Oracle® Cloud

Using the Oracle Database Adapter with Oracle Integration

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Preface

This guide describes how to configure the Oracle Database Adapter as a connection in an integration in Oracle Integration.

Note:
The information in this guide applies to all of your Oracle Integration instances. It doesn't matter which edition you're using, what features you have, or who manages your cloud environment. You'll find what you need here, including notes about any differences between the various flavors of Oracle Integration when necessary.

Topics
• Audience
• Documentation Accessibility
• Related Resources
• Conventions

Audience

This guide is intended for developers who want to use the Oracle Database Adapter in integrations in Oracle Integration.

Documentation Accessibility

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

Access to Oracle Support

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

Related Resources

See these Oracle resources:
• Oracle Cloud
  http://cloud.oracle.com
• Using Integrations in Oracle Integration
• Using the Oracle Mapper with Oracle Integration

Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td>monospace</td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>
Understand the Oracle Database Adapter

Review the following conceptual topics to learn about the Oracle Database Adapter and how to use it as a connection in integrations in Oracle Integration. A typical workflow of adapter and integration tasks is also provided.

Topics:
• Oracle Database Adapter Capabilities
• Oracle Database Adapter Restrictions
• What Application Version Is Supported?
• Workflow to Create and Add an Oracle Database Adapter Connection to an Integration

Oracle Database Adapter Capabilities

The Oracle Database Adapter enables you to integrate the Oracle database residing behind the firewall of your on-premises environment with Oracle Integration through use of the on-premises connectivity agent. Use the Oracle Database Adapter to poll for new and updated records for processing in Oracle Integration. For example, any new record added to the Employee table in your Oracle database can be synchronized with Oracle HCM Cloud using Oracle Integration. In addition, use the Oracle Database Adapter to execute SQL queries or stored procedures in the Oracle database. For example, quotes in Oracle CPQ Cloud can be created as Orders in the on-premises Oracle database by sending SQL statements or stored procedures using the Oracle Database Adapter.

The Oracle Database Adapter provides the following capabilities:

• Support for invocation of stored procedures in the Oracle database.
• Support for non-JDBC (PL/SQL boolean, PL/SQL record, and PL/SQL table) data-types in outbound invocations of stored procedures.
• Support for execution of DML statements and SQL queries: Select, Insert, Update, and Delete.

Select the Run a SQL Statement option on the Basic Info page of the Adapter Endpoint Configuration Wizard to execute simple SQL queries. For complex SQL queries, use stored procedures by selecting the Invoke a Stored Procedure option on the Basic Info page of the Adapter Endpoint Configuration Wizard. Stored procedures can reduce the complexity of a SQL query.

• Support for generating XSD from PureSQL. This feature generates an XSD from a PureSQL statement provided by dynamically querying the table.
• Support for polling new and updated records for processing in the Oracle database. The Oracle Database Adapter supports distributed polling and multithreading. Distributed polling helps eliminate duplicate polling of the same records while multithreading provides optimum performance.
• Support for updating or inserting multiple records in a single request.
• Support for a logical delete polling strategy. This strategy involves updating a special field on each row once it is processed.
• Support for performing a `SELECT` operation against database tables.
• Support for database fault mapping. See Define Fault Mapping in Orchestrated Integrations.
• Support for processing message payloads up to 10 MB in size. In the case of polling, you must set the Rejected Value property to REJECTED on the Polling Strategy and Options page. If the incoming message is greater than the 10 MB threshold size, that particular record is updated to REJECTED instead of READ. If the outbound operation returns a response greater than the 10 MB threshold size, the response message is ignored and a fault response is sent to the calling client.

**Note:**

In Java, Unicode characters are represented as 2 bytes.

The Oracle Database Adapter is one of many predefined adapters included with Oracle Integration. You can configure the Oracle Database Adapter as a connection in an integration in Oracle Integration.

### Oracle Database Adapter Restrictions

Note the following Oracle Database Adapter restrictions in Oracle Integration.

• If stored procedures contain arguments of PL/SQL boolean, PL/SQL record, and PL/SQL table types, wrappers are generated. Otherwise, you must generate your own wrappers.
• Cross schema stored procedures are not allowed in cases where Oracle Integration must generate the wrappers.
• The Oracle Database Adapter does not support polling when the logical delete column is in lower case.
• No order is maintained while polling records.
• When importing an Oracle Integration Cloud Service integration that contains PLS or SQL stored procedures, the wrapper package required for the storage procedures is not recreated in the target database. To add the wrapper package, confirm JPublisher is installed on the target database and define the original stored procedure. After confirming JPublisher is installed and the stored procedure is defined, open the PL/SQL Wrapper utility and execute the add scripts command to add the scripts included in the exported inventory archives (IAR) file. For newly created integrations in Oracle Integration, this step is not required. Wrapper package creation occurs automatically.
What Application Version Is Supported?

For information about which application version is supported by this adapter, see the Oracle Integration Adapters Certification Matrix under section **Oracle Integration Adapters Certification** at the top of the page:

Oracle Integration Adapters Certification Matrix

Workflow to Create and Add an Oracle Database Adapter Connection to an Integration

You follow a very simple workflow to create a connection with an adapter and include the connection in an integration.

<table>
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<th>Step</th>
<th>Description</th>
<th>More Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Create the adapter connections for the applications you want to integrate. The connections can be reused in multiple integrations and are typically created by the administrator.</td>
<td>Create an Oracle Database Adapter Connection</td>
</tr>
<tr>
<td>2</td>
<td>Create the integration. When you do this, you add trigger and invoke connections to the integration.</td>
<td>Create Integrations and Add the Oracle Database Adapter Connection to an Integration</td>
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<tr>
<td>3</td>
<td>Map data between the trigger connection data structure and the invoke connection data structure.</td>
<td>Map Data of Using Integrations in Oracle Integration</td>
</tr>
<tr>
<td>4</td>
<td>(Optional) Create lookups that map the different values used by those applications to identify the same type of object (such as gender codes or country codes).</td>
<td>Manage Lookups of Using Integrations in Oracle Integration</td>
</tr>
<tr>
<td>5</td>
<td>Activate the integration.</td>
<td>Manage Integrations of Using Integrations in Oracle Integration</td>
</tr>
<tr>
<td>6</td>
<td>Monitor the integration on the dashboard.</td>
<td>Monitor Integrations of Using Integrations in Oracle Integration</td>
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<td>Assign Business Identifiers for Tracking Fields in Messages and Manage Business Identifiers for Tracking Fields in Messages of Using Integrations in Oracle Integration</td>
</tr>
<tr>
<td>8</td>
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<td>Manage Errors of Using Integrations in Oracle Integration</td>
</tr>
</tbody>
</table>
Create an Oracle Database Adapter Connection

A connection is based on an adapter. You define connections to the specific cloud applications that you want to integrate.

Topics:
- Prerequisites for Creating a Connection
- Create a Connection

Prerequisites for Creating a Connection

You must satisfy the following prerequisites for creating a connection with Oracle Integration.

1. Ensure that you have write permissions to the database.
2. Ensure that you have the required permissions to run stored procedures and SQL statements.
3. Know the database URL, including the hostname or IP address and the port number.
4. Know the database system ID and service name.
5. Know the username and password for connecting to the database.
6. Oracle Integration can connect to Oracle Real Application Clusters (RAC) databases with the on-premises connectivity agent using Single Client Access Name (SCAN) as the hostname while configuring the connection. SCAN provides a single name for clients to access any Oracle Database running in a cluster.

Create a Connection

The first step in creating an integration is to create the connections to the applications with which you want to share data.

1. In the navigation pane, click Integrations, then click Connections.
2. Click Create.
Note:

You can also create a connection in the integration canvas of:

- An orchestrated integration (See Define Inbound Triggers and Outbound Invokes.)
- A basic routing integration (See Add a Trigger (Source) Connection.)

The Create Connection — Select Adapter dialog is displayed.

3. Select an adapter from the dialog. You can also search for the type of adapter to use by entering a partial or full name in the Search field, and clicking Search. The Create New Connection dialog is displayed.

4. Enter the information to describe the connection.

- Enter a meaningful name to help others find your connection when they begin to create their own integrations. The name you enter is automatically added in capital letters to the Identifier field. If you modify the identifier name, do not include a blank space (for example, Sales Opportunity).
- Select the role (direction) in which to use this connection (trigger, invoke, or both). Only the roles supported by this adapter are displayed for selection. When you select a role, only the connection properties and security policies appropriate to that role are displayed on the Connections page. If you select an adapter that supports both invoke and trigger, but select only one of those roles, then try to drag the adapter into the section you did not select, you receive an error (for example, configure an Oracle Service Cloud (RightNow) Adapter as only an invoke, but drag the adapter to the trigger section).
- Enter an optional description of the connection.
5. Click **Create**.

Your connection is created and you are now ready to configure connection details, such as email contact, connection properties, security policies, connection login credentials, and (for certain connections) agent group.

**Add a Contact Email**

From the Connection Administrator section of the connection, you can add a contact email address for notifications.

1. In the **Email Address** field, enter an email address to receive email notifications when problems occur.
2. In the upper right corner, click **Save**.

**Configuring Connection Properties**

Enter connection information so your application can process requests.

1. Click **Configure Connectivity**.
   The Connection Properties dialog is displayed.
2. Enter the host name or IP address of the database server.
3. Enter the database server port number.
4. Enter the system or site ID.
5. Enter the database service name.
6. Click **OK**.

You are now ready to configure connection security.

**Configuring Connection Security**

Configure security for your database connection by selecting the security policy and setting login credentials. A database connection is only allowed for publicly accessible databases.

1. Click **Configure Credentials**.
2. Enter your login credentials.
   a. Select the security policy. Only the Username Password Token policy is supported. It cannot be deselected.
   b. Enter a username and password to connect to the database.
   c. Reenter the password a second time.
3. Click **OK**.

**Configure an Agent Group**

Configure an agent group for accessing the service hosted on your premises behind the fire wall.

1. Click **Configure Agents**.
The Select an Agent Group page appears.

2. Click the name of the agent group.

3. Click Use.

To configure an agent group, you must download and install the on-premises connectivity agent. See Download and Run the On-Premises Agent Installer and About Agents and Integrations Between On-Premises Applications and Oracle Integration in Using Integrations in Oracle Integration.

Test the Connection

Test your connection to ensure that it is successfully configured.

1. In the upper right corner of the page, click Test.

2. If your adapter connection uses a WSDL, you are prompted to select the type of connection testing to perform:

   • **Validate and Test**: Performs a full validation of the WSDL, including processing of the imported schemas and WSDLs. Complete validation can take several minutes depending on the number of imported schemas and WSDLs. No requests are sent to the operations exposed in the WSDL.

   • **Test**: Connects to the WSDL URL and performs a syntax check on the WSDL. No requests are sent to the operations exposed in the WSDL.

   If successful, the following message is displayed and the progress indicator shows 100%.

   Connection connection_name was tested successfully.

3. If your connection was unsuccessful, an error message is displayed with details. Verify that the configuration details you entered are correct.

4. When complete, click Save, then click Close.
Add the Oracle Database Adapter Connection to an Integration

When you drag the Oracle Database Adapter into an integration, the Adapter Endpoint Configuration Wizard appears. This wizard guides you through configuration of Oracle Database Adapter endpoint properties.

The following sections describe the wizard pages that guide you through configuration of the Oracle Database Adapter as a trigger and an invoke in an integration.

Topics:
- Basic Information Page
- Trigger Polling Page
- Invoke Stored Procedure Page
- Invoke SQL Statement Page
- Table Operation Page
- Operations on Table Page
- Summary Page

See Oracle Database Adapter Capabilities.

Note:

The Oracle Database Adapter does not support the regeneration of WSDL artifacts. See Regenerating a WSDL File for Integrations (in Using Integrations in Oracle Integration).

Basic Information Page

Specify a name, description, and operation type on the Basic Info page of each trigger and invoke connection in your integration.
What do you want to call your endpoint?
Identifies the connection with a meaningful name that defines the purpose of connection. For example, `CreateEmployeeInDB` for a database connection that adds new employee data. The name can include English alphabetic characters, numbers, underscores, and dashes. The name cannot include:

- Blank spaces (for example, `My DB Connection`)
- Special characters (for example, `#;83&` or `rightnow4`)
- Multibyte characters

What operation do you want to perform?

- **Invoke a Stored Procedure** — Select to run a stored procedure on the database.
- **Run a SQL Statement** — Select to run a SQL query on the database.
- **Perform an Operation On a Table** — Select to perform one of the following operations on a table. You can update or insert multiple records in a single request.
  - Insert
  - Update
  - Insert or Update (Merge)
  - Select

Notes

- When operations in a SQL statement such as `Update`, `Concat`, and `Merge` accept values for the in-bound invocation of an integration, they do not work. For example, the following query does not work:

  ```sql
  select concat(empname, 'ss') from DB_AQ where empno=#empno
  ```

  ```sql
  select empno from DB_AQ where empname=concat(#empname, 'YY')
  ```

  As a workaround, handle these scenarios during payload mapping. For example, perform a concatenation during mapping of the payload. The final output can then be passed as input to the SQL query.

- **IN/BETWEEN** operators are not supported with bind parameters. Use greater than (`>`) and less than (`<`) operators instead.

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**Trigger Polling Page**

Select the root database table for the service query.

**Topics**

- Polling Page
Polling Page

The following table describes the key information on the Polling page.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Tables</td>
<td>Imports tables and the root database table for the service query.</td>
</tr>
<tr>
<td>Remove Tables</td>
<td>Removes the selected table from the service query tables list.</td>
</tr>
<tr>
<td>Review and Manage relationships reachable from the root database table.</td>
<td>Appears after importing tables. Select Edit to open the Relations page where you can view, create, and remove relationships between tables.</td>
</tr>
<tr>
<td>Review and verify the attributes created from the imported tables and relationships.</td>
<td>Appears after importing tables. Select Edit to open the Attributes Filtering page where you can review, verify, select or deselect the attributes in the object model created from the imported tables and the defined relationships.</td>
</tr>
<tr>
<td>Polling Strategy and Options</td>
<td>Appears after importing tables. Select Edit to open the Polling Strategy and Options page where you can define the polling strategy and specify polling options.</td>
</tr>
</tbody>
</table>

Manage Tables Page

The following table describes the key information on the Manage Tables page. The Manage Tables page appears when you select Import Tables on the Polling page.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Select the schema for the tables and views you are importing. Special characters (for example, #) are not supported in schema names. See Special Characters are Not Supported in Schema Names.</td>
</tr>
<tr>
<td>Table Type</td>
<td>The type of the table to which the schema or view is applied. The list allows these selections: • All — selects all available tables and views. • Materialized View — selects materialized views. • Materialized View Log — selects materialized view logs. • Synonym — selects the alias for the schema object. • Table — selects tables. • View — selects views.</td>
</tr>
<tr>
<td>Table Name</td>
<td>Specify the table name. Table names are case sensitive.</td>
</tr>
<tr>
<td>Search</td>
<td>Click to search for the specified table.</td>
</tr>
<tr>
<td>Available Tables</td>
<td>Lists the tables that meet the selection criteria.</td>
</tr>
<tr>
<td>Selected Tables</td>
<td>Lists your table selection.</td>
</tr>
</tbody>
</table>
Relations Page

The following table describes the key information on the Relations page. The Relations page appears when you select Edit for the Review and Manage relationships reachable from the root database table option on the Polling page.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create New</td>
<td>Opens the Create Relation page with these options:</td>
</tr>
<tr>
<td></td>
<td>• Parent Table — selects the parent table for the relationship between tables.</td>
</tr>
<tr>
<td></td>
<td>• Child Table — selects the child table for the relationship between tables.</td>
</tr>
<tr>
<td></td>
<td>• Relationship — defines the relationship between the parent and child tables.</td>
</tr>
<tr>
<td></td>
<td>• Attribute Name — Applies attributes to the table relationship.</td>
</tr>
<tr>
<td></td>
<td>• Mapping — Displays the mapping for the table relationship.</td>
</tr>
<tr>
<td>Detach</td>
<td>Opens the Relationships list in a new window.</td>
</tr>
</tbody>
</table>

Polling Strategy and Options Page

The following table describes the key information on the Polling Strategy and Options page. The Polling Strategy and Options page appears when you select Edit for Polling Strategy and Options on the Polling page.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical Delete Field</td>
<td>Selects a field in the root database table. To allow the selection, polling must be enabled in the Status column.</td>
</tr>
<tr>
<td>Read Value</td>
<td>Identifies the value that is used to indicate a row has been read. For example, PROCESSED. Surrounding quotes are not required.</td>
</tr>
<tr>
<td>Unread Value</td>
<td>Indicates the rows to process. Only rows with Logical Delete Field and column values that match the Unread Value are read.</td>
</tr>
<tr>
<td>Rejected Value</td>
<td>Set to REJECTED. If the incoming message is greater than the 10 MB threshold size, that particular record is updated to REJECTED instead of READ. If the outbound operation returns a response greater than the 10 MB threshold size, the response message is ignored and a fault response is sent to the calling client.</td>
</tr>
<tr>
<td>Polling Frequency (Sec)</td>
<td>Specifies the polling frequency (in seconds) for new records or events.</td>
</tr>
</tbody>
</table>
Invoke Stored Procedure Page

Enter the invoke stored procedure values. The Invoke a Stored Procedure page appears when you select **Invoke a Stored Procedure** as the operation to perform on the Basic Info page.

You can specify the following values on the Invoke a Stored Procedure page.

- Select the database schema that includes the data you want to query (for example, you want to query details about an employee based on their employee ID).
- Select a stored procedure or package from the list that is displayed after you select the database schema.

**Note:**

- Stored procedures return binary large objects (for example, BLOB database data types) as base64Binary types in XML. Depending upon the use cases, these can be decoded during transformation using inbuilt functions such as decodeBase64 or can be passed as-is for downstream processing.
- Adapter input/output parameters are defined based on the stored procedure IN/OUT parameters. The IN parameter corresponds to the request and the OUT parameter is translated as the response.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Schema</td>
<td>Select a database schema from the list. This action refreshes the page to display fields for selecting a package or procedure to invoke. Special characters (for example, #) are not supported in schema names. See Special Characters are Not Supported in Schema Names.</td>
</tr>
<tr>
<td>Select Package</td>
<td>Select the database package. This action refreshes the page to display the procedures available for the package. When importing a predefined integration package containing PLS or SQL stored procedures, the wrapper package is not recreated in the target database. To add the wrapper package, confirm JPublisher is installed on the target database and define the original stored procedure. After confirming JPublisher is installed and the stored procedure is defined, open the PL/SQL Wrapper utility and execute the add scripts command to add the scripts included in the exported inventory archives (IAR) file.</td>
</tr>
<tr>
<td>Select Procedure</td>
<td>Displays the in (inbound), out (outbound), and in/out (inbound/outbound) parameters for the selected package.</td>
</tr>
<tr>
<td>Arguments</td>
<td>Display the in, out, and in/out parameters that are passed with this procedure.</td>
</tr>
</tbody>
</table>
Invoke SQL Statement Page

Enter the SQL statement values. The Run a SQL Statement page appears when Run a SQL Statement is selected as the operation to perform on the Basic Info page. You can specify the following values on the Run a SQL Statement page.

**Note:**

- Do not use schema/database names in SQL queries. Configure the details in the connection. For example:

  Update HR.employee set HR.employee.first_name = 'Name' where HR.employee.employee_id='1'

  can be changed to a simple query, such as:

  Update employee set first_name = 'Name' where employee_id='1'

  where HR is used in the connection details. This restricts a user with specific privileges to a particular schema/database.

- When configuring the adapter as an invoke connection, ensure that proper spaces are provided between key words for a pure SQL statement. For example, the following statement fails during integration activation because there is no blank space between VALUES and (#

  INSERT INTO table_name VALUES(#EMPNO, #EMPNAME)

  Add a blank space between VALUES and (#, and the statement is successfully processed.

  INSERT INTO table_name VALUES (#EMPNO, #EMPNAME)

- When configuring the adapter as an invoke connection, define all bind parameters in the same order and define the parameters that takes absolute values at the end.

  INSERT INTO table_name (EMPNO, EMPNAME, EMPUUID, EMPPHONE, EMPHIREDATE) VALUES (#EMPNO, #EMPNAME, Sys_guid(), NULL, SYSDATE)

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQL Query</td>
<td>Identifies the SQL query.</td>
</tr>
<tr>
<td>Validate SQL Query</td>
<td>Validates the SQL query syntax.</td>
</tr>
<tr>
<td>Element</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Status</td>
<td>Displays the SQL query syntax validation status. When syntax validation is successful, the message Success! appears.</td>
</tr>
</tbody>
</table>

### Table Operation Page

You can update or insert multiple records in a single request.

**Topics:**
- Import Tables Page
- Relationships Page
- Create Relationship Page
- Attribute Filtering Page
- Advanced Options Page
- Operations on Table Page

### Import Tables Page

Filter and select the tables to import based on the selected schema. These tables are used to generate a SQL statement based on the operation selected.

You can import the following number of tables:
- A maximum of three tables for insert, update, and insert or update actions
- A maximum of five tables for the select - operation on table feature
- A maximum of five tables for the polling feature

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schema</td>
<td>Select the schema to use. The page is refreshed to display the tables available for selection.</td>
</tr>
<tr>
<td>Name Filter</td>
<td>Filter the display of tables.</td>
</tr>
<tr>
<td>Available</td>
<td>Select the tables on which to insert or update records.</td>
</tr>
<tr>
<td>Selected</td>
<td>Displays the selected tables.</td>
</tr>
</tbody>
</table>

### Relationships Page

Review the relationships between the selected tables and optionally create, remove, or rename relationships. These relationships are used in the insert or update SQL statements.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationships Table</td>
<td>Displays the relationships defined on the root database table and any related tables (one-to-one or one-to-many).</td>
</tr>
</tbody>
</table>
Create Relationship Page

Specify the parent and child relationships to use in the SQL statement.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>Click to create new relationships.</td>
</tr>
<tr>
<td>Remove</td>
<td>Click to remove a selected relationship.</td>
</tr>
<tr>
<td>Rename</td>
<td>Click to rename a selected relationship.</td>
</tr>
</tbody>
</table>

**Parent Table**
- Select the parent table.

**Child Table**
- Select the child table.

**Mapping Type**
- Select the mapping type (one-to-many, one-to-one, or one-to-one with the foreign key on the child table). For example, if you selected *Employees* as the parent table and *Departments* as the child table, the following options are displayed:
  - *Employees* has a 1:1 Relationship with *Departments*
  - *Employees* has a 1:1 Relationship with *Departments* (Foreign Key on Child table)
  - *Employees* has a 1:M Relationship with *Departments*

**Parent and Child Table**
- Associate the foreign key fields to the primary key fields.

**Relationship Name**
- Optionally name the relationship (a default name is generated).

Attribute Filtering Page

Filter out the attributes to exclude.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributes Tree</td>
<td>Deselect any attributes to exclude from the database query. You cannot exclude primary key attributes.</td>
</tr>
</tbody>
</table>

Advanced Options Page

Provide additional advanced options such as sequencing. This is only valid for the insert and merge operations.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table</td>
<td>Displays the selected table.</td>
</tr>
</tbody>
</table>
Operations on Table Page

Select the database tables. To use the bulk extract feature, you must choose the `SELECT` operation from the Perform an Operation On a Table list on the Basic Info page.

### Operations on Table Page

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sequence</strong></td>
<td>Specify that the primary key is assigned from a sequence on any insert. Click <strong>Search</strong> and select a sequence from the list. The adapter generates sequence numbers in a batch of 50. Configure sequences in increments of 50. This issue only applies to the Oracle Database Adapter.</td>
</tr>
</tbody>
</table>

---

**Note**: It is recommended that you import the tables together for the adapter to automatically recognize the relationship. If you import the tables separately, you must explicitly create the table relationship.

**Filter By**
Enter the initial letters to filter the display of table names.

**Table Names**
Select the tables to import.

**Import Tables**
Click to import the tables. The page is refreshed for you to select the parent database table.

**Select the parent database table**
Select the parent (root) table from the list. If using multiple related tables, this is the top-level parent table in the relationship. After making your selection, the page is refreshed for you to view and edit the table relationships.

**Add || Remove Tables**
Click to add more tables or remove tables no longer in use.

**Review and manage parent database table relationships**
Click **Edit** to view and edit the table relationships. The relationships automatically identified by the adapter are displayed. See Review and manage parent database table relationships Option.
### Review and filter columns from selected database tables

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review and filter columns from selected database tables</td>
<td>Click <strong>Edit</strong> to view and edit the table attributes. You can deselect any attributes to exclude from the database queries. Primary key attributes cannot be excluded. See Review and filter columns from selected database tables Option.</td>
</tr>
</tbody>
</table>

### Review and edit SQL query

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
</table>
| Review and edit SQL query | Click **Edit** to view and edit the default SQL query. See Review and edit SQL query Option.  
*Note:* This field is available for a Select operation on the table. |

### Review and manage parent database table relationships Option

**Table 3-1** - Review and manage parent database table relationships Option

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create New Relations</td>
<td>Click to create a new relationship.</td>
</tr>
<tr>
<td>Relations</td>
<td>View the existing parent and child table relationships automatically created by the adapter.</td>
</tr>
</tbody>
</table>

### Review and filter columns from selected database tables Option

**Table 3-2** - Review and filter columns from selected database tables Option

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributes Tree</td>
<td>View and deselect attributes automatically created by the adapter.</td>
</tr>
</tbody>
</table>

### Review and edit SQL query Option

**Table 3-3** - Review and edit SQL query Option

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
</table>
| SQL Edit | Click to manually edit the query in the **SQL Query** field.  
*Note:* This is only applicable for a Select operation on a table. |
Table 3-3  (Cont.) - Review and edit SQL query Option

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edit using Expression Builder</td>
<td>Click to edit the query in the Expression Builder.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Add New</strong>: Click to add new criteria to the SQL query.</td>
</tr>
<tr>
<td></td>
<td>1. Click <strong>Add New</strong>.</td>
</tr>
<tr>
<td></td>
<td>2. In the <strong>First Argument</strong> field, click <strong>Edit</strong>, and select the</td>
</tr>
<tr>
<td></td>
<td>argument to add (for example, <code>deptno</code>).</td>
</tr>
<tr>
<td></td>
<td>3. In the <strong>Operator</strong> field, select the operator to use for the</td>
</tr>
<tr>
<td></td>
<td>comparison from the dropdown list (for example, <code>=</code>).</td>
</tr>
<tr>
<td></td>
<td>4. In the <strong>Second Argument</strong> field, select the option to use:</td>
</tr>
<tr>
<td></td>
<td>• <strong>Literal</strong>: Click to specify a value. If selected, you are prompted</td>
</tr>
<tr>
<td></td>
<td>to select the data type (for example, integer) and specify the value.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Parameter</strong>: Click to specify a bind parameter.</td>
</tr>
<tr>
<td></td>
<td>• <strong>Query Key</strong>: Click to run the comparison against another column</td>
</tr>
<tr>
<td></td>
<td>in the table.</td>
</tr>
</tbody>
</table>

New criteria is appended to the SQL query with a **WHERE** clause. If you add subsequent SQL queries, they are appended to the SQL query with an **AND** clause

• **Add Nested**: Click to add nested criteria to the SQL query.
• **Edit**: Click to edit the SQL criteria you specified.
• **Remove**: Click to edit the SQL criteria you specified.
Click to edit the query with the Expression Builder.

**Maximum Number of Records to be fetched** Select the number of records to fetch with this SQL query.
Summary Page

You can review the specified adapter configuration values on the Summary page.

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
</table>
| Summary | Displays a summary of the configuration values you defined on previous pages of the wizard.  
The information that is displayed can vary by adapter. For some adapters, the selected business objects and operation name are displayed. For adapters for which a generated XSD file is provided, click the XSD link to view a read-only version of the file.  
To return to a previous page to update any values, click the appropriate tab in the left panel or click Back. Click Cancel to cancel your configuration details. |
Implement Common Patterns Using the Oracle Database Adapter

You can use the Oracle Database Adapter to implement the following common patterns.

Topics:
- Define Fault Mapping in Orchestrated Integrations
- Define a Select Operation on Database Tables

Define Fault Mapping in Orchestrated Integrations

You can define fault mappings in integrations. This mapping transforms a Database Adapter fault when used as a target into the source format defined in its WSDL. You add the Database Adapter to a scope action in an orchestrated integration and select this fault in the Fault Handler part of the scope action.

A serviceInvocationError fault mapping is defined in the WSDL.

In the mapper, the elements of serviceInvocationError provide details about the runtime fault:
- type: The type of fault.
- title: The title of the fault.
- detail: Information about the fault cause.
- errorCode: Information about the fault code.
- remedialAction: How to fix the fault.

This fault structure is populated during runtime when any exception occurs in an outbound invocation (for example, a primary key violation).

If using the adapter in a map data integration, only reason, detail, and errorCode are available in the mapper.

Assume an exception (for example, NumberFormatException) occurs in an invoke (outbound) adapter. Exceptions are mapped in fault mappings and returned to the source format as defined in its WSDL contract. In this use case, a stored procedure is used that accepts only an integer type. If you invoke the adapter by passing a noninteger value, Oracle Integration reports the fault back to you.

To define fault mapping:
1. Create connections for the SOAP Adapter and the Database adapter.
2. Create an orchestrated integration.
3. Drag the SOAP Adapter into the integration canvas as a trigger.

The Adapter Endpoint Configuration wizard is displayed.
4. Configure the SOAP Adapter (for this example, named s1).

5. From the Actions palette, drag a Scope action below the SOAP Adapter.

6. From the Invokes palette, drag the Database Adapter inside the scope.

7. The Adapter Endpoint Configuration wizard is displayed.

7. Select an operation to invoke any stored procedure that accepts only an integer as the input parameter (for this example, the adapter is named db1).


9. In the integration canvas, click Reposition and move the s1 map inside the scope.

10. Define mappings for s1.
11. Click the **Fault Handler** part and select **Oracle Database : serviceInvocationError db1**.

12. From the **Actions** palette, drag a **Fault Return** action inside the **Fault Handler** part.

The root element for the fault is `serviceInvocationError`. The fault includes other elements that carry the fault details: `type`, `title`, `detail`, `errorCode`, and `remedialAction`. The `detail` element carries information about the fault cause. The `remedialAction` element suggests the action to fix the fault.

14. From the menu, select Tracking and define the tracking field.

15. Activate and invoke the integration by passing a string value (that is, a noninteger value) from the SOAP UI.

```xml
<typ:getOrganization>
  <typ:partyId>test</typ:partyId>
</typ:getOrganization>
```

The fault response returns information similar to the following:

```xml
<nstrgmp:code>XSD object conversion error</nstrgmp:code>
<nstrgmp:message>An error occurred while parsing XML representing a Java object.</nstrgmp:message>
<nstrgmp:severity>Unable to convert the XSD element DATA_IN whose SQL type is INTEGER and JDBC type is INTEGER. Cause: java.lang.NumberFormatException: For input string: "test"</nstrgmp:severity>
<nstrgmp:detail>
<nstrgmp:code>serviceInvocationError</nstrgmp:code>
<nstrgmp:message>Check to ensure that the XML data describing the object matches the definition of the element in the XSD.</nstrgmp:message>
<nstrgmp:detail/>
<nstrgmp:code/>
<nstrgmp:message/>
<nstrgmp:severity/>
<nstrgmp:detail/>
</nstrgmp:detail>
</nstrgmp:ServiceErrorMessage>
</detail>
```

**Define a Select Operation on Database Tables**

You can define a `SELECT` operation to perform against database tables. This section provides a high level overview of creating an integration in which an Oracle Database Adapter is configured as an invoke connection to retrieve table records from the Oracle Database.

To define a `SELECT` operation on database tables:

1. Configure SOAP Adapter and Oracle Database Adapter connections.
2. Select **App Driven Orchestration** in the Create Integration - Select a Style dialog.
3. Add and configure the SOAP Adapter as a trigger connection in the integration.
The SOAP Adapter is configured to accept an input and return the response received from the invoke connection.

4. Add the Oracle Database Adapter as an invoke connection in the integration. This invokes the Adapter Endpoint Configuration Wizard.

5. On the Basic Info page, select Perform an Operation On a Table as the type of operation to perform and Select as the operation to perform on the table.

6. On the Operate On Table page, specify the schema and tables to import, and click Import Tables. For this example, the following values are specified.
   - Schema: HR
   - Table Type: TABLE
   - Table Name: %TAB
   - Selected Tables: EMPLOYEE_TAB and DEPARTMENT_TAB. The tables are imported together for the Oracle Database Adapter to recognize the relation between the tables.

   The page is refreshed for you to select the parent (root) database table.

7. Select the parent table (for this example, DEPARTMENT_TAB is selected). This page enables you to:
   - View the automatically created table relationships and create new ones.
   - View and deselect attributes.
   - View and edit the automatically created SQL query.
8. If you want to edit the automatically created SQL query, click **Edit** to the right of **Review and edit SQL Query**.

   a. Click **Edit using Expression Builder**. You can also manually edit the SQL query by clicking **SQL Edit**.

   b. Click **Add New** to add new criteria to the SQL query. The automatically created SQL query is displayed below the link.

   c. Specify values for the following fields, and click **OK**.
      - **First Argument**
      - **Operator**
      - **Second Argument**

      For example:
The criteria you specify are appended to the existing SQL query as part of a \texttt{WHERE} clause. Any additional SQL query criteria you specify are appended as part of an \texttt{AND} clause. For example:

\begin{verbatim}
SELECT DISTINCT t0.DEPTNO, t0.DEPTNAME, t0.LOC FROM DEPTARTMENT_TAB t0, EMPLOYEE_TAB t1 WHERE ((t0.DEPTNO = #deptno) AND (t1.EMPID > 999)) AND (t1.DEPTNO = t0.DEPTNO))
\end{verbatim}

d. Click \textbf{OK}.

9. Click \textbf{Next}.

10. View your selections on the Summary page. Links to the tables you selected to import and SQL query you specified are provided.

11. Click \textbf{Done} to exit the Adapter Endpoint Configuration Wizard.

12. Complete the integration by performing mapping and tracking tasks.

13. Activate the integration.

14. Copy the link to invoke the integration from under the \textbf{How to Run} link.

15. Invoke the integration from a tool such as the SOAP UI.

16. Review the values returned by the Oracle Database Adapter.
Troubleshoot the Oracle Database Adapter

Review the following topics to learn about troubleshooting issues with the Oracle Database Adapter.

Topics:
- Set Null to Collections
- Resolve Error ORA-04068: existing state of packages has been discarded
- Unable to Execute Stored Procedures with a PL/SQL Table When the Table Uses a Different Schema
- Wrappers Require Regeneration After Objects Change
- Special Characters are Not Supported in Schema Names
- Resolve Message Time Out Errors
- Recover from a CLOUD-0005: Unable to Establish Connection Error

Additional integration troubleshooting information is provided. See Troubleshoot Oracle Integration in Using Integrations in Oracle Integration.

Set Null to Collections

You may sometimes want to pass null to the adapter while mapping collections. If you do not map those collections, an ORA-06550 pl/sql statement ignored error can occur. To avoid this error, map the collections using the mapping component attribute name='xsi:nil'. This action ensures that a null collection is propagated to the adapter.

Resolve Error ORA-04068: existing state of packages has been discarded

If you receive a java.sql.SQLException: ORA-04068: existing state of packages has been discarded error, then perform the following tasks.

1. Ensure that the stored procedure is stateless.
2. Avoid using global variables.

Unable to Execute Stored Procedures with a PL/SQL Table When the Table Uses a Different Schema

You receive the following error when you attempt to use a stored procedure that contains a PL/SQL record, PL/SQL table, or boolean data type and the stored procedure is not defined in the schema used to create the connection. This is deliberately restrict-
ed because PL/SQL record, PL/SQL table, or boolean data types require wrappers to be generated that may fail when you do not have the required permissions on the selected schema.

Please select procedure from the same schema based on the username that was used to create connection. This procedure contains PL/SQL RECORD, PL/SQL TABLE, or BOOLEAN data type and hence wrapper generation can fail due to privilege problems.

As a workaround, move the stored procedure to the schema used to create the connection. If you cannot change the schema, then define a wrapper stored procedure in the schema that does not reply on PL/SQL record, PL/SQL table, or boolean data types. Instead, you can use SQL object types.

Wrappers Require Regeneration After Objects Change

The adapter automatically generates the wrapper packages and objects for stored procedures used in an integration when PL/SQL boolean, table, and record types are involved. If the underlying objects (that is, the IN/OUT parameters) are changed, the wrappers must be regenerated after you delete the existing wrapper’s packages and objects. During design time or activation, the wrappers are regenerated automatically with the latest object definitions available in the database.

Special Characters are Not Supported in Schema Names

If you use schema names with special characters such as #, integration activation fails. For stored procedures, the schema derives the names of the types in the XSD. If the type name contains #, the XSD has problems with the name. Use a schema name that does not contain any special characters.

Resolve Message Time Out Errors

The following errors can occur during both design time (in both the inbound and outbound directions) and runtime.

- Message not received within X seconds of wait interval

There can be multiple reasons for a time out occurring, such as connectivity issues between Oracle Integration and the connectivity agent or the connectivity agent being disabled. Ensure that the connectivity agent is up and running if you see this error. Check the status of the agent under Dashboards > Agents in Oracle Integration.
Note:

When using the adapter to connect to an Oracle E-Business Suite database instance and this error continuously occurs, review the SQL query plans and other SQL tuning aspects. The adapter relies on JDBC driver APIs to fetch metadata such as table details, stored procedure details, and so on. This involves execution of certain SQL queries by the JDBC driver involving SYS tables such as the `ALL_TYPES` table. Since Oracle E-Business Suite has a large data dictionary, these metadata queries requires tuning consideration to improve overall performance of the adapter.

- **SQLState: 08006**  
  **errorCode: 17002**  
  **message: IO Error: Connection timed out**

This error can occur when database sessions are terminated by a network firewall or some other reason. The adapter automatically recovers during this state and new connections are created. However, a few requests using old connections may time out. Ensure that the firewall is not terminating idle connections.

- Timeouts can also occur due to design problems. Avoid certain antipatterns. For example, do not explicitly update the same table as an invoke operation when the same table is getting polled on the trigger side.

### Recover from a CLOUD-0005: Unable to Establish Connection Error

If you receive the following error:

```
CLOUD-0005: Unable to establish connection.  
Please check connection parameters.  
IO Error: Invalid connection string format, a valid format is: "host:port:sid" and the Service Name contains HYPHEN "-"
```

Perform the following steps:

1. Check if the service name can be modified to remove the hyphen (-).
2. If you cannot remove the hyphen, prefix the host name in the database connection with // (for example, //host.test.com).