIA infrastructure.
ID	Business friendly identifier found in the participating application for this object instance	Business documents generated by Oracle AIA applications have these populated wherever they are applicable. PO Number and Order Number are examples.
ContextID	Optional element to identify additional qualifiers for the ID. Used in the case of multi-part keys - for example if an Item is unique within a set, then the Item Number would be the ID and the Set ID value would be a ContextID value	Business documents generated by Oracle AIA applications have these populated wherever they are applicable. SetID within a set form an example
ApplicationObjectKey	Participating application specific internally generated unique identifier for this object instance	Business documents generated by Oracle AIA applications populate this information. This represents the primary key of the object at the participating application.

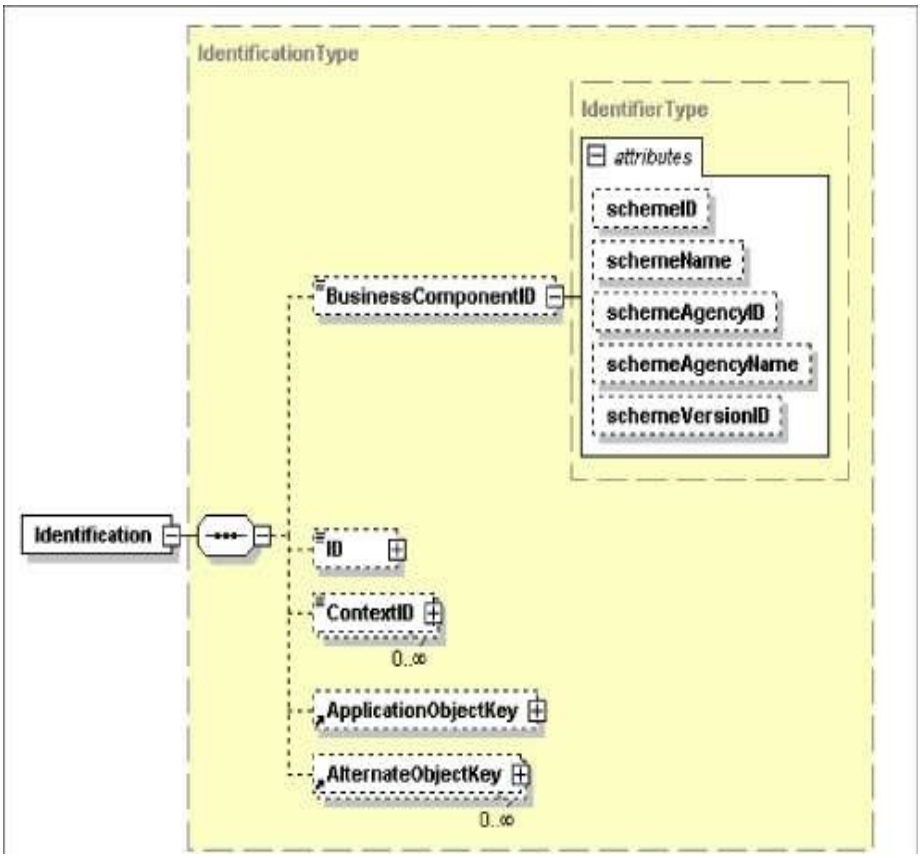
Name	Purpose	Details
AlternateObjectKey	One or more ways of additionally identifying the object's instance.	*Optional*. Use this element to capture additional identifying details if necessary.

To define the context in which an identifier is valid, a set of attributes that describes the context of the key is supported in addition to the actual key value.

The following table describes the purpose of each of the attributes:

Name	Type	Description
BusinessComponentID ID ApplicationObjectKey/ID AlternateObjectKey/ID	Element	The element is used to store the actual object ID.
schemeID	Optional attribute	Identification scheme of the identifier. Attribute schemeID provides information about the object type identified by the ID, for example ItemGUID for the GUID of an item and PartyGUID for the GUID of a party. For the BusinessComponentID, the schemeID is set to the name of the object followed by ' GUID'. For the ID, the schemeID is set to the name of the element as known in the participating application.
scheme VersionID	Optional attribute	Version of the identification scheme.
schemeAgencyID	Optional attribute	ID of the agency that manages the identification scheme of the identifier. The GUIDs generated by Oracle AIA will have AIA 01 populated in this attribute. For identifiers generated by participating applications, the short code for that of the participating application will be stored in this attribute.

This diagram illustrates the Business Component ID:



Structure of the Business Component ID

Example of how the BusinessComponentID is populated in the EBM:

```
<telcoitem:Identification>
<corecom:BusinessComponentID
mlns:corecom="http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V1"
schemeID="ITEM_ID_COMMON"
schemeAgencyID="AIA_20">31303838373539343330313937393531
</corecom:BusinessComponentID>
<corecom:ID
xmlns:corecom="http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V1"
schemeID="ItemNumber" schemeAgencyID="PORTAL">0.0.0.1 /product 349330
1</corecom:ID>
<corecom:ApplicationObjectKey
xmlns:corecom="http://xmlns.oracle.com/Enterpriser
Objects/Core/Common/V1">
<corecom:ID schemeID="PortalPoid" schemeAgencyID="PORTAL">0.0.0.1 /product
349330 1</corecom:ID>
 </corecom:ApplicationObjectKey>
</telcoitem:Identification>
```

21.5.1. How to Populate Values for corecom:Identification

To populate values for corecom:Identification:

Follow these guidelines everywhere that has corecom:Identification or any of its derivations.

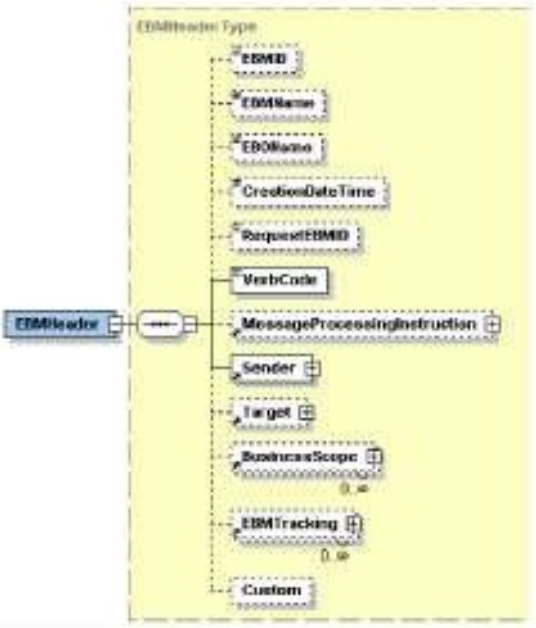
1. SchemeAgencyID for Common is ***COMMON***.
2. SchemeAgencyID for ID/ContextID/ApplicationObjectKey is the same as exsl:node-set ($senderNodeVariable)/ID, which is also used as Column Name for lookupXref and lookupDVM.
3. Scheme ID for BusinessComponentID is the same as XrefTableName in lookupXref/populateXref.

21.6. Introducing EBM Header Concepts

Every EBM that is processed by ABCS and Enterprise Business Service (EBS) contains an EBM header in addition to object-specific information. The objective of the EBM header is to carry information that can be used to:

- Track important information
- Audit
- Indicate source and target systems
- Handle errors and traces

This diagram illustrates the components of an EBM header:



EBM header components

The following sections provide details about each of the components.

21.6.1. Standard Elements

This section discusses the standard elements in a message header.

21.6.1.1. EBMID

This element contains a GUID to uniquely identify the EBM. The GUID is generated using a provided standard XPath function.

XPath function to generate GUID:

orcl:generate-guid()

Example:

```
<EBMHeader>
<EBMID>33303331343032313534393138393830</EBMID>
. . .
</EBMHeader>
```

21.6.1.2. EBOName

This element contains the fully qualified name of the EBO in the notation: {namespaceURI}localpart.

Example:

```
<EBMHeader>
<EBOName>{http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/Invoice/V1}Qu
eryInvoice</EBOName>
. . .
</EBMHeader>
```

21.6.1.3. RequestEBMID

This element contains the originating request GUID that uniquely identifies the originating request ID. The EBS populates this field in the response message by extracting it from the request message.

Example:

```
<EBMHeader>
<RequestEBMID>33303331343032313534393138393830</RequestEBMID>
. . .
</EBMHeader>
```

21.6.1.4. CreationDateTime

This element contains a timestamp that reflects when the EBM was created. The timestamp should be presented in UTC, which can be presented in current datetime and GMT offset as:

```
yyyy '-' mm '-' dd 'T' hh ':' mm ':' ss ('.' s +)? (zzzzzz)?

XPath function to generate CreationDateTime:
xp20:current-dateTime()
```

Example:

```
<EBMHeader>
<CreationDateTime>200 7-04-2 7T12:22:17-08:00</CreationDateTime>
. . .
</EBMHeader>
```

21.6.1.5. VerbCode

This element contains the verb represented by the EBM.

Example:

```
<EBMHeader>
<VerbCode >Query</VerbCode>
. . .
</EBMHeader>
```

21.6.1.6. MessageProcessingInstruction

This element contains instructions on how the message should be processed. This section indicates if the EBM is a production system-level message that should go through its standard path, or if it is a testing-level message that should go through the testing/simulation path.

MessageProcessingInstruction contains two fields:

- EnvironmentCode:

  Can be set to either CAVS or PRODUCTION. The default is PRODUCTION. Setting the value to PRODUCTION indicates that the request needs to be sent to a concrete endpoint. Setting the value to CAVS indicates that the request needs to be sent to CAVS Simulator.

- DefinitionID:

  Specifies the test definition ID.

  It should be populated with the value of the property "Routing.[PartnerlinkName].CAVS.EndpointURI" from AIAConfigurationProperties.xml when the "Routing.[PartnerlinkName].RouteToCAVS" property is set to “true” in AIAConfigurationProperties.xml.

21.6.1.7. When to Populate Standard Header Fields

The standard header elements should be populated whenever a message is created. This occurs when:

- Transforming an application request ABM into an EBM in a requester ABC implementation service.
- Transforming an application response ABM into an EBM in a provider ABC implementation service.

21.6.1.8. How to Populate Message Processing Instruction

To populate message processing instruction:

1. Add instructions to indicate how a message will be processed.

   This instruction is normally used to tell the system to run the message in production mode or in simulation/testing mode.

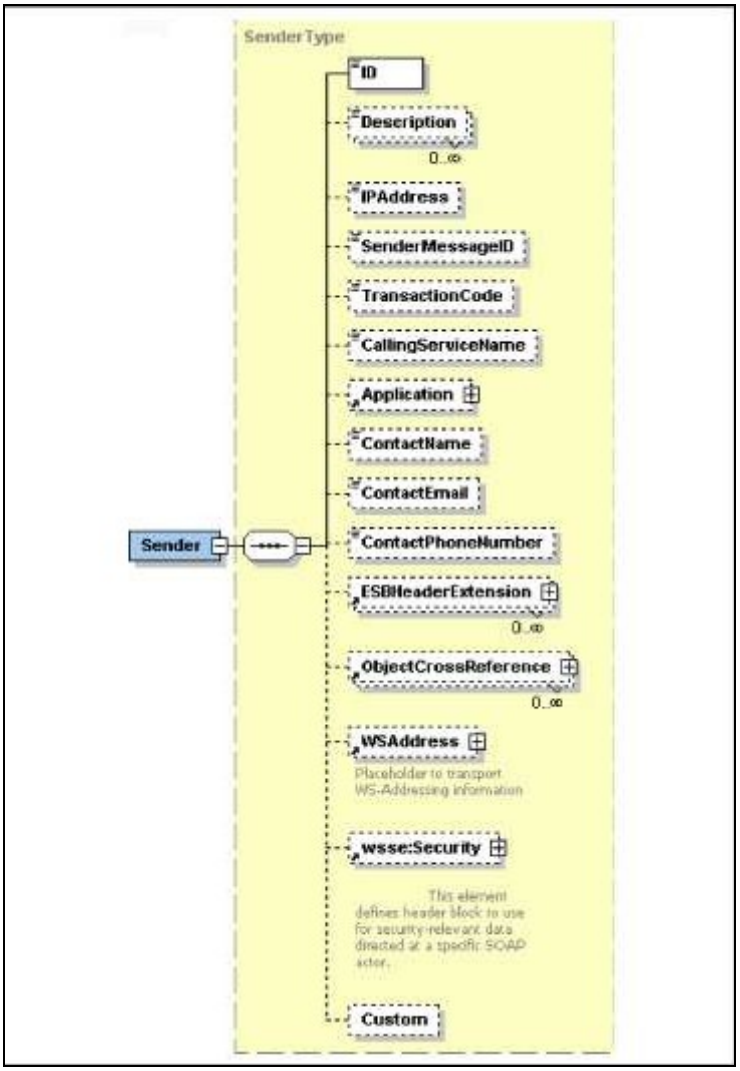
2. These fields are currently populated by the CAVS.

   Usually, the fields are populated in the SOAP Header before initiating a testing request.

```
<corecom:MessageProcessingInstruction>
    <corecom:EnvironmentCode>
 <xsl:text disable-output-escaping="no">Production</xsl:text>
    </corecom:EnvironmentCode >
</corecom:MessageProcessingInstruction>
```

21.6.2. Sender

The Sender contains information about the originating application system.



Structure of the Sender element

This table provides details about each element in the Sender element.

Element	Description
ID	Contains the sender system identifier code. This is a mandatory element. This element represents the unique identifier of each source system. ReqABCSImpl should call the API detailed in the section below to populate this value.
Description	This is the long description of the Sender System. ReqABCSImpl should call the API

Element	Description
	detailed in the section below to populate this value.
IPAddress	Represents the IP address of the sender system. ReqABCSImpl can call the API detailed below to populate this value.
SenderMessageID	This is the ID that can uniquely identify the message sent by the sender system. ReqABCSImpl may have this information and that information can be used to populate this element.
Transaction Code	This is the task code in the sender system that is used to generate this message. ReqABCSImpl has this information and should use that while preparing the EBM.
CallingServiceName	Name for the calling ABCS. Will be populated by source ABCS.
Application	Holds information about the originating application.
Application/ID	The sender system can designate the originating application code in this element. ReqABCSImpl should call the API detailed in the section below to populate this value.
Application/Version	The sender system can designate the version of the originating application in this element. ReqABCSImpl should call the API detailed in the section below to populate this value.

This code a sample Sender element:

```
<corecom:Sender>
<corecom:ID>SEBL_01</corecom:ID>
<corecom:Description/>
<corecom:IPAddress/>
<corecom:SenderMessageID>33303331343032313534393138393830</corecom:SenderM
essageID>
<corecom:CallingServiceName>{http://xmlns.oracle.com/SampleSiebelApp}Creat
eCustomerSiebelInputFileReader</corecom:CallingServiceName>
<corecom:Application>
<corecom:ID/>
<corecom:Version>1.0</corecom:Version>
</corecom:Application>
<corecom:ContactName/>
<corecom:ContactEmail/>
<corecom:ContactPhoneNumber/>
</corecom:Sender>
```

21.6.2.1. SenderMessageID

This element uniquely identifies the message that originated in the source application. Inbound request message is one of the potential sources for this element. The Application Business Message (ABM) (payload sent by the source application) can either have SenderMessageID populated in the payload or stored in ABM Header. Populated during the inbound message transformation from ABM into EBM in the ReqABCSImpl.

This information could subsequently be used by downstream services that are planning to send a message to the same sender application to establish the context.

21.6.2.2. When to Populate Sender System Information

The Sender System information should be populated whenever an EBM is created. This occurs when:

- Transforming a request ABM into an EBM in a requester ABC implementation service.
- Transforming a response ABM into an EBM is a provider ABC implementation service.

21.6.2.3. How to Populate Sender System Information

To populate sender system information:

1. Use the following XPath function to retrieve the Sender System information from AIA System Registration Repository based on the system ID/Code and then return the data as an XML Node-Set:

```
ebh:getEBMHeaderSenderSystemNode(senderSystemCode as string,
senderSystemID as string,
) return senderSystem as node-set
```

2. Pass either the senderSystemCode or the senderSystemID.

   The function will locate the system information in AIA System Registration Repository based on either the code or the ID.

21.6.2.4. TransactionCode

The TransactionCode is used to identify the operation in the sender system that generated the sender message.

The inbound request message is one of the potential sources for this element.

To preserve the context, the value of this element is used when constructing the 'AIAFaultMessage' in the *catch* of a fault handler.

This information could subsequently be used by downstream services that are planning to send a message to the same sender application to establish the context.

21.6.2.5. ContactName

This element is the name of the contact of the sender system. The value will be retrieved from AIA System Registration Repository by doing a lookup. ReqABCSImpl should call the API detailed in the section below to populate this value. This information could be made available in the fault message or in the request message to be sent to external businesses by the downstream services.

21.6.2.6. ContactEmail

This element is the email of the contact of the sender system. The value will be retrieved from AIA System Registration Repository by doing a lookup. ReqABCSImpl should call the API to populate this value. This information could be made available in the fault message or in the request message to be sent to external businesses by the downstream services.

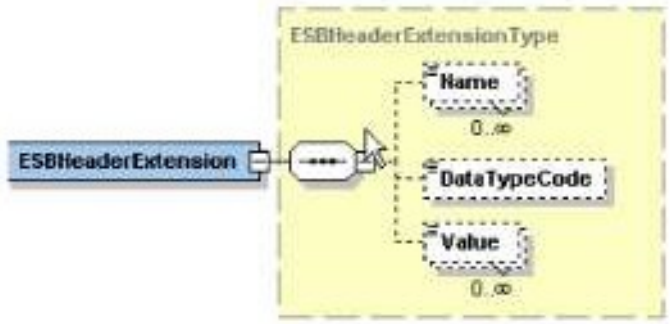
21.6.2.7. ContactPhoneNumber

This element is the phone number of the contact of the sender system. The value will be retrieved from AIA System Registration Repository by doing a lookup. ReqABCSImpl should call the API to populate this value. This information could be made available in the fault message or in the request message to be sent to external businesses by the downstream services.

21.6.2.8. ESBHeaderExtension

This element provides an additional facility to accommodate the transmission of additional information from source application. Some data passed from sender system must be transported through the EBM message life cycle and is needed for identifying and processing the target system. The target Application Business Message (ABM) may not have a placeholder for those kinds of data. Since they can't be forced to provide a placeholder for every such element, this Enterprise Service Bus (ESB) header will be used to hold that information. ESB has name/value pair and this component can have as many such elements as possible.

This diagram illustrates the structure of the ESBHeaderExtension element.



Structure of ESBHeaderExtension element

This table describes the elements in the ESBHeaderExtension element.

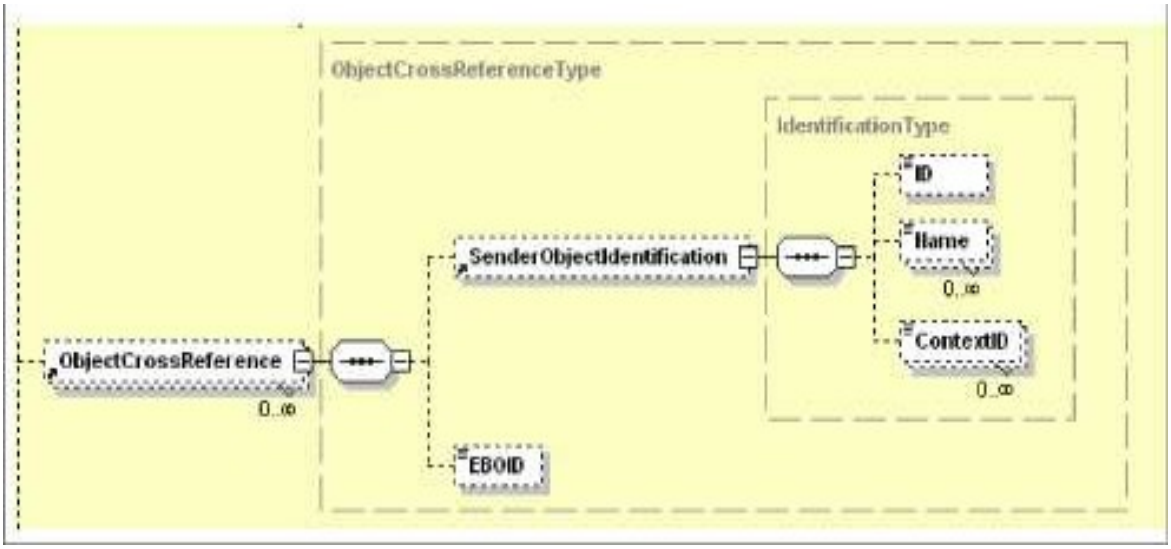
Element	Description
ESBHeaderExtension/Name	ESB Header element name is the same as the ID. Even though it allows multiple names for EBM header scenarios there is only one value that is same as the ID. Any transformation in the life cycle of the EBM header can populate this field.
ESBHeaderExtension/DataTypeCode	ESB Header element data type is populated by source ABCS.
ESBHeaderExtension/Value	ESB Header element value is populated by source ABCS. Even though it allows different placeholders for different data types, for simplicity only this element is populated. Any transformation in the life cycle of the EBM header can populate this field.

This diagram illustrates a sample ESBHeaderExtension:

Structure of the ESBHeaderExtension element

21.6.2.9. ObjectCrossReference

This component will store the identifier information of the sender objects and the corresponding cross-reference identifier. Since the EBM can be used for bulk processing this element can be repeated as well. This data may be repeated in the data area but to maintain uniform XPath location information about them, they are maintained here as well. ReqABCSImpl populates this value.



Structure of the ObjectCrossReference element

This table describes the elements in the ObjectCrossReference element.

Element	Description
ObjectCrossReference/SenderObjectIdentification	Contains all the key field name and key field values for the object. The data is provided by the sender system. ReqABCSImpl has this information and populates this value.
ObjectCrossReference/SenderObjectIdentification/ID	Identifies the object type of the sender system e.g. ORDER ReqABCSImpl has this information and populates this value
ObjectCrossReference/SenderObjectIdentification/Name	This will identify the description of the sender system, for example, Purchase Order. ReqABCSImpl has this information and populates this value.

Element	Description
ObjectCrossReference/SenderObjectIdentification /ContextID	Identifies the sender system's object identifiers. If the sender's object has multiple values then repeat this as many times. Use the attribute schemeID to set the Key Name and the Key value should be stored in the element itself. ReqABCSImpl has this information and populates this value.
ObjectCrossReference/EBOID	This is the corresponding cross-reference identifier stored in the integration layer. ReqABCSImpl has this information and populates this value.

21.6.2.10. How to Add Object Cross Reference information in the Sender System Information

To add a cross-reference entry in the sender system's ObjectCrossReference:

1. You need to add the identifier information of the sender objects and the corresponding cross-reference identifier.

   a. EBOID - Provide the corresponding cross-reference identifier in the integration layer. *ReqABCSImpl* will have this information and populate this value.

   b. SenderObjectIdentification – Populate the key field name and key field values for the object. The data is provided by the Sender System.

   - ID - Identifies the object type of the sender system e.g. ORDER *ReqABCSImpl* will have this information and populate this value
   - NAME - Identifies the description of the sender system e.g. Purchase Order. ReqABCSImpl will have this information and populate this value.
   - ContextID - Identifies the sender system's object identifiers. If the sender's object has multiple values then repeat this as many times. Use the attribute *SchemeID* to set the key name and store the key value in the element itself. *ReqABCSImpl* will have this value and it populates the value.

21.6.2.11. WS Address

This element holds all WS-Addressing elements. This element will transport WS-Addressing elements and exchange WS-Addressing elements between requester and target system. A local version of WS-Address schema is stored in a specified directory. ReqABCSImpl populates this. This element needs to be populated in the request EBM only when the provider application will send the response in an asynchronous mode. The provider application sending an asynchronous response will leverage the value of this element to identify the callback address.

21.6.2.12. Custom

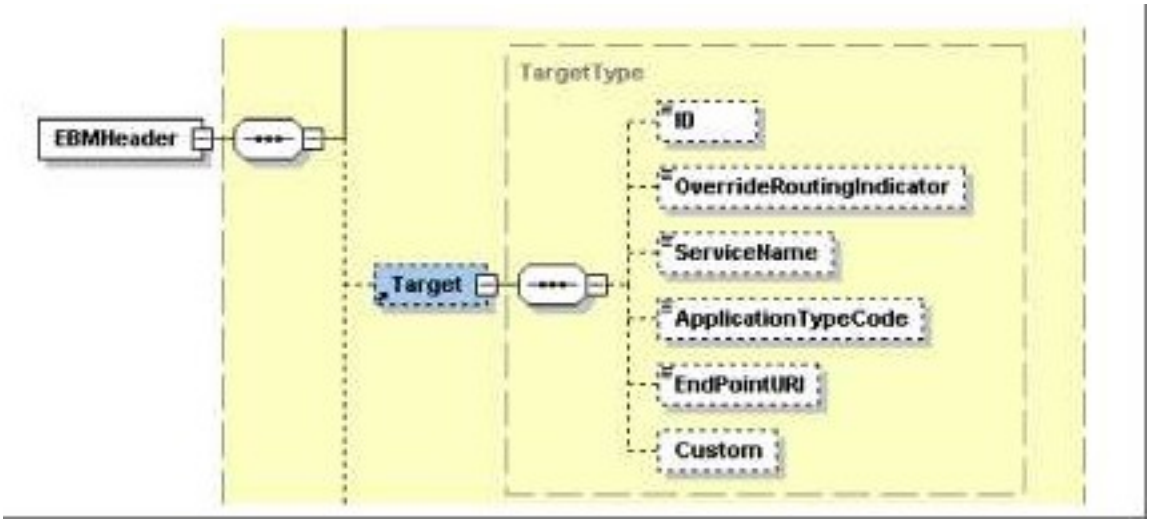
This element is the complex type that customers can extend to add their own elements.

For more information about specific usage of this element, see Implementing the Fire-and-Forget Message Exchange Pattern.

21.6.3. Target

The Target section is populated only when there is a need to override the routing rules for the target system defined in Mediator. For bulk processing it is assumed that all objects reach the same target system defined in a routing rule. In that scenario you must define the appropriate target system information in this element if you need to override the routing rule. The overriding target system information is applicable to all the objects in the data area. It has to be noted that the requester ABCS should never populate the target system. The Enterprise Business Flow (EBF) or an EBS alone can populate the details.

The Target element contains information regarding the target/receiving system and has these elements:



Structure of the Target element

21.6.3.1. ID

Use this element to identify target systems to route to when the routing rules are overridden. Populated by EBS when the target system must be overridden. The value of the participating application instance code.

21.6.3.2. ApplicationTypeCode

This element identifies the type of application. An identifier for the application type where multiple instances of the same application type may be registered in the integration platform. The application type may contain the version number of the application if more than one version is supported on the system.

This field should be populated at the same time as the Target/ID field is populated in the EBS (or in an EBF), usually in the ABCS. The value of this field should come from the function aia:getSystemType(<ID>), where ID is the system ID value that is populated in Target/ID. EBS routing rules almost always check this field for a value or lack of value when determining the routing target.

21.6.3.3. Custom

This is the complex type that customers can extend to add their own elements when needed.

Example

The code sample of Target element:

```
<corecom:Target>
<corecom:ID>PORTAL_01</corecom:ID>
<corecom:ApplicationTypeCode>PORTAL_01</corecom:ApplicationTypeCode>
</corecom:Target>
```

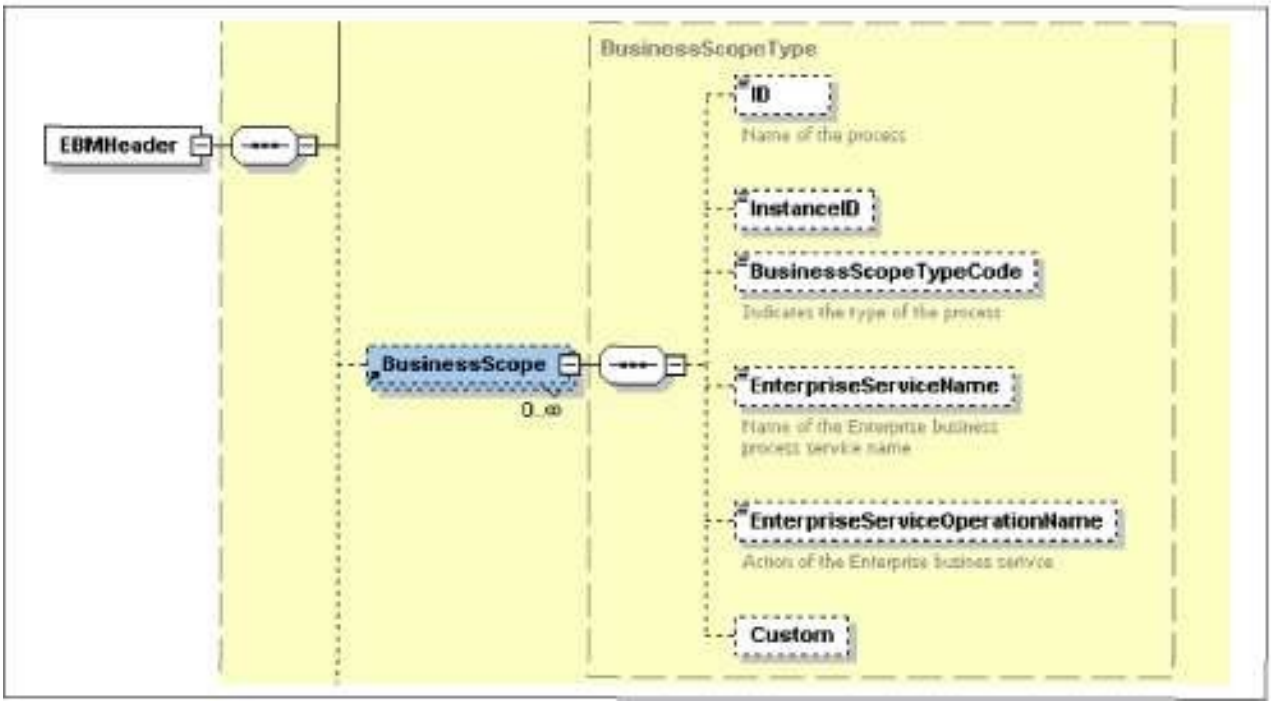
21.6.4. BusinessScope

This section captures business scope specification related information defined in UN/CEFACT Standard business definition header.

Every EBM must contain at least two rows for these elements.

- One row with type *Business Scope* describes the end-to-end business process that the message is part of.
- The second row describes the main message associated in the flow (for example, order message in ProcessOrder flow).

For most of the cases, each end-to-end process will have one message only. However in complex business scenarios there could be multiple messages spawned or forked from the process. In that case each spawned message must be a row in this section. The example below describes how this works:



Structure of the BusinessScope element

21.6.4.1. ID

An optional identifier that identifies the contract this instance relates to. ReqABCSImpl populates this value. This is the name of the process or message given by the applications.

21.6.4.2. InstanceID

A unique identifier that references the instance of the scope (for example, process execution instance of document instance). This is an alpha numeric code assigned by the application team concatenated with a GUID. For message type business scope section use the same EBMID as used in the top section.

21.6.4.3. BusinessScopeTypeCode

This element indicates the kind of business scope. Values are:

- ***BusinessScope*** (UMM)
- ***BusinessService*** (for ebXML)
- ***Message***

ReqABCSImpl populates this value.

21.6.4.4. EnterpriseServiceName

Name of the EBS where this message belongs. Known to the message creator, be it ABCS or EBS. ReqABCSImpl populates this value.

21.6.4.5. EnterpriseServiceOperationName

Name of the action of the EBS this message belongs. Known to the message creator, be it ABCS or EBS. ReqABCSImpl populates this value.

21.6.4.6. Custom

A complex type for customer to extend to add extra elements.

21.6.4.7. How to Add Business Process Information

Every EBM must contain at least two rows for these elements:

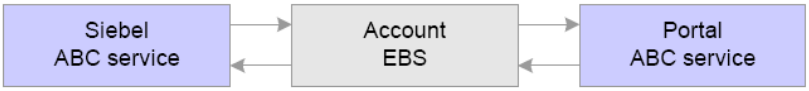
- One row with type Business Process describes the end-to-end business process the message is part of.
- The second row describes the main message associated in the flow, for example, the order message in ProcessOrder flow.

In most cases, each end-to-end process will have only one message. However in complex business scenarios there could be multiple messages spawned or forked from the process. In that case each spawned message must be a row in this section.

The use case example below describes how this works. To keep things simple the example limits the messages to the immediate child of the process and the subsequent chaining of messages are not taken into account.

21.6.5. Use Case: Request/Response

GetAccountBalance: Sends a request message with account number as input and receive account balance as response.



Use Case: Request/Response

21.6.5.1. Request EBM

Two rows: One for the Process and one for the Request EBM Message involved in the process.

```
<BusinessScope>
<ID>Siebel- Portal-Get -Account-Balance</ID>
<InstanceID>GETACCTBAL/1001</InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>GetAccountBalance</EnterpriseServiceOperat
ionName>
  <BusinessScope>
  <BusinessScope>
<ID> AccountBalanceReqMessage </ID>
<InstanceID> ACCTBALMSG/9001[the EBMID in the top element to be used here]
</InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>GetAccountBalance</EnterpriseServiceOperat
ionName>
</BusinessScope>
```

21.6.5.2. Response EBM

Two rows: One for the process and one for the Response EBM Message involved in the process.

```
<BusinessScope>
<ID>Siebel- Portal-Get -Account-Balance</ID>
<InstanceID>GETACCTBAL/10 01</InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>GetAccountBalance</EnterpriseServiceOperat
ionName>
</BusinessScope>
<BusinessScope>
<ID>] AccountBalanceResMessage </ID>
<InstanceID> ACCTBALMSG/9002[the EBMID in the top element to be used here
</InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>GetAccountBalance</EnterpriseServiceOperat
ionName>
</BusinessScope>
```

21.6.6. Use Case: Asynchronous Process

SyncProduct: Portal sends an async message to Siebel to sync the product details.

Use Case: Asynchronous Process

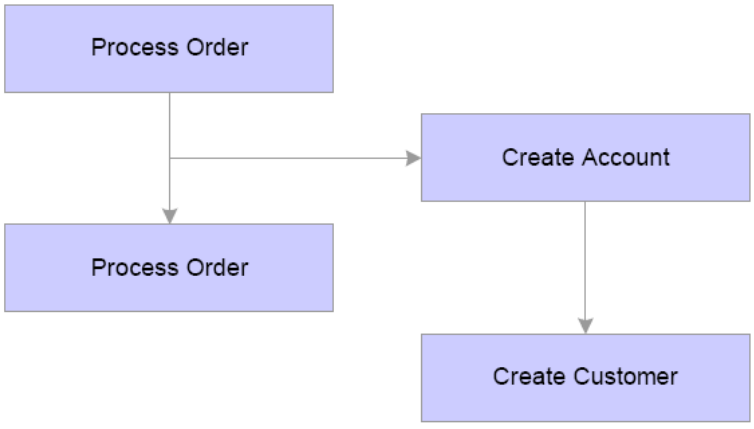
21.6.6.1. Request EBM

Two rows: One for the process and one for the Request EBM Message involved in the process.

```
<BusinessScope>
<ID>Portal-Siebel-Product-Sync</ID>
<InstanceID>PRODSYNC/1003</InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>ProductEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>SyncProduct</EnterpriseServiceOperationNam
e>
</BusinessScope>
<BusinessScope>
<ID>  ProductSyncReqMessage </ID>
<InstanceID> PRODSYNCREQ/9003 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>ProductEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>SyncProduct</EnterpriseServiceOperationNam
e>
</BusinessScope
```

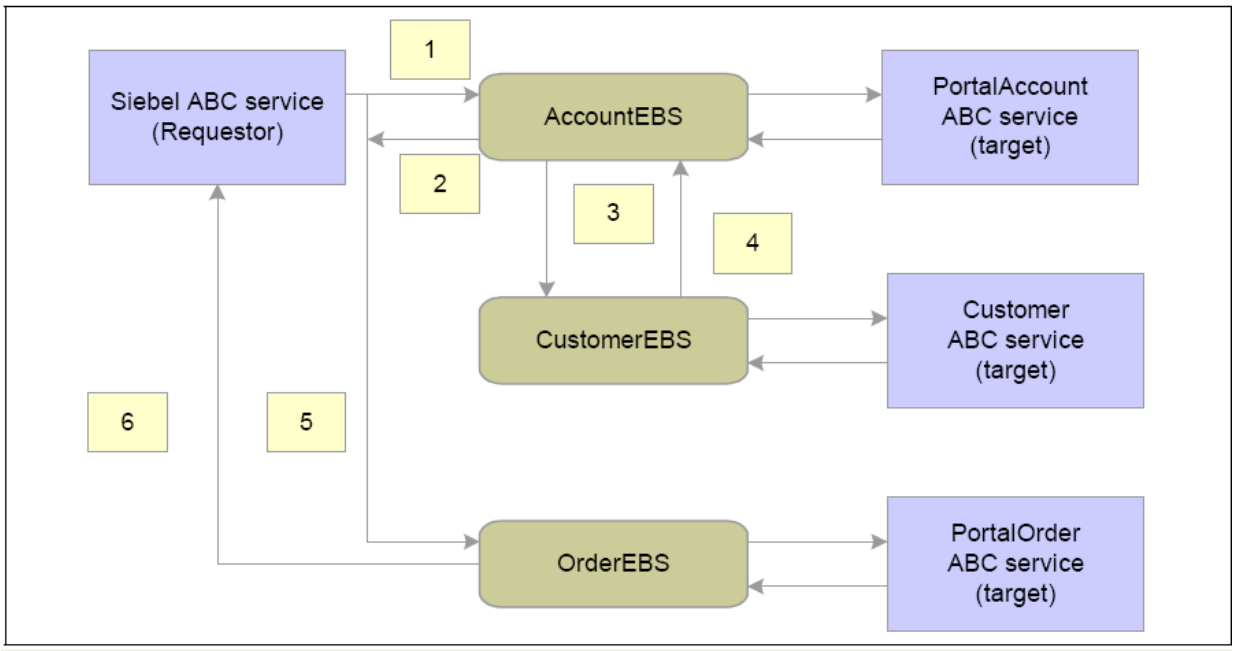
21.6.7. Use Case: Synchronous Process with Spawning Child Processes

ProcessOrder: Siebel sends an order. It will first spawn CreateAccount in the portal, and then it will process the order in the portal.



Synchronous Process with Spawning Child Processes

This diagram illustrates the ProcessOrder flow:



ProcessOrder flow

Message 5: ProcessOrder Request EBM

Four rows:

- One for the process
- One for the Process Order Request Message in the process
- One for the create account request message in the process (spawned immediate child)
- One for the create account response message in the process (spawned immediate child)

```
<BusinessScope>
<ID>End-to-End-Order-Processing </ID>
<InstanceID> ORDPROCESSING/1004 </InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>OrderEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>ProcessOrder</EnterpriseServiceOperationNa
me>
</BusinessScope>
<BusinessScope>
<ID> Process-Order-Request-Message </ID>
<InstanceID> PROCESSORDERREQMSG /9004 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>OrderEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>ProcessOrder</EnterpriseServiceOperationNa
me>
</BusinessScope>
<BusinessScope>
<ID>Create-Account-Request-Message </ID>
<InstanceID> CREATEACCTREQMSG /9005 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
```

```
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateAccount</EnterpriseServiceOperationN
ame>
</BusinessScope>
<BusinessScope>
<ID> Create-Account-Response-Message </ID>
<InstanceID> CREATEACCTRESPMSG /9020</InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateAccount</EnterpriseServiceOperationN
ame>
</BusinessScope>
```

Message 6: Process Order Response EBM

Two rows:

- One for the process
- One for the Process Order Response in the process

```
<BusinessScope>
<ID>End-to-End-Order-Processing </ID>
<InstanceID> ORDPROCESSING/1004 </InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>OrderEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>ProcessOrder</EnterpriseServiceOperationNa
me>
</BusinessScope>
<BusinessScope>
<ID> Process-Order-Response-Message</ID>
<InstanceID> PROCESSORDERRESPMSG /9019</InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>OrderEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>ProcessOrder</EnterpriseServiceOperationNa
me>
</BusinessScope>
```

Message 1: Create Account Request EBM

Four rows:

- One for the process
- One for the Create Account Request Message in the process
- One for the create customer request message in the process (spawned immediate child)
- One for the create customer response message in the process (spawned immediate child)

```
<BusinessScope>
<ID> Portal-Account-Creation </ID>
<InstanceID> CREATEACCT/1008 </InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateAccount</EnterpriseServiceOperationN
ame>
</BusinessScope>
<BusinessScope>
```

```
<ID> Create-Account-Request-Message </ID>
<InstanceID> CREATEACCTREQMSG/9008 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateAccount</EnterpriseServiceOperationN
ame>
</BusinessScope>
<BusinessScope>
<ID> Create-Customer-Request-Message </ID>
<InstanceID> CREATECUSTREQMSG/9009 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>CustomerEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateCustomer</EnterpriseServiceOperation
Name>
</BusinessScope>
<BusinessScope>
<ID> Create-Customer-Response-Message </ID>
<InstanceID> CREATECUSTRESPMSG/9021 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>CustomerEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateCustomer</EnterpriseServiceOperation
Name>
</BusinessInstruction>
```

Message 2: Create Account Response EBM

Two rows:

- One for the process
- One for the Create Account Response Message in the process

```
<BusinessScope>
<ID> Portal-Account-Creation-Response </ID>
<InstanceID> CREATEACCTRESP/1008 </InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateAccount</EnterpriseServiceOperationN
ame>
</BusinessScope>
<BusinessScope>
<ID> Create-Account-Response-Message </ID>
<InstanceID> CREATEACCTRESPMSG/9020 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>AccountEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateAccount</EnterpriseServiceOperationN
ame>
</BusinessScope>
```

Message 3: Create Customer Request EBM

Two rows:

- One for the process
- One for the Create Customer request message in the process

```
<BusinessScope>
<ID> Oracle-Customer-Create </ID>
```

```
<InstanceID> CREATECUST/1009 </InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>CustomerEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateCustomer</EnterpriseServiceOperation
Name>
</BusinessScope>
<BusinessScope>
<ID> Create-Customer-Request-Message </ID>
<InstanceID> CREATECUSTREQMSG/9009 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>CustomerEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateCustomer</EnterpriseServiceOperation
Name>
</BusinessScope>
```

Message 4: Create Customer Response EBM

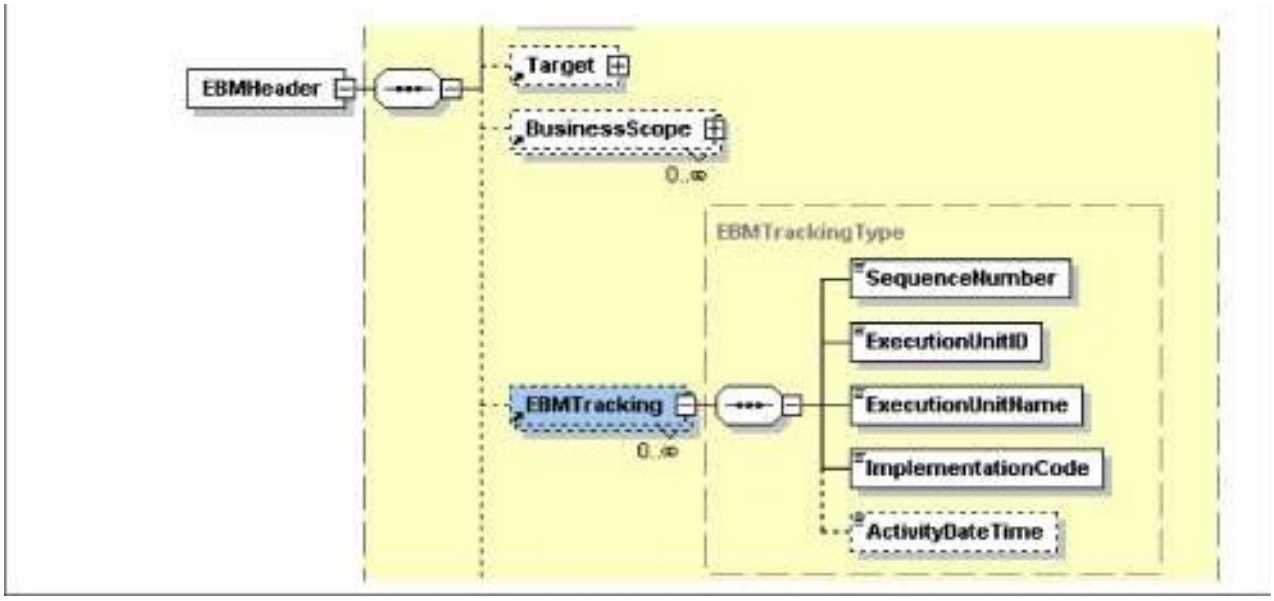
Two rows:

- One for the process
- One for the Create Customer response message in the process

```
<BusinessScope>
<ID> Oracle-Customer-Create-Response </ID>
<InstanceID> CREATECUSTRESP/10 09 </InstanceID>
<BusinessScopeTypeCode>BusinessScope</BusinessScopeTypeCode>
<EnterpriseServiceName>CustomerEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateCustomer</EnterpriseServiceOperation
Name>
</BusinessScope>
<BusinessScope>
<ID> Create-Customer-Response-Message </ID>
<InstanceID> CREATECUSTREQMSG/9021 </InstanceID>
<BusinessScopeTypeCode>Message</BusinessScopeTypeCode>
<EnterpriseServiceName>CustomerEBS</EnterpriseServiceName>
<EnterpriseServiceOperationName>CreateCustomer</EnterpriseServiceOperation
Name>
</BusinessScope>
```

21.6.8. EBMTracking

EBMTracking contains tracking information about each node that the EBM has been through. EBMTracking may appear multiple times, once for each execution unit it passes through.



Structure of the EBMTracking element

21.6.8.1. SequenceNumber

This element contains the sequence number of the node the EBM has been through.

21.6.8.2. ExecutionUnitID

This element contains the ID of the execution unit, node, or process ID.

21.6.8.3. ExecutionUnitName

This element contains the fully qualified name of the execution unit, node, or process ID.

21.6.8.4. ImplementationCode

This element contains the category of the execution unit, which indicates the type of the execution unit such as BPEL, Mediator, or Java Service.

21.6.8.5. ActivityDateTime

This element contains the timestamp indicating when the EBM was processed by the execution unit. The timestamp should be presented in UTC, which can be presented in current datetime, and GMT offset as:

```
yyyy '-' mm '-' dd 'T' hh ':' mm ':' ss ('.' s+)? (zzzzzz)?
```

21.6.8.6. When to populate EBM Tracking Information

Add an EBMTracking entry to the EBM header whenever a message is processed by a service.

This section should be populated when:

- Transforming a request ABM into an EBM in a requester ABC implementation service.
- Transforming a response ABM into an EBM is a provider ABC implementation service.
- The message passes through a BPEL process.

Example of EBM Tracking

```
<EBMTracking>
<SequenceNumber>1</SequenceNumber>
<ExecutionUnitID>6 8 56 8</ExecutionUnitID>
<ExecutionUnitName>{http://xmlns.oracle.com/ABCSImpl/Siebel/Invoice/v0}Que
ryInvoiceSiebelReqABCSImpl</ExecutionUnitName>
<CategoryCode>BPEL</CategoryCode>
<ActivityDateTime>2 001-12-17T09:30:47-05:00</ActivityDateTime>
</EBMTracking>
<EBMTracking>
<SequenceNumber>2</SequenceNumber>
<ExecutionUnitID>4435</ExecutionUnitID>
<ExecutionUnitName>OrderEBS</ExecutionUnitName>
<ExecutionUnitName>{http://xmlns.oracle.com/EnterpriseServices/Core/Invoic
e/v0}QueryInvoiceEBS</ExecutionUnitName>
<CategoryCode>ESB</CategoryCode>
<ActivityDateTime>2 001-12-17T09:30:47-05:00</ActivityDateTime>
</EBMTracking>
<EBMTracking>
<SequenceNumber>3</SequenceNumber>
<ExecutionUnitID>6 8 594</ExecutionUnitID>
<ExecutionUnitName>{http://xmlns.oracle.com/ABCSImpl/Portal/Invoice/v0}Que
ryInvoicePortalProvABCSImpl</ExecutionUnitName>
<CategoryCode>BPEL</CategoryCode>
<Activity DateTime>2 001-12-17T09:30:47-05:00</ActivityDateTime>
</EBMTracking>
```

21.6.9. Custom

You can extend the custom types to add any extra elements or attributes you may need. You can also take advantage of the XSLT file extensibility features to add the necessary code to either populate or read values or both from the custom section.

22. Configuring Oracle AIA Processes for Error Handling and Trace Logging

This chapter discusses the following topics:

For more information about Oracle AIA B2B error handling, see Introduction to B2B Integration Using AIA.

22.1. Overview of Oracle BPEL and Mediator Process Error Handling

This section provides an overview of Oracle BPEL process error handling and discusses various types of faults.

22.1.1. Understanding Oracle BPEL Error Handling

The Oracle Application Integration Architecture (AIA) Error Handling Framework groups BPEL process errors into two categories:

- Runtime Faults.
- Business Faults.

Runtime Faults

A runtime fault can occur in one of two scenarios:

- The partner link invocation fails.
- The partner link receives a named fault indicating that it is a runtime fault.

These faults are not user-defined and are issued by the system. Some of the situations in which a BPEL process can encounter a runtime fault include the following:

- The process tries to use a value incorrectly.
- A logic error occurs.
- A SOAP fault occurs in a SOAP call.
- An exception is issued by the server, and so forth.

AIA Services built as BPEL processes should be enabled and configured to catch and handle the runtime faults.

Business Faults

A business fault can occur in one of two scenarios:

- A BPEL process runs a throw activity after evaluating a condition as a fault.
- An Invoke activity receives a named fault indicating that it is a business fault.

Business faults are the application-specific faults that are generated when erroneous conditions take place when the message is being processed. These faults are specified by the BPEL process component and are defined in the WSDL.

AIA Services built as BPEL processes should be enabled and configured to catch and handle the runtime, as well as business faults.

22.1.2. Understanding Oracle Mediator Error Handling

A Mediator component can handle both runtime faults and business faults.

Runtime Faults

These are faults that occur because of some problem in the underlying system, such as the network not being available.

Business Faults

These are exceptions that are returned by called Web services. These are application-specific and are explicitly defined in the service's WSDL file.

AIA Services built as Mediator components should be configured to catch and handle the business faults.

However, fault policies are applicable to parallel routing rules only. For sequential routing rules, the fault goes back to the caller and it is the responsibility of the caller to handle the fault.

We recommend the usage of sequential routing rules only.

For more information about configuring the Mediator to handle business faults arising from synchronous invocations using sequential routing rules, see Guidelines for Configuring Mediator for Handling Business Faults.

22.2. Overview of AIA Error Handler Framework

For more information about the Error Handling Framework and its features, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up and Using Error Handling and Logging."

22.3. Enabling AIA Processes for Fault Handling

This section discusses the following topics:

- What Do I Need to Know About Fault Policy Files
- How to Implement Fault Handling in BPEL Processes

22.3.1. What Do I Need to Know About Fault Policy Files

A fault policy bindings file associates the policies defined in a fault policy file with the SOA composite application (or the service component or reference binding component). The fault policy bindings file must be named fault-bindings.xml. This conforms to the fault-bindings.xsd schema file.

Fault policy file names are not restricted to one specific name. However, AIA recommends a naming convention to be followed for the fault policy files. All fault policy files should be named using the convention <ServiceName>FaultPolicy.xml. They must conform to the fault-policy.xsd schema file.

For more information about naming conventions, see Oracle AIA Naming Standards for AIA Development.

AIA recommends that the fault policy bindings file should be defined to associate the policies defined in a fault policy file with the SOA composite application.

AIA Foundation Pack comes with a default fault policy, which is stored in the Oracle Meta Data Services Repository, in the folder AIAMetaData/faultPolicies/V1. When default fault policies are to be used, then the composite.xml file should have the following elements added to it:

```
<property name="oracle.composite.faultPolicyFile">[pointer to the fault
policy xml file in the MDS]</property>

<property name="oracle.composite.faultBindingFile">[pointer to the fault
policy bindings file fault-bindings.xml in the MDS]</property>
```

When the Service Constructor is used to construct the AIA Services, and if the developer opts for using a default fault policy file, then Service Constructor will automatically insert the preceding elements in the composite.xml file.

For more information about Service Constructor, see Working with Service Constructor.

If a developer chooses to have a customized, service-specific fault policy file for her AIA Service, then, AIA recommends that the fault policy file and fault policy bindings file (fault-bindings.xml) be placed in the same directory as the composite.xml file of the SOA composite application.

When a developer is using the Service Constructor tool to construct the AIA Services and opts for using a service-specific fault policy file and fault policy bindings file, then the tool will create a template file in the same directory as the composite.xml file of the SOA composite application. The developers need to define the fault policies in those template files. In this case, the tool will not create the XML elements <property> in the composite.xml.

For more information, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite*, "Using Mediator Error Handling," Schema Definition File for Fault-policies.xml and Schema Definition File for Fault-bindings.xml.

22.3.1.1. Associating a Fault Policy File with Fault Policy Bindings File

The following example shows how to associate a fault policy defined in a sample fault-policy file with a fault-policy binding.xml file.

Consider a sample fault policy file, SamplesQueryCustomerPartyPortalProvABCSImplFaultPolicy.xml, with the fault polices defined as shown here:

```
<faultPolicies xmlns="http://schemas.oracle.com/bpel/faultpolicy">
<faultPolicy version="2.0.1"
id="SamplesQueryCustomerPartyPortalProvABCSImplFaultPolicy" . . . . . .
. ></faultPolicy>
</faultPolicies>
```

We need to associate the policies defined in the preceding fault policy file with the level of fault policy binding that you are using—either a SOA composite application or a component (BPEL process or Oracle Mediator service component).

To do this, you need to modify the template fault-bindings.xml file (created by the AIA Service Constructor when the developer chooses to have a service-specific fault policy instead of using a default fault policy).

In the fault-bindings.xml file, the association is done as shown here:

```
<faultPolicyBindings version="2.0.1"
xmlns="http://schemas.oracle.com/bpel/faultpolicy"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <composite
faultPolicy="SamplesQueryCustomerPartyPortalProvABCSImplFaultPolicy"/>

</faultPolicyBindings>
```

Note: In this example, the association is made at the level of the SOA composite application.

We recommend that the fault policy binding level be a SOA composite application by default because this conforms with our recommendation that a composite needs to be built with a single component in it.

22.3.2. How to Implement Fault Handling in BPEL Processes

To implement fault handling in a BPEL process:

1. Define an EBM HEADER variable in the BPEL process and populate it as the first step.

   The Error Handling Framework uses this variable to populate the fault message with contextual details from the Enterprise Business Message (EBM) header. If the BPEL process is an Application Business Connector Service (ABCS), then input is an Application Business Message (ABM), and the EBM HEADER variable should be populated as soon as the ABM is converted to an EBM. This way, if the error occurs on a partner link after this transformation step, the Error Handling Framework will be able to access and use the EBM header details.

2. Define a fault policy for the BPEL process and bind the process with this policy in fault-bindings.xml.

   When you are using a service-specific fault policy file, always use the CompositeJavaAction, oracle.apps.aia.core.eh.CompositeJavaAction, as specified in the default policy. Including this CompositeJavaAction accounts for error notifications and error logging.

   For more information about how to define a fault policy XML file to handle business faults, see Handling Business Faults.
   For more information about how to define a fault policy XML file to handle runtime faults in the synchronous message exchange pattern (MEP), see Implementing Error Handling for the Synchronous Message Exchange Pattern.
   For more information about how to define a fault policy XML file to handle runtime faults in the asynchronous MEP, see Implementing Error Handling and Recovery for the Asynchronous Message Exchange Pattern to Ensure Guaranteed Message Delivery.

3. Define the catch blocks.

   The default behavior of the fault policy after the CompositeJavaAction is to do a rethrow. This returns the execution control to the catch or catch-all block specified in the BPEL process.

   In a way, interception of faults using a fault policy is transparent to you because the CompositeJavaAction rethrows the same fault that has been intercepted by it. So in BPEL, you must catch the fault, such as a binding or remote fault, which is expected out of the invoke activity.

   Hence, define a catch block for each business fault and runtime fault that can be expected at design time.

4. Define a catch-all block.

   This assists in catching any unexpected errors that may occur while you are running the process.

For more information about defining BPEL catch and catch-all blocks for the synchronous request-response MEP, see Guidelines for BPEL Catch and Catch-All Blocks in Synchronous Request-Response,
For more information about defining BPEL catch and catch-all blocks for the asynchronous MEP, see Guidelines for BPEL Catch and Catch-All Blocks.

22.4. Implementing Error Handling for the Synchronous Message Exchange Pattern

This section discusses the following topics:

- Guidelines for Defining Fault Policies
- Guidelines for BPEL Catch and Catch-All Blocks in Synchronous Request-Response
- Guidelines for Configuring Mediator for Handling Business Faults

22.4.1. Guidelines for Defining Fault Policies

This section discusses the following topics:

- Defining a Fault Policy XML File for Handling Runtime Faults
- Defining a Fault Policy XML File for Handling Business Faults

22.4.1.1. Defining a Fault Policy XML File for Handling Runtime Faults

Define faults in the fault policy XML file per guidelines illustrated in the following code snippet. In the fault policy, define a section under Conditions as shown here:

```
<faultName xmlns:bpelx="http://schemas.oracle.com/bpel/extension"
name="bpelx:remoteFault">
<condition>
        <action ref="aia-ora-java"/>
</condition>
</faultName>
<faultName xmlns:bpelx="http://schemas.oracle.com/bpel/extension"
name="bpelx:bindingFault">
   <condition>
        <action ref="aia-ora-java"/>
   </condition>
</faultName>
```

Though AIA recommends that by default, remote and binding faults should be defined, as shown previously, other runtime faults can be handled in the same way if required per the functionality of the service.

For example, if you are required to handle the subLanguageExecutionFault fault, then define the section as shown under:

```
<faultName xmlns:bpelx="http://schemas.oracle.com/bpel/extension"
name="bpelx:subLanguageExecutionFault">
               <condition>
                     <action ref="aia-ora-java"/>
               </condition>
        </faultName>
```

However, all the runtime faults that are defined in the fault policy file need to be caught in the BPEL process in a catch block, which is specific to the fault.

For more information about defining BPEL catch and catch-all blocks for the synchronous request-response MEP**,** see Guidelines for BPEL Catch and Catch-All Blocks in Synchronous Request-Response,

22.4.1.2. Defining a Fault Policy XML File for Handling Business Faults

The Fault Management Framework will be used to handle the business faults that are for an invoke activity. In other words, only business faults thrown by external services and applications when invoked using the invoke activity are intercepted by the Oracle Fusion Middleware Fault Management Framework, according to the definitions specified in the fault policy file.

The business faults that are internal to the BPEL, business faults thrown by a throw activity, for example, are not intercepted by the Fault Management Framework.

To define a fault policy to intercept Oracle AIA faults:

1. Examine your partner link WSDL and check to determine whether it is throwing any Oracle AIA faults.
2. If it is throwing Oracle AIA faults, look for the partner link namespace and name of the fault in the partner link WSDL.
3. In the fault policy, define a section under Conditions as shown in the example here:

```
<Conditions>

<faultName
xmlns:corecustomerpartyebs="http://xmlns.oracle.com/EnterpriseServices/Cor
e/CustomerParty/V2" name="corecustomerpartyebs:fault">
                <condition>
<test>[ XPath expression to be evaluated for the fault variable
available in the fault]
</test>
                        <action ref="aia-ora-java"/>
                </condition>
          </faultName>
</Conditions>
```

Note: To avoid unnecessary processing, ensure that you specify retry options only when explicitly required.

4. Configure the default condition to call the aia-ora-java action. For example:

```
<Conditions>

<faultName
xmlns:corecustomerpartyebs="http://xmlns.oracle.com/EnterpriseServices/Cor
e/CustomerParty/V2" name="corecustomerpartyebs:fault">
                <condition>
<test>[ XPath expression to be evaluated for the fault variable
available in the fault]
</test>
                        <action ref="aia-ora-java"/>
                </condition>
```

```
          </faultName>

 <faultName>

   <condition>
              <action ref="aia-ora-java"/>
          </condition>
     </faultName>
</Conditions>
```

5. All the business faults that are defined in the fault policy file need to be caught in the BPEL process in a catch-block that is specific to the business fault.

For more information, see Guidelines for BPEL Catch and Catch-All Blocks in Synchronous Request-Response.

22.4.2. Guidelines for BPEL Catch and Catch-All Blocks in Synchronous Request-Response

Each BPEL process should have explicit catch blocks for remote faults, binding faults, business faults (Oracle AIA faults), and any other fault expected on a partner link at design time. Use these guidelines for defining these catch blocks.

22.4.2.1. Handling Business Faults

To handle an internal business fault:

1. In the case of a BPEL process carrying out a throw activity, construct a business fault message (Oracle AIA fault message) and populate the AIA Fault message with the ECID, in fashion similar to the following example:.

```
<sequence name="SequenceBusinessFault">
        <assign name="AssignBusinessFault">
          <copy>
            <from
expression="ora:processXSLT('xsl/EBM_to_Fault.xsl',bpws:getVariableData('E
BM_HEADER'))"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault"/>
          </copy>
          <copy>
            <from expression="'invalid account id'"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultMessage/corec
om:Text"/>
          </copy>
          <copy>
            <from expression="'invalid account id'"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultMessage/corec
```

```
om:Stack"/>
          </copy>
          <copy>
            <from expression="ora:getInstanceId()"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:InstanceID"/>
          </copy>
          <copy>
            <from expression="'BPEL'"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ImplementationCode"/>
          </copy>
          <copy>
            <from expression="ora:getProcessId()"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ID"/>
          </copy>
<copy>
            <from expression="ora:getECID()"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ExecutionContextID"/>
        </assign>
        <throw name="Throw_custom_business_fault" faultName="client:fault"
           faultVariable="AIAFaultMessage"/>
           </sequence>
```

Note: Please ensure that in EBM_to_Fault.xsl, the <corecom:ExecutionContextID/> element is injected under the element <corecom:FaultingService>.

2. Catch the preceding fault message in the catch block. In the catch block:
   - Send the AIA Fault Message as a reply.
   - Invoke the AIAAsyncErrorHandlingBPELProcess with this Oracle AIA fault message as input.
   - Throw the AIA Fault Message that has been caught. This rethrow enables the process to appear as faulted in the Enterprise Manager Console.

To handle an external business fault:

1. In the case of an Invoke activity in the BPEL receiving an AIA fault message as a response, catch the AIA fault message in the catch block. In the catch block:
   - Send the AIA Fault Message as reply.
   - Throw the AIA Fault Message that has been caught. This rethrow enables the process to appear as faulted in the Oracle Enterprise Manager Console.

Note: In this case, we do not invoke the AIAAsyncErrorHandlingBPELProcess because the business fault is already handled by the Oracle Fusion Middleware Fault Management Framework, according to the fault polices defined in the associated fault policy file.

22.4.2.2. Handling Runtime Faults Defined in the Fault Policy File

For each of the runtime faults that has been defined in the fault policy xml file, have a catch block in the BPEL.

To handle runtime faults defined in the fault policy file:

1. In the catch block, construct an Oracle AIA fault message.
2. Send this Oracle AIA fault message as the reply.
3. Rethrow the fault that has been caught. This will enable the process to appear as faulted in the Oracle BPEL Console.

22.4.2.3. Handling Runtime Faults Not Defined in the Fault Policy File

Each BPEL process should also have a catch-all block to process runtime faults that are not caught in catch-blocks and not defined in the fault policy file.

To define the catch-all block:

1. Construct an Oracle AIA fault message. Populate the AIA Fault message with ECID as shown in the following example.

```
<sequence name="SequenceBusinessFault">
        <assign name="AssignBusinessFault">
          <copy>
            <from
expression="ora:processXSLT('xsl/EBM_to_Fault.xsl',bpws:getVariableData('E
BM_HEADER'))"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault"/>
          </copy>
          <copy>
            <from expression="'invalid account id'"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultMessage/corec
om:Text"/>
          </copy>
          <copy>
            <from expression="'invalid account id'"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultMessage/corec
om:Stack"/>
          </copy>
          <copy>
```

```
            <from expression="ora:getInstanceId()"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:InstanceID"/>
          </copy>
          <copy>
            <from expression="'BPEL'"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ImplementationCode"/>
          </copy>
          <copy>
            <from expression="ora:getProcessId()"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ID"/>
          </copy>
<copy>
            <from expression="ora:getECID()"/>
            <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ExecutionContextID"/>
        </assign>
        <throw name="Throw_custom_business_fault" faultName="client:fault"
           faultVariable="AIAFaultMessage"/>
          </sequence>
```

Note: Please ensure that in EBM_to_Fault.xsl, the <corecom:ExecutionContextID/> element is injected under the element <corecom:FaultingService>.

2. Invoke the AIAAsyncErrorHandlingBPELProcess with this Oracle AIA fault message as input.
3. Send this Oracle AIA fault message as the reply.
4. Throw AIA fault message. This will enable the process to appear as faulted in the Oracle Enterprise Manager Console.
5. Unless otherwise required, these catch and catch-all blocks can be defined at the top-level scope and do not need to be defined at the scope for each partner link.

For more information about the Fault Management Framework, see Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite.

22.4.3. Guidelines for Configuring Mediator for Handling Business Faults

Oracle Mediator provides fault policy-based error handling for business faults. However, fault policies are applicable to parallel routing rules only. For sequential routing rules, the fault goes back to the caller (that has invoked the mediator) and it is the responsibility of the caller to handle the fault.

We recommend using only sequential routing rules.

When a service invoked by the mediator throws a business fault, this fault needs to be propagated up to the service that has invoked the mediator.

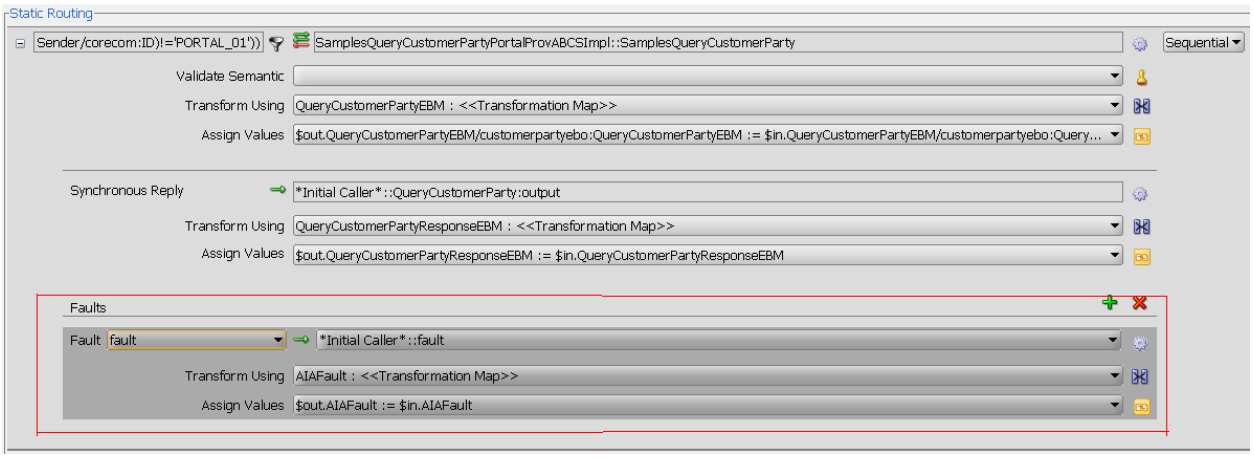
This section discusses how to configure the mediator to handle business exceptions returned by the services invoked by the mediator.

Here are some points to consider:

- When the mediator invokes a service, the invoked service can throw any of the business faults that are defined in its WSDL.
- The fault that is thrown by the invoked service is propagated back to the mediator.

To configure the mediator to handle business exceptions returned by the services invoked by the mediator:

1. Open the mediator in design-mode using JDeveloper.
2. Using the routing rules panel, assign the inbound fault reaching the mediator to the outbound fault, which is now propagated by the mediator to the service that invoked it.



Assignment of the faults in the mediator

3. As shown in the preceding diagram, assign the inbound fault from the target service's WSDL operation to the outbound fault that is propagated by the mediator to its invoker service.

For more information about how to assign faults, see Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite.

22.5. Implementing Error Handling and Recovery for the Asynchronous Message Exchange Pattern to Ensure Guaranteed Message Delivery

This section discusses the following topics:

- Overview

- Configuring Milestones
- Configuring Services Between Milestones
- Guidelines for BPEL Catch and Catch-All Blocks
- Guidelines for Defining Fault Policies
- Configuring Fault Policies to Not Issue Rollback Messages
- Using the Message Resubmission Utility API

22.5.1. Overview

In the context of AIA, guaranteed message delivery for the asynchronous MEP means that the message initiated from a sender is persisted until it is successfully delivered to and acknowledged by the receiver, if acknowledgement is expected.

The sender and receiver are not necessarily the participating applications. Rather, they are logical milestones in an Oracle AIA integration flow. Multiple milestones could be in an Oracle AIA integration scenario.

Temporary unavailability of any hardware or software service in an asynchronous message flow does not result in a lost message or a delivery failure. The Error Handling framework provides a way for the message to be persisted until the hardware or software service becomes available.

Once an integration administrator has been notified of the unavailable resource by the Error Console, she can address the resource issue. The integration administrator can then use the Message Resubmission Utility to resubmit the persisted message into the integration scenario from the appropriate transaction milestone point, enabling its delivery to the next component or milestone.

For more information about running the Message Resubmission Utility, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Using the Message Resubmission Utility."

These points summarize primary aspects of an implementation of the guaranteed message delivery programming model for the asynchronous MEP.

- Message persistence milestones

  Messages are picked from a persistence store (source), processed, and pushed to the next persistence store (target). The message is not removed from the source until it has been successfully processed and delivered to the target. The source and target may be applications. Each persistence store represents a milestone and may be a database, file system, JMS queue, or JMS topic.

  For more information about configuring milestones, see Configuring Milestones.

- Global transaction

  These tasks must be accomplished as a part of the global transaction:

  - Picking up the message from the source.

- Processing the message by one or more services.
- Delivering the message to the target.

The initiation of a service from the source with an input message initiates a transaction. All the services invoked downstream participate in this global transaction. This global transaction ends or is committed when the message is successfully delivered to the target and removed from the source.

In the case of an error, an exception is raised and the transaction initiated is rolled back with the message safe in the source. The message is either in the source or target and is not lost.

For more information about configuring the global transaction, see Configuring Services Between Milestones.

- Error handling and recovery

  Any exceptions due to system or business errors must generate a rollback of all preceding services and trigger a single error notification to the Integration Administrator. This requires marking the message in the source as faulted, preventing it from being processed until the error condition is removed.

  For more information about configuring error rollback, see Configuring Fault Policies to Not Issue Rollback Messages.

  In case of system errors, once the exception condition has been removed, the faulted messages in the source must be reset. This enables them to be resubmitted. The Message Resubmission Utility can be used to resubmit the messages for reprocessing by the correct source.

  In case of business errors, the faulted messages in the source must be removed and sent to fallout management for further action. Fallout management is a custom implementation in which the messages encountering business errors are segregated and processed separately.

  For example, suppose that orders submitted for processing encounter a business error. As a part of an Order Fallout Management implementation, the Order message and error message are routed to an application that introspects the error messages and raises a trouble ticket that provides an explanation of the error and the suggested remedial action. After the remedial action is taken, the order is reprocessed.

  Error handling and recovery for the asynchronous MEP are implemented as follows to ensure guaranteed message delivery:

  1. Ensure that each message has a unique message identifier.
  2. Populate the EBM header with the source milestone identifier.
  3. Ensure that the fault notification contains the message identifier and source milestone identifier of the faulted message.
  4. Use the Message Resubmission Utility to recover and resubmit a faulted message.

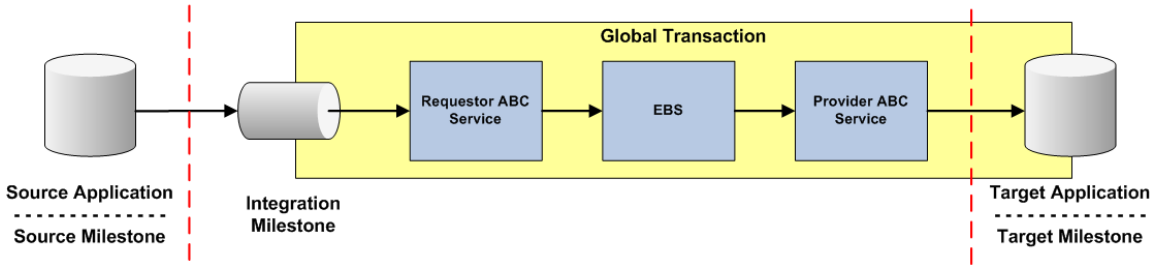
For more information about how to implement these configurations, see Configuring Milestones and Configuring Services Between Milestones.
For more information about using the Message Resubmission Utility, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Using the Message Resubmission Utility."
For more information about the Message Resubmission Utility API, see Using the Message Resubmission Utility API.

22.5.2. Configuring Milestones

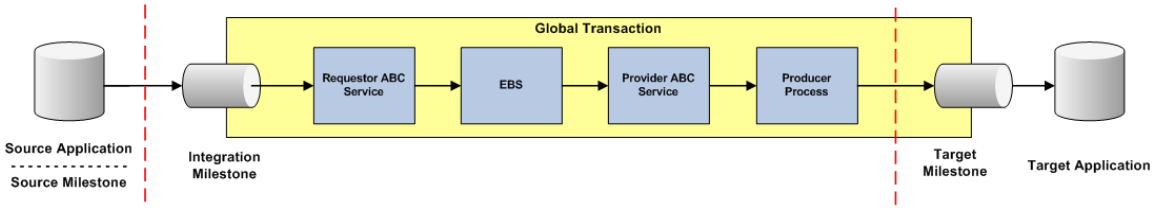
As a part of implementing error handling and recovery for the asynchronous MEP to ensure guaranteed message delivery, messages must be persisted at milestones. The movement of messages between milestones must be guaranteed.

A milestone can be a JMS queue or a JMS topic.

These diagrams illustrate a few possible milestone locations across an integration flow.



Integration flow in which the receiver target milestone is the target participating application



Integration flow in which the receiver target milestone is within the global transaction space

22.5.3. Configuring Services Between Milestones

Completing these activities will ensure that the services between milestones are configured to provide error handling and recovery for the asynchronous MEP to ensure guaranteed message delivery.

22.5.3.1. Populating Message Resubmission Values

These parameters in the EBM header must be populated in the JMS consumer service transformation:

- SenderResourceTypeCode

  Indicates the type of resource or system in which the rolled-back message is stored, whether Queue or Topic.

- SenderResourceID

  Identification of the resource/system of type SenderResourceTypeCode.

- SenderMessageID

  Identification of the message persisted in the resource/system associated with type SenderResourceTypeCode.

Scenario 1

When an ABM in the JMS Queue or Topic is triggering the JMS Consumer Service, then the preceding information needs to be passed to the requester ABCS as a part of the ABM header.

For more information, see Populating the ABM with Message Resubmission Values in JMSConsumerAdapter.

In the JMS Consumer Service, this information needs to be configured to be sent to the ABM header. In the requester ABCS, this information is extracted from the ABM header and sent to the EBM header in the transformation.

For more information, see Populating the EBM Header with Resubmission Values in the Requester ABCS.

Scenario 2

When an EBM in the JMS Queue or Topic is triggering the JMS consumer service, use an EBM-to-EBM transformation and populate (overwrite) the resubmission values in the EBM message. The following values in the EBM header fields of the inbound message should be overwritten with the new values for the ResourceType, Resource Name, and JMS Message ID pertaining to the current milestone.

- <corecom:SenderResourceTypeCode>
- <corecom:SenderResourceID>
- <corecom:SenderMessageID>

Following is a sample code snippet from the EBM-to-EBM XSL:

```
<corecom:IntermediateMessageHop>
            <corecom:SenderResourceTypeCode>
              <xsl:value-of
select="/custebo:CreateCustomerPartyListEBM/corecom:EBMHeader/corecom:Faul
tNotification/corecom:FaultMessage/corecom:IntermediateMessageHop/corecom:
SenderResourceTypeCode"/>
              </corecom:SenderResourceTypeCode>
            <corecom:SenderResourceID>
              <xsl:value-of select="/
custebo:CreateCustomerPartyListEBM/corecom:EBMHeader/corecom:FaultNotifica
tion/corecom:FaultMessage/corecom:IntermediateMessageHop/corecom:SenderRes
ourceID"/>
            </corecom:SenderResourceID>
            <corecom:SenderMessageID>
```

```
                <xsl:value-of
select='mhdr:getProperty("in.property.jca.jms.JMSMessageID")'/>
            </corecom:SenderMessageID>
</corecom:IntermediateMessageHop>
```

22.5.3.1.1. Populating the ABM with Message Resubmission Values in JMSConsumerAdapter

Ensure that the ABM is enriched with the following content:

- The unique Message ID. The JMSMessageID in the JMS header is used as the value.
- The resource name. This is the JMS Queue/Topic name. This is the same as the <svcdoc: ResourceName> value in the JMSConsumerAdapter's composite.xml.
- The type of the resource. The possible values are Queue or Topic.

Use specifically designated fields in the ABM for this purpose. These fields are identified at the time of design.

Within the mediator-based JMSConsumerAdapter:

- Use the transformation step in the mediator routing rule.
- In the XSL used by the transformation, assign the values of the JMS Message ID, Resource Name, and Resource Type to the specifically designated fields of the ABM.

The following example illustrates how to assign the JMS Message ID to the ABM:

```
<xsl:attribute name="MessageId">
<xsl:value-of
select='mhdr:getProperty("in.property.jca.jms.JMSMessageID")'/>
</xsl:attribute>
```

Note that in this example, the assumption is that the ABM has a specific attribute, MessageId, to which the JMS Message ID is assigned.

In some cases, only one designated field may be available in the ABM. In such scenarios, concatenate the values of the JMS Message ID, Resource Name, and Resource Type and assign the value to the specific designated field of the ABM. While concatenating these values, we recommend using ***::*** as the separator.

For example, consider a Siebel Customer ABM, ListOfCmuAccsyncAccountIo. In this ABM, assume that the MessageId attribute of the ListOfCmuAccsyncAccountIo element is designated to hold the information about JMS Message ID, Resource Name, and Resource Type at design time. The following code snippet illustrates how to concatenate the data and assign it to the ABM.

```
<xsl:attribute name="MessageId">
        <xsl:value-of
select='concat(mhdr:getProperty("in.property.jca.jms.JMSMessageID"),"::
SampleQueue","::Queue")'/>
</xsl:attribute>
```

22.5.3.1.2. Populating the EBM Header with Resubmission Values in the Requester ABCS

Note: Ensure that the <corecom: FaultNotification/> element is inserted into the EBM header when transforming the ABM to the EBM.

When the ABM arrives at the requester ABCS, it contains the JMS Message ID, Resource Name, and Resource Type values because these values were already made available in the designated fields of the ABM.

Extract these values from the ABM and enter the following elements in the EBM header within the <corecom:IntermediateMessageHop> element:

- <corecom:SenderResourceTypeCode>: Populate it with the Resource Type value
- <corecom:SenderResourceID>: Populate it with the Resource Name value
- <corecom:SenderMessageID>: Populate it with the JMS Message ID value

The XSL that performs the ABM-to-EBM transformation should accomplish this task. The task is straightforward when three different ABM fields are designated for holding the three resubmission values. For example:

```
<corecom:IntermediateMessageHop>
            <corecom:SenderResourceTypeCode>
              <xsl:value-of select="[xpath to the ABM field holding the
ResourceType]"/>
              </corecom:SenderResourceTypeCode>
            <corecom:SenderResourceID>
              <xsl:value-of select="[xpath to the ABM field holding the
Resource Name]"/>
            </corecom:SenderResourceID>
            <corecom:SenderMessageID>
              <xsl:value-of select="[xpath to the ABM field holding the
Message Id]"/>
            </corecom:SenderMessageID>
</corecom:IntermediateMessageHop>
```

The following content discusses how resubmission values are extracted from the ABM and assigned to the EBM header when all three resubmission values are concatenated and assigned to a single designated field in the ABM.

For example, consider a Siebel Customer ABM, ListOfCmuAccsyncAccountIo. In this ABM, assume that the MessageId attribute of the ListOfCmuAccsyncAccountIo element has been designated to hold the information about the JMS Message ID, Resource Name, and Resource Type, concatenated using ***::*** as a separator. See the previous section for more information.

The following code snippet will extract the resubmission values and assign them to EBM header elements.

```
<xsl:variable name="MsgId">
            <xsl:value-of select="substring-
after(/seblcustabo:ListOfCmuAccsyncAccountIo/@MessageId,'::')"/>
          </xsl:variable>
         <corecom:IntermediateMessageHop>
           <corecom:SenderResourceTypeCode>
             <xsl:value-of select="substring-after($MsgId,'::')"/>
          </corecom:SenderResourceTypeCode>
           <corecom:SenderResourceID>
             <xsl:value-of select="substring-before($MsgId,':: ')"/>
           </corecom:SenderResourceID>
           <corecom:SenderMessageID>
             <xsl:value-of select="substring-
before(/seblcustabo:ListOfCmuAccsyncAccountIo/@MessageId,'::')"/>
```

```
        </corecom:SenderMessageID>
    </corecom:IntermediateMessageHop>
```

The XSL that performs the ABM-to-EBM transformation should accomplish this task.

For more information about resubmitting messages, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Using the Message Resubmission Utility."

22.5.3.2. Configuring All Services to Participate in a Single Global Transaction

Configure a single global transaction as follows:

- Ensure that no commit points are between two milestones.
- Ensure that the work done between two milestones is one logical unit of work.

For more information about configuring the global transaction, see Designing and Developing Enterprise Business Services, Designing Application Business Connector Services, Constructing the ABCS, and Designing and Constructing Enterprise Business Flows.

22.5.4. Guidelines for BPEL Catch and Catch-All Blocks

This section discusses the following topics:

- Handling Runtime Faults Defined in the Fault Policy File
- Handling Runtime Faults Not Defined in the Fault Policy File

22.5.4.1. Handling Runtime Faults Defined in the Fault Policy File

For each of the runtime faults that has been defined in the fault policy xml file, have a catch block in the BPEL. In the catch block, rethrow the fault that has been caught. This will enable the process to appear as faulted in the Oracle Enterprise Manager Console.

22.5.4.2. Handling Runtime Faults Not Defined in the Fault Policy File

Each BPEL process should also have a catch-all block to process runtime faults that are not caught in catch-blocks and not defined in the fault policy file.

To define the catch-all block:

1. Construct an Oracle AIA fault message. Populate the AIA Fault message with ECID as shown in the following example.

```
<copy>
```

```
        <from expression="ora:getECID()"/>
         <to variable="AIAFaultMessage" part="AIAFault"
query="/corecom:Fault/corecom:FaultNotification/corecom:FaultingService/co
recom:ExecutionContextID"/>
     </copy>
```

2. Invoke the AIAAsyncErrorHandlingBPELProcess with this Oracle AIA fault message as input.
3. Throw the AIA fault message. This will enable the process to appear as faulted in the Oracle Enterprise Manager Console.
4. Unless otherwise required, these catch and catch-all blocks can be defined at the top-level scope and do not need to be defined at the scope for each partner link.

For more information, see Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite.

22.5.5. Guidelines for Defining Fault Policies

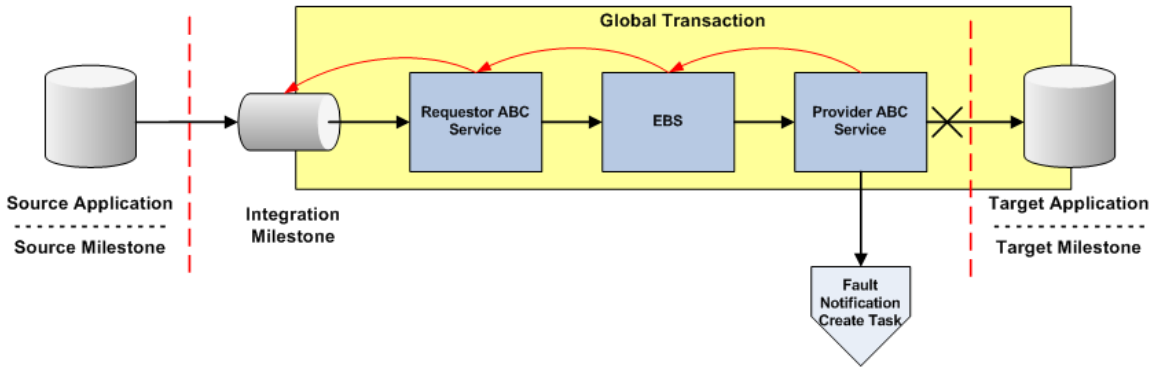
For more information, see Defining a Fault Policy XML File for Handling Runtime Faults.

22.5.6. Configuring Fault Policies to Not Issue Rollback Messages

According to the guaranteed message delivery programming model, when a message cannot be delivered to a service or component in the flow of a global transaction, the message is rolled back to the appropriate source milestone. This source milestone corresponds to an Oracle Advanced Queue, JMS Topic, or Mediator Resequencer Store. The message will be persisted here until it can be resubmitted for delivery to the service or component.

The BPEL processes along the transaction rollback path will issue fault messages and should be configured to not issue rollback messages as well. The configuration deciphers a rollback transaction so that services in the rollback path do not issue unnecessary notifications.

Without this configuration to suppress rollback messages, these processes will issue unnecessary notifications. For example, in the transaction rollback flow illustrated in the diagram, redundant rollback notifications would be sent out by the Requester ABCS, in addition to the one sent out by the Provider ABCS, which is the only one that should be issued.



Transaction rollback flow

To suppress unnecessary notifications for a rollback transaction:

- Use bpelx:rollback instead of throw in the catch blocks.

```
<throw name="ThrowEBSFault" faultName="bpelx:rollback"/>
```

- Use a Java snippet to invoke the Oracle AIA Error Handler.

```
<bpelx:exec name="Java_Embedding_1" language="java" version="1.5">
   <![CDATA[
   oracle.apps.aia.core.eh.InvokeBusinessErrorHandler.process((oracle.xml.
   parser.v2.XMLElement)getVariableData("inputVariable","FaultMessage","/n
   s1:Fault"));]]>
</bpelx:exec>
```

- Add an empty no-op action to the fault policies of Mediator and BPEL processes along the transaction rollback flow. This empty no-op action is ***aia-no-action***.

When a Mediator or BPEL process receives a rollback message, the control will be directed to the class ***oracle.apps.aia.core.eh.CompositeJavaNoAction***, which is implemented against the ***aia-no-action*** action. The ***oracle.apps.aia.core.eh.CompositeJavaNoAction*** class is an empty operation, meaning that it does nothing, and thus suppresses further notifications in the rollback flow.

These sample BPEL and Mediator fault policies illustrate the way in which these conditions should be defined in impacted fault policy files.

The ***aia-no-action*** fault policy contains a filter expression to perform no action in the case of the rollback fault ORABPEL-02180.

```
<?xml version="1.0" encoding="UTF-8"?>
<faultPolicy version="2.0.1"
id="SamplesCreateCustomerPartyPortalProvABCSImplFaultPolicy"
xmlns:env="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns="http://schemas.oracle.com/bpel/faultpolicy"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
   <Conditions>
         <faultName
xmlns:plmfault="http://xmlns.oracle.com/EnterpriseServices/Core/CustomerPa
rty/V2" name="plmfault:fault">
               <condition>
                     <test>$fault.summary/summary[contains(., "ORABPEL-
02180")]</test>
                     <action ref="aia-do-nothing"/>
```

```
                </condition>
                <condition>
                      <action ref="aia-ora-java"/>
                </condition>
          </faultName>
          <faultName>
                <condition>
                      <test>$fault.summary/summary[contains(., "ORABPEL-
02180")]</test>
                      <action ref="aia-do-nothing"/>
                </condition>
                <condition>
                      <action ref="aia-ora-java"/>
                </condition>
          </faultName>
    </Conditions>
    <Actions>
          <!--  This action will attempt 8 retries at increasing intervals
of 2, 4, 8, 16, 32, 64, 128, and 256 seconds. -->
          <Action id="aia-ora-retry">
                <retry>
                      <retryCount>1</retryCount>
                      <retryInterval>2</retryInterval>
                      <exponentialBackoff/>
                      <retryFailureAction ref="aia-ora-java"/>
                      <retrySuccessAction ref="aia-ora-java"/>
                </retry>
          </Action>
          <!--  This is an action will cause a replay scope fault -->
          <Action id="ora-replay-scope">
                <replayScope/>
          </Action>
          <!-- This is an action will bubble up the fault  -->
          <Action id="ora-rethrow-fault">
                <rethrowFault/>
          </Action>
          <!-- This is an action will mark the work item to be "pending
recovery from console" -->
          <Action id="ora-human-intervention">
                <humanIntervention/>
          </Action>
          <!--  This action will cause the instance to terminate  -->
          <Action id="ora-terminate">
                <abort/>
          </Action>
          <Action id="aia-do-nothing">
                <javaAction
className="oracle.apps.aia.core.eh.CompositeJavaNoAction"
defaultAction="ora-rethrow-fault">
                      <returnValue value="REPLAY" ref="ora-terminate"/>
                      <returnValue value="RETRHOW" ref="ora-rethrow-
fault"/>
                      <returnValue value="ABORT" ref="ora-terminate"/>
                      <returnValue value="RETRY" ref="aia-ora-retry"/>
                      <returnValue value="MANUAL" ref="ora-human-
intervention"/>
                </javaAction>
```

```
        </Action>
        <Action id="aia-ora-java">
              <javaAction
className="oracle.apps.aia.core.eh.CompositeJavaAction"
defaultAction="ora-rethrow-fault">
                    <returnValue value="REPLAY" ref="ora-terminate"/>
                    <returnValue value="RETHOW" ref="ora-rethrow-
fault"/>
                    <returnValue value="ABORT" ref="ora-terminate"/>
                    <returnValue value="RETRY" ref="aia-ora-retry"/>
                    <returnValue value="MANUAL" ref="ora-human-
intervention"/>
              </javaAction>
        </Action>
   </Actions>
</faultPolicy>
```

22.5.7. Using the Message Resubmission Utility API

The Message Resubmission Utility API enables external programs to use the functionality of enabling a message that is in error state to be ready again to be consumed for a transaction. This utility would typically be run after the associated problem that caused the message to end in error is fixed.

For more information about the Resubmission Utility, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Using the Message Resubmission Utility."

22.6. How to Configure AIA Services for Notification

This section discusses the standard configuration steps that need to be performed when you are handling a BPEL fault.

This section discusses how to:

- Define corrective action codes.
- Define error message codes.

For more information about how to define notification roles, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide*, "Setting Up Error Handling."

22.6.1. Defining Corrective Action Codes

For faults that are *not* due to invocation of external services and applications using an ***invoke*** activity, define corrective action codes and details in the oracle.apps.aia.core.eh.i18n.EHCorrectiveActionRB class. This is a ListResourceBundle and contains the key-value pairs.

This custom XPath function is available to get details from this resource bundle in a localized format:

```
Signature: aia:getCorrectiveAction (String key, String locale, String
delimiter)
```

Parameter details include:

- Key

  The corrective action code.

- Locale

  A concatenated string of language code, country code, and variant. For example, en-US-WIN.

- Delimiter

  The delimiter used in Locale parameter, such as -.

22.6.2. Defining Error Message Codes

For faults that are not due to invocation of external services and applications using an invoke activity, define error message codes and details in the oracle.apps.aia.core.eh.i18n.EHResourceBundle class. This is a ListResourceBundle and contains the key-value pairs.

This custom XPath function is available to get details from this resource bundle in a localized format:

```
Signature: aia:getErrorMessage (String key, String locale, String
delimiter)
```

Parameter details include:

- Key

  The corrective action code.

- Locale

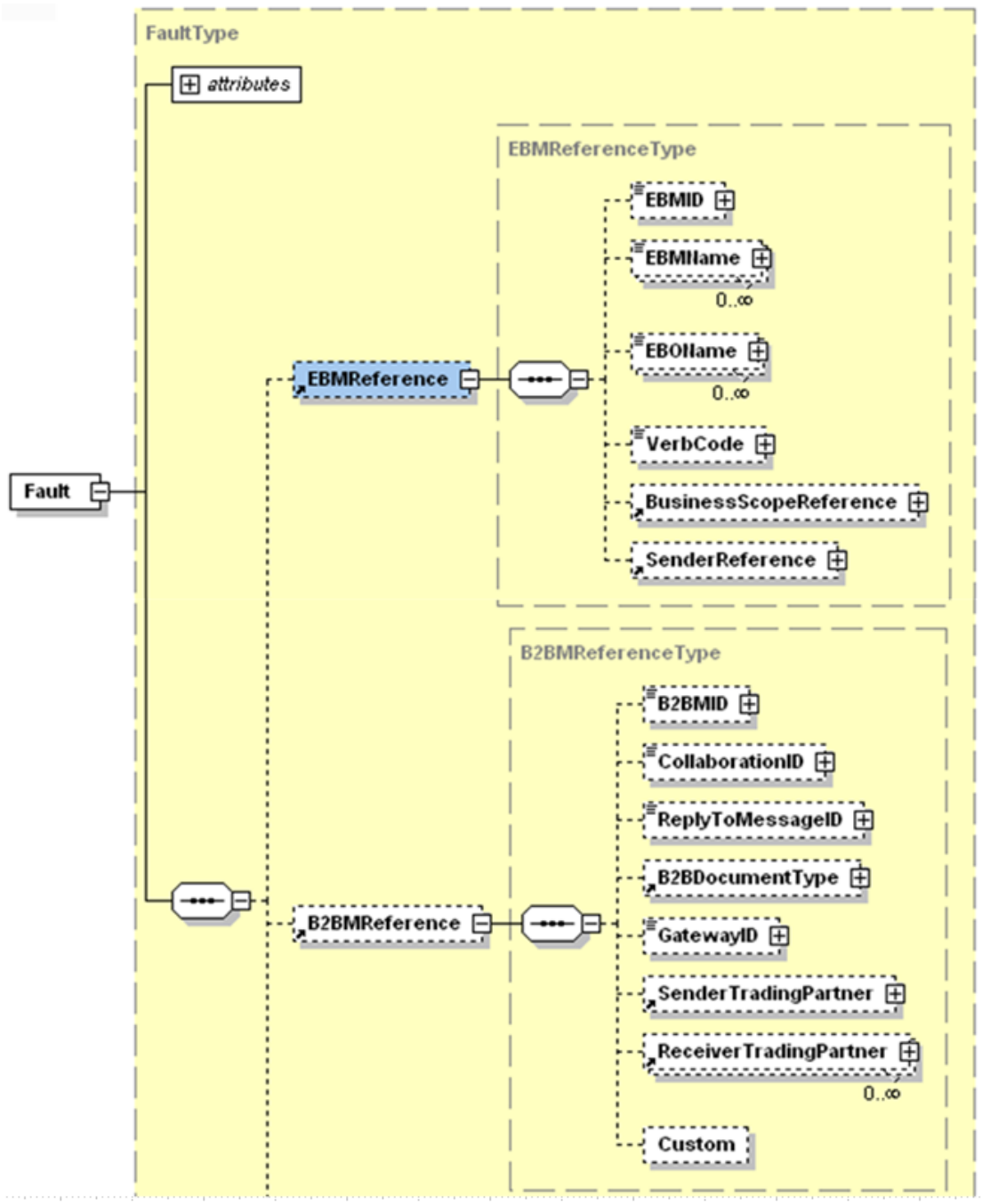
  A concatenated string of language code, country code, and variant, for example, en-US-WIN.

- Delimiter

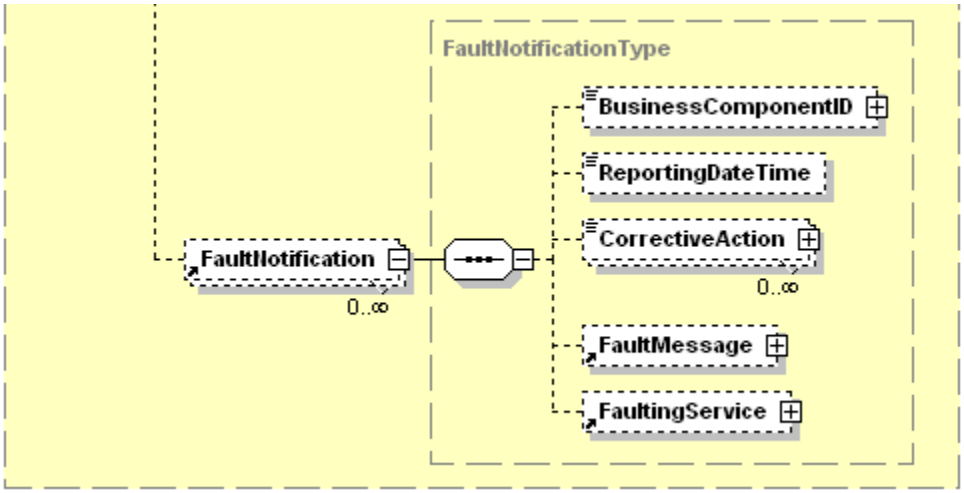
  The delimiter used in Locale parameter, such as -.

22.7. Describing the Oracle AIA Fault Message Schema

The top-level element of this schema is Fault. It has three elements: EBMReference, B2BMReference, and FaultNotification.



Fault element and its child elements (1 of 2)

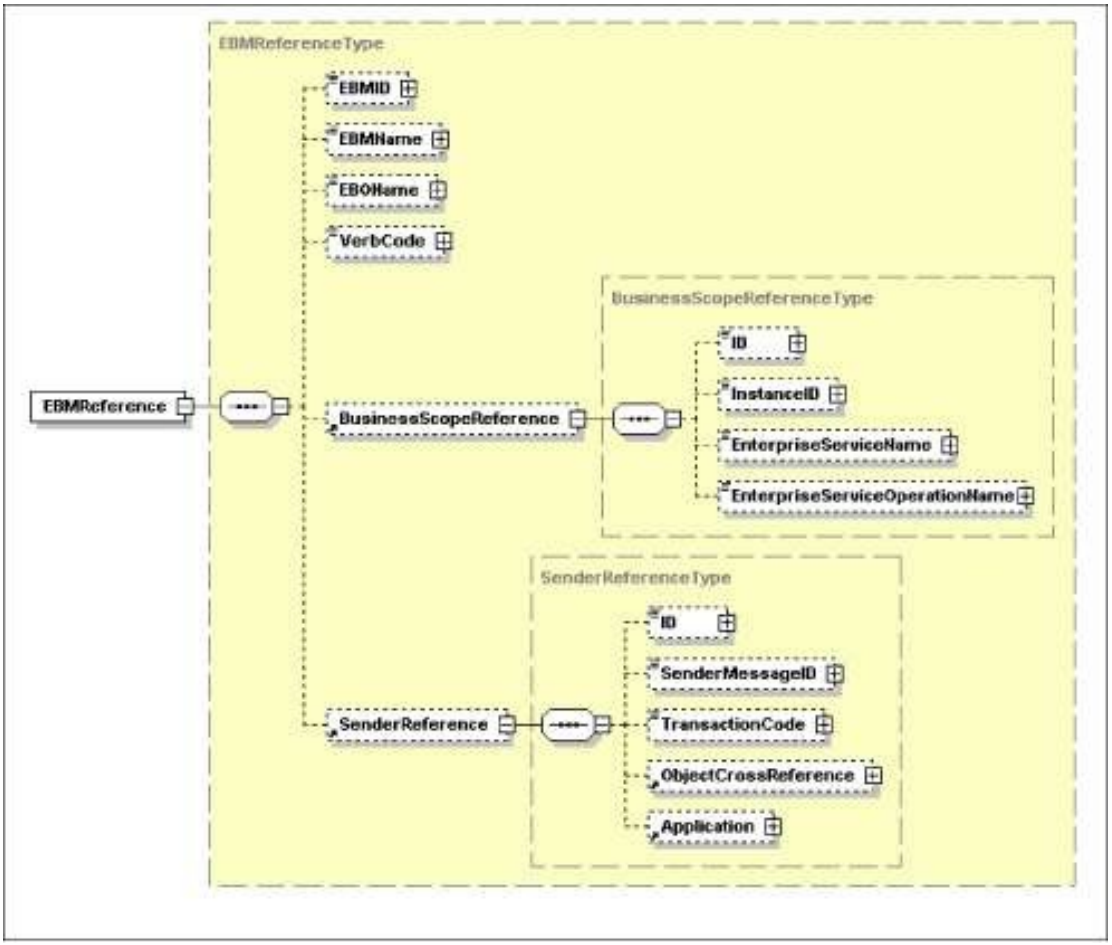


Fault element and its child elements (2 of 2)

Name	Purpose	Details
EBMReference	Provides contextual information about the fault instance. All values are taken from the EBM header of the EBM in a faulted service instance.	**For more information,** see Describing the EBMReference Element.
B2BMReference	Provides business-to-business (B2B)-specific details when an error is in a B2B flow from Oracle AIA.	**For more information,** see Describing the B2BMReference Element.
FaultNotification	Provides actual details of the fault.	**For more information,** see Describing the FaultNotification Element.

22.7.1. Describing the EBMReference Element

This section provides details about the EBMReference element in the Oracle AIA fault message schema.



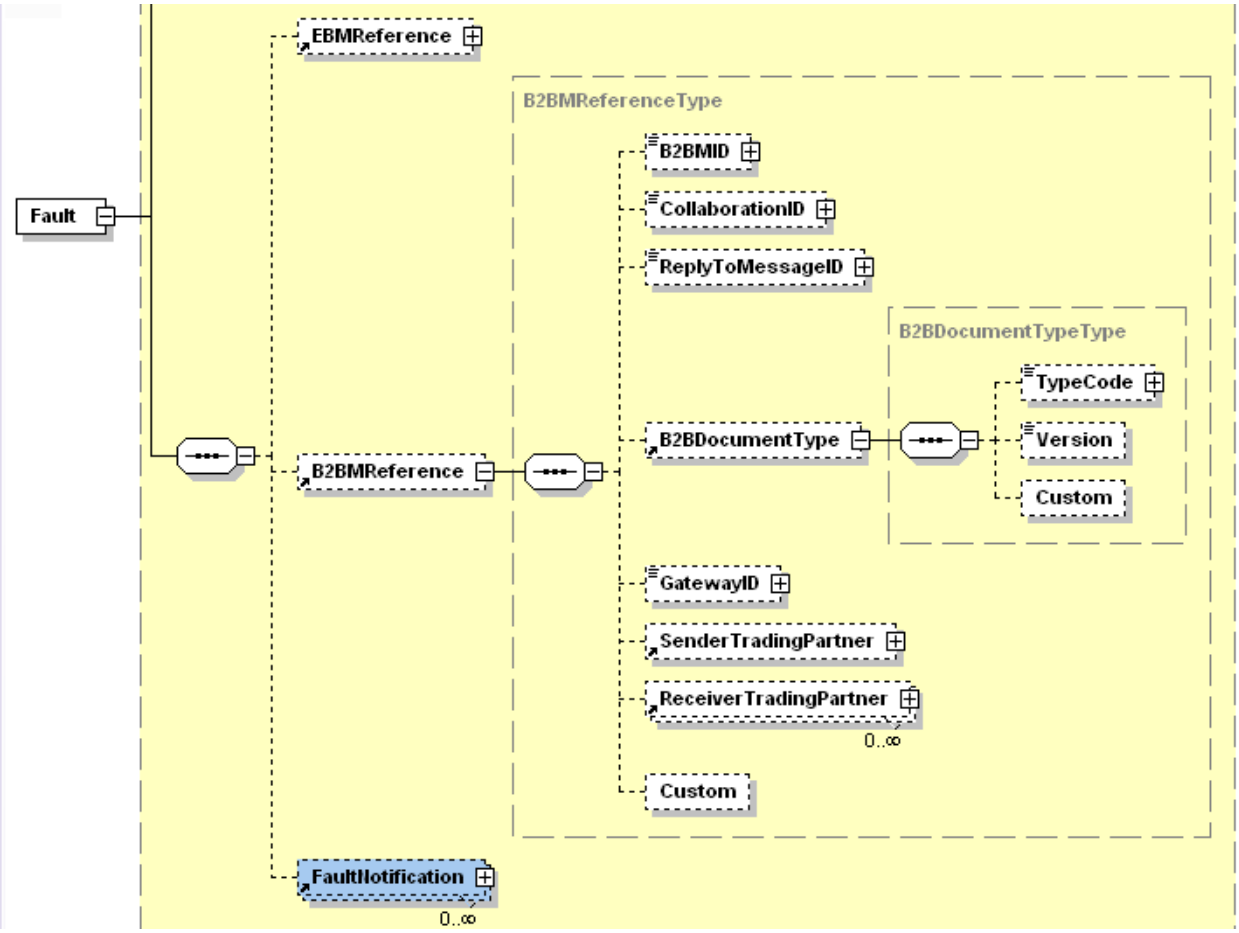
EBMReference element and its child elements

Name	Purpose	Details
EBMID	Provides the EBMID in the message.	**For more information,** see Introducing EBM Header Concepts.
EBMName	Provides the EBMName in the message.	**For more information,** see Introducing EBM Header Concepts.
EBOName	Provides the EBOName in the message.	**For more information,** see Introducing EBM Header Concepts.
VerbCode	Provides the VerbCode in the message.	**For more information,** see Introducing EBM Header Concepts.

Name	Purpose	Details
BusinessScopeReference	Provides the BusinessScopeReference in the message. Provides details about the end-to-end scenario in which the faulted service instance was participating. **Note:** This is the instance of the BusinessScopeReference in which BusinessScopeTypeCode is equal to BusinessProcess.	**For more information,** see Introducing EBM Header Concepts.
SenderReference	Provides the SenderReference in the message.	**For more information,** see Introducing EBM Header Concepts.

22.7.2. Describing the B2BMReference Element

This section provides details about the B2BMReference element in the Oracle AIA fault message schema.



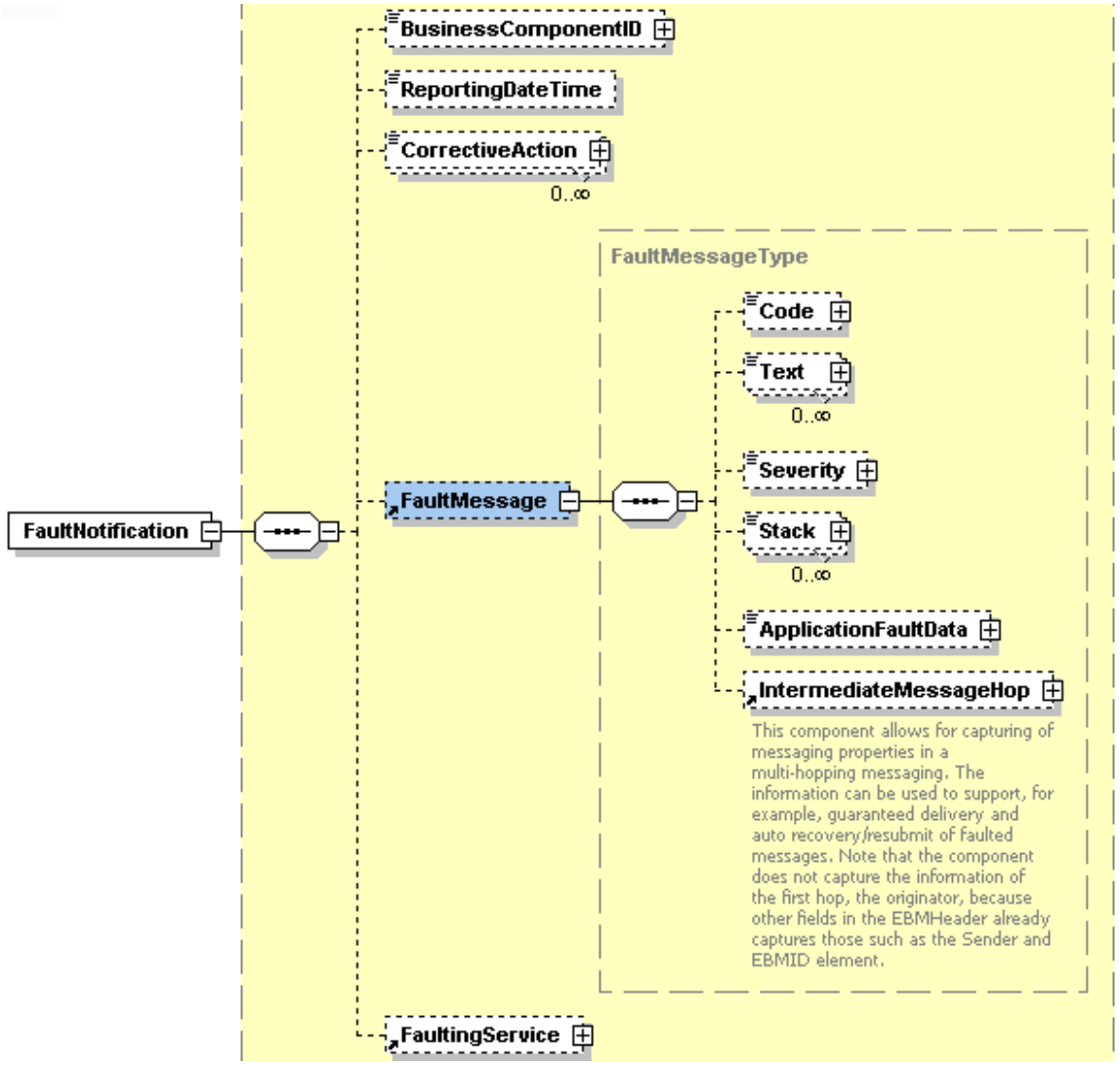
B2BMReference element and its child elements

Name	Purpose	Details
B2BMID	Provides the message ID used to identify the transaction in Oracle B2B.	A user can use this message ID to query for a failed business message in Oracle B2B and retry the failed transaction. **For more information,** Introduction to B2B Integration Using AIA.
CollaborationID	Provides the collaboration ID that is common across multiple request-and-response messages related to the same business transaction.	**For more information,** Introduction to B2B Integration Using AIA.
ReplyToMessageID	Provides the ID of the reply-to message.	**For more information,** Introduction to B2B Integration Using AIA.
B2BDocumentType/TypeCode	Provides the document type of the failed	This information from the fault can be

Name	Purpose	Details
	transaction in Oracle B2B.	used to define document-type-specific error processing. For example, you could assign errors resulting from different document types to different users for resolution. **For more information,** Introduction to B2B Integration Using AIA.
B2BDocumentType/Version	Provides the document type version of the failed transaction in Oracle B2B.	**For more information,** Introduction to B2B Integration Using AIA.
SenderTradingPartner/TradingPartnerID	Provides the name of the sending trading partner in the B2B flow.	**For more information,** Introduction to B2B Integration Using AIA.
ReceiverTradingPartner/TradingPartnerID	Provides the name of the receiving trading partner in the B2B flow.	**For more information,** Introduction to B2B Integration Using AIA.
GatewayID	Provides the name of the B2B software used to initiate the flow, for example, Oracle B2B.	**For more information,** Introduction to B2B Integration Using AIA.

22.7.3. Describing the FaultNotification Element

This section provides details about the FaultNotification element in the Oracle AIA fault message schema.

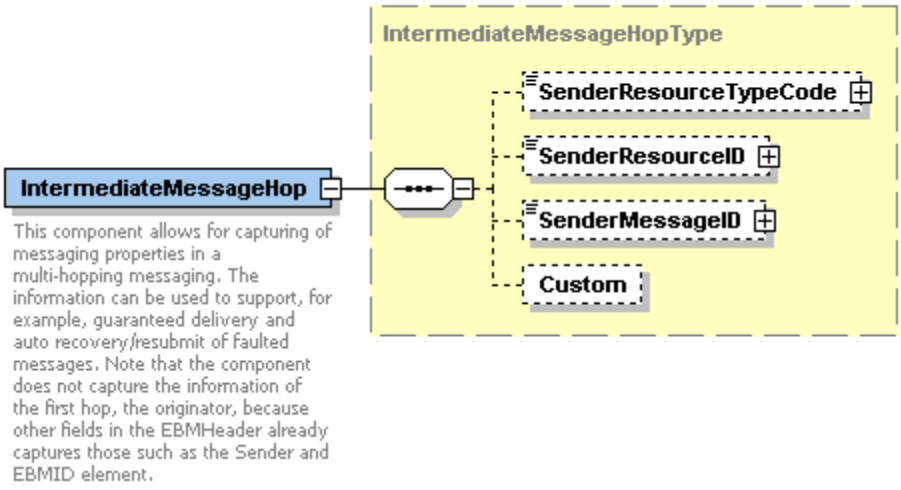


FaultNotification element and its child elements

Name	Purpose	Details
BusinessComponentID	Unique key for the application.	Provides an agnostic representation of the object instance.
ReportingDateTime	Provides the date and time at which the service faulted.	The date and time at which the service faulted.
CorrectiveAction	Provides the possible corrective action for the fault.	The corrective action for the fault.
FaultMessage	Provides details of the actual fault message.	See the “FaultMessage Element” section subsequently.
FaultingService	Provides details of the faulting service.	See the “FaultingService Element” section subsequently.

22.7.3.1. FaultMessage Element

Name	Purpose	Details
Code	Provides the error code.	This is the fault code that was received.
Text	Provides error details.	This describes the details of the fault.
Severity	Provides the severity of the error.	This is the severity of the fault expressed as an integer.
Stack	Provides the error stack.	This is the complete fault stack.
ApplicationFaultData	Enables the fault message to be extended to accept any kind of XML input.	Enables a fault message to be extended to include any kind of XML input, as decided by the implementation scenario. **For more information** about extending fault messages, see Extending Fault Messages.
IntermediateMessageHop	Captures properties specific to a message in a multi-hop transaction.	Properties that are captured here can be used to support use cases implementing guaranteed message delivery and message recovery. **For more information** about implementing guaranteed message delivery and message recovery, see Implementing Error Handling and Recovery for the Asynchronous Message Exchange Pattern to Ensure Guaranteed Message Delivery.



IntermediateMessageHop element

22.7.3.2. IntermediateMessageHop Element

Name	Purpose	Details
SenderResourceTypeCode	Used for storing the type of resource or system that is the sender of this message in the multi-hopping messaging layer.	Example values of this element are Queue, Topic, or Resequence Store.
SenderResourceID	Provides identification of the resource or system associated with the SenderResourceTypeCode.	Identification of the resource or system associated with the SenderResourceTypeCode.
SenderMessageID	Provides message identification in the context of the resource or system associated with the SenderResourceTypeCode.	Message identification in the context of the resource or system associated with the SenderResourceTypeCode.

22.7.3.3. FaultingService Element

Name	Purpose	Details
ID	Provides the date and time at which the service faulted.	This is the name of the faulting service.
ImplementationCode	Provides the possible corrective action for the fault.	This is a string describing the type of service that faulted. Possible values are BPEL, JAVA, and OTHER.
InstanceID	Provides the details of the actual fault message.	This is the instance ID of the faulted service. If the service is a BPEL process, this is the BPEL instance ID.
ExecutionContextID	Provides the value for the ECID.	This is an ID generated for a group of service invocations/executions.

22.8. Extending Fault Messages

This section discusses the following topics:

- Overview
- Extending a Fault Message

22.8.1. Overview

When an error occurs within an integration flow, within a Mediator service or BPEL process, the Error Handling framework captures the error within a fault message. This fault message is made available in the error details within the Oracle BPM Worklist.

For more information about using the Oracle BPM Worklist with Oracle AIA error handling, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Using the Oracle BPM Worklist."

Fault message content is defined by the FaultType message schema definition in Meta.xsd, which is located in \EnterpriseObjectLibrary\Infrastructure\V1\Meta.xsd. If your fault message requirements are not met by the default elements of the schema, you can use the ApplicationFaultMessage element included in the schema to extend the scope of the fault details captured in the message.

For more information about the fault message schema, see Describing the Oracle AIA Fault Message Schema.

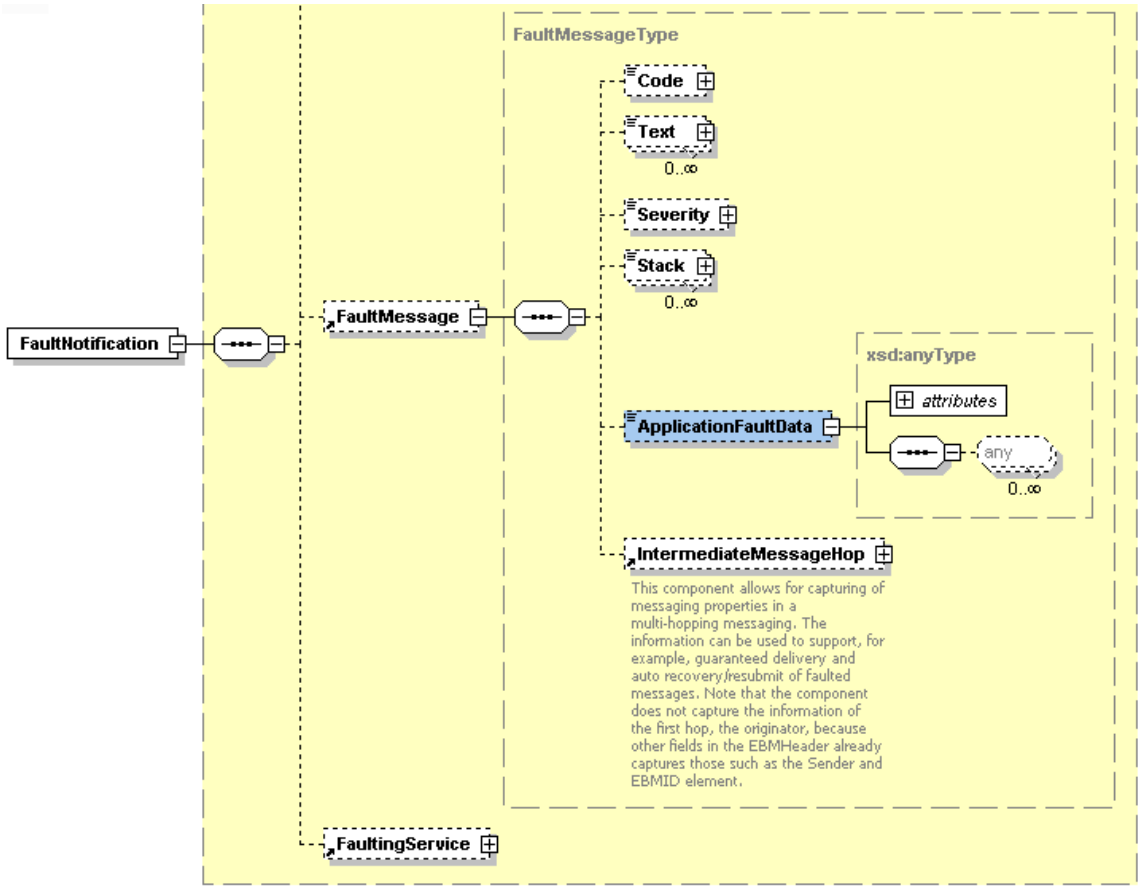
Extending fault details can add functionally rich information to the fault message to help the integration flow consumer better understand the context of the fault, leading to more effective error resolution. These additional fault details can be used to enable extended error handling functionality as well.

For more information about extending error handling, see Extending Error Handling.

For example, you can enrich the fault message with Order Number and Fulfillment System values, which are required to perform extended error handling tasks that update Order tables and create new service requests in an Order Fallout Management application.

22.8.2. Extending a Fault Message

Extending a fault message uses the ApplicationFaultData element of type ***xsd:anyType*** in the FaultType message schema definition in Meta.xsd.



ApplicationFaultData element highlighted in Meta.xsd

The ApplicationFaultData element is populated by a fault extension handler that you will configure to be invoked by the Error Handling Framework at runtime in the case of BPEL faults.

The input to the fault extension handler is the default fault message. The fault extension handler enriches the fault message with additional content defined by the ApplicationFaultData element. Control of the enriched fault message is passed from the fault extension handler to the Error Handling Framework, which then passes the fault message on to the Oracle AIA common error handler for further processing.

To extend a fault message:

1. Create a fault extension handler that will be invoked to enrich the fault message.
2. In the Error Ext Handler field on the Error Notifications page, enter the name of the error extension handler that will be invoked to extend the fault message. For example, enter ***ORDERFOEH_EXT*** for an Order Fallout error extension handler.

   Based on the combination of error code, system code, service name, and process name parameters, the Error Handling framework checks to determine whether the error extension handler has a nondefault parameter defined.

   If so, the framework locates the full classpath for the parameter in the AIAConfigurationProperties.xml file and makes a call out to that handler with the base fault message as input.

Within this error extension handler, the fault message will be enriched to accommodate custom content. It will then be sent back to the Error Handling framework for further processing.

For more information about the Error Notifications page, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up Error Handling," How to Set Up AIA Error Handling Configuration Details.

3. Access the AIAConfigurationProperties.xml file in $AIA_HOME/aia_instances/$INSTANCE_NAME/AIAMetaData/config. Define a property name that matches the error extension handler name that you defined in step 2. The value for this property is the fully qualified class path of the handler.

```
<ModuleConfiguration moduleName="ErrorHandler">
    <Property name="COMMON.ERRORHANDLER.IMPL">
oracle.apps.aia.core.eh.AIAErrorHandlerImpl</Property>
    <Property name="COMMON.ERRORHANDLER_EXT.IMPL">
oracle.apps.aia.core.eh.AIAErrorHandlerExtImpl</Property>
    <Property name="EH.ORDERFOEH_EXT.IMPL">
oracle.apps.aia.pip.eh.AIAOrderFalloutErrorHandlerExtImpl</Property>
```

Example error extension handler property and value in AIAConfigurationProperties.xml

It is through this class that the extension; Order Number and Fulfillment System values, for example; are added to the fault message using *xsd:anyType* in the ApplicationFaultData element in Meta.xsd.

4. Implement the IAIAErrorHandlerExtension interface in your error extension handler class registered in AIAConfigurationProperties.xml. Implement these methods:

   - handleCompositeSystemError for BPEL system errors
   - handleBusinessError for BPEL custom errors

Following is the interface structure:

IAIAErrorHandler Interface Class

```
public interface IAIAErrorHandler
{
  /**
    *
    * @param ebmHeader
    * @param faultMessage
    */
  public void logErrorMessage(Element ebmHeader, String faultMessage);

  /**
    *
    * @param XMLELfaultMessage
    */
  public void logErrorMessage(XMLElement XMLELfaultMessage);

  /**
    *
```

```
     * @param ebmHeader
     * @param faultMessage
     */
   public void logErrorMessage(Node ebmHeader, String faultMessage);

   /**
     * @since FP 2.3
     * @param faultMessage
     * @param jmsCorrelationID
     */
   public void sendNotification(String faultMessage, String
jmsCorrelationID,
                                                HashMap compositeDetailsHM);
}
```

IAIAErrorHandlerExtension Interface Class

```
package oracle.apps.aia.core.eh;
public interface IAIAErrorHandlerExtension
{
   /**
    *
    * @param iFaultRecoveryContext
    * @param faultMessageConstructed
    * @param componentType
    * @return
    */
   public String handleCompositeSystemError(IFaultRecoveryContext
iFaultRecoveryContext,
                                            String faultMessageConstructed,
                                            String componentType);


   /**
    *
    * @param faultMessageConstructed
    * @return
    */
   public String handleBusinessError(String faultMessageConstructed);
}
```

You can view extended field values in the error logs accessed in Oracle Enterprise Manager.

For more information about viewing error logs in Oracle Enterprise Manager, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide*, "Using Trace and Error Logs."

You should also be able to view them in email notifications if they have been configured appropriately.

For more information about customizing error notifications, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide*, "Customizing Error Notification Emails."

22.9. Extending Error Handling

This section provides an overview of error handling extension and discusses how to implement an error handling extension.

22.9.1. Overview

The default error handling behavior for BPEL and Mediator errors is to route fault messages to the Oracle AIA common error handler, which logs the error and delivers the fault messages to the Oracle AIA error topic. The default Oracle AIA error listener subscribes to this Oracle AIA error topic, picks up the fault message, and calls the error notification process, which issues a notification to the Oracle BPM Worklist if configured to do so.

For more information about the using the Oracle BOM Worklist with AIA, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Using the Oracle BPM Worklist."

You can extend the Error Handling Framework to perform actions beyond these default behaviors.

For example, you may want a particular error to trigger default error-handling behavior, in addition to extended error handling behavior, such as updating a table and creating a new request in an application.

To implement an error-handling extension, you may also need to extend fault messages to provide additional values.

For more information about extending fault messages, see Extending Fault Messages.

22.9.2. Implementing an Error Handling Extension

To implement an error handling extension:

1. On the Error Notifications page, enter a value against Error Type for an error code, system code, process name, and service name value combination.

   For more information about the Error Notifications page, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide,* "Setting Up Error Notifications for Oracle AIA Processes," Setting Up Error Handling, How to Set Up AIA Error Handling Configuration Details.

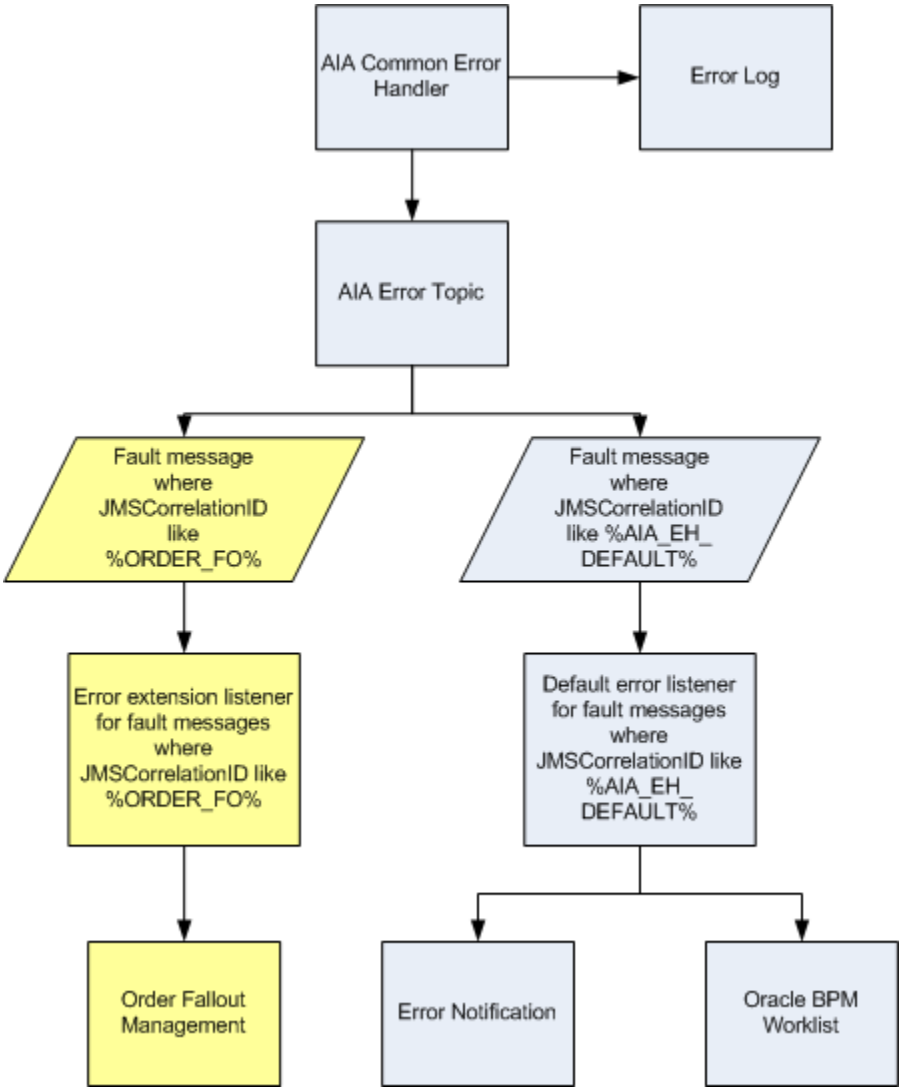
   The Error Handling Framework uses the Error Type value to stamp the JMSCorrelationID JMS header. The JMSCorrelationID is used by the custom error listener to identify fault messages that require its custom error handling.

2. Implement an error extension listener to subscribe to the Oracle AIA error topic.

Configure an error extension listener to filter fault messages based on the JMS Header - JMSCorrelationID value defined by the error type you created in step 1.

For example, you can create an Order Fallout error extension listener that will pick up fault messages with the JMSCorrelationID value of ***ORDER_FO***. ***ORDER_FO***. This is the Error Type value you defined on the Error Notifications page in step 1.

The Order Fallout error extension listener can then extract values from the fault message, extended to include Order Number and Fulfillment System values, for example. The error extension listener can then pass those values to an Order Fallout Management application, for example, which can use those values to update Order tables and create new service requests.



Sample extended error handling flow alongside a default error handling flow

22.10. How to Configure Oracle AIA Processes for Trace Logging

These custom XPath trace logging functions are available to BPEL and Mediator services operating in an Oracle AIA ecosystem.

- Determines whether trace logging is enabled for the service or at the overall system level:

```
aia:isTraceLoggingEnabled(String logLevel, String processName)
```

- Generates the actual trace log:

```
aia:logTraceMessage(String  level, Element ebmHeader, String message)
```

When developing a BPEL or Mediator process, always call the aia:isTraceLoggingEnabled() function first. If it returns a *true* result, then have the process call the aia:logTraceMessage() function.

These log files are stored in the *<aia.home>/logs/* directory.

In addition to these custom XPath functions, a Java API is also available so that any application developer can use it to log trace messages.

For more information about using trace logs, see *Oracle Application Integration Architecture Foundation Pack: Infrastructure Components and Utilities Guide*, “Using Trace and Error Logs.”

22.10.1. Describing Details of the isTraceLoggingEnabled Custom XPath Function

The isLoggingEnabled custom XPath function is a utility function that returns a Boolean result. The function signature is:

```
aia:isTraceLoggingEnabled (String logLevel, String processName)
```

These are the parameter details:

- logLevel

  Possible values include:

  - ***Severe***
  - ***Warning***
  - ***Info***
  - ***Config***
  - ***Fine***
  - ***Finer***
  - ***Finest***

- processName

Name of the Oracle AIA service using this function.

22.10.2. Describing Details of the logTraceMessage Custom XPath Function

The logTraceMessage custom XPath function generates a trace message, which contains the details of the message to be included in the trace log.

This function accepts the EBM header and the verbose logging message as parameters. Various elements from the EBM header will be used to populate supplemental attributes to the log message. If the EBM header is not passed, these supplemental attributes are set as empty strings.

The function signature is aia: logTraceMessage (String level, Element ebmHeader, String message). These are the parameter details:

- level

  Possible values include:

  - ***Severe***
  - ***Warning***
  - ***Info***
  - ***Config***
  - ***Fine***
  - ***Finer***
  - ***Finest***

- ebmHeader

  EBM header.

- message

  Verbose text message to be logged.

22.10.3. Describing the Trace Logging Java API

In addition to the isTraceLoggingEnabled and logTraceMessage custom XPath functions, a trace Logging Java API is also available so that any application developer can log trace messages. These functions are available through the trace logging Java API.

One of the function signatures is AIALogger. isTraceLoggingEnabled (String logLevel, String processName). This function determines whether trace logging is enabled for the service or at the overall system level. These are the parameter details:

- logLevel

  Possible values include:

- ***Severe***
- ***Warning***
- ***Info***
- ***Config***
- ***Fine***
- ***Finer***
- ***Finest***

- processName

  Name of the Oracle AIA service using this function.

Another function signature is AIALogger. logTraceMessage (String level, Element ebmHeader, String message). This function generates the actual trace log. These are the parameter details:

- level

  Possible values include:

  - ***Severe***
  - ***Warning***
  - ***Info***
  - ***Config***
  - ***Fine***
  - ***Finer***
  - ***Finest***

- ebmHeader

  EBM header.

- message

  Verbose text message to be logged.

23. Working with Security

This chapter describes Web service security, secure service to service interactions, and application security context.

This chapter discusses the following topics:

23.1. Introduction to Web Service Security Using Oracle Web Services Manager

Oracle Web Services Manager (WSM) security and management has been completely redesigned and rearchitected. The previous release, Oracle WSM 10*g,* was delivered as a standalone product or as a component of the Oracle SOA Suite. In the 11*g* release, Oracle WSM has been integrated into the Oracle WebLogic Server.

For more information about Oracle Web Services Manager for 11g, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1.*

Oracle Application Integration Architecture (AIA) recommends decoupling security logic from service development by configuring Web service security declaratively using Oracle WSM Oracle WSM during deployment. You should use Web service security rather than SSL unless you have a compelling reason, such as participating applications that do not support it.

In AIA, Oracle WSM is installed as part of SOA Suite, and there are out of the box policies for most commonly used security use cases. Oracle WSM has policies for adding a particular security function as standalone or in combination with other security functions.

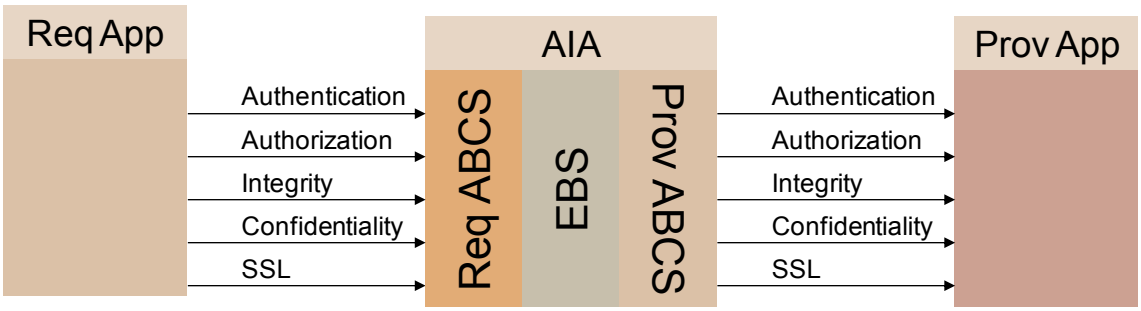
For a list of the out of the box policies, refer to *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, "Predefined Policies."

23.2. Securing Service to Service Interaction

By securing service to service interaction, you:

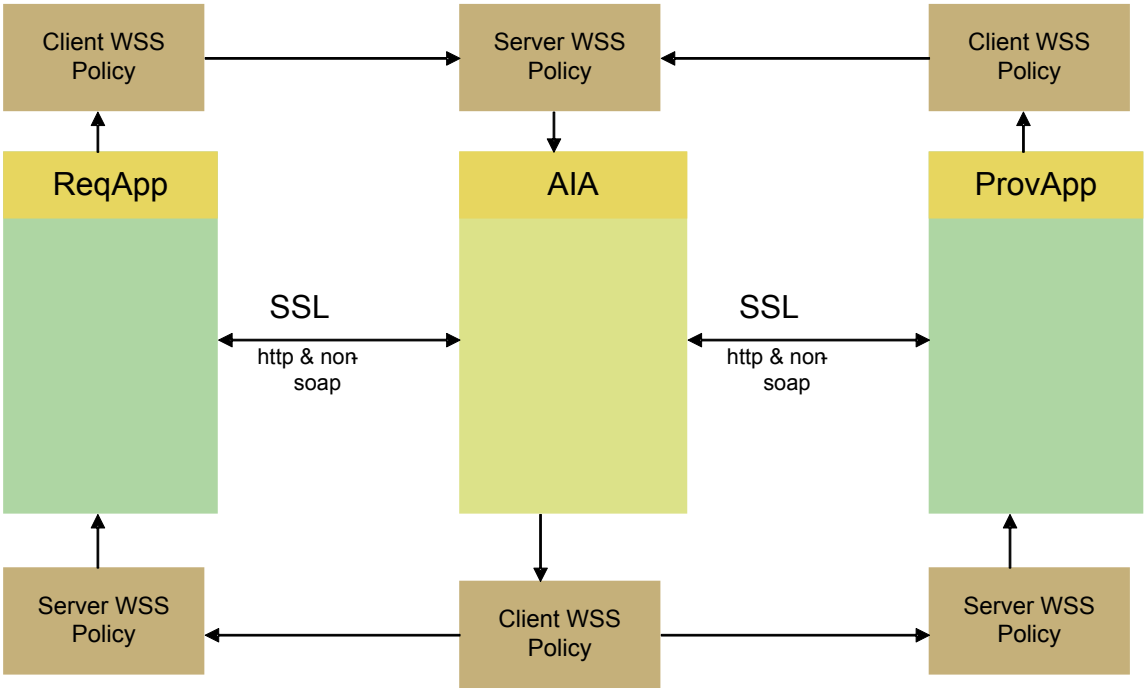
- Identify clients through authentication.
- Secure messages through encryption.
- Avoid message tampering with digital signatures.

- Encrypt the channel through SSL.



High-level security architecture diagram

We recommend using Oracle WSM to configure Web service security in Oracle AIA. To enable security on an AIA service you use Oracle WSM to assign the appropriate service policy. To call a secured service, you assign the appropriate client side policy.



Oracle AIA security with policies and SSL

23.2.1. Enabling Security in Application Services

Applications can use their built-in capabilities to enable security for services If the applications have choice to choose a product for enabling security, they should look at Oracle WSM and check if Oracle WSM has agent support for the application and use Oracle WSM .

If the applications have capability to enable any kind of security, then they should use Web service security for authentication, encryption, and integrity. Otherwise, they can use SSL to secure the connection.

23.2.2. Invoking Secured AIA Services

Application can use their built in capabilities to configure security for calling secured AIA services. If the applications have choice to choose a product for security, they should look at Oracle WSM and check if Oracle WSM has agent support for the application and use Oracle WSM.

When interacting with a AIA service which is enabled for WS-security, it needs to add security header in SOAP header with all the information needed for security functions on AIA service. Based on the security of the AIA service, they need to add information for any combination of Authentication, encryption and integrity.

Here is a sample of Security Header for Authentication:

```
<wsse:Security  env:mustUnderstand="1">
<wsse:UsernameToken  wsu:Id="UsernameToken-dXtD14011QZUTlfIaSrMhw22">
<wsse:Username>weblogic</wsse:Username>
<wsse:Password  Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-
wss-username-token-profile-1.0#PasswordText">weblogic1</wsse:Password>
</wsse:UsernameToken>
</wsse:Security>
```

If the AIA service requires SSL, then application should configure SSL for both one way and two- way SSL.

23.2.3. Enabling Security in AIA Services

To enable security in AIA services:

1. Determine what type of security is needed.

   AIA recommends using WS-security for authentication, encryption and integrity.

2. Find the WS-policy with the appropriate combination of features.

   For example, if you need encryption and integrity, then you need to find the policy which does both encryption and integrity.

23.2.3.1. How to Attach Oracle WSM Policies to Service

To attach Oracle WSM policies to *service*:

1. Attach policy to *service* to enable security for a service.

For more information about how to attach policies, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, “Attaching Policies to Web Services”.

This document is available at
http://download.oracle.com/docs/cd/E12839_01/web.1111/b32511/attaching.htm#CEGDGIHD

2. Configure policies.

You may need to perform additional configurations for each policy.

For more information about how to configure each policy, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, “Configuring Policies”.

This document is available at
http://download.oracle.com/docs/cd/E12839_01/web.1111/b32511/configuring.htm#BABCJHEB

3. Diagnose problems.

For more information about how to diagnose problems, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, “Diagnosing Problems”.

This document is available at
http://download.oracle.com/docs/cd/E12839_01/web.1111/b32511/diagnosing.htm#CHDIDCHA

23.2.3.2. Should I Secure All AIA Services?

Security can have a negative impact in terms of performance so it needs to be carefully used. AIA mandates securing services whose interaction with other services cross organizational boundaries. Any AIA service that is being called from clients outside corporate network needs to be secured. In case of A2A integration where all the services are within same organization inside firewall, it might not be truly necessary secure all the services. Some customers may choose to secure the first mile and the last mile alone.

23.2.4. Invoking Secured Application Services

First you need to determine what type of security is enabled on the Application service. In the case of WS-security, the application may have enabled any combination of authentication, encryption, and integrity. Then you need to find the WS-policy that matches the combination used for the application. For example, if you need encryption and integrity, then you need to find the policy which does both encryption and integrity

23.2.4.1. How to Attach Oracle WSM Policies to Reference\

To attach Oracle WSM policies to *reference*:

1. Attach policy to *reference* to enable security or to call a secure service.

For more information about how to attach policies, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, “Attaching Policies to Web Services”.

This document is available at
http://download.oracle.com/docs/cd/E12839_01/web.1111/b32511/attaching.htm#CEGDGIHD

2. Configure policies.

   You may need to perform additional configurations for each policy.

   In the case of WS-Security client side basic authentication policy, you need to do the following

   a. Configure credential store

   b. Add the UserID and password associating with a key into the store.

   c. Use the key in the policy.

   Please refer to AIA Basic Authentication sample for detailed steps on how to configure WSSecurity basic authentication in AIA. This sample is available in the Infrastructure/Samples directory installed with Foundation Pack.

For more information about how to configure each policy, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, "Configuring Policies".

This document is available at:

http://download.oracle.com/docs/cd/E12839_01/web.1111/b32511/configuring.htm#BABCJHEB

3. Diagnose problems.

For more information about how to diagnose problems, see *Oracle Fusion Middleware Security and Administrator's Guide for Web Services 11g Release 1*, "Diagnosing Problems".

This document is available at:
http://download.oracle.com/docs/cd/E12839_01/web.1111/b32511/diagnosing.htm#CHDIDCHA

23.3. Application Security Context

This section provides an overview of application security and discusses:

- Exchange of security context between participating application and application business connector (ABC) service
- Mapping application security context in the ABCS to and from standard security context
- AppContext mapping service or XPath function
- Structure for security context
- Attribute names
- Propagating standard security context through Enterprise Business Service (EBS) and Enterprise Business Flow (EBF)

23.3.1. Introduction to Application Security

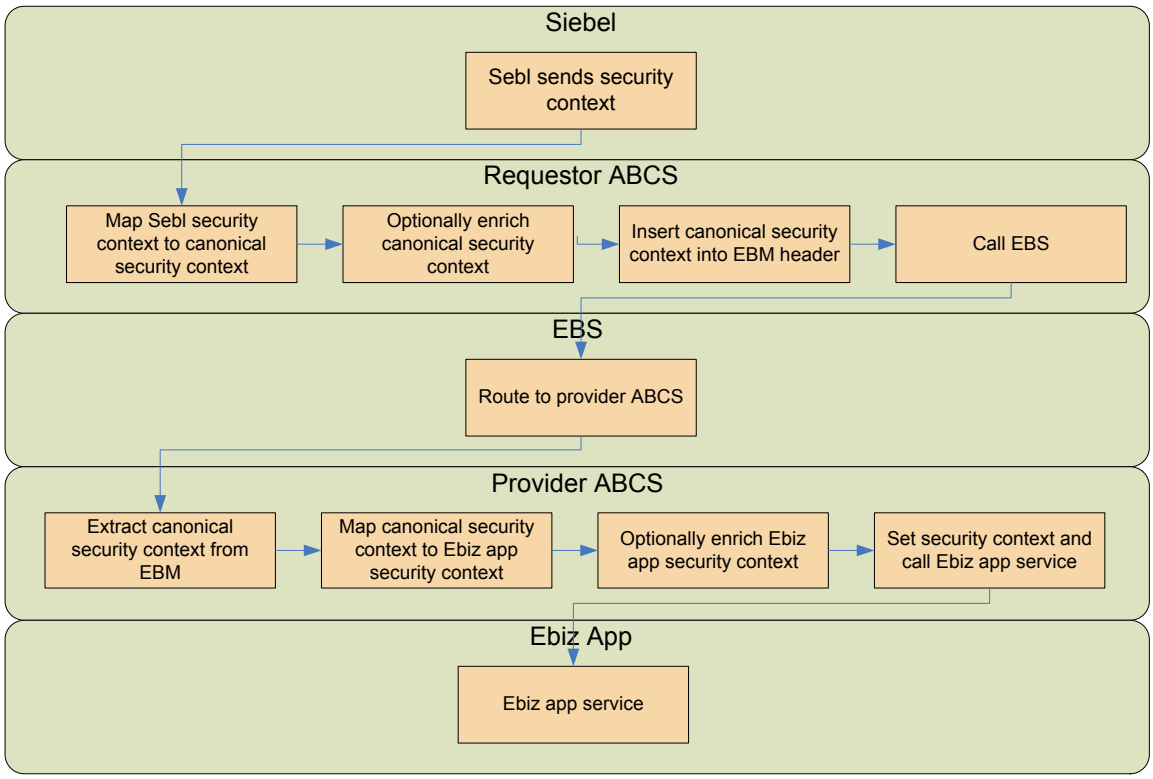
The Oracle AIA application security model allows Oracle AIA to integrate participating applications with different security representations in a standard way by eliminating point-to-point security.

This section discusses:

- Exchanging security information between participating applications and ABCSs
- Transforming application security context into standard format in ABCSs
- Propagating the standard security context from ABCS to ABCS through EBS and EBF
- Transforming standard security context to application security context.

The participating applications are developed during different times with different concepts and implementation of authentication and authorization. When applications are integrated, you must pass authentication and authorization information between applications. Oracle AIA application security context standardizes the exchange of participating applications' authentication and authorization information between various applications so that any application can be integrated with any other application.

This diagram illustrates the high level functional flow:



Security functional flow

23.3.2. How to Exchange Security Context between Participating Applications and ABCSs

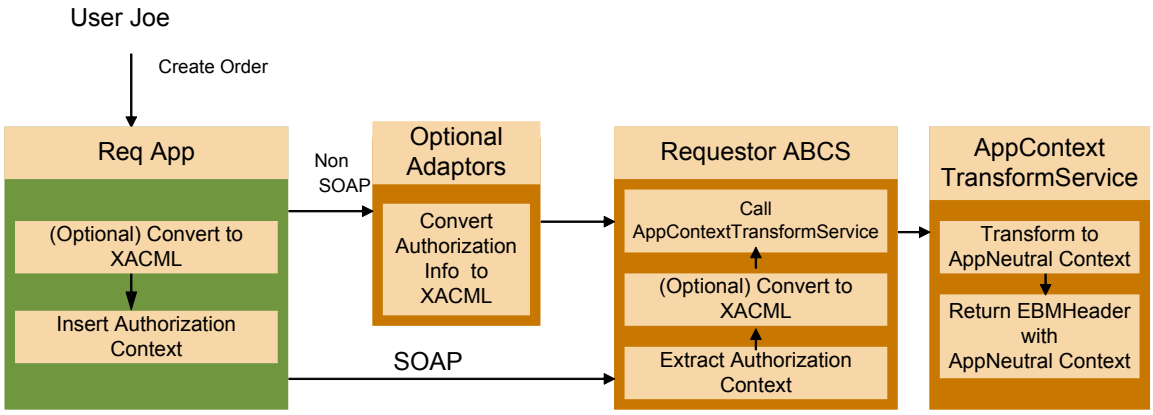
App Context is any information that needs to be sent to the provider application to process the message sent from requester application or vice versa. This includes but is not limited to authentication and authorization information., We address the exchange of authorization information in app context, but the design will support adding other context information.

Oracle AIA determined XACML Context Request as the best standard to represent authorization information. XACML is an OASIS standard for managing access control policy. Released in 2003 and based on XML, XACML is designed to become a universal standard for describing who has access to which resources. XACML includes a policy language and a query language that results in a Permit, Deny, Intermediate (error in query), or Not Applicable response. The query language is expressed in XACML context that is recommended by Oracle AIA for exchanging authorization info.

23.3.2.1. Requester Applications

The preferred approach is to let the requester application send app context information as an XACML request to the Requester ABCS. If the applications are not capable of formulating context information in XACML request, then the participating application will send app context information in a SOAP header or as part of business message content.

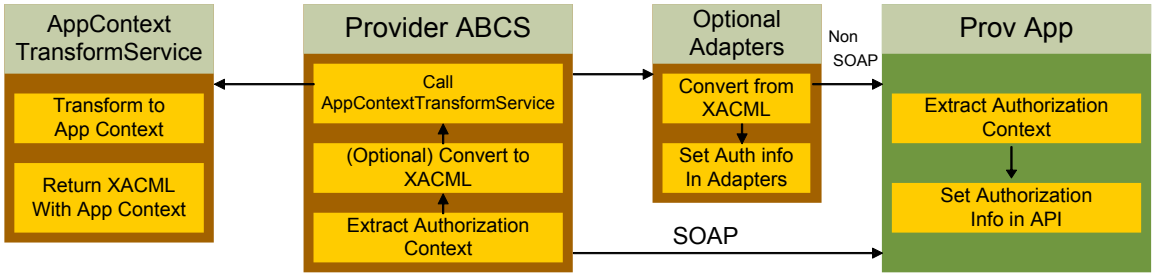
Oracle AIA recommends the use of a protocol specific adapter if the participating application doesn't use a SOAP interface. In that scenario, the adapter receives the app context in a custom way and prepares the participating application specific XACML request and sends it to the ABCS.



Requester application flow

23.3.2.2. Provider Applications

The preferred approach is to let the provider ABCS send the app context as an XACML request to the provider application. If the provider application cannot receive an XACML request, but has a SOAP interface, then the provider ABCS will send the app security context in custom XML format inside a SOAP header or as part of a business document. If the provider application doesn't support a SOAP interface, then the provider ABCS sends app context in XACML request format to the adapter service that sets the appropriate security context needed for the security mechanism in use.



Provider application flow

23.3.3. Mapping Application Security Context in ABCS To and From Standard Security Context

The requester ABCS will either receive the application security context in XACML format or convert into XACML format. The requester ABCS calls an external service to map application security context to standard security context. The ABCS passes the application security context in XACML format and receives application neutral security context in XACML format.

23.3.4. Using the AppContext Mapping Service

Oracle AIA recommends using one external service per application. This service is also responsible for populating additional values needed in standard or application context that is returned. This service can be implemented as XPath functions or web service with these names:

- Request TransformToAppContext (EBMHeader)
- Request TransformToAppNeutralContext (Request)

```
<definitions
targetNamespace="http://www.oracle.com/AIA/AppContextTransformService"
xmlns:corecom="http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V2"
          xmlns:xacml-context="http://docs.oasis-
open.org/xacml/access_control-xacml-2.0-context-schema-cd-04.xsd"
xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:tacs="http://www.oracle.com/AIA/AppContextTransformService"
xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/">
   <types>
   <xsd:schema
targetNamespace="http://www.oracle.com/AIA/AppContextTransformService"
elementFormDefault="qualified">
<xsd:import namespace="http://docs.oasis-open.org/xacml/access_control-
xacml-2.0-context-schema-cd-04.xsd"
schemaLocation="http://[HOST:PORT]/AIAComponents/EnterpriseObjectLibrary/R
elease2/Core/Common/V2/access_control-xacml-2.0-context-schema-cd-04.xsd"
/>
<xsd:import
namespace="http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V2"
schemaLocation="http://[HOST:PORT]/AIAComponents/EnterpriseObjectLibrary/R
elease2/Core/Common/V2/Meta.xsd" />
</xsd:schema>
```

```
  </types>
  <message name="Request">
    <part name="Request" element="xacml-context:Request"/>
  </message>
  <message name="EBMHeader">
    <part name="EBMHeader" element="corecom:EBMHeader"/>
  </message>
  <portType name="TransformAppContext">
    <operation name="TransformToAppContext">
      <input message="EBMHeader"              name="EBMHeader"/>
      <output message="Request"/>
    </operation>
    <operation name="TransformToAppNeutralContext">
      <input message="Request"              name="Request"/>
      <output message="Request"/>
    </operation>
  </portType>
</definitions>
```

This service is implemented for the participating application and meets any integration scenario using that application.

Oracle AIA recommends using BPEL with co-location to implement this service. ABCS should call this service using a dynamic partner link so that customers can plug in other implementations of this service.

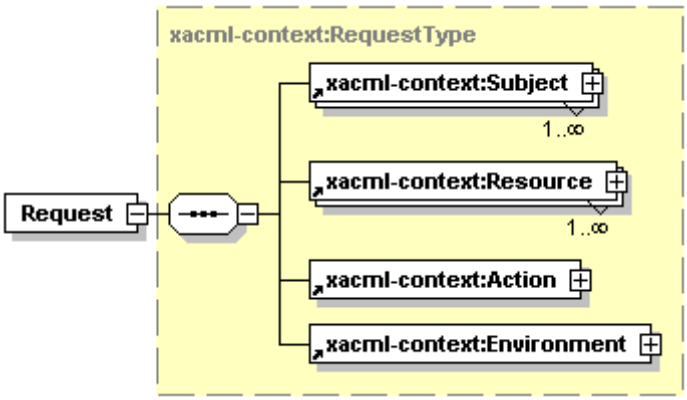
The property to load the service implementation is loaded from AIAConfig property file. The name of the property is TransformAppContextService. By default this property is not configured and the default implementation is used.

The default implementation of this service is based on DVM and cross-reference. Whenever a new application or integration scenario is added, new DVM values must be populated but the service does not need to be changed.

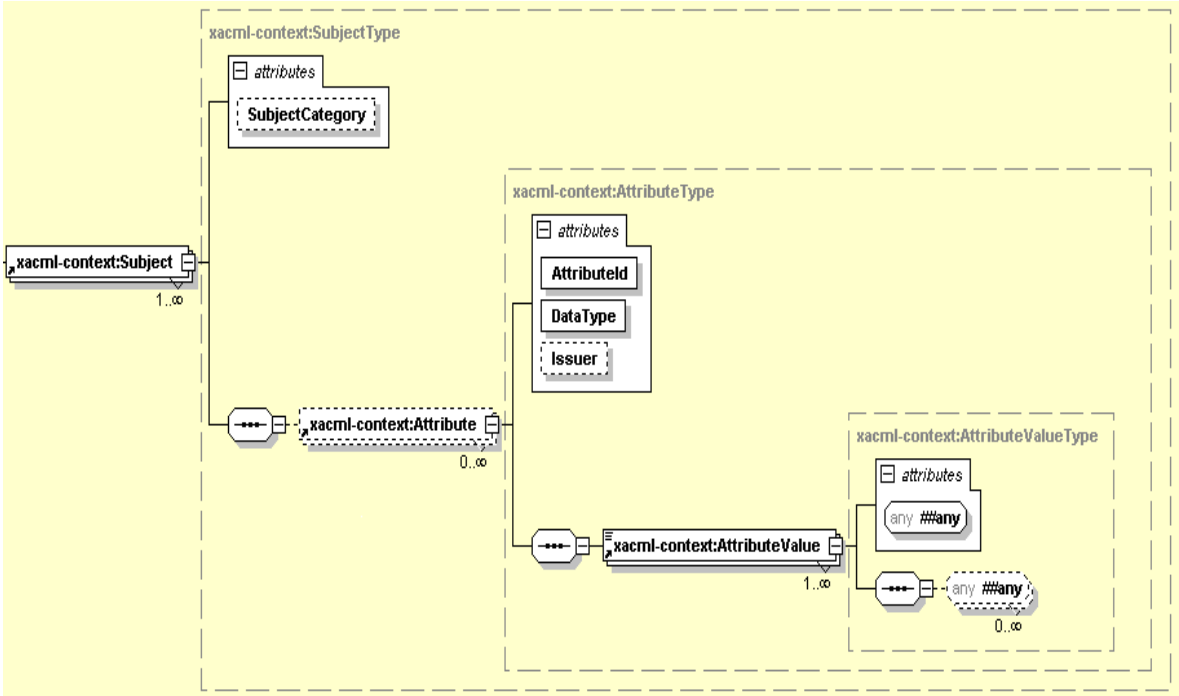
23.3.5. Understanding the Structure for Security Context

The XACML Request element is used as the parameter to the app context structure. This request element carries participating application information and calling service information in addition to authorization information.

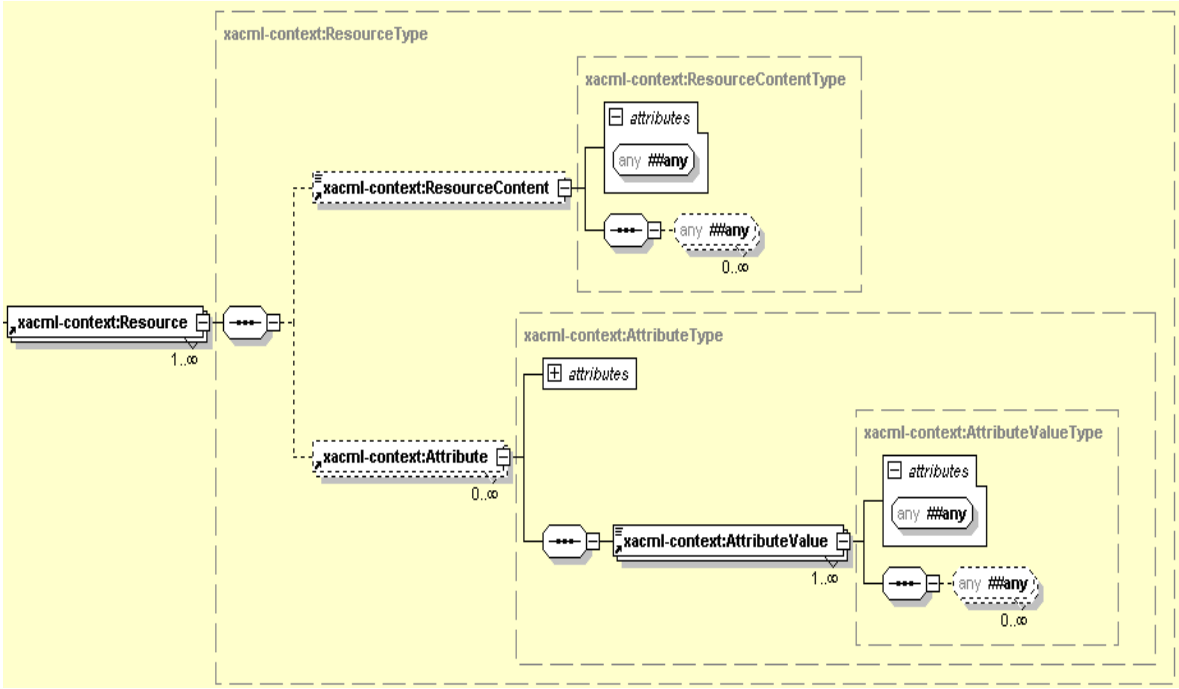
These diagrams illustrate the request element in XACML context:



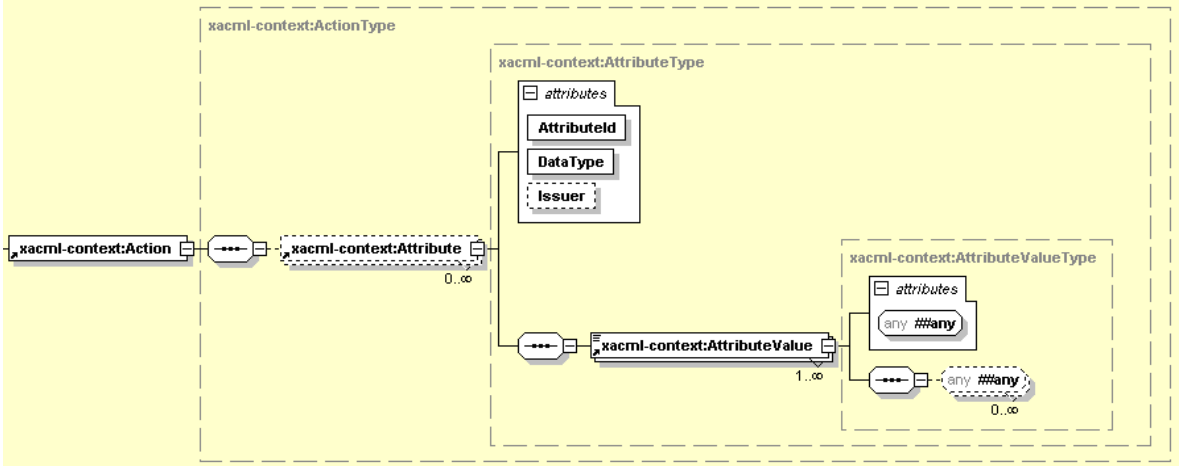
Structure of XACML Request



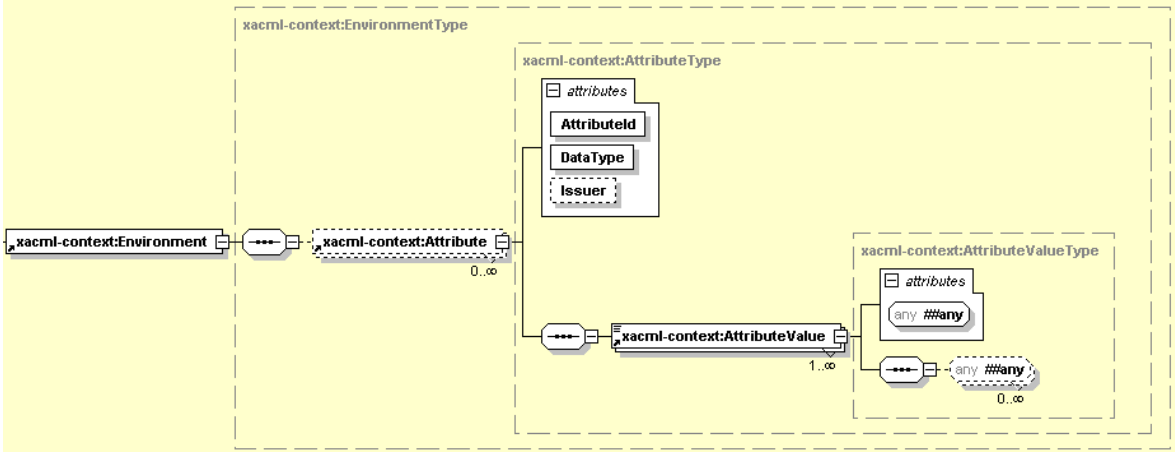
Structure of XACML Subject



Structure of XACML Resource



Structure of XACML Action



Structure of XACML Environment

This example shows the SEBL AppContext information that is sent to the security service:

```
<AIAAppContext xmlns=http://www.oracle.com/AIA/AppContext>
  <ServiceInfo>
     <ServiceName>O2C2SeibelABCS</ServiceName>
  </ServiceInfo>
  <ParticipatingAppInfo>
     <Name>Siebel</Name>
     <Version>8.0</Version>
  </ParticipatingAppInfo>
  <Request xmlns="urn:oasis:names:tc:xacml:2.0:context:schema:cd:04"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="
urn:oasis:names:tc:xacml:2.0:context:schema:cd:04 http://docs.oasis-
open.org/xacml/access_control-xacml-2.0-context-schema-cd-04.xsd">
     <Subject>
      <Attribute AttributeId="siebel:user" DataType="xs:string">
        <AttributeValue>SAdmin</AttributeValue>
      </Attribute>
      <Attribute AttributeId="siebel:org" DataType="xs:string">
        <AttributeValue>siebl1</AttributeValue>
      </Attribute>
```

```
        </Subject>
        <Resource>
        </Resource>
        <Action>
        </Action>
        <Environment/>
    </Request>
</AIAAppContext>
```

23.3.6. Using Attribute Names

Use these guidelines for attribute names:

1. Service information attributes:
   - AIA:Service:Name – Name of the service calling the transform service
2. Participating application information attributes:
   - AIA:ParticipatingApp:Name – Name of the participating application
   - AIA:ParticipatingApp:Version – Version of the participating application
   - AIA:ParticipatingApp:SystemID – unique identifier of participating application
3. Application attributes:
   - Oracle AIA recommends using this convention for naming the attributes for all the applications: Application name: attribute name.
4. Application neutral attributes:

   Oracle AIA recommends using AIA as prefix for all the application neutral attributes. These are the application neutral attributes are identified so far:

   - User: to represent user
   - BusinessUnit: to represent organization or operating unit

23.3.7. Propagating Standard Security Context through EBS and EBF

The standard security context is inserted into the Enterprise Business Message (EBM). As an EBM is propagated through various EBSs and EBFs to the destination ABCS, security context is propagated along with the EBM to the target ABCS where it is used to propagate to the target application

23.3.8. Implementing Application Security Context

Here are the high level steps for implementing application security context requester side as well as provider side.

23.3.8.1. How to Implement Requester-Side Application Security Context

To implement requester-side application security context:

1. If an adapter is used, convert application security context information into XACML format in the adapter service.
2. If the application is sending information in data directly to requester ABCS, convert application's security context information to XACML format.
3. If new standard attributes are needed, work with internal architecture team.
4. Implement application context mapping service.
5. In Requester ABCS, call application mapping service to convert application specific app context information to application neutral app context information.
6. Call EBS.

23.3.8.2. How to Implement Provider-Side Application Security Context

To implement provider-side application security context:

1. Implement application context mapping service.
2. In Provider ABCS, call application context mapping service to convert application neutral app context information to application specific app context information.
3. If you need to send information in data directly to provider application, convert applications security context information from XACML data to required form.
4. If an adapter is used, convert application security context information from XACML format to required form in adapter service.

24. Working with AIA Design Patterns

This chapter discusses the design patterns used in Oracle Application Integration Architecture (AIA) and provides solutions to specific problems that you may encounter.

This chapter discusses the following topics:

- AIA Message Processing Patterns
- AIA Assets Centralization Patterns
- AIA Assets Extensibility Patterns

24.1. AIA Message Processing Patterns

This section discusses AIA message processing patterns and provides solutions to specific problems that you may encounter.

24.1.1. Synchronous Request-Reply Pattern: How to get Synchronous Response in AIA

Problem

Many use cases warrant consumers to send requests synchronously to service providers and get immediate responses to each of their requests. These use cases need the consumers to wait until the responses are received before proceeding to their next tasks.

For example, Customer Relationship Management (CRM) applications might provide features such as allowing customer service representatives as well as systems to send requests to providers for performing tasks such as Account balance retrieval, Credit Check, ATP (advanced time to promise) calculation etc. CRM applications expect the responses to be used in the subsequent tasks; and hence, would preclude the users from performing other tasks until the responses are received.

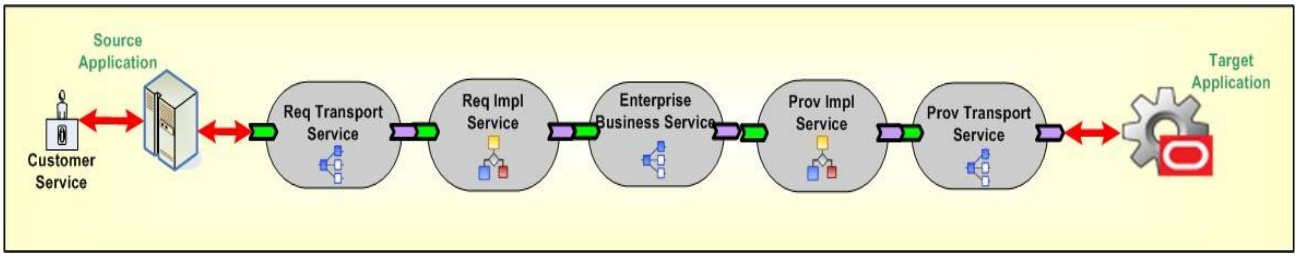
Solution

AIA recommends using the synchronous request and response service interface in all the composites involved in processing or connecting the backend systems. There shouldn't be any singleton service in the services involved in the query processing. The general recommendation is for all of the intermediary services as well as the service exposed by provider application to implement request / response based interface – two-way operation. Even though it is technically possible to design all services but the initial caller as to implement two one-way requests, this implementation technique should be used as scarcely as possible.

Implementation should strive to ensure that no persistence of state information (dehydration) as well as audit details are done by any of the intermediary services as well as by the ultimate service provider. These techniques will help in keeping the latency as low as possible.

AIA also recommends that the intermediary services are co-located to eliminate the overheads normally caused by marshalling and un-marshalling of SOAP documents.

The following diagram illustrates how a business task implemented as an Enterprise Business Service (EBS) is invoked synchronously by requester application.



Invoking an EBS synchronously by the requester application

Impact

- All the resources are locked in until the response from service provider goes back to the originating system or user.
- Either a transaction timeout or an increased latency may result if any of the services or the participating application takes more time for processing.
- Service providers must be always available and ready to fulfill the service requests.
- Service providers doing real-time retrieval and collation of data from multiple back-end systems in order to generate a response message could put an enormous toll on the overall resources as well as an increase in the latency. Synchronous request / response design pattern should not be used to implement tasks that involve real-time complex processing. Off loading of work needs to be done – design need to be modified to accommodate the staging of quasi-prepared data so that the real-time processing could be made as light as possible.
- Services involved in implementing synchronous request / response pattern should refrain themselves from doing work for each of the repeatable child nodes present in the request message. High number of child nodes in the payload in a production environment could end up having an adverse impact on the system.

24.1.2. Asynchronous Fire-And-Forget Pattern

Problem

The requester application should be able to continue its processing after submitting a request regardless of whether the service providers needed to perform the tasks are immediately available or not. Besides that, the user initiating the request will not have a functional need to wait until the request is fully processed. The bottom line is, the service requesters and service providers need to have the capability to produce and consume messages at their own pace without directly depending upon each other to be present.

Also, the composite business processes should be able to support the infrastructure services like error handling and business activity monitoring services in a decoupled fashion without depending on the participating application or the AIA functional process flows.

For example, Order capture applications will like to keep taking orders irrespective of whether the back end systems such as Order Fulfillment systems needed for fulfilling the order requests are available at that time or not. Order capture applications will not want order capturing capability to be stopped because of non-availability of any of the services / edge applications participating in the execution of order fulfillment process.

Solution

AIA recommends the fire-and-forget pattern using queuing technology with database or file as a persistence store to decouple the participating application from the integration layer. The queue acts as a staging area allowing the requester applications to place the request messages. And, the request messages will subsequently be forwarded to service providers on behalf of requester as and when the service providers are ready to process them.

It is highly recommended that the enqueueing of the request message into the queue is within the same transaction initiated by the requester application to perform its work. This will ensure that the request message is enqueued into the queue only when the participating application's transaction is successful. The request message will not be enqueued in situations where the transaction is not successful. Care also has to be taken to ensure that the services residing between 2 consecutive milestones are enlisting themselves into a single global transaction.

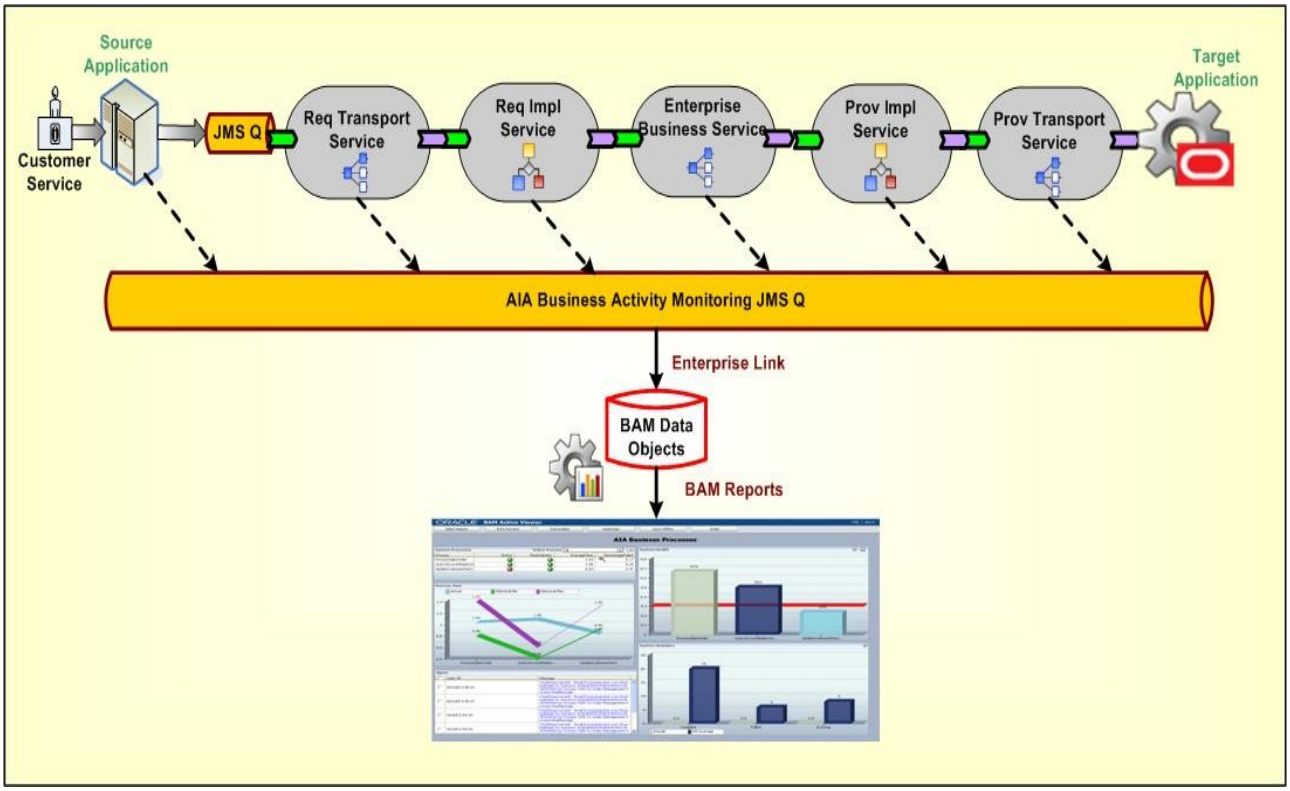
Refer to Implementing Error Handling and Recovery for the Asynchronous Message Exchange Pattern to Ensure Guaranteed Message Delivery to understand how milestones are being used as intermediate reliability artifacts to ensure the guaranteed delivery of messages.

AIA recommends having a queue per business object. All various requests emanating from a requester application for a business object will use the same queue.

- The following diagram shows how JMS queues are used to decouple the source application from the integration layer processing. The source application submits the message to the JMS queue and continues with its other processing without waiting for a response from the integration layer.

  The AIA composite business process may not be up and running while the application continues to produce the messages in the JMS queue. When the AIA composite business process comes up, it will start consuming the messages and process them.

- This diagram also shows how the monitoring services can be decoupled from the main AIA functional flows with the help of the JMS queue. All the AIA services and the participating applications can fire a monitoring message into the queue and forget about how it will be processed by the downstream applications. In this pattern the services or participating applications don't expect any response. Similarly, the AIA infrastructure services will capture the system/business errors from the composite business processes and publish them to an AIA error topic, which will be used by the error handling framework for further processing (resubmission/notification/logging, and so on).



Fire-and-forget pattern using queuing technology

Impact

The default implementation does not have an inherent support for notifying the requester application of success as well as failure of messages. Even though the middleware systems provide ability to monitor and administer the flow of in-flight message transmissions, there will be use cases where requester applications will either want to be notified or have a logical reversal of work done programmatically.

For more information about how compensation handlers can be implemented for this message exchange pattern, see Designing Application Business Connector Services and Constructing the ABCS.

24.1.3. Guaranteed Delivery Pattern: How to Ensure Guaranteed Delivery in AIA

Problem

Message delivery cannot be guaranteed when the participating systems and the services integrating those systems interact in an unreliable fashion.

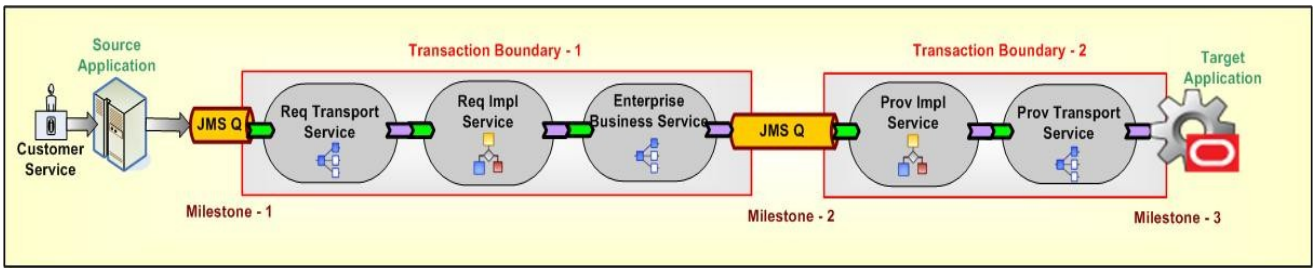
For example, the Order Capture system might submit an order fulfillment request that will trigger a business process, which in turn will invoke the services provided by multiple disparate systems to fulfill the request. Expecting all of the service providers to be available always might be unrealistic.

Solution

A milestone is a message checkpoint where the enriched message is preserved after completing a certain amount of business functionality at this logical point or is submitted to the participating application for further processing of that message in an end-to-end composite business process. A milestone helps to commit the business transactions done to that logical point and also releases the resources used in the AIA services and the participating application.

AIA recommends introducing the milestones at appropriate logical points in an end-to-end integration having the composite business processes, business activity services, or data services designed and implemented for integrating disparate systems to address a business requirement. Queues with database or file as persistence store are being used to implement milestones.

The following diagram shows how to ensure guaranteed delivery with the help of milestones for a simple use case where the customer service representative updates the billing profile on the source application and the updated profile is reflected in the backend billing systems.



Ensuring guaranteed delivery using milestones

AIA recommends that the source application push the billing profile information to milestone -1 (JMS Queue) in a transactional mode to ensure the guaranteed delivery of the message. This transaction is outside the AIA transaction boundaries and so is not shown in the diagram. Once the billing profile information is stored in milestone-1, the source application resources can be released because AIA world ensures the guaranteed delivery of that message to the target application.

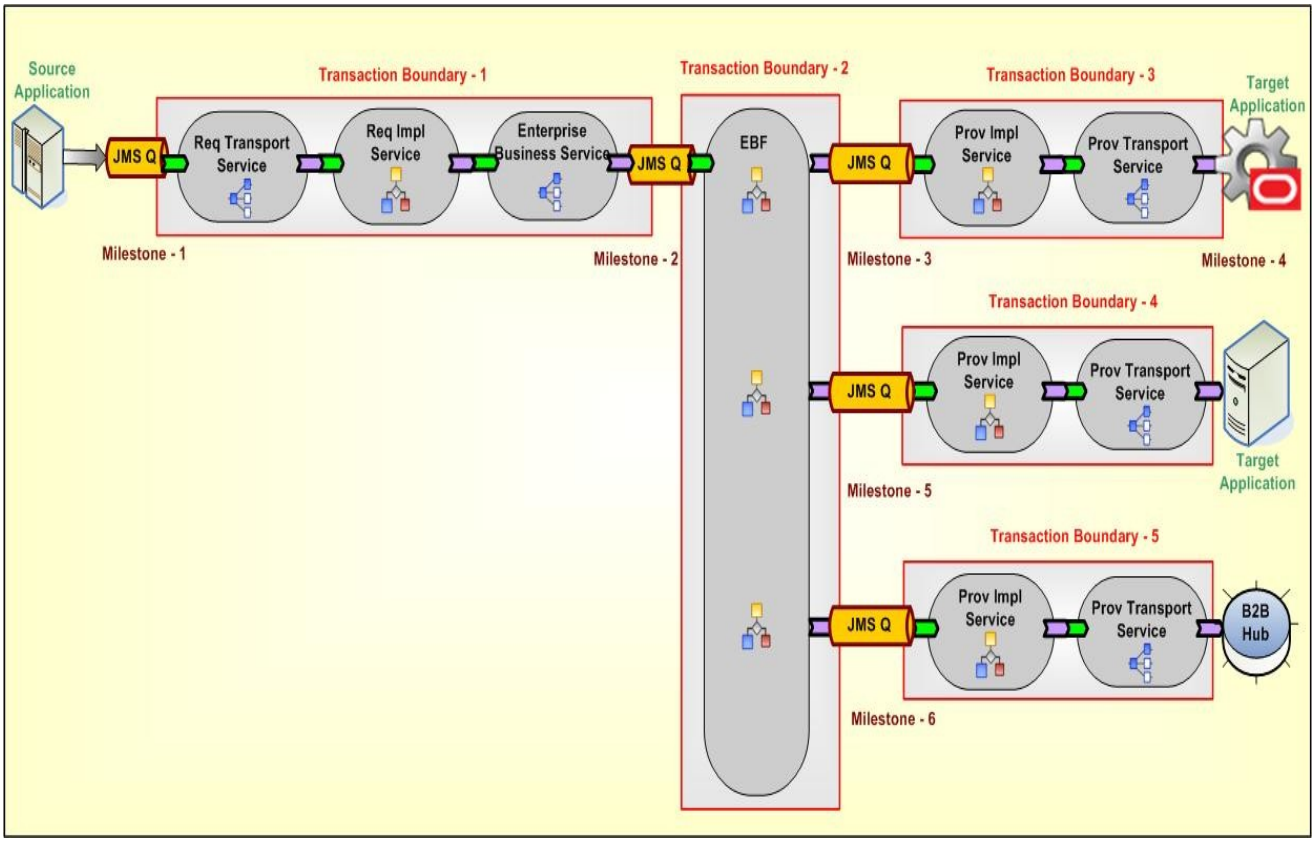
The implementation service would have the message enrichment logic (if needed) and the Enterprise Business Service (EBS) would route the enriched message to appropriate providers or milestone-2 (optional for very simple and straightforward use cases such as no enrichment or processing requirements for implementation service).

All the enriched messages would either be transferred to milestone-2 or rolled back to milestone – 1 for corrective action/resubmission. To achieve this, all the services present between milestone-1 and milestone-2 have to enlist themselves in a single global transaction. Once the messages are transferred to milestone-2, all the milestone-1 implementation service instances would be released to accommodate new requests.

The provider implementation service will pick up the billing profile information and ensure the message is delivered to the target application. The target application may or may not have the capability of participating in the transaction between milestone-2 and milestone-3 so the implementation service should be designed to take care of the compensatory transactions.

AIA recommends that the target application build the XA capability to ensure guaranteed delivery. If the target application doesn't have the XA capability, the implementation service should be designed for manual compensations or semi-automatic/automatic compensations based on the target system's capability to acknowledge the business message delivered from AIA.

The following diagram shows the usage of milestones to ensure guaranteed delivery for a complex use case where the source system submits an order provisioning request to AIA:



Using milestones to ensure guaranteed delivery in a complex use case

Impact

Introducing a milestone adds processing overhead and could impact the performance of composite business processes, business activity services, or data services. So selecting the number of milestones is a challenge for the designers. At the same time, minimizing the milestones thereby adding more work to a single transaction could also have a detrimental effect.

Ensuring reliable messaging between the “milestones” and the “application and milestone” to achieve the guaranteed delivery adds transactional overheads. This could impact the performance at runtime in some situations (if the amount of work to be done between two milestones is too large) and may also require additional process design requirements for compensation.

24.1.4. Service Routing Pattern: How to Route the Messages to Appropriate Service Provider in AIA

Problem

Requester applications should build tightly coupled services if they need to send information to a specific target system. The logic to identify the service provider, and in some cases the service provider instance (when you have multiple application instances for the same provider) have to be embedded within the logic of caller service. The decision logic in the caller service has to be constantly undergoing changes as and when either a new service provider is added into the mix or an existing service provider is retired from that mix.

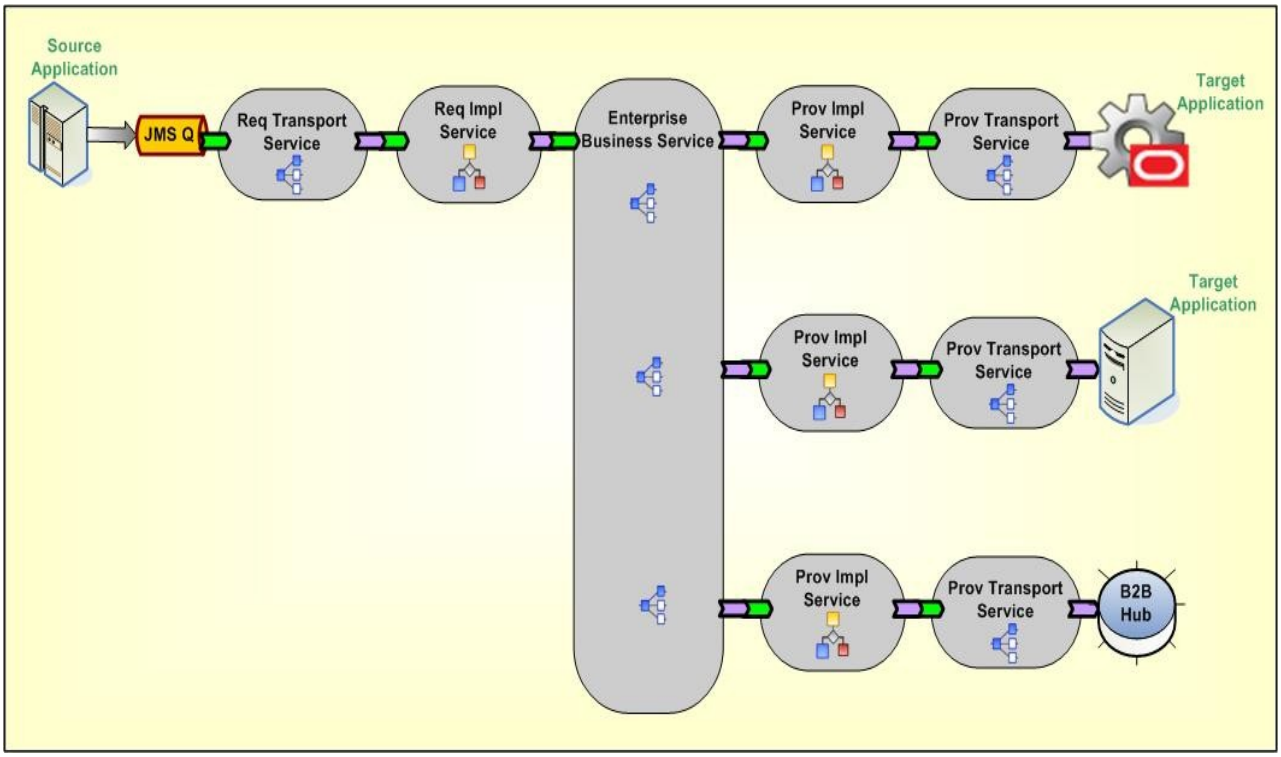
For example, a customer might have three billing system implementations—two instances of vendor A's billing system, one dedicated to customers who reside in North America and the second dedicated to the customers residing in Asia-Pacific; one instance of vendor B's billing system dedicated to customers residing in other parts of the world. The requester service needs to have the decision logic to discern to whom to delegate the request.

Solution

AIA recommends content-based service routing to appropriate target service implementations to further process this message and send it to the target applications. AIA recommends externalizing the decision logic to determine the right service provider from the actual requester application / service. This decision logic will be incorporated in the routing service. This allows for declaratively changing the message path when unforeseen conditions occur. Enterprise Business Service acts as a routing service. This facilitates one-to-many message routing based on the content-based filtering. A message originating from a requester can go to all the targets, some of the targets, or just one of the targets based on the business rules or content filters.

The routing service evaluates the rule and deciphers the actual service provider that needs to be used for processing a specific message. Using this approach, the clients / service requesters are totally unaware of the actual service providers. Similarly, the underlying service providers will be oblivious to the client applications that made the request. This allows for introducing new providers as well as retiring existing providers without making any changes to the actual requester service.

The following diagram illustrates how a request sent by Req Impl Service (requester service) is sent to either one of two target applications or to a trading partner (B2B) using context based routing by routing service.



Content-based service instance routing

Impact

For the requester service to be loosely coupled with the actual service providers, the routing service should act as the abstraction layer; therefore, its service interface has to be carefully designed. Its interface can actually emulate the actual service provider's interface if only one unique service provider exists or it can have a canonical interface.

Even though Mediator technologies allow for routing rules to be added in a declarative way, validation of different routing paths need to be tested before deploying them in production.

Managing the decision logic locally in each of the routing services might lead to duplication as well as conflict – having them managed in centralized rule management system such as Oracle Business Rules Engine is an option to be considered.

24.1.5. Competing Consumers Pattern: How are Multiple Consumers used to Improve Parallelism and Efficiency?

Problem

When the requester application produces a huge number of business messages which should be handled and sent to the target application, consuming all the messages to meet the expected throughput is a challenge. This becomes much more profound when processing of each message involves interacting with a multitude of systems thereby resulting in blocking for a significant period of time waiting for them to complete their work.

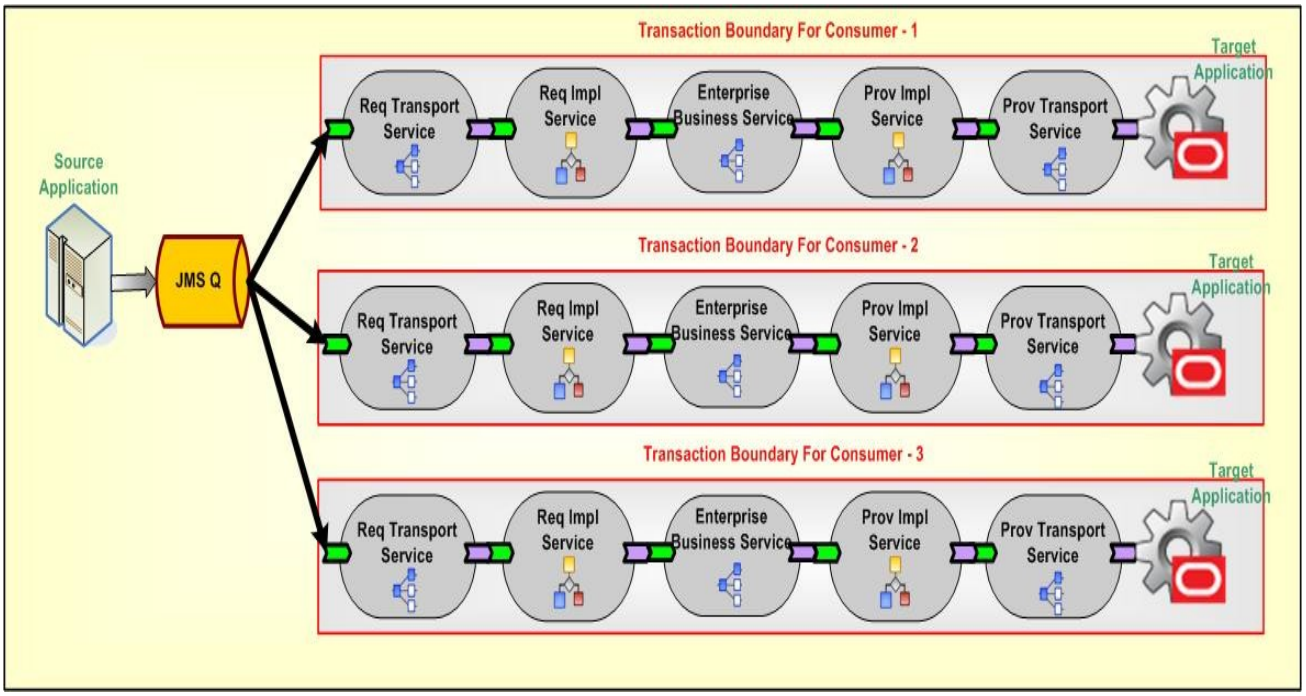
For example, the Order capture application submits orders in order processing queue for fulfillment of orders. Each of the order fulfillment requests needs to be picked from the queue and handed over to order orchestration engine for decomposition – only upon the acknowledgment, next message could be picked up from the order processing queue. Unplanned outages of order orchestration platform could result in large accumulation of order fulfillment requests and serial processing of these requests upon availability of platform could cause inordinate amount of delay.

Solution

AIA recommends setting up multiple consumers or listeners connected to the source queue. AIA assumes that the requester application has published messages into the source queue.

Refer to Asynchronous Fire-And-Forget Pattern for more details.

Setting up multiple listeners, triggers consumption of multiple messages in parallel. Even though multiple consumers are created to receive the message from a single queue (Point-to-Point Channel), only one of the consumers could receive the message upon the delivery by JMS. Even though all of the consumers compete with each other to be the receiver, only one of them would end up receiving the message. Based on the business requirements, this pattern can be used across the nodes with each consumer set up on each node in an HA environment, or on a cluster to improve the scalability, or within the AIA artifact.



Setting up multiple consumers or listeners connected to the source queue

Impact

This solution only works for the queue and cannot be used with the Topic (Publish-Subscribe channel). In case of Topic, each of the consumers will receive a copy of the message.

Since multiple consumers are processing the messages in parallel, the messages are not processed in a specific order. If they need to be processed in sequence without compromising parallelism and efficiency for a functional reason, then you must introduce a staging area to hold these messages until a contiguous sequence is received before delivering them to the ultimate receivers.

24.1.6. Asynchronous - Delayed Response Pattern: How does the Service Provider Communicate with the Requester when Synchronous Communication is not Feasible

Problem

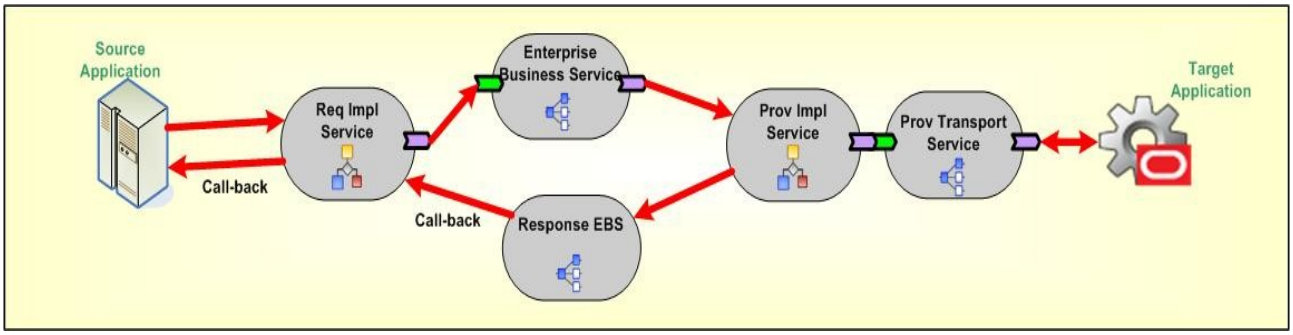
When a service provider has to take a large amount of time to process the request, how can the requester be communicated about the outcome without keeping the requester in a suspended mode during the entire processing?

For example, the Order Capture application submits a request for fulfillment of order. The order fulfillment process itself could take anywhere from several minutes to several days depending upon the complexity of tasks involved. Even though the Order Capture application would like to know the outcome of the fulfillment request, it cannot afford to wait idly until the process is completed to know the outcome.

Solution

AIA recommends using the asynchronous delayed response pattern where the requester submits a request to the integration layer and sets up a callback response address by populating the metadata section in the request message (WSA Headers). The callback response address points to the end point location of the original caller's service that would be contacted by service provider after the completion. Since multiple intermediary services are involved before sending the message to the ultimate receiver, sending the callback address via the metadata section in the message is needed. In addition to callback address, the requester is expected to send correlation details that would allow service provider to send this information in the future conversations so that the requesters will be able to associate the response messages with the original requests.

Since a request – delayed response pattern is asynchronous in nature, the requester will not be waiting for the response after sending the request message. In the flow implementing this pattern, it is recommended that all of the services involved have 2 one-way operations. A separate thread must be invoked to initiate the response message. When the AIA provider service processes the message after getting a reply from the provider participating application, it creates a response thread by invoking the response EBS. The response EBS uses the WSA headers to identify the requesting service and processes the response to invoke the callback address given by the requesting application. The EBS will have a pair of operations to support two one-way calls – one for sending the request and another for receiving the response. Both the operations will be independent and atomic. A correlation mechanism is used to establish the application or caller's context.



Example of the asynchronous delayed response pattern

Impact

Provider applications need to have the capability to persist the correlation details as well as the callback address sent by the requester application and need these details populated in the response message.

24.2. AIA Assets Centralization Patterns

This section describes how to avoid redundant data model representation and service contract representation in AIA.

24.2.1. How to Avoid Redundant Data Model Representation in AIA

Problem

The service contracts between the applications and AIA interfaces need to use similar business documents or data sets which results in the redundant data models representation. A change in the data model is very difficult to apply and it is very difficult to govern.

Solution

AIA recommends separation of the data model or schemas physically from the service contracts or the implementations. These schemas should be centralized at a location which could be referenced easily during design or runtime.

All the EBOs (Enterprise Business Objects), ABOs (Application Business Objects), and any other utility schemas should be maintained at a central location in a structured way.

As the EBO schemas are used for various business processes in common, a thorough analysis should be done before coming up with a canonical data model.

Impact

- A change in the data model / schema should be treated very carefully because multiple dependent service contracts could be impacted with a small change.
- Versioning policies should be clearly defined, otherwise redundant service implementations for a minor change may occur.
- Governance is a challenge to manage the shared data models or common assets.

24.2.2. How to Avoid Redundant Service Contracts Representation in AIA

Problem

The granularity of the service contract can be at the operation level or at the entity level. The entity level definition can have various operations defined in the same service contract but the implementation can be at operation level which results in creating multiple implementation artifacts using the same service contract. This causes redundant service contracts representation in various implementations.

Solution

AIA recommends that the service contracts (WSDL) be separated physically from the implementations. These service contracts should be centralized at a location which can be referenced easily during design or runtime.

All the EBS (Enterprise Business Service), ABCS (Application Business Connector Service), and any other utility service contracts should be maintained at a central location in a structured way.

Impact

- A change in the service contract should be treated very carefully because multiple dependent service implementations could be impacted with a small change.
- Governance is a challenge to manage the shared service contracts or common assets.

24.3. AIA Assets Extensibility Patterns

This section discusses the extensibility patterns for AIA assets and describes the problems and solutions for extending:

- Existing schemas
- AIA services
- Existing transformations

- Business processes

24.3.1. Extending Existing Schemas in AIA

Problem

The delivered schemas may not be sufficient for some customer specific business operations, so the customer may want to add elements to the existing schemas in an upgrade safe manner. This wouldn't be possible by just adding the customer-specific elements in an existing schema, and the schema extension model is needed.

Solution

To allow customers to extend the EBO or Enterprise Business Message (EBM) schemas in a non-intrusive manner, the complex type defined for every business component and the common component present in each of the EBO or EBM schemas has an extension placeholder element called *Custom* at the end. The data type for this custom element is defined in the schema modules allocated for holding customer extensions in the custom EBO schema files.

For example, the custom element added at the end of the complex type in the "Schema-A" acts as a place holder to bring the customer extensions added in the "Custom Schema-A".

Here the Schema- A is "AIAComponents\EnterpriseObjectLibrary\Industry\Telco\EBO\CustomerParty\V2\CustomerPartyEBO.xsd"

```
<xsd:complexType name="CustomerPartyAccountContactCreditCardType">
   <xsd:sequence>
   <xsd:element ref="corecom:Identification" minOccurs="0"/>
   <xsd:element ref="corecom:CreditCard" minOccurs="0"/>

<xsd:element name="Custom"
type="corecustomerpartycust:CustomCustomerPartyAccountContactCreditCardTyp
e" minOccurs="0"/>

    </xsd:sequence>
    <xsd:attribute name="actionCode" type="corecom:ActionCodeType"
use="optional"/>
</xsd:complexType>
```

And the Custom Schema – A is "AIAComponents\EnterpriseObjectLibrary\Industry\Telco\Custom\EBO\CustomerParty\V2\CustomCustomerPartyEBO.xsd"

```
<!-- ================================================================= --
>
   <!-- ==============  CustomerParty Custom Components ================ -
->
<!-- ============================================================ -->
   <xsd:complexType name="CustomCustomerPartyAccountAttachmentType"/>
   <xsd:complexType name="CustomCustomerPartyAccountContactType"/>
<xsd:complexType name="CustomCustomerPartyAccountContactCreditCardType">
```

<!-- CUSTOMERS CAN ADD EXTENSIONS HERE ….. →

```
</xsd:complexType>
   <xsd:complexType name="CustomCustomerPartyAccountContactUsageType"/>
```

24.3.2. Extending AIA Services

Problem

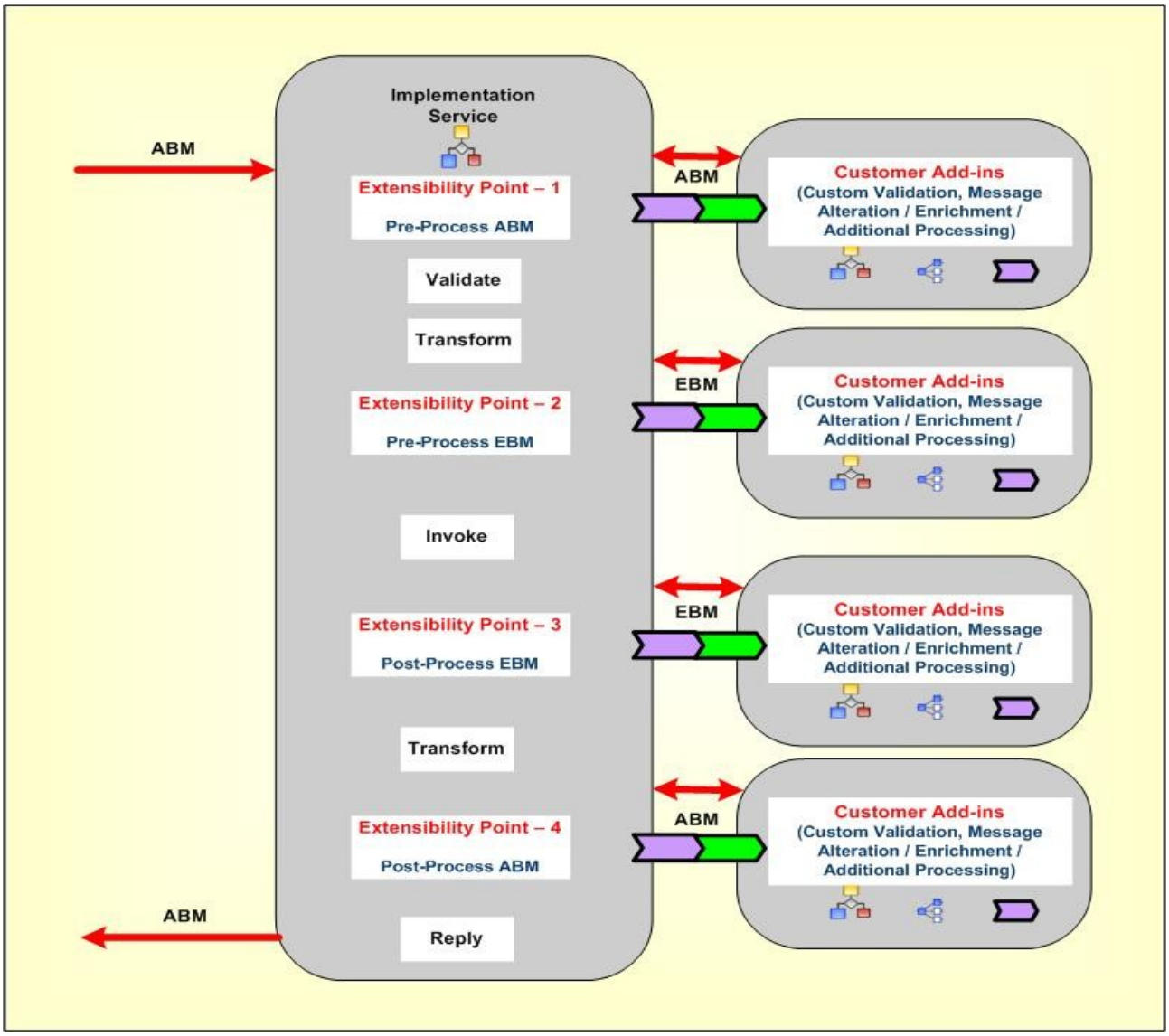
The services delivered to the customer might not be sufficient to address some of the customer-specific business functionality. The customer may want to add some validation logic, enrich the existing content in the service or add some processing logic in between the existing service implementation. Adding this logic in the existing service code wouldn't ensure upgrade safety because the upgrade process would overwrite the existing service code with new functionality added as part of the upgrade. So, customers need a service extension model.

Solution

AIA recommends introducing various extension points at logical points during the service implementation. There are four logical extension points identified in the ABCS to perform the customer specific validations, content enrichment/message alteration, and any additional logic that customer would like to implement with the given payload at that extension point. Typically there are two pre-processing and two post-processing extension points identified: pre-processing ABM, post-processing ABM, pre-processing EBM and post-processing EBM.

The number of extension points might be less than four or more than four depending on the type of service implementation and also based on the type of message exchange pattern used by that service.

These extension points can be enabled or disabled based on whether the customer wishes to implement those custom extension points.



Extending AIA services

24.3.3. Extending Existing Transformations in AIA

Problem

The transformations delivered to the customer with existing schemas may not be sufficient for some customer specific business operations. The customer might want to add elements to the existing schemas and then add transformation maps for the newly added elements to transfer the information from one application to the other in an upgrade safe manner. This wouldn't be possible by just adding the customer-specific transformations in an existing XSL files, the transformations extension model is needed.

Solution

To allow the customers to extend the transformations in a non-intrusive manner, the call template statement is defined for every business component mapping present in each of the XSL transformation file which will call the "Custom Template" defined in the custom XSL transformation.

Here is the example to add new transformations for the custom elements added by the customer:

The main XSL mapping “XformListOfCmuAccsyncAccountIoToCreateCustomerPartyListEBM.xsl” would import the custom XSL file and have call template statement to the extension template for each complex type or business component like this:

```
<?xml version = '1.0' encoding = 'UTF-8'?>
..……..
xmlns:dvm="http://www.oracle.com/XSL/Transform/java/oracle.tip.dvm.LookupV
alue">
  <xsl:import
href="XformListOfCmuAccsyncAccountIoToCreateCustomerPartyListEBM_Custom.xs
l"/>
..……..
  <xsl:value-of select="aia:getServiceProperty($ConfigServiceName,
'Routing.CustomerPartyEBS.CreateCustomerPartyList.CAVS.EndpointURI',
false())"/>
            </corecom:DefinitionID>
          </xsl:if>
<xsl:call-template name="MessageProcessingInstructionType_ext">
            <xsl:with-param name="currentNode" select="."/>
</xsl:call-template>
        </corecom:MessageProcessingInstruction>
```

The custom XSL file would have the template definition where the customers can add their custom mappings for the newly added custom elements or existing elements which are not mapped in the main transformation.

```
<!-- HEADER CUSTOMIZATION -->
  <xsl:template name="EBMHeaderType_ext">
  <xsl:param name="currentNode"/>
    <!-- Customers add transformations here -->
  </xsl:template>
```

<xsl:template name="MessageProcessingInstructionType_ext">

```
  <xsl:param name="currentNode"/>
    <!-- Customers add transformations here -->
  </xsl:template>

 <!-- DATA AREA CUSTOMIZATION -->
  <xsl:template name="ContactType_ext">
    <xsl:param name="currentNode"/>
        <!-- Customers add transformations here -->
  </xsl:template>
```

24.3.4. Extending the Business Processes in AIA

Problem

The composite business processes or Enterprise Business Flows delivered to the customer may not be sufficient to address some of the customer specific business functionality. The customer may want to add more processing steps, message alteration, or additional processing logic between the existing composite business process implementation. Adding this logic in the existing process orchestration wouldn’t ensure upgrade safety so customers need a process extension model.

Solution

AIA recommends introducing extension points at logical points during the service implementation. There are no fixed logical extension points identified for the Composite Business Processes (CBP) or Enterprise Business Flows (EBF). The number of extension points depends on the complexity of the business process and the number of message types that the process is handling in the implementation.

It is recommended to have one pre-processing and one post-processing extension point for each message type at various logical points in CBP or EBF implementation. The extension process should always be a synchronous process using the same message payload for request and response for that extension point.

These extension points can be enabled or disabled based on whether the customer wishes to implement those custom extension points.

25. Best Practices and Recommendations for Designing and Building AIA Process Integration Packs

This chapter discusses best practices and recommendations for designing and building Oracle Application Integration Architecture (AIA) Process Integration Packs (PIPs).

This chapter discusses the following topics:

- General Guidelines for Design, Development, and Management of AIA Processes
- Building Efficient BPEL Processes

25.1. General Guidelines for Design, Development, and Management of AIA Processes

This section discusses the following topics:

- Interpreting Empty Element Tags in XML Instance Document
- Purging the Completed Composite Instances
- Syntactic / Functional Validation of XML Messages
- Provide Provision for Throttling Capability
- Artifacts Centralization

25.1.1. Interpreting Empty Element Tags in XML Instance Document

The XML Instance document should have empty element tags only when the sender intends to have the consumer nullify the values for the elements. Otherwise, these tags should not be present. Having these nonsignificant tags can have a huge impact on memory consumption and hence scalability of the application.

AIA recommends that Enterprise Business Messages (EBMs) have only significant elements.

Some applications can inspect the content and produce an XML document having only the significant tags, whereas the rest don't. Because the ABCS is intimate with the application, it can choose the appropriate style based on the application's behavior. In situations in which the applications produce Application Business Messages (ABM) containing all of the elements regardless of whether the elements underwent change or not, the requester connector services should assume that the empty elements in ABM are not significant; and should ignore them when producing EBM. The first code example shown here illustrates how this could be done. In situations in which ABMs contain only elements that underwent a change in value, the connector services should treat the presence of an empty element as the sender's intent to have the consumer nullify the values for that element. The second code example illustrates this use case. With service requesters producing EBM in the preceding manner, the job of the consumer becomes straightforward. It can assume that every element is a significant one—hence, the ABCS consuming the EBM should not skip the empty element. The third code example illustrates how a message containing significant elements can be processed.

```
<!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      ABM -> EBM transformation
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      Use this construct when the source Application's ABM contains
      all the elements defined in its schema regardless of whether
      or not all those elements underwent any change in value.  In
      this situation, in the interest of conserving memory, we will
      make the assumption that an empty element is NOT a significant
      element and we will ignore them.
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~--
>
    <xsl:if test="ABMSourceElement/text()">
        <EBMTargetElement>
            <xsl:value-of select="ABMSourceElement"/>
        </EBMTargetElement>
    </xsl:if>


    <!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      ABM -> EBM transformation
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      Use this construct when the source Application's ABM contains
      only those elements that underwent a change in value.  In this
      situation, the presence of an empty element can be considered
      significant and so we will not ignore it.
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~--
>
    <xsl:if test="ABMSourceElement">
        <EBMTargetElement>
            <xsl:value-of select="ABMSourceElement"/>
        </EBMTargetElement>
    </xsl:if>


    <!--~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      EBM -> ABM transformation
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
      If the above rules have been followed, then we can assume that
      any empty element in the EBM is a significant one, and therefore
      should not be ignored when transforming from EBM to ABM.  So
      use this construct.
    ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~--
>
```

```
<xsl:if test="EBMSourceElement">
    <ABMTargetElement>
        <xsl:value-of select="EBMSourceElement"/>
    </ABMTargetElement>
</xsl:if>
```

25.1.2. Purging the Completed Composite Instances

AIA highly recommends having a process in place to archive and clean up the completed composite instances after a specified period.

- Synchronous request / response-based completed composite instances should be purged from SOA dehydration data store after a month.
- Data synchronization-related composite instances should be purged 3–4 months after their completion.
- Composite Business Processes should be purged 1–2 years after their completion.

Even though this duration is subject to change based on policies prevailing at customer premises, attempts should be made to do the purging at the earliest time. Purging needs to be preceded by archiving of the instance data.

For more information, see *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite 11g Release 1,* "Deleting Large Numbers of Instances."

25.1.3. Syntactic / Functional Validation of XML Messages

This section discusses:

- Syntactic validation
- Data/functional validation

25.1.3.1. Syntactic Validation

With document style, a web service endpoint can use the capabilities of a validating parser and the run time to perform syntactic validation on business documents against their schema definitions.

A schema specifies the data shape of the payload that could be sent to the web service operation. When a SOAP message is received by the web-services handler, the schema pertaining to the operation being called is used to validate the content of the SOAP message.

Because this validation will have a performance impact, it needs to be used judiciously in a production environment. AIA recommends enabling the schema validation only for the service-receiving message from a requester outside its boundary. Even though the requester could be an internal application, the syntactic validation is normally applied at run time only for messages coming from an external source. We highly recommend that you turn off schema validation for the intermediary services residing in AIA layer.

In a development environment, we highly recommend that you turn on schema validation for all services during certain testing phases to ensure that messages produced by services are syntactically valid.

For more information about how to enable schema validation, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g Release 1.*

25.1.3.2. Data / Functional Validation

We highly recommend that the validation is done by the service provider. It could be done either by the provider ABCS or by the application itself.

25.1.4. Provide Provision for Throttling Capability

The implementation of cross-functional business processes often requires integrating endpoint systems having divergent nonfunctional characteristics such as availability and concurrent processing capability. Occasionally, the endpoints become unavailable due to planned or unplanned outages and many systems may not be able to handle large volumes of concurrent messages. Overwhelming these systems with a high-volume of requests may result in failure of target endpoints, which in turn will have a cascading impact on the overall integration. AIA recommends implementing store and forward capability using queues in most of the situations while interacting either with the requester or provider application. This gives opportunities for customers to implement throttling that would help impose a limit on the rate at which message requests are handed over to a specific endpoint.

For more information, see AIA Message Processing Patterns.

25.1.5. Artifacts Centralization

To facilitate the governance of shared artifacts such as Enterprise Business Objects, Enterprise Business Service WSDLs, Application Business Message Schemas, ABCS WSDLs, Domain Value Maps, and Cross-Reference Meta data, AIA highly recommends designing and implementing these artifacts independently from the service capabilities that use them. AIA strongly discourages the management and persistence of these artifacts as part of individual services. AIA's programming model recommends the use of MDS to persist these artifacts.

For more information about how MDS is used for centralization of these assets, see Using MDS in AIA.

25.2. Building Efficient BPEL Processes

This section provides some recommendations on how to keep the BPEL-based processes as lean as possible.

The section includes these topics:

- Using BPEL as "glue," not as a programming language
- Avoiding global variables wherever possible
- Avoiding large FlowN
- Controlling the persistence of audit details for a synchronous BPEL process

- Using non-idempotent services only when absolutely necessary
- Defining the scope of the transaction
- Disabling the audit for synchronous BPEL process service components
- Including no break-point activity in a request / response flow

25.2.1. Using BPEL as "Glue", Not as a Programming Language

BPEL is an orchestration language—it should be used primarily as a glue to orchestrate a set of services exposed by the application systems. Even though BPEL does support a wide array of programming constructs, they are not meant for building a complex programming logic within the BPEL process.

25.2.1.1. Keep the Number of BPEL Activities as Minimal as Possible

Use XSL instead of Assign

Avoid the use of multiple assign activities to populate various elements in an XML message. Consider using XSL to do the transformations. Because the invocation of XSL script comes with a cost, usage of XSL for populating the message should be considered only when more than 7–10 assignments have to be done.

Use XPath expressions to constrain the data set

Programming scenarios exist in which we have to loop through a given array of data (A), and operate on a specific subset of the array (using condition C). So the simple way of doing this is to have a while loop for A, and then a switch condition C inside the while loop. In this approach, we invariably end up looping through all the lines, leading to inefficiency. A better way to approach this situation is to use multi-indexes. So instead of accessing A as A[i] and then checking the condition, we can access A as A[C][i], where we will loop through all those elements of A(using i), where condition C is satisfied. This way, we reduce the number of BPEL activities.

25.2.1.2. Avoid Large *While* Loop

The typical usage patterns that are noticed are usage of *while* loop to process the following:

- Multiple repeating child instances in an XML message
- Large number of discrete object instances in an XML message

In situations in which the *while* loop is being used to process repeating child instances (maxOccurences is unbounded) in an XML message, the BPEL activities in the *while* loop have to be designed keeping the possibility of large number of iterations in mind. For example, having 50 activities to process a single instance in a while loop will suddenly result in creation of 5000 activities at run time when an instance document having 100 repeating instances is processed.

25.2.2. Avoiding Global Variables Wherever Possible

Within the assign activity in BPEL, local variables should be used instead of process variables wherever possible. Local variables are limited to the scope in the BPEL process. These get deleted from memory and from the database after you close the scope. On the other hand, the life cycle of a global / process variable is tied to the instance life cycle. These variables stay in memory or disk until the instance finishes. Thus, local variables are preferred to process or global variables. However, if the same variable is being used either in every iteration in the while loop or throughout the entire process, creating one global variable and having that accessed by all iterations would be better.

The following BPEL fragment illustrates the use of local variables.

```
<scope name="Scope_1">
  <variables>
              <variable
name="Invoke_CallprocessBillingMove_InputVariable"
                 messageType=

"sordmovsubabcs:ProcessFulfillmentOrderBillingBRMCommsMoveAddSubProcessReq
uestMessage"/>
              <variable
name="Invoke_CallprocessBillingMove_OutputVariable"
                  messageType=

"sordmovsubabcs:ProcessFulfillmentOrderBillingBRMCommsMoveAddSubProcessRes
ponseMessage"/>
        </variables>
        <sequence name="Sequence_MoveAdd_SubProcess">
                <assign name="Assign_Variable_Invoke_CallMoveAdd">
                     <copy>
                        <from variable="inputSubProcess"

query="/sordsubebo:ProcessFulfillmentOrderBillingBRMCommsSubprocessMessage
"/>
                        <to
variable="Invoke_CallprocessBillingMove_InputVariable"
                                       part="payload"

query="/sordsubebo:ProcessFulfillmentOrderBillingBRMCommsSubprocessMessage
"/>
                     </copy>
                </assign>
                <invoke name="Invoke_CallMove-Add_Subprocess"

partnerLink="ProcessFulfillmentOrderBillingBRMCommsMoveAddSubProcess"

portType="sordmovsubabcs:ProcessFulfillmentOrderBillingBRMCommsMoveAddSubP
rocess"
                           operation="processBillingMove"

inputVariable="Invoke_CallprocessBillingMove_InputVariable"

outputVariable="Invoke_CallprocessBillingMove_OutputVariable"/>
          </sequence>
</scope>
```

25.2.3. Avoiding Large FlowN

Careful consideration needs to be given during design of the BPEL process having FlowN activity—the developer needs to have a good understanding of the upper limit of N. Depending on the type of activities performed in a flow, one has to strongly consider the option of running the flows in an asynchronous mode by setting nonBlockingInvoke property in composite.xml to ***true***.

25.2.4. Controlling the Persistence of Audit Details for a Synchronous BPEL Process

auditLevel property sets the audit trail logging level. This configuration property is applicable to both durable and transient processes. This property controls the amount of audit events that are logged by a process. Audit events result in more database inserts into the audit_level and audit_details tables, which may impact performance. Audit information is used only for viewing the state of the process from Oracle Enterprise Manager Console. Use the ***Off*** value if you do not want to store any audit information. Always choose the audit level according to your business requirements and use cases

For synchronous BPEL processes, AIA recommends nonpersistence of instance details. For this, set the auditLevel property to ***Off*** at the service component level. This general guideline can be overridden for individual services based on use cases.

25.2.5. Using Non-Idempotent Services Only When Absolutely Necessary

Idempotent services are retryable. They reproduce the same results regardless of the number of times the service is invoked. They have absolutely no side effects. The default value for **idempotent** property is ***true***. Setting the **idempotent** property to ***false*** will result in dehydration of the process after running the partnerlink. The decision about the configuration of idempotent property needs to be done at the design and development time by the developer.

For more information about idempotent property, see *Oracle Fusion Middleware Developer's Guide for Oracle SOA Suite 11g Release 1*.

25.2.6. Defining the Scope of the Transaction

A transaction tends to grow big when it encompasses a set of activities to process each repeating node in an XML message and when the number of repeating nodes is quite large. The default value for the ***dspMaxThreadDepth*** property is set to ***600***. If the number of BPEL activities run in a transaction exceeds this value, BPEL engine issues an automatic implicit commit to end the transaction. This might not be in alignment with the application transaction semantics. This could probably be eliminated by setting this property to an arbitrarily high value. This approach anticipates that the global transaction as defined by the integration developer will end much prior to BPEL reaching the new threshold. In most of the situations, setting the property to a very high value will help the transaction to get completed. However, it has the potential to impact the overall scalability of the application. Hence, attempts should be made to keep the scope of the transaction as small as possible.

25.2.7. Disabling the Audit for Synchronous BPEL Process Service Components

AIA recommends turning off the audit completely for synchronous BPEL-based services that have no midprocess breakpoint activities.

- ***auditLevel***

  This property sets the audit trail logging level. This property controls the amount of audit events that are logged by a process. The value set at the BPEL process service component level overrides the value specified at the SOA Infrastructure, BPEL Process Service Engine, and Composite Application levels. Override the value only for synchronous BPEL processes that have no midprocess breakpoint activities.

  AIA recommends the following value to be set to this property.

  Off: The BPEL service engine does not capture the payload. The payload details are not available in the flow audit trails. Payload details for other BPEL activities are collected, except for assign activities. This level is optimal for most normal operations and testing.

  Set the bpel.config.auditLevel property to an appropriate value in the composite.xml file of your SOA project.

```
<component name="BPELProcess">
<implementation.bpel src="BPELProcess.bpel" />
<property name="bpel.config.auditLevel">Off</property>
</component>
```

25.2.8. Including No Break-Point Activity in a Request / Response Flow

We highly recommend that a BPEL service implementing synchronous request/response message exchange pattern has no break-point activity such as midprocess receive, wait, onMessage, onAlarm.

Similarly, a mediator service implementing synchronous request/response message exchange pattern should have no parallel routing rules. In 10.1.3.x, the ESB routing service implementing request/response message exchange pattern should have no target services invoked in asynchronous mode.

26. Tuning AIA Process Integration Packs

To maximize Oracle Application Integration Architecture (AIA) Process Integration Pack (PIP) performance, you must monitor, analyze, and tune all the components that are used by the PIP. This chapter describes the tools that you can use to monitor performance and the techniques for optimizing the performance of AIA PIP as well as the underlying Oracle Fusion Middleware components.

This chapter discusses the following topics:

26.1. Introduction to Tuning

Performance tuning usually involves a series of trade-offs. After you have determined what is causing the bottlenecks, you may have to modify performance in some other areas to achieve the desired results. However, if you have a clearly defined plan for achieving your performance objectives, the decision on what to trade for higher performance is easier because you have identified the most important areas.

26.1.1. How to Use Baselines

The most effective way to tune is to have an established performance baseline that can be used for comparison if a performance issue arises.

It is important to identify the peak periods at the site and install a monitoring tool that gathers performance data for those high-load times. Optimally, data gathering should be configured from when the application is in its initial trial phase during the QA cycle. Otherwise, this should be configured when the system is first in production.

26.1.2. How to Handle Resource Saturation

If any of the hardware resources are saturated (consistently at or near 100% utilization), one or more of the following conditions may exist:

- The hardware resources are insufficient to run the application
- The system is not properly configured.
- The application or database must be tuned.

For a consistently saturated resource, the solutions are to reduce load or increase resources. For peak traffic periods when the increased response time is not acceptable, consider increasing resources or determine if there is traffic that can be rescheduled to reduce the peak load, such as scheduling batch or background operations during slower periods.

26.1.3. How to Use Proactive Monitoring

Proactive monitoring usually occurs on a regularly scheduled interval, where a number of performance statistics are examined to identify whether the system behavior and resource usage has changed. Proactive monitoring can also be considered as proactive tuning.

Usually, monitoring does not result in configuration changes to the system, unless the monitoring exposes a serious problem that is developing. In some situations, experienced performance engineers can identify potential problems through statistics alone, although accompanying performance degradation is usual.

Experimenting with or tweaking a system when there is no apparent performance degradation as a proactive action can be a dangerous activity, resulting in unnecessary performance drops. Tweaking a system should be considered reactive tuning, and the steps for reactive tuning should be followed.

Oracle Fusion Middleware provides a variety of technologies and tools that can be used to monitor Server and Application performance. Monitoring is an important step in performance tuning and enables you to evaluate server activity, watch trends, diagnose system bottlenecks, debug applications with performance problems and gather data that can assist you in tuning the system.

For more information, see *Oracle Fusion Middleware Performance and Tuning Guide 11*g *Release 1, "*Monitoring Oracle Fusion Middleware." Also, refer to "Garbage Collection Configuration" for monitoring memory by enabling garbage collections.

26.1.4. How to Eliminate Bottlenecks

Tuning usually implies fixing a performance problem. However, tuning should be part of the life cycle of an application—through the analysis, design, coding, production, and maintenance stages. Oftentimes, the tuning phase is left until the system is in production. At this time, tuning becomes a reactive fire-fighting exercise, where the most important bottleneck is identified and fixed.

26.1.5. Top Performance Areas

Even though this chapter can be considered as a 'Quick Start' guide for fine tuning an AIA PIP, it is not intended to be a chapter detailing a complete list of areas to tune as well as about the techniques on how to identify as well as fix the issues.

For complete information about fine tuning Fusion Middleware application, see *Oracle Fusion Middleware Performance and Tuning Guide 11*g *Release 1.*

Here is the list of critical Oracle Fusion Middleware performance areas that need to be looked at to performance tune an AIA PIP.

- SOA dehydration database
  - Configuring database parameters for the most optimal performance
  - Identifying and fixing the bottlenecks
- Java Virtual Machine (JVM)
  - Configuring Garbage Collection to get the most optimal performance
  - Monitoring and Profiling the JVM
- Oracle Fusion Middleware components
  - Configuring FMW components for the most optimal performance
  - Configuring components for concurrency
  - Configuring logging levels
  - Configuring Meta Data Service
- Oracle Web Logic Server

The following sections discuss how to configure and tune of each of these areas.

26.2. Oracle Database Performance Tuning

This section contains the following topics:

26.2.1. How to Tune the Oracle Database

The Oracle database that is used as a dehydration data store by SOA Suite needs to be monitored and tuned to get the best performance from AIA applications.

Database administrators must monitor the database (for example, by generating automatic workload repository (AWR) reports for Oracle database) to observe lock contention, I/O usage and take appropriate action to address the issues.

26.2.2. Introducing Automatic Workload Repository

The Automatic Workload Repository (AWR) collects, processes, and maintains performance statistics for problem detection and self-tuning purposes. This data is both in memory and stored in the database. The gathered data can be displayed in both reports and views.

The statistics collected and processed by AWR include:

- Object statistics that determine both access and usage statistics of database segments
- Time model statistics based on time usage for activities, displayed in the V$SYS_TIME_MODEL and V$SESS_TIME_MODEL views
- Some of the system and session statistics collected in the V$SYSSTAT and V$SESSTAT views
- SQL statements that are producing the highest load on the system, based on criteria such as elapsed time and CPU time
- Active Session History (ASH) statistics, representing the history of recent sessions activity

26.2.3. Configuring Performance Related Database Initialization Parameters

Below are the minimum basic configurations to be set for the dehydration store. This SHOULD be implemented in the staging and production environment.

The following tables provide common init.ora parameters and their descriptions. Consider following these guidelines to set the database parameters. Ultimately, however, the DBA should monitor the database health and tune parameters based on the need. See the following tables

The values should be considered as starting values. Again these values can vary depending upon target environment's hardware and software topologies. Additional applications / processes, if any, that might run on the target environment could significantly have an impact on these properties. Further, these values need to be adjusted based on the inferences made using the data collected through monitoring tools.

Dehydration Store Specific Parameter	Recommended Setting for Staging and Production	
shared_pool_size	***800M***	Applicable when SGA Auto Tuning using `sga_target` and `sga_maxsize` is not being used. Consider setting MEMORY_TARGET instead of setting SGA and the PGA separately.

Dehydration Store Specific Parameter	Recommended Setting for Staging and Production	
sga_max_size	***1504M***	The SGA_MAX_SIZE initialization parameter specifies the maximum size of the System Global Area for the lifetime of the instance. You can dynamically alter the initialization parameters affecting the size of the buffer caches, shared pool, and large pool, but only to the extent that the sum of these sizes and the sizes of the other components of the SGA (fixed SGA, variable SGA, and redo log buffers) does not exceed the value specified by SGA_MAX_SIZE. Ensure that you regularly monitor the buffer cache hit ratio and size the SGA so that the buffer cache has an adequate number of frames for the workload. The buffer cache hit ratio may be calculated from data in the view V$SYSSTAT. Also the view V$DB_CACHE_ADVICE provides data that can be used to tune the buffer cache. Consider setting MEMORY_TARGET instead of setting SGA and the PGA separately.
pga_aggregate_target	***800M***	Specifies the target aggregate PGA memory available to all server processes attached to the instance.Starting from 11g, set MEMORY_TARGET instead of setting SGA and the PGA separately.
processes	***800***	

Dehydration Store Specific Parameter	Recommended Setting for Staging and Production	
log_buffer (applicable only for 10g database)	***30523392***	LOG_BUFFER specifies the amount of memory (in bytes) that Oracle uses when buffering redo entries to a redo log file. Redo log entries contain a record of the changes that have been made to the database block buffers. The LGWR process writes redo log entries from the log buffer to a redo log file The goal in sizing *log_buffer* is to set a value that results in the least overall amount of log-related wait events. Common wait events related to a too-small *log_buffer* size include high "*redo log space requests*" and a too-large log_buffer may result in high "*log file sync*" waits.
db_block_size	***8192***	DB_BLOCK_SIZE specifies (in bytes) the size of Oracle database blocks. The default block size of 8K is optimal for most systems. Set this parameter at the time of database creation.
job_queue_processes	***10***	JOB_QUEUE_PROCESSES specifies the maximum number of processes that can be created for the execution of jobs. It specifies the number of job queue processes per instance

Dehydration Store Specific Parameter	Recommended Setting for Staging and Production	
UNDO_MANAGEMENT	***AUTO***	UNDO_MANAGEMENT specifies which undo space management mode the system should use. When set to AUTO, the instance starts in automatic undo management mode. In manual undo management mode, undo space is allocated externally as rollback segments. Starting with Oracle Database 11g Release 1 (11.1), the default value of the `UNDO_MANAGEMENT` parameter is `AUTO` so that automatic undo management is enabled by default. You must set the parameter to `MANUAL` to turn off automatic undo management, if required.
open_cursors	***1000***	OPEN_CURSORS specifies the maximum number of open cursors (handles to private SQL areas) a session can have at once. You can use this parameter to prevent a session from opening an excessive number of cursors. It is important to set the value of OPEN_CURSORS high enough to prevent your application from running out of open cursors. The number varies from one application to another. Assuming that a session does not open the number of cursors specified by OPEN_CURSORS, there is no added performance impact to setting this value higher than actually needed. A value of 1000 for open_cursors will be a reasonable number to start with.

Dehydration Store Specific Parameter	Recommended Setting for Staging and Production	
Sga_target	***1504M***	Setting this parameter to a nonzero value enables Automatic Shared Memory Management. Consider using automatic memory management, both to simplify configuration and to improve performance. Consider setting MEMORY_TARGET instead of setting SGA and the PGA separately.
MEMORY_TARGET	***2500M***	MEMORY_TARGET specifies the Oracle system-wide usable memory. The database tunes memory to the MEMORY_TARGET value, reducing or enlarging the SGA and PGA as needed.
MEMORY_MAX_TARGET	***3000M***	MEMORY_MAX_TARGET specifies the maximum value to which a DBA can set the MEMORY_TARGET initialization parameter.
Session_cached_cursors	***200***	SESSION_CACHED_CURSORS specifies the number of session cursors to cache. Repeated parse calls of the same SQL statement cause the session cursor for that statement to be moved into the session cursor cache. Subsequent parse calls find the cursor in the cache and do not reopen the cursor. Oracle uses a least recently used algorithm to remove entries in the session cursor cache to make room for new entries when needed. This parameter also constrains the size of the PL/SQL cursor cache which PL/SQL uses to avoid having to re-parse as statements are re-executed by a user. A starting value of 200 is reasonable for a typical AIA system.

Dehydration Store Specific Parameter	Recommended Setting for Staging and Production	
TRACE_ENABLED	***FALSE***	TRACE_ENABLED controls tracing of the execution history, or code path, of Oracle. Oracle Support Services uses this information for debugging. Although the performance impacts incurred from processing is not excessive, you may improve performance by setting TRACE_ENABLED to FALSE.

26.2.4. Tuning Redo Logs Location and Sizing

Managing the database I/O load balancing is a non-trivial task. However, tuning the redo log options can provide performance improvement for applications running in an Oracle Fusion Middleware environment, and in some cases, you can significantly improve I/O throughput by moving the redo logs to a separate disk.

The size of the redo log files can also influence performance, because the behavior of the database writer and archiver processes depend on the redo log sizes. Generally, larger redo log files provide better performance by reducing checkpoint activity. It is not possible to provide a specific size recommendation for redo log files, but redo log files in the range of a hundred megabytes to a few gigabytes are considered reasonable. Size your online redo log files according to the amount of redo your system generates. A rough guide is to switch logs at most once every twenty minutes. Set the initialization parameter `LOG_CHECKPOINTS_TO_ALERT = TRUE` to have\checkpoint times written to the alert file.\The complete set of required redo log files can be created during database creation. After they are created, the size of a redo log size cannot be changed. New, larger files can be added later, however, and the original (smaller) ones can be dropped.

For more information, see *Oracle Fusion Middleware Performance and Tuning Guide 11*g *Release 1*.

26.2.5. Automatic Segment-Space Management (ASSM)

For permanent tablespaces, consider using automatic segment-space management. Such tablespaces, often referred to as bitmap tablespaces, are locally managed tablespaces with bitmap segment space management.

For backward compatibility, the default local tablespace segment-space management mode is `MANUAL`.

For more information, see *Oracle Database Concepts 11g Release 1*, "Free Space Management" and *Oracle Database Administrator's Guide 11g Release 1,* "Specifying Segment Space Management in Locally Managed Tablespaces."

26.2.6. Changing the Driver Name to Support XA Drivers

If your data sources require support for XA drivers, you must change the driver name on Oracle WebLogic Server. This is particularly true for environments in which BPEL processes assume XA is present when calling database adapters and JMS adapters.

Change the driver name using one of the following methods:

26.2.6.1. Edit in Oracle WebLogic Server Administration Console

To edit in Oracle WebLogic Server Administration Console

1. Log into Oracle WebLogic Server Administration Console.
2. In the left pane, select ***Domain Structure***.
3. Select ***Services > JDBC > Data Source > SOADataSource > Connection Pool***.
4. For the **Driver Class Name**, change the value to `oracle.jdbc.xa.client.OracleXADataSource`.

   This provides support for the XA driver.
5. Restart the server.

26.2.6.2. Edit the SOADataSource-jdbc.xml file

To edit the SOADataSource-jdbc.xml file

1. Open the `soaDataSource-jdbc.xml` file on Oracle WebLogic Server.
2. Change the `SOADataSource` driver name from

   oracle.jdbc.OracleDriver `to` ***oracle.jdbc.xa.client.OracleXADataSource***.

```
<?xml version="1.0" encoding="UTF-8"?>
<jdbc-data-source
/. . .
. . .
/ <name>SOADataSource</name>
<jdbc-driver-params>
<url>jdbc:oracle:thin:@adc60086fems.us.oracle.com:1537:co0yd570</url>
<driver-name>*oracle.jdbc.xa.client.OracleXADataSource*</driver-name>
<properties>
<property>
<name>user</name>
<value>fusion_soainfra</value>
</property>
</properties>
/ . . .
. . ./
```

```
</jdbc-driver-params>
/. . .
. . ./
</jdbc-data-source>
```

26.2.7. Configuring Database Connections and Datasource Statement Caching

By properly configuring the connection pool attributes in JDBC data sources in your WebLogic Server domain, you can improve application and system performance. The following sections include information about tuning options for the connection pool in a JDBC data source:

JDBC Datasource Connection Pool Settings

Statement Cache Type

The Statement Cache Type (or algorithm) determines which prepared and callable statements to store in the cache for each connection in a data source.AIA recommends the property to set to ***'LRU'***

Statement Cache Size

The Statement Cache Size attribute determines the total number of prepared and callable statements to cache for each connection in each instance of the data source. By caching statements, you can increase your system performance. However, you must consider how your DBMS handles open prepared and callable statements. In many cases, the DBMS will maintain a cursor for each open statement. This applies to prepared and callable statements in the statement cache.

AIA recommends keeping the default value of ***10***. If you cache too many statements, you may exceed the limit of open cursors on your database server. For example, if you have a data source with 50 connections deployed on 2 servers, if you set the Statement Cache Size to 10 (the default), you may open 1000 (50 x 2 x 10) cursors on your database server for the cached statements.

Initial Capacity and Maximum Capacity

For applications that use a database, performance can improve when the connection pool associated with a data source limits the number of connections. You can use the Maximum Capacity to limit the database requests from Oracle Application Server so that incoming requests do not saturate the database, or to limit the database requests so that the database access does not overload the Oracle Application Server-tier resource.

The connection pool ***MaxCapacity*** attribute specifies the maximum number of connections that a connection pool allows. By default, the value of MaxCapacity is set to 15. For best performance, you should specify a value for MaxCapacity that matches the number appropriate to your database performance characteristics.

Limiting the total number of open database connections to a number your database can handle is an important tuning consideration. You should check to make sure that your database is configured to allow at least as large a number of open connections as the total of the values specified for all the data sources MaxCapacity option, as specified in all the applications that access the database.

AIA recommends setting Initial as well as Maximum Capacity to 50 to start with; and make the necessary adjustments based on the database performance.

Getting the Right Mix of Performance and Fault Tolerance

The following 4 options can be used to get the right mix of performance and fault tolerance for your system.

- **Test Frequency**

  Enable periodic background connection testing by entering the number of seconds between periodic tests. . If the request is made within the time specified for Seconds to Trust an Idle Pool Connection, since the connection was tested or successfully used by an application, WebLogic Server skips the connection test.

- **Test Reserved Connections**

  If Test Reserved Connections is enabled on your data source, when an application requests a database connection, WebLogic Server tests the database connection before giving it to the application. If the request is made within the time specified for Seconds to Trust an Idle Pool Connection, since the connection was tested or successfully used by an application, WebLogic Server skips the connection test before delivering it to an application.

- **Seconds to Trust an Idle Pool Connection**

  Seconds to Trust an Idle Pool Connection is a tuning feature that can improve application performance by minimizing the delay caused by database connection testing, especially during heavy traffic. However, it can reduce the effectiveness of connection testing, especially if the value is set too high. The appropriate value depends on your environment and the likelihood that a connection will become defunct.

- **Remove Infected Connections Enabled**

  Specifies whether a connection will be removed from the connection pool after the application uses the underlying vendor connection object. If you disable removing infected connections, you must make sure that the database connection is suitable for reuse by other applications.

  When set to ***true*** (the default), the physical connection is not returned to the connection pool after the application closes the logical connection. Instead, the physical connection is closed and recreated.

  When set to ***false***, when the application closes the logical connection, the physical connection is returned to the connection pool and can be reused by the application or by another application.

For more information, see *Oracle Database Performance Tuning Guide 11g Release 1, "*Generating Automatic Workload Repository Reports," *Oracle Database Administrator's Guide 11g Release 1, "*Monitoring Performance," *Oracle Fusion Middleware Oracle WebLogic Server Administration Console Online Help,*" JDBC Data Source: Configuration: Connection Pool," and *Oracle Fusion Middleware Configuring and Managing JDBC for Oracle WebLogic Server 11g Release 1,* "Tuning Data Source Connection Pool Options."

26.2.8. Oracle Metadata Service (MDS) Performance Tuning

For optimal performance of MDS APIs, the database schema for the MDS repository must be monitored and tuned by the database administrator. This section lists some recommended actions to tune the database repository:

- Collect schema statistics
- Increase redo log size
- Reclaim disk space
- Monitor the database performance

26.2.8.1. Using Database Polling Interval for Change Detection

MDS employs a polling thread which queries the database to gauge if the data in the MDS in-memory cache is out of sync with data in the database. This can happen when metadata is updated in another JVM. If it is out of sync, MDS clears any out of date-cached data so subsequent operations see the latest versions of the metadata.

MDS invalidates the document cache, as well as MDS cache, so subsequent operations have the latest version of the metadata.

The polling interval can be configured or changed post deployment through MBeans. The element maps to the `ExternalChangeDetection` and `ExternalChangeDetectionInterval` attributes of the `MDSAppConfig` MBean.

Prior to packaging the Enterprise ARchive (EAR) file, you can configure the polling interval by adding this entry in adf-config.xml:

```
<mds-config>
<persistence-config>
<external-change-detection enabled="true" polling-interval-secs="T"/>
</persistence-config>
</mds-config>
```

In the example above, 'T' specifies the polling interval in seconds. The minimum value is 1. Lower values cause metadata updates that are made in other JVMs, to be seen more quickly. It is important to note, however, that a lower value can also create increased middle tier and database CPU consumption due to the frequent queries. By default, polling is enabled ('true') and the default value of 30 seconds should be suitable for most purposes. Consider increasing the value to a higher number if the number of updates to MDS are few and far between.

For more information, see *Oracle Fusion Middleware Administrator's Guide,* "Changing MDS Configuration Attributes for Deployed Applications."

26.2.8.2. Tuning Cache Configuration

MDS uses a cache to store metadata objects and related objects (such as XML content) in memory. MDS Cache is a shared cache that is accessible to all users of the application (on the same JVM). If a metadata object is requested repeatedly, with the same customizations, that object may be retrieved more quickly from the cache (a "warm" read). If the metadata object is not found in the cache (a "cold" read), then MDS may cache that object to facilitate subsequent read operations depending on the cache configuration, the type of metadata object and the frequency of access.

Cache can be configured or changed post deployment through MBeans. This element maps to the `MaximumCacheSize` attribute of the `MDSAppConfig` mbean.

For more information, see *Oracle Fusion Middleware Administrator's Guide 11*g *Release 1*, "Changing MDS Configuration Attributes for Deployed Applications."

Having a correctly sized cache can significantly improve throughput for repeated reading of metadata objects. The optimal cache size depends on the number of metadata objects used and the individual sizes of these objects. Prior to packaging the Enterprise ARchive (EAR) file, you can manually update the cache-config in adf-config.xml, by adding the following entry:

```
<mds-config>
<cache-config>
<max-size-kb>200000</max-size-kb>
</cache-config>
</mds-config>
```

For more information about tuning the MDS as well as the database, see *Oracle Database Performance Tuning Guide 11g Release 1,* "Optimizing Instance Performance" and *Oracle Fusion Middleware Performance and Tuning Guide 11*g *Release 1,* "Oracle Meta Data Service Performance Tuning."

26.3. Configuring the Common SOA Infrastructure

This section discusses properties that impact the entire SOA infrastructure.

26.3.1. Configuring SOA Infrastructure Properties

These settings apply to all SOA Composite applications running in the SOA infrastructure. The properties set at this level impact all deployed SOA composite applications, except those composites for which you explicitly set different audit level values at the composite application or service engine levels. AIA recommends configuring at least the following properties.

auditLevel

This property sets the audit trail logging level. This property controls the amount of audit events that are logged by a process.

AIA recommends the following value to be set to this property.

- **Production:** The BPEL service engine does not capture the payload. The payload details are not available in the flow audit trails. Payload details for other BPEL activities are collected, except for assign activities. This level is optimal for most normal operations and testing.

captureCompositeInstanceState

Enabling this option may result in additional run time overhead during instance processing. This option provides for separate tracking of the running instances. All instances are captured as either running or not running. This information displays later in the ***State*** column of the composite instances tables for the SOA Infrastructure and SOA composite application, where it shows the counts of running instances versus total instances. You can also limit the view to running instances only

Valid states are ***Running, Completed, Faulted, Recovery Needed, Stale, Terminated, Suspended***, and ***State Not Available***.

The ***Running*** and ***Completed*** states are captured only if this check box is selected. Otherwise, the state is set to ***Unknown***. The conditional capturing of these states is done mainly to reduce the performance overhead on SOA Infrastructure run time.

Note: If this property is disabled and you create a new instance of a SOA composite application, a new instance is created, but the instance does not display as running, faulted, stale, suspended, terminated, completed, or requiring recovery in the table of the Dashboard page of the composite application. This is because capturing the composite state of instances is a performance-intensive process.

AIA recommends disabling this property.

PayloadValidation

This property validates incoming and outgoing XML documents. If set to True, the SOA Infrastructure applies schema validation for incoming and outgoing XML documents.

This property is applicable to both durable and transient processes. The default value is ***False***. This value can be overridden to turn on schema validation based on business needs. Turning on schema validation both at SOA Infrastructure as well as at the BPEL Process Service engine will cause the schema validation to be done twice.

26.3.2. Disabling HTTP Logging

To disable HTTP logging from Weblogic Console for Admin, SOA and BAM servers

1. Login to Weblogic Console
2. Environments -> Servers -> Admin Server -> Logging -> HTTP -> Uncheck HTTP access log file enabled option

To change log level to error (From EM):

3. Login to EM
4. SOA Infrastructure -> Logs -> Log Configuration

26.4. BPEL – General Performance Recommendations

This section discusses how to:

- Configure BPEL service engine properties
- Configure BPEL properties inside a composite
- Monitor the BPEL service engine

26.4.1. Configuring BPEL Process Service Engine Properties

The basic BPEL Process Manager performance tuning properties can be configured via WLST or Enterprise Manager. These properties must be configured:

auditLevel

This property sets the audit trail logging level. This property controls the amount of audit events that are logged by a process.

AIA recommends the following value to be set to this property.

- **Production:** The BPEL service engine does not capture the payload. The payload details are not available in the flow audit trails. Payload details for other BPEL activities are collected, except for assign activities. This level is optimal for most normal operations and testing.

instanceKeyBlockSize.

This property controls the instance ID range size. Oracle BPEL Server creates instance keys (a range of process instance IDs) in batches using the value specified. After creating this range of in-memory IDs, the next range is updated and saved in the ci_id_range table. For example, if instanceKeyBlockSize is set to 100, Oracle BPEL Server creates a range of instance keys in-memory (100 keys, which are later inserted into the cube_ instance table as cikey). To maintain optimal performance, ensure that the block size is larger than the number of updates to the ci_id_range table. The default value is 10000.AIA recommends the default value to be used as is.

auditDetailThreshold

This property sets the maximum size (in kilobytes) of an audit trail details string before it is stored separately from the audit trail. If an audit trail details string is larger than the threshold setting, it is not immediately loaded when the audit trail is initially retrieved; a link is displayed with the size of the details string. Strings larger than the threshold setting are stored in the audit_details table, instead of the audit_trail table. The details string typically contains the contents of a BPEL variable. In cases where the variable is very large, performance can be severely impacted by logging it to the audit trail. The default value is 50000 (50 kilobytes). AIA recommends retaining the default value

LargeDocumentThreshold

This property sets the large XML document persistence threshold. This is the maximum size (in kilobytes) of a BPEL variable before it is stored in a separate location from the rest of the instance scope data. This property is applicable to both durable and transient processes. Large XML documents impact the performance of the entire Oracle BPEL Server if they are constantly read in and written out whenever processing on an instance must be performed. The default value is 10000 (100 kilobytes). AIA recommends changing the value to ***50000***.

PayloadValidation

This property validates incoming and outgoing XML documents. If set to True, the Oracle BPEL Process Manager applies schema validation for incoming and outgoing XML documents.

This property is applicable to both durable and transient processes. The default value is False. This value can be overridden to turn on schema validation based on business needs. Turning on schema validation both at SOA Infrastructure as well as at the BPEL Process Service engine will cause the schema validation to be done twice.

DispatcherInvokeThreads (dspInvokeThreads in 10g)

Specifies the total number of threads allocated to process invocation dispatcher messages. Invocation dispatcher messages are generated for each payload received and are meant to instantiate a new instance. If the majority of requests processed by the engine are instance invocations (as opposed to instance callbacks), greater performance may be achieved by increasing the number of invocation threads. Higher thread counts may cause greater CPU utilization due to higher context switching costs. The default value is 20. AIA recommends this value as the starting point. This parameter can be used throttle the requests to avoid overloading the mid-tier / database tier / participating application systems and tune for best performance.

DispatcherEngineThreads (dspEngineThreads in 10g)

Specify the total number of threads allocated to process engine dispatcher messages. Engine dispatcher messages are generated whenever an activity must be processed asynchronously. If the majority of processes deployed are durable with a large number of dehydration points (mid-process receive, onMessage, onAlarm, and wait activities), greater performance may be achieved by increasing the number of engine threads. Note that higher thread counts can cause greater CPU utilization due to higher context switching costs. The default value is 30. Since the majority of AIA flows don't have dehydration points, AIA recommends the value to be set to ***20***. This parameter can be used to throttle the requests to avoid overloading the mid-tier / database tier / participating application systems and tune for best performance.

DispatcherSystemThreads (dspSystemThreads in 10g)

Specifies the total number of threads allocated to process system dispatcher messages. System dispatcher messages are general clean-up tasks that are typically processed quickly by the server (for example, releasing stateful message beans back to the pool). Typically, only a small number of threads are required to handle the number of system dispatch messages generated during run time. The default value is 2. AIA recommends the default value is kept as is.

Disable BPEL Monitors and Sensors

Select this check box to disable all BPEL monitors and sensors defined for all BPEL components across all deployed SOA composite applications.

syncMaxWaittime

This property sets the maximum time the process result receiver waits for a result before returning. Results from asynchronous BPEL processes are retrieved synchronously by a receiver that waits for a result from Oracle BPEL Server. This property is applicable to transient processes. The default value is 45. Value of syncMaxWaittime parameter mainly depends on the scenario and the number of concurrent processes.

StatsLastN

This property sets the size of the most-recently processed request list. After each request is finished, statistics for the request are kept in a list. A value less than or equal to 0 disables statistics gathering. This property is applicable to both durable and transient processes.

For more information, see *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite 11g*, "Configuring BPEL Process Service Engine Properties."

26.4.2. Configuring BPEL Properties Inside a Composite

This section lists the config properties of some sections of the deployment descriptor.

For each configuration property parameter, a description is given, as well as the expected behavior of the engine when it is changed. All the properties set in this section affect the behavior of the component containing the BPEL composite only. Each BPEL process can be created as a component of a composite. These properties are modified through WLST

inMemoryOptimization

This property indicates to Oracle BPEL Server that this process is a transient process and dehydration of the instance is not required. When set to True, Oracle BPEL Server keeps the instances of this process in memory only during the course of execution. This property can only be set to True for transient processes or processes that do not contain any dehydration points such as receive, wait, onMessage and onAlarm activities. This property has the following values:

- ***False*** (default): instances are persisted completely and recorded in the dehydration store database.
- ***True***: Oracle BPEL Process Manager keeps instances in memory only.

AIA recommends setting the value to ***True*** for transient BPEL processes. BPEL processes that have request / response pattern with no dehydration points should have this property set to ***True***.

- ***completionPersistPolicy***

  This property configures how much of instance data should be saved. It can only be set at the BPEL component level. AIA recommends setting the property to 'Off' for transient services. In that situation, no instances of process are saved. It will persist only the faulted instances.

- ***PayloadValidation***

  This property is set at the partnerlink level. This property validates incoming and outgoing XML documents. If set to ***True***, the Oracle BPEL Process Manager applies schema validation for incoming and outgoing XML documents. When set to True the engine validates the XML message against the XML schema during <receive> and <invoke> for this partnerLink. If the XML message is invalid then bpelx:invalidVariables run time BPEL Fault is thrown. This overrides the domain level validateXML property. The default value is ***False***. This value can be overridden to turn on schema validation based on business needs.

26.4.3. How to Monitor the BPEL Service Engine

The request and thread statistics for all BPEL process service components running in the service engine need to be monitored regularly to check whether the above properties need to be tweaked. The statistics page for the BPEL engine provides valuable information. These details help determine how the BPEL engine is performing:

- Details on Pending requests in the service engine
- Active requests in the service engine
- Thread statistics for the service engine

The statistics page also provides information about the count, minimum, average, and maximum processing times for each of the tasks. This information will help the developer as well as administrator identify the hot spots.

For more information, see *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite 11g Release 1.*

26.5. Oracle Mediator: General Performance Recommendations

This section discusses how to:

- Configure Mediator service engine properties
- Monitor the Mediator service engine

26.5.1. Configuring Mediator Service Engine Properties

You can configure the properties of Mediator Service Engine by setting the parameters mentioned in this section. These parameters can be set by setting the values of the parameters in the Mediator Service Engine Properties page. These properties must be configured:

auditLevel

This property sets the audit trail logging level. This property controls the amount of audit events that are logged by a process.

AIA recommends the following value to be set to this property.

- **Production:** All events are logged. All audit details, except the details of assign activities, are logged. Instance tracking information is collected, but payload details are not captured and these details are not available in the flow audit trails. This level is optimal for most typical operations and testing.

metricsLevel

Administrator can set the Mediator-specific flag metricsLevel for configuring the Dynamic Monitoring Service (DMS) metrics level. DMS metrics are used to measure the performance of application components. The possible values of this flag are:

- ***Enabled*** - Enables DMS metrics tracking
- ***Disabled*** - Disables DMS metrics tracking

AIA recommends disabling the DMS metrics tracking in production. Consider turning this on when there is a need for tracking DMS metrics.

DeferredWorkerThreadCount

Specifies the number of deferred dispatchers for processing messages in parallel. For higher loads consider increasing this parameter to have more outbound threads for deferred processing as each parallel rule is processed by one of the DeferredWorkerThreads. Default value is 4 threads. AIA recommends changing the value to a higher number only when there are a significant number of mediator services having parallel routing rules.

DeferredMaxRowsRetrieved

When the Mediator routing rule type is set to ***'Parallel'***, DeferredMaxRowsRetrieved sets the number of maximum rows (maximum number of messages for parallel routing rule processing) that are retrieved from Mediator store table (that stores messages for parallel routing rule) for processing.

Note that each message retrieved in this batch is processed by one worker thread at a time. The default value is 20 threads. AIA recommends altering the value only when there are a significant number of mediator services having parallel routing rules.

- ***DeferredLockerThreadSleep***

  For processing parallel routing rules, Oracle Mediator has a daemon locker thread that retrieves and locks messages from Mediator store database. The thread polls the database to retrieve messages for\ parallel processing. When no messages are available, the locker thread "sleeps" for the amount of time specified in the DeferredLockerThreadSleep and prevents round trips to database.

  Default value is 2 seconds. Consider increasing the value to a higher number, say 120 seconds, for PIPs having no mediator components with parallel routing rules.

  During the specified time, no messages are available for parallel routing in either of the following cases:

  - There are no Mediator components with parallel routing rules deployed.
  - Mediator component(s) with parallel routing rule is deployed, but there are no continuous incoming messages for such components.

- ***SyncMaxWaitTime***

  The maximum time a request and response operation takes before timing out. Default value is 45 seconds.

26.5.2. How to Monitor the Mediator Service Engine

The efficiency level of the mediator service engine can be assessed by monitoring the following:

- Routing Statistics
- Request breakdown statistics.
- Instance statistics

The request breakdown statistics provide information about the count as well as the time taken for processing each of the following actions:

- Invoke one-way

- Enqueues
- Transformation
- Invoke request-response
- Publish
- Condition evaluation
- Message validation

Keeping the number of time consuming actions such as enqueues, message validations, transformations as minimal as possible will be critical for improving the performance and scalability.

For more information, see *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite 11g Release 1.*

26.6. Tuning Oracle Adapters for Performance

Oracle technology adapters integrate Oracle Application Server and Oracle Fusion Middleware components such as Oracle BPEL Process Manager (Oracle BPEL PM) or Oracle Mediator components to file systems, FTP servers, database queues (advanced queues, or AQ), Java Message Services (JMS), database tables, and message queues (MQ Series).

This section describes how to tune Oracle Adapters for optimal performance.

This section focuses only on the tuning aspect for technology adapters that are used by AIA to integrate with applications.

For more information about Oracle Adapters, see *Oracle Fusion Middleware User's Guide for Technology Adapters.*

26.6.1. How to Tune JMS Adapters

This section describes some of the properties that can be set for the Oracle SOA JMS Adapter to optimize performance.

For more information, see *Oracle Fusion Middleware User's Guide for Technology Adapters,* "Introduction to the Oracle JMS Adapter."

If during stress it is taking time to read the messages off the queue, then the following JMS adapter thread can be increased to get the desired output. The following parameter needs to be set in the bpel.xml property file to achieve the above purpose:

To improve performance, the ***adapter.jms.receive.threads*** property can be tuned for an adapter service. The default value is 1, but multiple inbound threads can be used to improve performance. When specified, the value of ***adapter.jms.receive.threads*** is used to spawn multiple inbound poller threads.

Be very cautious about increasing the value for this property. Increasing the value would increase the load for Fusion Middleware Server as well as put additional stress on the downstream systems such as application systems / databases. Consider increasing the value only when the CPU is underutilized.

The following parameter needs to be set in the composite.xml property file to achieve the above purpose.

For example:

```
<activationAgents>
  <activationAgent className="…" partnerLink="MsgQueuePL">
    ... <property
name="adapter.jms.receive.threads">5</property>
  </activationAgent>
</activationAgents>
<activationAgents>
  <activationAgent className="…" partnerLink="MsgQueuePL">
    ... <property
name="adapter.jms.receive.threads">5</property>

  </activationAgent>
```

26.6.2. How to Tune AQ Adapters

If during stress it is taking time to read the messages off the queue, then the following AQ adapter thread can be increased to get the desired output. The following parameter needs to be set in the bpel.xml property file to achieve the above purpose:

To improve performance, the ***adapter.aq.receive.threads*** property can be tuned for an adapter service. The default value is ***1***, but multiple inbound threads can be used to improve performance. When specified, the value of ***adapter.aq.receive.threads*** is used to spawn multiple inbound poller threads.

Abundant caution needs to be exhibited before increasing the value for this property. Increasing the value would increase the load for Fusion Middleware Server as well as put additional stress on the downstream systems such as application systems / databases. Consider increasing the value only when the CPU is underutilized.

The following parameter needs to be set in the composite.xml property file to achieve the above purpose.

For example:

```
<service name="dequeue" ui:wsdlLocation="dequeue.wsdl">
<interface.wsdl
interface="http://xmlns.oracle.com/pcbpel/adapter/aq/raw/raw/dequeue/#wsdl.interfa
ce(Dequeue_ptt)"/>
<binding.jca config="dequeue_aq.jca">
<property name="adapter.aq.dequeue.threads" type="xs:string"
many="false">5</property>
```

```
</binding.jca>
</service>
<service name="dequeue" ui:wsdlLocation="dequeue.wsdl">
```

26.6.3. How to Tune Database Adapters

MaxTransactionSize

This property controls the number of records processed per transaction by each thread. This should be set to a reasonable value, such as 100.

NumberOfThreads:

This property controls how many threads the DB adapter uses to process records. The default is 1.

Reducing the numProcessorThread (setting numProcessorThread=4) may improve performance in Core2 Duo boxes but not for Netburst boxes.

UseBatchDestroy:

This property controls how the processed records are updated (ex: Deleted for DeletePollingStrategy, MarkedProcessed for LogicalDeleteStrategy). If set, only one update/delete will be executed for all the rows part of that transaction. The number of rows in a transaction is controlled by the MaxTransactionSize option.

MaxTransactionSize:

- If set to a large value such as 1000, turning on the UseBatchDestroy option could have a negative impact on performance.
- Setting a large MaxTransactionSize and a small MaxRaiseSize could have negative impact on performance.
- Maintaining 10:1 ratio could give better performance.

26.7. Purging the Completed Composite Instances

Data growth from auditing and dehydration can have a significant impact on database performance and throughput. See the sections on "auditLevel" for audit configuration and "inMemoryOptimization" for dehydration configuration.

These tables are impacted by instance data growth:

- Audit_trail
- Audit_details
- Cube_instance
- Cube_scope
- Dlv_message
- Dlv_subscription

- Document_ci_ref
- Document_dlv_message_ref
- Schema_md
- Task
- Work_item
- Xml_document
- Header_properties

The database administrator needs to continuously monitor the growth of these tables and make sure these tables are configured properly to give the optimal performance.

In addition, AIA highly recommends having a process in place to archive and clean up the completed composite instances after a specified period.

- Synchronous request / response based completed composite instances should be purged from SOA dehydration data store after a month.
- Data synchronization related composite instances should be purged 3 – 4 months after their completion.
- Composite Business Processes should be purged 1 – 2 years after their completion.

Even though this duration is subject to change based on policies prevailing at customer premises, attempts should be made to do the purging at the earliest. Purging needs to be preceded by archival of the instance data.

For more information about performing this task, refer to 'Deleting large number of instances' section in *Oracle Fusion Middleware Administrator's Guide for Oracle SOA Suite 11g* to get complete information on how to perform this task.

26.8. Tuning Java Virtual Machines (JVMs)

This section discusses how to optimize the JVM heap.

26.8.1. How to Optimize the JVM Heap - Specifying Heap Size Values

The goal of tuning your heap size is to minimize the time that your JVM spends doing garbage collection while maximizing the number of clients that the Fusion Middleware stack can handle at a given time.

Specifically the Java heap is where the objects of a Java program live. It is a repository for live objects, dead objects, and free memory. When an object can no longer be reached from any pointer in the running program, it is considered "garbage" and ready for collection. A best practice is to tune the time spent doing garbage collection to within 5% of execution time.

The JVM heap size determines how often and how long the virtual machine spends collecting garbage. An acceptable rate for garbage collection is application-specific and should be adjusted after analyzing the actual time and frequency of garbage collections. If you set a large heap size, full garbage collection is slower, but it occurs less frequently. If you set your heap size in accordance with your memory needs, full garbage collection is faster, but occurs more frequently.

In production environments, set the minimum heap size and the maximum heap size to the same value to prevent wasting virtual machine resources used to constantly grow and shrink the heap. Ensure that the sum of the maximum heap size of all the JVMs running on your system does not exceed the amount of available physical RAM. If this value is exceeded, the Operating System starts paging and performance degrades significantly. The virtual machine always uses more memory than the heap size. The memory required for internal virtual machine functionality, native libraries outside of the virtual machine, and permanent generation memory (memory required to store classes and methods) is allocated in addition to the heap size settings.

To tune the JVM garbage collection options you must analyze garbage collection data and check for the frequency and type of garbage collections, the size of the memory pools, and the time spent on garbage collection.

Before you configure JVM garbage collection, analyze the following data points:

- How often is garbage collection taking place? Compare the time stamps around the garbage collection.
- How long is a full garbage collection taking?
- What is the heap size after each full garbage collection? If the heap is always 85 percent free, for example, you might set the heap size smaller.
- Do the young generation heap sizes (Sun) or Nursery size (Jrockit) need tuning?

You can manually log garbage collection and memory pool sizes using verbose garbage collection logging:

Sun JVM command line options:

```
-verbose:gc
-XX:+PrintGCDetails
-XX:+PrintGCTimeStamps
```

Jrockit JVM command line options:

```
-XXverbose:gc
```

For example, you can use the following JVM options to tune the heap:

- If you run out of heap memory (not due to a memory leak), increase -Xmx.
- If you run out of native memory, you may need to decrease -Xmx.
- For Sun JVM, modify -Xmn to tune the size of the heap for the young generation.
- For Oracle JRockit, modify -Xns:<nursery size> to tune the size of the nursery.
- If your AIA service instance runs on a dedicated host, set the heap size value as high as possible but make sure it does not exceed the available physical RAM.

Following values are suggested for 32-bit Sun JVM running on 32-bit Linux on 32-bit / 64-bit hardware. It also assumes that the host machine has sufficient physical RAM installed and that other OS processes aren't consuming a significant portion of the available memory.

JVM Parameters	Recommended Value for Production	Notes
Initial heap size	***2048***	It is recommended that Initial Heap and Maximum Heap are set to the same value for the proper memory utilization and minimize major garbage collection. A small heap will become full quickly and must be garbage collected more often. It is also prone to more fragmentation, making object allocation slower. A large heap introduces a slight overhead in garbage collection times. A heap that is larger than the available physical memory in the system must be paged out to disk, which leads to long access times or even application freezes, especially during garbage collection. In general, the extra overhead caused by a larger heap is smaller than the gains in garbage collection frequency and allocation speed, as long as the heap doesn't get paged to disk. Thus a good heap size setting would be a heap that is as large as possible within the available physical memory.
Maximum heap size	***2048***	
Enable J2SE 5.0 Platform Mbeans	***Enable***	Keep it enabled, so that memory and cpu real time monitoring can be done and further tuning can be done if required.
-XX:PermSize	***256***	This setting is used to allocate memory outside of heap space to hold java classes. Note: JRockit JVM does not have this capability.
-XX:MaxPermSize	***256***	
-XX:AppendRatio	***3***	
-XX:NewSize	***1228***	Another important heap configuration is the garbage collector's generational settings. The garbage collector optimizes collection by classifying
-XX:MaxNewSize	***1228***	
-XX:SurvivorRatio	***6***	

JVM Parameters	Recommended Value for Production	Notes
-XX:+AggressiveOpts	***Set in the JVM argument***	objects by how long they live. Most of the BPEL engine's objects are short lived, thus they live in the "Eden" space. We recommend sizing the "Eden" space to be 60-70% of the total maximum heap size. The following command line starts Java with a Eden sizing that is 60% of the maximum heap size. Also If you are using 2 or more than 2 CPUs and it is a non-Windows machine, it is recommended to use -XX:+ AggressiveOpts jvm flag. The -XX:+ AggressiveOpts option inspects the machine resources (size of memory and number of processors) and attempts to set various parameters to be optimal for long-running, memory allocation-intensive jobs. Note this flag does not affect Windows performance. In JRockit JVM, young (new) generation is called nursery size – and it is specified using –Xns<size>

26.9. Tuning Weblogic Application Server

This section discusses how to optimize the Weblogic server for high performance.

26.9.1. Domain Startup Mode - Production

The Weblogic server needs to be created using production mode. This will set many properties like log level to minimum to optimize the Weblogic server performance.

26.9.2. Work Manager - default

To handle thread management and perform self-tuning, WebLogic Server implements a default Work Manager. This Work Manager is used by an application when no other Work Managers are specified in the application's deployment descriptors.

In many situations, the default Work Manager WebLogic Server's thread-handling algorithms assign each application its own fair share by default. Applications are given equal priority for threads and are prevented from monopolizing them.

26.9.3. Tuning Network I/O

Download and enable performance pack for the specific operating system where Weblogic server is installed.

27. Oracle AIA Naming Standards for AIA Development

This chapter provides general guidelines and discusses naming standards for:

- XML
- Enterprise Business Services (EBSs)
- Enterprise Business Flows (EBFs)
- Application Business Connector Services (ABCSs)
- Composites
- Common types.
- Domain value mapping
- Cross References
- BPEL
- Custom Java classes
- Package structure

27.1. General Guidelines

The goal is to ensure that the intent of each artifact is clear, and that the text associated with the artifact conveys as much information as possible given the space constraints. The following should be applied whenever applicable:

- Avoid abbreviations

  Abbreviations may be ambiguous. The names used need to be spelled out. Do not abbreviate unless the object name becomes too long.

- Artifact names must be alphanumeric

  Names must be composed only of alphanumeric character with these rules:

  - Word comprising a name should be concatenated without spaces in an upper camel-case fashion.

  Example: Purchase Order.

  - Avoid using numeric characters in the name unless it is required to convey some business meaning.

  - No special characters such as spaces, '-', '_', '.', '$', '%', '#', []

- Indicate artifact type in the name to reduce ambiguity

  When the same name is used for different artifact types, append a suffix to indicate its type. This will make it easier to distinguish these artifacts by identifying their types:

  <Artifact Name><Type Suffix>.

  Example: InvoiceEBO, InvoiceEBOType, InvoiceEBM, InvoiceEBMType.

- The total path length to a named artifact must not exceed 17000 characters.

  Some operating systems such as Windows have a limit of 255 characters for file names. Some room is left for prefixing with complete network directory or URL.

27.1.1. XML Naming Standards

The following standards are based on UN/CEFACT - XML Naming and Design Rules.

27.1.1.1. General Naming Standards

Follow these general naming standards:

- Lower-Camel-case must be used for naming attributes.

  Example: <xsd:attribute name="unitCode"/>.

- Upper-Camel-case must be used for naming elements and types.

  Example: <xsd:element name="UnitOfMeasure"/> <xsd:complexType name="InvoiceEBOType"/>

- Names must be singular unless the concept itself is plural.

  For example repeating elements must have a singular name.

- Names must not contain special characters such as: space, '-', '_', '.', '$', '%', '#', ...
- Avoid having numeric characters in the name.

  There are cases were using a numeric character is required to convey some significance.

- Complex type names should end with the 'Type' suffix to make it easier to recognize types from elements.

  Example: <xsd:complexType name="InvoiceEBOType"/>

- The name of a simple type definition should be the name of the root element with the 'ContentType' suffix.

  Example: <xsd:simpleType name="PhoneNumberContentType">

27.1.1.2. General Namespace Naming Standards

These are the general namespace naming rules. More detailed rules are described in the following sections, especially naming rules for EBS and ABCSs.

- All namespaces must start with "http://xmlns.oracle.com/".
- Namespaces used by Enterprise Business Objects (EBOs) and Enterprise Business Messages (EBMs) will start with "http://xmlns.oracle.com/EnterpriseObjects/".

  Example: http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/Invoice/V1
- Namespaces used for externally facing services must start with "http://xmlns.oracle.com/EnterpriseServices/".

  Examples: http://xmlns.oracle.com/EnterpriseServices/Core/Invoice/V1 http://xmlns.oracle.com /EnterpriseServices/Industry/Telco/Invoice/V1
- Namespaces for versioned artifacts must have the major version number as a suffix with 'V' as an abbreviation for 'version'.

  Example: "http://xmlns.oracle.com/ EnterpriseObjects/Core/EBO/Invoice/V1".
- The namespace structure should closely map to the taxonomy of the types it encapsulates.

  Example: Horizontal: "http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/Invoice/V1".

  Telco: "http://xmlns.oracle.com/EnterpriseObjects/Industry/Telco/EBO/Invoice/V1".
- Namespaces for artifacts generated within ABCSs must start with: "http://xmlns.oracle.com/ABCS/".
- When importing or including schema in a schema file, the schema location must always use relative path.

  Example: <xsd:importnamespace="http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/Invoice/V1" schemaLocation="../../../. ./Core/EBO/Invoice/InvoiceEBO .xsd"/>
- Namespace prefixes must be a minimum of 6 lowercase characters abbreviation of the namespace.

  The abbreviation must be descriptive and unambiguous within the context where it is being used.
- Namespace Prefixes for EBOs and EBMs must adhere to the following standard wherever used regardless
  of the applications or technology used.

  Auto-generated prefixes such as ns1, ns2 must not be used. Auto-generated prefixes for standard namespaces such as xsd, xsi etc. are acceptable.

Prefixes	Namespace Pattern	Files
corecomcust	http://xmlns.oracle.com/EnterpriseObjects/Core/Custom/Common/V1	CustomCommonComponents, CustomReferenceComponents
coreinvcust	http://xmlns.oracle.com/EnterpriseObjects/Core/Custom/EBO	CustomInvoiceEBO

Prefixes	Namespace Pattern	Files
	/Invoice/V1	
corecom	http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V1	CommonComponents. Reference Components
coreinv	http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/Invoice/V1	InvoiceEBO
coreinv	http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/Invoice/V1	InvoiceEBM
telcocomcust	http://xmlns.oracle.com/EnterprisObjects/Industry/Telco/Custom/Common/V1	CustomCommonComponents, CustomReferenceComponents
telcoinvcust	http://xmlns.oracle.com/EnterpriseObjects/Industry/Telco/Custom/EBO/Invoice/V1	CustomInvoiceEBO
telcocom	http://xmlns.oracle.com/EnterpriseObjects/Industry/Telco/Common/V1	CommonComponents. Reference Components
telcoinv	http://xmlns.oracle.com/EnterpriseObjects/Industry/Telco/EBO/Invoice/V1	InvoiceEBO
telcoinv	http://xmlns.oracle.com/EnterpriseObjects/Industry/Telco/EBO/Invoice/V1	InvoiceEBM

27.1.1.3. Participating Applications Names

When participating application names are part of an artifact name, upper-camel-case short names should be used. For cases where an abbreviation is needed, an upper-case abbreviation should be used.

Application	Short Name	Abbreviation
Oracle E-Business Suite	Ebiz	EBIZ
Oracle Siebel	Siebel	SEBL
Oracle PeopleSoft	PeopleSoft	PSFT
Oracle JD Edwards Enterprise One	JDEOne	JDE1
Oracle JD Edwards World	JDEWorld	JDEW
Oracle Transportation Management Suite	Logistics	LOGIS
Oracle Telephony @Work	Telephony	TELE
Oracle Demantra	Demantra	DMTR
Oracle Communications Billing and Revenue Management	Portal	PORTAL
Oracle Retail Applications	Retek	RETEK

27.2. Composites

A Composite is unit of deployment for SCA and contains Service Components.

Development Composites

The name of the Development Composite is same as the name of the Oracle Application Integration Architecture (AIA) artifact.

The Development Composites are created for the following AIA artifacts:

- Composite Business Process
- Enterprise Business Flow
- Enterprise Business Service
- Application Business Connector Service
- Utility Services

Examples: SalesOrderOrchestrationProcess, InterfaceCustomerToFulfillmentEBF, CreateCustomerEBS, CreateOrderSiebelReqABCSImpl, AsyncErrorHandlerService

27.3. Composite Business Process

Composite Business Processes are long running SOA BPEL orchestration processes.

Artifact	Name	Example
Service Name (in the WSDL)	[Optional Industry] [Verb][EBO Name]CBP	OrchestrateSalesOrderCBP, TelcoResolveComplaintCBP
Namespace	http://xmlns.oracle.com/CompositeProcess/{Core/ or Industry/[Industry Name]}/{EBO name}/V{VersionNumber}	http://xmlns.oracle.com/CompositeProcess /Core/SalesOrder/V1 http://xmlns.oracle.com/ CompositeProcess /Industry/Telco/SalesOrder/V1
Namespace Prefix	Follow the namespace prefix standard.	coreordprocess, telordprocess, …
WSDL	[Service Name].wsdl	OrchestrateSalesOrderCBP.wsdl TelcoResolveComplaintCBP.wsdl
WSDL Message	Request message: [Verb][EBO Name]ReqMsg Response message: [Verb][EBO Name]RespMsg	OrchestrateSalesOrderReqMsg, OrchestrateSalesOrderRespMsg
WSDL Port Type	[Service Name]Service	OrchestrateSalesOrderCBPService, TelcoResolveComplaintCBPService
WSDL Port Type Operations	[Verb][EBO Name]	OrchestrateSalesOrder
BPEL Flow Name	[Service Name]V[Version Number]	ProcessSalesOrderCBP, TelcoVerifyCustomerCBPV2

27.4. Enterprise Business Services

Enterprise Business Services are SOA Mediator Routing Services with routing rules to invoke the appropriate Composite Business Processes, Enterprise Business Flows and Application Business Connector Services.

Artifact	Name	Example
Service Name [in the WSDL]	[Optional Industry Name][Verb][EBO Name]EBS	CreateOrderEBS, UpdateCustomerEBS, TelcoProcessInvoiceEBS
Namespace	http://xmlns.oracle.com/EnterpriseServices/{Core/ or Industry/[Industry Name]}/{EBO name}/V{VersionNumber}	http://xmlns.oracle.com/EnterpriseServices/Industry/Telco/Invoice/V1 http://xmlns.oracle.com/EnterpriseServices/Core/Invoice/V2
Namespace Prefix	Follow the namespace prefix standard.	coreinv, telcoinv, …
WSDL	[Service Name].wsdl	CreateOrderEBS.wsdl, UpdateCustomerEBS.wsdl, TelcoProcessInvoiceEBS.wsdl
WSDL Message	Request message: [Verb][EBO Name]ReqMsg Response message: [Verb][EBO Name]RespMsg	CreateOrderReqMsg CreateOrderRespMsg
WSDL Port Type	Request – Response EBS or Request Only EBS : [ServiceName] Response EBS in one-way call: [Service Name]Response	CreateOrderEBS, CreateOrderEBSResponse, TelcoProcessInvoiceEBS, TelcoProcessInvoiceEBSResponse
WSDL Port Type Operations	Request – Response EBS or Request Only EBS : [Verb][EBO Name] Response EBS in one-way call: [Verb][EBO Name]Response	CreateOrder, CreateOrderResponse
Mediator Routing Service Name	[Service Name]V[Version Number]	CreateOrderEBS, CreateOrderEBSV2, UpdateCustomerEBSV2, TelcoProcessInvoiceEBSV2

27.5. Enterprise Business Flow

These are the BPEL flows used primarily to interact with multiple Enterprise Business Services.

Artifact	Name	Example
Service Name (in the WSDL)	[Optional Industry] [Verb][EBO Name]EBF	ProcessOrderEBF, TelcoVerifyCustomerEBF
Namespace	http://xmlns.oracle.com/EnterpriseFlows/{Core/ or Industry/[Industry	http://xmlns.oracle.com/EnterpriseFlows/Core/Order/V1

Artifact	Name	Example
	Name]}/{EBO name}/V{VersionNumber}	http://xmlns.oracle.com/ EnterpriseFlows /Industry/Telco/Order/V1
Namespace Prefix	Follow the namespace prefix standard.	coreordflow, telordflow, …
WSDL	[Service Name].wsdl	ProcessOrderEBF.wsdl, TelcoVerifyCustomerEBF.wsdl
WSDL Message	Request message: [Verb][EBO Name]ReqMsg Response message: [Verb][EBO Name]RespMsg	ProcessOrderReqMsg, ProcessOrderRespMsg
WSDL Port Type	[Service Name]Service	ProcessOrderEBFService, VerifyAccountEBFService
WSDL Port Type Operations	[Verb][EBO Name]	ProcessOrder
BPEL Flow Name	[Service Name]V[Version Number]	ProcessOrderEBF, TelcoVerifyCustomerEBFV2

27.6. Application Business Connector Service

Application Business Connector Services are of two categories: Requester and Provider.

27.6.1. Requester Application Business Connector Service

Requester ABCS are the services that serve requests coming from client applications and process these requests and delegate them to the EBSs.

Artifact	Name	Example
Service Name (in the wsdl)	[Verb][App Entity Name][Short Application Name][Optional Industry]ReqABCSImpl	CreateOrderSiebelReqABCSImpl UpdateOrderSiebelTelcoReqABCSImpl CreateCustomerPortalTelcoReqABCSImpl
Namespace	http://xmlns.oracle.com/ABCSImpl/{Participating Application Name}/{Core/ or Industry/[Industry Name]}/{App Entity Name}/V{version}	http://xmlns.oracle.com/ABCSImpl/Siebel/Core/Order/V1 http://xmlns.oracle.com/ABCSImpl/Portal/Industry/Telco/ Customer/V2
Namespace Prefix	Follow the namespace prefix standard.	abcsimplsieblelinv, abcsimplportalprod, …
WSDL	[Service Name].wsdl	CreateOrderSiebelReqABCSImpl.wsdl UpdateOrderSiebelTelcoReqABCSImpl.wsdl CreateCustomerPortalTelcoReqABCSImpl.wsdl

Artifact	Name	Example
WSDL Message	Request message: Verb[ABO Name]ReqMsg Response message: Verb[ABO Name]RespMsg	CreateOrderReqMsg, CreateOrderRespMsg UpdateOrderLinesReqMsg, UpdateOrderLinesRespMsg
WSDL Port Type	BPEL: [Service Name]Service Mediator: [Service Name]	CreateOrderSiebelReqABCSImplService UpdateOrderSiebelReqABCSImpl
WSDL Port Type Operations	Verb[ABO Name] Should be self-describing to reflect the functionality needed by the application.	UpdateOrder, GetOrderLines, …
BPEL Flow Name/ Mediator Routing Service Name	[Service Name]V[Version Number]	CreateOrderSiebelReqABCSImplV2 UpdateOrderSiebelTelcoReqABCSImpl CreateCustomerPortalTelcoReqABCSImpl

27.6.2. Provider Application Business Connector Services

Provider Application Business Connector Services are the implementation of Enterprise Business Services.

Artifact	Name	Example
Service Name (in the WSDL)	[Verb][App Entity Name][Short Application Name][Optional Industry]ProvABCSImpl	CreateOrderSiebelProvABCSImpl UpdateOrderSiebelTelcoProvABCSImpl CreateCustomerPartyTelcoPortalProvABCSImpl
Namespace	http://xmlns.oracle.com/ABCSImpl/{Participating Application Name}/{Core/ or Industry/[Industry Name]}/{App Entity Name}/V{version}	http://xmlns.oracle.com/ABCSImpl/Siebel/Core/Order/V1 http://xmlns.oracle.com/ABCSImpl/Portal/Industry/Telco/ CustomerParty/V2
Namespace Prefix	Follow the namespace prefix standard.	abcsimplsieblelinv, abcsimplportalprod, …
WSDL	[Service Name].wsdl	CreateOrderSiebelProvABCSImpl.wsdl UpdateOrderSiebelTelcoProvABCSImpl.wsdl CreateCustomerPartyTelcoPortalProvABCSImpl.wsdl
WSDL Message	Request message: [Verb][ABO Name]ReqMsg Response message: [Verb][ABO Name]RespMsg	CreateOrderReqMsg, CreateOrderRespMsg
WSDL Port Type	BPEL: [Service Name]Service	CreateOrderSiebelProvABCSImplSer

Artifact	Name	Example
	Mediator: [Service Name]	vice UpdateOrderSiebelProvABCSImpl
WSDL Port Type Operations	[Verb][ABO Has one operation which should match the operations exposed by the corresponding EBS.	UpdateOrder, getOrderLines, …
BPEL Flow Name/ Mediator Routing Service Name	[Service Name]V[Version Number]	CreateOrderSiebelProvABCSImplV2 UpdateOrderSiebelTelcoProvABCSImpl CreateCustomerPortalTelcoProvABCSImpl

27.7. Common Types

Developers may need to create types that are can be used in EBS or ABCSs. These types may be used for Error Handling, Logging, Security, etc. These types are not publicly available and are just used by the implementation of the services in Mediator or BPEL.

These types must conform to the following naming standards:

27.7.1. Namespace

The types will be published with the following namespace pattern:
http://xmlns.oracle.com/ABS/common/{type name}/V{version}

Examples:

- http://xmlns.oracle.com/ABS/common/ErrorHeader/V1
- http://xmlns.oracle.com/ABS/common/LoggingContent/V1

27.7.2. Local Name

{Type name}Type

Examples:

- ErrorHeaderType
- LoggingContentType

27.7.3. JMS Adapter Producer/Consumer Service for Requesters

Artifact	Name	Example
Database User/Schema	JMSUSER	

Artifact	Name	Example
Table Name	AIA_<App><ABO>JMSQTABV[Version Number]	AIA_SiebelCustomerJMSQTAB AIA_EbizOrderJMSQTABV2
Queue Names	AIA_<App><ABO>JMSQueue V[Version Number]	AIA_SiebelCustomerJMSQueue AIA_EbizOrderJMSQueueV2
Correlation ID	<Verb><App><ABO> V[Version Number]	CreateSiebelCustomer CreateEbizOrderV2
JMS Producer adapter enqueues message to AQ	<Optional Verb><ABO><App>JMSProducer V[Version Number]	CreateCustomerSiebelJMSProducer OrderSiebelJMSProducerV2
JMS Consumer adapter service picks up message and routes to the ABCS	< Optional Verb><ABO><App>JMSConsumer V[Version Number]	CreateCustomerSiebelJMSConsumer OrderSiebelJMSConsumerV2

27.7.4. JMS Adapter Producer/Consumer Service for Providers

Artifact	Name	Example
Database User/Schema	JMSUSER	
Table Name	AIA_<App><ABO>ProvJMSQTABV[Version Number]	AIA_SiebelCustomerProvJMSQTAB AIA_EbizOrderProvJMSQTABV2
Queue Names	AIA_<App><ABO>ProvJMSQueue V[Version Number]	AIA_SiebelCustomerProvJMSQueue AIA_EbizOrderProvJMSQueueV2
Correlation ID	< Optional Verb><App><ABO>Prov V[Version Number]	CreateSiebelCustomerProv EbizOrderProvV2
JMS Producer adapter enqueues message to AQ	< Optional Verb><ABO><App>ProvJMSProducer V[Version Number]	CreateCustomerSiebelProvJMSProducer OrderSiebelJMSProvProducerV2
JMS Consumer adapter service picks up message and routes to the ABCS	< Optional Verb><ABO><App>ProvJMSConsumer V[Version Number]	CreateCustomerSiebelProvJMSConsumer OrderSiebelProvJMSConsumerV2

27.7.5. JMS Adapter Producer/Consumer Service for EBM

Artifact	Name	Example
Database User/Schema	JMSUSER	
Table Name	AIA_<EBO>JMSQTABV[Version Number]	AIA_CustomerJMSQTAB AIA_OrderJMSQTABV2

Artifact	Name	Example
Queue Names	AIA_<EBO>JMSQueue V[Version Number]	AIA_CustomerJMSQueue AIA_OrderJMSQueueV2
Correlation ID	< Optional Verb><EBO> V[Version Number]	CreateCustomer OrderV2
JMS Producer adapter enqueues message to AQ	< Optional Verb><EBO>JMSProducer V[Version Number]	CreateCustomerJMSProducer OrderJMSProducerV2
JMS Consumer adapter service picks up message and routes to the ABCS	< Optional Verb><EBO>JMSConsumer V[Version Number]	CreateCustomerJMSConsumer OrderJMSConsumerV2

27.7.6. Participating Application Service

Artifact	Name	Example
Name	Registered in Mediator with the same name as exposed by the application.	BRMCUSTService, Account_BS
Namespace	Follows the namespace used by the application.	
Namespace Prefix	Follow the namespace prefix standard.	
WSDL	Follows the WSDL name as exposed by the application.	
WSDL Message	Follows the message names exposed in the application WSDL.	
WSDL Port Type	Follows the port types exposed in the application WSDL.	
WSDL Port Type Operations	Follows the operation names exposed in the application WSDL	
WSDL Binding	Follows the WSDL	
WSDL Service	Follows the service name exposed in the application WSDL	

27.8. DVMs and Cross References

When creating DVMs, the following naming standards should be followed:

27.8.1. DVMs

When creating DVMs, the following naming standards should be followed:

27.8.1.1. Map Name

Map names:

- Must start with the object name.

  This will allow you to identify maps that belong to a certain object. The object name should be equivalent to the EBO name.

- Should be followed by the element name that needs domain value mapping.
- Must be uppercase.

Pattern: {Object Name}_{Element Name}

Examples: CUSTOMERPARTY_ACCOUNTTYPECODE, INVOICE_REJECT_REASON, SALESORDER_CARRIER_TYPECODE

DVM File Name Examples: CUSTOMERPARTY95ACCOUNTTYPECODE, INVOICE95REJECT95REASON, SALESORDER95CARRIER95TYPECODE

27.8.1.2. Map Column Names

Map column names:

- Must be set to the participating application instance name abbreviation that the column value represents. This name can be the application name and its version, or an instance name in case two similar applications of the same version are integrated. The name must be a unique identifier for the application instance across the integration platform in the form: {Application Abbreviated Name}_{Sequence Number}. The sequence number uniquely identifies multiple instances of the same application.
- Must be uppercase.
- A column named COMMON must be always added. This column contains the values used in the EBOs
  within the platform.

Examples: COMMON, EBIZ_01, PSFT_01, SEBL_02, SEBL_03, PORTAL_01, IFLEX_01, ...

27.8.2. Cross References

When creating cross-reference virtual tables in the cross-reference tables, the following naming standard should be followed:

27.8.2.1. Table Name

Table names:

- Must not exceed 48 characters.
- Must start with the object name.

This will allow us to identify cross-references that belong to a certain object. The object name should be equivalent to the EBO name.

- Must be followed by the element name that needs cross-referencing.

  If exceeds 48 characters, it should be properly abbreviated.

- Must be uppercase.

Pattern: {Object Name}_{Element Name}

Examples: ORDER ORDERID, INVOICE INVOICEID, CUSTOMER ID, ...

27.8.2.2. Column Names

Column names:

- Must not exceed 48 characters.
- Must be set to the participating application instance name abbreviation that the column value represents.

  The name must be a unique identifier for the application instance across the integration platform in the form: {Application Abbreviated Name}_{Sequence Number}. The sequence number uniquely identifies multiple instances of the same application.

- Must be uppercase.
- Must have a column named COMMON added.

  This column contains the values used in the EBOs within the platform. Examples: COMMON, EBIZ_01, PSFT_01, SEBL_02, SEBL_03, PORTAL_01, IFLEX_01, ...

27.9. BPEL

This section discusses naming standards for:

- BPEL activities
- Other BPEL artifacts

27.9.1. BPEL Activities

Follow these naming standards for BPEL activities:

27.9.1.1. BPEL Process Name and Namespace

The BPEL process JDeveloper project name should match the BPEL process name (use default project setting).

- Name standards:

  - The name should follow the general standard naming standards depending on whether it is being used for EBS, ABCS Impl, or Adapter Service.
  - The name should clearly describe the process and action/verb being performed.
- Namespace standards:
  - The namespace should follow the general namespace standards depending on whether it is being used for EBS, ABCS Impl, or Adapter Service.
  - The namespace must reflect the taxonomy of the process.
  - The namespace must include the major version number where appropriate.

27.9.1.2. Partner Link

Follow these guidelines:

- The name should follow the general standard naming standards.
- A partner link name is visible internally within the BPEL process.
- The partner link name must have the same name as the service it is linking to.

Pattern: <Service Name>

Example: CustomerService

27.9.1.3. Assign

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Assign' prefix.
- Followed by a name describing what is being assigned. If what is assigned is a message, then use the
  message name.
- In case there are multiple assignments, provide a name that describes the group of assignments if possible.

Pattern: Assign<Name of what is being assigned>

Example: AssignPaymentEBM, AssignOrderInitialValues

27.9.1.4. Compensate

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Compensate' prefix.
- Followed by the name of the scope encapsulating the tasks to be compensated.

Pattern: Compensate<scope name>

Example: CompensateProcessCreditCheckMilestone, Compensate TranseferFundsScope

27.9.1.5. Decide

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Decide' prefix.
- Followed by the name of the decision.

Pattern: Decide<name of decision>

Example: DecideRequiresManualApproval, DecideOverrideCreditLimit

27.9.1.6. Flow

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts by a name describing the tasks being run concurrently.
- Ends with the 'Flow' suffix.

Pattern: <Name describing concurrent tasks>Flow Example: CallManufacturersFlow, GetQuotesFlow.

27.9.1.7. FlowN

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts by a name describing the dynamic tasks being run concurrently.
- Ends with the 'FlowN' suffix.
- The index variable name should be the flow name with 'Index' as suffix.

Pattern: name = <Name describing concurrent tasks>FlowN, index variable = <Name describing concurrent tasks>FlowNIndex

Example: ActivateUsersFlowN (ActivateUsersFlowNIndex), CheckSuppliersFlowN (CheckSuppliersFlowNIndex).

27.9.1.8. Invoke

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Invoice' prefix.

- Followed by the partner link to be invoked.
- Followed by 'Call' if synchronous invocation or 'Start' is asynchronous invocation.
- Followed by the operation name within the partner link.

Pattern: Invoke<Partner Link Name>{Call/Start}<Operation>

Example: InvokeCustomerServiceCallGetCustomer, InvokeNotificationServiceStartNotifyByEmail

27.9.1.9. Java Embedding

Follow these guidelines:

- The name should follow the general standard naming standards.
- The name should be similar to a Java method Name with lower-camel-case.

Pattern: <A name describing the functionality>

Example: getDiscountPrice

27.9.1.10. Pick

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Pick' prefix.
- Followed by a name describing as accurate as possible all branches (onMessage and onAlarm) within the pick activity.

Pattern: Pick<Name describing the branches to pick from>

Example: PickOrderAckOrTimeout, PickFirstQuote

27.9.1.11. Receive

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Receive' prefix.
- Contains the name of the message it is receiving.

Pattern: Receive<Message Name>

Example: ReceiveUpdateInvoiceEBM

27.9.1.12. Reply

Follow these guidelines:

- The name should follow the general standard naming standards.

- Starts with the 'Receive' prefix.
- Contains the name of the response message that is relevant to the message used in the corresponding
  Receive activity if applicable.

Pattern: Receive<Response Message Name>

Example: UpdateInvoiceResponseEBM

27.9.1.13. Scope

Follow these guidelines:

- The name should follow the general standard naming standards.
- Including brief information about transaction type may be appropriate.
- Use 'Milestone' as the suffix if the scope is a candidate for end-user monitor.
- If it not intended to be presented in the end-user monitor, use 'Scope' as the suffix.

Pattern: <Name describing the Scoped Tasks>{ Scope |Milestone}

Examples: GetCreditRating Scope, GetLoanOfferScope, ProcessCreditCheckMilestone

27.9.1.14. Sequence

Follow these guidelines:

- The name should follow the general standard naming standards.
- The sequence name should describe the steps performed in the sequence.
- The sequence name should end with 'Sequence' suffix.

Pattern: <Name describing the Sequenced Tasks>Sequence

Example: GetCustomerInfoSquence

27.9.1.15. Switch

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Switch' prefix.
- Followed by the name of what is being evaluated

Pattern: Switch<Name of what is being evaluated> Example: SwitchCreditRating

27.9.1.16. Case

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Case' prefix.
- Followed by the name of the evaluated value.

Pattern: Case<Name evaluated value>

Example: CaseBadCredit, CaseApprovalRequired

27.9.1.17. Terminate

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Terminate' prefix.
- Followed by a name describing the termination reason.

Pattern: Terminate<reason of termination>

Example: Terminate Timeout, TerminateEndOfProcess

27.9.1.18. Throw

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'Throw' prefix.
- Followed by the fault name.
- The fault variable name is typically named the same as the fault name.

Pattern: Throw<fault name>

Example: ThrowExceededMaxAmount, which uses ExceededMaxAmount variable.

Note. When defining a Catch in the Scope activity, the displayed catch name is the fault name.

27.9.1.19. Transform

Follow these guidelines:

The name should follow the general standard naming standards.

- Starts with the 'Xform' prefix.
- Followed by the source name.
- Followed by 'To'.
- Followed by the destination name.

Pattern: Xform<source>To<destination>

Example: XformBillToPortal80Bill

27.9.1.20. Wait

Follow these guidelines:

The name should follow the general standard naming standards.

- Starts with the 'Wait' prefix.
- Followed by a name describing the reason for waiting.

Pattern: Wait<Name describing the waiting reason>

Example: WaitOrderAcknowledgeTimeout, WaitWarmUpTime

27.9.1.21. While

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with the 'While' prefix.
- Followed by a name describing the loop condition.

Pattern: While<Name describing the loop condition>

Example: WhileAllMsgsSent

27.9.2. Other BPEL Artifacts

Follow these guidelines for other BPEL artifacts:

27.9.2.1. Variables

Follow these guidelines:

- The name should follow the general standard naming standards.
- Use lower-camel-case for variable names.
- The data type must not be part of the variable name.

Example: accountBalance, invoiceAmount.

27.9.2.2. Properties

Property names follow the general BPEL variables naming standards

27.9.2.3. Sensors

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with a name describing the nature of the sensor.
- Ends with 'Sensor' suffix.

Pattern: <Name describing the sensor>Sensor Example: CreditRatingSensor

27.9.2.4. Sensor Actions

Follow these guidelines:

The name should follow the general standard naming standards.

- Starts with the sensor name with the 'Sensor' suffix.
- Followed by the name describing the sensor action.
- Ends with 'Action' suffix.

Pattern: <Sensor Name>Sensor<Name describing the sensor action>Action

Example: CreditRatingSensorBAMFeedAction

27.9.2.5. Correlation Sets

Follow these guidelines:

- The name should follow the general standard naming standards.
- Starts with a name describing the correlation set.
- Ends with 'CorSet' suffix.

Pattern: <Name describing the correlation>CorSet Example: PurchaseOrderCorSet

27.9.2.6. Correlation Set Properties

The correlation set property names follows the general BPEL variables naming standards.

27.10. Custom Java Classes

Custom Java class must follow the standard Java coding practices. The Java code components names types must conform to the Oracle Corporate Java Coding Standards: http://bali.us.oracle.com/bali/ojcs/front.html.

All of ABS custom java code must exist in a sub-package:

oracle.apps.aia.<lba>... where lba stands for logical business area.

Externally facing services implemented in Java must have the version number part of the package to be in line with our namespace naming standards. This will also allow us to publish the same service under different versions at the same time.

oracle.apps.aia.<lba>... v<version> where lba stands for logical business area.

Note. To avoid collisions, 'aia' must be defined as an application in the Fusion Application.

Examples:

- oracle.apps.aia.util.logging: contains util java classes used for logging.
- oracle.apps.aia.security.siebel.login: contains java modules to login into Siebel.
- oracle.apps.aia.order.siebel.V1: contains an order query service implemented in Java.
- oracle.apps.aia.item.pricediscount.v3: contains a Java Service price discount engine.

27.11. Package Structure

Mediator and BPEL JDeveloper projects will be source controlled directly into ClearCase. The complete ABS source control packaging structure is described in the Infrastructure Release Installation and Packaging FDD. These projects may be source controlled under different hierarchy root directories to group them under core, industry, and projects within each industry.

28. Appendix: Delivered Oracle AIA XPath Functions

This appendix provides details about these XPath functions that are delivered with the Oracle Application Integration Architecture (AIA) Foundation Pack for use in Oracle AIA process integration packs (PIPs):

Note. These functions can be called from BPEL and XSLT, as well as Mediator routing rule filters.

28.1. aia:getSystemProperty()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:getSystemProperty (string propertyName, boolean
needAnException)
```

28.1.1. Parameters

`propertyName`	Name of the system property for which to retrieve the value.
`needAnException`	Used to specify whether to throw an exception if the property is not found, otherwise return empty string.

28.1.2. Returns

Returns the string value of the system property identified by `propertyName`. If the property is not found, either an exception will be thrown or an empty string is returned, depending on the value of the `needAnException` parameter.

28.1.3. Usage

XSLT example:

```
<xsl:variable name="activeRuleset"
select="aia:getSystemProperty('Routing.ActiveRuleset',
true())"/>
```

BPEL example:

```
<assign name="AssignVar">
    <copy>
        <from
expression="aia:getSystemProperty('Routing.
         ActiveRuleset',true())"/>
        <to variable="ActiveRuleset"/>
    </copy>
</assign>
```

28.2. aia:getSystemModuleProperty()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:getSystemModuleProperty (string moduleName, string
propertyName, boolean needAnException)
```

28.2.1. Parameters

`moduleName`	Module for which to retrieve the property.
`propertyName`	Name of the property for which to retrieve the value.
`needAnException`	Used to specify whether to throw an exception if the property is not found, otherwise return empty string.

28.2.2. Returns

Returns the string value of the module property identified by `moduleName` and `propertyName`. If the module property is not found, then the system property of the same name will be returned. If the system property with the same name is not found, then either an exception will be thrown or an empty string is returned, depending on the value of the `needAnException` parameter.

28.2.3. Usage

XSLT example:

```
<xsl:variable name="errHdlrImpl" select="aia:get
```

```
SystemModuleProperty('ErrorHandler','COMMON.ERRORHANDL
ER.IMPL',true())"/>
```

BPEL example:

```
<assign name="AssignVar">
    <copy>
        <from
expression="aia:getSystemModuleProperty('
         ErrorHandler','COMMON.ERROR
         HANDLER.IMPL',true())"/>
        <to variable="ErrorHandler"/>
    </copy>
</assign>
```

28.3. aia:getServiceProperty()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.
aia.core.xpath.AIAFunctions"

string aia:getServiceProperty (string serviceName, string propertyName,
boolean needAnException)
```

28.3.1. Parameters

`serviceName`	Service for which to retrieve the property.
`propertyName`	Name of the property for which to retrieve the value.
`needAnException`	Used to specify whether to throw an exception if the property is not found, otherwise return empty string.

28.3.2. Returns

Returns the string value of the service property identified by `serviceName` and `propertyName`. If the service property is not found, then the system property of the same name will be returned. If the system property with the same name is not found, then either an exception will be thrown or an empty string is returned, depending on the value of the `needAnException` parameter.

28.3.3. Usage

XSLT example:

```
xsl:variable name="defaultSystemID"
select="aia:getServiceProperty('{http://xmlns.oracle.c
om/ABCSImpl/Siebel/Core/UpdateCustomerPartySiebelReqAB
CSImpl/V2}UpdateCustomerPartySiebelReqABCSImplV2','Def
ault.SystemID',true())"/>
```

BPEL example:

```
<assign name="AssignVar">
    <copy>
        <from expression= "aia:getServiceProperty
         ('{http://xmlns.oracle.com/ABCSImpl/
         Siebel/Core/UpdateCustomerPartySiebelReq
```

```
                    ABCSImpl/V2}UpdateCustomerPartySiebelReq
                    ABCSImplV2','Default.SystemID',true())"/
                    >
                  <to variable="DefaultSystemID"/>
              </copy>
          </assign>
```

28.4. aia:getEBMHeaderSenderSystemNode()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

node-set aia:getEBMHeaderSenderSystemNode (string senderSystemCode, string
senderSystemID)
```

28.4.1. Parameters

`senderSystemCode`	System Code as defined in AIA Systems.
`senderSystemID`	System Internal Id as defined in AIA Systems.

28.4.2. Returns

Returns a node-set of system information from the AIA System Registration Repository for the given System Code or Internal ID.

28.4.3. Usage

Given this set up in the AIA System Registration Repository on the Application Registry page:

Internal Id	System Code	System Description	IP Address
siebel	SEBL_01	Siebel Instance 01	xxxxx.siebel.com

URL	System Type	Application Type
http://xxxxx.siebel.com:80/ec	SIEBEL	CRM

Version	Contact Name	Contact Phone	Contact E-Mail
8.0	Siebel contact	1234567891	Siebelcontact@Siebel.com

Settings on the Application Registry page

Both `aia:getEBMHeaderSenderSystemNode('SEBL_01', '')` and `aia:getEBMHeaderSenderSystemNode('', 'siebel')` would return this node-set:

```
<ID xmlns="">SEBL_01</ID>
<Description xmlns="">Siebel Instance 01</Description>
<IPAddress xmlns="">xxxxx.siebel.com</IPAddress>
<ContactName xmlns="">Siebel contact</ContactName>
<ContactPhone xmlns="">1234567891</ContactPhone>
```

```
<ContactEmail xmlns="">Siebelcontact@Siebel.com</ContactEmail>
<Url xmlns="">http://xxxxx.siebel.com:80/ecommunications_enu</Url>
<Application xmlns="">
   <ID>CRM</ID>
   <Version>8.0</Version>
</Application>
```

XSLT example:

Note. This example requires `<xsl:stylesheet version="2.0" ...>`

```
<xsl:variable name="senderNodeVariable">
    <xsl:copy-of select="aia:getEBMHeaderSender
     SystemNode($RequestTargetSystemID,'')"/>
</xsl:variable>

<corecom:Sender>
    <corecom:ID>
    <xsl:value-of select="$RequestTargetSystemID"/>
    </corecom:ID>
    <corecom:Description>
      <xsl:value-of select="$senderNodeVariable/
       Description"/>
    </corecom:Description>
    <corecom:IPAddress>
      <xsl:value-of select="$senderNodeVariable/
       IPAddress"/>
    </corecom:IPAddress>
    <corecom:CallingServiceName> ...
</corecom:CallingServiceName>
    <corecom:Application>
      <corecom:ID>
        <xsl:value-of select="$senderNodeVariable
         /Application/ID"/>
      </corecom:ID>
      <corecom:Version>
        <xsl:value-of select="$senderNodeVariable
         /Application/Version"/>
      </corecom:Version>
    </corecom:Application>
    <corecom:ContactName>
      <xsl:value-of select="$senderNodeVariable/
       ContactName"/>
    </corecom:ContactName>
    <corecom:ContactEmail>
      <xsl:value-of select="$senderNodeVariable/
       ContactEmail"/>
    </corecom:ContactEmail>
    <corecom:ContactPhoneNumber>
      <xsl:value-of select="$senderNodeVariable/
       ContactPhone"/>
    </corecom:ContactPhoneNumber>
    ...
</corecom:Sender>
```

28.5. aia:getSystemType()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:getSystemType (string systemCode)
```

28.5.1. Parameters

systemCode	System code as registered in the AIA System Registration Repository database.

28.5.2. Returns

Returns the System Type associated with a System Code as registered in the AIA System Registration Repository database.

28.5.3. Usage

Given this set up in the AIA System Registration Repository on the Application Registry page:

Internal Id	System Code	System Description	IP Address	URL	System Type	A
siebel	SEBL_01	Siebel Instance 01			SIEBEL	C

Settings on the Application Registry page

The result of `aia:getSystemType('SEBL_01')` would be the string 'SIEBEL'.

XSLT example:

```
<xsl:variable name="systemType"
select="aia:getSystemType('SEBL_01')"/>
```

BPEL example:

```
<assign name="AssignVar">
    <copy>
        <from expression= "aia:getSystemType('SEBL_01
         ')"/>
        <to variable="SystemType"/>
    </copy>
</assign>
```

28.6. aia:getErrorMessage()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:getErrorMessage (string errorCode, string localeString, string
delimiter)
```

28.6.1. Parameters

`errorCode`	The error code.
`localeString`	Delimited locale string.
`Delimiter`	Delimiter used in the `localeString`.

28.6.2. Returns

This function will look up the error message resource bundle and return a localized string for the input `errorCode`. The `localeString` is a concatenated string of LanguageCode, CountryCode, and Variant delimited by the `delimiter` specified. If no locale is found with the input parameters, the system default locale is used.

For more information, see java.util.Locale documentation.

28.6.3. Usage

XSLT example:

```
<xsl:variable name="errMsg"
select="aia:getErrorMessage
('AIA_ERR_AIAO2C2_1007','','')"/>
```

BPEL example:

```
<assign name="Assign_Fault">
    <copy>
        <from expression="'AIA_ERR_AIAO2C2_1007'"/>
        <to variable="AIAFaultMsg" part="AIAFault"
         query="/corecom:Fault/corecom:Fault
         Notification/corecom:FaultMessage/
         corecom:Code"/>
    </copy>
    <copy>
        <from expression="aia:getErrorMessage('
         AIA_ERR_AIAO2C2_1007','','')"/>
        <to variable="AIAFaultMsg" part="AIAFault"
         query="/corecom:Fault/corecom:Fault
         Notification/corecom:FaultMessage/
         corecom:Text"/>
    </copy>
</assign>
```

28.7. aia:getCorrectiveAction()

```
namespace aia="g aia:getCorrectiveAction (string correctiveActionCode,
string localeString, string delimiter)
```

28.7.1. Parameters

`correctiveActionCode`	The corrective action code.
`localeString`	Delimited locale string.
`Delimiter`	Delimiter used in the `localeString`.

28.7.2. Returns

This function will look up the Corrective Action Code resource bundle and return a localized string for the input `correctiveActionCode`. The `localeString` is a concatenated string of LanguageCode, CountryCode, and Variant delimited by the `delimiter` specified. If no locale is found with the input parameters, the system default locale is used.

For more information, see java.util.Locale documentation.

28.7.3. Usage

XSLT example:

```
<xsl:variable name="corrAction"
select="aia:getCorrectiveAction('SAMPLECODE','','')"/>
```

BPEL example:

```
<assign name="Assign_Fault">
    <copy>
        <from expression="aia:getCorrectiveAction('
         SAMPLECODE','','')"/>
        <to variable="AIAFaultMsg"
part="AIAFault"query=
          "/corecom:Fault/corecom:FaultNotification/
          corecom:CorrectiveAction"/>
    </copy>
</assign>
```

28.8. aia:isTraceLoggingEnabled()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:isTraceLoggingEnabled (string logLevel, string processName)
```

28.8.1. Parameters

`logLevel`	Log level that you wish to log.
`processName`	Name of the process.

28.8.2. Returns

Boolean indicating whether or not the specified `logLevel` is enabled for the specified process.

This function will do two things:

1. Check whether logging is enabled or disabled for the input process name from the AIAConfigurationProperties.xml file.
2. Check if the trace logger log level is set to log the input log level.

This function will return a true only when both the above conditions return true, otherwise it will return false. If the `logLevel` parameter is null or if it is incorrectly specified, this function returns false. If `processName` is null or empty strings, this function returns null.

28.9. aia:logErrorMessage()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:logErrorMessage (node-set ebmHeader, string message)
```

This function logs an error message. If the `ebmHeader` parameter is null or not passed, the message is logged without any supplemental attributes. An error message is always logged with the level SEVERE.

28.9.1. Parameters

`ebmHeader`	The Enterprise Business Message (EBM) header providing context for the error message.
`Message`	Message to log.

28.9.2. Returns

Returns an empty string.

28.10. aia:logTraceMessage()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

string aia:logTraceMessage (string level, node-set ebmHeader, string
message)
```

This function logs a trace message. If the `ebmHeader` parameter is null or not passed, the message is logged without any supplemental attributes. If the `level` parameter is null or if it is incorrectly specified, a message is logged with level ***INFO***. Level should be one of java.util.logging.Level. The levels in descending order are:

- ***SEVERE*** (highest value)

- ***WARNING***
- ***INFO***
- ***CONFIG***
- ***FINE***
- ***FINER***
- ***FINEST*** (lowest value)

28.10.1. Parameters

`Level`	Level of the trace message.
`ebmHeader`	The EBM Header providing context for the trace message.
`Message`	Message to log.

28.10.2. Returns

Returns an empty string.

28.11. aia:getNotificationRoles()

```
namespace aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia
.core.xpath.AIAFunctions"

node-set aia:getNotificationRoles (string systemId, string errorCode,
string serviceName, string processName)
```

28.11.1. Parameters

`systemId`	System ID.
`errorCode`	The error code.
`serviceName`	Name of the errored service.
`processName`	Name of end-to-end process.

28.11.2. Returns

This function will query the AIA System Registration Repository with input values and return a node-set containing the actor role and the FYI role corresponding to the input `errorCode`.

For example:

```
<actor>seblAdmin</actor>
<fyi>seblCSR</fyi>
```

If `serviceName` is null or empty strings or if no value is found from the AIA System Registration Repository, this function returns the default roles specified in the AIAConfigurationProperties.xml file.

28.12. aia:getAIALocalizedString()

```
namespace
aia="http://www.oracle.com/XSL/Transform/java/oracle.apps.aia.core.xpath.AIAF
unctions"
```

```
string aia:getAIALocalizedString (string resourceBundleId, string key, node
params)
```

```
string aia:getAIALocalizedString (string resourceBundleId, string key, string
language, string country, node params)
```

28.12.1. Parameters

`resourceBundleId`	Identifies the AIA resource bundle from which to retrieve the localized string. Currently accepted values are: "***Telco/SalesOrder", "Telco/CustomerParty", "Telco/BillingManagement***", or ***"Telco/ProductLifeCycle***".
`key`	The key whose value has to be picked up from the resource bundle.
`language`	Language, according to java.util.Locale, for which to retrieve the localized string.
`Country`	Country, according to java.util.Locale, for which to retrieve the localized string.
`Params`	Node supplying the values for any bind variables within the localized string.

The AIAConfigurationProperties.xml file contains a set of module configuration properties that provide the mapping of `resourceBundleId` values to resource bundle class names. This mapping is used at runtime to determine which resource bundle class to use for looking up the localized string.

Example of the module-level configuration properties:

```
<ModuleConfiguration moduleName="ResourceBundle">
     <property name="Telco/BillingManagement">oracle.apps.aia.core.
      i18n.AIAListResourceBundle</property>
     <property name="Telco/ProductLifeCycle">oracle.apps.aia.core.
      i18n.AIAListResourceBundle</property>
     <property name="Telco/SalesOrder">oracle.apps.aia.core.i18n.
      AIAListResourceBundle</property>
     <property name="Telco/CustomerParty">oracle.apps.aia.core.i18n.
      AIAListResourceBundle</property>
</ModuleConfiguration>
```

28.12.2. Returns

This function returns the localized string for the passed `key` from an AIA resource bundle, identified by `resourceBundleId`. If `language` and `country` are omitted, the default locale is assumed.

28.12.3. Usage

BPEL example:

```
<assign name="Assign_1">
     <copy>
          <from variable="inputVariable" part=
           "payload" query="/sordabo:ListOfSWIOrderIO/
           sordabo:SWIOrder/sordabo:OrderNumber"/>
          <to variable="localizedStringParams"
           query="/bpelcom:parameters/bpelcom:item/
           bpelcom:value"/>
     </copy>
     <copy>
          <from expression="aia:getAIALocalizedString
           ('Telco/SalesOrder','ORDER_NUMBER_MESSAGE',
           bpws:getVariableData(&quot;localizedString
           Params&quot;))"/>
          <to variable="internationalizedstring"/>
     </copy>
</assign>
```

29. Appendix: XSL for Use in Developing CAVS-Enabled Oracle AIA Services

This appendix provides XSL text that should be used in developing Composite Application Validation System (CAVS)-enabled Oracle Application Integration Architecture (AIA) services.

29.1. AddTargetSystemID.xsl

This section provides XSL that should be used in developing provider application business connector (ABC) services to be CAVS-enabled.

For more information about how to use this XSL, see Developing ABCS for CAVS Enablement.

```
<?xml version="1.0" encoding="UTF-8" ?>
<xsl:stylesheet version="1.0"
 xmlns:bpws="http://schemas.xmlsoap.org/ws/2003/03/business-process/"
 xmlns:plnk="http://schemas.xmlsoap.org/ws/2003/05/partner-link/"

xmlns:ehdr="http://www.oracle.com/XSL/Transform/java/oracle.tip.esb.server
.
  headers.ESBHeaderFunctions"
 xmlns:hwf="http://xmlns.oracle.com/bpel/workflow/xpath"

xmlns:xp20="http://www.oracle.com/XSL/Transform/java/oracle.tip.pc.service
s.
  functions.Xpath20"

xmlns:xref="http://www.oracle.com/XSL/Transform/java/oracle.tip.xref.xpath
.
  XRefXPathFunctions"
 xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
 xmlns:ora="http://schemas.oracle.com/xpath/extension"
 xmlns:ids="http://xmlns.oracle.com/bpel/services/IdentityService/xpath"

xmlns:orcl="http://www.oracle.com/XSL/Transform/java/oracle.tip.pc.service
s.
  functions.ExtFunc"
 xmlns:corecom="http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V2"
 xmlns:aia=http://www.oracle.com/XSL/Transform/java/oracle.apps.aia.core.
  xpath.AIAFunctions exclude-result-prefixes="xsl plnk coresalesorder ns0
ns3
  ns5 ns1 client corecustcom ns4 corecom bpws ehdr aia hwf xp20 xref ora
ids
  orcl">
  <xsl:param
name="ConfigServiceName">{[ABCServiceNamespace]}[ABCServiceName]
    </xsl:param>
```

```
<xsl:param name="ConfigPropertyName">Default.SystemID</xsl:param>

<xsl:template match="/*">
  <xsl:copy>
      <xsl:apply-templates select="@*|node()"/>
  </xsl:copy>
</xsl:template>

<xsl:template match="corecom:EBMHeader">
  <xsl:copy>
      <xsl:apply-templates select="@*|node()"/>
  </xsl:copy>
</xsl:template>

<xsl:template match="corecom:EBMHeader/corecom:Sender">
  <xsl:copy-of select="."/>
  <xsl:if test="not(following-sibling::corecom:Target)">
      <corecom:Target>
          <xsl:variable name="TargetID" select="aia:getServiceProperty
           ($ConfigServiceName,$ConfigPropertyName,true())"/>
          <corecom:ID>
              <xsl:value-of select="$TargetID"/>
          </corecom:ID>
          <corecom:ApplicationTypeCode>
              <xsl:value-of select="aia:getSystemType($TargetID)"/>
          </corecom:ApplicationTypeCode>
      </corecom:Target>
  </xsl:if>
</xsl:template>

<xsl:template match="corecom:EBMHeader/corecom:Target">
  <corecom:Target>
      <xsl:copy-of select="@*"/>
      <xsl:variable name="TargetID">
          <xsl:choose>
              <xsl:when test="corecom:ID/text()">
                  <xsl:value-of select="corecom:ID/text()"/>
              </xsl:when>
              <xsl:otherwise>
                  <xsl:value-of select="aia:getServiceProperty
                   ($ConfigServiceName,$ConfigPropertyName,true())"/>
              </xsl:otherwise>
          </xsl:choose>
      </xsl:variable>
      <corecom:ID>
          <xsl:copy-of select="corecom:ID/@*"/>
          <xsl:value-of select="$TargetID"/>
      </corecom:ID>
      <xsl:copy-of select="corecom:OverrideRoutingIndicator"/>
      <xsl:copy-of select="corecom:ServiceName"/>
      <corecom:ApplicationTypeCode>
          <xsl:copy-of select="corecom:ApplicationTypeCode/@*"/>
          <xsl:choose>
              <xsl:when test="corecom:ApplicationTypeCode/text()">
                  <xsl:value-of select="corecom:ApplicationTypeCode
                   /text()"/>
              </xsl:when>
```

```
                <xsl:otherwise>
                    <xsl:value-of select="aia:getSystemType($TargetID)"/>
                </xsl:otherwise>
            </xsl:choose>
        </corecom:ApplicationTypeCode>
        <xsl:copy-of select="corecom:EndPointURI"/>
        <xsl:copy-of select="corecom:Custom"/>
    </corecom:Target>
  </xsl:template>

  <xsl:template match="@*|node()">
    <xsl:copy-of select="."/>
  </xsl:template>

</xsl:stylesheet>
```

29.2. SetCAVSEndpoint.xsl

This section provides XSL that should be used in developing requester ABCSs to be CAVS-enabled

For more information about how to use this XSL, see Developing ABCS for CAVS Enablement.

```
<?xml version="1.0" encoding="UTF-8" ?>
<xsl:stylesheet
version="1.0"xmlns:xsl=http://www.w3.org/1999/XSL/Transform

xmlns:ehdr="http://www.oracle.com/XSL/Transform/java/oracle.tip.esb.server
.
  headers.ESBHeaderFunctions"
 xmlns:jhdr="http://xmlns.oracle.com/esb"
 xmlns:corecom=http://xmlns.oracle.com/EnterpriseObjects/Core/Common/V2
  exclude-result-prefixes="xsl corecom ehdr jhdr">
  <xsl:template match="/">
    <xsl:copy-of select="/*"/>

<xsl:variablename="Endpoint"select="/*/corecom:EBMHeader/corecom:Message
     ProcessingInstruction/corecom:DefinitionID"/>
    <xsl:if test="$Endpoint!=''">
        <xsl:variable name="SetEndpoint"select="ehdr:setOutboundHeader
         ('/jhdr:ESBHeader/jhdr:location',$Endpoint,'jhdr=http://xmlns.
         oracle.com/esb;')"/>
    </xsl:if>
  </xsl:template>
</xsl:stylesheet>
```

30. Appendix: Shipped B2B Connector Services with AIA Foundation Pack

This appendix provides information about the following shipped business-to-business (B2B) Connector Services:

- X12ProcessSalesOrderReqB2BCSImpl
- X12UpdateSalesOrderProvB2BCSImpl

30.1. X12ProcessSalesOrderReqB2BCSImpl

The sample X12ProcessSalesOrderReqB2BCSImpl is built to demonstrate the inbound integration of EDI X12 B2B document standard-based Sales Orders to the Oracle Application Integration Architecture (AIA) Demo Order Orchestration process. Details of the B2B Connector Service (B2BCS) are as follows.

The X12ProcessSalesOrderReqB2BCSImpl is invoked by the AIAB2BInterface when there is a new inbound B2B document received by Oracle B2B having a Document Type of '850.'

Direction	Inbound
B2B Document Mapped From	**Standard:** EDI X12
	Standard Version: 4010
	Document Type: 850
	XML Schema Definition: oramds:/apps/AIAMetaData/AIAComponents/B2BObjectLibrary/X12/4010/Oracle/850_4010.xsd
	Namespace: urn:oracle:b2b:X12/V4010/850
	Oracle B2B .ecs File: $AIA_HOME/Infrastructure/B2B/cfg/b2b-tpsetup-configuration.zip/soa/b2b/EDI_X12/4010/850/850/850_4010.ecs
Enterprise Business Message (EBM) Mapped To	**Name:** ProcessSalesOrderEBM
	Namespace: http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/SalesOrder/V2
	XML Schema Definition: oramds:/apps/AIAMetaData/AIAComponents/EnterpriseObjectLibrary/Core/EBO/SalesOrder/V2/SalesOrderEBM.xsd
Enterprise Business Service (EBS) Invoked	**WSDL:** oramds:/apps/AIAMetaData/AIAComponents/EnterpriseBusinessServiceLibrary/Core/EBO/SalesOrder/V2/SalesOrderEBSV2.wsdl
	Port: http://xmlns.oracle.com/EnterpriseServices/Core/SalesOrder/V2#wsdl.interface(SalesOrderEBS)

	Operation: ProcessSalesOrder
Mapping Details	$AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12ProcessSalesOrderReqB2BCSImpl/xsl/X12850B2BM_To_ProcessSalesOrderEBM.xsl
B2BCS WSDL Location	oramds:/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/EDI_X12/RequestorB2BCS/V1/X12ProcessSalesOrderReqB2BCSImpl.wsdl
B2BCS jDev Project Location	$AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12ProcessSalesOrderReqB2BCSImpl/X12ProcessSalesOrderReqB2BCSImpl.jpr

30.2. X12UpdateSalesOrderProvB2BCSImpl

The sample X12UpdateSalesOrderProvB2BCSImpl is built to demonstrate the outbound integration of EDI X12 B2B document standards-based Sales Orders Acknowledgements from the AIA Demo Order Orchestration process. Details of the B2BCS are as follows.

The X12UpdateSalesOrderProvB2BCSImpl is invoked by the AIADemoUpdateSalesOrderEBS.

Direction	Outbound
B2B Document Mapped To	**Standard:** EDI X12
	Standard Version: 4010
	Document Type: 855
	XML Schema Definition: oramds:/apps/AIAMetaData/AIAComponents/B2BObjectLibrary/X12/4010/Oracle/855_4010.xsd
	Namespace: urn:oracle:b2b:X12/V4010/855
	Oracle B2B .ecs File: $AIA_HOME/Infrastructure/B2B/cfg/b2b-tpsetup-configuration.zip/soa/b2b/EDI_X12/4010/855/855/855_4010.ecs
EBM Mapped From	**Name:** UpdateSalesOrderEBM
	Namespace: http://xmlns.oracle.com/EnterpriseObjects/Core/EBO/SalesOrder/V2
	XML Schema Definition: oramds:/apps/AIAMetaData/AIAComponents/EnterpriseObjectLibrary/Core/EBO/SalesOrder/V2/SalesOrderEBM.xsd
Mapping Details	$AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12UpdateSalesOrderProvB2BCSImpl/xsl/UpdateSalesOrderEBM_To_X12855B2BM.xsl
B2BCS WSDL Location	oramds:/apps/AIAMetaData/AIAComponents/B2BServiceLibrary/Connectors/wsdls/EDI_X12/ProviderB2BCS/V1/X12UpdateSalesOrderProvB2BCSImpl.wsdl
B2BCS jDev Project Location	$AIA_HOME/Infrastructure/B2B/src/B2BConnectors/EDIX12B2BCSApp/X12UpdateSalesOrderProvB2BCSImpl/X12UpdateSalesOrderProvB2BCSImpl.jpr

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