



A large red diagonal shape covers the left side of the slide, containing the Oracle University logo. To the right of this shape is a collage of three images: a man in a plaid shirt looking down at a laptop, a person in a blue shirt looking at a computer screen, and a group of three people (two men and one woman) looking at a document together.

Integrated Cloud Applications & Platform Services

Oracle Application Express Workshop II

Electronic Presentation

D79657GC20

Edition 2.0 | April 2017

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1

Course Overview

Objectives

After completing this course, you should be able to:

- Enhance application pages using collections, dynamic actions, plug-ins, and JavaScript
- Extend application capabilities using RESTful web services, Table APIs, and custom themes and templates
- Secure, package, and deploy an application
- Optimize and maintain applications



Road Map

Lesson 1: Course Introduction

Lesson 2: Oracle APEX Overview

Unit 1: Enhancing Application Pages

Unit 2: Adding Advanced APEX
Functionality to an Application

Unit 3: Making an Application
Production-ready

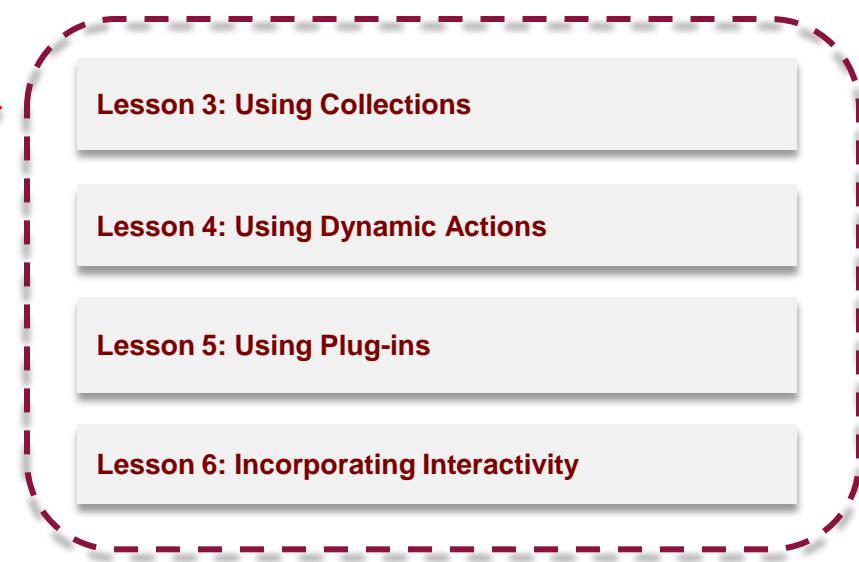


Lesson 3: Using Collections

Lesson 4: Using Dynamic Actions

Lesson 5: Using Plug-ins

Lesson 6: Incorporating Interactivity



Day 1

Road Map

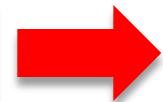
Lesson 1: Course Introduction

Lesson 2: APEX Overview

Unit 1: Enhancing Application Pages

Unit 2: Adding Advanced APEX
Functionality to an Application

Unit 3: Making an Application
Production-ready



Lesson 7: Generating and Using Table APIs

Lesson 8: Creating and Using RESTful Web
Services

Lesson 9: Using Themes and Templates

Lesson 10: Using jQueryUI ThemeRoller



Day 2

Road Map

Lesson 1: Course Introduction

Lesson 2: APEX Overview

Unit 1: Enhancing Application Pages

Unit 2: Adding Advanced APEX
Functionality to an Application

Unit 3: Making an Application
Production-ready

Lesson 11: Securing an Application

Lesson 12: Deploying and Maintaining an
Application

Lesson 13: Optimizing an Application

Lesson 14: Globalization and Translation

Day 3

Course Environment



Operating system

- Linux x64

Installed products

- Oracle Database 12c R1
- Oracle Application Express 5.0
- Oracle REST Data Services
- Java Platform (JDK)
- Internet Browser (Firefox)



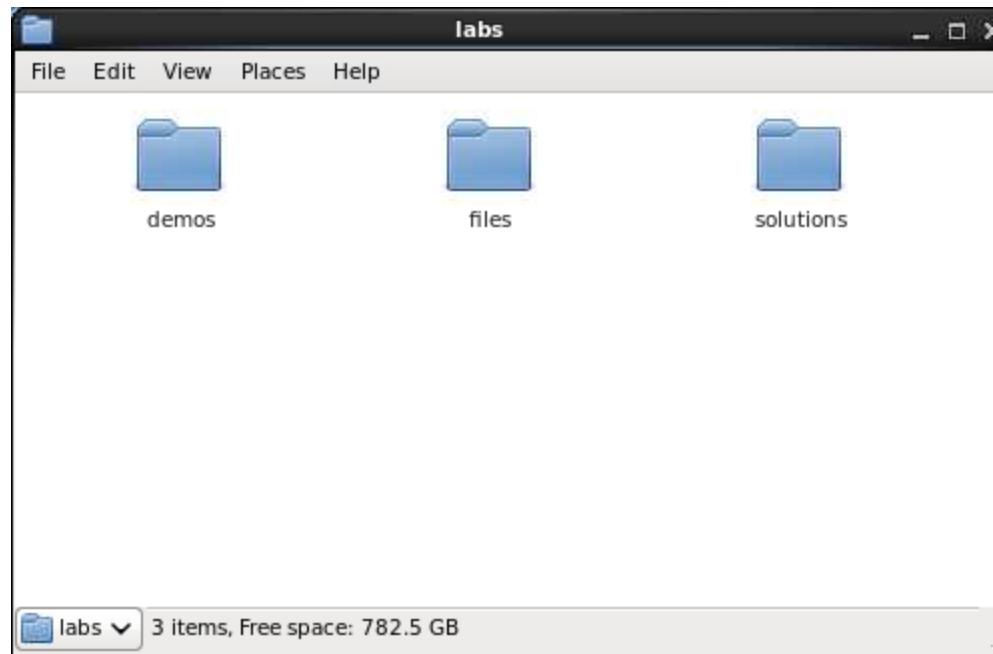
Workspace Details

- An Oracle Application Express workspace is assigned to you.
 - Workspace name: apex
 - Username: apex
 - Password: apex
- Log in to your workspace to complete the practice tasks in the Activity Guide.



Accessing the labs Directory

/home/oracle/labs



Introducing Course Persona: Jack

Persona 1 Name **Jack**

Designation **Application Developer**



Jack is an application developer in a start-up software company named 'XWHYZEE Technologies' and he reports to Jill.

Recently, Jack used Oracle's rapid application development tool 'Application Express 5.0' (APEX 5.0) to develop an application called 'Project Tracking System' (PTS). PTS enables Jill to track and manage multiple projects and team members seamlessly. Now that Jack has some experience creating a complete end-to-end solution using APEX, he decides to upgrade the application functionalities using some of the advanced APEX features.

Career Profile: Jack is an application developer and has good experience in using SQL and PL/SQL while working with database applications. Recently, he successfully created an application using Oracle Application Express.

Training Requirement: In order to upgrade PTS using Oracle APEX 5.0, Jack should be able to:

- ✓ Implement advanced APEX functionalities such as collections, dynamic actions, plug-ins, AJAX, jQuery, and JavaScript to application pages
- ✓ Integrate the web services functionality
- ✓ Create customized themes and templates
- ✓ Secure the application
- ✓ Package and deploy the application

Demo Application: Project Tracking System

Project Tracking System (PTS) is a web application developed as part of APEX 5.0 Workshop I training.



New Functionality to be Built

- Team members should be able to create and send their weekly status reports to their reporting managers.
- Implement a rich user interface experience using advanced APEX features like AJAX, jQuery, JavaScript, dynamic actions, and plug-ins.
- Customize the look and feel using themes and templates.
- Secure the application against common threats.

Practice Application: GlobalMart Management Tool

GlobalMart Management Tool (GMT) is a web application developed as part of APEX 5.0 Workshop I training.



New Functionality to be Built

- Add to cart functionality
- Implement a rich user interface experience using advanced APEX features like AJAX, jQuery, JavaScript, dynamic actions, and plug-ins.
- Customize the look and feel using themes and templates.
- Secure the application against common threats.

2

Introduction and Review

Jack Reviews APEX Concepts and PTS Features



Objectives

After completing this lesson, you should be able to:

- List the various Oracle Application Express (APEX) components and their features
- Examine additional APEX resources



What Is Oracle Application Express?

Oracle Application Express is a rapid web application development tool for Oracle database.

The screenshot shows the Oracle Application Express (APEX) dashboard. At the top, there's a navigation bar with links for Application Builder, SQL Workshop, Team Development, Packaged Apps, and user profile information. Below the navigation bar, there are four main icons: Application Builder (blue square with a pencil icon), SQL Workshop (green square with a database and cloud icon), Team Development (yellow square with a circular arrow icon), and Packaged Apps (red square with a grid icon). To the right of these icons is a sidebar titled "About" which provides a brief overview of APEX. The main content area features three sections: "Top Applications", "Top Users", and "News and Messages". The "News and Messages" section contains a message about attending the ODTUG Kscope15 conference and a link to the FAQ. There are also "System Message" notifications. On the right side of the dashboard, there are summary boxes for "Dashboard" metrics: 10 Applications, 94 Tables, 0 Features, and 4 Packaged Apps. Further down, there are sections for "Site-Specific Tasks" and "Accessibility Mode".

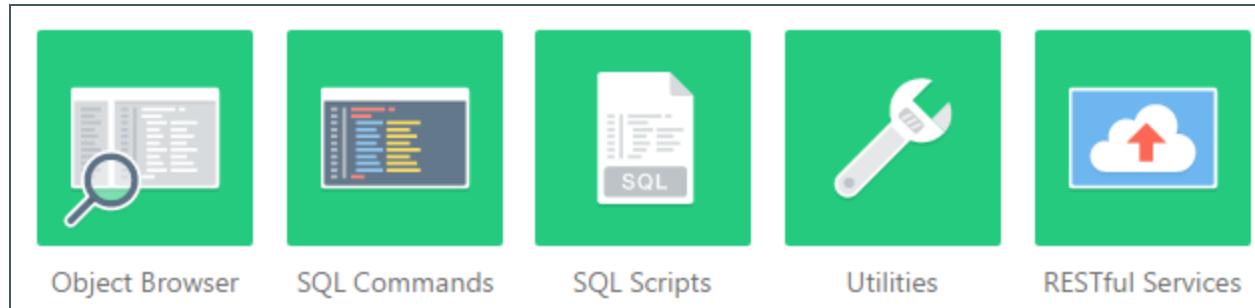
Building Your Database Application

The screenshot shows the Oracle Application Express interface. At the top, there are tabs for Application Builder, SQL Workshop, Team Development, and Packaged Apps. Below the tabs are four icons: Create (blue page with green plus), Import (blue page with blue arrow), Dashboard (blue dashboard with charts), and Workspace Utilities (blue wrench). A search bar and a toolbar with Go, Actions, Reset, and Create > buttons are visible. In the main area, three applications are listed: Sample Database Application (100, red icon), GlobalMart Management Tool (101, orange icon), and PROJECT TRACKING SYSTEM (102, purple icon). A red arrow points from the 'Create' button in the top navigation to the 'Create Page >' button in the bottom navigation of the 'PROJECT TRACKING SYSTEM' application's interface. The 'PROJECT TRACKING SYSTEM' interface shows five main tabs: Run Application, Supporting Objects, Shared Components, Utilities, and Export / Import. Below these are four pages: 0 - Global Page - Mobile, 1 - Home, 2 - Home, and 3 - Project Status Report.

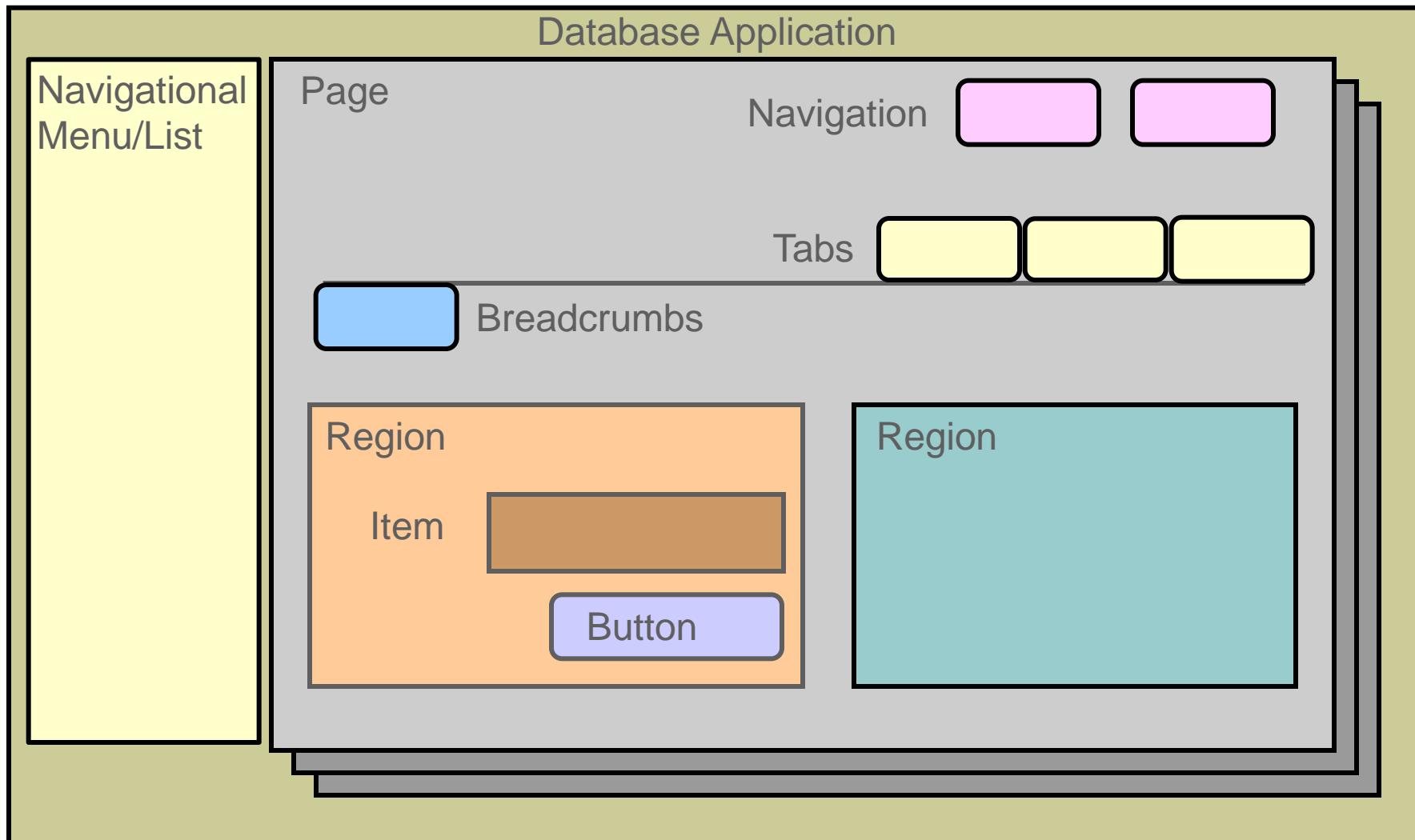
Building and Accessing Database Objects

SQL Workshop enables you to view and manage database objects from a web browser. You can:

- Create and browse database objects
- Execute SQL commands
- Load and run scripts
- Specify RESTful services



Components of a Database Application



Page Designer: The World's Most Advanced IDE

The screenshot shows the Oracle Page Designer interface. On the left, the **Component Selector** displays a hierarchical tree of page components for "Page 6: Create Employees". The tree includes sections for Regions, Content Body (with "In the NEWS [Global Page]" and "Create Employees" items), Buttons (with "CREATE" and "CANCEL" buttons), and Page Items (with "P6_EMPLOYEE_ID", "P6_FIRST_NAME", and "P6_LAST_NAME"). On the right, the **Property Editor** shows various page properties: Name (Create Employees), Page Alias, Title (Create Employees), Page Group (- Select -), User Interface (Desktop), Page Mode (Normal), Page Template (Theme Defa), Template Options (Use Template Defaults), CSS Classes, and Media Type.

Component Selector

Property Editor

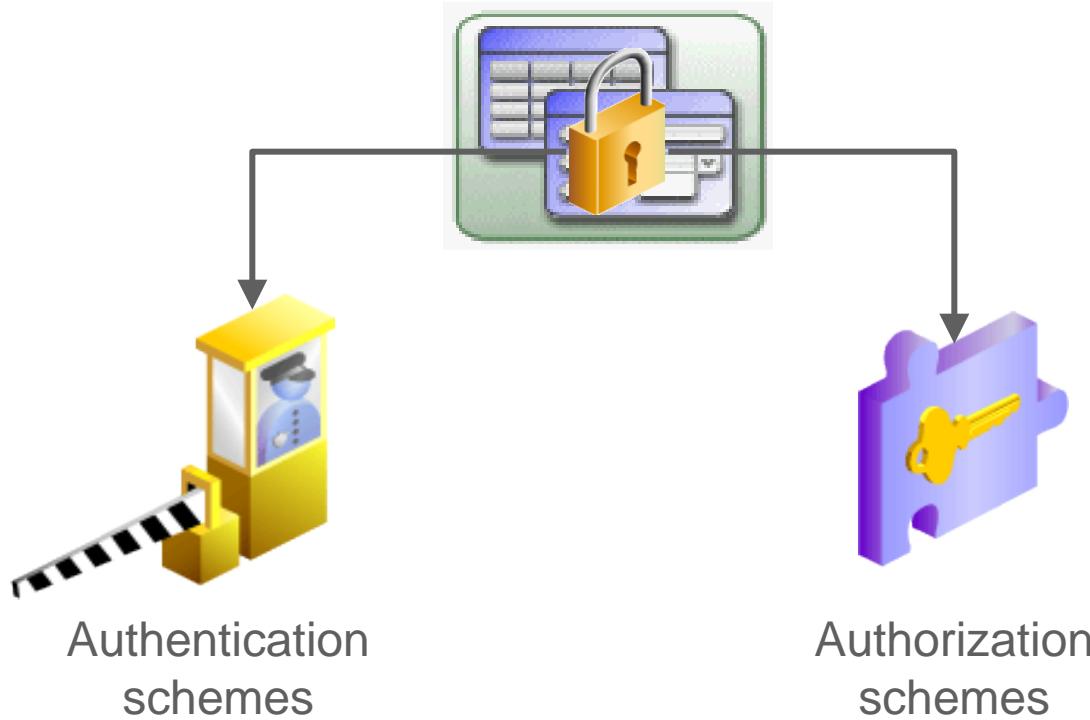
Next level of declarative programming → Design your page as you visualize.

Page Designer: Drag-and-drop from Gallery

The screenshot illustrates the Oracle Page Designer interface, highlighting features for drag-and-drop functionality.

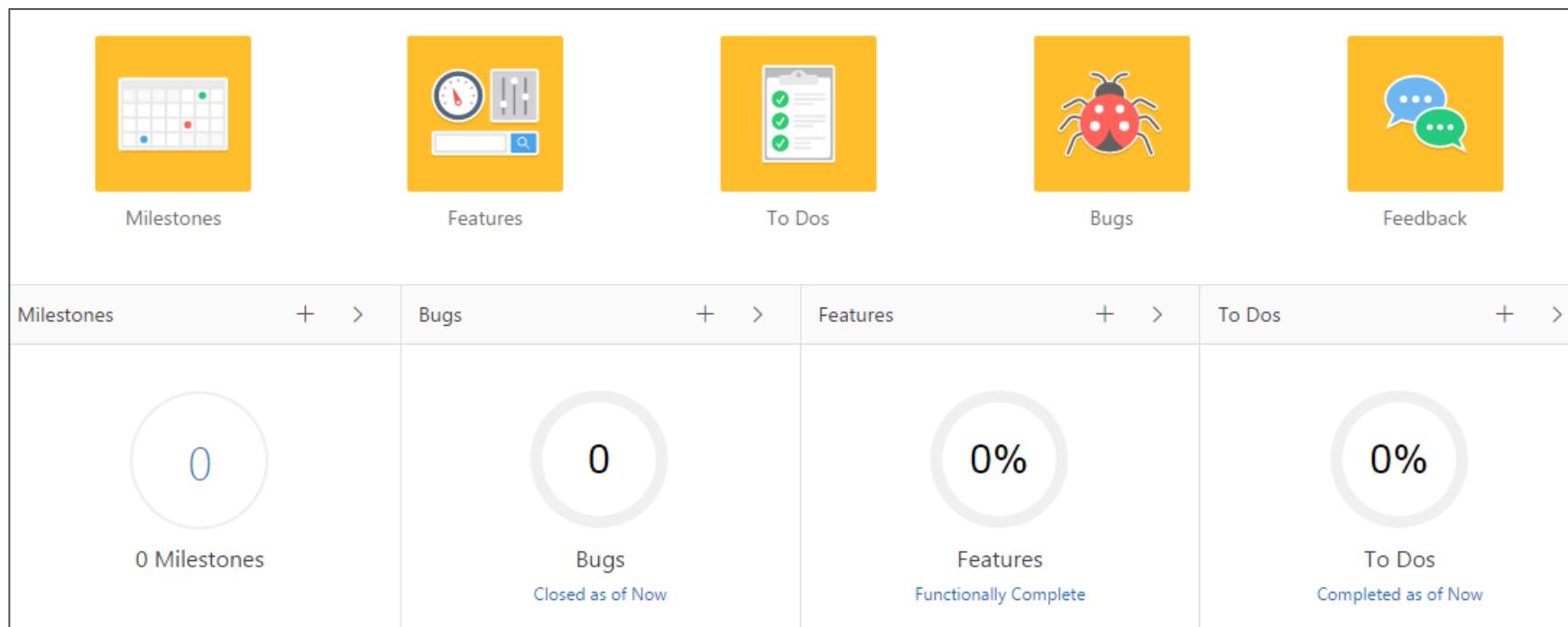
- Toolbar:** A horizontal bar at the top containing various icons for file operations (e.g., Open, Save, Print), navigation (e.g., Back, Forward), and search.
- Page Structure:** The main workspace shows a hierarchical page structure with sections like Grid Layout, Messages, Page Search, Help, PAGE HEADER, PAGE NAVIGATION, BREADCRUMB BAR, and CONTENT BODY.
- Gallery:** A panel at the bottom right containing a grid of icons representing different page components. The components listed are:
 - Regions, Items, Buttons
 - Breadcrumb, Calendar, Chart, Classic Report, Classic Report (based on Function), Help Text, Interactive Report, Legacy Calendar
 - List, Map Chart, PL/SQL Dynamic, Region Display, Static Content, Tabular Form, Tree, URL
- Annotations:** Red boxes and callouts highlight specific features:
 - A red box labeled "Short-cut Icons" points to the toolbar icons.
 - A red box labeled "Drag 'n' Drop" points to the gallery icons.
 - A red box labeled "Gallery" points to the bottom panel.

Securing Database Applications



Components of Oracle Application Express: Team Development

Team Development enables you to manage the application development process.



What Is a Packaged Application?

Packaged Applications are fully functional applications that you can view, use, and customize.

Single Export File

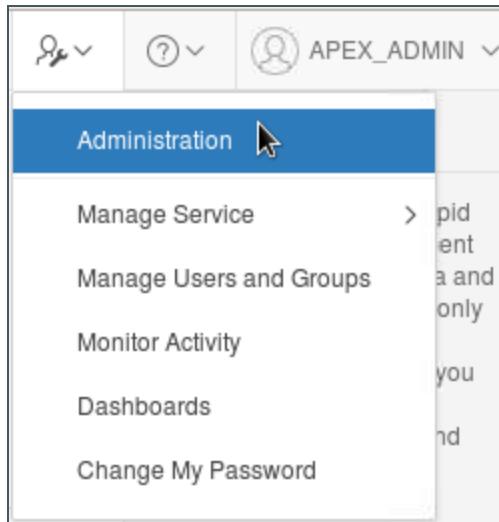
Application definitions

- Page rendering (regions, items, buttons, and so on)
- Page processing (computations, validations, and so on)

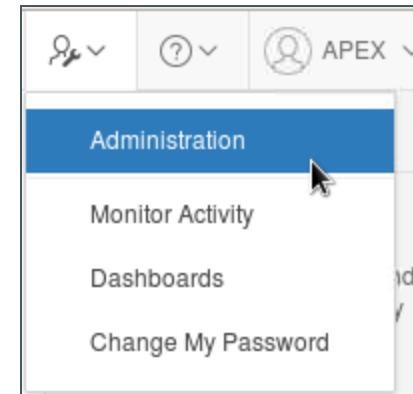
Supporting objects

- Database objects
- Seed data needed when application is installed
- Application image files
- CSS files
- Custom JavaScript files

Application Express Workspace Administration



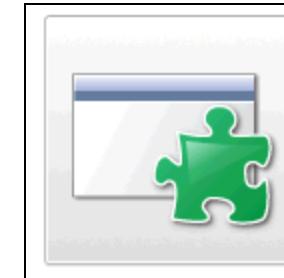
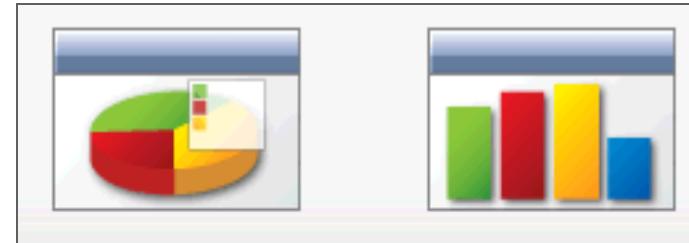
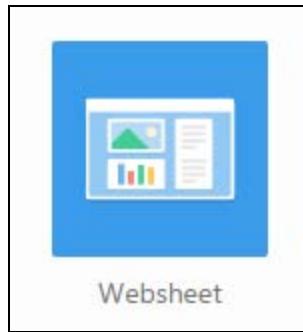
Workspace
Administrator
User



Developer
User



Oracle Application Express: Other Features



Additional Resources: Application Express OTN Page

Oracle Technology Network > Developer Tools > Application Express > Overview

Overview Downloads Documentation Community Learn More



Oracle Application Express (APEX)

Build applications using only your web browser.

Application Express enables you to design, develop and deploy beautiful, responsive, database-driven applications using only your web browser. See how you can take advantage of this fully-supported, no-cost feature of the Oracle Database.

[APEX on Oracle Cloud](#) [Try apex.oracle.com](#) [Download Now](#)

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Learning Library for Oracle Application Express

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Take this 5 day course from Oracle University!

 Oracle Application Express: Workshop II
Take this 3 day course from Oracle University!

 Oracle Application Express: Administration
Take this 2 day course from Oracle University!

Welcome Overview Latest Additions Getting Started Learn by Action Additional Resources

Welcome

Welcome to the Oracle Application Express Learning Library. The library is home to information about Oracle Application Express and links to other Application Express related content.

- Click on the **Overview** tab to read the 2 minute elevator pitch for Application Express.
- View the latest content added to the learning library for Oracle Application Express on the **Latest Additions** tab.
- If you are new to Oracle Application Express begin at the **Getting Started** tab for general guidance.
- Review the role-specific highlights, activities, and tutorials on the **Learn by Action** tab.
- Check out the **Additional Resources** tab to access a wealth of collateral from outside the Oracle Application Express Learning Library.

All tabs provide links to general documentation, training, support, customer, and partner web sites.

Click [here](#) to see a listing of all available training for Oracle Application Express on the Oracle Learning Library (OLL).



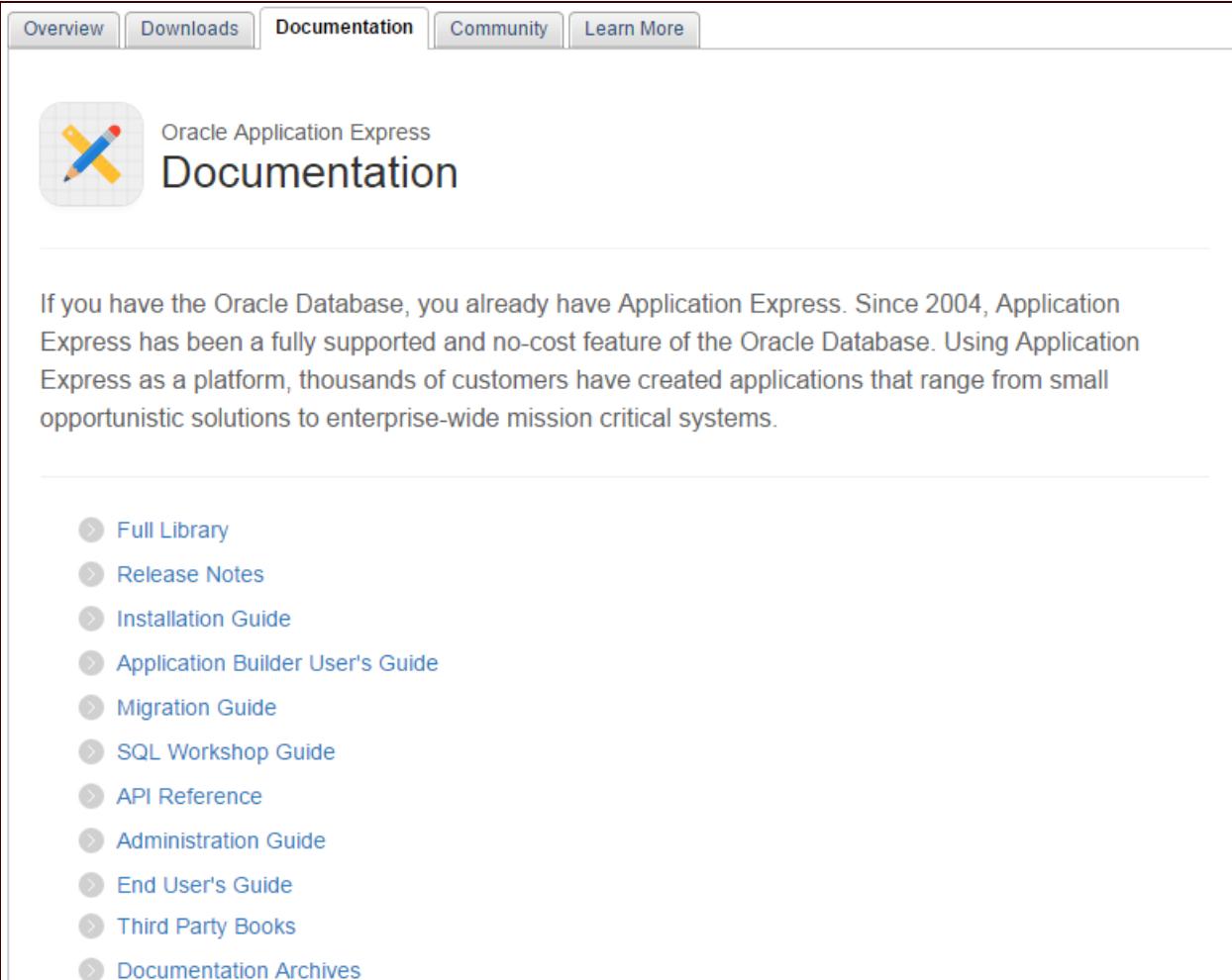
Useful Links

-  Oracle Technology Network (OTN...)
-  Product Documentation
-  OTN Discussion Forum
-  apex.oracle.com - Free hosted ev...

My Oracle Support


Support solutions for Oracle Premier Support Customers

Additional Resources: Documentation and Tutorials



The screenshot shows the Oracle Application Express Documentation homepage. At the top, there is a navigation bar with tabs: Overview, Downloads, Documentation (which is the active tab), Community, and Learn More. Below the navigation bar is a logo consisting of a yellow pencil and a blue paintbrush forming an 'X' shape, next to the text "Oracle Application Express Documentation". A horizontal line separates this from the main content area. The main content area contains a paragraph of text followed by a list of links. The text reads: "If you have the Oracle Database, you already have Application Express. Since 2004, Application Express has been a fully supported and no-cost feature of the Oracle Database. Using Application Express as a platform, thousands of customers have created applications that range from small opportunistic solutions to enterprise-wide mission critical systems." Below this text is another horizontal line. Underneath the line is a list of documentation links, each preceded by a grey circular arrow icon:

- [Full Library](#)
- [Release Notes](#)
- [Installation Guide](#)
- [Application Builder User's Guide](#)
- [Migration Guide](#)
- [SQL Workshop Guide](#)
- [API Reference](#)
- [Administration Guide](#)
- [End User's Guide](#)
- [Third Party Books](#)
- [Documentation Archives](#)

Oracle Application Express Developer Certified Expert

The screenshot shows the Oracle Certification page for Oracle Application Express (APEX). At the top, there are navigation links: Home > Training > Database > Database Application Development > Oracle Application Express (Oracle APEX). To the right are contact information (Local: 1800 103 4775 Intl: +91 80 67863102) and a Live Chat link.

Below the navigation, there are three tabs: Training Courses (selected), Certification (highlighted in red), and Learning Paths.

The main content area is titled "Oracle Application Express (Oracle APEX) Certification". It includes a note: "Click on the boxes below to learn detailed requirements for achieving each certification." followed by a question mark icon.

A large callout box highlights the "Certified Expert" certification, which is described as "Oracle Application Express Developer Certified Expert". A purple border surrounds this box. Below it, a text box states: "The Oracle Certified Expert certification program grants credentials that recognize competency in specific technologies, architectures or domains not currently covered in the path-based Oracle Certifications."

An arrow points from the "Certified Expert" box down to a section titled "Step 1 - Pass Exam". This section contains two main parts: "Exam" (listing "Oracle Application Express (APEX) 4: Developing Web Applications 1Z0-450") and "Exam Preparation (optional)" (listing "Oracle Application Express: Developing Web Applications"). A "Register Now" button is located at the bottom of the "Exam" section.

Summary

In this lesson, you should have learned how to:

- List the various Oracle APEX components and their particular functions
- Examine additional APEX resources



Practice 2 Overview: Introduction and Review

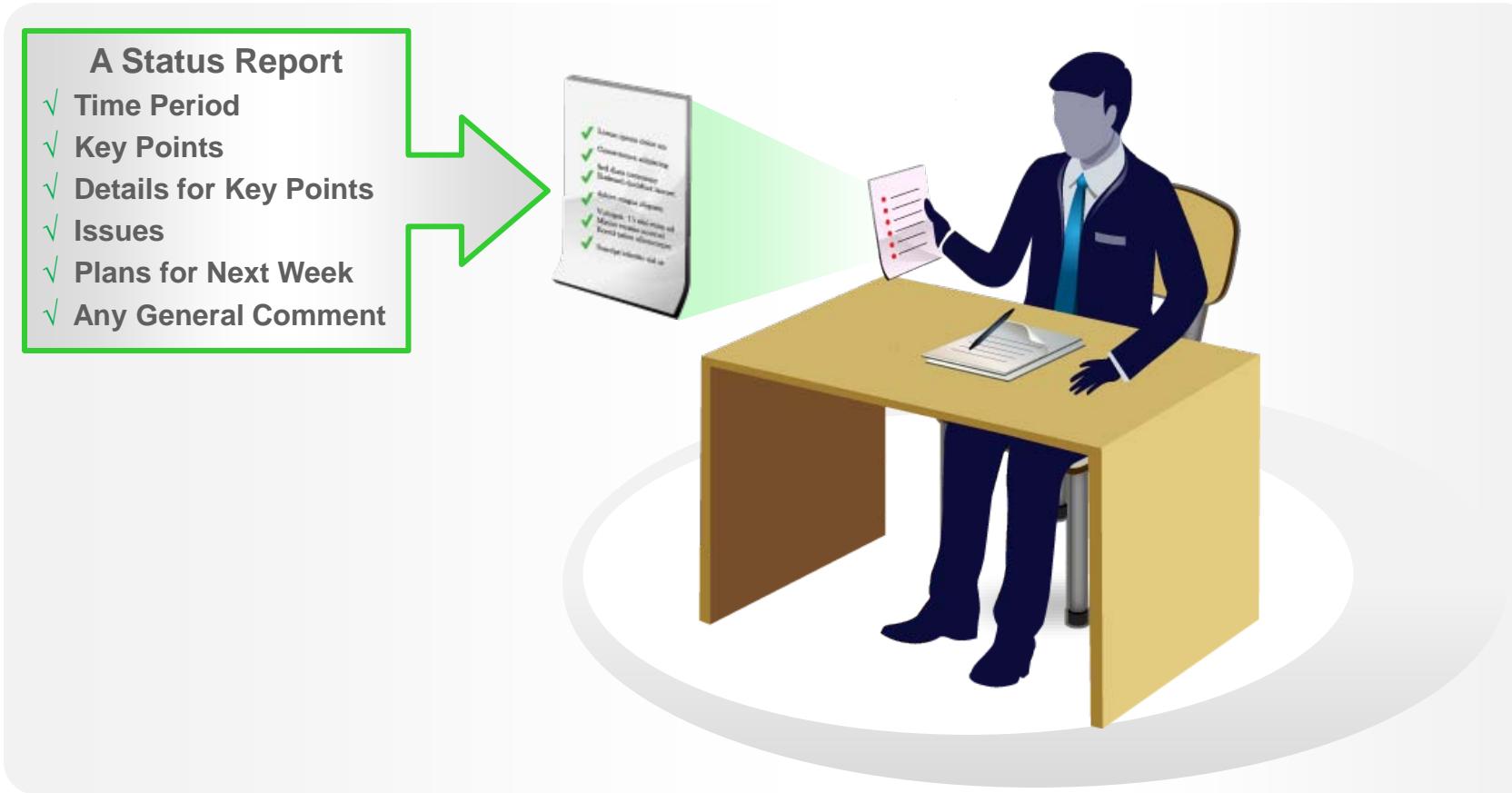
This workshop covers the following topics:

- Accessing the lab environment
- Reviewing the demonstration application: Project Tracking System
- Reviewing the practice application: GlobalMart Management Tool

3

Using Oracle APEX Collections

Using Collections in PTS



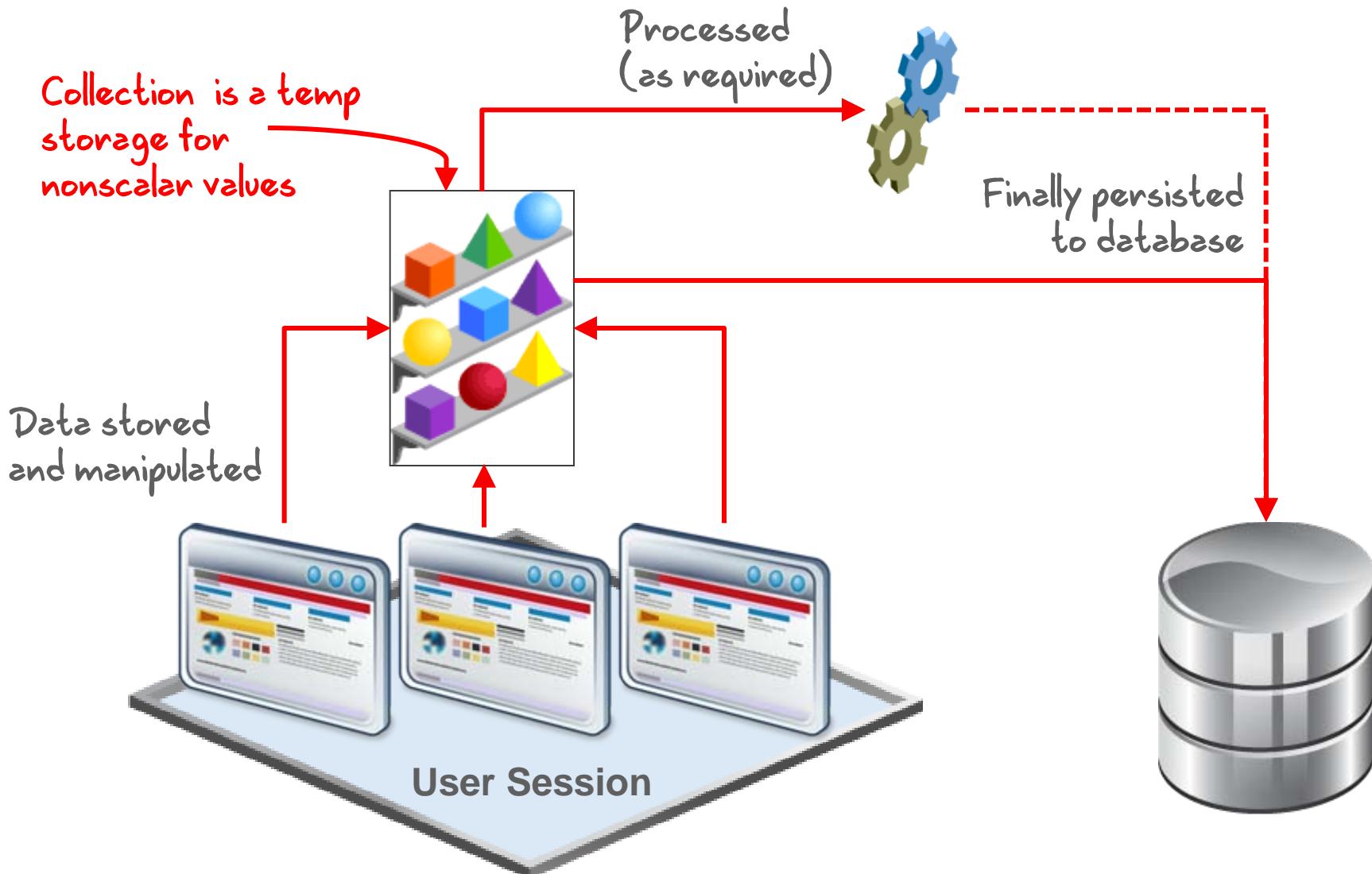
Objectives

After completing this lesson, you should be able to:

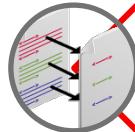
- Describe collections
- Identify APIs available for using collections
- Create, access, and manipulate collections



What Is a Collection?



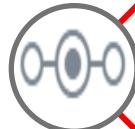
Common Use Cases



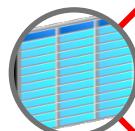
Data Entry Wizard



Multiple Updates to a Page



Collecting Unknown Number of Attributes



Build a Tabular Forms Manually



Create Report on Dynamic SQL

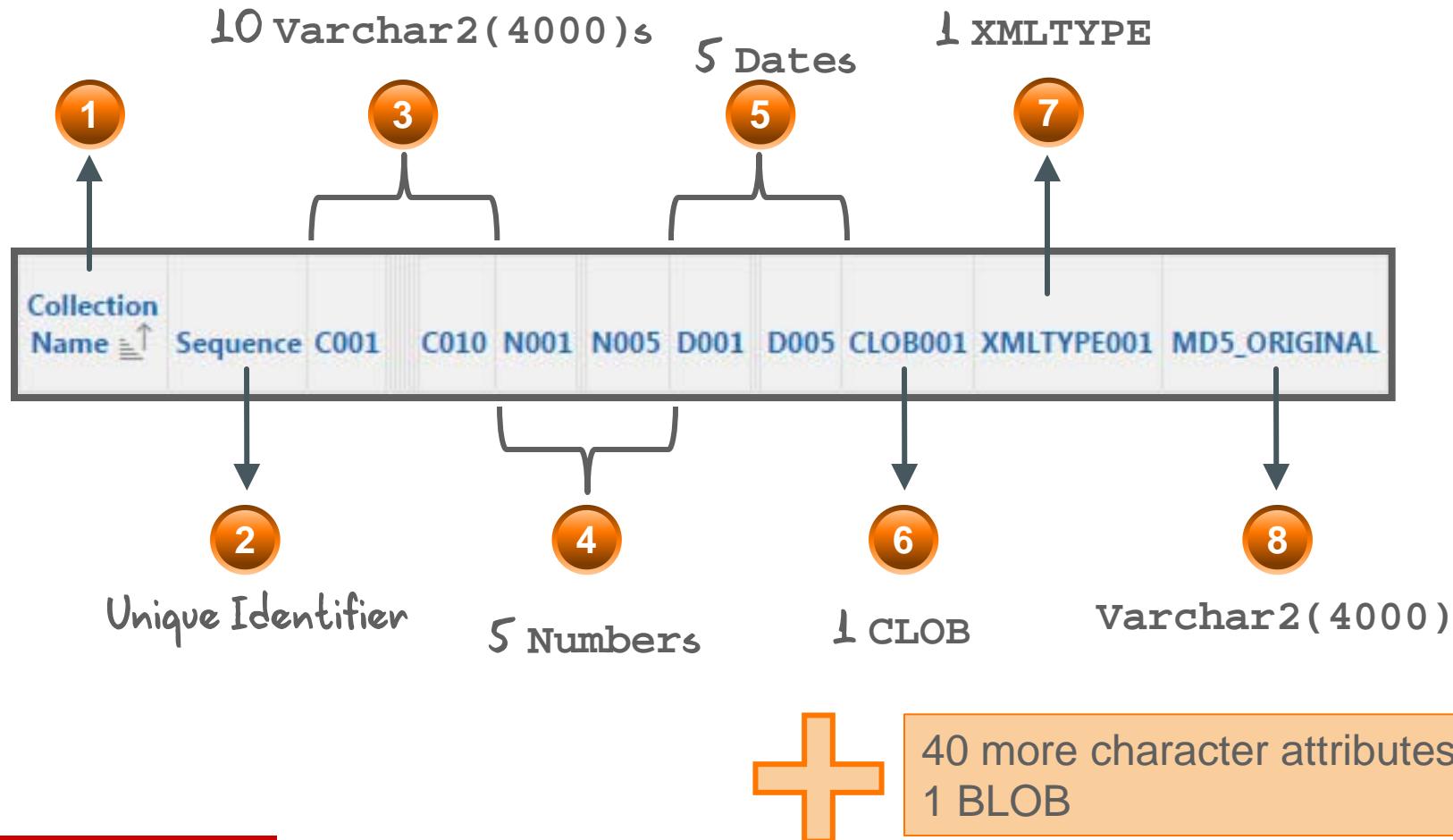
APEX_COLLECTION API: Overview

- APEX_COLLECTION is a PL/SQL Application Programming Interface (API).
- You use this API to:
 - Create a collection
 - View data in a collection
 - Insert rows to the collection
 - Update the collection
 - Delete the collection



Collection Structure and Data Types

A collection is created with the following default structure:



Creating a Collection

Points to consider while creating a collection:

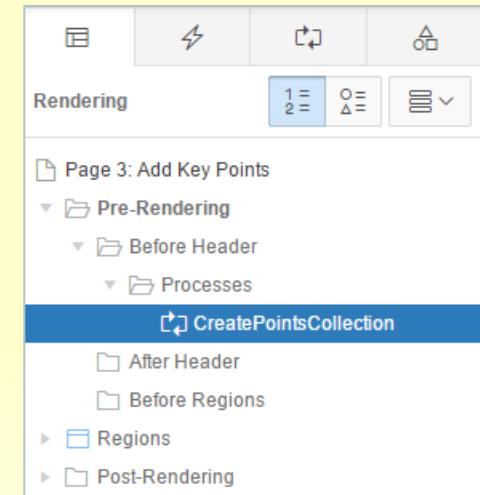
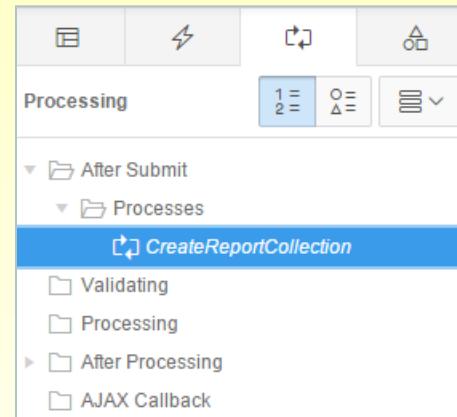
- Which of the create APIs to use?
- Where to place the code?

API	Usage (C=>Collection)
CREATE_COLLECTION	Creates an empty C with the given name
CREATE_OR_TRUNCATE_COLLECTION	If C with given name exists, it truncates (empties) the C. Else, creates empty C with given name
CREATE_COLLECTION_FROM_QUERY CREATE_COLLECTION_FROM_QUERY_B	Creates and populates a C using given SQL query (up to 50 character attributes in C)
CREATE_COLLECTION_FROM_QUERY2 CREATE_COLLECTION_FROM_QUERYB2	Creates and populates a C using given SQL query (first 5 number attributes, then up to 50 character attributes in C)

Creating a Collection: Syntax and Example

```
APEX_COLLECTION.CREATE_COLLECTION  
( p_collection_name IN VARCHAR2 );
```

```
APEX_COLLECTION.CREATE_COLLECTION(  
    p_collection_name => 'REPORT' );
```



Viewing the Collection in Session State

Items Pages Queries Tables PL/SQL Images Debug **Session** Errors

Page [?](#) Find [?](#) **Set**
Rows [?](#) View [?](#)

Application: 23419 Salome PTS [?](#)

Session **1939939626641**
User **ORA01**
Workspace **222551113530400223**

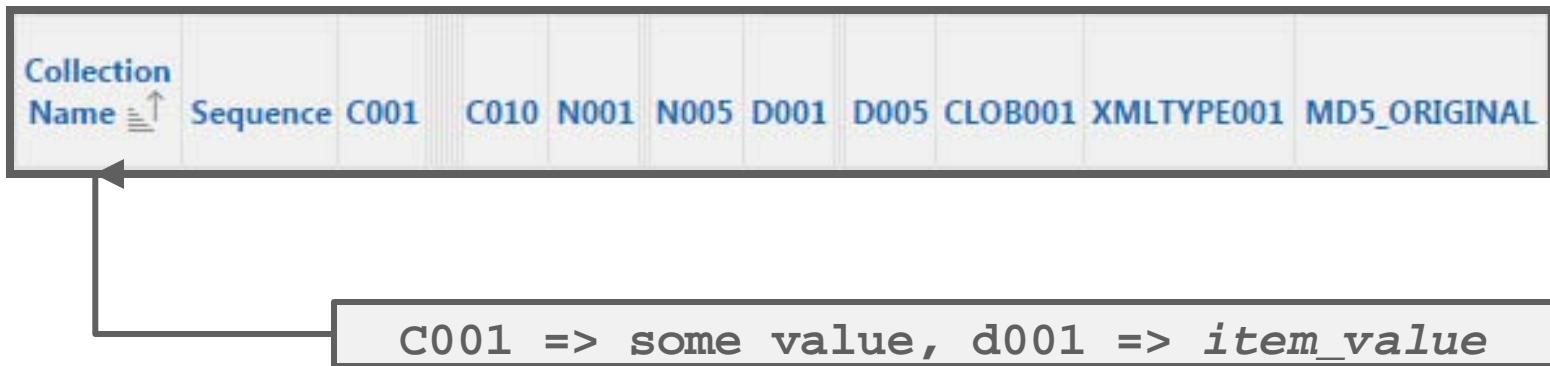
Browser Language **en**

Collection Name ↑	Sequence	C001	C002	C003	C004	C005	C006	C007	C008	C009	C010	N001	N002	N003	N004	N005	D001	D002
POINT	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REPORT	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	04/06/2015	04/10/2015

Adding Members to a Collection

Points to Remember:

- The collection must be created.
- Seq_id is generated automatically.
- Map the values to the respective member attribute.



Adding Members: Syntax and Example

```
APEX_COLLECTION.ADD_MEMBER ( p_collection_name IN VARCHAR2,  
                             p_c001 IN VARCHAR2 default null, ...  
                             p_c050 IN VARCHAR2 default null,  
                             p_n001 IN NUMBER default null, ...  
                             p_n005 IN NUMBER default null,  
                             p_d001 IN DATE default null, ...  
                             p_d005 IN DATE default null,  
                             p_clob001 IN CLOB default empty_clob(),  
                             p_blob001 IN BLOB default empty_blob(),  
                             p_xmltype001 IN XMLTYPE default null,  
                             p_generate_md5 IN VARCHAR2 default 'NO');
```

```
declare  
    seq_id          varchar2(100);  
begin  
    seq_id := apex_collection.add_member(p_collection_name => 'REPORT',  
                                         p_d001 => :P5_START_DATE,  
                                         p_d002 => :P5_END_DATE);  
  
    :reportid := seq_id;  
end;
```

Accessing a Collection

```
SELECT c001, c002, c003, n001, d001  
FROM APEX_collections  
WHERE collection_name = '<collection name in CAPS>'
```

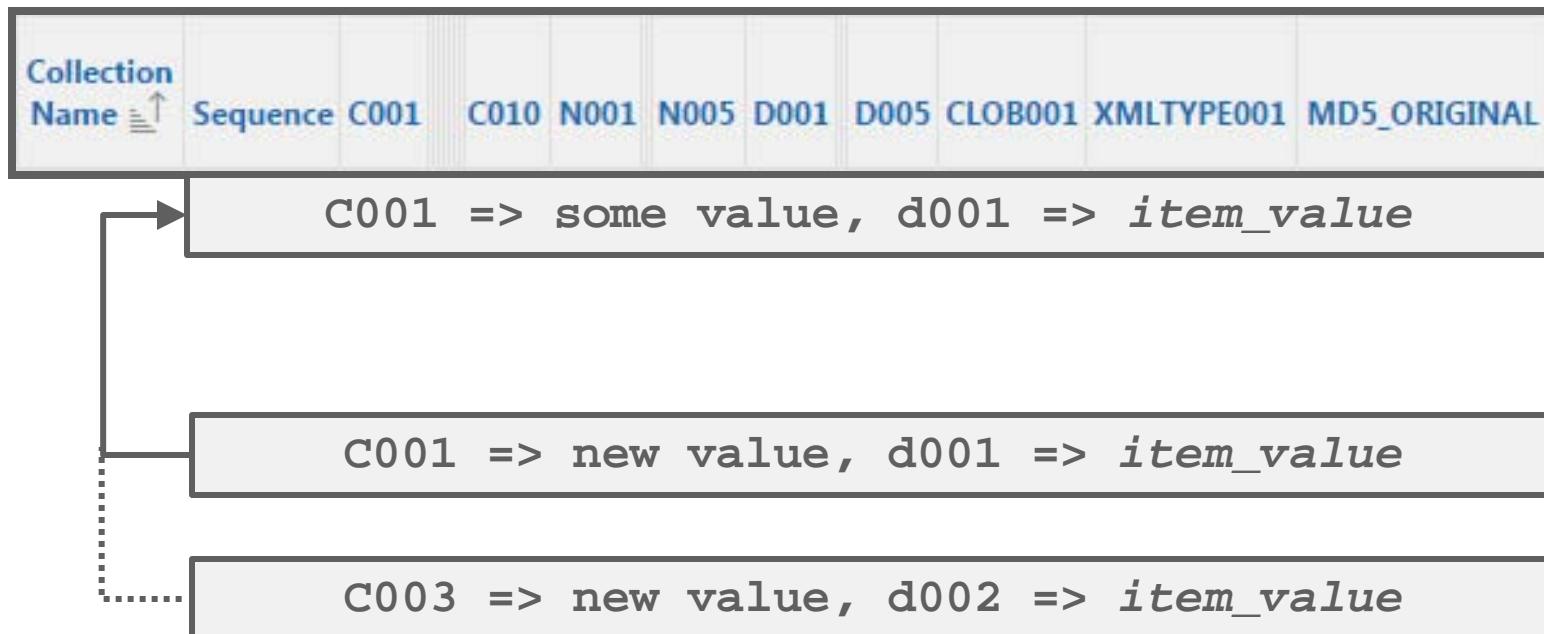
```
select  
    APEX_ITEM.DISPLAY_AND_SAVE(1,seq_id) Sno,  
    APEX_ITEM.TEXT(2,c001) KeyPoint  
from apex_collections  
where collection_name = 'POINT'
```



Updating Members of a Collection

Point to Remember:

- Update method will replace an entire collection member.

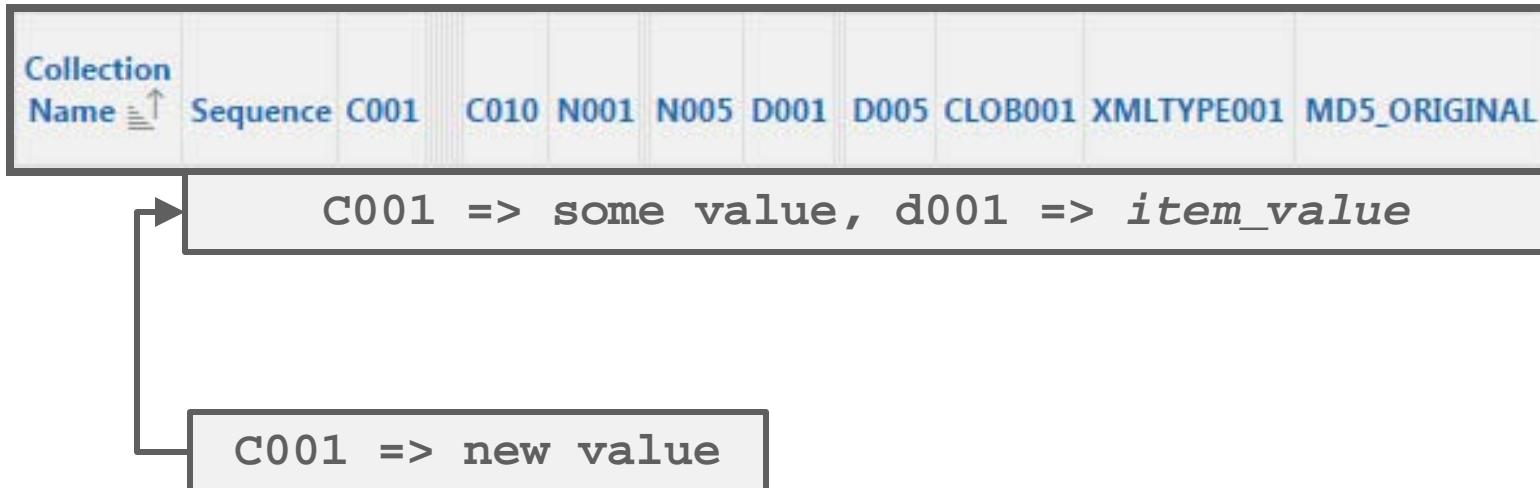


Updating Members: Syntax and Collection

```
APEX_COLLECTION.UPDATE_MEMBER ( p_collection_name IN VARCHAR2,  
                                p_seq IN VARCHAR2 DEFAULT NULL,  
                                p_c001 IN VARCHAR2 default null, ...  
                                p_c050 IN VARCHAR2 default null,  
                                p_n001 IN NUMBER default null, ...  
                                p_n005 IN NUMBER default null,  
                                p_d001 IN DATE default null, ...  
                                p_d005 IN DATE default null,  
                                p_clob001 IN CLOB default empty_clob(),  
                                p_blob001 IN BLOB default empty_blob(),  
                                p_xmltype001 IN XMLTYPE default null,  
                                p_generate_md5 IN VARCHAR2 default 'NO');
```

```
APEX_COLLECTION.UPDATE_MEMBER (  
    p_collection_name => 'POINT',  
    p_seq => APEX_APPLICATION.G_F01(i),  
    p_c001 => APEX_APPLICATION.G_F02(i));
```

Updating Member Attributes of a Collection



Updating Member Attributes: Syntax and Collection

```
APEX_COLLECTION.UPDATE_MEMBER_ATTRIBUTE (
    p_collection_name IN VARCHAR2,
    p_seq IN VARCHAR2,
    p_attr_number IN VARCHAR2,
    p_attr_value IN VARCHAR2);
```

```
begin
  apex_collection.update_member_attribute(
    p_collection_name => 'REPORT',
    p_seq => :reportid,
    p_attr_number => '6',
    p_attr_value => :P7_ISSUES);
end;
```

Other Useful Methods

API	Usage (C=>Collection)
COLLECTION_EXISTS	Returns True if C with given name already exists. Else, returns False.
COLLECTION_MEMBER_COUNT	Returns total number of members in the C
RESEQUENCE_COLLECTION	Removes gaps in seq IDs, but maintains member order
DELETE_MEMBER	Deletes member with given seq_id
TRUNCATE_COLLECTION	Removes all members from the C with the given name
DELETE_COLLECTION	Deletes all members of C and the C itself

Additional Resource: Collections Packaged Application

Sample Collections

Home Basic Collections Data Synchronization API Examples Administration

Sample Collections

Use collections to store and manipulate large amounts of data

Use this Oracle Application Express (APEX) collections sample to extend session state management to deal with arrays of session-based data. Oracle APEX page items provides automatic session management for single value items, but does not manage arrays of session state. Oracle APEX collections provides the ability to manage user session state for an array ("table" of rows and columns). The Oracle database has temporary tables, but since each page view in Oracle APEX has a stateless model, each page view in Oracle APEX is a new database session. For this reason Oracle temporary tables can not be used for any multi page use case. Oracle APEX provides API's to create and manage APEX collection session state. See the example Use Cases and example API syntax links below to learn more about using Oracle APEX collections.

 Basic Collections

Creating a Basic Collection. Create a user defined collection name on a simple Employee table structure.

 Data Synchronization

Populate a collection from a sample Employees table, update the collection, and then synchronize the data in the collection with the base table.

 API Examples

View Oracle APEX API examples which you can use in your own application.

Summary

In this lesson, you should have learnt how to:

- Describe collections
- Identify APIs available for using collections
- Create, access, and manipulate collections



Practice 3 Overview: Using Oracle APEX Collection

This practice covers the following topics:

- Creating and Updating a Collection
- Accessing a Collection

Creating Dynamic Actions

Creating Dynamic Actions in PTS



Objectives

After completing this lesson, you should be able to:

- Describe how dynamic actions work in Oracle APEX
- Use custom code and advanced properties to create dynamic actions
- Delete a Row in a Report using dynamic actions
- Process a Modal Window



Review: What is a Dynamic Action?

Dynamic actions are behaviors that are executed as users interact with the application.

Dynamic Action Example

Employee Details	
First Name	Diana
Last Name	Lorentz
Email	DLORENTZ
Phone Number	590.423.5567
Hire Date	07-FEB-99
Job Id	IT_PROG
Salary	4200
Commission Pct	<input type="text"/>
Manager Id	103
Department Id	60

Employee Details	
First Name	Diana
Last Name	Lorentz
Email	DLORENTZ
Phone Number	590.423.5567
Hire Date	07-FEB-99
Job Id	SA_REP
Salary	4200
Commission Pct	<input type="text"/>
Manager Id	103
Department Id	60

Commission Pct is disabled when Job is not Sales Representative.

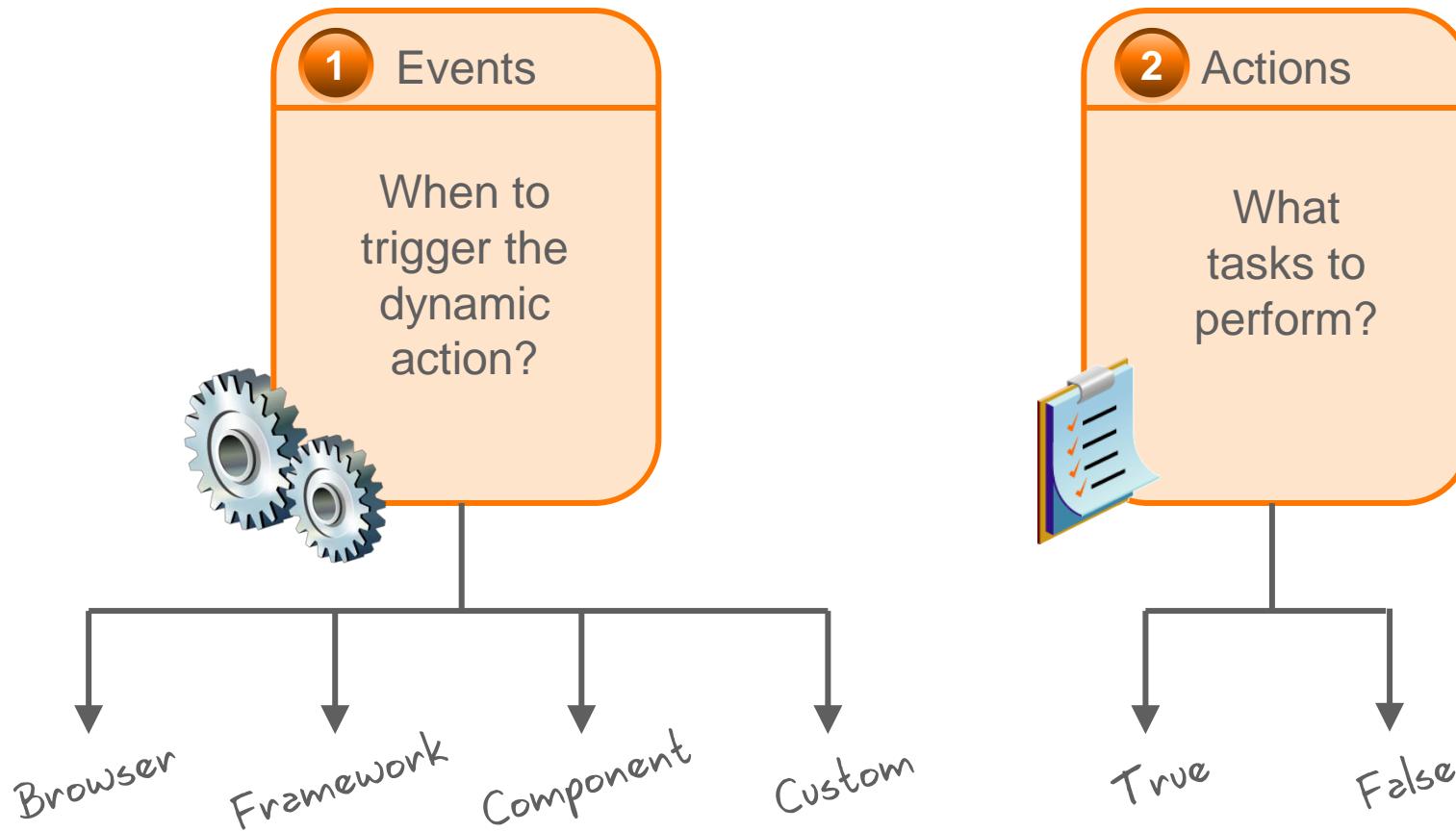
Review: Basic Dynamic Actions

Some of the common dynamic actions are:

- Hide/Show items and buttons
- Enable/Disable items and buttons
- Highlighting an Item
- Creating a Cascading LOV
- Setting the Value of an Item



Components of Dynamic Actions



Creating a Dynamic Action

Create a dynamic action from:

- A specific item or button
- The Dynamic Actions tab

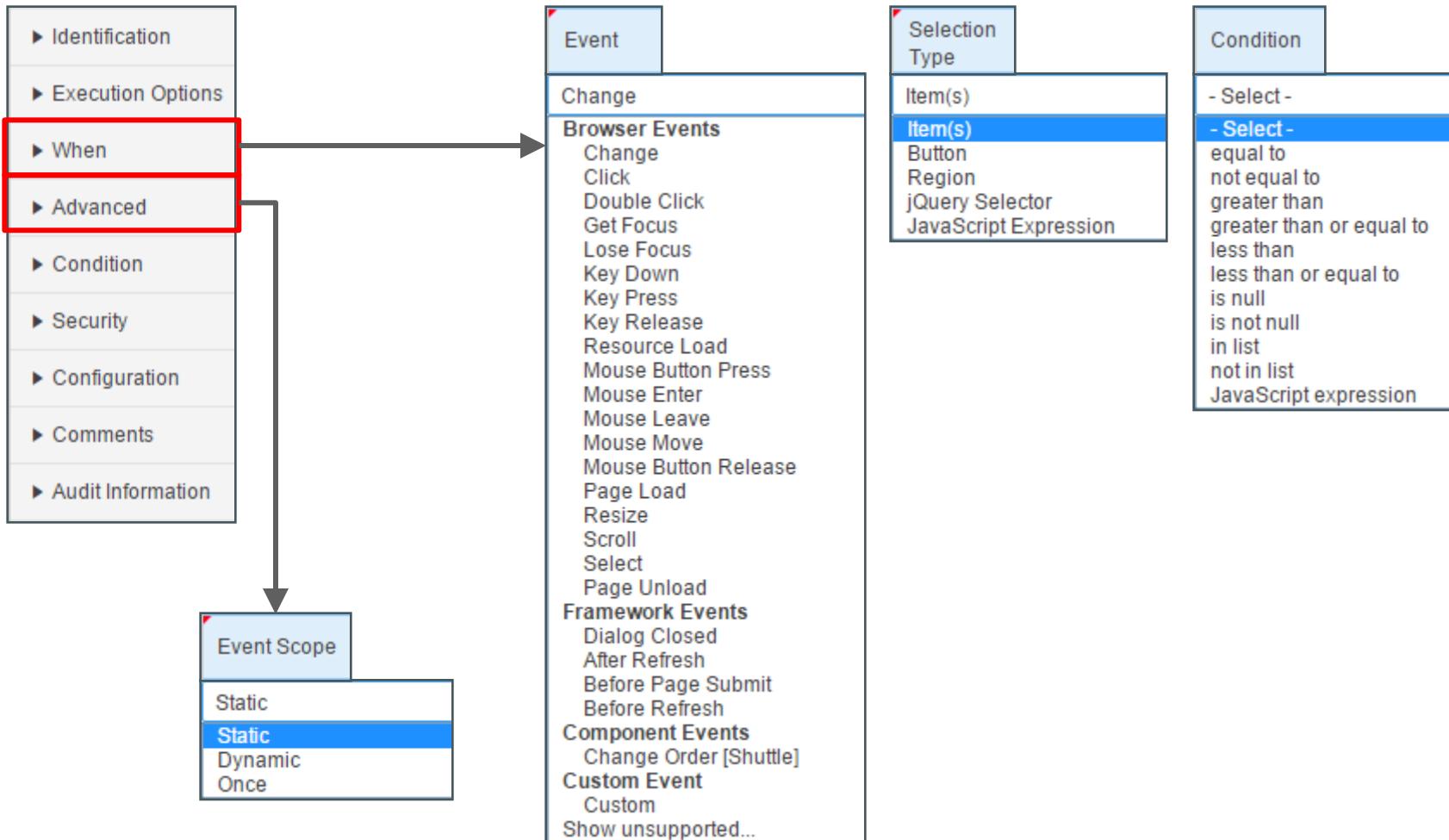
The screenshot shows the Oracle Dynamic Actions interface. At the top, there are four icons: a grid (List View), a lightning bolt (Dynamic Actions), a double arrow (Preview), and a triangle (New). Below this is a toolbar with a 'Dynamic Actions' button and a list icon. The main area is titled 'Dynamic Actions' and contains a tree view of events:

- Events
 - Page Load
 - Change
 - Click
 - AddRow
 - Refresh
 - Dialog Closed

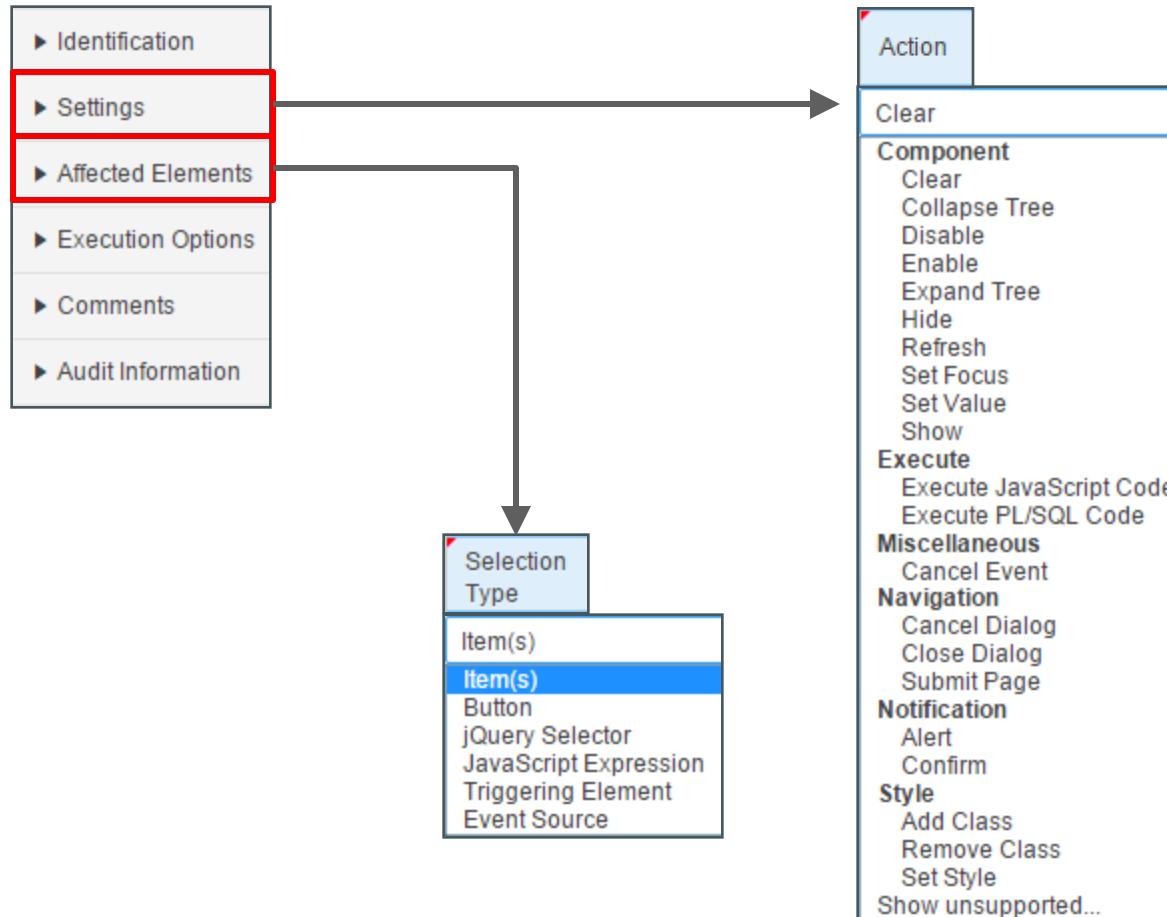
The screenshot shows the Oracle Dynamic Actions interface with a context menu open over a 'Regions' node in the tree view. The menu is titled 'SAVE' and includes the following options:

- Create Button
- Create Dynamic Action** (highlighted with a blue background and a cursor pointing at it)
- Duplicate
- Delete (with a 'Del' link)
- Post-R
- Copy to other Page...
- Expand All Below
- Collapse All Below

Dynamic Actions: Events



Dynamic Actions: Actions



Deleting a Row in a Report

To create a dynamic action to delete a row in a report:

1. Create the column with a link to click to delete the row.
2. Create a dynamic action event that is triggered when the delete link is clicked.
3. Create a set of actions that should be performed when the delete link is clicked:
 1. Ask for confirmation to delete
 2. Get the ID of the row to delete and set it to a hidden item
 3. Execute the code to delete the row
 4. Refresh the report
 5. Display a notification that the row was deleted

Processing a Modal Window

The screenshot shows a modal window titled "Add Key Points" overlaid on a larger application window. The modal has a header "Add Details for the Key Point", a "Seq id" field containing "1", an "Enter Details" rich text editor, and a "Save and Close" button.

Main Application Window:

- Title: Add Key Points
- Buttons: Previous, Save, Next, Cancel
- Table: Shows one row with Sno 1 and Key Point Completed Dynamic Actions Lesson.
- Text: release 1.0 [Set Screen Reader Mode On](#)

Modal Window:

- Title: Add Details for the Key Point
- Text: Seq id: 1
- Form: Enter Details (Rich Text Editor toolbar with B, I, etc.)
- Text: Add Another Key Point
- Buttons: Save and Close

Creating Custom Events

1. Create a custom dynamic action
2. Define the action
3. Invoke the event

1

Identification

Name	Custom Event DA
Execution Options	
Sequence	10
When	
Event	Custom
Custom Event	customEvent
Selection Type	JavaScript Expression
JavaScript Expression	
document	

2

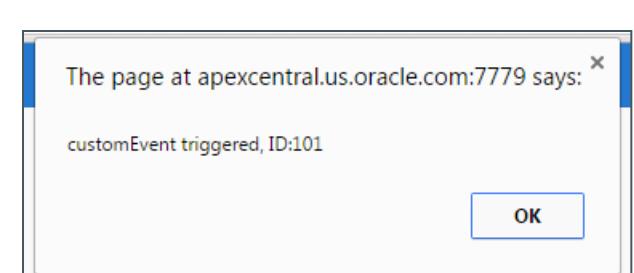
Identification

Action	Execute JavaScript Code
Settings	
Code	
alert('customEvent triggered, ID:' + this.data.id);	
Affected Elements	
Selection Type	- Select -
Execution Options	
Sequence	10
Event	Custom Event DA
Fire When Event Result Is	True
Fire On Page Load	<input type="radio"/> Yes <input checked="" type="radio"/> No

3

Execute when Page Loads

```
apex.event.trigger(document,'customEvent',{ id: 101});
```



Additional Resource: Sample Packaged Application

Sample Dynamic Actions

Home Simple Style Server Side Complex Administration

Sample Dynamic Actions

Add interactivity to your applications with dynamic actions

Please click on any of the examples to get started.

Disable/Enable	Hide/Show	Add/Remove Class (Error)	Add/Remove Class (Focus)
Disable and enable items automatically	Declaratively hide and show items based on user input	Using the Add and Remove Class actions to highlight errors	Using the Add and Remove Class actions to show focus
Stripe Report	Execute PL/SQL Code	Set Values (SQL)	Set Values (PL/SQL)
Using a dynamic action plug-in to enhance a report	Executing PL/SQL as part of a dynamic action	Using a dynamic action to execute SQL	Automatically calculate values via PL/SQL based on user input
Timer	Refresh	Filter and Refresh	Shuttle Refresh
Utilize a timer for repeating dynamic actions	Refresh a report based on user interactions with an interactive report	Use a dynamic action to filter a report	Use a dynamic action with a shuttle page item to control a report
Delete and Refresh	Slider Plug-In		
Use a multi-part dynamic action to confirm deletions and refresh a report	Use a dynamic action with a custom plug-in page item		

Summary

In this lesson, you should have learned how to:

- Describe how dynamic actions work in Oracle APEX
- Use custom code and advanced properties to create dynamic actions
- Delete a Row in a Report using dynamic actions
- Process a Modal Window



Practice 4 Overview: Using Dynamic Actions

This practice covers creating advanced dynamic actions.

Using Plug-ins in an Application

Using Plug-ins in PTS



Objectives

After completing this lesson, you should be able to:

- Identify different plug-ins available for Oracle APEX
- Import and use plug-ins
- Optimize the performance of plug-ins



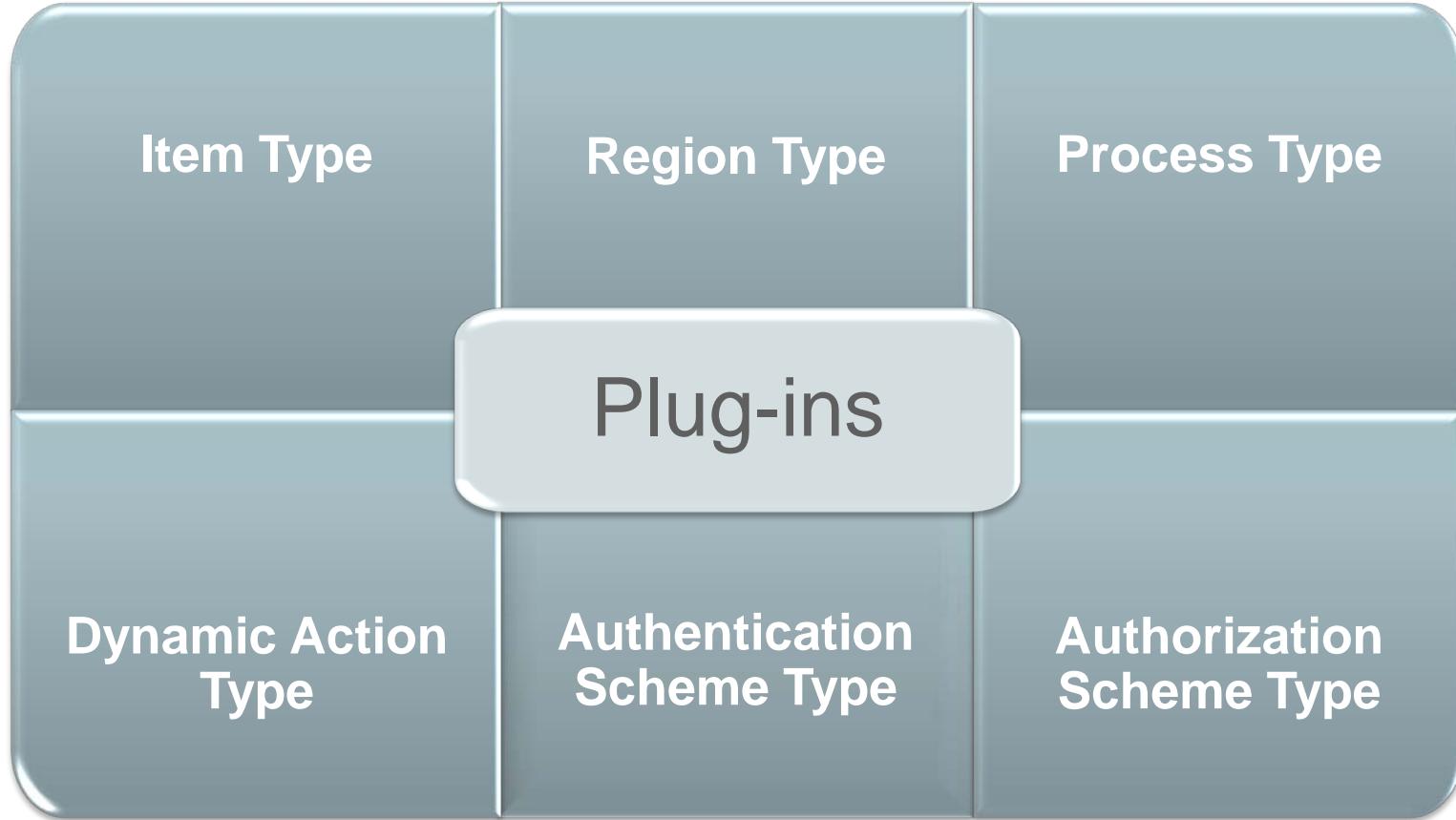
What Is a Plug-In?

The screenshot displays the Oracle Project Management application interface with several custom plug-ins integrated:

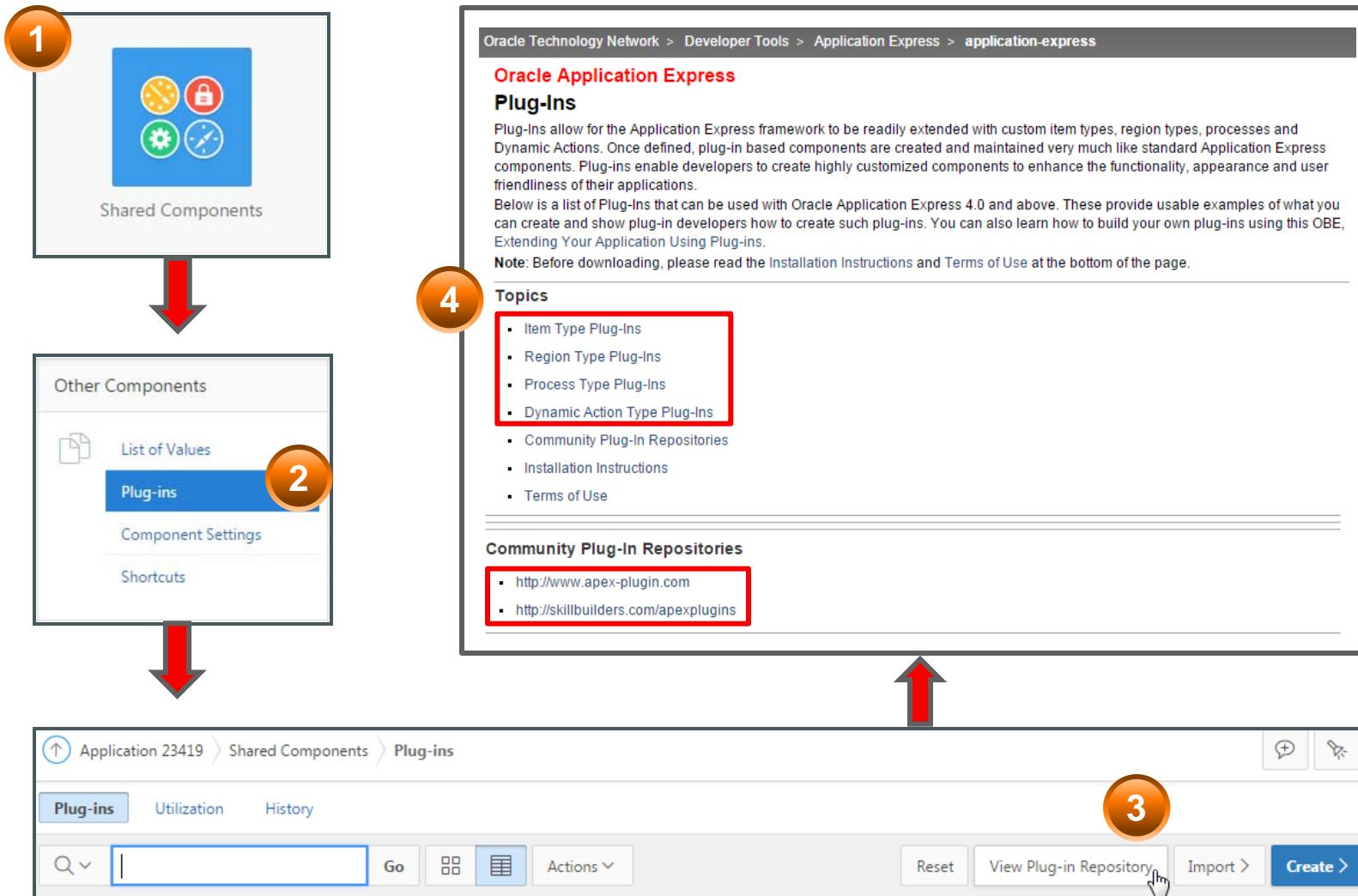
- ACL Warning Plug-in:** A banner at the top left indicates "ACL Warning" with the message: "Access control for this application is currently disabled. All users are currently Administrators. Navigate to [application administration](#) to enable access control."
- Badge List Plug-in:** A sidebar on the left shows project statistics: 3 Active projects, 0 with Past Due Milestones, 0 I'm Following, and 0 My Active Projects.
- Slide Tooltip Plug-in:** A tooltip for the "Hot" status in the badge list sidebar displays the details: Description: Hot, Owners: sam.ple, Tags: (empty).
- D3 Bar Chart Plug-in:** A chart showing the distribution of projects by category. The chart has one bar labeled "Default" with a value of 3.0. The legend indicates "Watch 33% (1)" and "Hot 67% (2)".
- Flot Pie Chart Plug-in:** A donut chart showing project status distribution: Watch (orange) and Hot (red).
- Cloud Tag Plug-in:** A tag cloud at the bottom left showing "TPS 1" and "REVIEW 1".



Types of Plug-ins



Accessing the Plug-In Repository

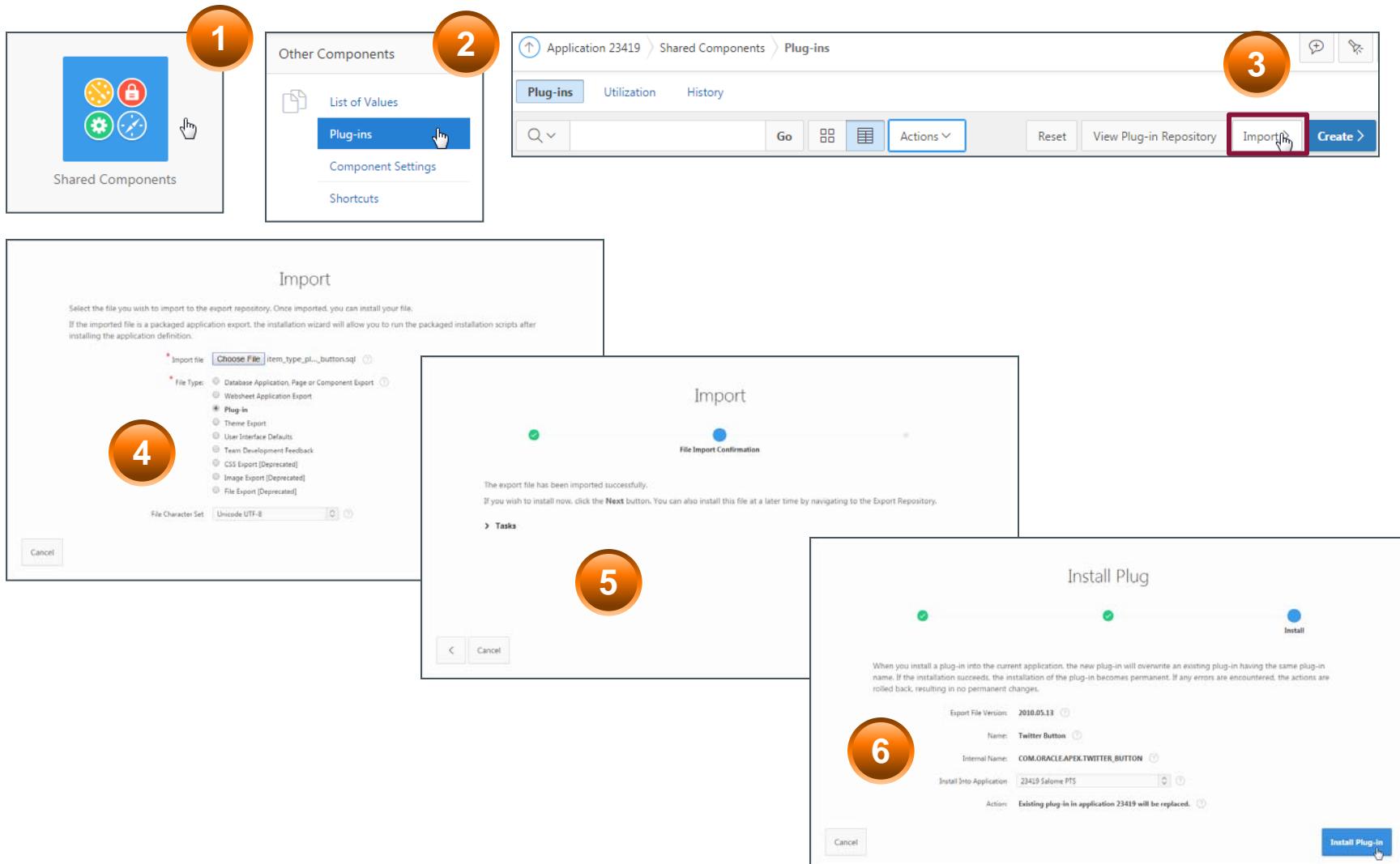


How to Use a Plug-In in an Application

To use a plug-in in an application:

1. Import a plug-in.
2. Edit or create an item, region, process, or dynamic action type to use the plug-in.
3. Run the application to test the plug-in functionality.

Importing a Plug-In



Using an Item Plug-in

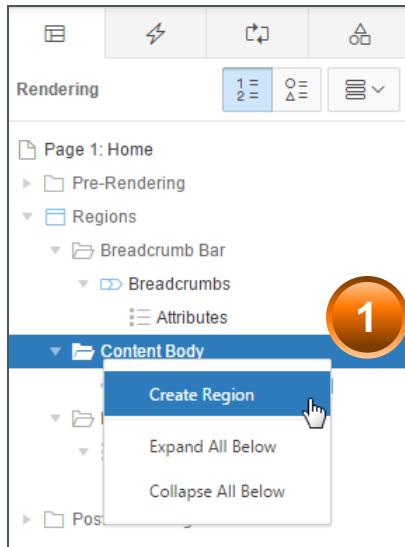
The screenshot shows the Oracle ADF Designer interface. In the left pane, under 'Regions > Content Body > Create Employees > Items', there is a list of items. One item, 'P6_EMAIL', is selected and highlighted with a blue background. An orange circle with the number '1' is placed over the 'P6_EMAIL' item.

This screenshot shows the 'Identification' tab of the item editor for the 'P6_EMAIL' item. The 'Name' field contains 'P6_EMAIL'. The 'Type' dropdown menu is open, showing various item types. The 'PicInsideEditBox [Plug-In]' option is selected and highlighted with a blue background. An orange circle with the number '2' is placed over the 'PicInsideEditBox [Plug-In]' option in the dropdown.

This screenshot shows a form with eight input fields. The fields are labeled: 'First Name *' with a person icon, 'Last Name *' with a person icon, 'Email *' with an envelope icon, 'Phone Number *' with a telephone icon, 'Mobile Number *' with a telephone icon, 'Address' with a document icon, 'Designation *' with a clipboard icon, and 'Salary' with a document icon. An orange circle with the number '4' is placed over the 'Email' field.

This screenshot shows the 'Settings' tab of the item editor for the 'P6_EMAIL' item. Under the 'Image' section, the 'Email' option is selected and highlighted with a blue background. An orange circle with the number '3' is placed over the 'Email' option in the list.

Using a Region Plug-In



This screenshot shows the 'Identification' tab of the 'D3 Bar Chart [Plug-In]' configuration dialog. The 'Title' field is set to 'Projects By Status'. The 'Type' dropdown is also set to 'D3 Bar Chart [Plug-In]'. The 'Source' section contains a list of various chart types, with 'D3 Bar Chart [Plug-In]' selected. Other options include 'Breadcrumb', 'Calendar', 'Chart', 'Classic Report', and 'Classic Report (based on Function)'. The 'Layout' section includes options like 'List', 'Map Chart', and 'Sequence'. The 'Position' section includes 'Parent Region' and 'Show unsupported...'. A large orange circle labeled '2' is positioned over the 'Type' dropdown.

This screenshot shows the 'SQL Query' tab of the configuration dialog. It contains a code editor with the following SQL query:

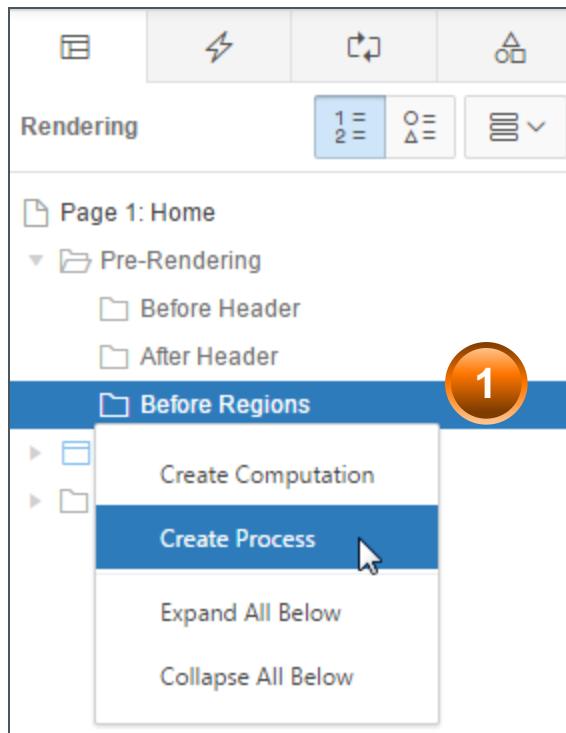
```
select count(project_name),  
       p.status  
  from oehr_projects p  
 group by p.status
```

A large orange circle labeled '3' is positioned over the code editor area.

This screenshot shows the 'Attributes' tab of the configuration dialog. It includes sections for 'X Values Column' (set to 'STATUS'), 'Y Values Column' (set to 'COUNT(PROJECT_NAME)'), 'Link Target' (set to 'No Link Defined'), 'Display' (set to 'Vertical, Side by Side'), 'Multiple Series' (unchecked), 'Series Name' (set to 'Projects By Status'), 'Multiple Colors' (radio button set to 'No'), 'X-Axis Title' (set to 'Project Status'), 'Y-Axis Title' (set to 'Project Count'), 'Legend' (set to 'No Legend'), and 'Height Measure' (set to 'Bars Area'). A large orange circle labeled '4' is positioned over the 'X Values Column' section.



Using a Process Plug-in



A screenshot of the 'Identification' tab of a process configuration dialog. The 'Name' field is set to 'Update Status on Tweeter'. The 'Type' dropdown is set to 'Twitter Status Update [Plug-In]'. The 'Source' section shows the same PL/SQL code as the previous screenshot. The 'Execution Options' section includes checkboxes for 'Run Once' and 'Run Before Row Processing'.

A screenshot of the 'Settings' tab of a process configuration dialog. The 'Status' section displays the message 'Working on Oracle APEX...'. A progress bar at the bottom indicates the task is 100% complete.

Using a Dynamic Action Plug-In

The image shows the Oracle APEX interface for configuring dynamic actions. It consists of three main panels:

- Left Panel:** Shows the "Dynamic Actions" list under the "Events" section, specifically the "Click" category. A sub-menu for "DeleteRow" is open, and a callout bubble labeled **1** points to the "Create TRUE Action" button.
- Middle Panel:** An "Identification" configuration panel for a selected action. The "Action" dropdown is set to "Notification [Plug-In]". The "Affected Element" section is expanded, showing "Selection Type" (checkbox selected). The "Text" area contains the message "The selected row was successfully deleted.". Callout bubble **2** points to the "Notification [Plug-In]" option in the list.
- Right Panel:** Another "Identification" configuration panel for a "Notification [Plug-In]" action. It has fields for "Title" ("Row Deleted") and "Text" ("The selected row was successfully deleted."). Callout bubble **3** points to the "Title" field. Below it are fields for "Image URL", "Sticky" (set to "Yes"), and "Hide After x Seconds" (set to "5").

Callout Bubbles:

- Points to the "Create TRUE Action" button in the Dynamic Actions list.
- Points to the "Notification [Plug-In]" option in the Action list.
- Points to the "Title" field in the Notification configuration panel.
- Points to the success message in the notification dialog.

Creating a Plug-In

The image consists of three vertically stacked screenshots from the Oracle Application Development Framework interface, illustrating the process of creating a new plug-in.

- Screenshot 1:** The "Plug-ins" tab is selected in the navigation bar. A large orange circle labeled "1" highlights the "Create" button in the top right corner of the toolbar.
- Screenshot 2:** The "Create Plug-in" dialog is open. It shows two options: "From Scratch" (selected) and "As a Copy of an Existing Plug-in". A large orange circle labeled "2" highlights the "Next >" button at the bottom right.
- Screenshot 3:** The "Plug-in:" configuration page is shown. The "Name" tab is active. A dropdown menu is open under the "Type" field, listing several options: "Region", "Authentication Scheme Type", "Authorization Scheme Type", "Dynamic Action", "Item", "Process". A large orange circle labeled "3" highlights the "Region" option in the dropdown.

Optimizing Performance of a Plug-In

- Invoke the callback from a PL/SQL package rather than from the plug-in.
- Store the files that are attached to the plug-in definition in a directory on the web server.

Summary

In this lesson, you should have learned how to:

- Identify different plug-ins available for Oracle APEX
- Import and use plug-ins
- Optimize the performance of plug-ins



Practice 5 Overview: Using Plug-Ins in an Application

This practice covers importing and using the following types of plug-ins:

- Region
- Process
- Dynamic Action

Incorporating Interactivity Using JavaScript and jQuery

Using JavaScript, AJAX, and jQuery in PTS



Hey Jack, hearing lots of good news about the Project Tracking System. You seem to have put a lot of effort into it.

Thanks! Yes. However, the tool I used for development was really user-friendly and I was able to build the application quite effortlessly.

So, are you all done with this application or do you plan to include more features?

I am currently upgrading the application. I have added some new features to the application and I am now thinking about using some of my Java web scripting skills too.

Sounds really interesting. Looking forward to what you have put together.

Objectives

After completing this lesson, you should be able to:

- Use JavaScript, AJAX, and jQuery functionalities in an application



JavaScript, AJAX, jQuery: Overview

JavaScript

- A programming language
- Incorporates interactivity in web pages
- Supported and interpreted by all browsers
- Best used to incorporate client-side processing and validations

AJAX

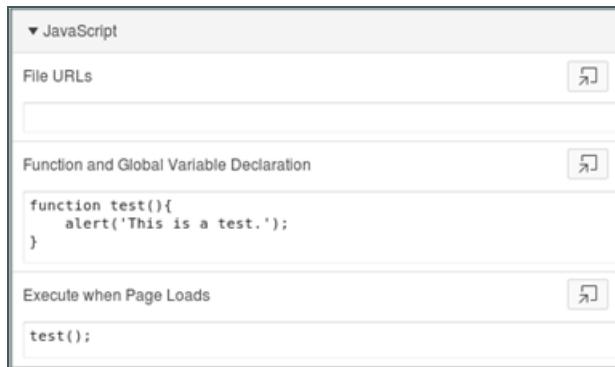
- Expansion: Asynchronous JavaScript and XML
- Enables submission of page components to server for validation and processing

jQuery

- A framework
- Provides a JavaScript library
- Many free jQuery plug-ins available
- Oracle APEX 5.0 includes jQuery version 2.1.3

Using JavaScript: A Simple Example

1. Add JavaScript to Page Definition



2. Save and run the page



Using JavaScript Functionalities in APEX

There are two main considerations while using JavaScript in APEX:

- Where to write the script?
 - Page HTML header
 - Page JavaScript
 - Separate JS file
- Where to call the script?
 - From links (button, page branch, reports)
 - Target -> URL => # (this will call the JavaScript)
 - From Dynamic Actions
 - From Processes/Computations/Validations

JavaScript APIs

Namespaces	Variable	Functions
apex	apex.gPageContext\$	apex.confirm apex.submit
apex.da	-	apex.da.resume
apex.event	-	apex.event.trigger
apex.item	-	apex.item.hide apex.item.getValue
apex.debug	-	apex.debug.log apex.debug.info
apex.navigation	-	apex.navigation.dialog apex.navigation.redirect

Specifying Static ID for Regions

▼ Advanced

Static ID	emplist
Custom Attributes	
Region Image	
Image Tag Attributes	
Region Display Selector	<input checked="" type="radio"/> Yes <input type="radio"/> No
Exclude Title from Translation	<input checked="" type="radio"/> Yes <input type="radio"/> No

Using jQuery

Oracle APEX includes the following libraries:

- jQuery 1.7.1,
- jQuery UI 1.8.22,
- jQuery Mobile - 1.1.1

Reference the jQuery library in JavaScript code using:

- \$
- jQuery
- apex.jquery

Introducing qTip jQuery Plug-in

qTip² jQuery plugin

Home Demos Download Guides Options Plugins API FAQ Donate Forum

Introducing... qTip²

About qTip² is the second generation of the advanced qTip plugin for the ever popular jQuery framework.

Building on 1.0's **user friendly**, yet **feature rich** base, qTip² provides you with tonnes of features like **speech bubble tips** and **imagemap support**, and best of all... it's completely free under the MIT/GPLv2 licenses!

Features qTip² is packed full of features including:

Speech bubble tips	Integrated AJAX	Viewport repositioning	z-index stacking
Modal tooltips	Imagemap & SVG support	IE6 support (BGIFrame)	

...and lots more!

Compatibility

 8+	 3+	 6+	 9+	 2+, iOS 4+
--	--	--	--	---

Using jQuery: qTip² plug-in Tooltip Example

1. Link the plug-in details to the page
2. Customize a label text
3. Run the page

▼ JavaScript

File URLs
`/i/libraries/jquery-qtip2/2.0-6.26.2011/jquery.qtip.min.js`

Function and Global Variable Declaration

```
jQuery.browser = {};
(function () {
    jQuery.browser.msie = false;
    jQuery.browser.version = 0;
    if (navigator.userAgent.match(/MSIE ([0-9]+)\./)) {
        jQuery.browser.msie = true;
        jQuery.browser.version = RegExp.$1;
    }
})();
```

Execute when Page Loads

```
$(document).ready(function()
{
    $('a[title]').qtip();
});
```

▼ CSS

File URLs
`/i/libraries/jquery-qtip2/2.0-6.26.2011/jquery.qtip.min.css`

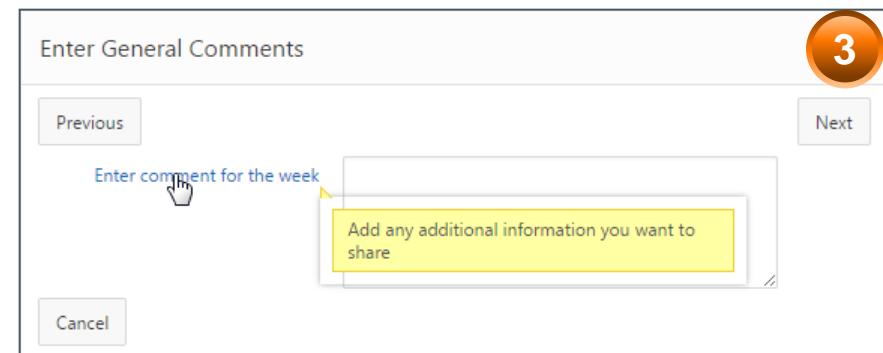
▼ Identification

Name `P6_COMMENT`

Type `Textarea`

▼ Label

Label `Enter comment for the week `



Using AJAX

Use AJAX to interact with the server/database without submitting an entire page.



AJAX and APEX

Built-in AJAX in Oracle APEX

- Pagination in an Interactive Report
- Cascading LOVs
- Autocomplete items
- Refreshing a region

When to Use

Use AJAX when you want to:

- Set session state
- Execute a block of PLSQL
- Update a field of a record when a button is clicked, or a check box is changed.
- Fetch values from the database

Summary

In this lesson, you should have learned how to:

- Use jQuery, JavaScript, and AJAX functionalities in an application



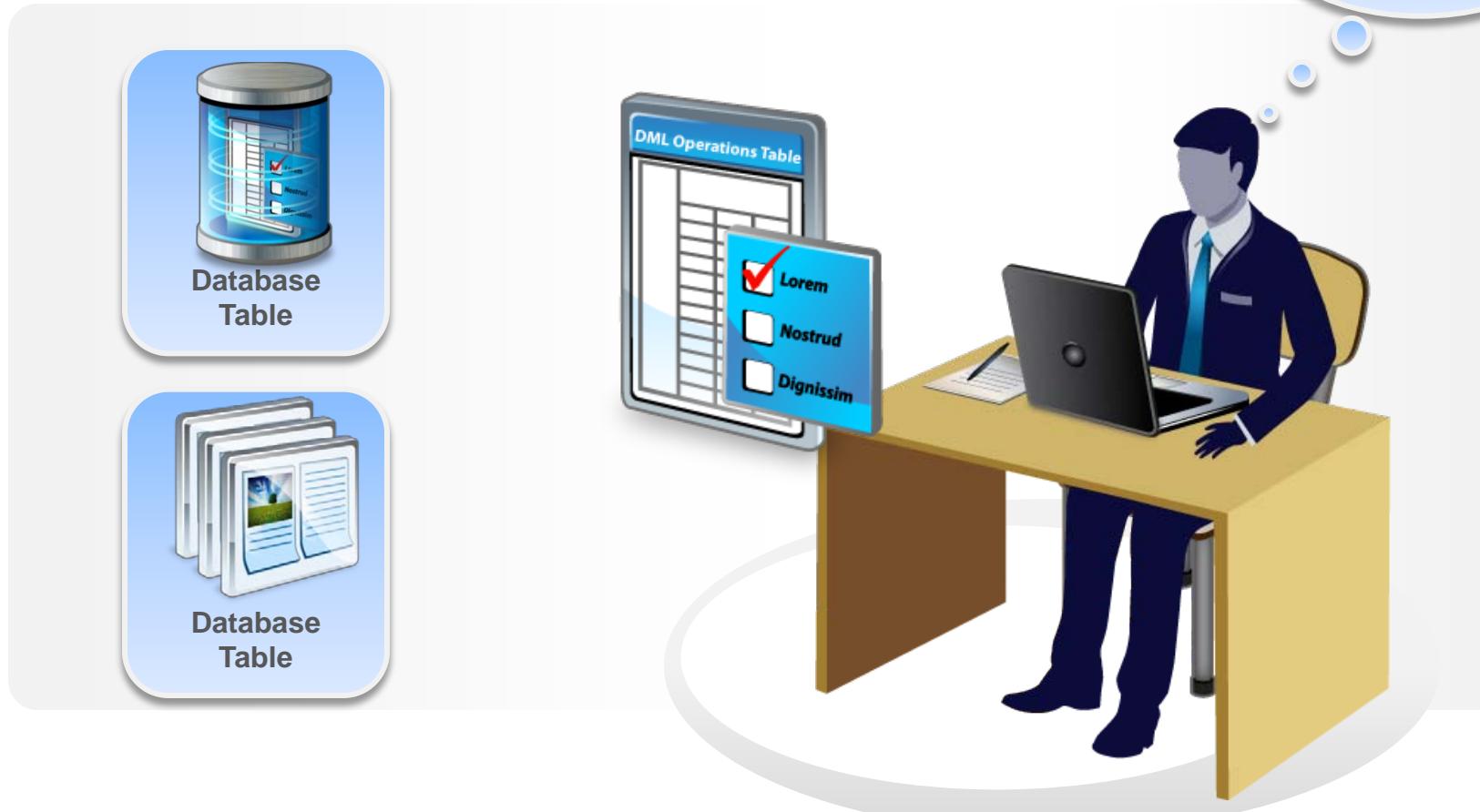
Practice 6 Overview: Incorporating Interactivity Using JavaScript and jQuery

This is a guided practice that covers adding:

- Animation
- Customization
- Auto-Scrolling Region

Generating and Using Table APIs

Generating and Using Methods on Tables in PTS



Objectives

After completing this lesson, you should be able to:

- Generate methods on tables
- Modify the API with custom rules
- Create a form that uses the API



What Are Methods on Tables?

- A utility that allows you to create a PL/SQL package-based API on a specified table.
- Package on a table includes:
 - INS procedure
 - UPD procedure
 - DEL procedure
 - GET procedure
 - GET procedure–MD5
 - Build MD5 procedure

Steps to Generate Methods on Tables

- 1. Navigate to **SQL Workshop > Utilities**.**
- 2. Click **Methods on Tables**. The Create Table API page appears.**
- 3. Enter a Package Name.**
- 4. Select the Tables for which you want to generate a PL/SQL package.**
- 5. Create the Package.**
- 6. Review the results.**

Add Additional Business Rules to the API

- Computations
- Validations

```
insert into "PROJECTS" (
    "PROJECT_ID", "PROJECT_NAME", "PROJECT_TYPE", "PROJECT_DESCRIPTION" ,
    "PROJECT_STATUS", " PROJECT_PLANNED_START_DATE ", " PROJECT_START_DATE ", "
PROJECT_PLANNED_END_DATE ", "PROJECT_END_DATE ", "PROJECT_UPGRADE_YN",
    "PROJECT_CREATED_BY"
) values (
    "PROJECT_ID", initcap("PROJECT_NAME"), "PROJECT_TYPE", "PROJECT_DESCRIPTION" ,
"PROJECT_STATUS", " PROJECT_PLANNED_START_DATE ", "
PROJECT_START_DATE ", "PROJECT_PLANNED_END_DATE ", "PROJECT_END_DATE
", "PROJECT_UPGRADE_YN", "PROJECT_CREATED_BY"
);

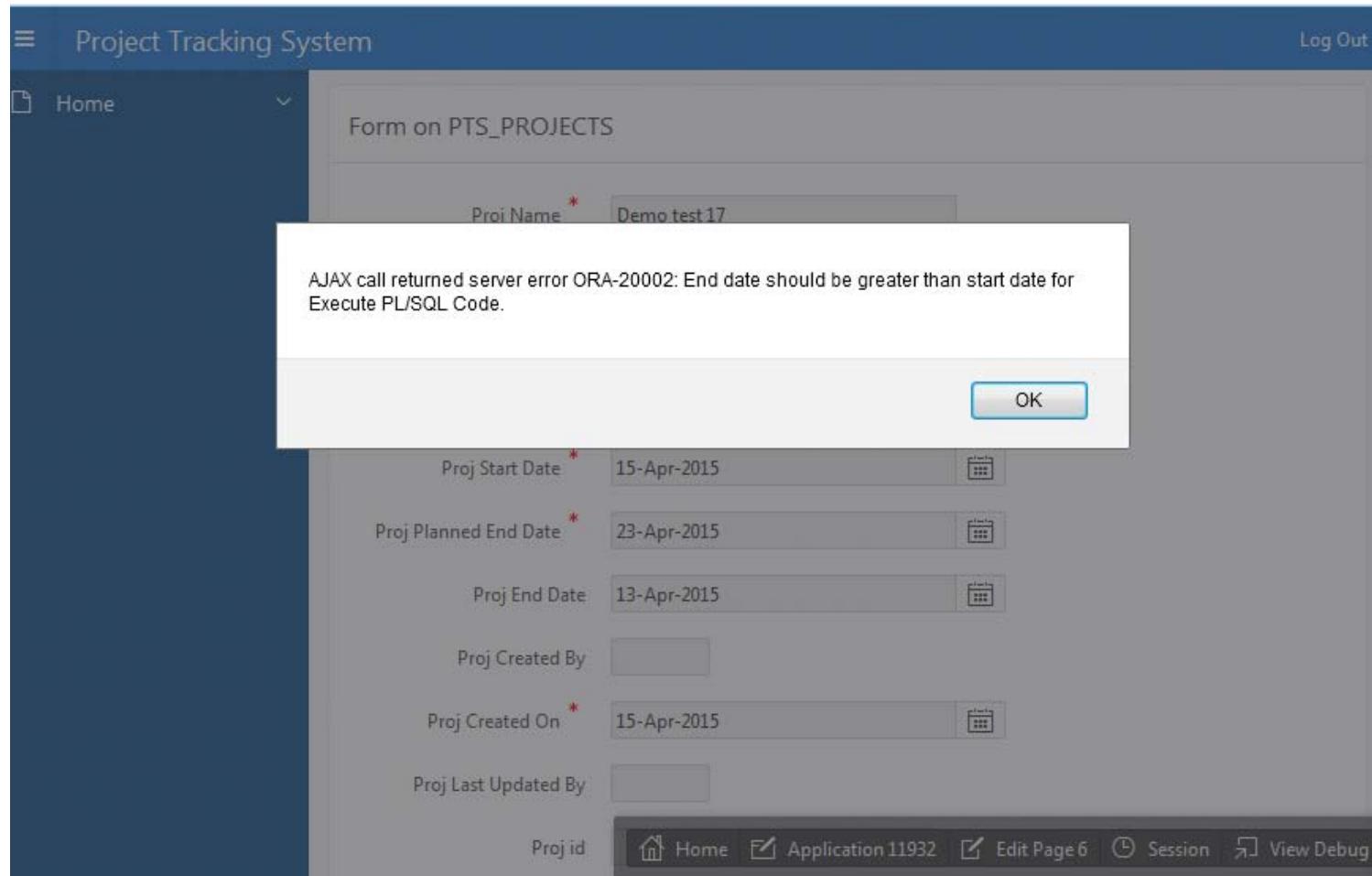
)
```

```
if P_PROJECT_END_DATE <= P_PROJECT_START_DATE then
    raise_application_error(-20002, 'End date should be greater than start
date');
end if;
```

Creating a Form that Uses the API

1. Create a Report and Form in a Table.
2. Change the conditions for the DML processes to Never.
3. Change the page items Source to:
 - Source Type: Null
 - Source Used: Only when current value in session state is null
4. Add an After Header process to run the GET procedure.
5. Add three On submit–After Computations and Validations processes:
 - UPD procedure: Based on Save button
 - DEL procedure: Based on Delete button
 - INS procedure: Based on Create button

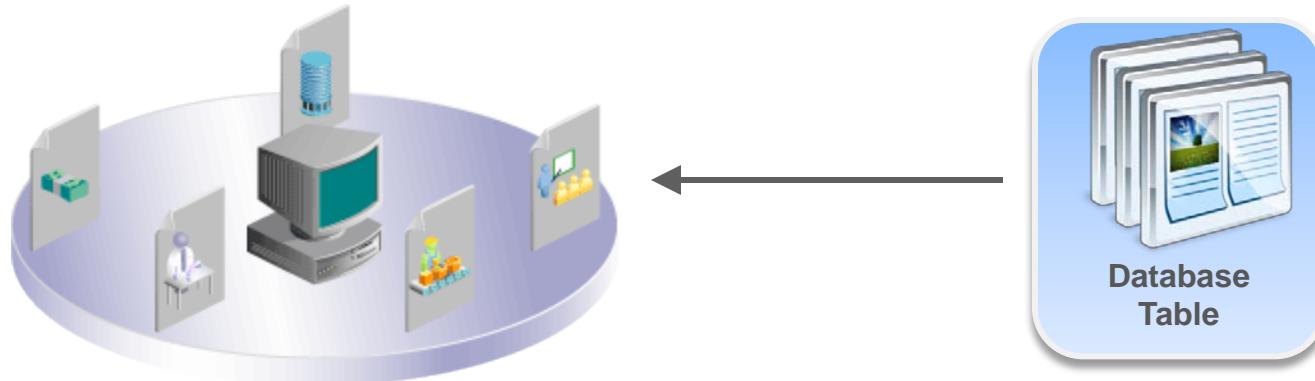
Raising Errors From the API



Case Scenario 2

In Jack's organization, there is a table that many applications are using currently. There are different business rules applied and handled by each application separately.

Using table APIs, Jack suggests building the packages so that business rules are consistent and manual workload is also reduced.



Case Scenario 3

XYZ is an e-commerce application developed using APEX. It needs to add the following business rules:

- Whenever the stock is below the reorder point, only good customers will have their order immediately processed.
- Good customers of a product are defined as those who have bought at least twice the average sales per customer over the last 12 months.
- Put the orders of bad payers on a waiting list, until they pay the amount due.

It needs to add the following computation:

- Increase the credit limit of the customers' credit card by 25% if the card usage is greater than 5,000 per month.

Quiz



Generating Methods on a Table provides for easy standardization across applications.

- a. True
- b. False

Practice 7 Overview: Generating and Using Table APIs

This practice covers the following topics:

- Generating Methods on Tables
- Modifying the API with custom rules
- Creating a Form that uses the API

Summary

In this lesson, you should have learned how to:

- Generate a method in a table
- Modify the API with custom rules
- Create a form that uses the API



Creating and Using RESTful Web Services

Using RESTful Services in PTS



Objectives

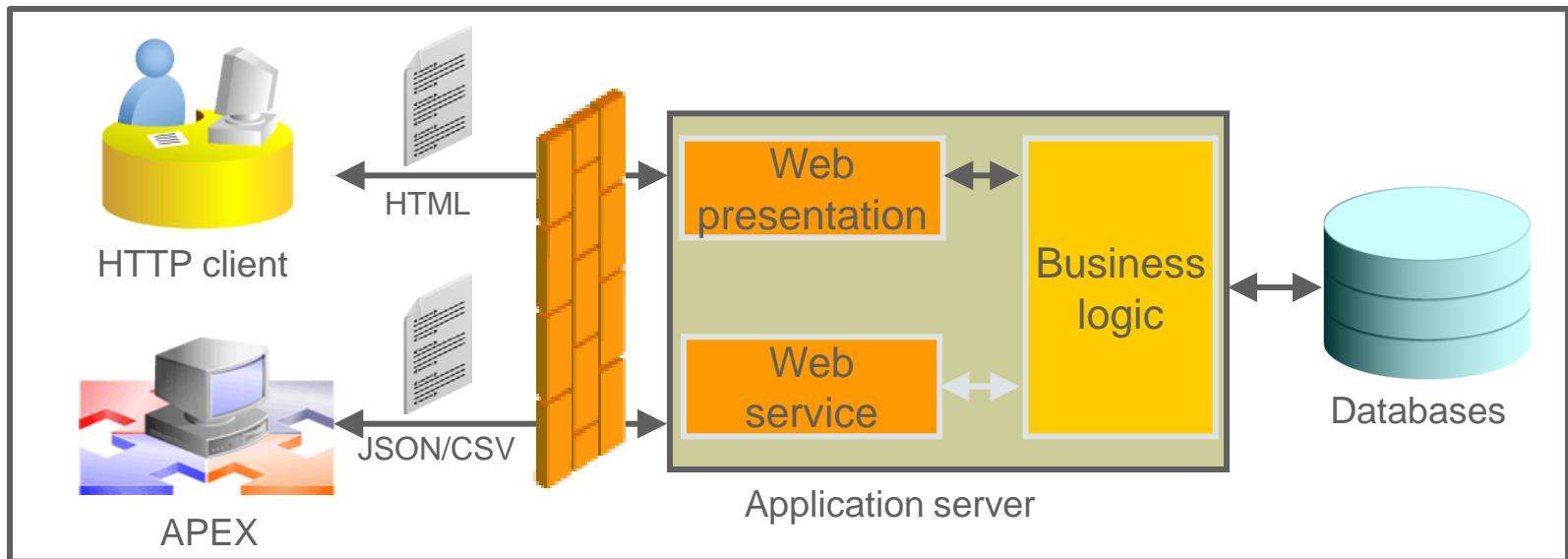
After completing this lesson, you should be able to:

- Create a RESTful Web Service
- Create an application that consumes a RESTful Web Service
- Invoke a RESTful Web Service using a Java client



What Is a Web Service?

- Web services enable applications to interact with one another on the web.
- The scope of RESTful Web Service is found in the:
 - URI
 - Service method that is described by the HTTP methods: GET, POST, PUT, and DELETE



What Are RESTful Web Services?

- An architecture standard for accessing information
- Built on HTTP
- Commonly used in dynamic languages, such as PHP
- RESTful Web Services have three main characteristics:
 - The services use HTTP methods explicitly.
 - The services are accessible through Uniform Resource Identifiers (URIs).
 - The services are stateless.
- Examples:
 - Creates a native mobile application using the same database as the corresponding APEX web application
 - Integrates with back office operations
 - Provides data persistence for a static single page web application

Advantages of RESTful Web Services

- Provide a common data access layer that can be accessed from any platform
- Simple
- Based on familiar HTML, GET, POST, PUT, and DELETE methods
- Widely used by Twitter, Netflix, Dropbox, PayPal, Flickr, and Amazon S3
- Stateless, which reduces overhead and complexity on the server
- Support caching and light weight
- Can be called through the web browser

RESTful Web Service Components

Module

Template 1

Resource Handler 1

- Method
- Source Type
- Format

Source
Parameters

Resource Handler 2

- Method
- Source Type
- Format

Source
Parameters

Template 2

Resource Handler 1

- Method
- Source Type
- Format

Source
Parameters

Resource Handler 2

- Method
- Source Type
- Format

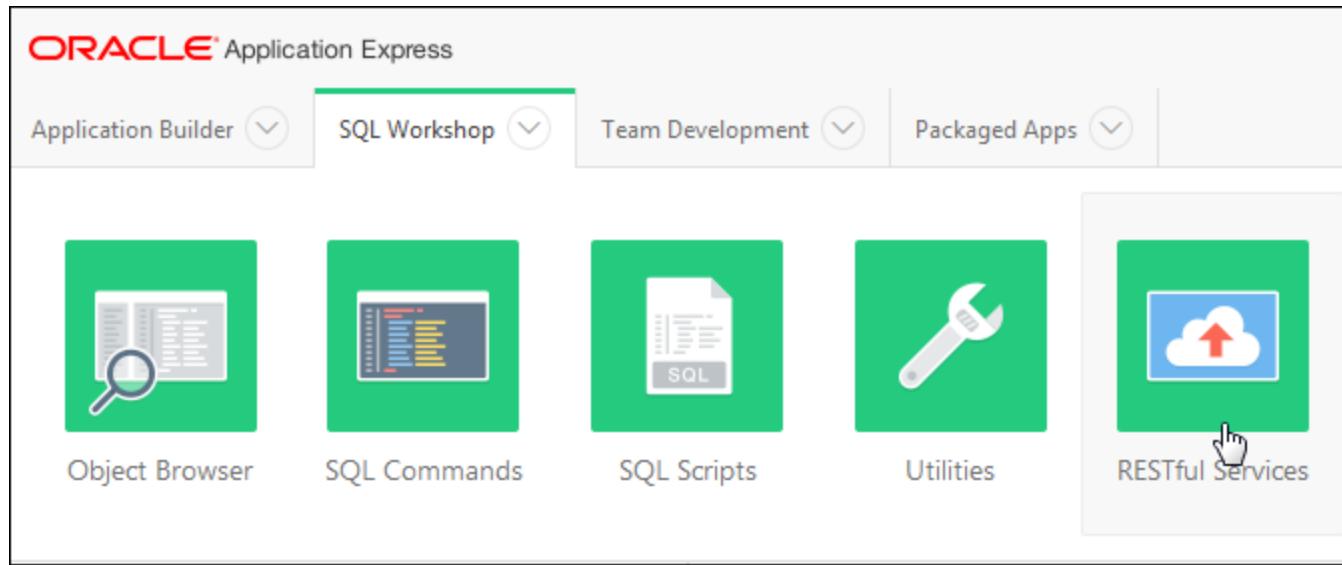
Source
Parameters

ORDS and RESTful Web Services

ORDS performs the following tasks with respect to RESTful services:

- Request dispatching
- JSON generation for simple GET requests
 - Pagination
 - Lower cases column names
 - Omits null values
 - Generates JSON links
- Simple JSON parsing, form data parsing
- Exception and error handling and responses (HTML)

Accessing RESTful Services



Creating a RESTful Web Service

RESTful Services Module

* Name example_ws

URI Prefix

Origins Allowed

Status Published

* Pagination Size 25

Required Privilege - Assign Privilege -

Add a Resource Template

* URI Template example_ws

Priority 0

Entity Tag Secure HASH

Add a Resource Handler

Method GET

Source Type Query Format JSON

* Source select * from oe_hr_employees

Create Module

Creating a RESTful Web Service

RESTful Service

- [example_ws](#)
- [example_ws](#)
- [\[ab\] GET](#) **GET**
- [+ Create Handler](#)
- [+ Create Template](#)

Resource Handler

A resource handler is a query or an anonymous PL/SQL block responsible for handling a part. Although multiple resource handlers can be defined for a resource template, only one resource method is permitted.

RESTful Service Module:

URI Template: example_ws
Method: GET
Source Type: Query Format: JSON
Requires Secure Access: No
Pagination Size:

Source

* Source

```
select * from oe_hr_employees|
```

To test the behaviour of the RESTful Service Handler, click the Test button below. If the REST parameters, click the Set Bind Variables button to set test values for the parameters. Before you have saved all changes to this page by clicking Apply Changes. For better results, ensure your browser is up to date.

[Test](#) [Set Bind Variables](#)

Testing the RESTful Web Service

`http://<hostname>:<port>/apex/teach/example_ws`

```
{  
  - items: [  
    - {  
        employee_id: 198,  
        first_name: "Donald",  
        last_name: "OConnell",  
        email: "DOCONNEL",  
        phone_number: "650.507.9833",  
        hire_date: "1999-06-21T04:00:00Z",  
        job_id: "SH_CLERK",  
        salary: 2600,  
        manager_id: 124,  
        department_id: 50  
      },  
    - {  
        employee_id: 199,  
        first_name: "Douglas",  
        last_name: "Grant",  
        email: "DGRANT",  
        phone_number: "650.507.9844",  
        hire_date: "2000-01-13T05:00:00Z",  
        job_id: "SH_CLERK",  
        salary: 2600,  
        manager_id: 124,  
        department_id: 50  
      },  
    - {  
        employee_id: 200,  
        first_name: "Jennifer",  
        last_name: "Whalen",  
        email: "JWHALEN",  
        phone_number: "515.123.4444",  
        hire_date: "1987-09-17T04:00:00Z",  
        job_id: "AD_ASST",  
        salary: 4400,  
        manager_id: 101,  
        department_id: 10  
      }  
  ]  
}
```

Adding a Bind Variable to the RESTful Web Service

Resource Handler

A resource handler is a query or an anonymous PL/SQL block. Although multiple resource handlers can be defined for a single RESTful Service Module, only one can be active at a time. It is recommended to use an anonymous PL/SQL block if you want to reuse the same code across multiple resource handlers.

Parameters

No Parameters defined

Create Parameter

RESTful Service Module:

URI Template: example_ws

Method: GET

Source Type: Query Format: CSV

Requires Secure Access: No

Pagination Size: [empty input field]

Source

* Source

```
select * from oechr_employees where department_id = :DEP
```

Resource Handler Parameter

Parameters to a resource handler can also be manually defined to bind HTTP headers to the resource handler. This allows a URI template parameter to be mapped to a specific data type. For example, a resource handler might need to know the value of the HTTP Accept-Language header in order to localize the generated representation.

RESTful Service Module: example_ws

URI Template: example_ws

Resource Handler: GET

Handler Source:

```
select * from oechr_employees where department_id = :DEP
```

*** Name:** DEP

Bind Variable Name: DEP

Access Method: IN

Source Type: HTTP Header

Parameter Type: String

RESTful Web Service: Examples



Simple Query



Query with Parameter



PL/SQL



Feed



RESTful Web Service: Example

Simple Query

RESTful Services > RESTful Service Module

Employees

- employees**
 - (ab) GET
 - + Create Handler
- employees/{id}**
 - (ab) GET
 - + Create Handler
- employeesfeed/**
 - (ab) GET
 - + Create Handler
- + Create Template

Resource Handler: GET

A resource handler is a query or an anonymous PL/SQL block responsible for handling a particular HTTP method. Although multiple resource handlers can be defined for a resource template, only one resource handler per HTTP method is permitted.

RESTful Service Module: ?

URI Template: Employees ?

Method: GET ?

Source Type: Query ?

Format: JSON ?

Requires Secure Access: No ?

Pagination Size: ?

Source

* Source ?

1 select * from employees

RESTful Web Service: Example

Simple Query JSON Results

<http://<hostname>:<port>/apex/teach/hr/empinfo/>

```
{"next":{"$ref":"https://apex.oracle.com/pls/apex/apexws2/Employees?page=1"},"items": [{"employee_id":505,"first_name":"Fiorello","last_name":"LaGuardia","email":"fiorello.laguardia@pts.com","phone_number":"2125553923","mobile_number":"1235342653","address":"Hangar Center, Third Floor, Flushing, NY","designation":"Senior Manager","salary":240000,"hire_date":"2014-06-08T00:00:00Z"}, {"employee_id":504,"first_name":"Frank","last_name":"OHare","email":"frank.ohare@pts.com","phone_number":"7735557693","mobile_number":"3157862405","address":"10000 West OHare, Chicago, IL","designation":"Manager","salary":180000,"manager_id":505,"hire_date":"2003-06-06T00:00:00Z"}, {"employee_id":518,"first_name":"Turner","last_name":"Thomas","email":"turner.thomas@pts.com","phone_number":7642788982,"mobile_number":"1238767344","address":1234 Sacramento, CA,"designation":"Manager","salary":180000,"manager_id":505,"hire_date":"2014-04-06T00:00:00Z"}, {"employee_id":520,"first_name":"Rebecca","last_name":"Mary","email":"rebecca.mary@pts.com","phone_number":3157862401,"mobile_number":"3157862401","address":5623 W University Dr, Tempe, AZ,"designation":"Manager","salary":180000,"manager_id":505,"hire_date":"2014-09-06T00:00:00Z"}, {"employee_id":501,"first_name":"John","last_name":"Dulles","email":john.dulles@pts.com,"phone_number":7035552143,"mobile_number":7035558967,"address":45020 Aviation Drive, Sterling, VA,"designation":"Developer","salary":100000,"manager_id":504,"hire_date":2009-01-01T00:00:00Z}, {"employee_id":502,"first_name":"William","last_name":"Hartsfield","email":william.harstfield@pts.com,"phone_number":4045553285,"mobile_number":9873567899,"address":6000 North Terminal Parkway, Atlanta, GA,"designation":"Senior Developer","salary":140000,"manager_id":504,"hire_date":2013-06-06T00:00:00Z}, {"employee_id":503,"first_name":"Edward","last_name":Logan,"email":edward.logan@pts.com,"phone_number":6175553295,"mobile_number":5673459876,"address":1 Harborside Drive, East Boston, MA,"designation":QA Engineer,"salary":90000,"manager_id":504,"hire_date":2000-03-05T00:00:00Z}, {"employee_id":506,"first_name":Albert,"last_name":Lambert,"email":albert.lambert@pts.com,"phone_number":3145554022,"mobile_number":3157862399,"address":10701 Lambert International Blvd., St. Louis, MO,"designation":Trainee,"salary":50000,"manager_id":518,"hire_date":2015-01-01T00:00:00Z}, {"employee_id":507,"first_name":Eugene,"last_name":Bradley,"email":eugene.bradley@pts.com,"phone_number":8605551835,"mobile_number":2349872345,"address":Schoephoester Road, Windsor Locks, CT,"designation":Trainee,"salary":50000,"manager_id":518,"hire_date":2015-02-01T00:00:00Z}, {"employee_id":508,"first_name":King,"last_name":John,"email":king.john@pts.com,"phone_number":3242597586,"mobile_number":3148762983,"address":602 Scottsdale, AZ,"designation":Developer,"salary":100000,"manager_id":518,"hire_date":2013-10-02T00:00:00Z}, {"employee_id":509,"first_name":Blake,"last_name":Joesph,"email":blake.joseph@pts.com,"phone_number":6231148976,"mobile_number":2345432345,"address":89 Camelback Road, Scottsdale, AZ,"designation":Trainee,"salary":50000,"manager_id":518,"hire_date":2005-03-11T00:00:00Z}, {"employee_id":510,"first_name":Clark,"last_name":James,"email":clark.james@pts.com,"phone_number":5672878364,"mobile_number":9874569834,"address":56234 New Blvd, NJ,"designation":Developer,"salary":100000,"manager_id":518,"hire_date":2010-08-08T00:00:00Z}, {"employee_id":511,"first_name":Jones,"last_name":Thomas,"email":jones.thomas@pts.com,"phone_number":1232347865,"mobile_number":7896438734,"address":Super Center, Second Floor, Tampa, FL,"designation":Senior Developer,"salary":140000,"manager_id":520,"hire_date":2014-06-09T00:00:00Z}, {"employee_id":512,"first_name":Scott,"last_name":Bren,"email":scott.bren@pts.com,"phone_number":3157862403,"mobile_number":3157862403,"address":2000 North Terminal Parkway, Atlanta, GA,"designation":Trainee,"salary":50000,"manager_id":518,"hire_date":2015-01-01T00:00:00Z}]}]
```

RESTful Web Service: Example

Query with a Parameter

The screenshot shows the Oracle RESTful Services interface. On the left, the navigation pane lists resources: Employees, employees, employees/{id}, employeesfeed/, and employeesfeed/. The employees/{id} item is selected and has a sub-menu with a GET handler. A cursor is hovering over the "Handler: GET" button for this item. The main panel displays the "Resource Handler: GET" configuration screen. The URI Template is set to "employees/{id}", the Method is "GET", Source Type is "Query One Row", Requires Secure Access is "No", and Pagination Size is empty. Below this, the "Source" section contains a code editor with the SQL query: "select * from employees where employee_id = :id". To the right of the source code is a "Parameters" table:

Name	Bind Variable Name	Access Method	Source Type	Parameter Type
id	id	IN	URI	String

RESTful Web Service: Example Query with Parameter Results

Source

* Source select * from employees where employee_id = :id

Bind Variable	Value
:ID	505

1 - 1

https://apex.oracle.com/pls/apex/apexws2/employees/505

```
{"employee_id":505,"first_name":"Fiorello","last_name":"LaGuardia","email":"fiorello.laguardia@pts.com","phone_number":"2125553923","mobile_number":"1235342653","address":"Hangar Center, Third Floor, Flushing, NY","designation":"Senior Manager","salary":240000,"hire_date":"2014-06-08T00:00:00Z"}
```

RESTful Web Service: Example PL/SQL

The screenshot shows the Oracle REST Data Services interface. On the left, there's a sidebar with a globe icon and the text "Employees". Below it are several items: "employees" (with a gear icon), "[ab] GET", "[ab] POST" (which is highlighted in light blue), "+ Create Handler", "employees/{id}" (with a gear icon), and "[ab] GET".

The screenshot shows the "Resource Handler" configuration dialog. At the top right are "Cancel" and "Create" buttons. The main area has the following fields:

- RESTful Service Module:** Employees
- URI Template:** Employees
- Method:** POST
- Source Type:** PL/SQL
- MIME Types Allowed:** application/json
- Requires Secure Access:** No

Below this is a "Source" section with a "Source" field containing PL/SQL code:

```
1 declare
2   id employees.employee_id%TYPE;
3 begin
4   id := employees_seq.nextval;
5 end;
6 /
```

RESTful Web Service: Example Feed

The screenshot shows the Oracle RESTful Services interface. In the top navigation bar, 'RESTful Services' is selected. Under the 'Employees' module, several resource handlers are listed:

- employees**: GET method, + Create Handler
- employees/{id}**: GET method, + Create Handler
- employeesfeed/**: GET method (highlighted with a cursor icon), + Create Handler, + Create Template

Resource Handler:

A resource handler is a query or an anonymous PL/SQL block responsible for handling a particular HTTP method. Although multiple resource handlers can be defined for a resource template, only one resource handler per HTTP method is permitted.

RESTful Service Module: [?](#)

URI Template: **employeesfeed/** [?](#)

Method: **GET** [?](#)

Source Type: **Feed** [?](#)

Requires Secure Access: **No** [?](#)

Pagination Size: **25** [?](#)

Source

* Source [?](#)

SQL Editor:

```
1 select employee_id, first_name from employees order by employee_id, first_name
```

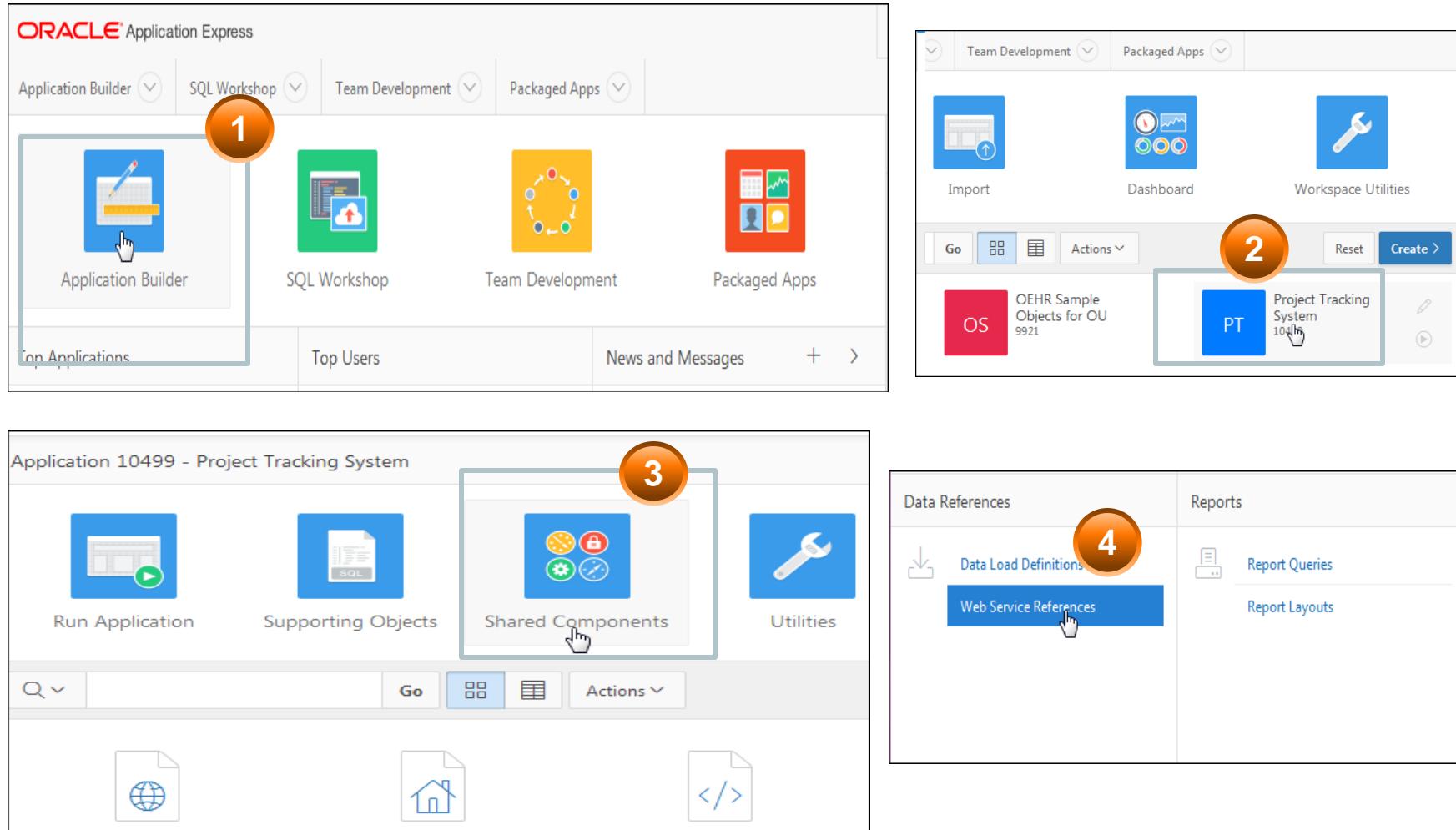
RESTful Web Service: Example

Feed Results

<http://<hostname>:<port>/apex/teach/hr/employeefeed/>

```
{"next":{"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/?page=1"}, "items":[{"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/501"}, "employee_id":501, "first_name":"John"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/502"}, "employee_id":502, "first_name":"William"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/503"}, "employee_id":503, "first_name":"Edward"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/504"}, "employee_id":504, "first_name":"Frank"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/505"}, "employee_id":505, "first_name":"Fiorello"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/506"}, "employee_id":506, "first_name":"Albert"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/507"}, "employee_id":507, "first_name":"Eugene"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/508"}, "employee_id":508, "first_name":"King"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/509"}, "employee_id":509, "first_name":"Blake"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/510"}, "employee_id":510, "first_name":"Clark"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/511"}, "employee_id":511, "first_name":"Jones"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/512"}, "employee_id":512, "first_name":"Scott"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/513"}, "employee_id":513, "first_name":"Ford"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/514"}, "employee_id":514, "first_name":"Smith"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/515"}, "employee_id":515, "first_name":"Allen"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/516"}, "employee_id":516, "first_name":"Ward"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/517"}, "employee_id":517, "first_name":"Martin"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/518"}, "employee_id":518, "first_name":"Turner"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/519"}, "employee_id":519, "first_name":"Adams"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/520"}, "employee_id":520, "first_name":"Rebecca"}, {"uri": {"$ref":"https://apex.oracle.com/pls/apex/apexws2/employeesfeed/521"}, "employee_id":521, "first_name":"Miller"}]}
```

Accessing the Web Service Referencing Page



Steps to Create and Consume a RESTful Web Service

1. Create a Database Application.
2. Create a Web Service Reference in your application.
3. Create a Form and Report page that uses the web service.
4. Test your application.

Step 1: Creating a Database Application

Application 102

Application 102 - PROJECT TRACKING SYSTEM

Edit Application Properties

Tasks

Run Application Supporting Objects Shared Components Utilities Export / Import

Search Go Actions Create Page >

0 - Global Page - Mo... 1 - Home 2 - Home 3 - Project Status Re...

Recent Pages

Recently Edited Pages

14. Project Details
13. Projects_List
41. Enter Key Points
42. Enter Issues Faced
1. Home
40. Enter Report Period
6. Create Employees
46. Add Details

The screenshot shows the Oracle Application Express (APEX) interface for an application named "Application 102 - PROJECT TRACKING SYSTEM". At the top, there's a toolbar with icons for navigation and application management. Below it, a main menu bar includes "Edit Application Properties" and "Tasks". The "Tasks" section lists various application pages like "Project Details", "Projects_List", and "Enter Key Points". The main content area displays five large blue buttons with icons: "Run Application" (play button), "Supporting Objects" (SQL document), "Shared Components" (circular icons for database objects), "Utilities" (wrench), and "Export / Import" (down and up arrows). Below these are search and navigation tools. A grid of recent pages is shown at the bottom, with four visible: "Global Page - Mo...", "Home", "Home", and "Project Status Re...".

Step 2: Creating a Web Service Reference

The screenshot shows the Oracle Application Express interface. On the left, there is a sidebar titled "Data References" with two items: "Data Load Definitions" and "Web Service References". A mouse cursor is hovering over the "Web Service References" item, which is highlighted with a blue background. To the right, a main window titled "Create Web Service Reference" is displayed. The window contains a descriptive text about creating web service references, three radio button options for selecting the type of reference, and two buttons at the bottom: "Cancel" and "Next >".

Data References

Data Load Definitions

Web Service References

Create Web Service Reference X

Web service references in Application Express can be created for RESTful style web services, SOAP web services based on a Web Services Description Language (WSDL) document, or manually. RESTful style web services and manual style web services require detailed knowledge of the web service usually found in the documentation for the service. Web service references based on a WSDL only require knowledge of where the WSDL document is located.

What type of Web reference would you like to create?

REST Based on WSDL Manual

Cancel Next >

Step 2: Creating a Web Service Reference

Create REST Web Reference

REST Details

RESTful Web services rely on a simple resource-oriented architecture. The resource is identified by the URL and the method is described by the HTTP method. Inputs to the service are sometimes contained in the URL itself or in the HTTP payload. Inputs can also be read from HTTP headers sent with the request.

Application: **51492 Project Tracking System**

* Name: **Weather Conditions**

* URL: **http://api.openweathermap.org/data/2.5/weather**

Proxy:

HTTP Method: GET HEAD POST PUT DELETE

[**Next >**](#)

Step 2: Creating a Web Service Reference

Create REST Web Reference

allow the caller to specify how they would like to receive the response. Choose the output format from the list, then define output parameters as necessary. You can review the output from this Web service by clicking the **Test** button.

REST Outputs

Output Format: XML Text JSON [?](#)

* XPath to Output Parameters: [?](#)

Response Namespace: [?](#)

Output Parameters			Add Parameter
	Name	Path	Type
X	<input type="text" value="weather"/>	<input type="text" value="/weather"/>	<input type="button" value="String ▾"/>

[<](#) [Cancel](#) [Test](#) [Create](#)

Step 3: Creating a Form and Report on the Web Service

The screenshot shows the 'Create Page' wizard in Oracle Forms. The top section displays various form types: 'Form on a Table with Report' (selected), 'Form on a Table or View', 'Master Detail Form', 'Tabular Form', 'Form on a Procedure', 'Form on a SQL Query', 'Summary Page', and 'Form on Web Service'. The 'Form on Web Service' option is highlighted with a red box. A sub-dialog titled 'Create Form and Report on Web Service' is open below, showing the 'Choose Service and Operation' step. It lists a 'Web Service Reference' set to 'Weather Conditions' and an 'Operation' set to 'doREST'. A 'Next >' button is visible at the bottom right of the sub-dialog.

Create Page

Form on a Table with Report

Form on a Table or View

Master Detail Form

Tabular Form

Form on a Procedure

Form on a SQL Query

Summary Page

Form on Web Service

Form and Report on Web Service

Cancel

Create Form and Report on Web Service

Choose Service and Operation

Select the web service definition and an operation on which to build the form. If you do not have a web service reference defined, expand the Tasks region and create one.

* Web Service Reference: Weather Conditions

Web Service Reference Type: RESTful

* Operation: doREST

> Tasks

Cancel

Next >

Step 3: Creating a Form and Report on the Web Service

Create Form and Report on Web Service

Page and Region Attributes

Web Service Reference: **Weather Conditions**

Operation: **doREST**

* Page: **5**

* Page Name: **Weather Conditions**

* Page Mode: **Normal**

Page Group: **- Select Page Group -**

* Form Region Title: **Employees**

* Report Region Title: **Results**

Form Region Template: **Standard**

Report Region Template: **Standard**

< Cancel

Create Form and Report on Web Service

Input Items

Identify the names and labels for items created based on this service's input parameters.

To include an item, select **Yes** in the Create column. Otherwise, select **No**. If necessary, edit the item label.

Name	Type	Item Name	Item Label	Create
q	string	P5_Q	Location	Yes ▾
mode	string	P5_MODE	Mode	Yes ▾

< Cancel Next >

Step 3: Creating a Form and Report on the Web Service

Create Form and Report on Web Service x

Report Parameters

Select the parameters to include in the report. To select or deselect all parameters, select the check box in the column header.

For JSON response you only need to supply the name of the collection to store the response.

* Store Results in Collection ?

	Name	Parameter Type
<input checked="" type="checkbox"/>	weather	string

< Cancel Next > ↗

Step 4: Testing Your Application

Project Tracking System

Employees

Location: San Francisco

Mode: xml

Submit

Project Tracking System

Home

Projects

PTS_Employees

Weather Conditions

Employees

Location: San Francisco

Mode: xml

Results

Weather

scattered clouds

1 - 1

Consuming Your APEX Web Service Using Java

The image displays two terminal windows side-by-side, both titled "oracle@EDT3R28P0:~/labs/RESTemp".

Left Terminal (GET method):

```
[oracle@EDT3R28P0 Desktop]$ cd /home/oracle/labs/RESTemp
[oracle@EDT3R28P0 RESTemp]$ ./run.sh S 106
The URI to your RESTful Web Service is http://10.150.21.221:8083/apex/ora01/.
The request prior to the call: http://10.150.21.221:8083/apex/ora01/employees/106
HTTP/1.1 200 OK
first_name : Valli
hire_date : 1998-02-05T08:00:00Z
phone_number : 590.423.4560
email : VPATABAL
manager_id : 103
department_id : 60
last_name : Pataballa
salary : 4800
employee_id : 106
job_id : IT_PROG
[oracle@EDT3R28P0 RESTemp]$
```

Right Terminal (POST method):

```
The request prior to the call: http://10.150.21.221:8083/apex/ora01/employees/106
HTTP/1.1 200 OK
first_name : Valli
hire_date : 1998-02-05T08:00:00Z
phone_number : 590.423.4560
email : VPATABAL
manager_id : 103
department_id : 60
last_name : Pataballa
salary : 4800
employee_id : 106
job_id : IT_PROG
[oracle@EDT3R28P0 RESTemp]$ ./run.sh I
The URI to your RESTful Web Service is http://10.150.21.221:8083/apex/ora01/.
The request prior to the call: http://10.150.21.221:8083/apex/ora01/employees
Enter the first name: a
Enter the last name: b
Enter the email address: a@b.com
Enter the hiredate (DD-MM-YYYY): 16-06-2013
Enter the job id: SA REP
HTTP/1.1 200 OK
Employee id of new employee is 207
[oracle@EDT3R28P0 RESTemp]$
```

GET method

POST method

Scenario 1: E-Business Suite

Have you ever wanted to:

- Exchange data between EBS and other custom systems within your organization
- Build a mobile application using data from your EBS system

What technology would you recommend to perform the following tasks?

Scenario 2: Accessing the PTS Data

Jack has created a security application in his workspace using OEHR schema. Now he has a requirement to access the employees' data from the PTS database and wants to create a page in the security application which has the following requirements:

- It should display information about all employees in the PTS system.
- For each employee, it should display information such as employee ID, name, and login time.
- It should be able to create or update the employee information.

Practice 8 Overview: Creating and Using RESTful Web Services

This practice covers the following topics:

- Creating a RESTful Web Service
- Creating an application that consumes the RESTful Web Service

Summary

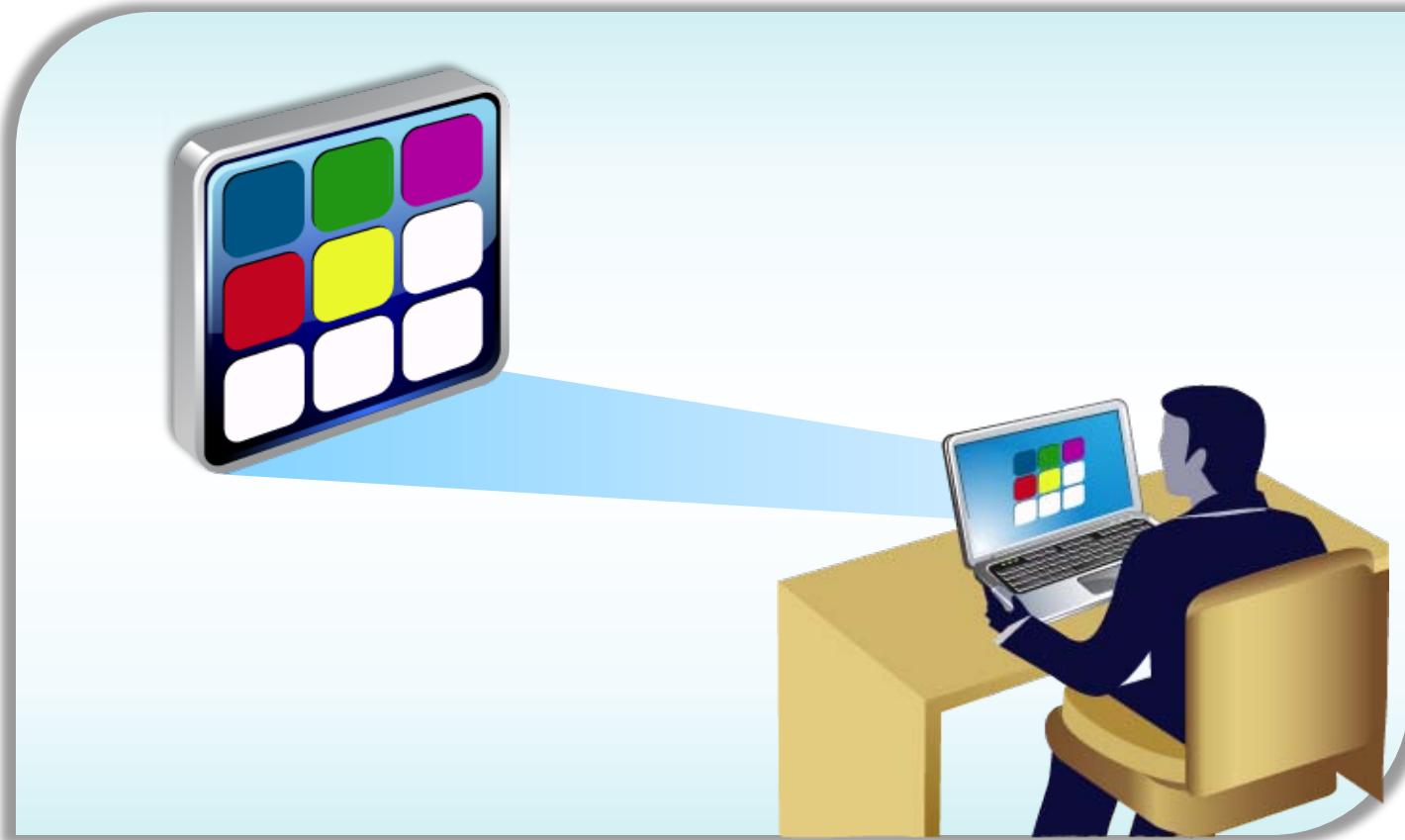
In this lesson, you should have learned how to:

- Create a RESTful Web Service
- Create an application that consumes a RESTful Web Service
- Invoke a RESTful Web Service using a Java client



Using Templates and Themes

Using Templates and Themes in PTS



Objectives

After completing this lesson, you should be able to:

- Explain the difference between the various types of applications (Desktop, Mobile, and Responsive Design)
- Explain how substitution strings work within a template
- Create a new theme and use it in an application



Types of Applications

- Desktop
- Mobile
- Responsive design



User Interface

- Default
- Auto Detect
- Global Page

The screenshot shows the 'User Interfaces' tab selected within the 'User Interface' section of the Oracle Application 102 configuration. The interface includes tabs for Definition, Security, Globalization, and User Interface. Below the tabs, there's a main area for 'Application 102' with buttons for Cancel and Apply Changes. A navigation bar at the top has links for Show All, User Interfaces (which is highlighted with a blue border), General Properties, Logo, and User Interface Det... . The 'User Interfaces' table lists two entries:

Name	Type	Default	Auto Detect	Global Page	Theme	Theme Style
Desktop	monitor icon	✓		15	Universal Theme - 42	Vita
Mobile	smartphone icon		✓	0	Mobile - 51	Default

Desktop Versus Mobile Applications

Home Page

The screenshot shows a desktop application window titled "Sample Database Application". The top navigation bar includes "Mobile", "Help", and a user account dropdown for "dimpi.sarmah@oracle.com". A sidebar on the left lists navigation items: Home (selected), Customers (7), Products (10), Orders (10), Reports, and Administration. The main content area displays a dashboard with two large metrics: "Monthly Sales" (\$0) and "Total Products" (10). Below these are sections for "Top Customers" and "Top Products". A sidebar on the right provides links for "Monthly Sales" (0), "Monthly Orders" (0), "Total Products" (10), and "Total Customers" (7). The bottom navigation bar includes links for "Home", "Edit Page 1", "Session", "View Debug", "Debug", and "Show Grid". A footer bar at the bottom right contains "Full Site" and "Logout" buttons.

Desktop Versus Mobile Applications Reports

Interactive Report

The diagram illustrates the difference between desktop and mobile application interfaces. On the left, a desktop application window titled "Sample Database Application" shows a hierarchical menu with "Products" selected. A yellow box highlights the "Interactive Report" feature. On the right, a mobile application window titled "Products" shows a list of items: Bag, Belt, Blouse, Business Shirt, and Jacket. A red box highlights the "Blouse" item. Arrows point from the desktop "Products" menu item to the mobile "Products" screen, and from the desktop "Interactive Report" box to the mobile "Blouse" item.

List View

Sample Database...

Customers

Products

Orders

Reports

Calendar

Full Site Logout

Sample Database Application

Home Customers Products Orders Reports

Create Product >

Available: Yes Last Date Sold: 3/14/2013

Sales: \$2,000.00 Customers: 6

Available: Yes Last Date Sold: 2/28/2013

Sales: \$330.00 Customers: 3

Business Shirt

Description: Leather belt
Price: \$30.00 Units: 11
Sales: \$330.00 Customers: 3

Description: Silk blouse ideal for all business women
Price: \$60.00 Units: 16
Sales: \$960.00 Customers: 5

Bag

Belt

Blouse

Business Shirt

Jacket

Search...

Full Site Logout

Products

Desktop Versus Mobile Applications

Forms

The image shows two versions of a 'Product Details' form side-by-side, illustrating the differences between desktop and mobile application forms.

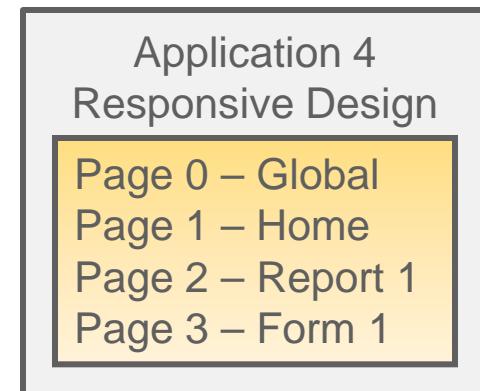
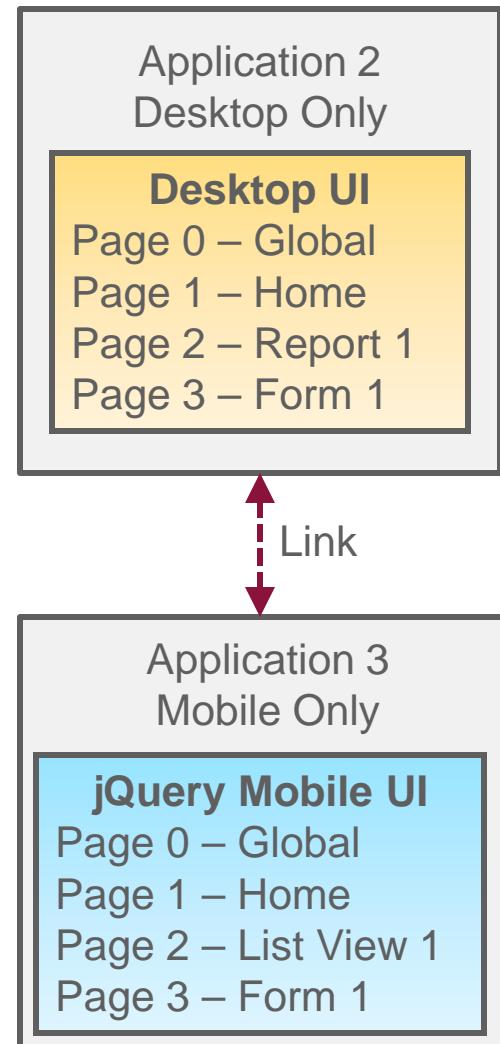
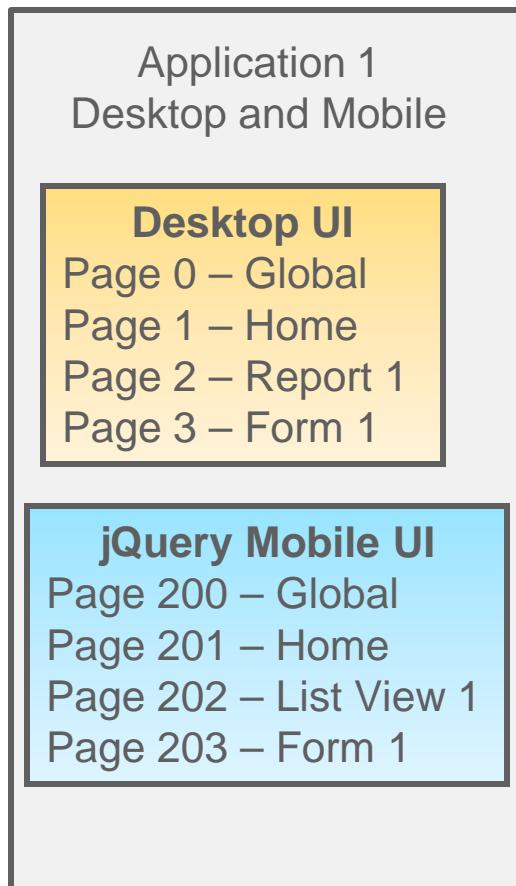
Desktop Version (Left):

- Product Name:** Bag
- Product Description:** Unisex bag suitable for carrying laptops with room for many additional items
- Category:** Accessories
- Product Available:** Yes (radio button selected)
- List Price:** 125
- Product Image:** Choose File (No file chosen) and Download
- Tags:** (empty input field)

Mobile Version (Right):

- Product:** Bag
- Category:** Accessories
- Product Available:** Yes (radio button selected)
- List Price:** 125
- Tags:** (empty input field)
- Description:** Unisex bag suitable for carrying laptops with room for many additional items
- Buttons:** Delete (white), Apply Changes (blue)
- Navigation:** Full Site (with star icon), Logout (with cross icon)

Application Options

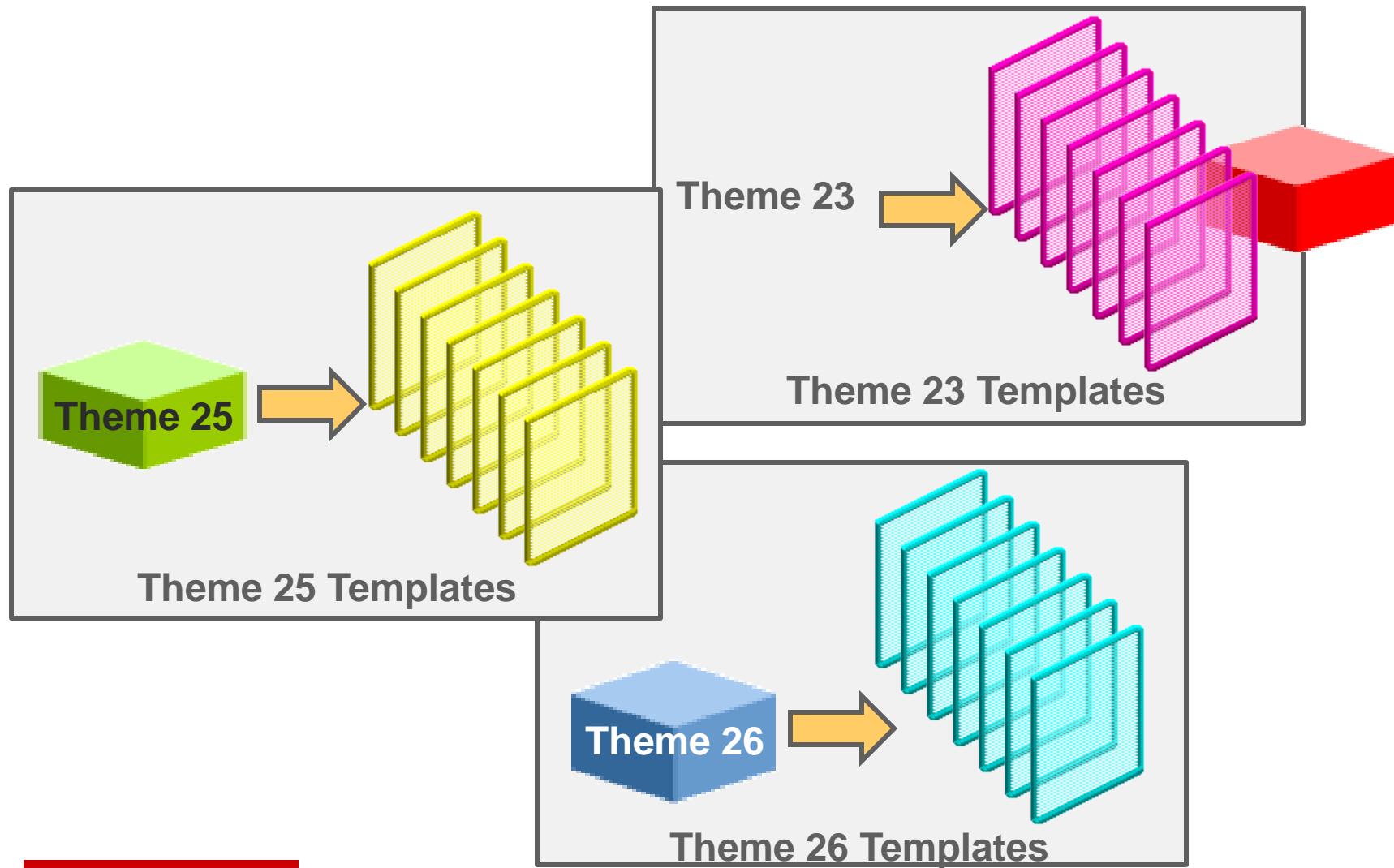


Types of Themes

- Universal Theme - 42
- Mobile Theme - 51
- Custom: Themes you create
- Legacy: Old themes before APEX 4.0



APEX-supplied Themes and Templates



What Are Templates?

- Templates define how the pages or the page components of an application are displayed.
- You can use the following templates:
 - Page
 - Region
 - Report
 - Label
 - List
 - Button
 - Breadcrumb
 - Calendar
 - Pop-up

Types of Templates

The screenshot shows the Oracle Application Builder interface, specifically the 'Templates' section under 'Shared Components'. The top navigation bar includes 'Application Builder', 'SQL Workshop', 'Team Development', 'Packaged Apps', and a breadcrumb path 'Application 102 > Shared Components > Templates'. Below the navigation is a toolbar with icons for comment, search, file, refresh, and a list count of 13. The main area has tabs for 'Templates' (selected), 'Subscription', 'Publish', 'Utilization', and 'History'. A search bar and a 'Reset' button are also present. The table lists various template types with columns for Type, Name, Subscribed From, Subscribers, References, Updated, Updated By, Default, Preview, and Theme. The 'Type' column is currently sorted by name.

Type	Name	Subscribed From	Subscribers	References	Updated	Updated By	Default	Preview	Theme
Theme	Theme			4			✓		4
Theme	Theme			1			✓		1
Theme	Breadcrumb			1			✓		
Theme	Button			0					
Theme	Label			0					
Theme	Legacy Calendar			1			✓		
Theme	List			0					
Theme	Page			0					
Button	Button, Alternative 2	Theme		0					
Button	Button,	Theme		0					
Button		Theme		0					

Using Substitution Strings in Templates

A substitution string:

- Is a defined character string
- Is replaced by an object at run time
- Must be in uppercase
- Begins and ends with a pound (#) symbol

Example: #TITLE# is a substitution string that is replaced with the title text at run time.

Definition
<p>Template</p> <pre><section class="#REGION_CSS_CLASSES# clearfix" id="#REGION_STATIC_ID#" #REGION_ATTRIBUTES# <div class="uRegionHeading"> <h1>#TITLE#</h1> #CLOSE##PREVIOUS##NEXT##DELETE##EDIT##CHANGE##CREATE##CREATE2##EXPAND##COPY##HELP# </div> <div class="uRegionContent clearfix"> #BODY# </div> </section></pre>

Page Template: <head>

```
<!DOCTYPE html>
<meta http-equiv="x-ua-compatible" content="IE=edge" />

<!--[if lt IE 7]><html class="no-js lt-ie10 lt-ie9 lt-ie8 lt-ie7" lang=&BROWSER_LANGUAGE.> <![endif]-->
<!--[if IE 7]><html class="no-js lt-ie10 lt-ie9 lt-ie8" lang=&BROWSER_LANGUAGE.> <![endif]-->
<!--[if IE 8]><html class="no-js lt-ie10 lt-ie9" lang=&BROWSER_LANGUAGE.> <![endif]-->
<!--[if IE 9]><html class="no-js lt-ie10" lang=&BROWSER_LANGUAGE.> <![endif]-->
<!--[if gt IE 9]><!--> <html class="no-js" lang=&BROWSER_LANGUAGE.> <!--<![endif]-->

<head>
  <meta charset="utf-8">
  <title>#TITLE#</title>
  #APEX_CSS#
  #THEME_CSS#
  #TEMPLATE_CSS#
  #THEME_STYLE_CSS#
  #APPLICATION_CSS#
  #PAGE_CSS#
  #FAVICONS#
  #HEAD#
  <meta name="viewport" content="width=device-width, initial-scale=1.0, maximum-scale=1.0, user-scalable=no"/>
</head>
<body class="t-PageBody t-PageBody--hideLeft t-PageBody--hideActions no-anim #PAGE_CSS_CLASSES#" #ONLOAD#
id="t_PageBody">
#FORM_OPEN#
<header class="t-Header" id="t_Header">
  #REGION_POSITION_07#
  <div class="t-Header-branding">
    <div class="t-Header-controls">
      <button class="t-Button t-Button--icon t-Button--header t-Button--headerTree" id="t_Button_navControl"
type="button"><span class="t-Icon fa-bars"></span></button>
    </div>
  ...

```

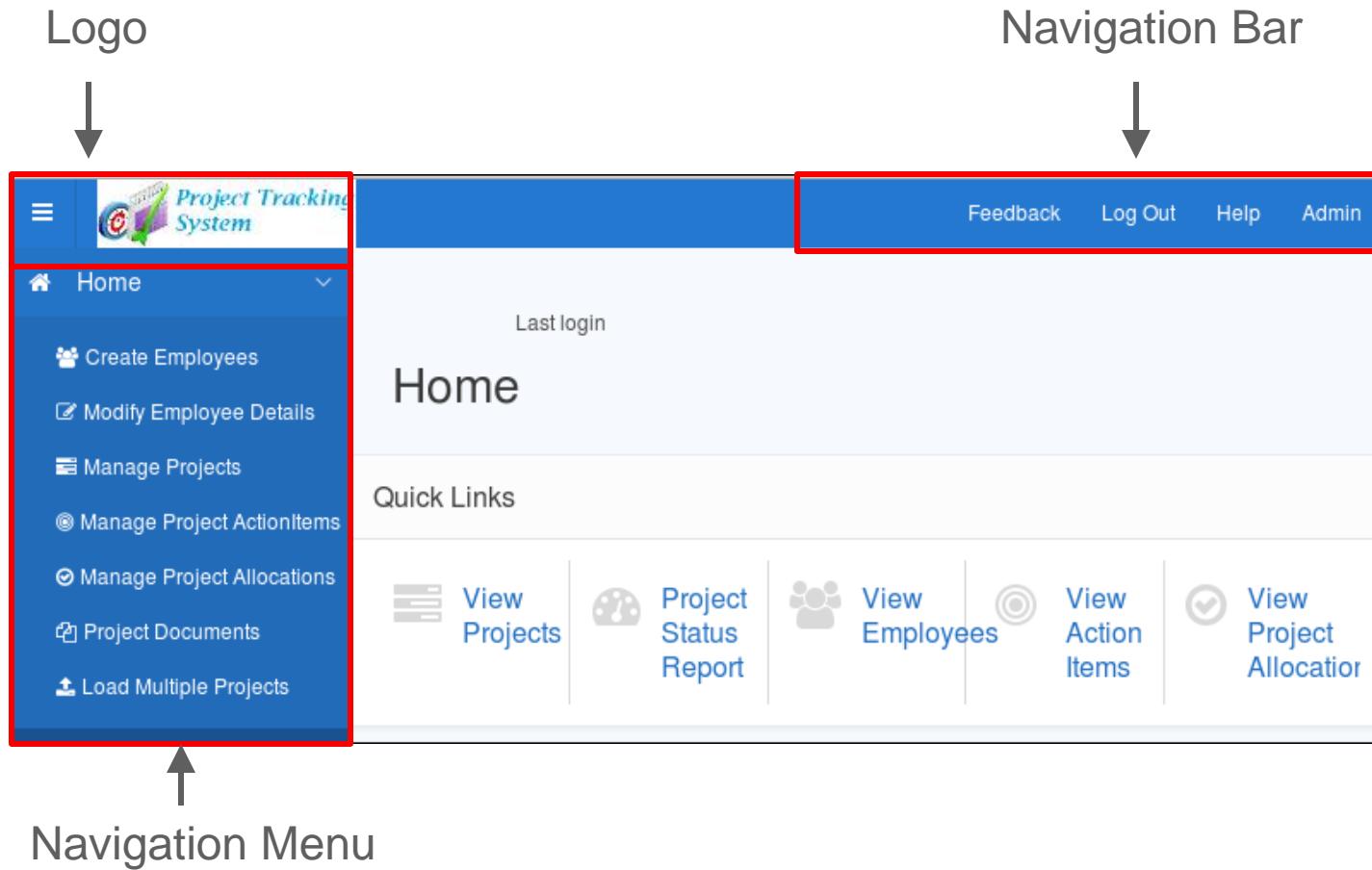
Page Source: <head>

```
<!--[if HTML5]><![endif]-->
<!doctype html>
<!--[if lt IE 7 ]> <html class="ie6 no-css3 no-js" lang="en"> <![endif]-->
<!--[if IE 7 ]>      <html class="ie7 no-css3 no-js" lang="en"> <![endif]-->
<!--[if IE 8 ]>      <html class="ie8 no-css3 no-js" lang="en"> <![endif]-->
<!--[if IE 9 ]>      <html class="ie9" lang="en"> <![endif]-->
<!--[if (gt IE 9)|!(IE)]><!--> <html class="no-js" lang="en"> <!--<![endif]-->
<head>
<!--[if !HTML5]>
    <meta http-equiv="X-UA-Compatible" content="IE=edge,chrome=1" data-bbox="328 311 408 338" />
<![endif]-->
    <meta charset="UTF-8" data-bbox="148 354 268 371" />
    <title>Sample Database Application</title>
    <link rel="icon" href="/i/favicon.ico" type="image/x-icon">
    <link rel="shortcut icon" href="/i/favicon.ico" type="image/x-icon">
    <link rel="stylesheet" href="/i/css/apex.min.css?v=4.2.1.00.08" type="text/css" />
<!--[if IE]><link rel="stylesheet" href="/i/css/apex_ie.min.css?v=4.2.1.00.08" type="text/css" /><![endif]-->
    <link rel="stylesheet" href="/i/libraries/jquery-ui/1.8.22/themes/base/jquery-ui.min.css" data-bbox="731 491 881 521" />
    <link rel="stylesheet" href="/i/themes/theme_25/css/4_2.css?v=4.2.1.00.08" type="text/css" />
    <link rel="stylesheet" href="/i/themes/theme_25/css/responsive_grid.css?v=4.2.1.00.08" type="text/css" />
<script type="text/javascript">
var apex_img_dir = "/i/", htmldb_Img_Dir = apex_img_dir;
</script>
<script src="/i/libraries/apex/minified/desktop_all.min.js?v=4.2.1.00.08" type="text/javascript"></script>
<script src="/i/libraries/apex/minified/legacy.min.js?v=4.2.1.00.08" type="text/javascript"></script>
<script type="text/javascript" src="/i/libraries/modernizr/2.5.3/modernizr.min.js?v=4.2.1.00.08"></script>
<!--[if lt IE 9]><script type="text/javascript" src="/i/libraries/respond-js/1.1.0/respond.min.js?v=4.2.1.00.08"></script><![endif]-->
    <script type="text/javascript" src="/i/themes/theme_25/js/4_2.min.js?v=4.2.1.00.08"></script>
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
        <meta name="viewport" content="width=device-width,initial-scale=1.0,maximum-scale=1.0,user-scalable=0" />
</head>
```

The diagram illustrates the flow of CSS and JavaScript files from the page source code. Arrows point from specific code snippets to yellow boxes labeled '#TITLE#', '#APEX_CSS#', '#THEME_CSS#', '#APEX_JAVASCRIPT#', and '#THEME_JAVASCRIPT#'. The code is organized into five main sections:

- #TITLE#**: Points to the `<meta http-equiv="X-UA-Compatible" content="IE=edge,chrome=1" />` and `<meta charset="UTF-8" />` lines.
- #APEX_CSS#**: Points to the `<link rel="stylesheet" href="/i/css/apex.min.css?v=4.2.1.00.08" type="text/css" />` line.
- #THEME_CSS#**: Points to the `<link rel="stylesheet" href="/i/themes/theme_25/css/4_2.css?v=4.2.1.00.08" type="text/css" />` and `<link rel="stylesheet" href="/i/themes/theme_25/css/responsive_grid.css?v=4.2.1.00.08" type="text/css" />` lines.
- #APEX_JAVASCRIPT#**: Points to the `<script type="text/javascript">` block containing the apex_img_dir variable.
- #THEME_JAVASCRIPT#**: Points to the `<script type="text/javascript" src="/i/libraries/modernizr/2.5.3/modernizr.min.js?v=4.2.1.00.08"></script>` line and the `<!--[if lt IE 9]><script type="text/javascript" src="/i/libraries/respond-js/1.1.0/respond.min.js?v=4.2.1.00.08"></script><![endif]-->` block.

Application Header



Page Template: <header>

```
<header class="t-Header" id="t_Header">
    #REGION_POSITION_07#
    <div class="t-Header-branding">
        <div class="t-Header-controls">
            <button class="t-Button t-Button--icon t-Button--header t-Button--headerTree"
id="t_Button_navControl" type="button"><span class="t-Icon fa-bars"></span></button>
        </div>
        <div class="t-Header-logo">
            <a href="#HOME_LINK#" class="t-Header-logo-link">#LOGO#</a>
        </div>
        <div class="t-Header-navBar">
            #NAVIGATION_BAR#
        </div>
    </div>
    <div class="t-Header-nav">
        #TOP_GLOBAL_NAVIGATION_LIST#
        #REGION_POSITION_06#
    </div>
</header>
```

Page Source: <header>

#LOGO#

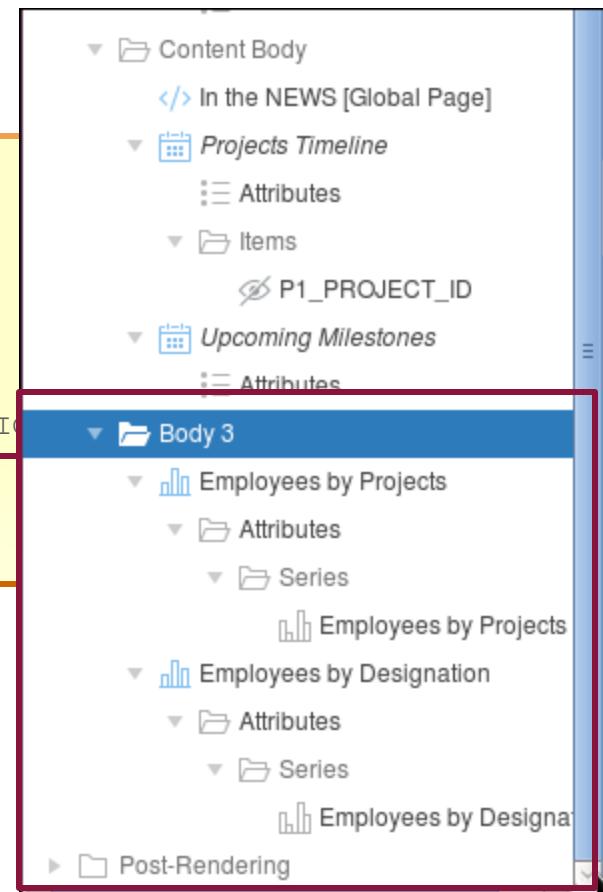
```
<div class="t-Header-logo">
    <a href="f?p=101:1:14633319515212" class="t-Header-logo-link"></a>
</div>
<div class="t-Header-navBar">
    <ul class="t-NavigationBar" id="2028263703523578821"><li class="t-NavigationBar-item">
        <a class="t-Button t-Button--icon t-Button--header t-Button--navBar"
href="javascript:apex.navigation.dialog('f?p=101:19:14633319515212::NO::19:P19_APPLICATION_ID,P19_PAGE_ID:101,1\u0026p_dialog_cs=HHQXqmbvCnmjQGkkXCw1nF1b8i-HcpOUNldC9y-FhGq4DkkQB_Hk9hVvHsSUEb-CP4yfRERcxlo74zaoF4BrXQ',{title:'Feedback',height:'500',width:'720',maxWidth:'960',modal:false,dialog:null}，'t-Dialog--standard',apex.jQuery('#R'));" role="button">
            <span class="t-Icon "></span><span class="t-Button-label">Feedback</span><span class="t-Button-badge"></span>
        </a>
    </li><li class="t-NavigationBar-item">
        <a class="t-Button t-Button--icon t-Button--header t-Button--navBar"
href="apex_authentication.logout?p_app_id=101&p_session_id=14633319515212" role="button">
            <span class="t-Icon "></span><span class="t-Button-label">Log Out</span><span class="t-Button-badge"></span>
        </a>
    </li><li class="t-NavigationBar-item">
        <a class="t-Button t-Button--icon t-Button--header t-Button--navBar"
href="f?p=101:17:14633319515212:1:NO:::" role="button">
            <span class="t-Icon "></span><span class="t-Button-label">Help</span><span class="t-Button-badge"></span>
        </a>
    </li>
    ...
</div>
</header>
...

```

#NAVIGATION_BAR#

Page Template: Body

```
<<div class="t-Body">
#SIDE_GLOBAL_NAVIGATION_LIST#
<div class="t-Body-main">
    <div class="t-Body-title" id="t_Body_title">
        #REGION_POSITION_01#
    </div>
    <div class="t-Body-content" id="t_Body_content">
        #SUCCESS_MESSAGE##NOTIFICATION_MESSAGE##GLOBAL_NOTIFICATION#
        <div class="t-Body-contentInner">
            #BODY#
        </div>
    </div>
```



Page Template: Position

The image shows the Oracle ADF Page Template: Position configuration interface on the left and its preview on the right.

Left Panel (Configuration):

- Identification:** Sequence: 10
- Layout:** Parent Region: - Select -, Position: Content Body (highlighted with a red box)
- Appearance:** Quick Pick: Position
- Grid:** Start New Row: Yes, Column: Automatic, Column Span: Automatic, Column CSS Classes, Column Attributes
- Advanced:**

A red arrow points from the "Position" field in the configuration panel to the "Content Body" region in the preview panel.

Right Panel (Preview):

- SUB REGIONS:** CLOSE, HELP, DELETE, CHANGE, CREATE
- CONTENT BODY:** Employees by Projects (with COPY, EDIT, PREVIOUS, NEXT buttons), ITEMS, REGION CONTENT, SUB REGIONS, CLOSE, HELP, DELETE, CHANGE, CREATE
- Projects Timeline:** (with COPY, EDIT, PREVIOUS, NEXT buttons), ITEMS, REGION CONTENT, SUB REGIONS, CLOSE, HELP, DELETE, CHANGE, CREATE
- Upcoming Milestones:** (with COPY, EDIT, PREVIOUS, NEXT buttons), ITEMS, REGION CONTENT, SUB REGIONS, CLOSE, HELP, DELETE, CHANGE, CREATE
- BODY 3:** Employees by Designation (with COPY, EDIT, PREVIOUS, NEXT buttons), ITEMS, REGION CONTENT, SUB REGIONS, CLOSE, HELP, DELETE, CHANGE, CREATE

Page Template

The screenshot shows the 'Project Tracking System' application interface. At the top, there's a blue header bar with the system logo, 'Project Tracking System', and navigation links: 'Feedback', 'Log Out', 'Help', and 'Admin'. Below the header, the main content area has a 'Last login' message and a 'Home' section. Under 'Quick Links', there are four items: 'View Projects' (with a bar chart icon), 'Project Status Report' (with a pie chart icon), 'View Page Template Body (3)' (which is highlighted with a yellow box), and 'View Project Allocations' (with a grid icon). A large red box highlights the main content area, which contains two charts: 'Employees by Projects' (bar chart) and 'Employees by Designation' (pie chart). The bar chart shows employee counts across six projects. The pie chart shows employee distribution by designation. At the bottom, there's a toolbar with various icons and buttons like 'Edit Page 1', 'Session', 'View Debug', 'Debug', 'Show Grid', 'Quick Edit', 'Theme Roller', and settings.

Last login

Home

Quick Links

View Projects

Project Status Report

View Page Template Body (3)

View Project Allocations

Employees by Projects

Employees by Designation

Senior Manager - 1
Trainee - 3
Senior Developer - 4
QA Engineer - 2
Manager - 3
Developer - 7

Home Application 101 Edit Page 1 Session View Debug Debug Show Grid Quick Edit Theme Roller

Using Button Templates

The diagram illustrates the configuration of a 'CREATE' button template in Oracle APEX. It consists of three main components:

- Rendering Tree:** Shows the 'Regions' section of the page structure. A red box highlights the 'Region Buttons' item under 'Content Body'. A red arrow points from this item to the 'Button' configuration screen.
- Button Configuration:** Displays the 'Identification' and 'Layout' sections. The 'Button Name' is set to 'CREATE' and the 'Label' is 'Create'. The 'Sequence' is 10, and the 'Region' is 'Projects1'. The 'Button Position' is 'Right of Interactive Report Search Bar'. Another red arrow points from the 'Region Buttons' item in the rendering tree to this screen.
- Appearance Configuration:** Shows the 'Text' button template selected. The 'Hot' state is 'Yes'. A red box highlights the 'Template Options' section, which contains a link to 'Use Template Defaults'. A red arrow points from the 'CREATE' button in the rendering tree to this screen.

Project Tracking System Interface: Shows the final result. The 'PROJECT TRACKING SYSTEM' page has a sidebar with various navigation items. On the right, a table displays project details. A blue 'Create' button is visible in the top right corner of the table's action bar. A mouse cursor is hovering over this 'Create' button.

Project Id	Project Name	Project Type	Project Description	Project Status	Project Planned Start Date	Project Start Date
612	MFG Petrol Industry	304	Engineering Design Capabilities in the Petrol Industry	101	19-JUN-15	19-JUN-15

Copying and Modifying a Template

PROJECT TRACKING SYSTEM

Home

- Create Employees
- Modify Employee Details
- Manage Projects
- Manage Project Action Items
- Project Documents
- Project Charts
- Salary and Service Chart
- Projects_List

Original - Hot

	Project Id	Project Name	Project Type	Project Description	Project Status	Project Planned Start Date	Project Start Date	
	612	MFG Petrol Industry	304	Engineering Design Capabilities in the Petrol Industry	101	19-JUN-15	19-JUN-15	0
	614	NoSQL Course Testing	302	Testing Course Lessons for NoSQL	101	01-MAY-15	01-MAY-15	1

PROJECT TRACKING SYSTEM

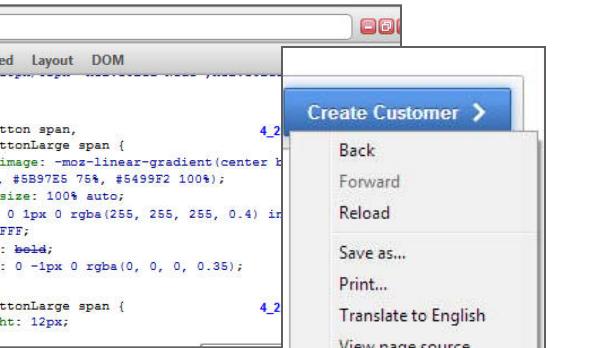
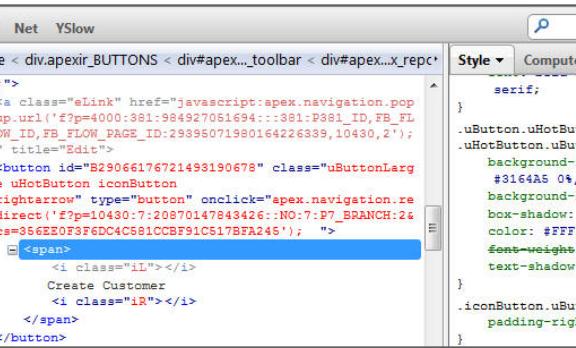
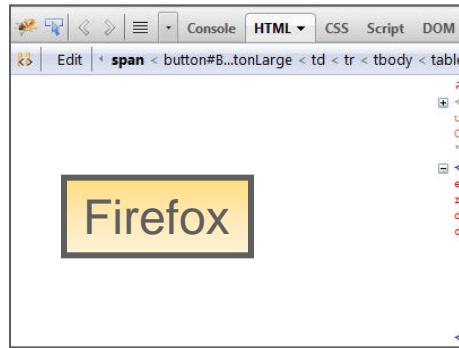
Home

- Create Employees
- Modify Employee Details
- Manage Projects
- Manage Project Action Items
- Project Documents
- Project Charts

Custom - Hot

	Project Id	Project Name	Project Type	Project Description	Project Status	Project Planned Start Date	Project Start Date	
	612	MFG Petrol Industry	304	Engineering Design Capabilities in the Petrol Industry	101	19-JUN-15	19-JUN-15	0

Inspecting Browser Elements



The image displays three browser developer tool interfaces side-by-side, each showing the inspection of a button element from an Oracle Application Express page titled "Create Customer".

Firefox: The "HTML" tab is selected. A yellow box highlights the "Create Customer" button. The element's code is visible in the left pane, and its styles are listed in the right pane under the "Style" tab.

Chrome: The "Elements" tab is selected. A yellow box highlights the "Create Customer" button. The element's code is visible in the left pane, and its styles are listed in the right pane under the "Style" tab.

IE: The "HTML" tab is selected. A yellow box highlights the "Create Customer" button. The element's code is visible in the left pane, and its styles are listed in the right pane under the "Style" tab.

In all three cases, the "Inspect element" option is highlighted in the context menu, which is open in the Chrome screenshot.

Copying a Template

It is best practice to copy a template and change it rather than changing the Oracle APEX-supplied templates.

Name	Subscribed From	Subscribers	References	Updated	Default	Preview	Theme	Copy
Breadcrumb	Theme	1	5		✓		42	
Breadcrumb	Theme		1	12 days ago	✓		125	
Standard Button	Theme		4		✓		51	
Text	Theme	1	20		✓		42	
Text	Theme		1	12 days ago	✓		125	
Text with Icon	Theme	1	0				42	



Modifying a Template

* Normal Template

```
1 <button class="t-Button t-Button--icon #BUTTON_CSS_CLASSES#" #BUTTON_ATTRIBUTES# onclick="#JAVASCRIPT#" type="button" id="#BUTTON_ID#"><span class="t-Icon t-Icon--left #ICON_CSS_CLASSES#" aria-hidden="true"></span><span class="t-Button-label">#LABEL#</span><span class="t-Icon t-Icon--right #ICON_CSS_CLASSES#" aria-hidden="true"></span></button>
```

Hot Template

```
1 <button value="#LABEL#" onclick="#JAVASCRIPT#" class="redButton" type="button" #BUTTON_ATTRIBUTES# id="#BUTTON_ID#">
2 <span width="100%">#LABEL#</span>
3 </button>
4 |
```

[Custom] Large Red Button - Icon

▼ CSS

File URLs

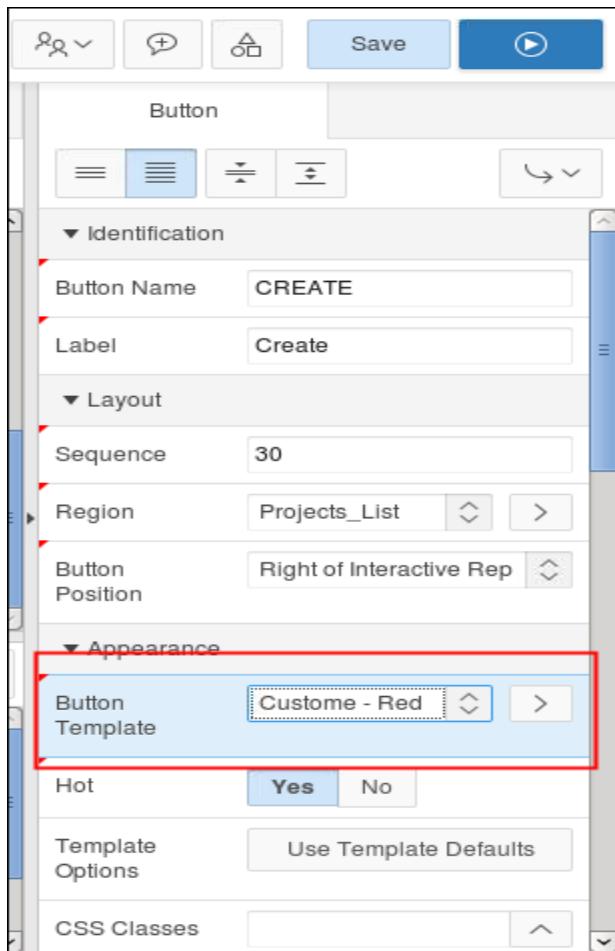
Inline

```
.redButton {
background-color: #FF0000;
border: 1px solid black;
}
```

▼ HTML Header

Page Definition - CSS

Associating Template with Button



The screenshot shows the 'PROJECT TRACKING SYSTEM' application. The top navigation bar includes links for Feedback, Log Out, Help, and Home. The main content area has a sidebar with links: Home, Create Employees, Modify Employee Details, Manage Projects, Manage Project Action Items, Project Documents, and Project Charts. The main panel displays a table with the following data:

Project Id	Project Name	Project Type	Project Description	Project Status	Project Planned Start Date	Project Start Date
612	MFG Petrol Industry	304	Engineering Design Capabilities in the Petrol Industry	101	19-JUN-15	19-JUN-15 0

A red box highlights the 'Create' button in the top right corner of the main panel.

Quiz



If you must create a new custom template, it is generally easier to start from the beginning.

- a. True
- b. False

Creating a Custom Theme

To create a custom theme:

1. Export your theme
2. Copy your theme
3. Edit your theme
4. Manage your workspace themes

Exporting Your Theme

The screenshot illustrates the process of exporting a theme in Oracle Application Express. It consists of two main panels: a sidebar on the left and a main content area on the right.

Left Sidebar (Themes Panel):

- Themes:** A section describing what a theme is: "A Theme is a named collection of templates used to define the user interface of an application."
- Tasks:** A list of actions:
 - Copy Theme
 - Delete Theme
 - Export Theme** (highlighted with a red box and a cursor icon)
 - Import Theme
 - Change Identification Number
 - Restore Theme Subscription
 - Manage Workspace Themes

Right Content Area:

- Header:** Themes (selected tab), Export, Applications, Websheets, Plug-ins, User Interface Defaults, Feedback.
- Section: Export Theme**
- Sub-section: Choose Application**
 - * Application: 102 PROJECT TRACKING SYSTEM
- Sub-section: Export Theme**
 - * Export Theme: 42. Universal Theme
 - File Format: UNIX
 - File Character Set: Unicode UTF-8
- Buttons:** Reset, Export (highlighted with a blue box and a cursor icon).

Copying Your Theme

The screenshot shows the 'Themes' section of the Oracle interface. On the left, there's a sidebar with options like 'Tasks', 'Copy Theme', 'Delete Theme', 'Export Theme', 'Import Theme', 'Change Identification Number', 'Restore Theme Subscription', and 'Manage Workspace Themes'. The 'Copy Theme' option is highlighted with a blue background and a cursor icon pointing at it.

Copy Theme

Copy Theme

Each theme is identified by a numeric identification number (ID). Use this to make a copy of an existing theme and specify a new theme ID. Copying a theme is useful if you wish to export a theme with a different ID.

Application: 102 PROJECT TRACKING SYSTEM

Copy from Theme: 42, Universal Theme

* Copy to this Theme ID: 125

Subscribe Theme: Yes

Cancel

Next >

This is a 'Copy Theme' dialog box. It has fields for 'Application' (set to '102 PROJECT TRACKING SYSTEM'), 'Copy from Theme' (set to '42, Universal Theme'), and 'Copy to this Theme ID' (set to '125'). There's also a 'Subscribe Theme' dropdown set to 'Yes'. At the bottom right is a large blue 'Next >' button with a hand cursor icon.

Copy Theme

Confirm

Application: 102 - PROJECT TRACKING SYSTEM

Copy Theme ID from: 42

Copy Theme ID to: 125

< Cancel

Copy Theme

This is a confirmation dialog box. It displays the copied theme details: 'Application: 102 - PROJECT TRACKING SYSTEM', 'Copy Theme ID from: 42', and 'Copy Theme ID to: 125'. It includes standard navigation buttons ('<', 'Cancel') and a large blue 'Copy Theme' button with a hand cursor icon.

Editing Your Theme

The screenshot illustrates the Oracle ADF interface for managing themes. It consists of two main panels: a left-hand navigation and configuration panel and a right-hand detailed configuration panel.

Left Panel: This panel is titled "User Interface" and contains a sidebar with "User Interface Attributes". Under this, there are two tabs: "Themes" (which is selected and highlighted in blue) and "Templates". The main area is titled "Files" and contains sections for "Static Application Files" and "Static Workspace Files".

Right Panel: This panel is titled "Theme" and shows the "Create / Edit Theme" screen. The top navigation bar includes links to "Application 102", "Shared Components", "Themes", and "Create / Edit Theme", along with various icons for navigation and search.

The "Theme" configuration screen includes the following fields:

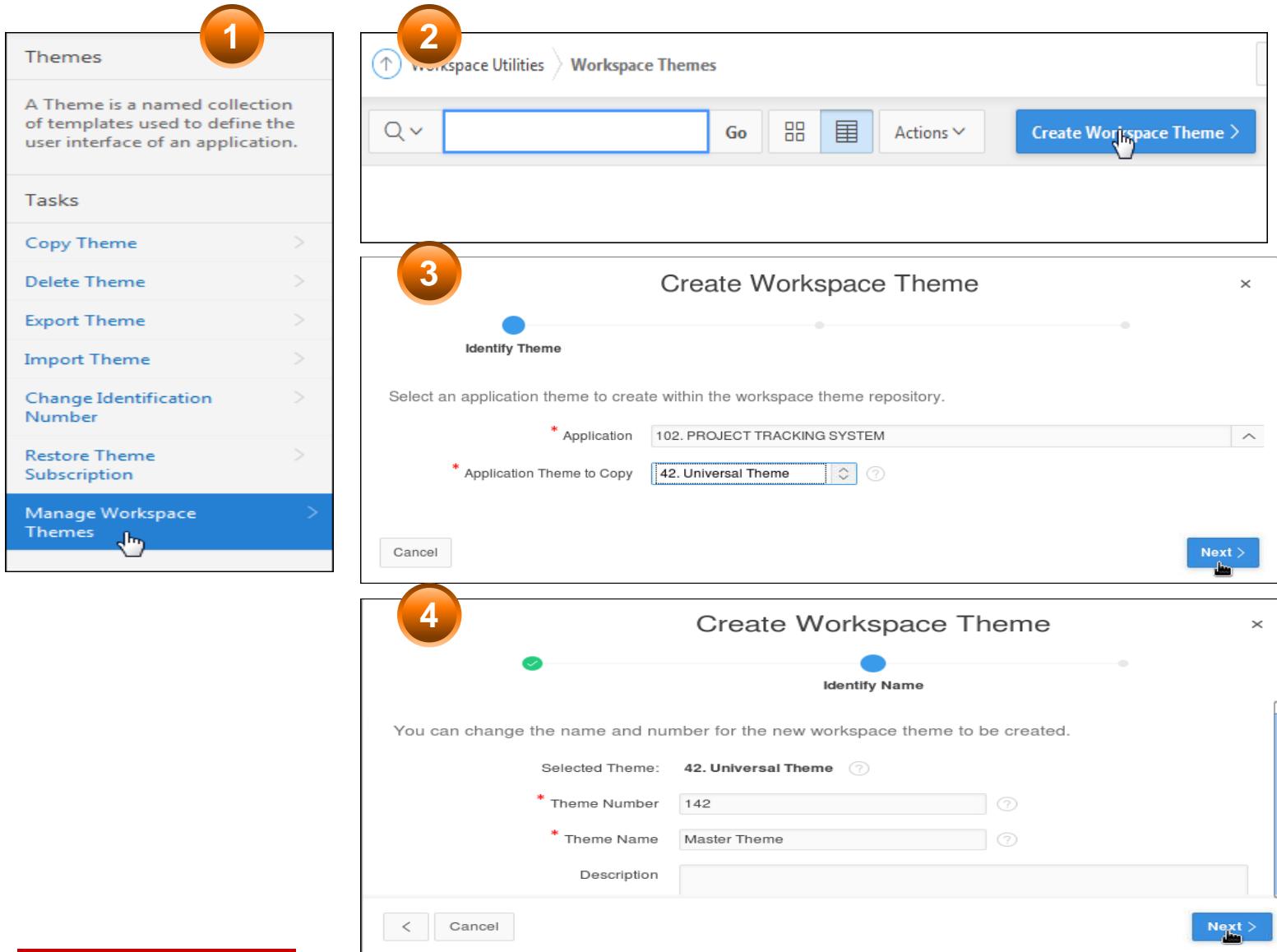
- Name:** Application: 102
- Theme Number:** 42
- Name:** Universal Theme
- User Interface:** Desktop
- Navigation Type:** List
- Implementation:** List
- Description:** (empty)

Below the configuration fields is a "Theme Subscription" section with buttons for "Verify", "Unsubscribe", "Refresh Theme", and "Publish Theme".

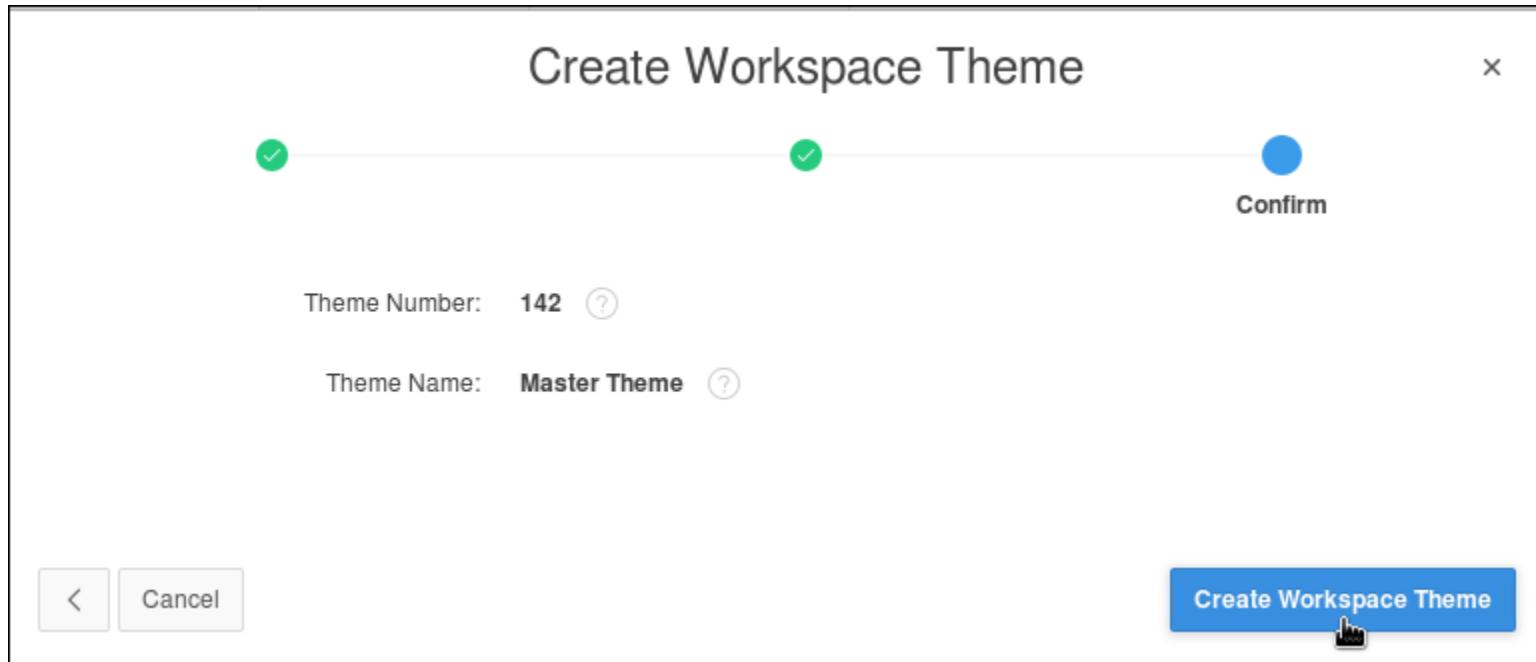
Table Data: Below the configuration panels is a table listing themes. The columns are: Number, Name, User Interface, Is Current, Subscribed From, Subscribers, Templates, Page Templates, Region Templates, Button Templates, and List Templates.

Number	Name	User Interface	Is Current	Subscribed From	Subscribers	Templates	Page Templates	Region Templates	Button Templates	List Templates
42	Universal Theme - 42*	Desktop	✓	Nonexistent Master		52	9	13	3	11
51	Mobile - 51*	Mobile	✓	Nonexistent Master		30	3	14	2	5

Managing Workspace Themes



Managing Workspace Themes



Creating a Master Application

The screenshot shows the Oracle Application Development Framework (ADF) Faces interface for creating a master application. At the top, a header bar displays "Application 102 - PROJECT TRACKING SYSTEM". On the right of the header is a "Edit Application Properties" button. In the center, there is a "Create Page >" button. Below the header, five main navigation icons are displayed:

- Run Application (Icon: play button)
- Supporting Objects (Icon: document with SQL)
- Shared Components (Icon: four circular icons representing various components)
- Utilities (Icon: wrench)
- Export / Import (Icon: download and upload arrows)

Below these icons, a toolbar includes search, go, actions, and a grid icon. The main content area displays eight page icons arranged in two rows of four:

Icon	Name
	0 - Global Page - Mobile
	1 - Home
	2 - Home
	3 - Project Status Report

Adding a Custom Theme to the Master Application

The image consists of three vertically stacked screenshots from an Oracle Application Express (APEX) interface, illustrating the process of creating a new theme.

Screenshot 1: Create Theme - Method

This screen shows a progress bar with one step completed (Method). It includes a radio button group for selecting the theme creation method:

- From the Repository
- As a copy from another application
- From Scratch
- From Export

Buttons at the bottom include "Cancel" and a "Next >" button, which is being clicked by a cursor.

Screenshot 2: User Interface

This screen shows a progress bar with two steps completed (User Interface). It displays a dropdown menu for the User Interface type, currently set to "Desktop". Buttons at the bottom include "<" and "Cancel" on the left, and "Next >" on the right, which is also being clicked by a cursor.

Screenshot 3: Create Theme - Identify Theme

This screen shows a progress bar with three steps completed (Identify Theme). It contains descriptive text about what a theme is, followed by theme selection fields:

A theme is a named collection of templates that defines the application user interface. Each theme contains templates for every type of application component and page control, including individual pages, regions, reports, lists, labels, breadcrumbs, buttons, and list of values. Templates contain HTML and variables that the Application Express engine substitutes with dynamic values at runtime.

Theme Type: All Themes

Theme: Master Theme (Theme 142)

Buttons at the bottom include "<" and "Cancel" on the left, and a "Next >" button on the right, which is being clicked by a cursor.

Switching the Current Theme

Number		Name	User Interface	Is Current	Subscribed From	Subscribers	Templates	Page Templates	Region Templates	Button Templates	List Templates
42		Universal Theme - 42 *	Desktop	✓	Nonexistent Master		52	9	13	3	11
51		Mobile - 51 *	Mobile	✓	Nonexistent Master		30	3	14	2	5
142		Master Theme - 142	Desktop		Theme Repository		52	9	13	3	11

Switch Theme

When you switch to a new theme, Application Builder maps all currently used templates to a template in the new theme using the template class. This report displays these template mappings and allow for selecting alternate templates when no templates with a matching template class exist.

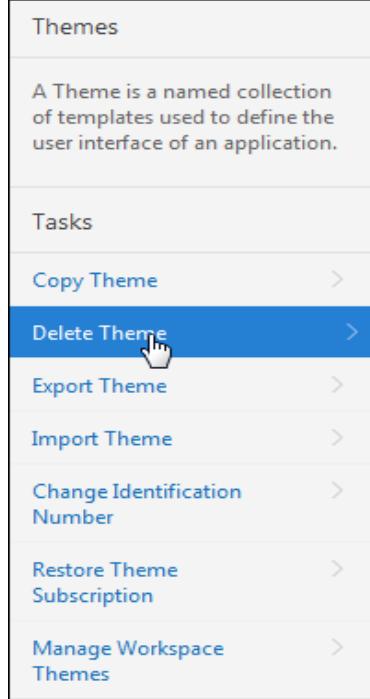
Application: **102 - PROJECT TRACKING SYSTEM** [?](#)

Currently Active Theme: **42. Universal Theme** [?](#)

Switch to Theme: **142. Master Theme** [?](#)

Template Type	From Template	To Template	Status
Breadcrumb	Breadcrumb	Breadcrumb ☰	✓
Button	Text with Icon	Text with Icon ☰	✓
	HTML button (legacy - APEX 5 migration)	HTML button (legacy - APEX 5 migration) ☰	✓
	Icon	Icon ☰	✓
	Text	Text ☰	✓

Deleting the Default Theme



Delete Theme

Delete Theme

Application: 102 - PROJECT TRACKING SYSTEM [?](#)

* Delete Theme: [?](#)

> Delete Theme

[Cancel](#) [Next >](#)

This is a screenshot of the 'Delete Theme' dialog box. It shows the application identifier '102 - PROJECT TRACKING SYSTEM'. The 'Delete Theme' field contains the value '101. My New Theme'. There are 'Cancel' and 'Next >' buttons at the bottom.

Copying an Existing Application From the Master Application

The screenshot illustrates the process of copying an application from a master system. It consists of two main windows:

- Create an Application (Top Window):** This window asks "What type of application would you like to create?" with four options: Desktop, Mobile, Websheet, and Packaged Application. Below these, a link "From a spreadsheet" leads to "Copy an existing application", which is highlighted with a red rectangle.
- Create Application (Bottom Window):** This window is titled "Create Application" and is currently on the "Identify Copy Target" step. It contains the following fields:
 - * Copy From: 102. PROJECT TRACKING SYSTEM
 - * Copy To: PROJECT TRACKING SYSTEM based on Master Theme
 - * New Application ID: 108
 - Copy Supporting Object Definitions: No

Quiz



A standard theme contains templates for every type of application component and region type.

- a. True
- b. False

Practice 11 Overview: Using Templates and Themes

This practice covers the following topics:

- Copying and Customizing a Button Template
- Creating a Custom Theme
- Creating a Master Application

Summary

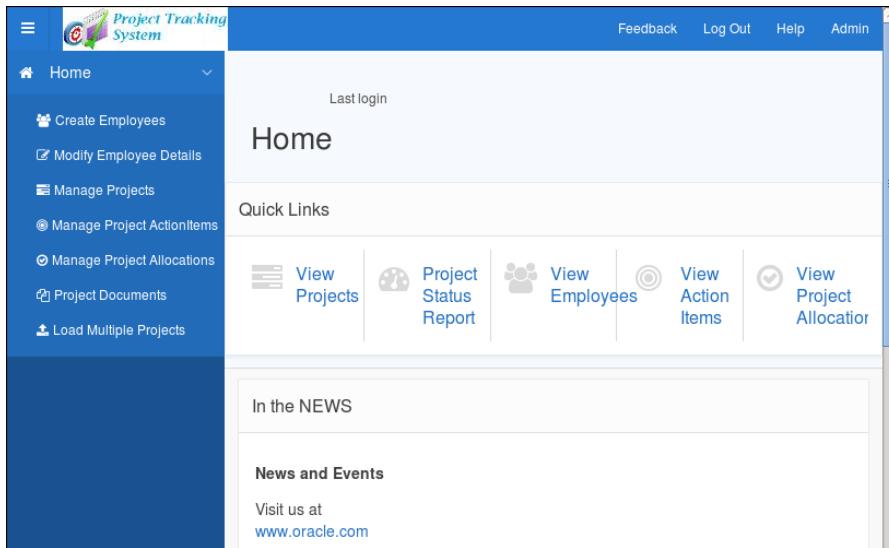
In this lesson, you should have learned how to:

- Differentiate between the various types of applications (Desktop, Mobile, and Responsive Design)
- Use substitution strings within a template
- Create a new theme and use it in an application



Developing a New Theme for Your Application Using Theme Roller

Theme Roller in PTS



Objectives

After completing this lesson, you should be able to develop a new theme for your application using Theme Roller.

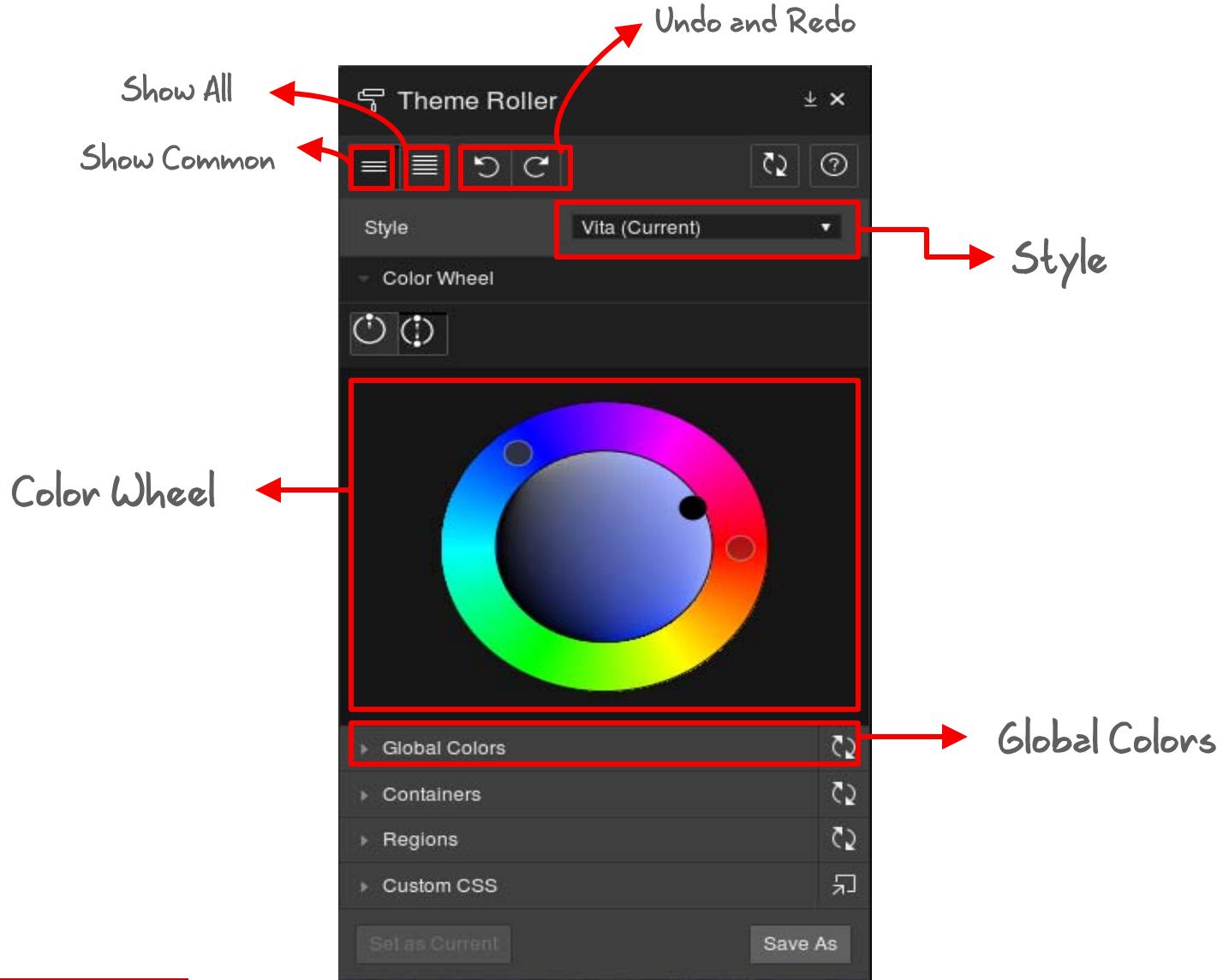


What is Theme Roller?

Theme Roller:

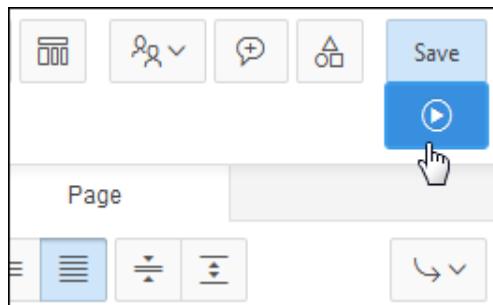
- Is a live CSS editor
- Allows developers to play around with theme colors, fonts, and theme layouts
- Allows easy customization of UI without getting into CSS, HTML, or JavaScript
- Can completely change the look and feel of UI just by playing around with Theme Roller
- Can save private themes using Theme Roller

Components of Theme Roller

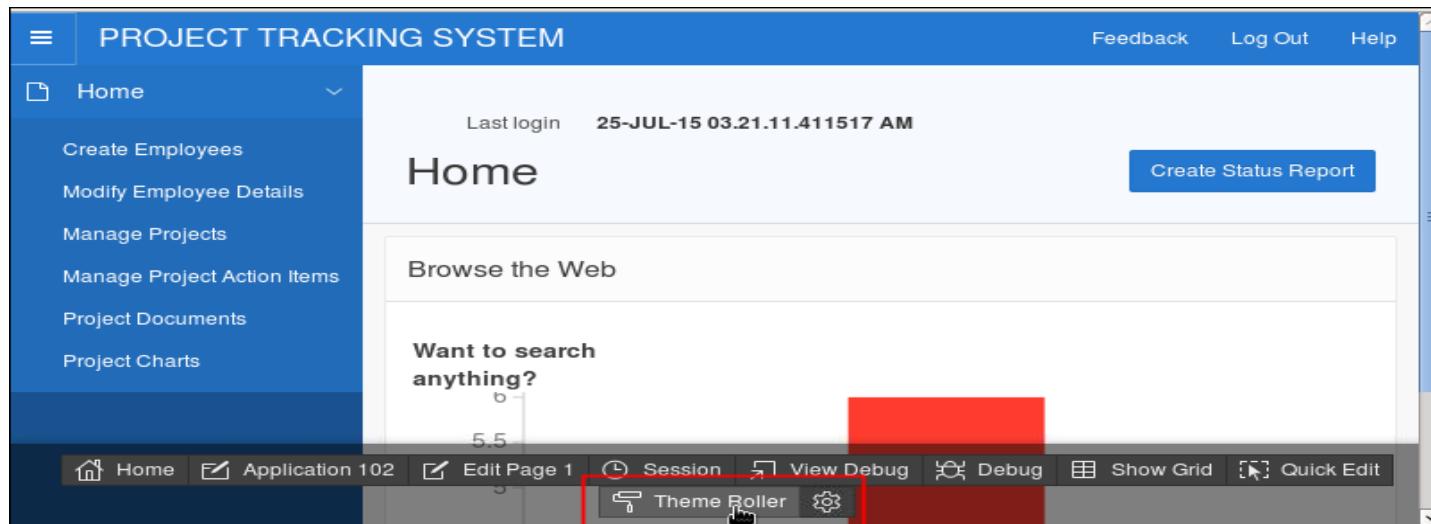


Using Theme Roller in PTS

1 Run the application.



2 Click Theme Roller on the APEX Developer toolbar.



Using Theme Roller in PTS

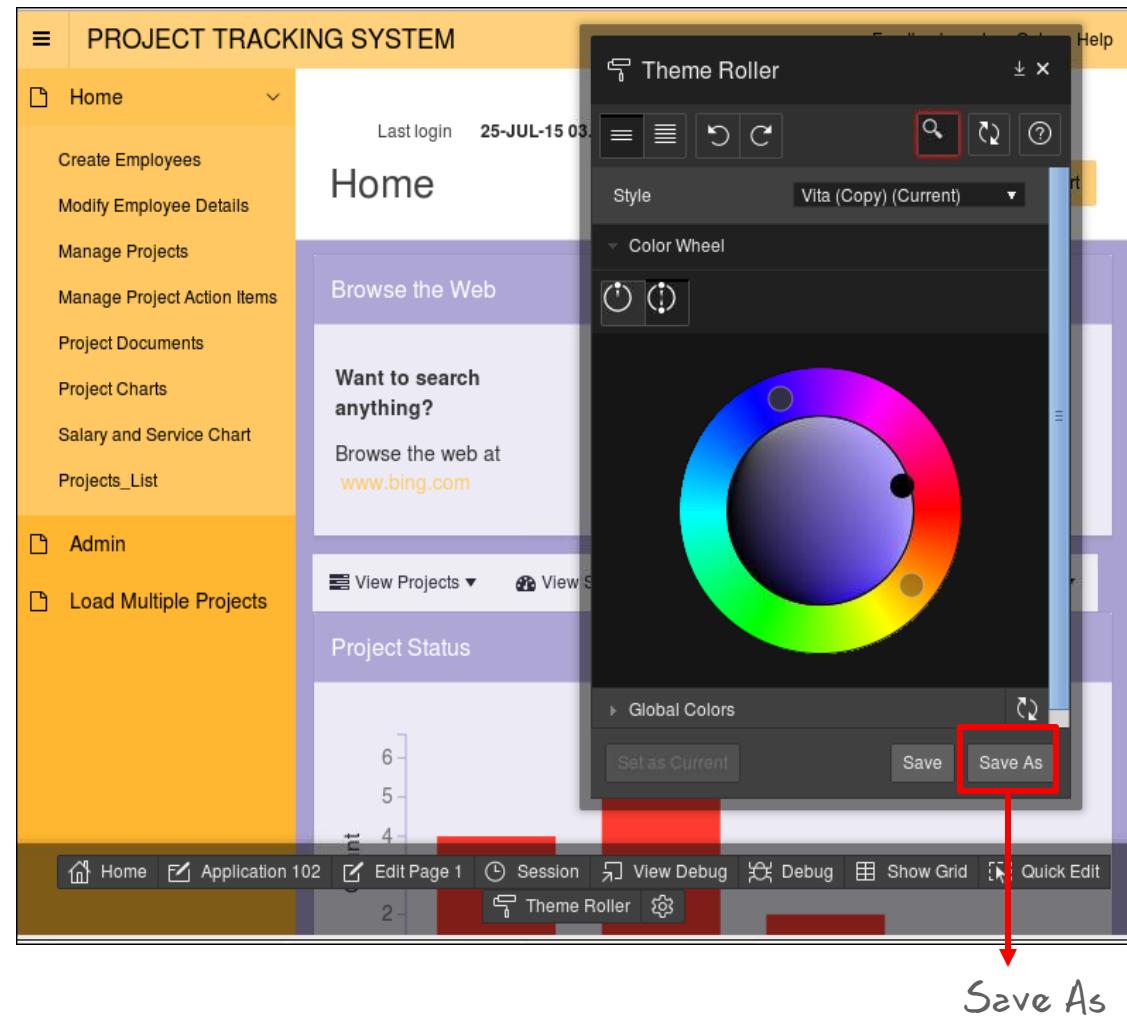
3

- To select a new style, choose an existing style from the Style list.



Using Theme Roller in PTS

- 4 To change all the colors of the theme style at once, drag the circles in the Color Wheel. You can choose between making your theme style dependent on one color (monochromatic) or two (dual).



Practice 10 Overview: Developing a New Theme for Your Application Using Theme Roller

In this practice, use Theme Roller to change the look and feel of the GMT application.

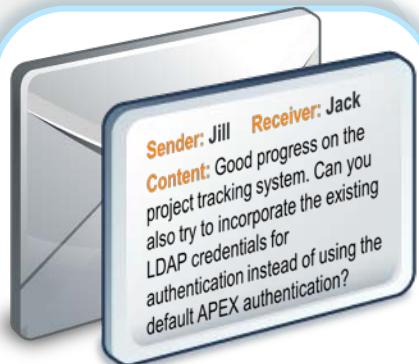
Summary

In this lesson, you should have learned how to develop a new theme for your application using Theme Roller.



Securing an Application

Securing PTS



Email by Jill



Blog page



Objectives

After completing this lesson, you should be able to:

- Prevent SQL Injection Attacks
- Prevent cross-site scripting
- Apply application-level security
- Authenticate users by using LDAP



Common Hacking Mechanisms

In this lesson, you learn to secure an APEX application against the following two common hacking mechanisms:

- SQL Injection
- Cross-Site Scripting



SQL Injection

SQL Injection is a technique for maliciously exploiting applications that use client-supplied data in SQL statements.

- Attackers trick the SQL engine into executing unintended commands.
- SQL Injection techniques may differ, but they all exploit a single vulnerability in the application.
- To immunize your code against SQL Injection Attacks, use bind arguments, or validate and sanitize all input concatenated to dynamic SQL.

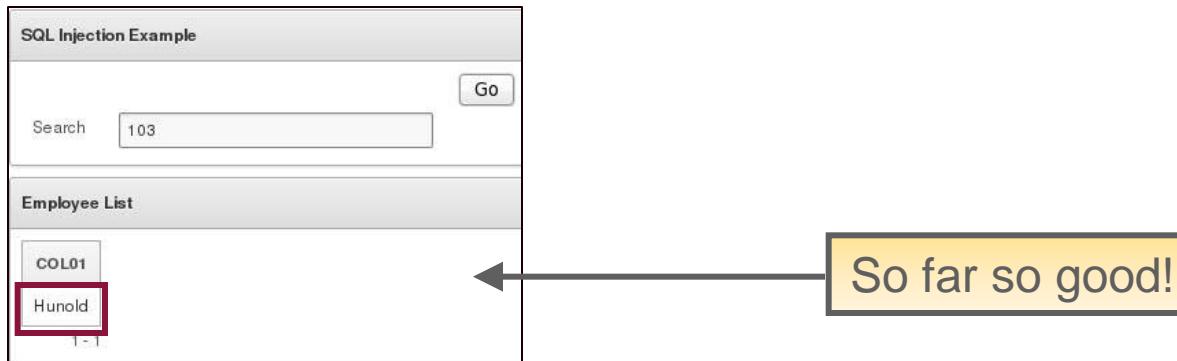


SQL Injection: Example

This page contains a search item and a PL/SQL process region with the following code:

```
declare
  lname varchar2(1000);
begin
  lname:= 'select last_name from oe/hr_employees where employee_id=' ||
  :P<n>_SEARCH;
  return lname;
end;
```

Execute the example and enter 103. Click Go.



SQL Injection: Example

Now try entering 103 union all select username from all_users.

All the names from the
all_users table are shown.
SQL Injection vulnerability!

SQL Injection Example

Search Go

Employee List

COL01
Hunold
ORA22
ORA21
ORA20
ORA19
ORA18
ORA17
ORA16
ORA15

Correcting SQL Injection: Using Bind Variables

Change the substitution string to use the bind variable:

```
declare
  lname varchar2(1000);
begin
  lname:= 'select last_name from oe/hr_employees where
employee_id=:P<n>_SEARCH';
  return lname;
end;
```

Execute the example and enter 103. Click Go.



Correcting SQL Injection: Using Bind Variables

However, entering 103 union all select username from all_users causes an error.

SQL Injection Example

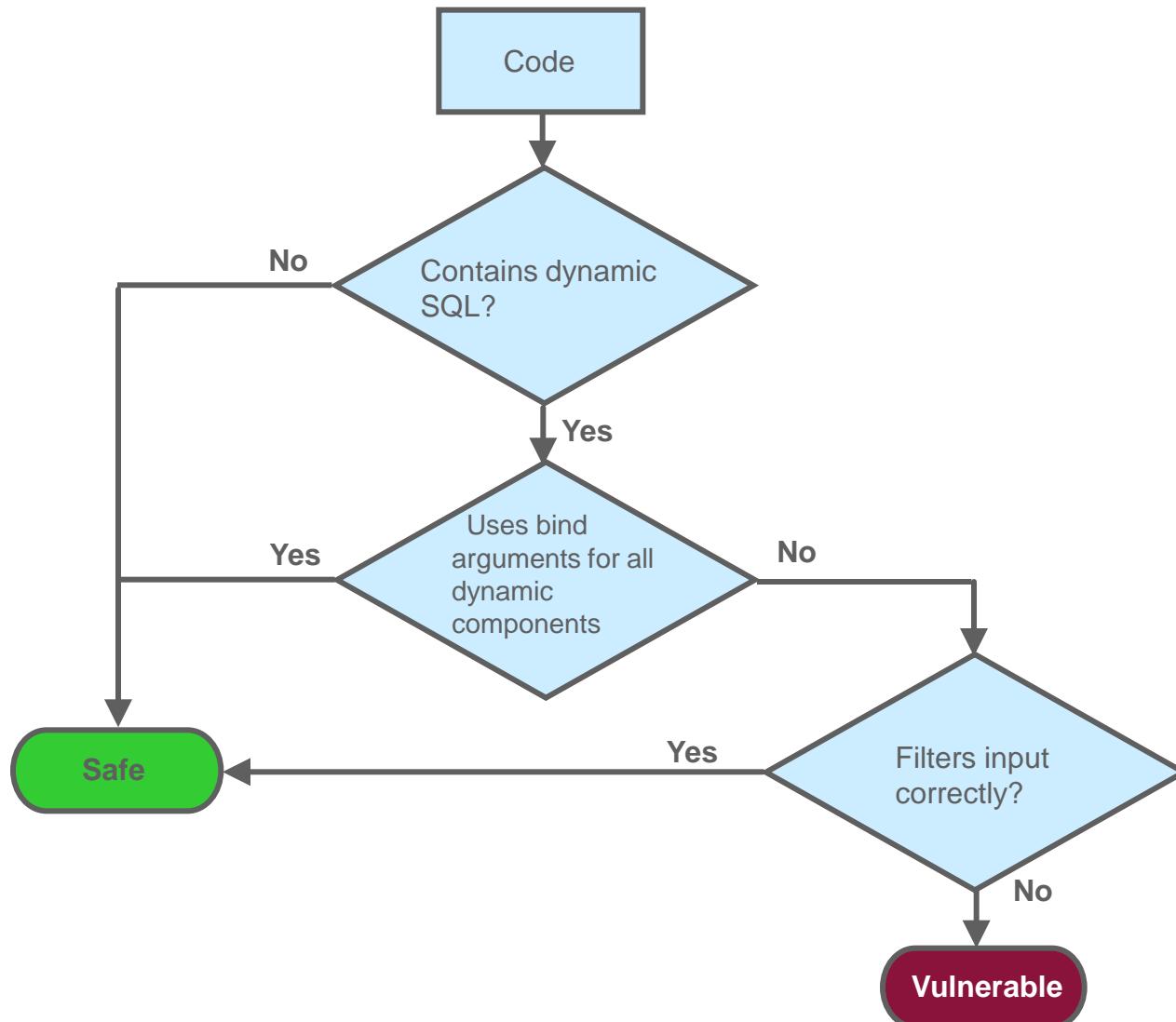
Search Go

Employee List

report error:
ORA-01722: invalid number

Bind variable can be used only to compare one value against another and cannot extend the query.

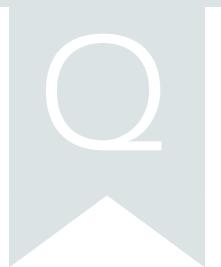
Assessing Vulnerability



Best Practices Against SQL Injection

Strategy	Description
Reduce the attack surface.	Ensure that all excess database privileges are revoked and only those routines that are intended for end-user access are exposed.
Avoid dynamic SQL with concatenated input.	Dynamic SQL built with concatenated input values presents the easiest entry point for SQL injections. Avoid constructing dynamic SQL this way.
Use bind arguments.	Parameterize queries by using bind arguments. Not only do bind arguments eliminate the possibility of SQL injections, they also enhance performance.
Filter and sanitize input.	<p>The Oracle-supplied DBMS_ASSERT package contains a number of functions that can be used to sanitize user input and to guard against SQL Injection in applications that use dynamic SQL built with concatenated input values.</p> <p>In case your filtering requirements cannot be satisfied by the DBMS_ASSERT package, you may need to create your own filter.</p>

Quiz



Code that is most vulnerable to SQL Injection Attacks:

- a. Input parameters
- b. Dynamic SQL with bind arguments
- c. Dynamic SQL with concatenated input values
- d. Call to external functions

Cross-Site Scripting

Cross-site scripting (also referred to as XSS) is a security breach that takes advantage of dynamically generated web pages.

- XSS happens when a web application is sent a script that activates when it is read by a user's browser.
- When activated, these scripts can steal data, even session credentials, and return the information to the attacker.
- These scripts could be rendered into HTML regions and other places within the application during normal page rendering.
- To prevent XSS, the Application Express engine escapes characters in certain cases.

Cross-Site Scripting: Example

1. Create a hidden item with default value “Welcome New User.”
2. Create a dynamic PL/SQL region with the
htp.p(:P<n>_H) ; source.

Cross-Site Scripting Demo

Print Value

Welcome New User

So far so good!

Cross-Site Scripting: Example

Replace the last ":" in the URL with the following script:

```
P<n>_H:<script>alert(document.cookie);</script>
```



Potentially harmful information can be displayed. XSS vulnerability!

Cross-Site Scripting: Example

To prevent XSS vulnerability, change the code in the dynamic PL/SQL region to escape the text sent to the browser:

```
htp.p(htf.escape_sc(:P<n>_H));
```

Cross-Site Scripting Demo

Print Value

```
<script>alert(document.cookie);</script>
```

The text is escaped and presented in the browser.

Specifying Browser Security

The screenshot shows the 'Edit Security Attributes' dialog for 'Application 20031'. The 'Security' tab is selected. Under the 'Browser Security' section, the following settings are configured:

- Cache:** Disabled
- Embed in Frames:** Deny
- HTML Escaping Mode:** Extended
- HTTP Response Headers:** An empty text area.

Buttons at the top right include 'Cancel' and 'Apply Changes' (highlighted with a blue border).

What Is a Directory?

- A directory is:
 - A special purpose, distributable database
 - Entry oriented
 - Used for storing and retrieving entries
- Applications that use directory services include:
 - Email address books
 - Corporate white pages
 - Centralized applications for managing credentials and privileges
 - Applications that configure and manage system resources

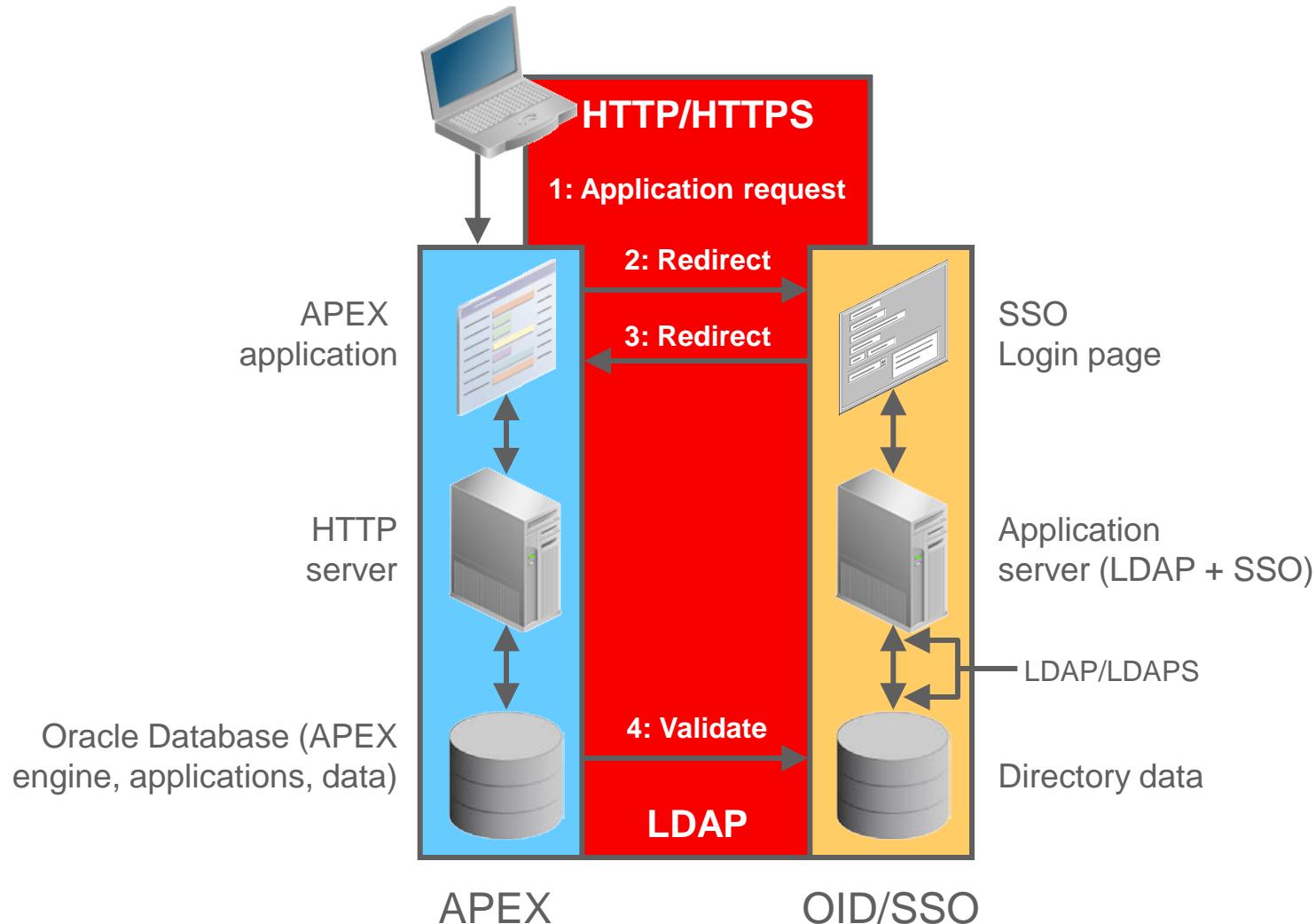
Oracle Internet Directory

Oracle Internet Directory is an LDAP v3 directory with the following characteristics:

- Scalability
- High availability
- Information security
- Integrated management



Technical Architecture: Overview



Authenticating Users by Using LDAP

1. Create users in Oracle Internet Directory.
2. Find the distinguished name (DN) of the users in Oracle Directory Services Manager.
3. Create an LDAP authentication scheme in Oracle APEX. By default, this scheme becomes your current authentication scheme.
4. Run the application and log in as an Oracle Internet Directory user.

Creating an LDAP Authentication Scheme in Oracle APEX

The image displays a step-by-step guide for creating an LDAP authentication scheme in Oracle APEX:

- Panel 1:** Shows the Oracle APEX navigation bar with 'Security' selected. The 'Authentication Schemes' link is highlighted with a blue box and circled with a large orange number '2'.
- Panel 2:** Shows the 'Authentication Schemes' page. The 'Create' button is highlighted with a blue box and circled with a large orange number '3'. A hand cursor icon is positioned over the 'Create' button.
- Panel 3:** Shows the 'Create Authentication Scheme' dialog box. The 'Method' section is visible, and the 'Create Scheme' dropdown is set to 'Based on a pre-configured scheme from the gallery' (radio button selected). The 'As a copy of an existing authentication scheme' option is also present. The 'Next >' button is highlighted with a blue box and circled with a large orange number '4'.

Creating an LDAP Authentication Scheme in Oracle APEX

7

Authentication Scheme

Name

* Name 5

* Scheme Type 6

Settings

* Host 6

Port 6

Use SSL 6

* Distinguished Name (DN) String 6

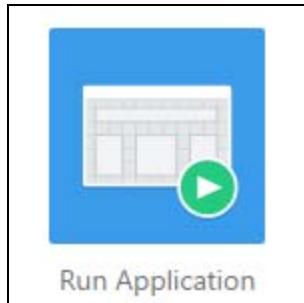
Use Exact Distinguished Name (DN) 6

LDAP Username Edit Function

Username Escaping 6

[Cancel](#) [Test LDAP Login](#) [Create Authentication Scheme](#)

Running the Application and Logging In as a User in Oracle Internet Directory



Sample Database Application

anupama Mobile Administration Help Logout

Home Customers Products Orders Reports

Search customers, orders and product data

Sales for this Month

3,565

Top Customers

Bradley, Eugene - 2 Order(s)	\$2,760.00
Logan, Edward - 2 Order(s)	\$2,420.00
Dulles, John - 1 Order(s)	\$2,380.00
Hartsfield, William - 2 Order(s)	\$2,370.00
LaGuardia, Fiorello - 1 Order(s)	\$1,090.00

Top Products

Jacket - 18 x \$1.50	\$2,700.00
----------------------	------------

Top Orders by Date

January 28, 2013	2,380
------------------	-------

Sample Database Application

Username: Anupama

Password: [REDACTED]

Login

To log in to the Sample Database application, please use your Application Express Workspace username and password.

For further information, please refer to "Utilizing Packaged Applications" in the Oracle Application Express Application Builder User's Guide.

Enter the username you created in OID.

Summary

In this lesson, you should have learned how to:

- Prevent SQL Injection Attacks
- Prevent cross-site scripting
- Apply application-level security
- Authenticate users by using LDAP



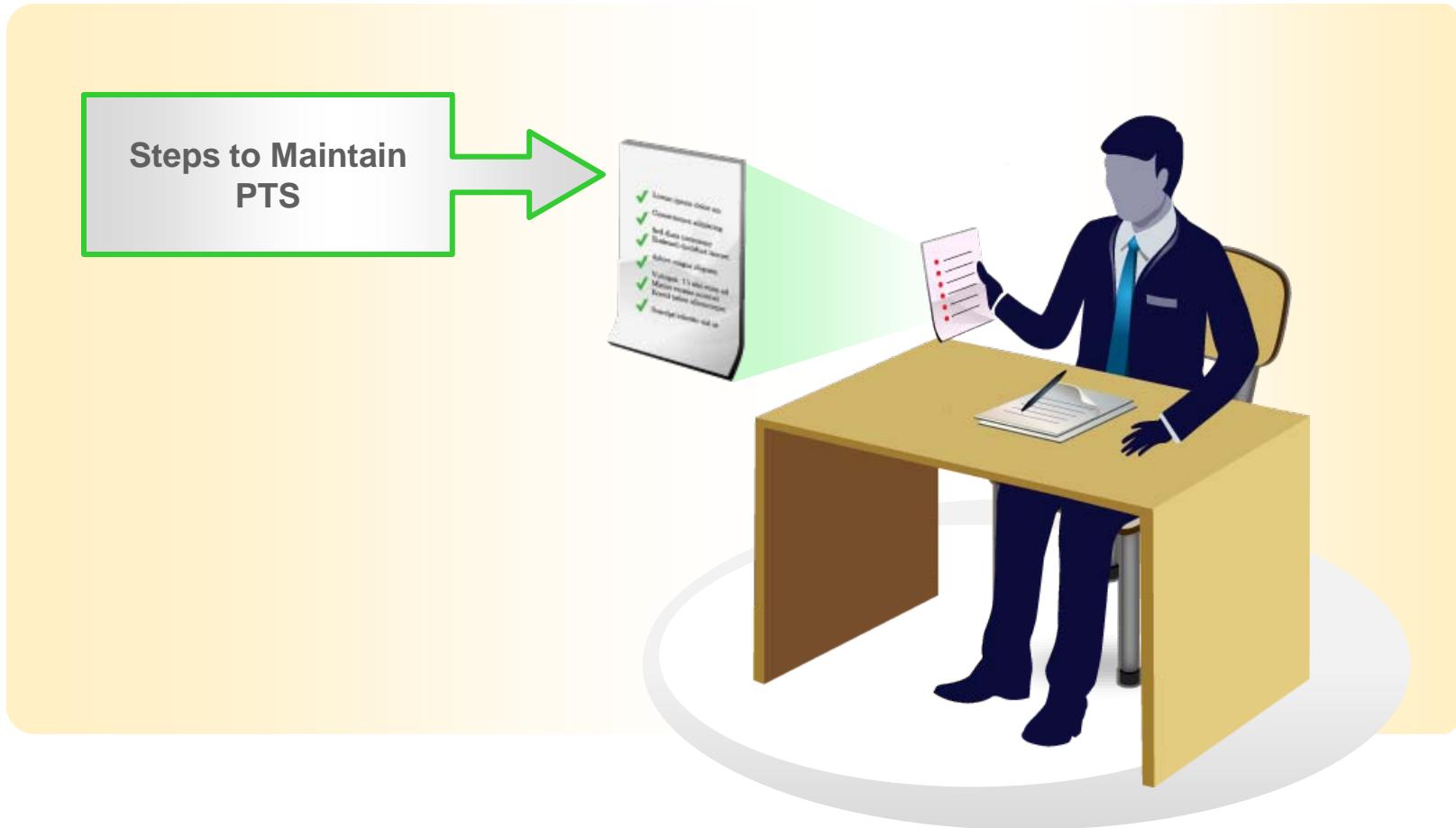
Practice 11-1 Overview: Securing an Application

This practice covers the following topics:

- Preventing SQL Injection Attacks

Deploying an Application

PTS Scenario



Objectives

After completing this lesson, you should be able to:

- Identify the supporting objects for an application
- Export an application and its supporting objects
- Import an application
- Install the supporting objects

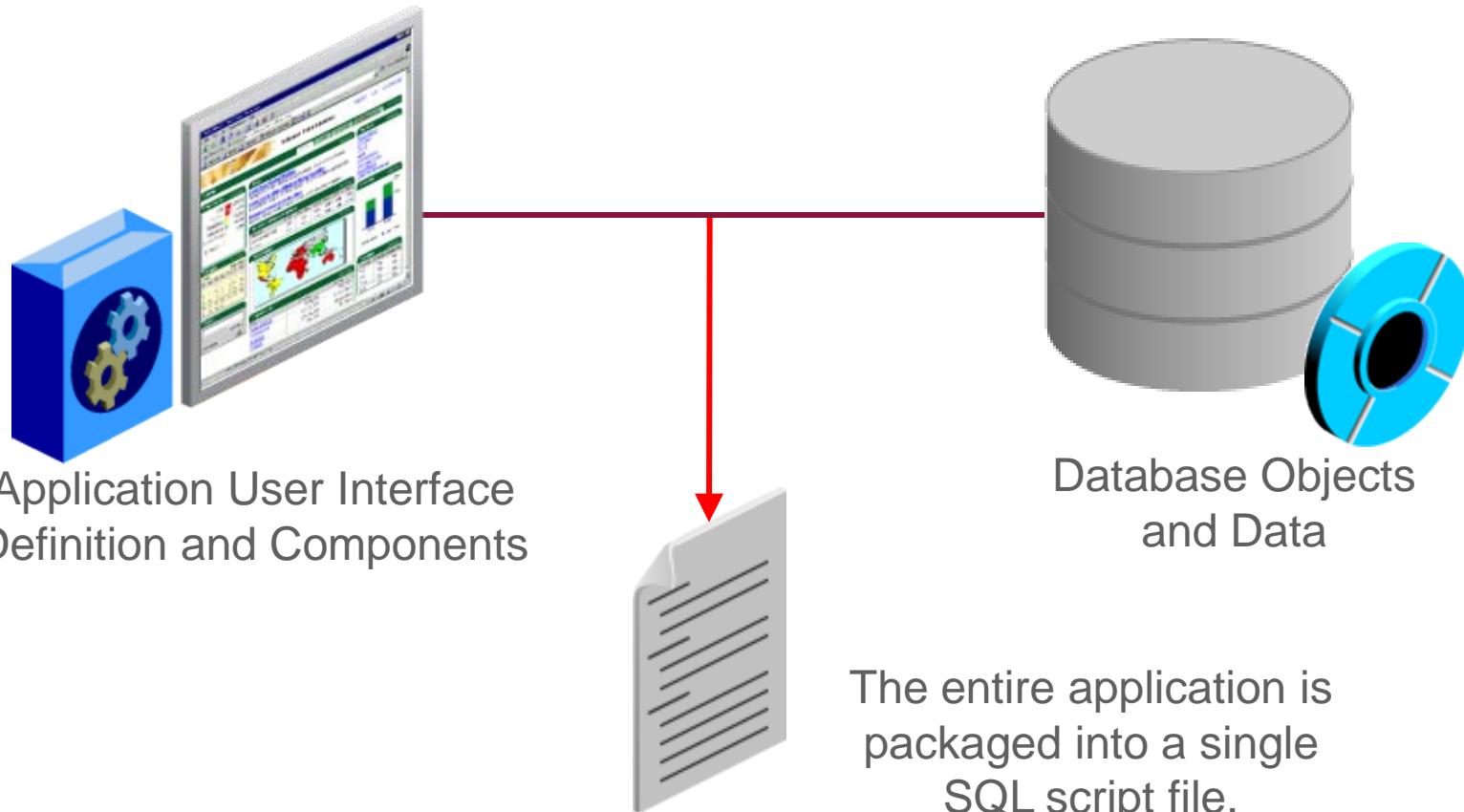


Steps to Deploy an Application

- 1.** Create a packaged application.
 - Identify the application's supporting objects.
 - Manage the supporting objects' definition.
 - Export the application.
- 2.** Import the packaged application.
- 3.** Install the packaged application.
- 4.** Publish the URL.

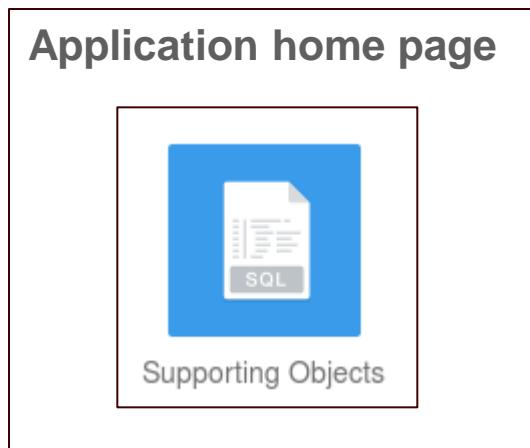
What Is a Packaged Application?

A packaged application simplifies the process of deploying an application.



What Are Supporting Objects?

Supporting objects are the database objects and data needed to run an application successfully.



Supporting Objects

Use this utility to define the database object definitions, images, and seed data to be included in your application export.

Application:	23159: Sample Database Application	Check for Objects:	No
Verify System Privileges:	Yes	Required Free KB:	100
Prompt for License:	No	Include in Export:	Yes

Installation	Upgrade	Deinstallation
<ul style="list-style-type: none">PrerequisitesApplication Substitution Strings 0Build Options 0Pre-installation Validations 0Installation Scripts 4Messages	<ul style="list-style-type: none">Upgrade Scripts 5Upgrade Message	<ul style="list-style-type: none">Deinstallation Script 1Deinstallation Message

Identifying the Supporting Objects for an Application

1



Utilities

2

**Database Object Dependencies**

Review the database objects referenced by this application.

3

Application	20922	Compute Dependencies		
Owner	Referenced Name	Referenced Type	Reference Count	
APEX5WSI	EMPLOYEES	Table	1	
	PROJECT_MEMBERS	Table	1	
APEX_050000	WWV_FLOW_GLOBAL	Package	2	
SALOME	APEX_ACCESS_CONTROL	Table	4	
	APEX_ACCESS_SETUP	Table	4	
	DOCUMENT_TYPES	Table	1	
	EMPLOYEES	Table	4	
	PROJECT_DOCUMENTS	Table	1	
	PROJECT_MEMBERS	Table	1	
	PROJECT_TYPES	Table	1	
	STATUS	Table	1	
	APEX_ACCESS_CONTROL	%	2	
	APEX_ACCESS_SETUP	%	2	
	DOCUMENT_TYPES	%	2	
	EMPLOYEES	%	5	
	PROJECTS	%	4	
	PROJECT_ACTIONITEMS	%	2	
	PROJECT_DOCUMENTS	%	2	
	PROJECT_MEMBERS	%	2	

Creating Installation Scripts

Installation

	Prerequisites	
	Application Substitution Strings	0
	Build Options	0
	Pre-installation Validations	0
	Installation Scripts	4
	Messages	

Specifying Prerequisites and Other Options

The screenshot shows the 'Prerequisites' tab selected in the top navigation bar of an Oracle application interface. The page title is 'Prerequisites'. The top menu includes 'Messages', 'Prerequisites' (selected), 'Substitutions', 'Build Options', 'Validations', 'Install', 'Upgrade', 'Deinstall', and 'Export'. Below the title, there is a section for 'Prerequisites' with a 'Cancel' button and a prominent 'Apply Changes' button. The first field is 'Required Free Space in KB:' with a value of '100'. The next section is 'Required System Privileges:' with several checkboxes:

- CREATE DATABASE LINK
- CREATE MATERIALIZED VIEW
- CREATE PROCEDURE
- CREATE SEQUENCE
- CREATE SYNONYM
- CREATE TABLE
- CREATE TRIGGER
- CREATE TYPE
- CREATE VIEW

A help icon (?) is located next to each privilege checkbox. Below this is a section titled 'Objects that will be Installed' with a note about avoiding errors due to pre-existing objects. It includes a 'Object Names' input field with an 'Add' and 'Remove' button, and a scrollable list area.

Application 20922 > Supporting Objects > Prerequisites

Messages Prerequisites Substitutions Build Options Validations Install Upgrade Deinstall Export

Prerequisites

Required Free Space in KB: ?

Required System Privileges:

- CREATE DATABASE LINK
- CREATE MATERIALIZED VIEW
- CREATE PROCEDURE
- CREATE SEQUENCE
- CREATE SYNONYM
- CREATE TABLE
- CREATE TRIGGER
- CREATE TYPE
- CREATE VIEW

?

Objects that will be Installed

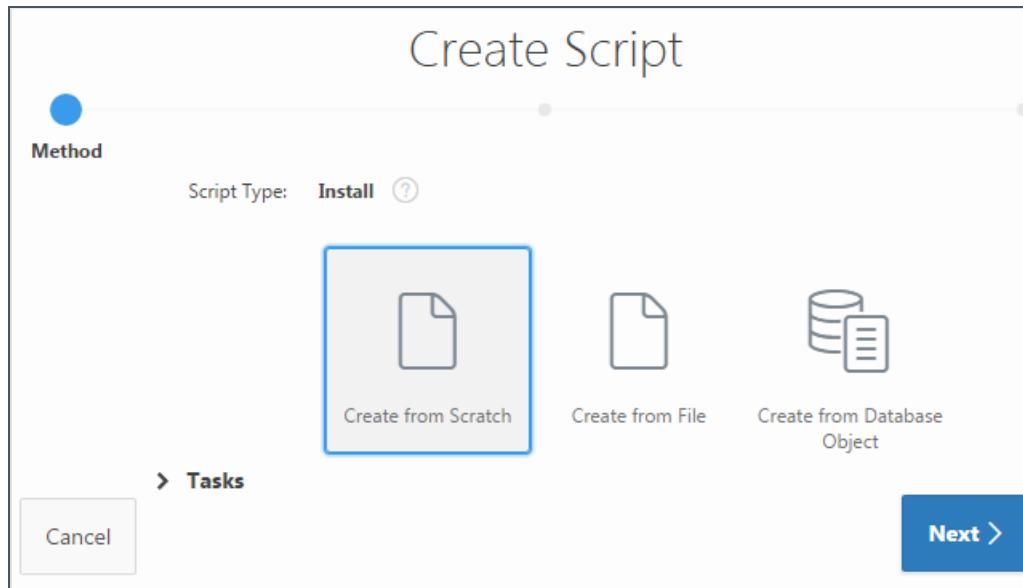
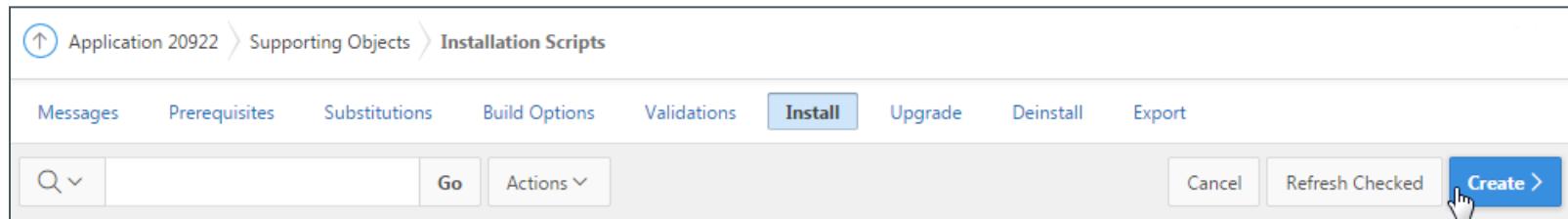
To avoid errors that may occur during the execution of the installation scripts due to pre-existing objects, we will check for the existence of objects with the names below. If any of them exist, the install will not proceed and the user will be provided the details.

Object Names ?

Specifying Build Options

The screenshot shows a software interface for managing application objects. At the top, there's a breadcrumb navigation: Application 20922 > Supporting Objects > Build Options. Below the navigation, a horizontal menu bar contains several tabs: Messages, Prerequisites, Substitutions, Build Options, Validations, Install, Upgrade, Deinstall, and Export. The 'Build Options' tab is currently selected, indicated by a blue background and white text. The main content area has a title 'Build Options' and a 'Cancel' button in the top right corner. A descriptive text below the title reads: 'Identify the build options that a user may change when installing this application.' Underneath this text, another message states: 'This application has no build options.'

Creating an Installation Script



Creating Upgrade Scripts

The screenshot shows the Oracle Upgrade interface. At the top left, there is a small window titled "Upgrade" with a "Upgrade Scripts" icon and the number "5". Below this, the main application window has a breadcrumb path: Application 20922 > Supporting Objects > Upgrade. The top navigation bar includes tabs for Messages, Prerequisites, Substitutions, Build Options, Validations, Install, **Upgrade**, Deinstall, and Export. The "Upgrade" tab is currently selected. Below the tabs is a search bar with a magnifying glass icon, a "Go" button, and an "Actions" dropdown. To the right are "Cancel" and "Create >" buttons. A message below the search bar states "No upgrade scripts found." In the lower section, there is a panel titled "Detect Existing Supporting Objects" with an "Apply Changes" button. It contains instructions for identifying existing supporting objects and a query editor. The query editor has a toolbar with icons for back, forward, search, and other database operations, and a results grid showing one row of data.

Creating Deinstallation Scripts

Deinstallation

 Deinstallation Script 1

Deinstallation Message

Application 20922 > Supporting Objects > Deinstall Script

Messages Prerequisites Substitutions Build Options Validations Install Upgrade **Deinstall** Export

Deinstall Script

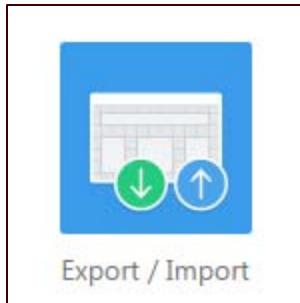
Cancel Create >

Define a script to drop database objects and static files that are created by the installation scripts.

Accessing the Export Page

a

From the Application home page



b

From the Supporting Object page

Tasks

[View Install Summary](#)

[Export Application](#)

[Install Supporting Objects](#)

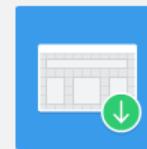
[Upgrade Supporting Objects](#)

[Remove All Supporting Objects](#)

What task would you like to perform?



Import



Export

Cancel

Next >

Exporting an Application

Export

Applications

Export Application

Choose Application

* Application: 20922 Project Tracking System_V1

Export Application

Selected Application: Project Tracking System_V1

Page Count: 33

Owner: SALOME

File Format: UNIX

Owner Override:

Build Status Override: Run and Build Application

Debugging: Yes

As of: minutes ago (~ 5 min delay)

File Character Set: Unicode UTF-8

Export Preferences

Export Supporting Object Definitions: Yes

Export Public Interactive Reports: Yes

Export Private Interactive Reports: No

Export Interactive Report Subscriptions: No

Export Developer Comments: Yes

Export Translations: Yes

Export with Original IDs: No

Quiz

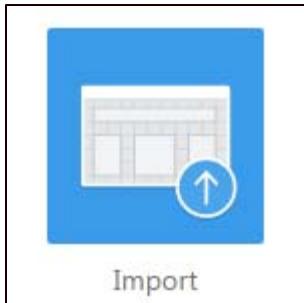


Before the application installation can proceed, the installer should check whether there is enough disk space to create all the objects that are needed. Where would you specify the required free space?

- a. Supporting Objects > Build Options
- b. Supporting Objects > Validations
- c. Supporting Objects > Install
- d. Supporting Objects > Prerequisites

Importing an Application

1



2

Import

Select the file you wish to import to the export repository. Once imported, you can install your file.

If the imported file is a packaged application export, the installation wizard will allow you to run the packaged installation scripts after installing the application definition.

* Import file PTS_APEX5.0_WSI.sql

* File Type: Database Application, Page or Component Export
 Websheet Application Export
 Plug-in
 Theme Export
 User Interface Defaults
 Team Development Feedback
 CSS Export [Deprecated]
 Image Export [Deprecated]
 File Export [Deprecated]

File Character Set

3

Import

File Import Confirmation

The export file has been imported successfully.

If you wish to install now, click the **Next** button. You can also install this file at a later time by navigating to the Export Repository.

> Tasks

Installing the Application

Install Database Application

When you install an application having the same ID as an existing application in the current workspace, the existing application is deleted and then replaced by the new application. If you attempt to install an application having the same ID as an existing application in a different workspace, a benign error message displays. If you are importing a packaged Application Express application, the installation wizard will allow you to install supporting objects.

Current Workspace: SALOME [?](#)

Export File Workspace ID: 222973639628611653 [?](#)

Export File Application ID: 14594 [?](#)

Export File Version: 2013.01.01 [?](#)

Export File Parsing Schema: APEX5WSI [?](#)

This application was exported from another workspace. [?](#)

* Application Origin: SALOME [?](#)

* Parsing Schema: Run and Build Application [?](#)

* Build Status: [?](#)

* Install As Application: Auto Assign New Application ID [?](#)
 Reuse Application ID 14594 From Export File
 Change Application ID

> Tasks

Cancel

Install

1

Install Application

Install Application

Supporting Objects

This application installer will guide you through the process of creating your database objects and seed data.

Application: 20031 - Project Tracking System_V1 [?](#)

Parsing Schema: SALOME [?](#)

Free Space Required in KB: 100 [?](#)

Install Supporting Objects: Yes [?](#)
 No

> Tasks

Cancel

Next >

2

Application Installed

Your imported file is located in the [Export Repository](#). Unless you plan to install it again, you should remove it.

Edit Application

Run Application

3

Publishing the Application URL

`http://app.oracle.com:8080/apex/f?p=<app_id>`

Provide this URL
to end users of the application
if your setup uses the
embedded PL/SQL gateway or
the APEX Listener.

`http://app.oracle.com/pls/apex/f?p=<app_id>`

Provide this URL
to end users of the application
if your setup uses Oracle
HTTP Server with `mod_plsql`.

Quiz



Which of the following can you export by using the Export/Import utility? (Select all that apply.)

- a. Application
- b. Uploaded cascading style sheets
- c. Uploaded images

Summary

In this lesson, you should have learned how to:

- Identify the supporting objects for your application
- Export your application
- Import your application
- Install the supporting objects



Practice 12 Overview: Deploying and Maintaining Your Application

This practice covers the following topics:

- Identifying which supporting database objects you want to export into a single file
- Exporting an application

Optimizing Your APEX Application

Optimizing the PTS Application



Objectives

After completing this lesson, you should be able to:

- Manage your services
- Monitor the activity of your application
- Monitor and improve the performance of your application



Application Performance Considerations

- Enable Caching
- Place image files on file system rather than upload into APEX
- Minimize number of JavaScript files
- Minify JavaScript and CSS files
- Create a sprite image combined into one image file
- Refer CSS files in the header tags and JavaScript in the HTML file
- Make XHR response small

Managing Services

[Manage Service](#)

Manage Service

[Make a Service Request](#)
Request access to a database schema, additional storage, or to terminate the workspace.

[Edit Message](#)
Edit the Workspace Message.

[Set Workspace Preferences](#)
Configure functionality available to developers within this workspace.

[Workspace Utilization](#)
View the workspace summary report, including schema and activity details.

[Manage Meta Data](#)

- [Developer Activity and Click Count Logs](#) >
- [Session State](#) >
- [Application Cache](#) >
- [Websheet Database Objects](#) >
- [Application Build Status](#) >
- [File Utilization](#) >
- [Interactive Report Settings](#) >

Monitoring Activity

Monitor Activity

Real Time Activity Archived Activity

[View Dashboard](#)

Page Views	Developer Activity	Sessions
By View > By Application > By Application and Page > By Day > By Hour > By Interactive Report >	By Developer > By Developer Bar Chart > By Day > By Application > Application Changes, detailed > By Day, Monthly View >	Active Sessions > Bar Chart of Active Sessions by Hour
Most Viewed Pages over All Applications > Monthly	By User Agent > By Browser > By Platform >	Login Attempts > Login Attempts by Authentication Result

Monitoring Activity: Page Views Reports

Page Views

- By View >
- By Application >
- By Application and Page > (Mouse cursor)
- By Day >
- By Hour >
- By Interactive Report >

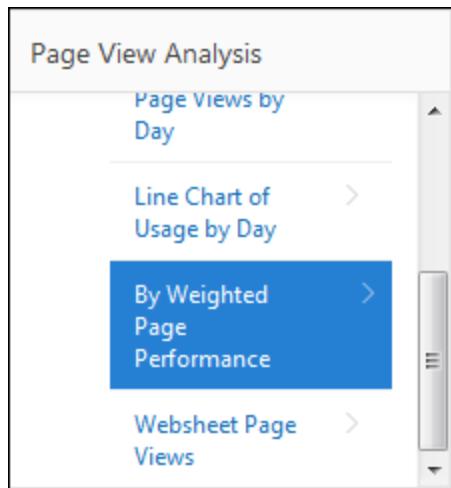
Monitor Activity > Page Views by Application and Page

Since: 1 day

Q Go Actions ▾

Application	Page	Average Elapsed	Distinct Users	Distinct Sessions	Page Events	Partial Page Views	Cached Regions	Page Name
4000	4500	0.447	1	1	26	0	0	Page Designer
4000	9	0.390	1	1	11	0	0	Shared Components
4000	4003	0.969	1	1	9	2	0	Templates
4000	4761	0.505	1	1	9	0	0	Translate Application
4000	1	0.608	1	2	8	0	0	Application Builder
10499	6	0.147	2	1	8	0	0	Projects1
4000	1000	0.083	1	1	6	0	0	Run Page
4000	571	0.525	1	1	5	0	0	Copy Template - New Template
4000	385	5.398	1	1	5	0	0	Seed and Publish Translatable Text
4000	1500	0.336	1	2	5	0	0	Application Builder
4000	4150	0.372	1	1	5	0	0	Page Definition

Monitoring Activity: Page View Analysis Reports



The screenshot shows a report titled "Monitor Activity > Page Views by Weighted Page Performance". The search bar includes "Since 1 day", "Application - All Applications -", and a "Set" button. The table has the following columns:

Application	Page	Page Name	Page Events	Average Elapsed	Weighted Average	Median Elapsed	Weighted Median	Median Content
10499	6	Projects1	8	0.1467	1.1735	0.1397	1.1175	
10499	101	Login Page	2	0.2362	0.4725	0.2362	0.4725	
10499	7	Form on PTS_PROJECTS	2	0.1896	0.3793	0.1896	0.3793	

Page number 1 - 3 is visible at the bottom right of the table.

Database Configuration Considerations

- Oracle APEX requires that the shared pool size of the target database be at least 150 MB.
- To check and change SHARED_POOL_SIZE, execute the following commands:

```
sqlplus / as sysdba
STARTUP
SHOW PARAMETER PFILE;
SHOW PARAMETER SHARED_POOL_SIZE;
ALTER SYSTEM SET SHARED_POOL_SIZE='150M' SCOPE=spfile;
SHUTDOWN
STARTUP
```

- If the system uses an initialization parameter file, check the `init<sid>.ora` file to make sure that the value of SHARED_POOL_SIZE is at least 150 MB.

Monitoring Application Performance

Reference session state values by using bind variables within your application:

```
select * from (
  select * from employees)
where (
  instr(upper("LAST_NAME") ,upper(nvl(:P<n>_REPORT_SEARCH,"LAST_NAME" ))) > 0 )
```

Report Search

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	PHONE_NUMBER	EMAIL
204	Hermann	Baer	515.123.8888	HBAER
116	Shelli	Baida	515.127.4563	SBAIDA
167	Amit	Banda	011.44.1346.729268	ABANDA
172	Elizabeth	Bates	011.44.1343.529268	EBATES
106	Valli	Pataballa	590.423.4560	VPATABAL

Monitoring Application Performance: #TIMING# Substitution String

Include the #TIMING# substitution string in the region footer.

The screenshot shows the page structure of an Oracle Application Express application. It includes a 'Header and Footer' region at the top, a 'Region Header' and 'Region Footer' for the main content area, and a 'Project Tracking System' report region below.

Header and Footer: This region contains the standard Oracle APEX header.

Region Header: This region is currently empty.

Region Footer: This region contains the text "This page took #TIMING# CPU seconds." which is highlighted with a red box.

Project Tracking System: This is a report region displaying employee data. The columns are: Emp Id, Emp First Name, Emp Last Name, Emp Email Id, Emp Phone, and Emp Mobile. The data is as follows:

Emp Id	Emp First Name	Emp Last Name	Emp Email Id	Emp Phone	Emp Mobile
EMP017	Martin	Johnson	martin.johnson@pts.com	3157862402	2221115555
EMP019	Adams	Henry	adams.henry@pts.com	3157862404	3452326789
EMP021	Miller	Emanuel	miller.emmanuel@pts.com	3157862406	2321213333

Report Footer: This region contains the text "This page took 0.09 CPU seconds." which is highlighted with a red box.

Monitoring Application Performance: Object Reports

Utilities

Data Workshop
Load and unload data using text files, XML, or a spreadsheet.

Generate DDL
Generate scripts for all or selected database objects within a schema.

Methods on Tables
Generate API scripts for DML operations on specified tables.

Object Reports
Access numerous reports on tables, exceptions, security, objects and PL/SQL code.

Schema Comparison
Show differences between database objects in two different schemas.

Utilities > Object Reports

Table Reports	Security Reports
Table Columns Table Comments Table Constraints Table Statistics Table Storage Sizes	Object Grants Column Privileges Role Privileges System Privileges
PL/SQL Reports	All Object Reports
Program Unit Arguments Unit Line Counts Search PL/SQL Source Code	All Objects Invalid Objects Object Creation Calendar Object Counts by Type Data Dictionary
Exception Reports	
Tables without Primary Keys Tables without Indexes Unindexed Foreign Keys Tables without Triggers	

Monitoring Application Performance: Caching

Caching reduces the time taken to render page or region. If cached, the page or region is rendered from a cached repository instead of being rendered dynamically.

The screenshot shows the 'Page Attributes' dialog for page 12 of 17. The 'Server Cache' section is selected. It includes fields for 'Cache Page' (set to 'Enabled'), 'Cache Timeout' (set to '6 hours'), and 'Cache Page Condition' (set to '- Select Condition Type -'). Below these are options for PL/SQL conditions like 'item / column=value', 'item / column not null', 'item / column null', 'request=e1', 'exists', and 'never none'. The 'Apply Changes' button is highlighted in blue at the top right.

Monitoring Application Performance: Tracing Your Session

1. In APEX, specify &p_trace=YES in URL.

```
http://<hostname>:<port>/apex/f?p=100:101&p_trace=YES
```

2. Navigate to the trace directory and execute the TKPROF utility.

```
tkprof <tracefilename.trc> <tracefilename>.prf SORT=PRSDSK,  
EXEDSK, FCHDSK PRINT=10
```

3. View the TKPROF analysis output.

Monitoring Application Performance: Database Monitor

The screenshot shows the Oracle Database Utilities interface. At the top, there are tabs: Application Builder, SQL Workshop (which is selected), Team Development, and Packaged Apps. Below the tabs, under the Utilities section, there are several options:

- Data Workshop**: Load and unload data using text files, XML, or a spreadsheet.
- Generate DDL**: Generate scripts for all or selected database objects within a schema.
- Methods on Tables**: Generate API scripts for DML operations on specified tables.
- Object Reports**: Access numerous reports on tables, exceptions, security, objects and PL/SQL code.
- Schema Comparison**: Show differences between database objects in two different schemas.
- Query Builder**: Build queries graphically by adding tables into a panel, and selecting columns to return.
- User Interface Defaults**: Specify layout properties to consistently generate items / columns across pages and applications.
- About Database**: Review database details. Note: A Database account granted the DBA role is required.
- Database Monitor**: Run database activity reports. Note: A Database account granted the DBA role is required. This option is highlighted with a red box and a cursor icon pointing to it.
- Recycle Bin**: Restore database objects that have been dropped.

The screenshot shows the Oracle Database Monitor interface. At the top, there are tabs: Application Builder, SQL Workshop (selected), and Utilities. Under the Utilities section, there are several monitoring options:

- Activity**
- Sessions**
- System Statistics**
- Top SQL**
- Long Operations**

Monitoring Application Performance: Locks

Locks prevent destructive interaction between transactions accessing the same resource.

Locks								
Status	SID	Instance ID	Username	Osuser	Client Info	Module	Object Owner	Object Name
	142	1	ORA01	oracle	-	SQL*Plus	ORA01	OEHR_EMPLOYEES
	30	1	APEX_PUBLIC_USER	oracle	ORA01_ADMIN:2715024486760901	APEX - SQL Workshop - No Autocommit	ORA01	OEHR_EMPLOYEES

Monitoring Application Performance: Tuning SQL

- Use bind variables whenever possible.
- Ensure that an optimal query plan is being used for the query.
- Enable SQL tracing for an entire page view to analyze with the Oracle utility, TKPROF.
- Use the hierarchical PL/SQL profiler to determine which functions contain inefficient PL/SQL code.

Monitoring Application Performance: Tuning Page Elements

- Set page processes to run per page (rather than per session).
- Optimize global page components.
- Use declarative conditions.
- Use “Rows X to Y” pagination for reports rather than “Rows X to Y of Z.”

Practice 13 Overview: Managing and Monitoring Your Application

This practice covers answering questions about:

- Managing your services
- Monitoring the activity of your application
- Monitoring and improving the performance of your application

Summary

In this lesson, you should have learned how to:

- Manage your services
- Monitor the activity of your application
- Monitor and improve the performance of your application



Globalization And Translation

Translating the PTS Application



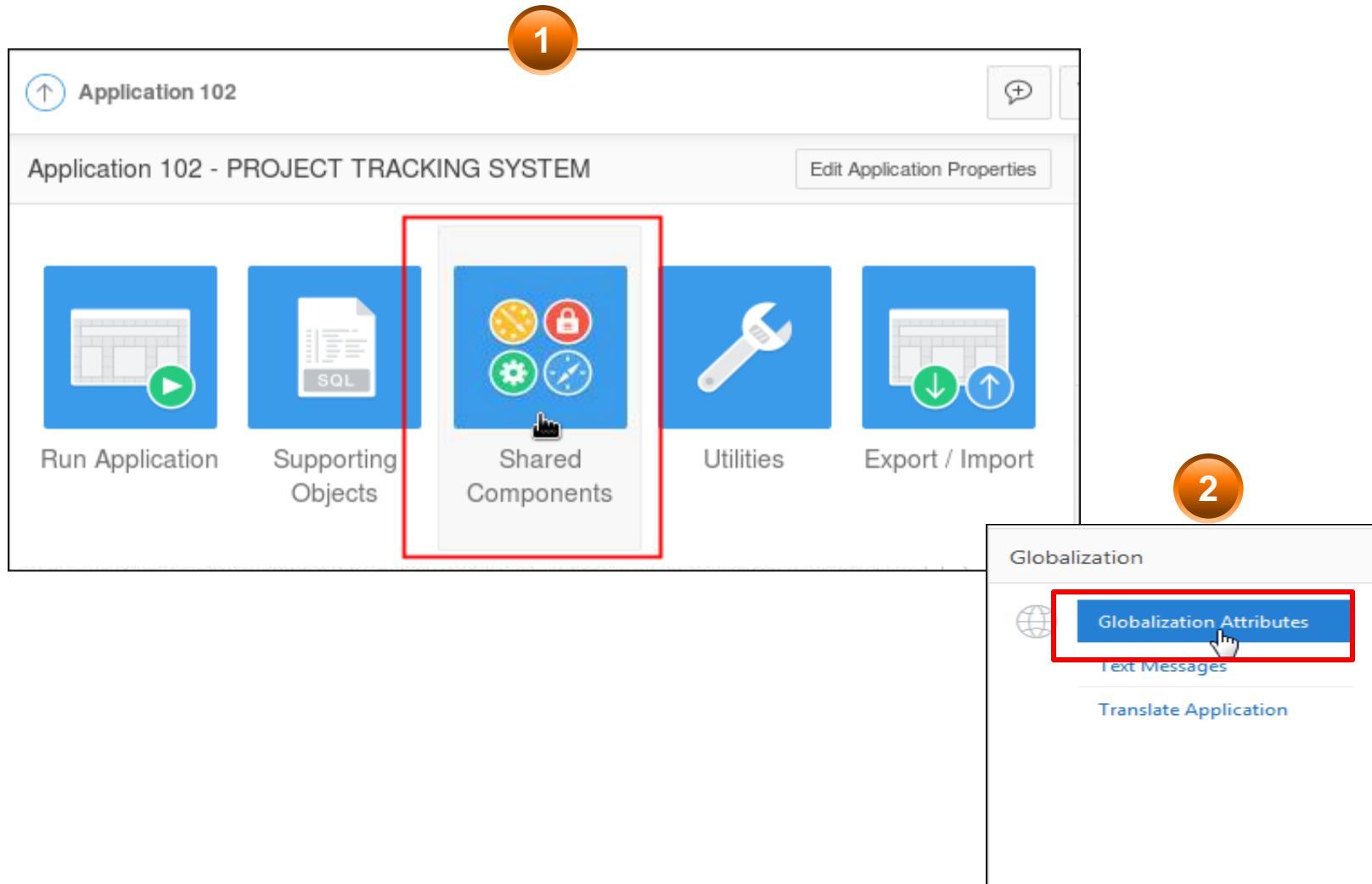
Objectives

After completing this lesson, you should be able to:

- Configure globalization attributes in an application
- Translate an application
- Specify a primary language for an application
- Translate messages used in PL/SQL procedures



Accessing the Globalization Attributes Page



Editing the Globalization Attributes Page

Definition Security **Globalization** User Interface

Application 102 Cancel **Apply Changes**

Globalization

Application Primary Language	English (en)	?
Application Language Derived From	Application Primary Language	?
Application Date Format	DD-MON-YYYY	?
Application Date Time Format		?
Application Timestamp Format		?
Application Timestamp Time Zone Format		?
Character Value Comparison		?
Character Value Comparison Behavior	Database session NLS setting (default)	?
Automatic Time Zone	No	?
Automatic CSV Encoding	Yes	?

No translations found

Translating an Application and Globalization Support

To translate an application built in APEX:

- Map the primary and target application IDs
- Seed and export the text to a file for translation
- Translate the text in the file
- Apply the translated file
- Publish the translated file

Step 1: Mapping the Target Language

2

Globalization

- Globalization Attributes
- Text Messages
- Translate Application

3

How to Translate

Define application languages
Map primary language application to translated applications.

Seed translatable text
Copy the translatable text from the primary application into the translation repository.

Download XLIFF translation files
Download files with translatable text from the translation repository.

Translate text
Send XLIFF files for translation or manually edit translation repository.

4

Actions ▾ Cancel Create >

5

Create/Edit Application Language Mapping

To perform a translation, you create a unique application ID for the translated application. Use this page to map an existing application ID to a translation application ID. Note that when an application mapping is deleted, any corresponding translated applications are also deleted.

Primary Language Application 102 PROJECT TRACKING SYSTEM

* Translation Application 50004

* Language French (France) (fr)
Brazilian Portuguese, Chinese (China), Chinese (Taiwan), English, French, German, Italian, Japanese, Korean, Spanish

Image Directory

Comments

> Application Language Mappings

Cancel Create

Step 2: Seeding and Downloading to a Translation File

3

How to Translate

Define application languages
Map primary language application to translated applications.

Seed translatable text
Copy the translatable text from the primary application into the translation repository.

Download XLIFF translation files
Download files with translatable text from the translation repository.

4

Primary Language Application: 102

Cancel Publish Download > Seed

Translated Application	Language	Published	Strings	Distinct Strings	Requires Synchronization
<input type="checkbox"/>	French (France) (fr)				Yes
<input checked="" type="checkbox"/> 50004					

XLIFF Export

Export XLIFF File for Application

Download XLIFF file for complete Application

* Language French (France) (fr)

Include XLIFF Target Elements

Export: All translatable elements
 Only those elements requiring translation

Step 3: Translating the XLIFF File

The screenshot shows a software interface with a sidebar on the left containing five items:

- How to Translate
 - from the primary application into the translation repository.
 - Download XLIFF translation files**
Download files with translatable text from the translation repository.
 - Translate text**
Send XLIFF files for translation or manually edit translation repository. (selected)
 - Apply XLIFF translation files**
Upload XLIFF files with translated text and apply translations to the translation repository.
 - Publish translated

The 'Translate text' item is highlighted with a blue background and a white hand cursor icon pointing at it. To its right is a large callout box with the title 'Translate Text' and two paragraphs of descriptive text, along with a 'Cancel' button at the bottom-left.

Step 4: Applying XLIFF Translation Files

3
Copy the translatable text from the primary application into the translation repository.

Download XLIFF translation files
Download files with translatable text from the translation repository.

Translate text
Send XLIFF files for translation or manually edit translation repository.

Apply XLIFF translation files
Upload XLIFF files with translated text and apply translations to the translation repository. 

Publish translated applications
Make the translated applications available to users.

4
 **Upload Files >**

Created By **Apply to Translation**

5
XLIFF Upload
Upload up to ten translated XLIFF files into the XLIFF repository. XLIFF files uploaded into the XLIFF file repository should **only** be translated files which were first generated via the XLIFF Export operation.

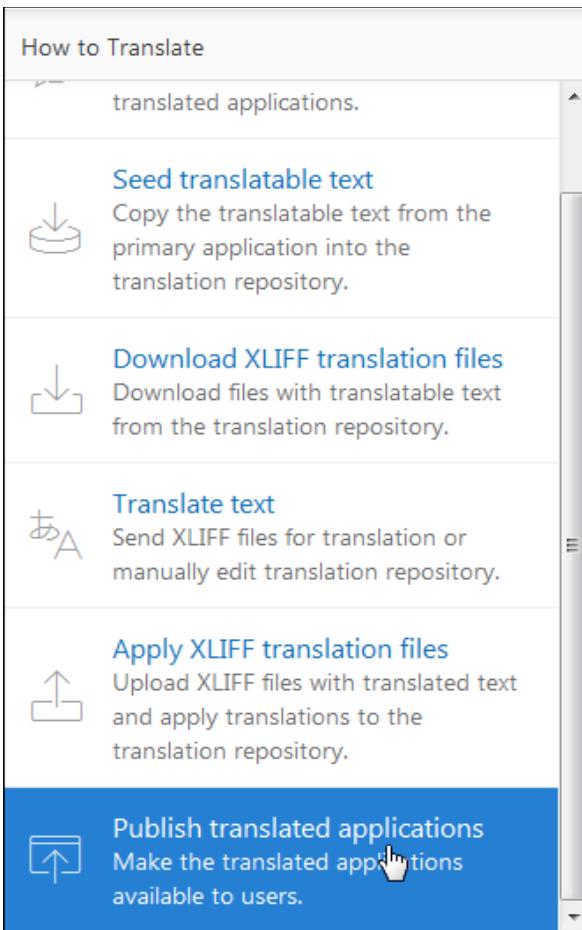
* 1 **Browse...** f102_50004_en_fr.xlf
2 **Browse...** No file selected.
3 **Browse...** No file selected.
4 **Browse...** No file selected.
5 **Browse...** No file selected.
6 **Browse...** No file selected.
7 **Browse...** No file selected.
8 **Browse...** No file selected.
... No file selected.
... No file selected.

Upload 

<input type="checkbox"/>	Filename	Document Size	Created	Created By	Apply to Translation
<input checked="" type="checkbox"/>	f102_50004_en_fr.xlf	117KB	1 seconds ago	APEX	102 >> 50004 (fr) 

Step 5: Publishing the Application

3



4

The screenshot shows a table for publishing applications:

Primary Language Application: 102		Cancel	Seed	Download >	Publish
Translated Application	Language	Published	Distinct Strings	Requires Synchronization	
<input checked="" type="checkbox"/> 50004	French (France) (fr)		13,177	1,038	Yes

Specifying the Primary Language for an Application

The screenshot shows a navigation menu on the left with the following items:

- Globalization
- Globalization Attributes** (highlighted with a blue background)
- Text Messages
- Translate Application

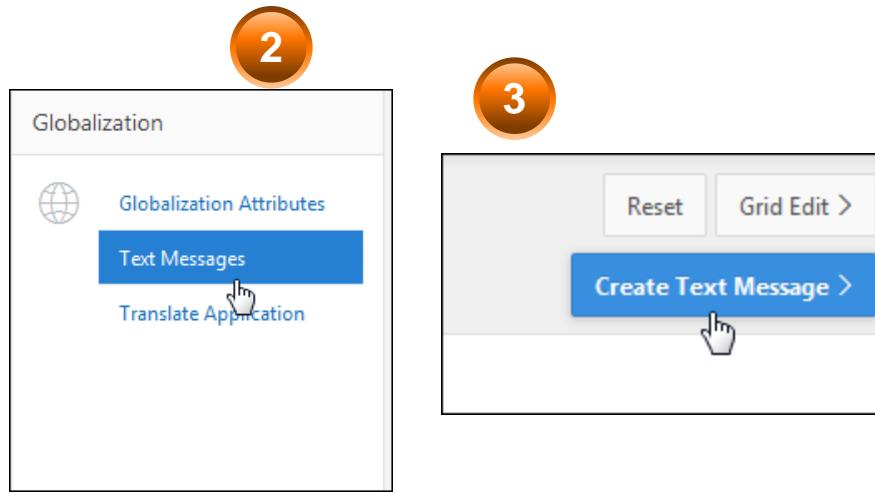
Application 102

Cancel **Apply Changes**

Globalization

Application Primary Language	English (en)	?
Application Language Derived From	Application Primary Language	?
Application Date Format	DD-MON-YYYY	?
Application Date Time Format		?
Application Timestamp Format		?
Application Timestamp Time Zone Format		?
Character Value Comparison		?
Character Value Comparison Behavior	Database session NLS setting (default)	?
Automatic Time Zone	No	?

Translating Messages Used in PL/SQL Procedures



Create/Edit Text Message

Messages are designed to provide translation services for use in PL/SQL.

Application: 102 PROJECT TRACKING SYSTEM

* Name: GOOD_MORNING

Language: English (en)

Used in JavaScript: No

Text (Example: Tax: %0 Total amount %1): Good Morning %1

Cancel Create And Create Another Create Text Message

Syntax for APEX_LANG.MESSAGE

```
BEGIN
  --
  -- Print the greeting
  --
APEX_LANG.MESSAGE('GOOD_MORNING',
  V('APP_USER'));
END;
```

Create/Edit Text Message

Action processed.

Messages are designed to provide translation services for use in PL/SQL.

Application: 102 PROJECT TRACKING SYSTEM

* Name: GOOD_MORNING

Language: French (France) (fr)

Used in JavaScript: No

Text (Example: Tax: %0 Total amount %1): bonjour %0

Cancel Create And Create Another Create Text Message

Practice 14 Overview: Applying Globalization and Translation

This practice covers the following:

- Configuring globalization attributes in an application
- Translating an application
- Specifying a primary language for an application
- Translating messages used in PL/SQL procedures

Summary

In this lesson, you should have learned how to:

- Translate an application
- Specify the primary language of an application
- Translate messages used in PL/SQL procedures



Oracle Database Exadata Express Cloud Service

Objectives

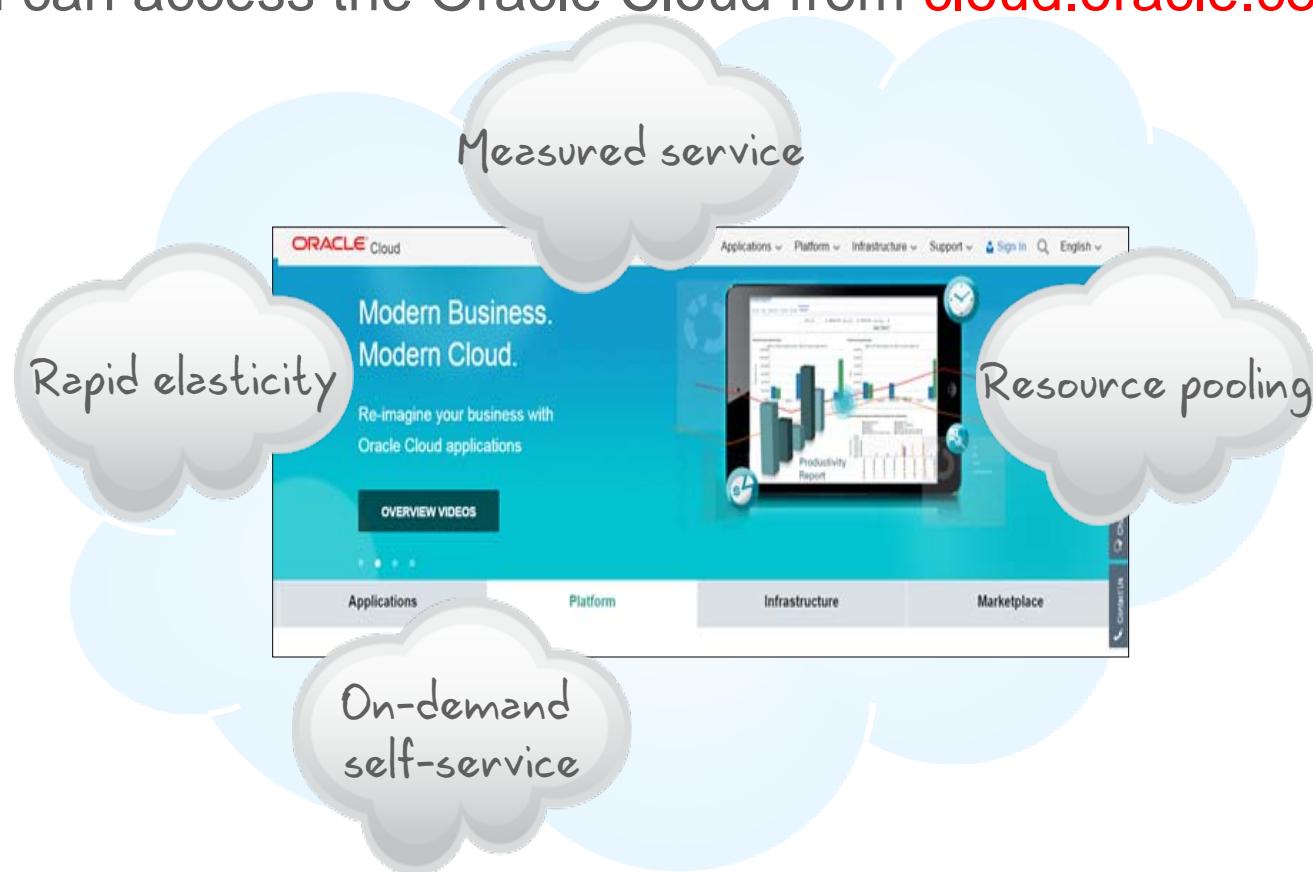
After completing this lesson, you should be able to:

- Access Oracle Application Express from Oracle Exadata Express Cloud Service
- Migrate On-premises Applications to Oracle Database Exadata Express Cloud Service

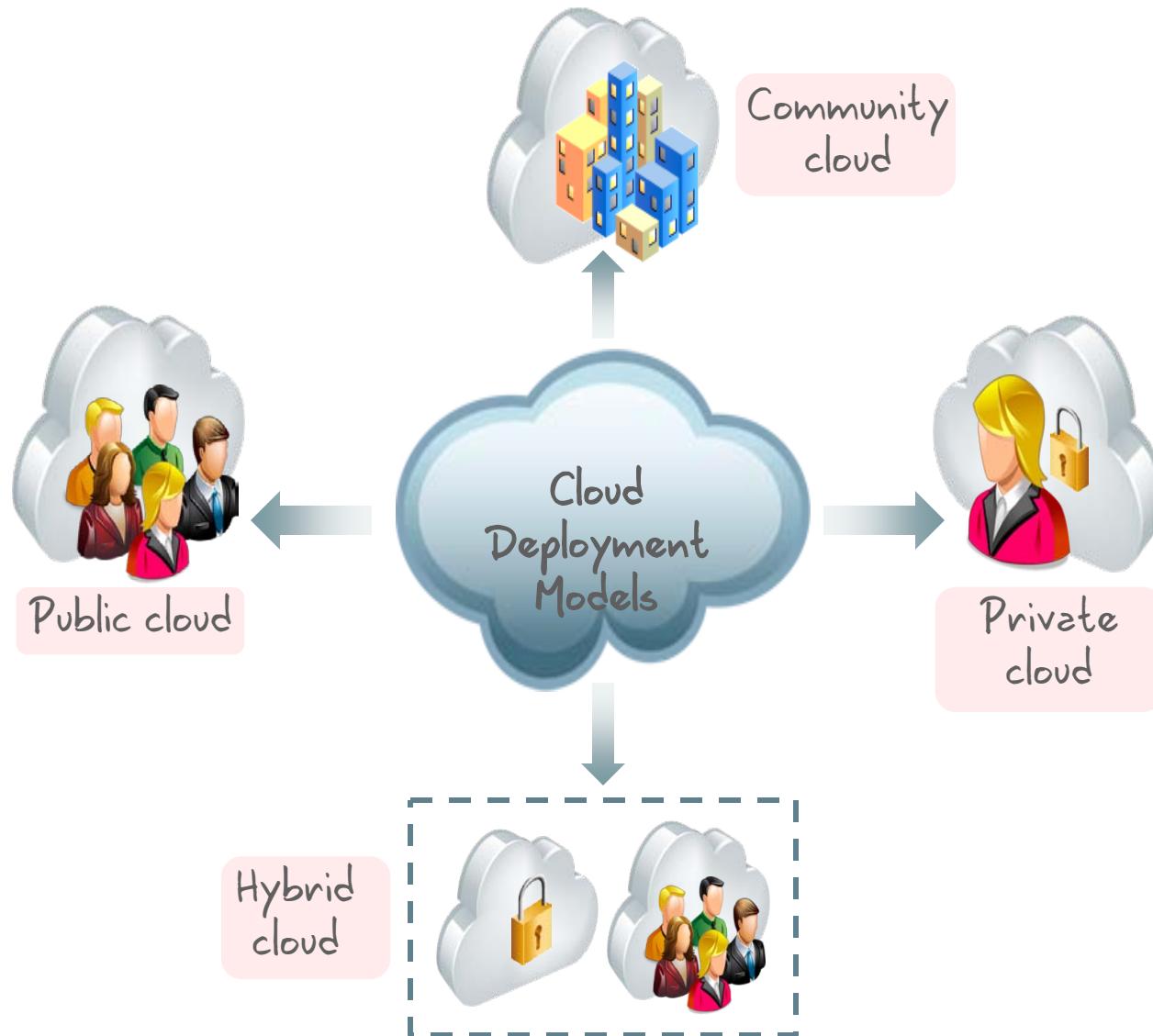


Introduction to Oracle Cloud

- Any business can now use the enterprise cloud provided by Oracle.
- You can access the Oracle Cloud from cloud.oracle.com.



Cloud Deployment Models



Oracle Cloud Services

Oracle Cloud provides three types of services:

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)



Oracle Cloud Services for Data Management

Oracle Database Cloud Service

- Provides you the ability to create full, running deployments of Oracle Database quickly and easily.

Oracle Database Backup Cloud Service

- Provides you the ability to store Oracle Database backups in the cloud.

Oracle Database Cloud - Database Schema Service

- Provides a multi-tenant cloud environment for using the Oracle Database.

Oracle Exadata Cloud Service

- Provides full Oracle Databases hosted on Oracle Exadata Database Machine inside the Oracle Cloud.

Oracle Database Exadata Express Cloud Service

- Provides Oracle Database 12c Release 2 Enterprise Edition, running on Oracle Exadata engineered systems.

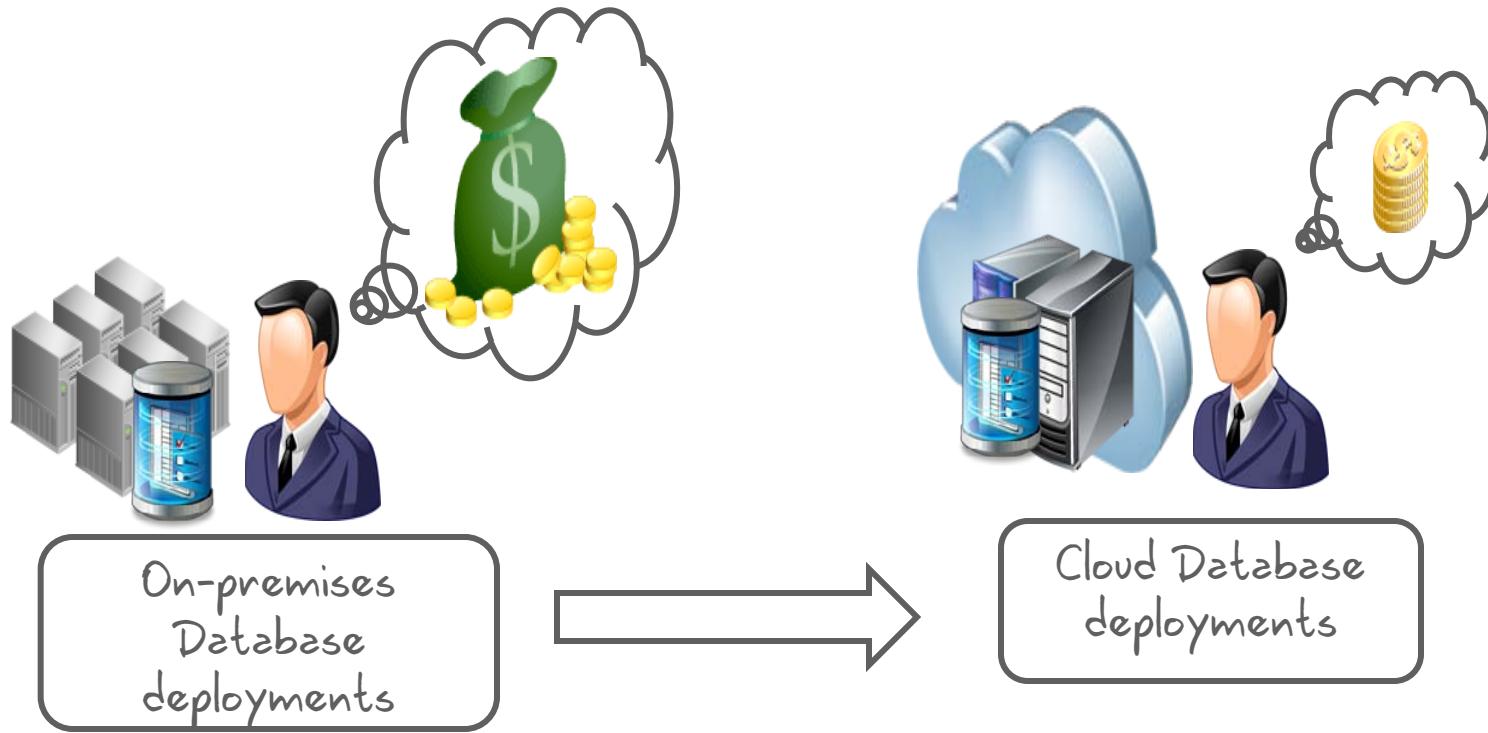
Oracle MySQL Cloud Service

- Provides MySQL in the Cloud.

Oracle Big Data Cloud Service

- Provides Hadoop clusters in the cloud.

Evolving from On-premises to Exadata Express Cloud Service

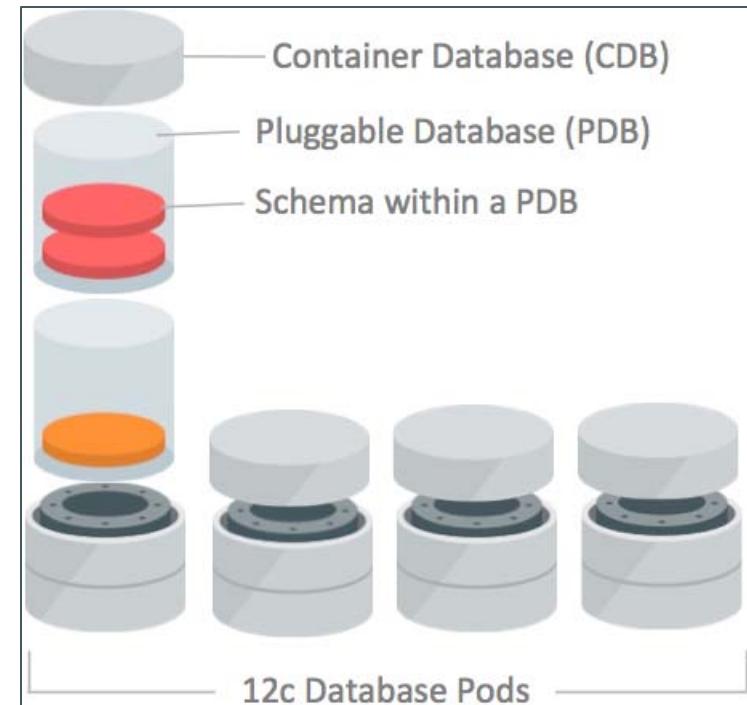


What is in Exadata Express Cloud Service?

- A fully managed database service
- Provides powerful yet elastic database cloud service for developers
- Provides on-demand access to a shared pool of database resources
- Comes with built-in tools for rapid application development
 - Oracle Application Express for web application development
 - Compatibility with external clients such as SQL Developer, SQLcl

Exadata Express Cloud Service for Users

- Oracle manages the service as multiple Container databases(CDBs), also known as database pods
- Each CDB can accommodate up to 1000 Pluggable databases(PDBs).
- Each user is provisioned with a PDB on subscribing to the service, where the user can create several schemas.



Exadata Express Cloud Service for Developers

- Developers can connect with a wide range of data sources for their applications
 - JSON Document Storage
 - Document Style data access
 - Oracle Rest Data Services



Getting Started with Exadata Express Cloud Service

1. Purchase a subscription.
2. Activate and verify the service.
3. Verify activation.
4. Learn about users and roles.
5. Create accounts for your users and assign them appropriate privileges and roles.
6. Set the password for the database user authorized to perform administrative tasks for your service (PDB_ADMIN).
7. Migrate your on-premises apex application to Oracle Exadata Express service.

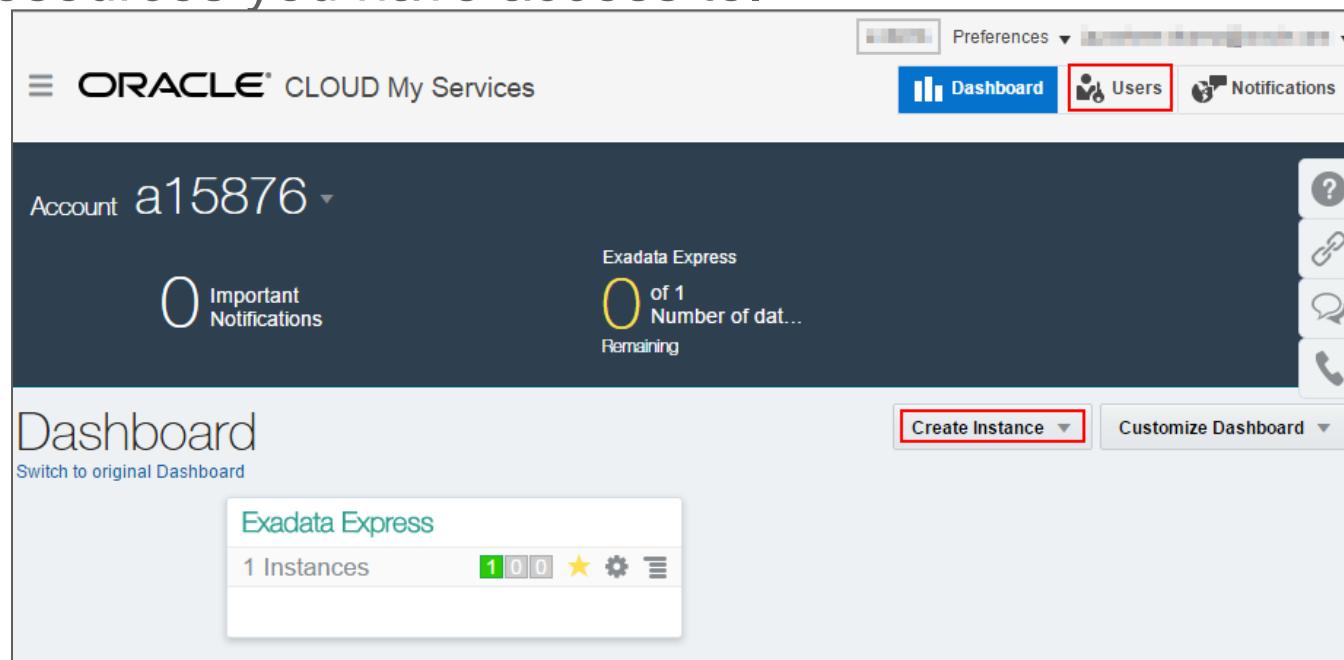
Note: You can refer to

[Using Oracle Database Exadata Express Cloud Service](#) for details on the subscription process.

Demonstration [link](#).

Getting Started with Exadata Express Cloud Service

- On signing into the service, you get access to the dashboard.
- Dashboard allows you to create database instances and users.
- The number of instances you create is limited by the amount of resources you have access to.



Managing Exadata Express Cloud Service

Service Instances

Create Service Instance Show: Active

exa4

Service Type: Exadata Express
Instance Id: 500033811
Status: Active
Size: BASIC

Service SFTP User Name: us148271
Service SFTP Host & Port:
den00xrc.us.oracle.com

Administrator: dbcloud-alm_ww@oracle.com
Requested By: dbcloud-alm_ww@oracle.com
Service Instance URL: <http://exa4-a1587...>

Open Service Console



Service Console: exa4

 Web Access Develop database and web apps using Oracle Application Express (APEX) Learn More Watch Video	Go to SQL Workshop Run SQL commands, execute SQL scripts and browse database objects	Develop with App Builder Declaratively develop and deploy data-driven apps
 Client Access Enable database client access, then connect using drivers and tools Learn More Watch Video	Define REST Data Services Create and manage RESTful web service interfaces to your database	Install Productivity Apps Browse and install productivity apps
 Administration Manage your cloud database Learn More Watch Video	Download Client Credentials Download a zip file containing your security credentials and network configuration files	Download Drivers Get database drivers for Java, .NET, Node.js, Python, PHP, Ruby, C, C++, Instant Client and more
	Disable Client Access Disable SQL*Net access and invalidate all existing client credential files	Download Tools Get SQL*Plus command-line and developer tools including SQL Developer and JDeveloper
	Create Database Schema Create a new schema for database objects	Create Document Store Enable or disable a schema-less document-style interface, with JSON storage and access
	Set Administrator Password Set or reset your database's privileged user (PDB_ADMIN) account password	Manage Application Express Use Application Express (APEX) administrative options

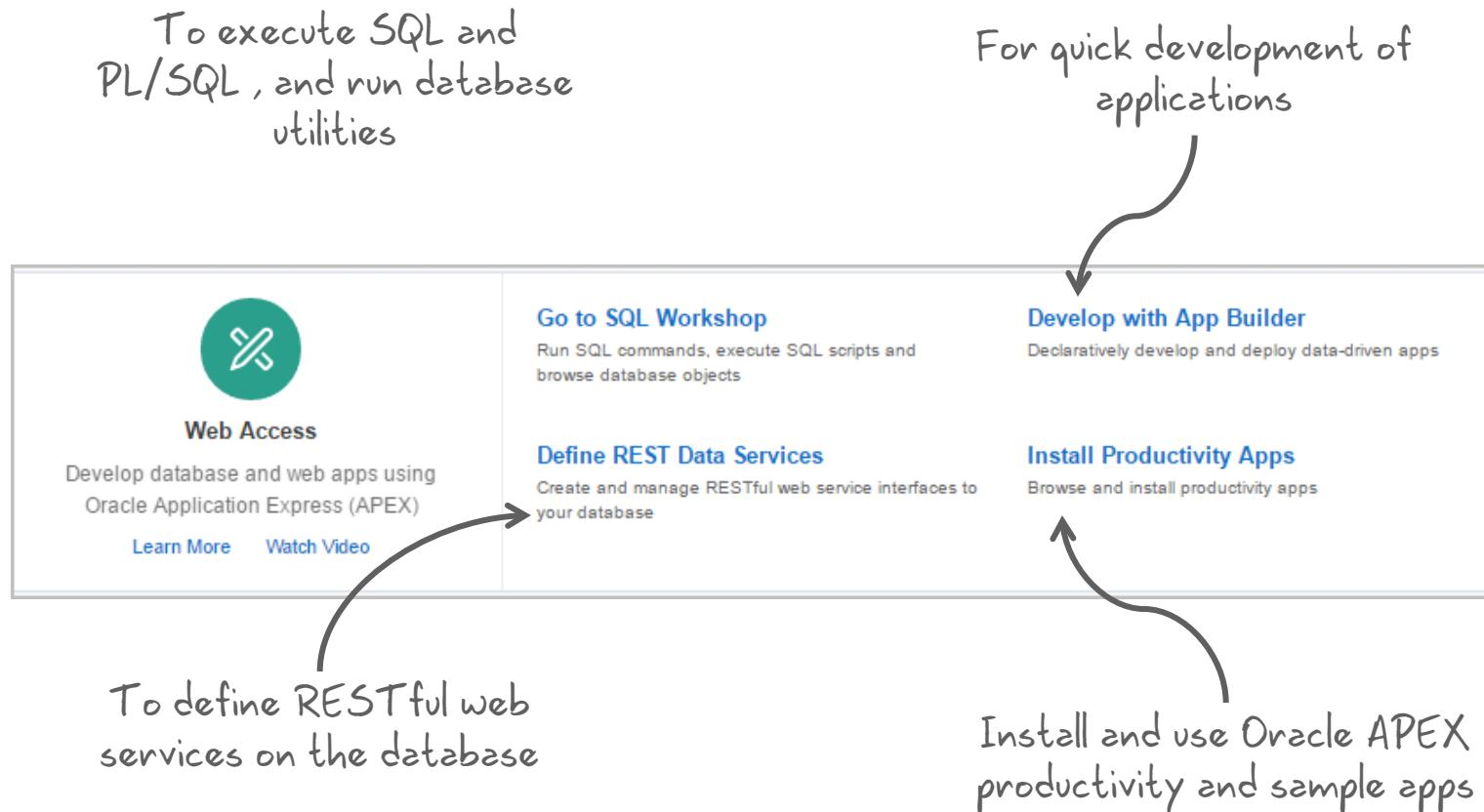
Service Console

- Service Console is the interface to use and manage the Exadata Express Cloud Service
- It provides three different perspectives of the instance
 - Web Access
 - Client Access
 - Administration

Service Console: exa4

 Web Access Develop database and web apps using Oracle Application Express (APEX) Learn More Watch Video	Go to SQL Workshop Run SQL commands, execute SQL scripts and browse database objects Learn More	Develop with App Builder Declaratively develop and deploy data-driven apps Learn More
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 Administration Manage your cloud database Learn More Watch Video	Download Client Credentials Download a zip file containing your security credentials and network configuration files Learn More	Download Drivers Get database drivers for Java, .NET, Node.js, Python, PHP, Ruby, C, C++, Instant Client and more Learn More
	Disable Client Access Disable SQL*Net access and invalidate all existing client credential files Learn More	Download Tools Get SQL*Plus command-line and developer tools including SQL Developer and JDeveloper Learn More
	Create Database Schema Create a new schema for database objects Learn More	Create Document Store Enable or disable a schema-less document-style interface, with JSON storage and access Learn More
	Set Administrator Password Set or reset your database's privileged user (PDB_ADMIN) account password Learn More	Manage Application Express Use Application Express (APEX) administrative options Learn More

Web Access through Service Console



Client Access Configuration through Service Console



Client Access

Enable database client access, then connect using drivers and tools

[Learn More](#) [Watch Video](#)

Enable Client Access

Enable client SQL*Net access to your database. You must first enable before seeing other options





Client Access

Enable database client access, then connect using drivers and tools

[Learn More](#) [Watch Video](#)

Download Client Credentials

Download a zip file containing your security credentials and network configuration files

Disable Client Access

Disable SQL*Net access and invalidate all existing client credential files

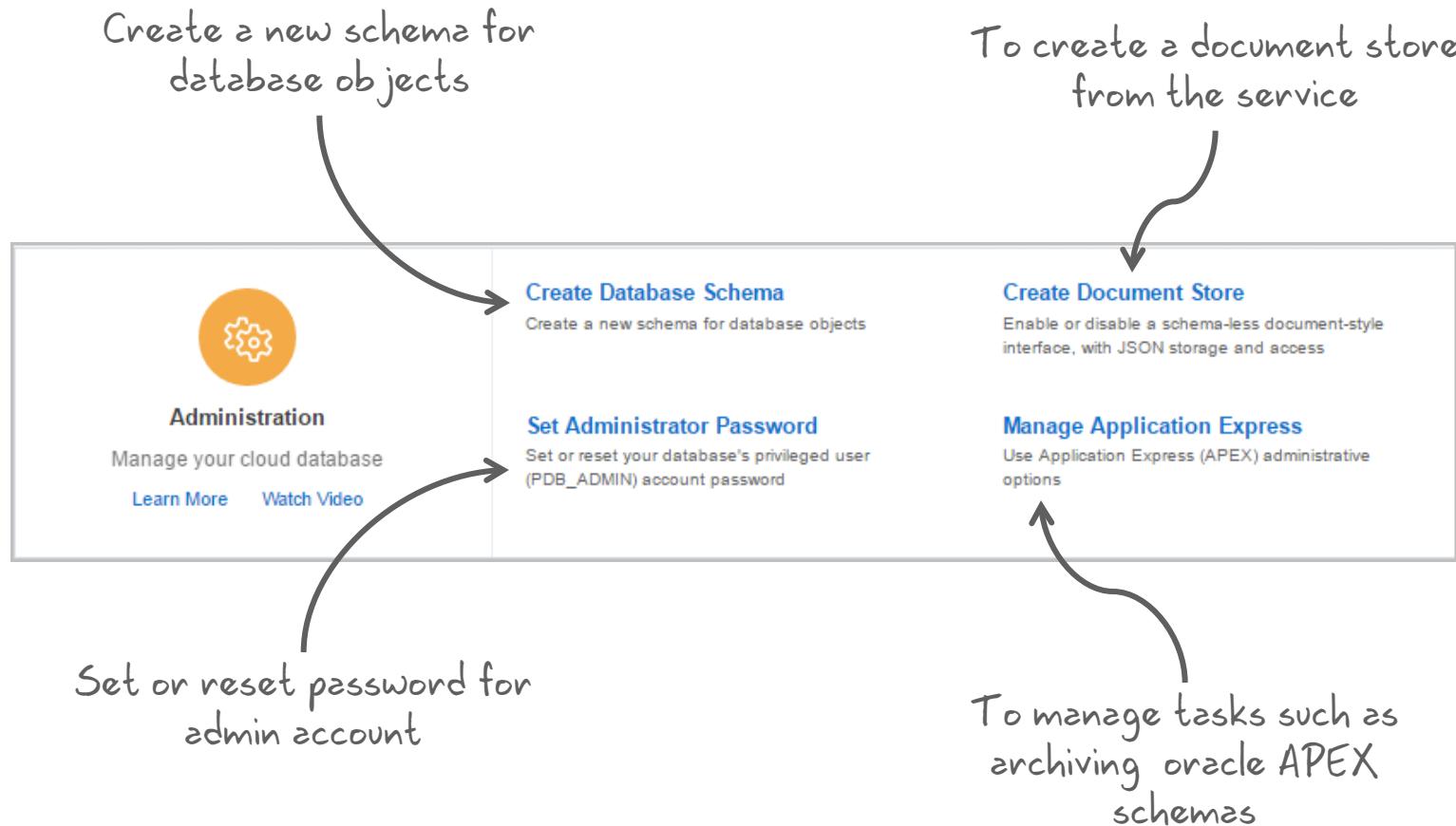
Download Drivers

Get database drivers for Java, .NET, Node.js, Python, PHP, Ruby, C, C++, Instant Client and more

Download Tools

Get SQL*Plus command-line and developer tools including SQL Developer and JDeveloper

Database Administration through Service Console



Develop with App Builder

1



Web Access

Develop database and web apps using Oracle Application Express (APEX)

[Learn More](#) [Watch Video](#)

Go to SQL Workshop

Run SQL commands, execute SQL scripts and browse database objects

Define REST Data Services

Create and manage RESTful web service interfaces to your database

Develop with App Builder

Declaratively develop and deploy data-driven apps

Install Productivity Apps

Browse and install productivity apps



2

The screenshot shows the Oracle Application Express interface. At the top, there is a navigation bar with tabs: Application Builder (selected), SQL Workshop, Team Development, and Packaged Apps. Below the navigation bar are four main icons: Create, Import, Dashboard, and Workspace Utilities. The Create icon is highlighted with a red box and has a red arrow pointing from the 'Develop with App Builder' section in the top image to it. At the bottom left, there is a list of applications, with 'Sample Database Application' being the first item.

Go to SQL Workshop

1



Web Access
Develop database and web apps using Oracle Application Express (APEX)
[Learn More](#) [Watch Video](#)

Go to SQL Workshop
Run SQL commands, execute SQL scripts and browse database objects

Define REST Data Services
Create and manage RESTful web service interfaces to your database

Develop with App Builder
Declaratively develop and deploy data-driven apps

Install Productivity Apps
Browse and install productivity apps

2

ORACLE Application Express

Application Builder ▾ SQL Workshop ▾ Team Development ▾ Packaged Apps ▾



Object Browser SQL Commands SQL Scripts Utilities RESTful Services

Define REST Data Services

1

The screenshot shows the Oracle Cloud homepage. On the left, there's a section for "Web Access" with a green icon of a computer monitor and keyboard. Below it, text says "Develop database and web apps using Oracle Application Express (APEX)" with "Learn More" and "Watch Video" links. To the right are three main links: "Go to SQL Workshop" (Run SQL commands, execute SQL scripts and browse database objects), "Define with App Builder" (Declaratively develop and deploy data-driven apps), and "Install Productivity Apps" (Browse and install productivity apps). The "Define REST Data Services" link under "Go to SQL Workshop" is highlighted with a red box and has a red arrow pointing down to the Oracle Application Express interface below.

2

The screenshot shows the Oracle Application Express interface. At the top, there's a navigation bar with tabs: "Application Builder", "SQL Workshop" (which is currently selected and highlighted in green), "Team Development", and "Packaged Apps". Below the navigation bar, there's a search bar with a magnifying glass icon, a "Go" button, and other action buttons like "Reset" and "Create >". A section titled "RESTful Services" contains a single entry: "oracle.example.hr" with a small cloud icon next to it. The entire interface is framed by a light gray border.

Install Productivity Apps

1

Web Access
Develop database and web apps using Oracle Application Express (APEX)
[Learn More](#) [Watch Video](#)

Go to SQL Workshop
Run SQL commands, execute SQL scripts and browse database objects

Define REST Data Services
Create and manage RESTful web service interfaces to your database

Develop with App Builder
Declaratively develop and deploy data-driven apps

Install Productivity Apps
Browse and install productivity apps

2

ORACLE Application Express

Application Builder ▾ SQL Workshop ▾ Team Development ▾ Packaged Apps ▾

App Gallery

search Productivity Apps Sample Apps

APEX Application Archive Software Development	Application Standards Tracker Tracking, Knowledge Management	Bug Tracking Software Development, Tracking
Checklist Manager Tracking, Team Productivity	Community Requests Software Development, Community	Customer Tracker Tracking, Marketing
Data Reporter Knowledge Management, Tracking, Proj...	Decision Manager Team Productivity, Tracking	Expertise Tracker Tracking, Knowledge Management
Feedback Software Development	Go Live Checklist Project Management	Group Calendar Team Productivity

Migrating On-premises Applications to Oracle Database Exadata Express Cloud Service

- You can migrate Oracle Application Express applications and data from on-premises Oracle Database installations to Oracle Database Exadata Express Cloud Service and vice-versa.
- You must have the Workspace Administrator privileges to export Oracle Application Express applications from an on-premises Oracle Database and Service Administrator privileges to import the exported packaged application to Exadata Express.

Creating an Application Export from the On-premises Database

The screenshot shows the Oracle Application Express interface. At the top, there are four main navigation links: Application Builder (selected), SQL Workshop, Team Development, and Packaged Apps. Below these are four icons: Application Builder (blue square with a pencil and paper), SQL Workshop (green square with a cloud and database), Team Development (yellow square with a circular flow diagram), and Packaged Apps (red square with a grid of icons). A horizontal bar below the navigation contains three sections: Top Applications, Top Users, and News and Messages, followed by a plus sign for more.

A blue bar labeled "apex" is overlaid on the interface, indicating the specific environment or tool being used.

The main workspace displays several application-related icons: Create (blue square with a plus sign), Import (blue square with an upward arrow), Dashboard (blue square with a clock and chart), and Workspace Utilities (blue square with a wrench).

Below these icons is a search bar with fields for "Q", "Go", "Actions", "Reset", and "Create >".

At the bottom, a list of applications is shown:

- Sample Database Application 100 (grey icon)
- GlobalMart Management Tool 101 (orange icon)
- PROJECT TRACKING SYSTEM 102 (purple icon, highlighted with a red border)

Creating an Application Export from the On-premises Database

The screenshot shows two views of the Oracle Application Express interface. The top view displays the main application navigation bar with tabs for Application Builder, SQL Workshop, Team Development, and Packaged Apps. Below this is the application-specific navigation bar for 'Application 2 - Project Tracking System' with icons for Run Application, Supporting Objects, Shared Components, Utilities, and Export / Import (which is highlighted with a red box). The bottom view is a detailed 'Export' page. It includes a search bar, a toolbar with 'Go' and other icons, and a navigation pane on the left with links for Global Page - Mobile and Home. The main content area has tabs for Export, Applications (which is selected), Websheets, Themes, Plug-ins, User Interface Defaults, and Feedback. A large 'Export Application' button is prominently displayed with a red box around it. To its right is a 'Reset' button. Below these are sections for choosing the application (set to '102 PROJECT TRACKING SYSTEM') and specifying export details like Page Count (39), Owner (PTS), and File Format (UNIX). To the right of the main form is a sidebar with links for Export Application, Tasks, Export Page, Manage Supporting Objects, Component Export, and Manage Export Repository.

Generating a Database Object Dependencies report for the application

The screenshot shows the Oracle Application Express Utilities page. Step 1 highlights the 'Utilities' icon in the main navigation bar. Step 2 highlights the 'Database Object Dependencies' link in the Utilities menu.

Application 102 - PROJECT TRACKING SYSTEM

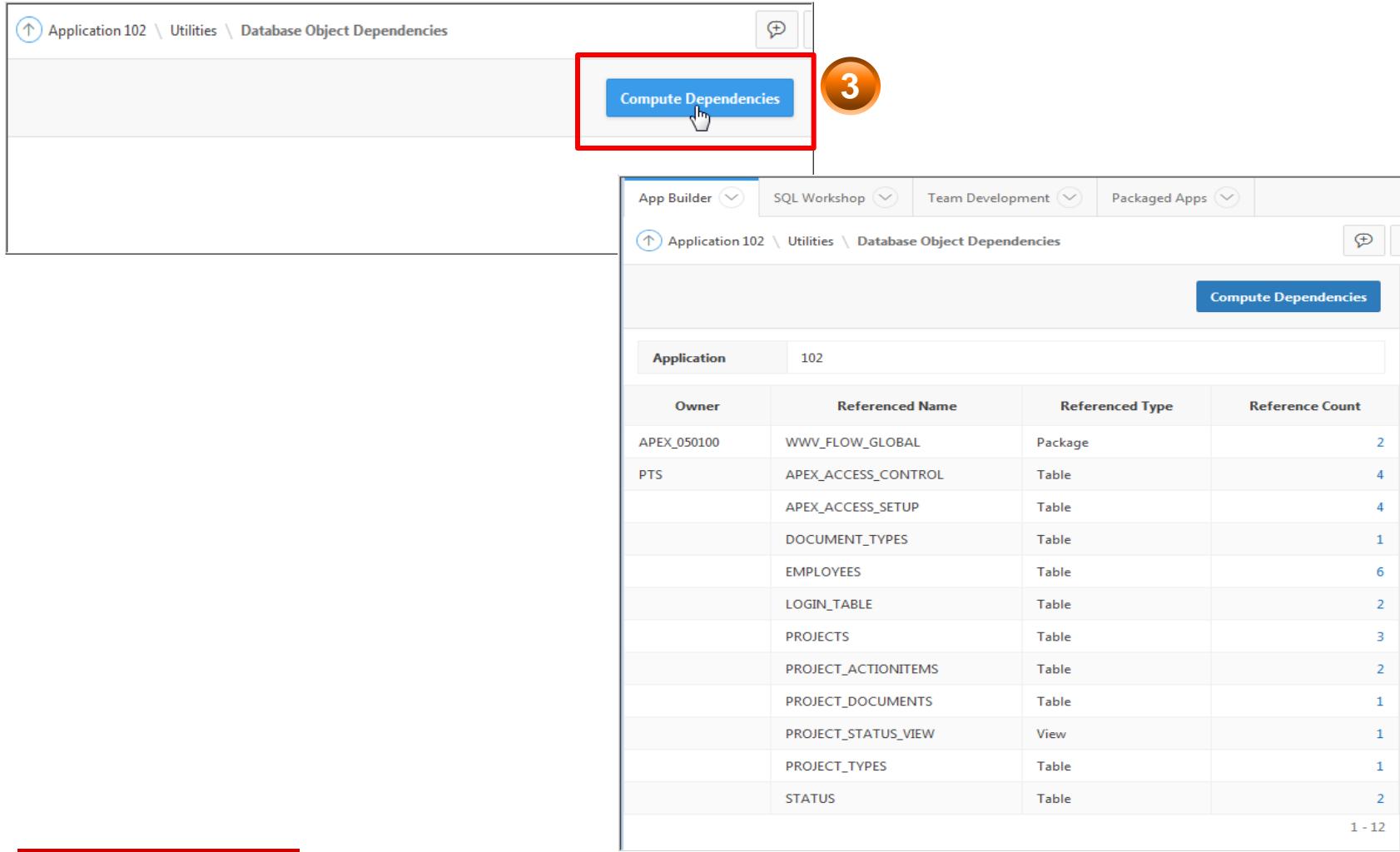
Edit Application Properties

Run Application Supporting Objects Shared Components Utilities Export / Import

Application Dashboard Advisor Recently Updated Pages Change History Debug Messages Export Repository

Database Object Dependencies Application Express Views

Generating a Database Object Dependencies report for the application



The screenshot shows two views of the Oracle Application Express 'Database Object Dependencies' page. The top view is a smaller preview, and the bottom view is the full page. Both views show the same interface with a 'Compute Dependencies' button highlighted by a red box and circled with a orange circle containing the number 3.

Owner	Referenced Name	Referenced Type	Reference Count
APEX_050100	WWW_FLOW_GLOBAL	Package	2
PTS	APEX_ACCESS_CONTROL	Table	4
	APEX_ACCESS_SETUP	Table	4
	DOCUMENT_TYPES	Table	1
	EMPLOYEES	Table	6
	LOGIN_TABLE	Table	2
	PROJECTS	Table	3
	PROJECT_ACTIONITEMS	Table	2
	PROJECT_DOCUMENTS	Table	1
	PROJECT_STATUS_VIEW	View	1
	PROJECT_TYPES	Table	1
	STATUS	Table	2

1 - 12

Importing the Exported On-premises Application into Exadata Express

The screenshot shows the Oracle Application Express interface. At the top, there are tabs: ORACLE Application Express, Application Builder, SQL Workshop, Team Development, and Packaged Apps. Below the tabs, there are three main icons: Create (blue square with a plus sign), Import (blue square with an upward arrow), and Dashboard (blue square with a clock and graphs). A red box highlights the Import icon.

The main content area is titled "Install Database Application". It shows a progress bar with two green checkmarks and one blue circle labeled "Install".

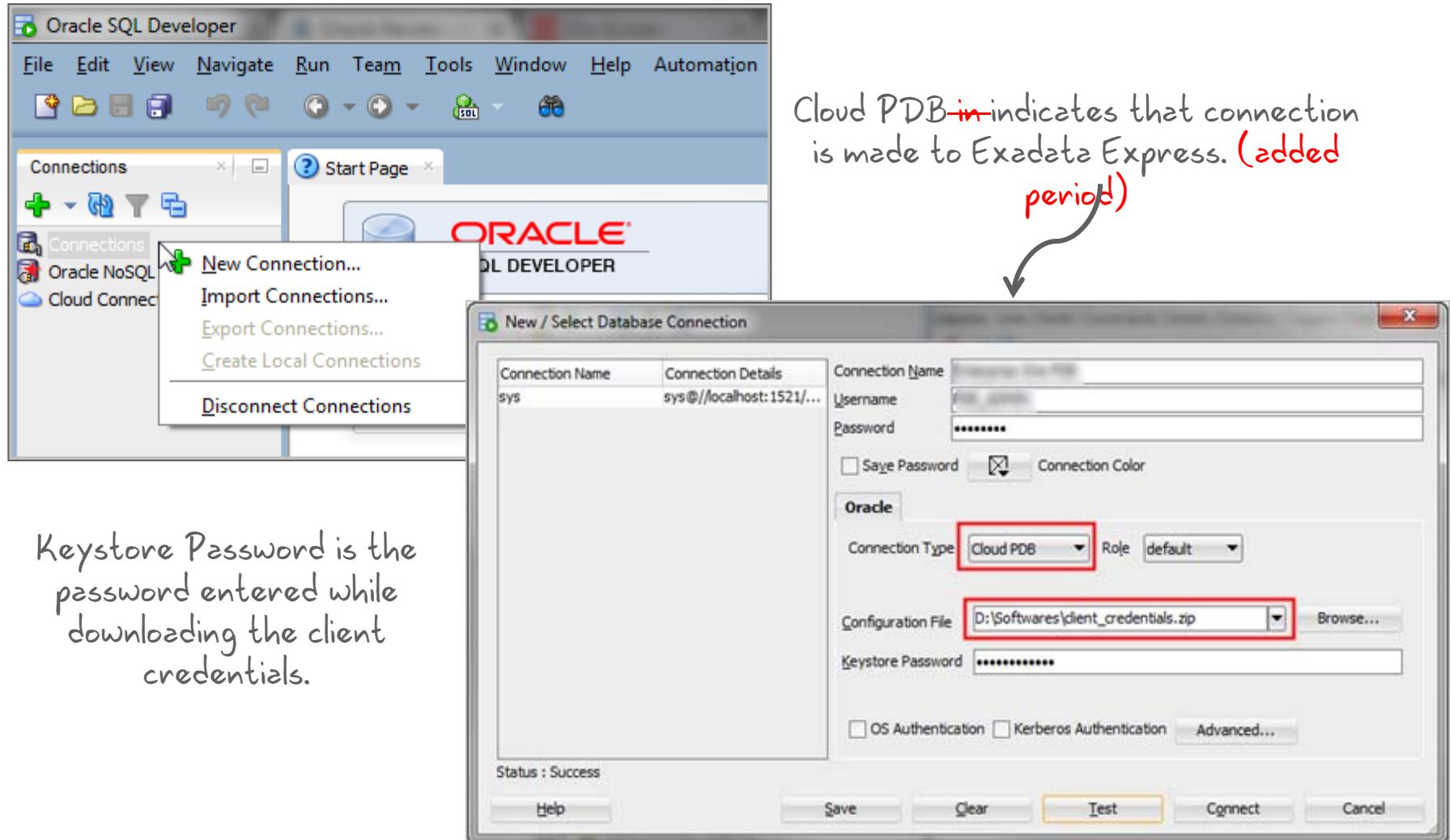
Below the progress bar, a note states: "When you install an application having the same ID as an existing application in the current workspace, the existing application is deleted and then replaced by the new application. If you attempt to install an application having the same ID as an existing application in a different workspace, a benign error message displays. If you are importing a packaged Application Express application, the installation wizard will allow you to install supporting objects."

The configuration options are as follows:

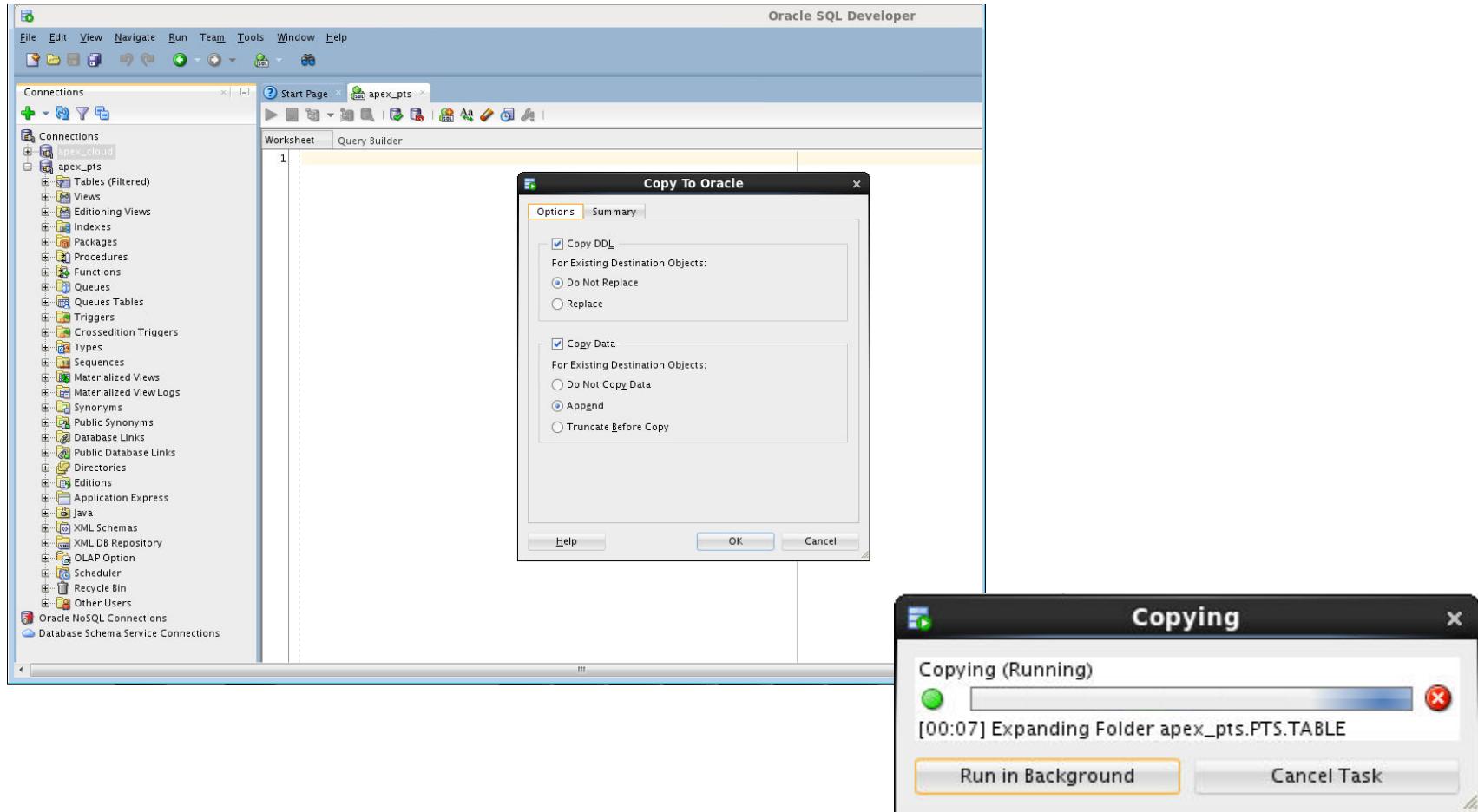
- Current Workspace: demo-a425379
- Export File Workspace ID: 2350393363791184
- Export File Application ID: 102
- Export File Version: 2013.01.01
- Export File Parsing Schema: PTS
- Application Origin: This application was exported from another workspace.
- * Parsing Schema: BQJZQLCBO2P
- * Build Status: Run and Build Application
- * Install As Application:
 - Auto Assign New Application ID
 - Reuse Application ID 102 From Export File
 - Change Application ID

At the bottom left are "Tasks" and navigation buttons (<, >, Cancel). At the bottom right is a large blue button labeled "Install Application" with a red box around it.

Moving Dependent On-premises Database Objects into Exadata Express using SQL Developer



Moving Dependent On-premises Database Objects into Exadata Express using SQL Developer



Additional Resources

For additional information about Oracle Cloud, refer to the following:

- Oracle Cloud portal:
 - <https://cloud.oracle.com/>
- Cloud documentation on Oracle Help Center:
 - <https://docs.oracle.com/>
- Oracle Exadata Express Cloud Service Using Guide on Oracle Help Center:
 - <http://docs.oracle.com/cloud/latest/exadataexpress-cloud/CSDBP/>

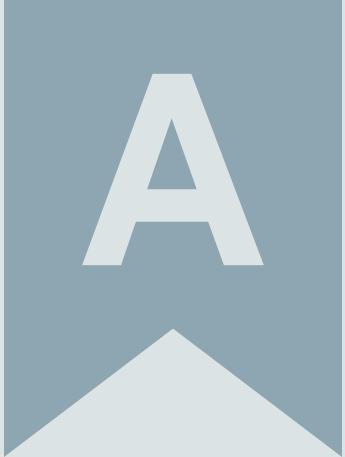


Summary

In this lesson, you should have learned how to:

- Access Oracle Application Express from Oracle Exadata Express Cloud Service
- Migrate On-premises Applications to Oracle Database Exadata Express Cloud Service





A

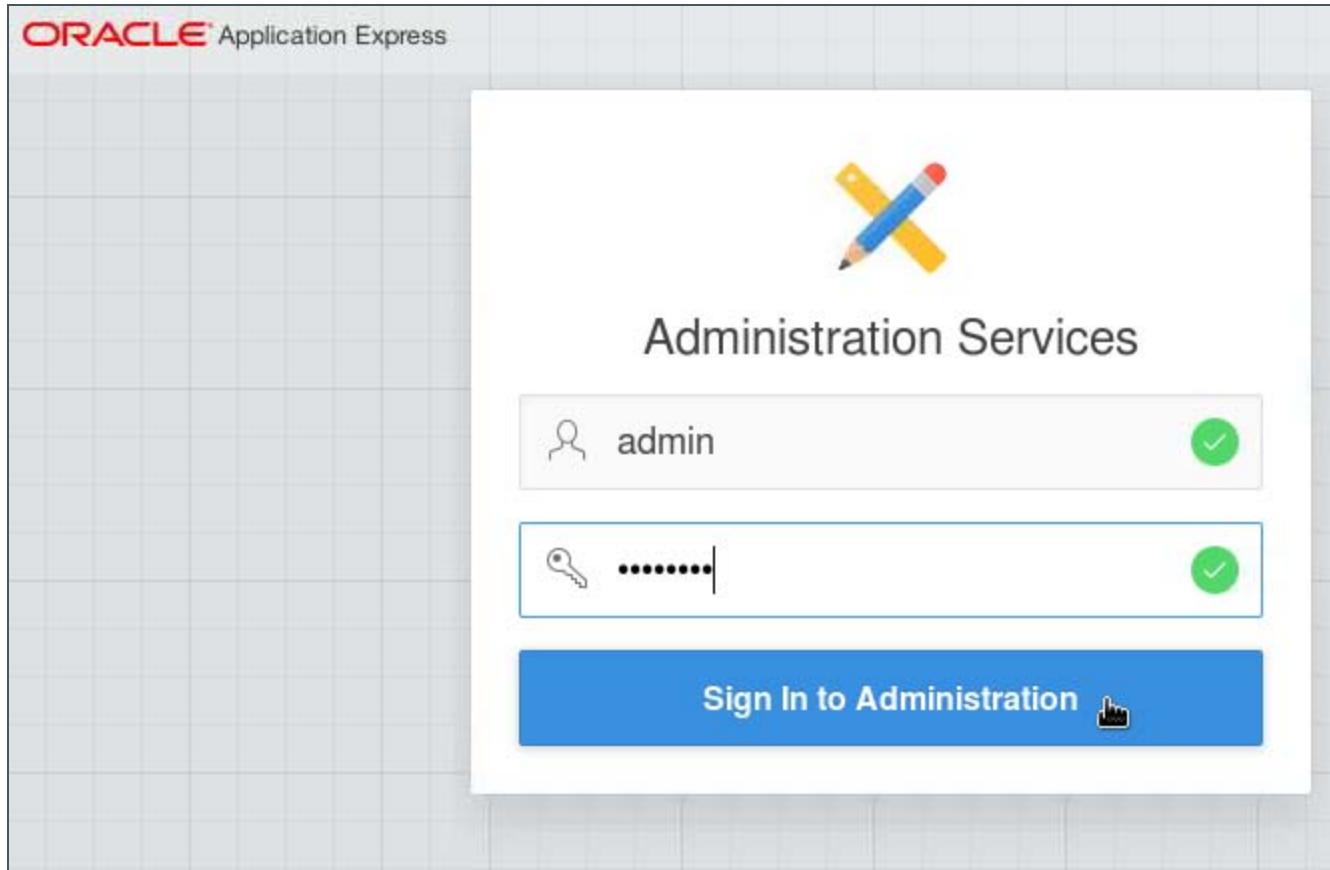
Quick Reference: Additional How-To Guide

Objectives

After completing this lesson, you should be able to:

- Create a workspace and a workspace administrator
- Create database objects
- Run SQL commands and SQL scripts
- Create a database application
- Create a report
- Create a form on a table with report
- Create a region
- Create and edit page items and buttons
- Create a branch
- Create a navigational menu entry
- Create lists and list entries

Logging In to Oracle Application Express Administration



Creating a Workspace and Workspace Administrator

You have requested to provision a new Workspace.

Workspace Information:

Name **demo**

Security Group ID **System Assigned**

Description ...

Administrator Information:

User Name **ADMIN**

E-mail **demo@oracle.com**

Schema Information:

Reuse Existing Schema **No**

Schema Name **DEMO**

Tablespace will be created **APEX_XXX**

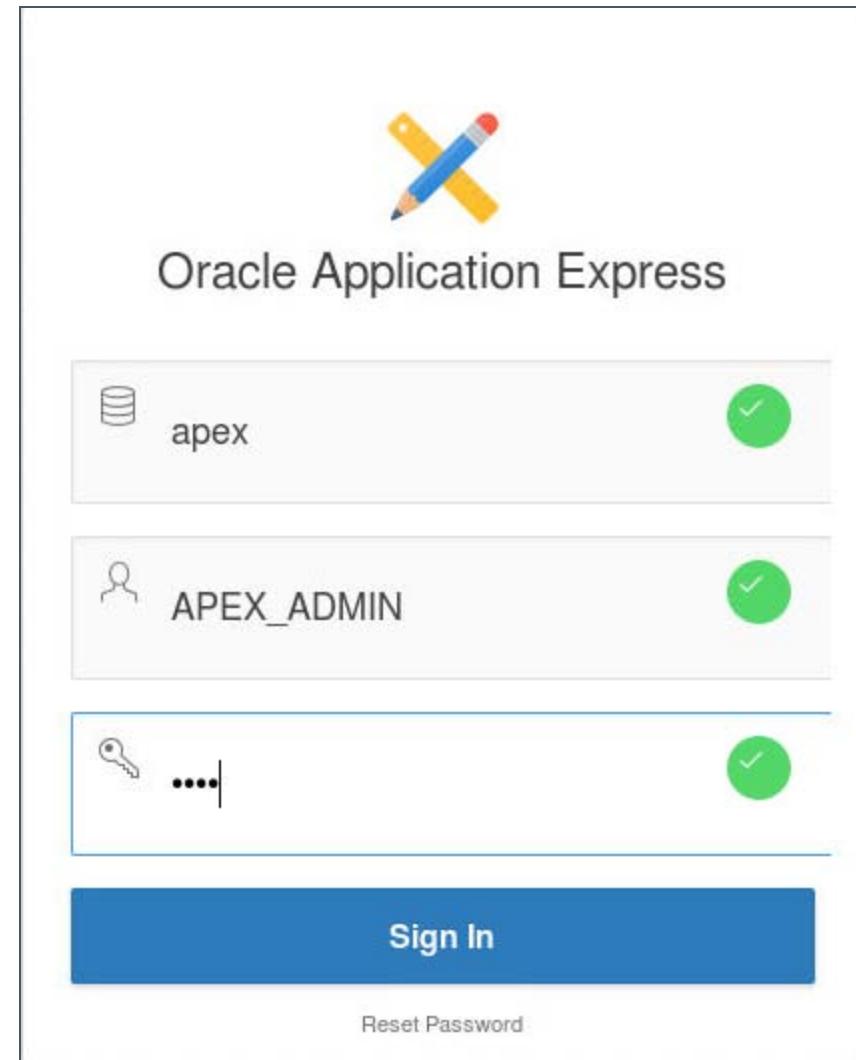
Datafile for tablespace **/u01/app/oracle/oradata/orcl/APEX_XXX.DBF**

Cancel **Create Workspace**

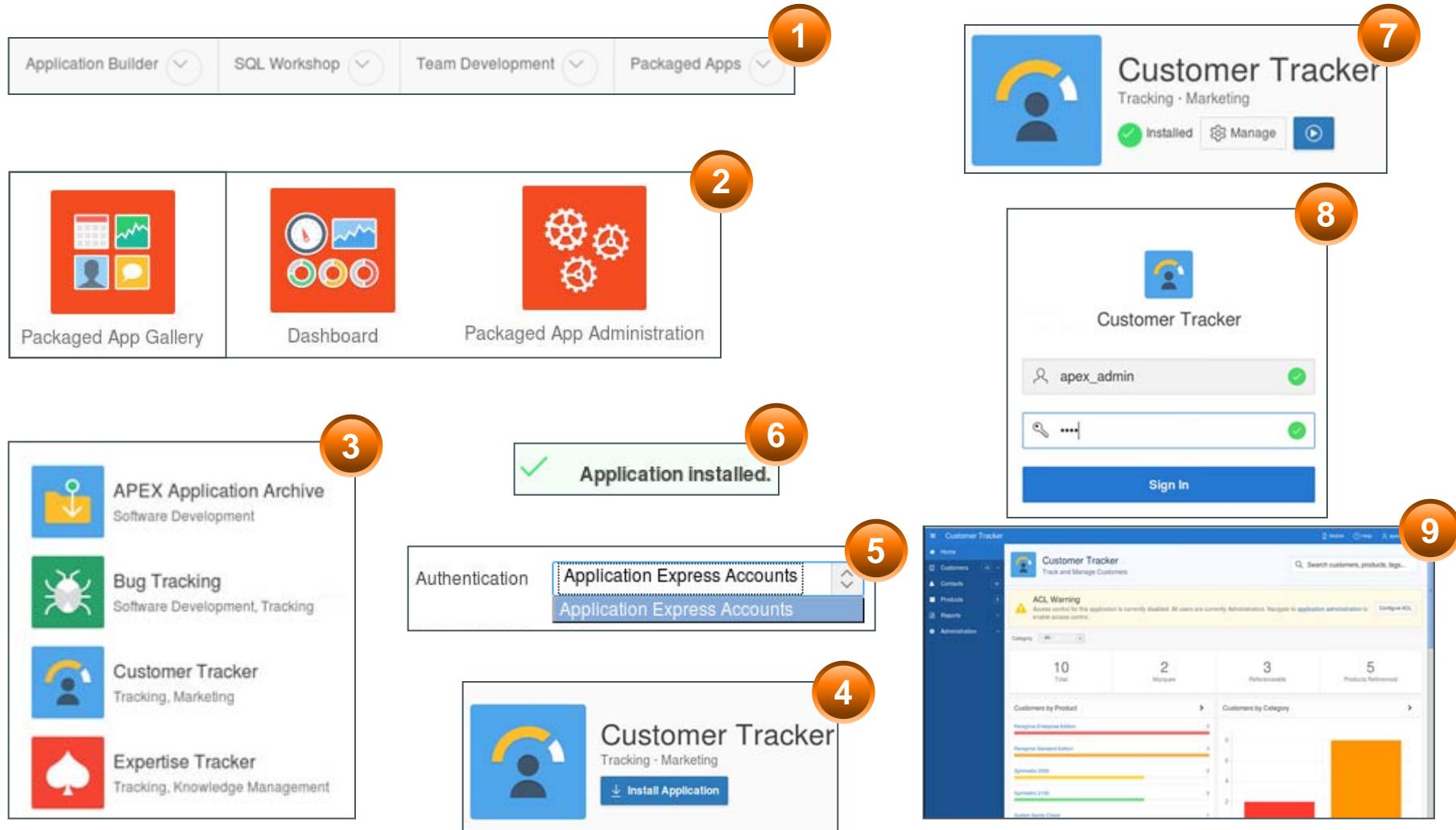
Logging In to a Workspace

To log in to an Oracle APEX workspace:

- Enter the correct URL in your browser address bar.
- Enter the workspace name.
- Enter the username and password.
- Click Sign In.

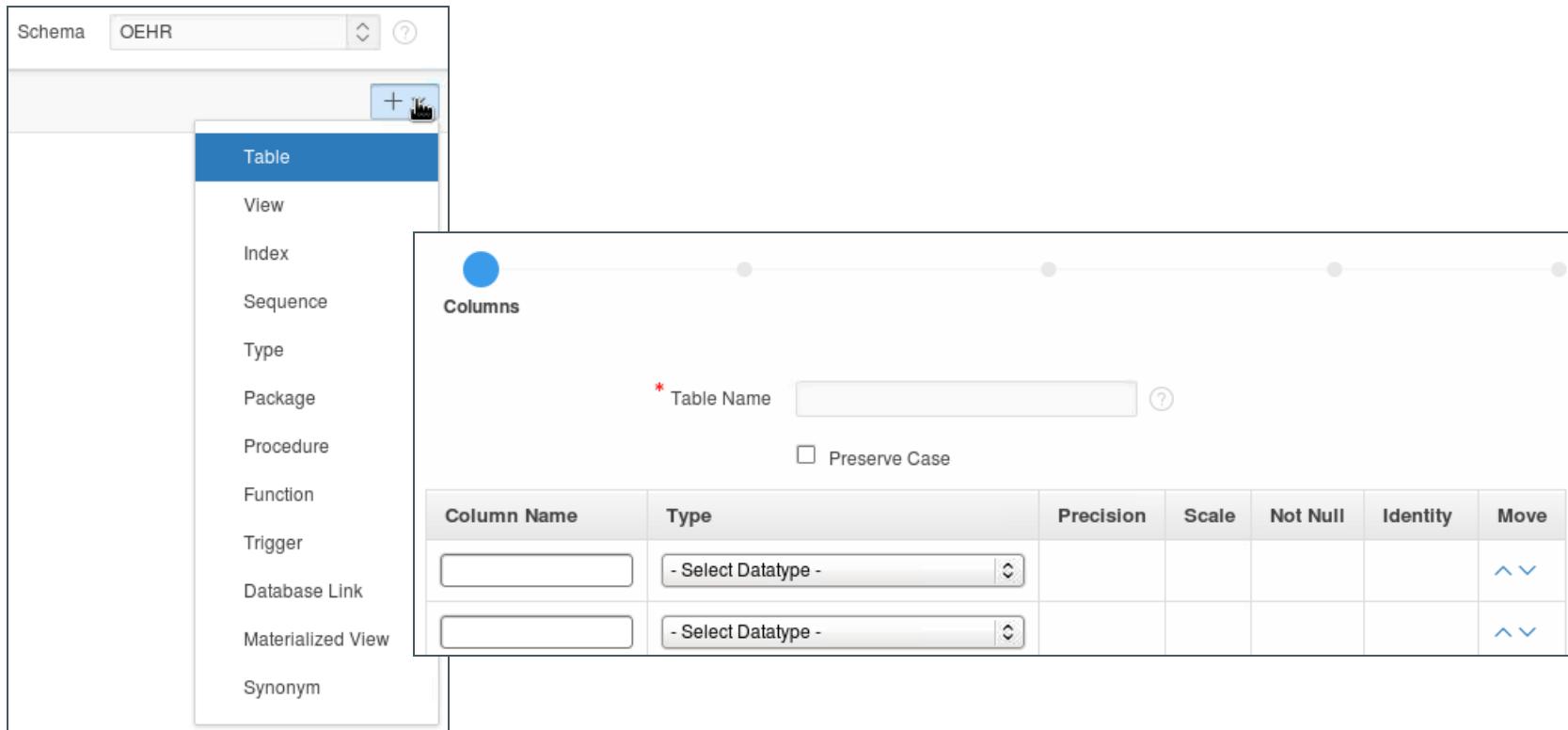


Installing a Packaged Application

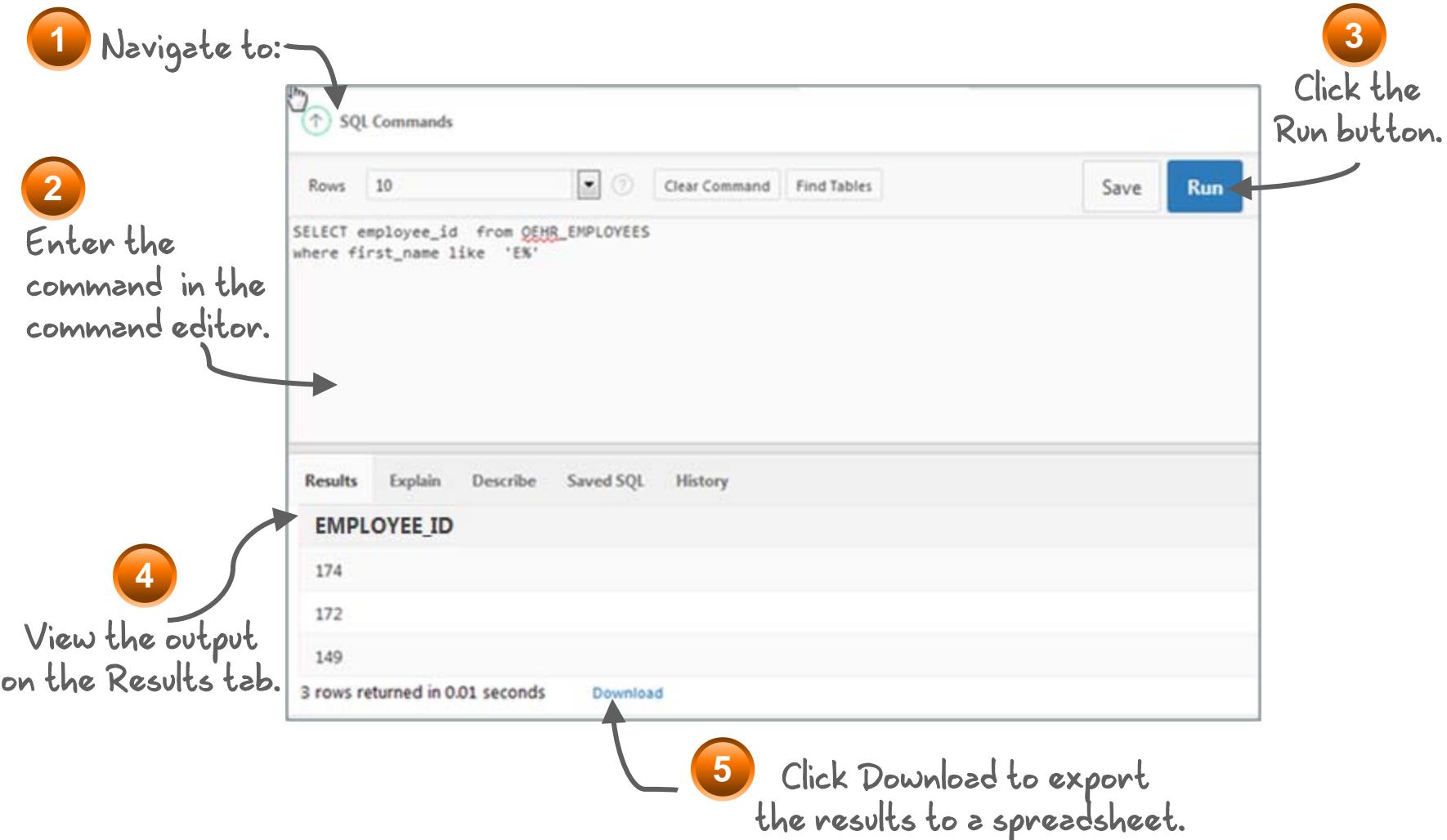


Creating Database Objects

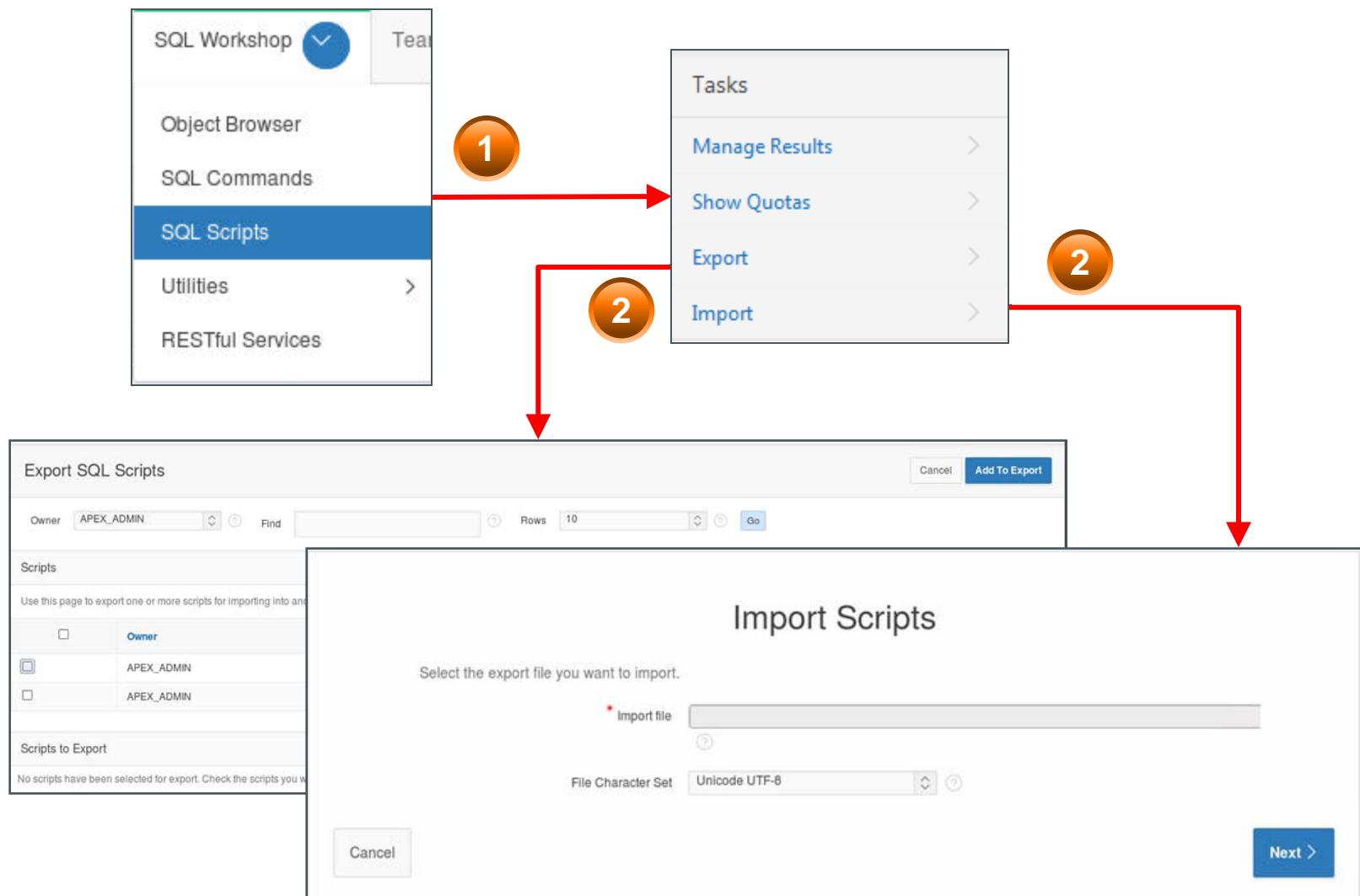
SQL Workshop > Object Browser > Create



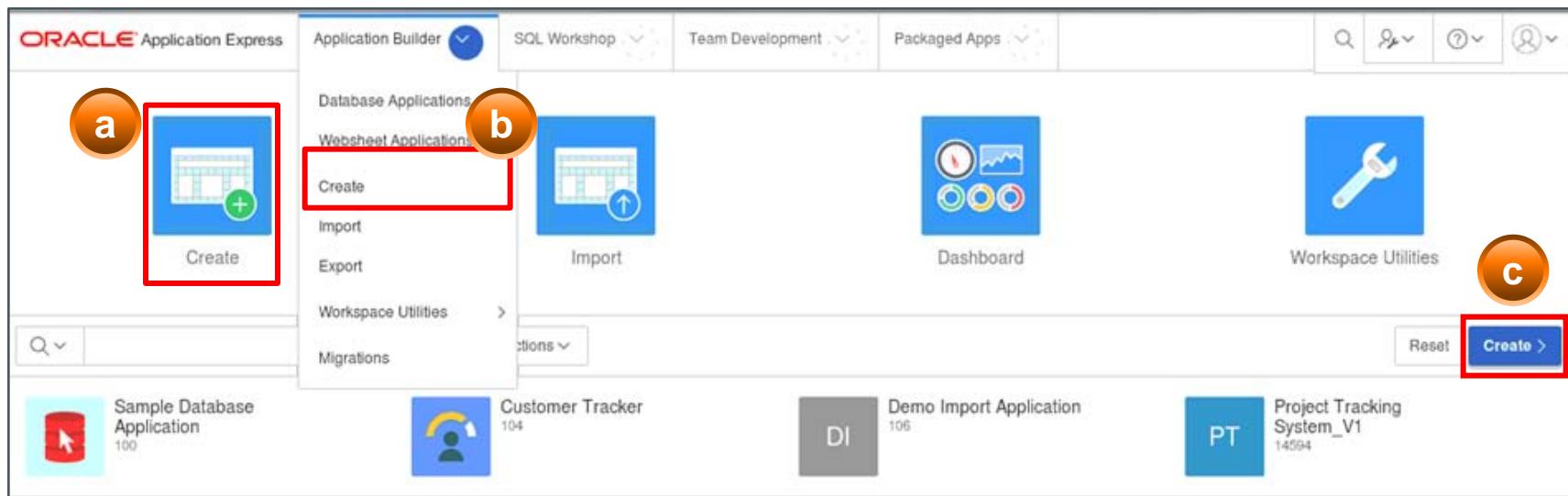
Running SQL Commands



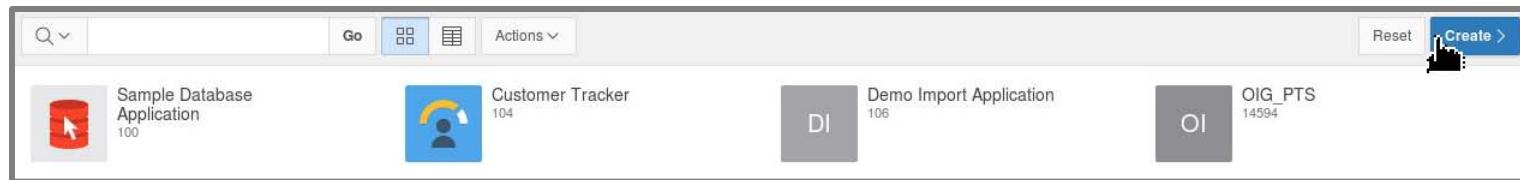
Importing and Running a SQL Script



Accessing the Create Application Wizard



Creating a Database Application



The screenshot shows the 'Create an Application' wizard. The title is 'Create an Application' and the sub-instruction is 'What type of application would you like to create?'. There are four options: 'Desktop' (selected), 'Mobile', 'Websheet', and 'Packaged Application'. Below these options is a link 'From a spreadsheet · Copy an existing application' which is highlighted with a red rectangle. At the bottom left are 'About' and 'Cancel' buttons, and at the bottom right is a 'Next >' button with a cursor icon over it.

Creating a Desktop Database Application

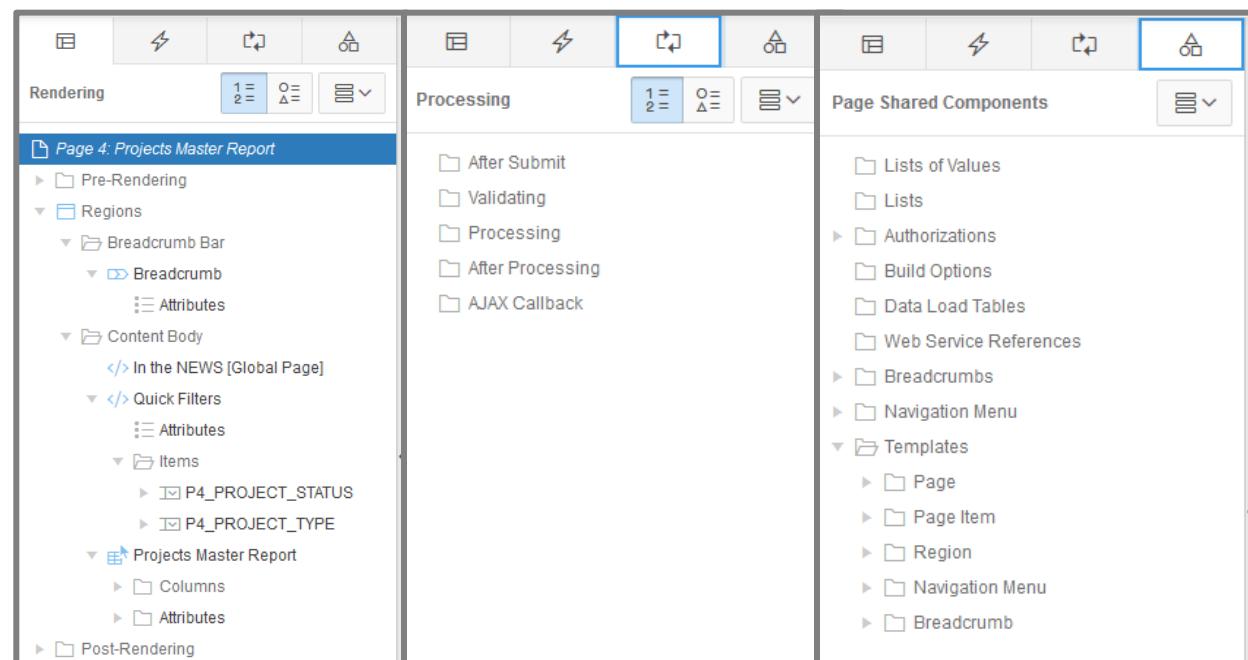
In the Create Application wizard, after selecting Desktop, perform the following steps:

1. Specify an application name.
2. Select the type of page you want to add.
3. Specify whether you want to copy shared components from another application.
4. Specify the authentication scheme and date format.
5. Select a theme.
6. Confirm your selections to create the application.



Page Definition: Overview

- A page is the basic building block of an application.
- Page Definition is divided into three sections:
 - Page Rendering
 - Page Processing
 - Shared Components



Different Views of a Page

Page Designer

The screenshot shows the Oracle Page Designer interface. On the left, there's a navigation sidebar with sections like 'Regions', 'Content Body', 'Quick Filters', and 'Post-Rendering'. The main area displays the 'Projects Master Report' page structure. It includes a 'PAGE HEADER' section, a 'BREADCRUMB BAR' with a 'Breadcrumb' component, and a 'CONTENT BODY' section. The 'CONTENT BODY' section contains regions for 'Regions', 'Items', and 'Buttons'. A modal window titled 'Page Rendering' is open, showing detailed configuration for the 'Page' and 'Regions' sections.

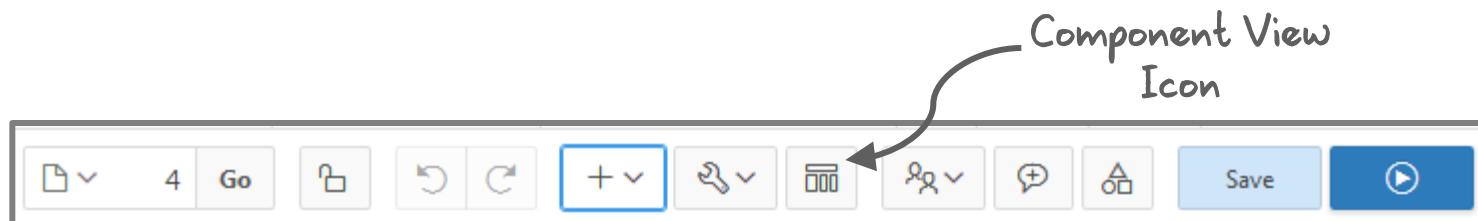
Component View

The screenshot shows the Oracle Component View interface. It displays the configuration for the 'Projects Master Report' page across three main tabs: 'Page Rendering', 'Page Processing', and 'Shared Components'. The 'Page Rendering' tab shows the page name, title, and regions. The 'Page Processing' tab shows computations, validations, processes, and branches. The 'Shared Components' tab lists various components like Navigation Menu, Desktop Navigation Menu, Lists of Values, Breadcrumbs, Breadcrumb, Lists, Plug-ins, and Templates, each with edit and add icons.

Switching Between Pages and View Types

Using the navigation bar, you can:

- Specify a specific page
- Undo or Redo a recent change
- Change view types
- Access links to create another Page, Region, Items and so on
- Access debugging tools
- Lock or unlock the page
- Save or ‘Save and Run’ the page



Creating a Report

To access the Create Report wizard by creating a new page:

1. Navigate to the Application home page and click Create Page.
2. From the “Select a page type” options, select Report.

To create a report by creating a new region on an existing page:

1. Select a report type region from the Regions Gallery.
2. Drag the selected report region into Content Body on the Grid Layout.
3. Update the report region properties in the Property Editor.



Editing Report Attributes

The screenshot shows the Oracle Reports interface. On the left is the report structure tree:

- Rendering
- Page 4: Projects Master Report
 - Pre-Rendering
 - Regions
 - Content Body
 - Projects Master Report
 - Columns
 - Attributes
 - Column Groups
 - Saved Reports
 - Primary Report
 - Post-Rendering

Annotations on the left side of the tree:

- Report Region**: Points to the "Projects Master Report" node.
- Collapsible tabs under Region**: Points to the "Attributes" and "Saved Reports" nodes.

On the right is the Property Editor window for the selected "Projects Master Report" node:

Region

Identification

- Title: Projects Master Report
- Type: Interactive

Source

SQL Query:

```
select PROJECTS.PROJECT_ID as  
PROJECT_ID,  
PROJECTS.PROJECT_NAME as  
PROJECT_NAME,
```

Page Items to Submit

Layout

- Sequence: 10
- Parent Region: - Select -
- Position: Content B

Appearance

Grid

Advanced

Header and Footer

Condition

Annotation on the right side of the Property Editor:

Report Region Attributes in Property Editor: Points to the "Position" field.

Types of Reports Supported for Mobile Interface

Create a Page

Application: 2 - PROJECT TRACKING SYSTEM

User Interface: Mobile

Select a page type:

- Blank Page
- Report
- Form
- Plug-ins
- Chart

Calendar Wizard Feed

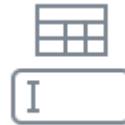
Show Unsupported: No

Create Page

- List View
- Column Toggle Report
- Reflow Report
- Report on Web Service

The screenshot shows the 'Create a Page' interface in Oracle Application Express. At the top, it displays the application name '2 - PROJECT TRACKING SYSTEM'. Below that, the 'User Interface' is set to 'Mobile'. A section titled 'Select a page type:' contains icons for 'Blank Page' (selected), 'Report', 'Form', 'Plug-ins', and 'Chart'. Another section below includes 'Calendar', 'Wizard', and 'Feed' icons. On the left, there's a 'Show Unsupported' dropdown set to 'No' and a 'Cancel' button. On the right, a large callout box highlights 'List View' (with a right-pointing arrow icon) and other report types: 'Column Toggle Report' (with a double arrow icon), 'Reflow Report' (with a downward arrow icon), and 'Report on Web Service' (with a cloud and grid icon). The entire interface has a clean, modern design with light blue and grey tones.

Types of Forms



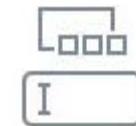
**Form on a
Table or View**



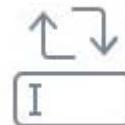
Tabular Form



**Form on a
Table with Report**



**Master Detail
Form**



**Form on a
Procedure**



**Form on a
SQL Query**



**Form on
Web Service**



**Form and Report
on Web Service**



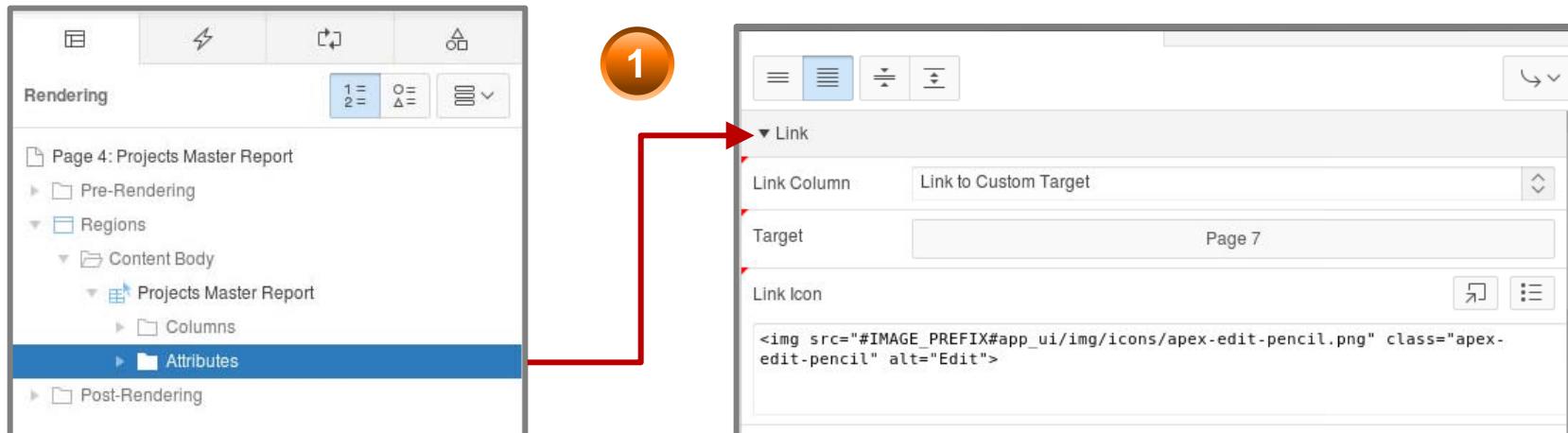
Summary Page

Creating a Form on a Table with Report



- Type of report
- Page number and name
- Region template and name
- Tabs
- Columns to display
- Image for edit link
- Page number and name
- Region template and name
- Primary key and trigger source
- Columns to edit
- Actions to enable (insert, update, and delete)

Linking a Report to a Form



This diagram illustrates the four steps to link a report to a form:

- Step 1:** The 'Link' configuration dialog is shown, where the 'Link Column' is set to 'Link to Custom Target' and the 'Target' is 'Page 7'. A red arrow points from the 'Attributes' section of the 'Rendering' page on the left to this dialog.
- Step 2:** The 'Link Builder - Target' dialog is shown. Under 'Type', it is set to 'Page in this application' and 'Page' is '7'. Under 'Set Items', there is a mapping for 'P7_PROJECT_ID' with a value of '#PROJECT_ID#'. A red circle with the number '2' is on this dialog.
- Step 3:** A red circle with the number '3' is on a report view titled '1. Primary Report' showing project details. A red arrow points from the report view to the 'Manage Projects' modal window.
- Step 4:** The 'Manage Projects' modal window is shown, displaying project details for various projects like 'MFG Sugar Industry' and 'APEX4.2 Course Development'. A red circle with the number '4' is on this window.

Report View (Step 3):

Project Id	Project Name	Project Type	Project Description	Project Status	Project Planned Start Date
604	MFG Sugar Industry	304	Engineering Design Capabilities in the Sugar Industry	104	20-JAN-15
607	APEX4.2 Course Development	302	Developing Course Lessons for APEX 4.2	104	15-DEC-14
601	APEX5.0 Course Development	302	Developing Course Lessons for APEX 5.0	102	01-JAN-15
602	AMEX Cobrand	301	Cobrand Application Development for AMEX	102	01-FEB-15

Manage Projects Modal (Step 4):

Project Name *	MFG Sugar Industry
Project Type *	304
Project Description *	Engineering Design Capabilities in the Sug
Project Status *	104
Project Planned Start Date *	20-JAN-15
Project Start Date *	01-FEB-15
Project Planned End Date *	23-MAR-15
Project End Date	26-MAR-15
Project Upgrade Yn *	N
Project Upgrade Of	
Project Created By *	504
Project Created On	01-FEB-15
Project Last Updated By *	504
Project Last Updated On	20-APR-15

Creating a Tabular Form

Create Tabular Form

Buttons and Branching

Cancel Button Label: Cancel

Branch to Page: 5

Apply Changes Button Label: Apply Changes

Branch to Page: 5

Create Tabular Form

This wizard builds a form to perform update, insert, and delete operations on multiple rows in a database table.

* Table / View Owner: PTS

* Table / View Name: EMPLOYEES (table)

* Select Columns:

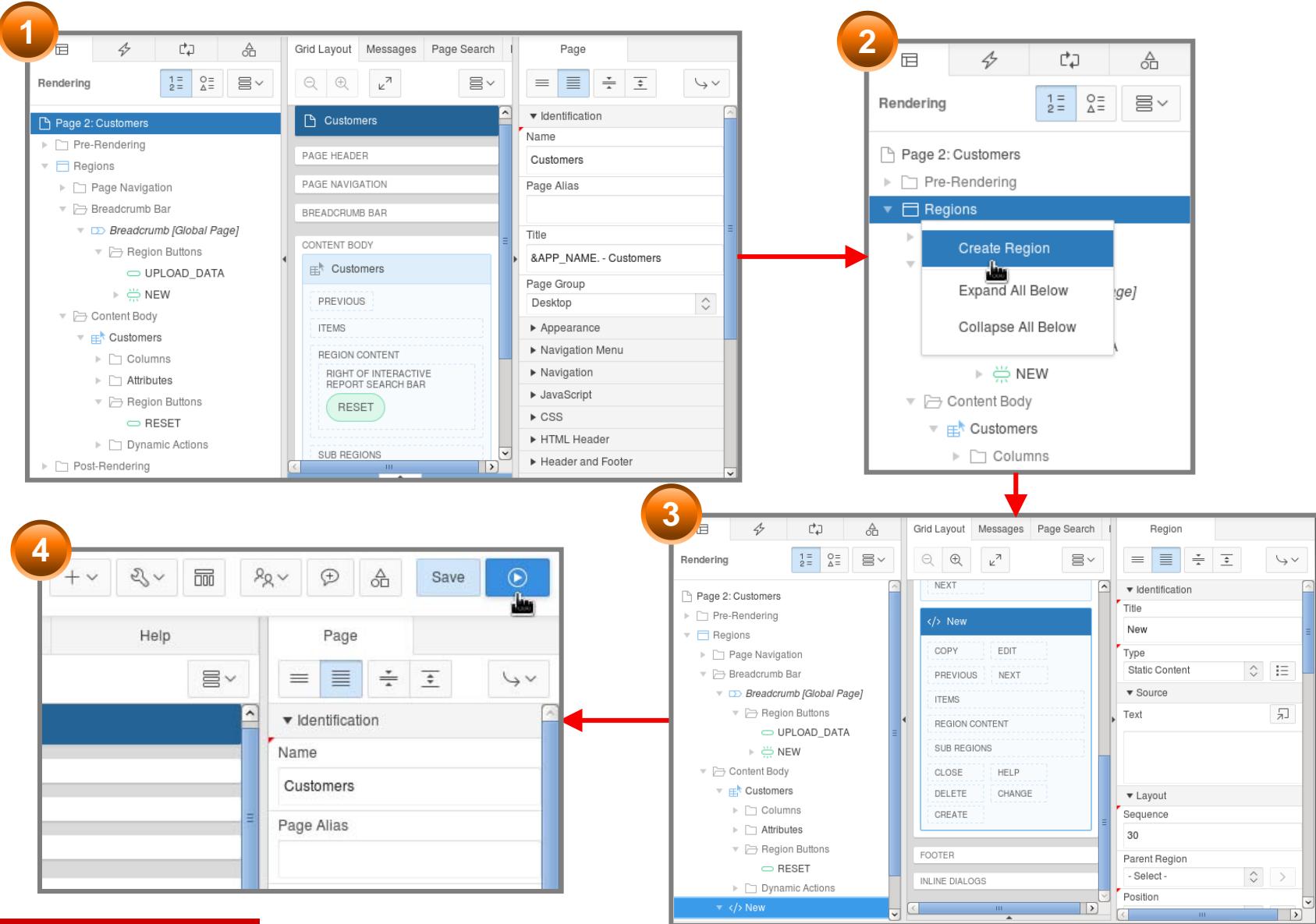
- EMPLOYEE_ID (Number)
- FIRST_NAME (Varchar2)
- LAST_NAME (Varchar2)
- EMAIL (Varchar2)
- PHONE_NUMBER (Varchar2)
- MOBILE_NUMBER (Varchar2)
- ADDRESS (Varchar2)
- DESIGNATION (Varchar2)
- SALARY (Number)

Allowed Operations: Update Only

Use User Interface Defaults: Yes No

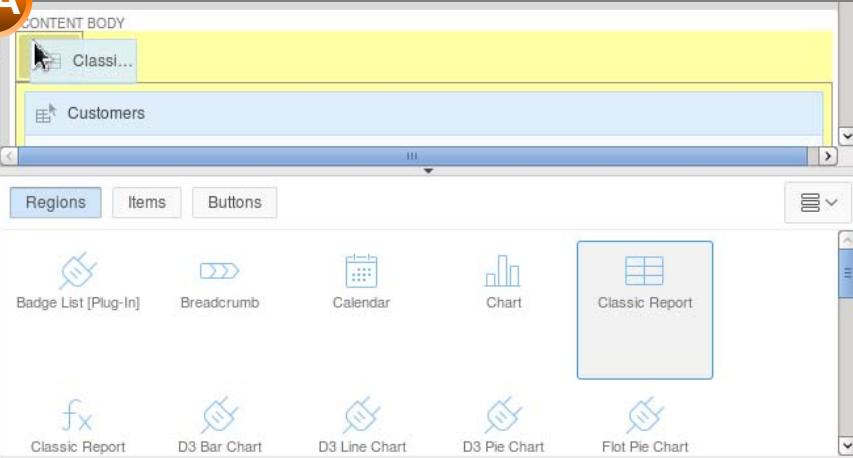
Next >

Adding a Region from the Rendering Tree

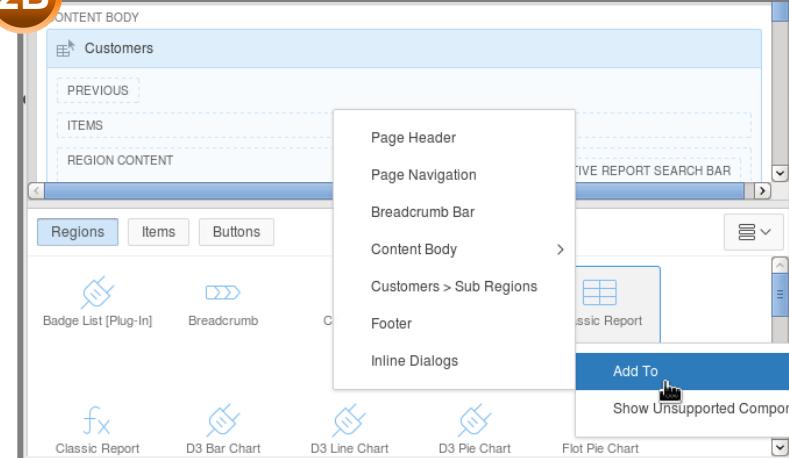


Adding a Region from the Gallery

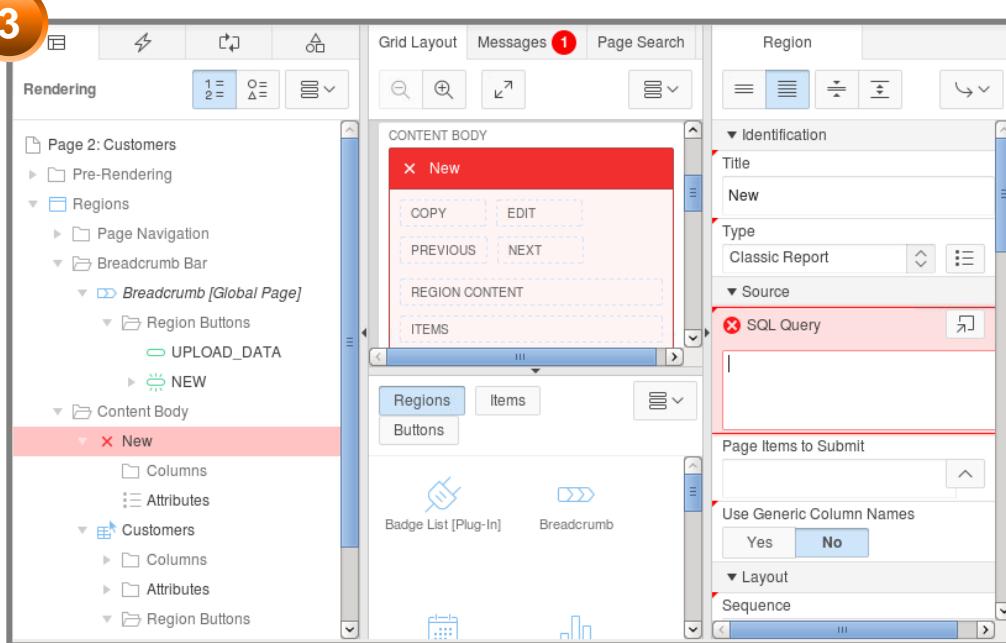
2A



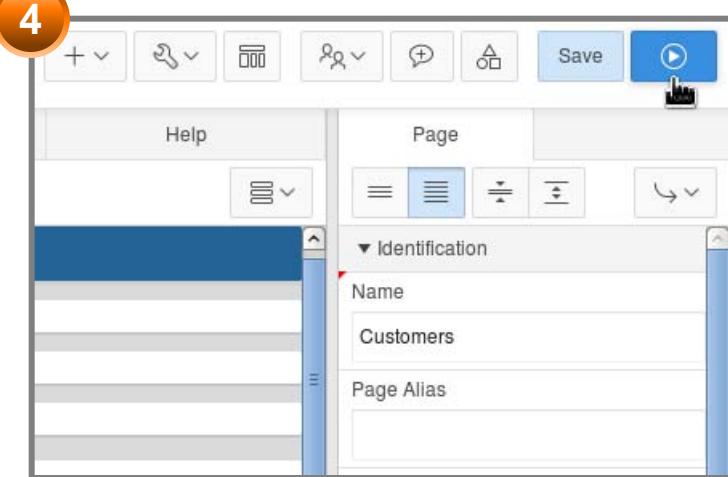
2B



3



4



Page Items: Examples

Sample Database Application - Product Details

Product Name *

Product Description

Category *

Product Available * Yes No

List Price *

Product Image Browse...

Tags

Create Order for: * Existing customer New customer

Customer *

Select List

Text Field

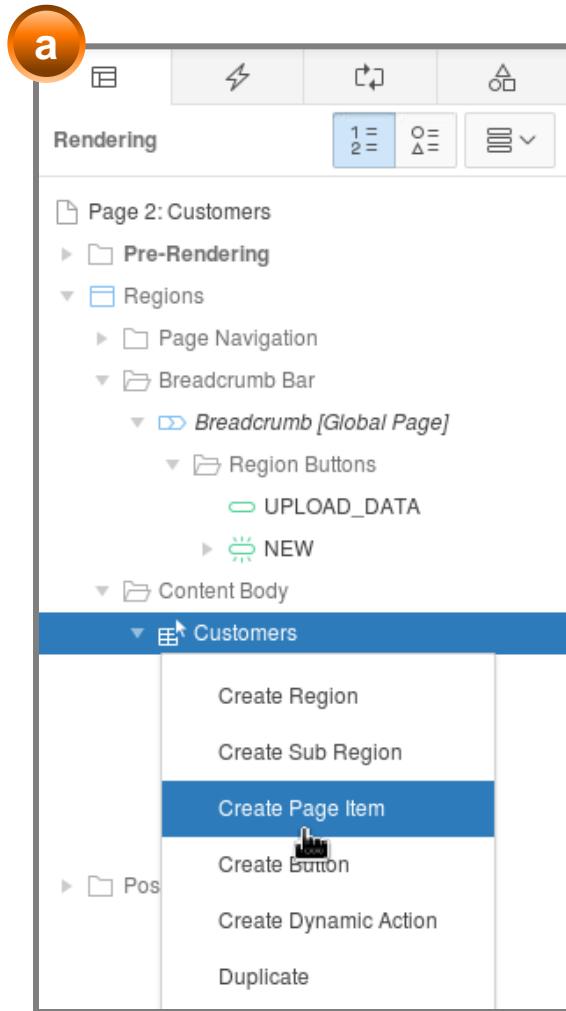
Text Area

Radio Group

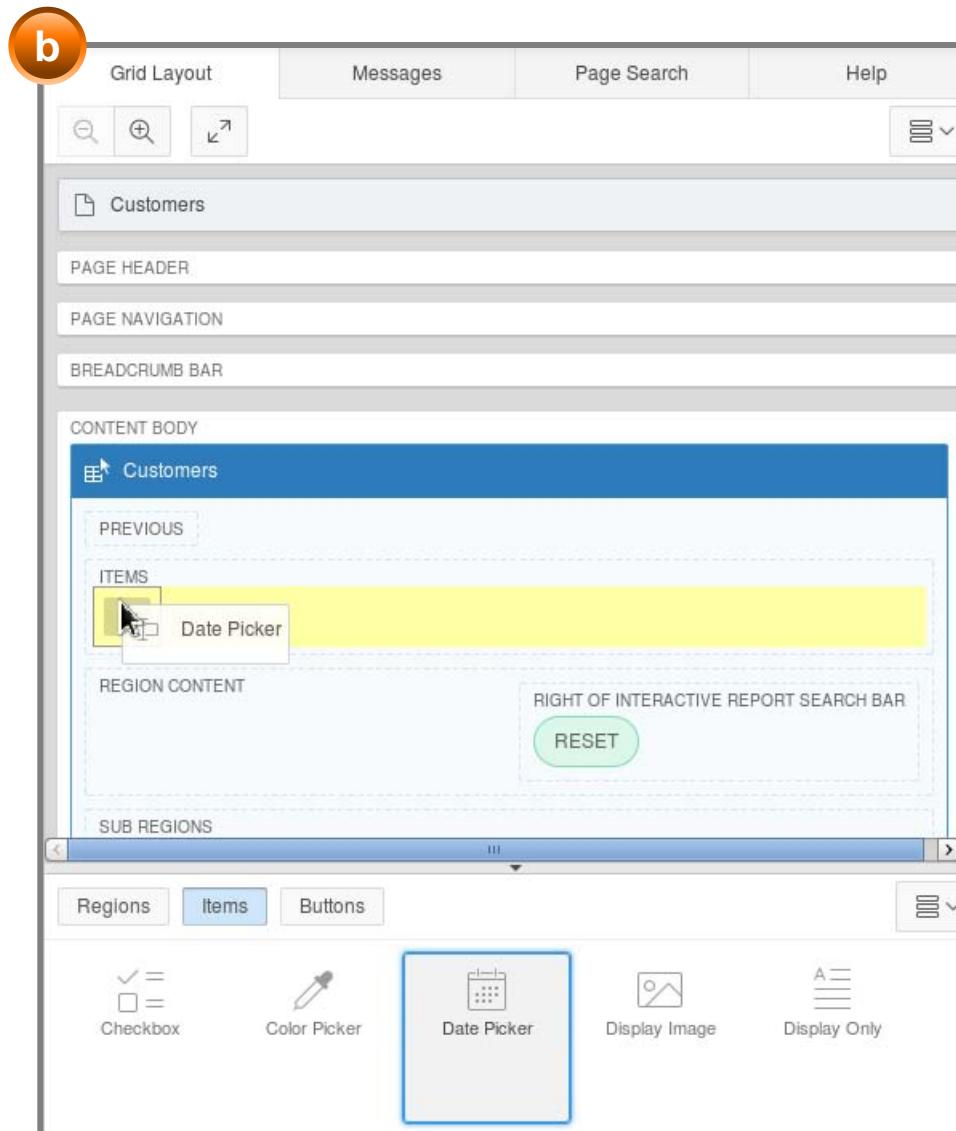
File Browse

Pop-up LOV

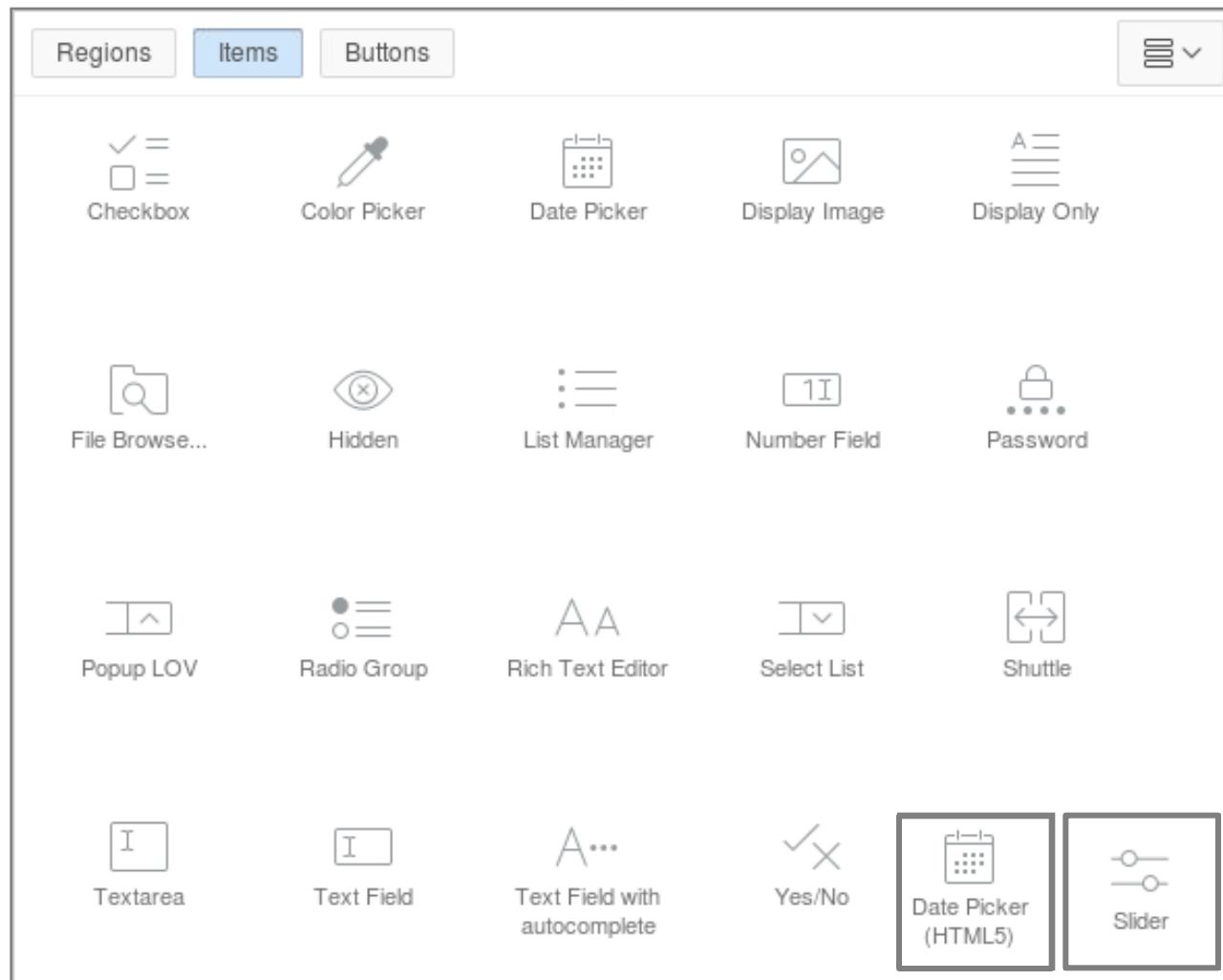
Creating a Page Item



OR



Types of Page Items

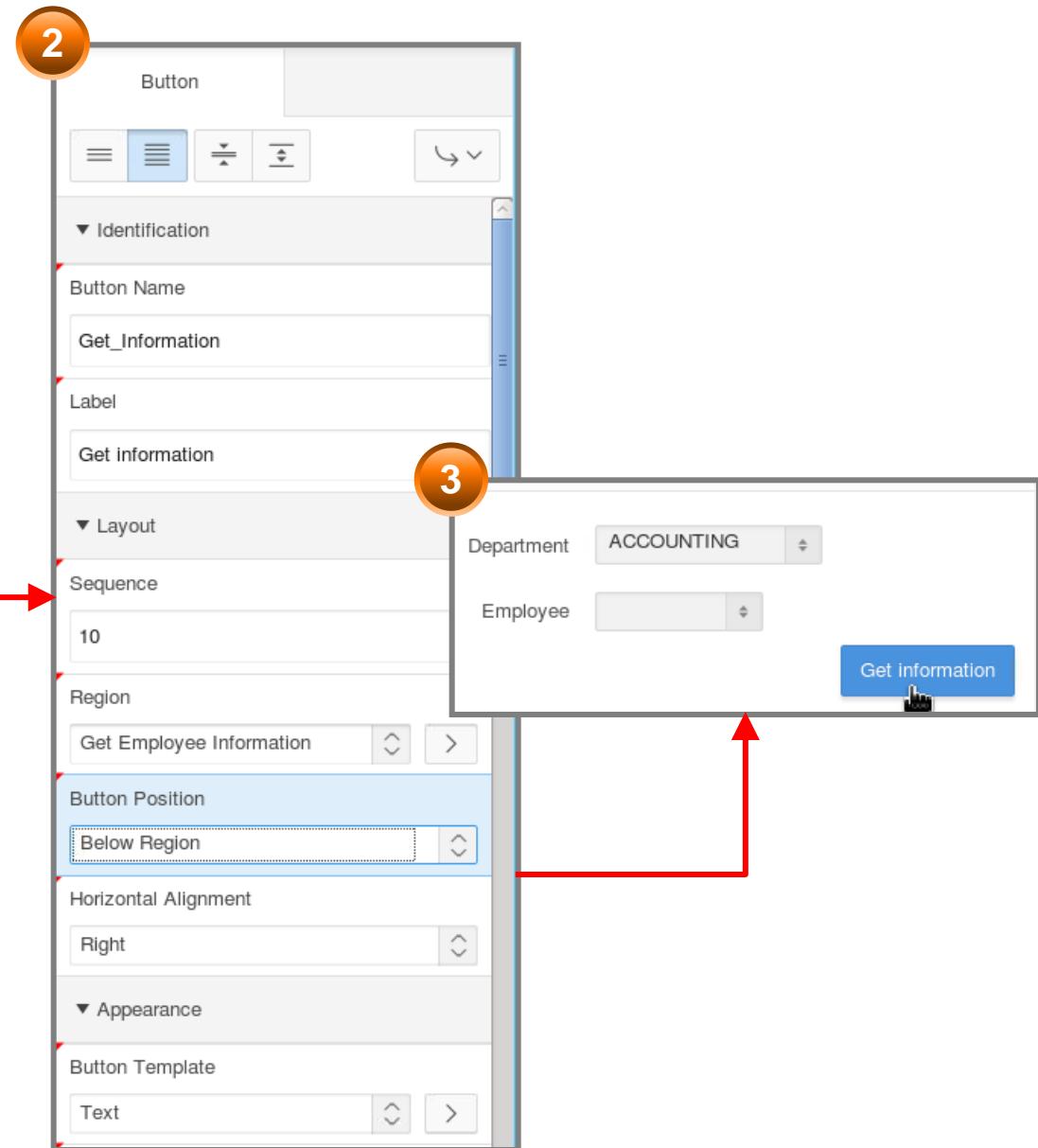
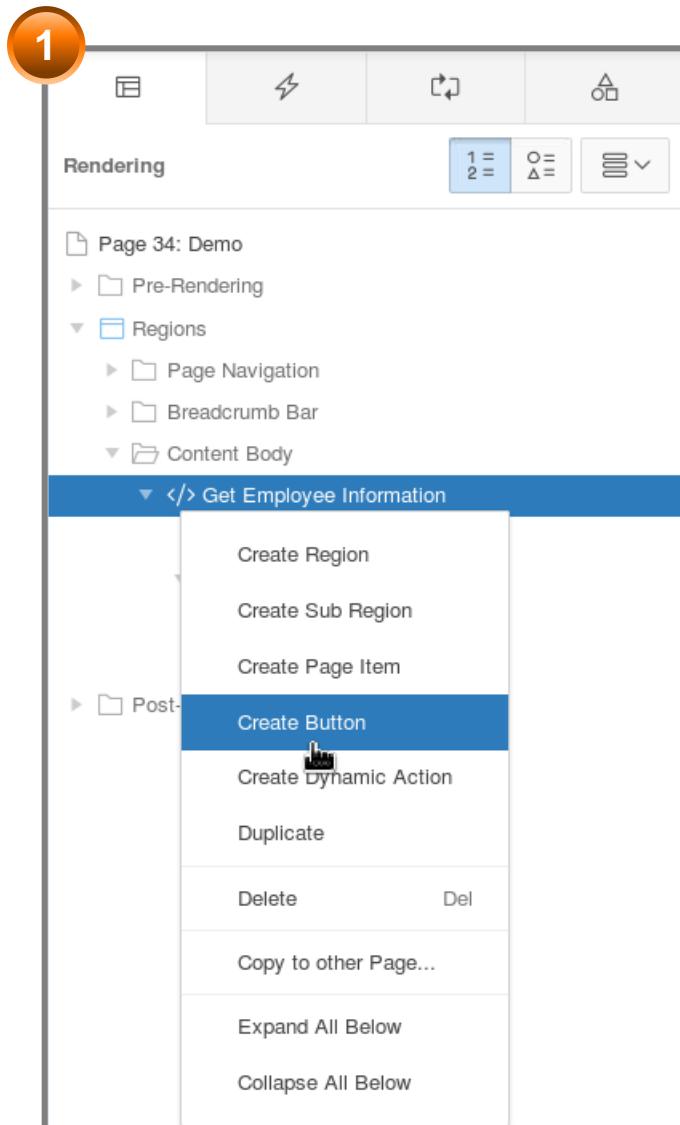


Editing an Item

Rendering pane Property Editor

The screenshot shows the Oracle Application Express (APEX) interface. On the left, the 'Rendering' pane is highlighted with a red border. It displays a tree view of page items under 'Page 7: Customer Details'. A context menu is open over the item 'P7_CUST_FIRST_NAME'. The menu options include 'Label', 'Type', 'Start New Row', and 'Yes'. The 'Type' option is selected. In the center, the 'WIZARD BODY' section shows a form with various input fields: 'P7_CUST_FIRST_NAME' (selected), 'P7_CUST_LAST_NAME', 'P7_CUST_STREET_ADDRESS1', 'P7_CUST_CITY', 'P7_CUST_STATE', 'P7_CUST_POSTAL_CODE', 'P7_CREDIT_LIMIT', 'P7_PHONE_NUMBER1', and 'P7_PHONE_NUMBER2'. At the bottom of the central pane are tabs for 'Regions', 'Items' (which is selected), and 'Buttons'. On the right, the 'Property Editor' is also highlighted with a red border. It lists various properties for the selected item, such as Identification, Label, Settings, Layout, Grid, Appearance, Validation, Advanced, Source, Default, Quick Picks, Condition, Read Only, Security, Configuration, Help, Comments, and Audit Information.

Creating a Button



Editing Button Attributes

The screenshot shows the Oracle APEX page editor interface. On the left, there's a tree view of the page structure under 'Page 34: Demo'. The 'Regions' section is expanded, showing 'Page Navigation', 'Breadcrumb Bar', and 'Content Body'. Within 'Content Body', 'Get Employee Information' is selected, revealing its internal structure: 'Attributes' (selected), 'Items' (containing 'P34_DEPARTMENT' and 'P34_EMPLOYEE'), and 'Region Buttons'. A specific button, 'Get_Information', is highlighted with a blue selection bar. A context menu is open over this button, displaying the following options:

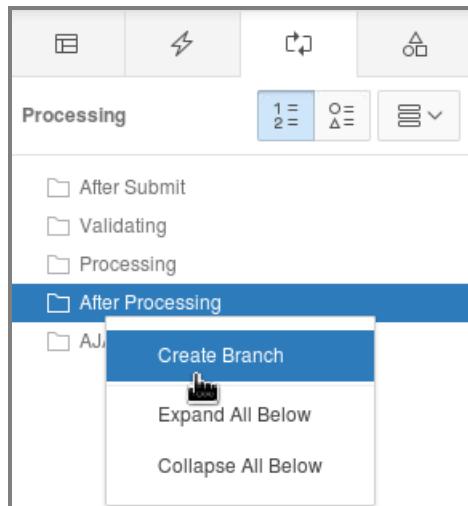
- Label: Get information
- Action: Submit Page

The screenshot shows the 'Button' configuration dialog. At the top, there are several icons for file operations. Below them is a section titled 'Identification' containing the following fields:

- Button Name: Get_Information
- Label: Get information

Under the 'Layout' section, the 'Sequence' is set to 10. The 'Region' field contains 'Get Employee Information'. In the 'Button Position' section, it is set to 'Below Region'. Under 'Horizontal Alignment', it is set to 'Right'. The 'Appearance' section is collapsed. In the 'Button Template' section, the template is set to 'Text'. The 'Hot' section at the bottom has three items, with the third item currently selected.

Creating a Branch



Creating the Branch

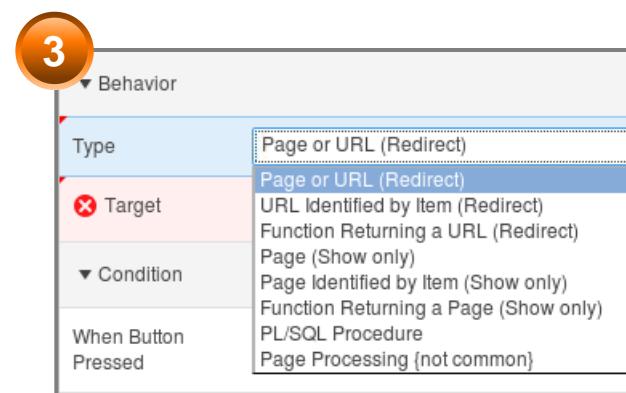
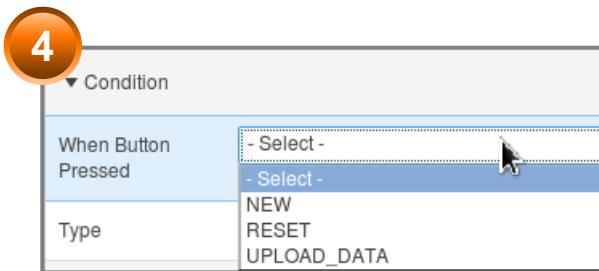
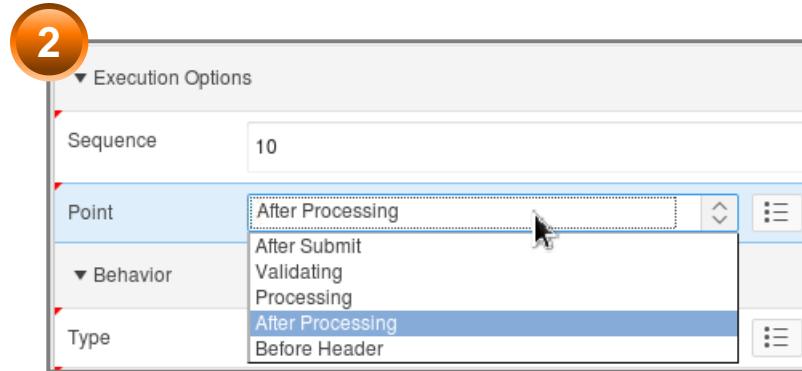
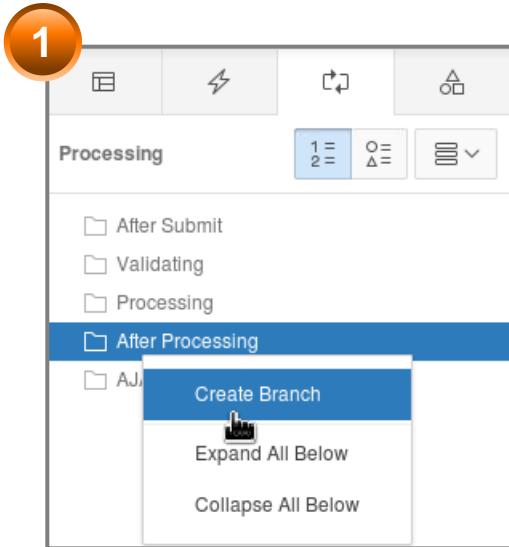
This screenshot shows the "Execution Options" dialog. It includes fields for "Sequence" (set to 10) and "Point". The "Point" dropdown is open, showing options: After Processing (selected), After Submit, Validating, Processing, After Processing, and Before Header. A handwritten note "Branch Point" with an arrow points to the "After Processing" option in the dropdown.

Branch Point

This screenshot shows the "Behavior" dialog. It includes fields for "Type" (set to "Page or URL (Redirect)", which is also highlighted with a blue background), "Target" (set to "Page or URL (Redirect)", also highlighted with a blue background), and "Condition". A handwritten note "Branch Type" with an arrow points to the "Page or URL (Redirect)" option in the "Type" dropdown.

Branch Type

Creating a Branch: Example

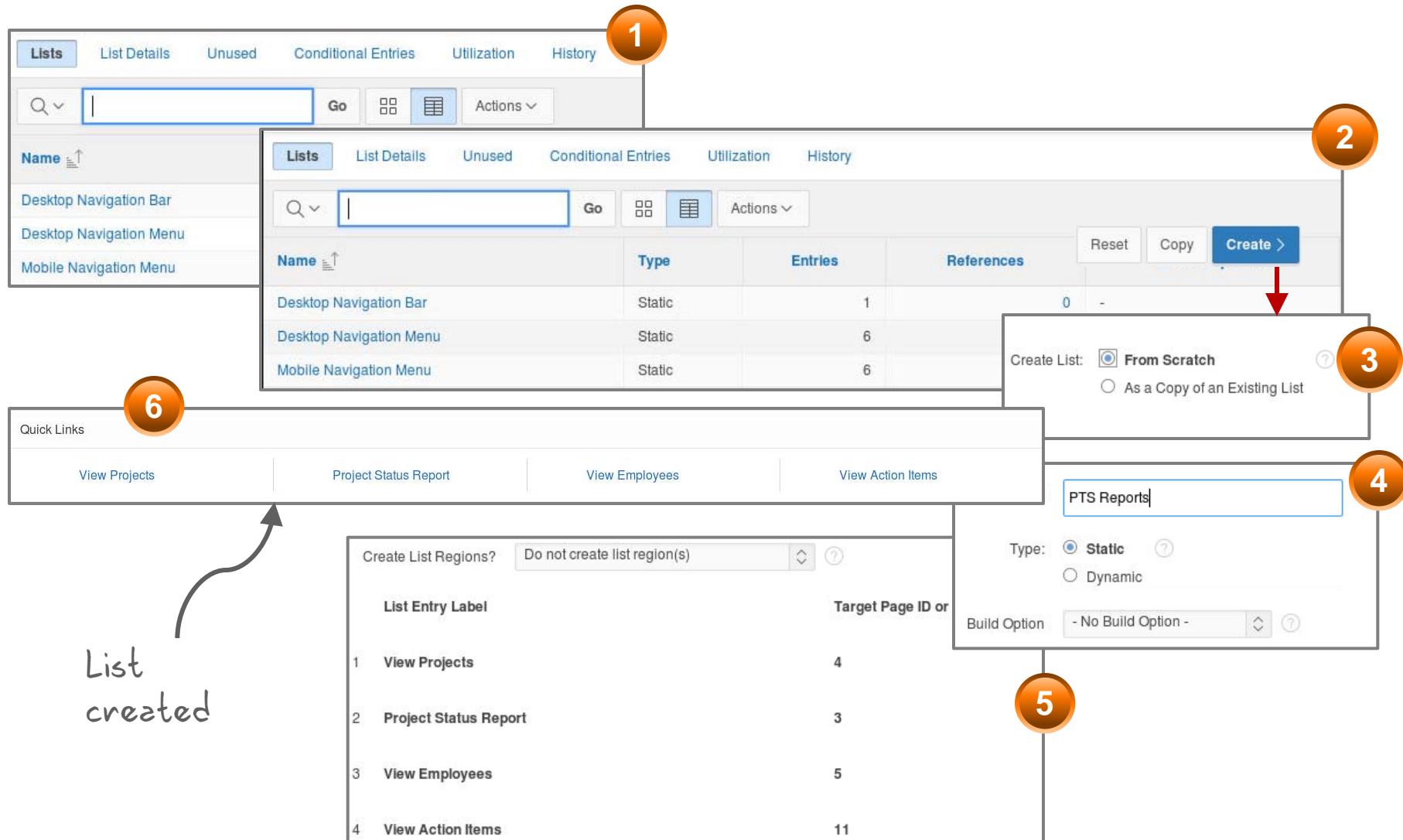


Creating Navigation Menu Entries

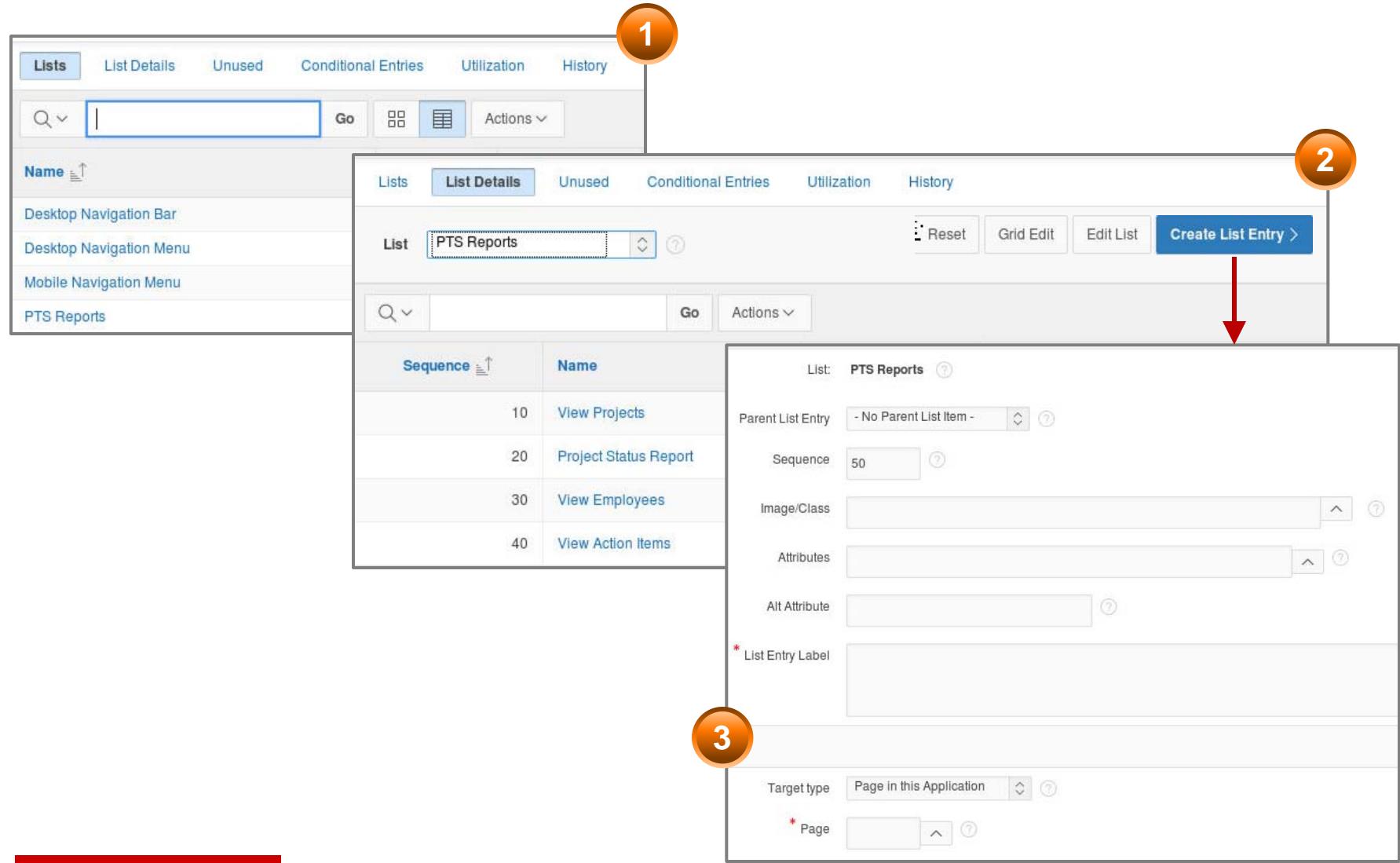
The screenshot illustrates the process of creating a navigation menu entry in Oracle ADF. The interface consists of several panels:

- Top Navigation Bar:** Lists, List Details, Unused, Conditional Entries, Utilization, History. The **List Details** tab is highlighted.
- Search Bar:** Includes a search input field, a Go button, and a Actions dropdown.
- Table View:** Shows a list of navigation items with columns for Name and Sequence. The first item is "Desktop Navigation Bar" with Sequence 10.
- Main Toolbar:** Lists, List Details, Unused, Conditional Entries, Utilization, History. The **Create List Entry >** button is highlighted.
- Create List Entry Dialog:** A modal window for creating a new entry. It includes fields for Parent List Entry (set to "Home"), Sequence (set to 20), Image/Class, Attributes, Alt Attribute, List Entry Label (set to "Create Employees"), Target type (set to "Page in this Application"), and Page (set to 6).
- Application Preview:** Shows the "PROJECT TRACKING SYSTEM" application with a navigation bar containing "Home" and "Create Employees" links, and a main content area displaying "Home".

Creating a Static List



Creating List Entries



Creating a Dynamic List

1

2

3

4

5

6

Project Plan

Project Plan

Project Plan

SQL scripts

Tracking Excel

Schema Excel

Query Source Type: SQL Query

* SQL Query:

```
select null as level_value
      , "DOCUMENT_NAME" as label_value
      , "DOCUMENT_URL" as target_value
      , null as is_current
      , null as image_value
      , null as image_attr_value
      , null as image_alt_value
  from "PROJECT_DOCUMENTS"
 order by 1
```

Build Query

Create List:

- From Scratch
- As a Copy of an Existing List

Name: Project Documents Quick Links

Type:

- Static
- Dynamic

Build Option: - No Build Option -

Lists

List Details

Unused

Conditional Entries

Utilization

History

Search bar

Actions

Desktop Navigation Bar

Desktop Navigation Menu

Mobile Navigation Menu

Desktop Navigation Bar

Desktop Navigation Menu

Mobile Navigation Menu

Entries

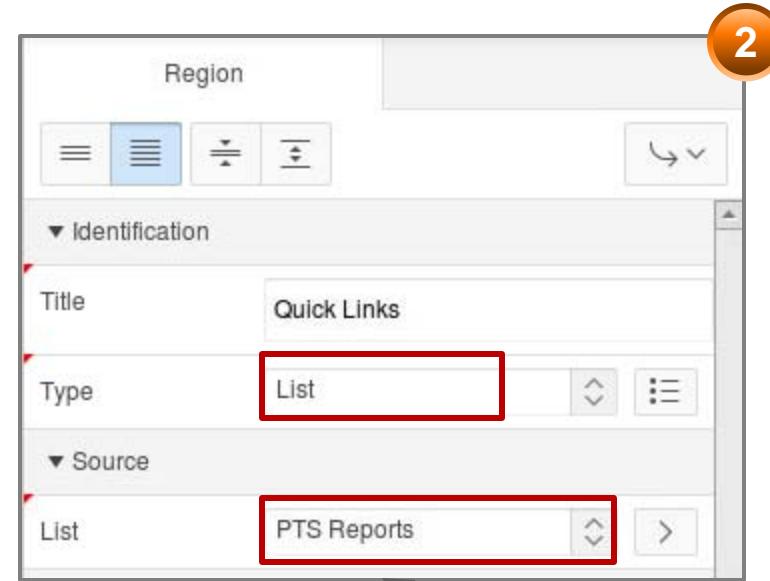
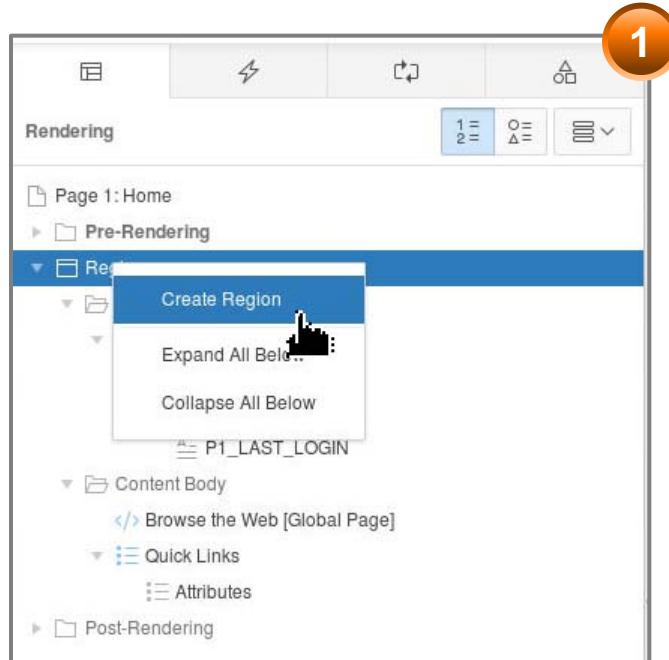
References

Reset

Copy

Create >

Creating a List Region

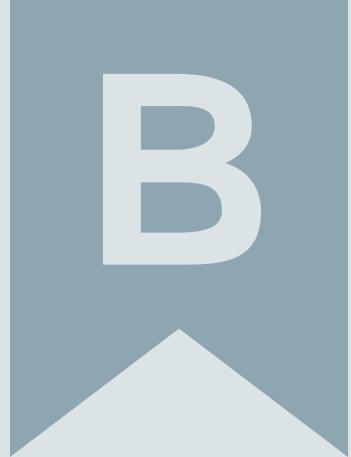


Summary

In this lesson, you should have learned how to:

- Create a workspace and a workspace administrator
- Create database objects
- Run SQL commands and SQL scripts
- Create a database application
- Create a report
- Create a form on a table with report
- Create a region
- Create and edit page items and buttons
- Create a branch
- Create a navigational menu entry
- Create lists and list entries





B

Oracle Application Express: Other Features

Objectives

After completing this lesson, you should be able to:

- Debug PL/SQL remotely in SQL Developer
- Synchronize beta and development feedback



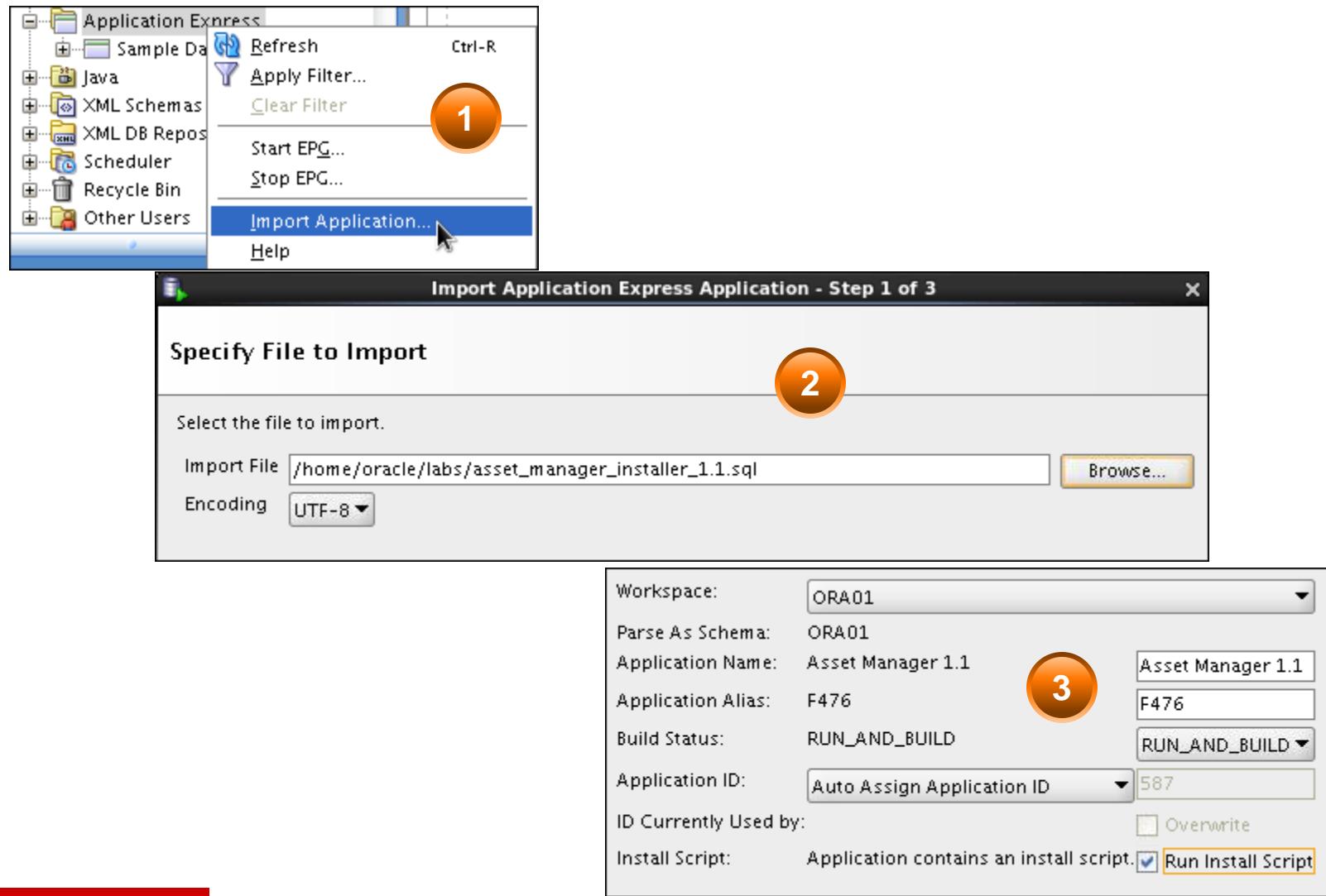
Agenda

- Debug PL/SQL Remotely in SQL Developer
- Synchronize Beta and Development Feedback

Remote PL/SQL Debugging with SQL Developer

1. Import packaged application.
2. Set DEBUG DBA privileges.
3. Compile PL/SQL package and package body for Debug.
4. Set remote Debug.
5. Add the DEBUG code to Application.
6. Debug Application with the DEBUG code.

Importing Your Packaged Application

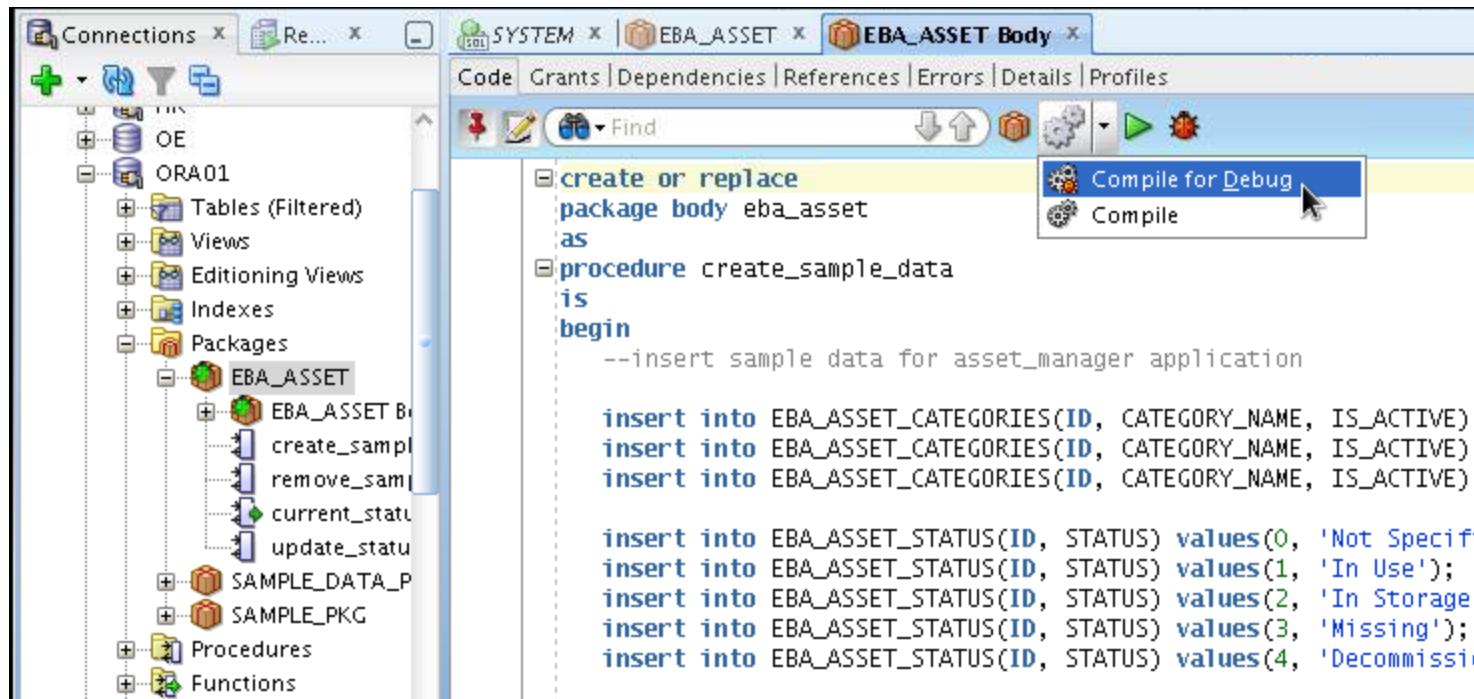


Setting DEBUG DBA Privileges

In SQL Developer, create a connection to SYSTEM and execute the following commands:

```
grant DEBUG CONNECT SESSION to <APEX_USER>;  
grant DEBUG ON <APEX_USER>. <package name> to PUBLIC;
```

Compiling the PL/SQL Package and Package Body for Debug



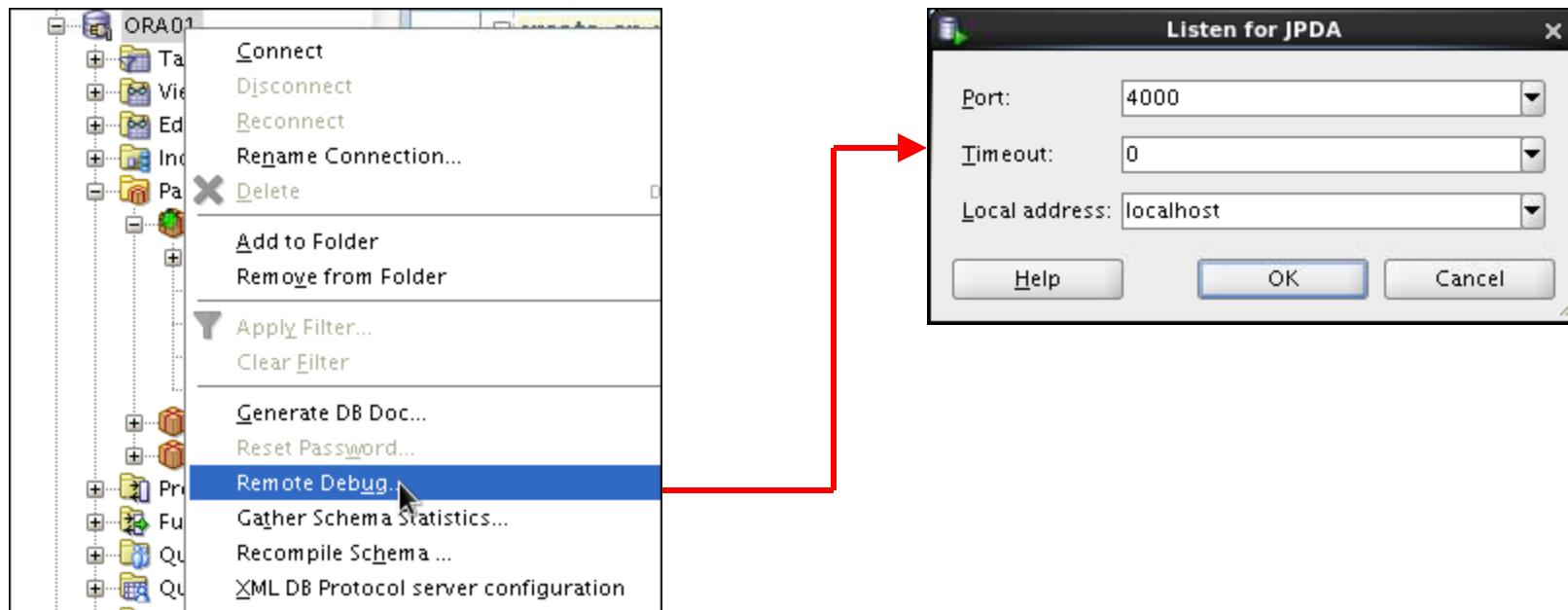
The screenshot shows the Oracle SQL Developer interface. On the left, the Object Navigator displays a tree structure of database objects under the connection 'ORA01'. The 'Packages' node is expanded, showing the 'EBA_ASSET' package and its sub-components: 'EBA_ASSET BODY', 'create_sample', 'remove_sample', 'current_status', 'update_status', 'SAMPLE_DATA_P', and 'SAMPLE_PKG'. Under 'Procedures' and 'Functions', there are no items listed. The main workspace shows the PL/SQL code for the 'EBA_ASSET BODY' package. The code includes a package body declaration for 'eba_asset' and a procedure named 'create_sample_data'. The procedure begins with a comment: '--insert sample data for asset_manager application'. It then contains several 'insert into' statements for the 'EBA_ASSET_CATEGORIES' and 'EBA_ASSET_STATUS' tables. A tooltip or context menu is open over the 'Compile for Debug' button in the toolbar, with the 'Compile' option also visible. The status bar at the bottom indicates the connection is 'SYSTEM'.

```
create or replace
package body eba_asset
as
procedure create_sample_data
is
begin
--insert sample data for asset_manager application

insert into EBA_ASSET_CATEGORIES(ID, CATEGORY_NAME, IS_ACTIVE)
insert into EBA_ASSET_CATEGORIES(ID, CATEGORY_NAME, IS_ACTIVE)
insert into EBA_ASSET_CATEGORIES(ID, CATEGORY_NAME, IS_ACTIVE)

insert into EBA_ASSET_STATUS(ID, STATUS) values(0, 'Not Specified');
insert into EBA_ASSET_STATUS(ID, STATUS) values(1, 'In Use');
insert into EBA_ASSET_STATUS(ID, STATUS) values(2, 'In Storage');
insert into EBA_ASSET_STATUS(ID, STATUS) values(3, 'Missing');
insert into EBA_ASSET_STATUS(ID, STATUS) values(4, 'Decommissioned');
```

Setting the Remote Debug



Adding the DEBUG Code to Your Process

Process: 3 of 4 Name: Update Asset Status

Cancel Delete Apply Changes

Show All Name Process Point Source Messages Conditions Security Configuration Comments

Name

Page: 11 Inventory Details

* Name: Update Asset Status

Type: PL/SQL anonymous block

Process Point

* Sequence: 35

Process Point: On Submit - After Computations and Validations

Run Process: Once Per Page Visit (default)

Source

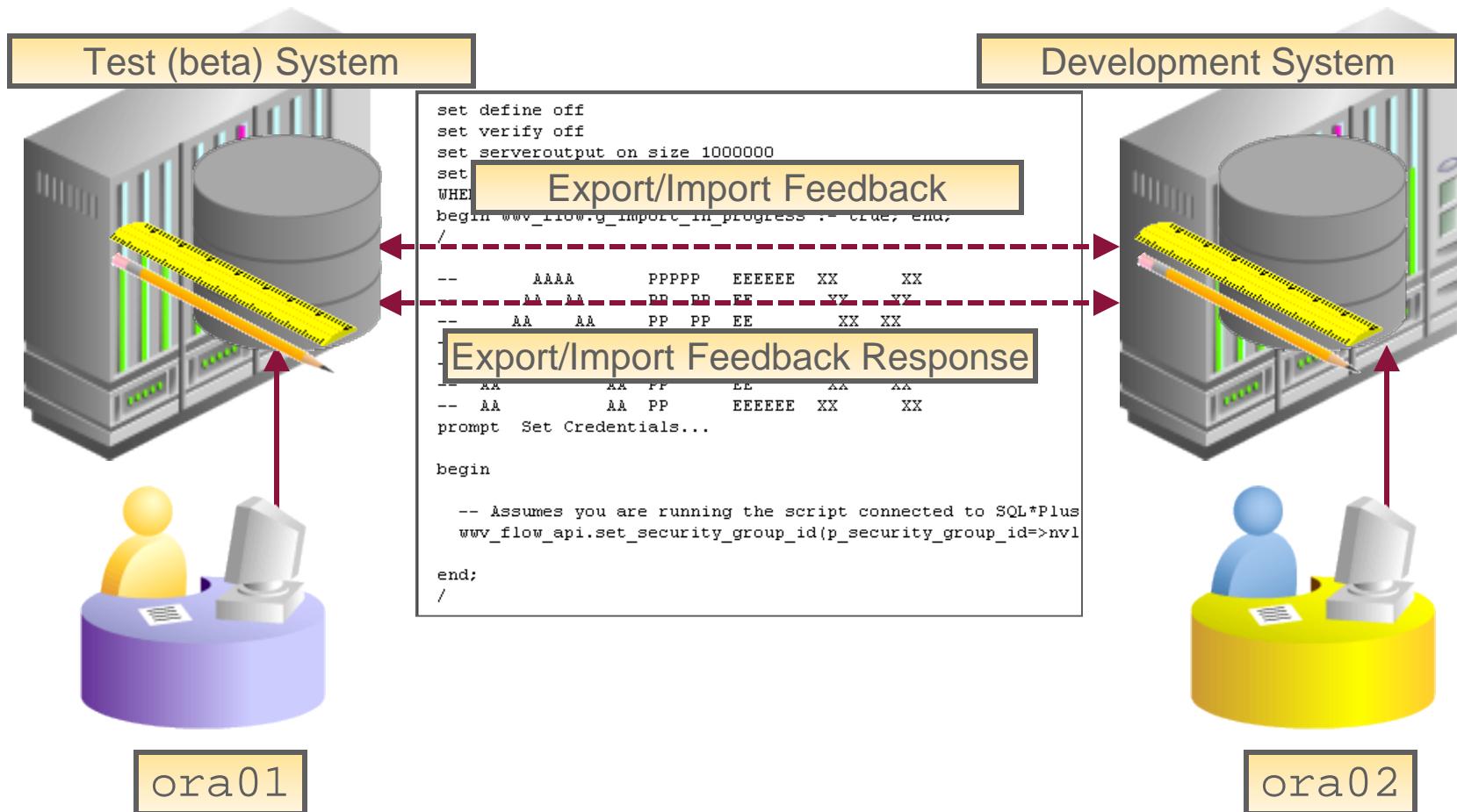
* Process [Download Source]

```
IF :DEBUG='YES' THEN
    dbms_debug_jdwp.connect_tcp('localhost',4000);
END IF;
eba_asset.update_status(:P11_ASSET_ID);
IF :DEBUG='YES' THEN
    dbms_debug_jdwp.disconnect;
END IF;
```

Agenda

- Debug PL/SQL Remotely in SQL Developer
- Synchronize Beta and Development Feedback

Synchronizing Beta and Development Feedback



Reviewing the Feedback Synchronization Source Identifier

Workspace Identifier:	2268532096926535
Workspace Status:	ASSIGNED
* Workspace Name	ORA01
First Schema Provisioned	ORA01
Feedback Synchronization Source Identifier	ORA01
Allow workspace to be automatically purged	Yes
Resource Consumer Group	
Builder Notification Message	

Workspace in the test system

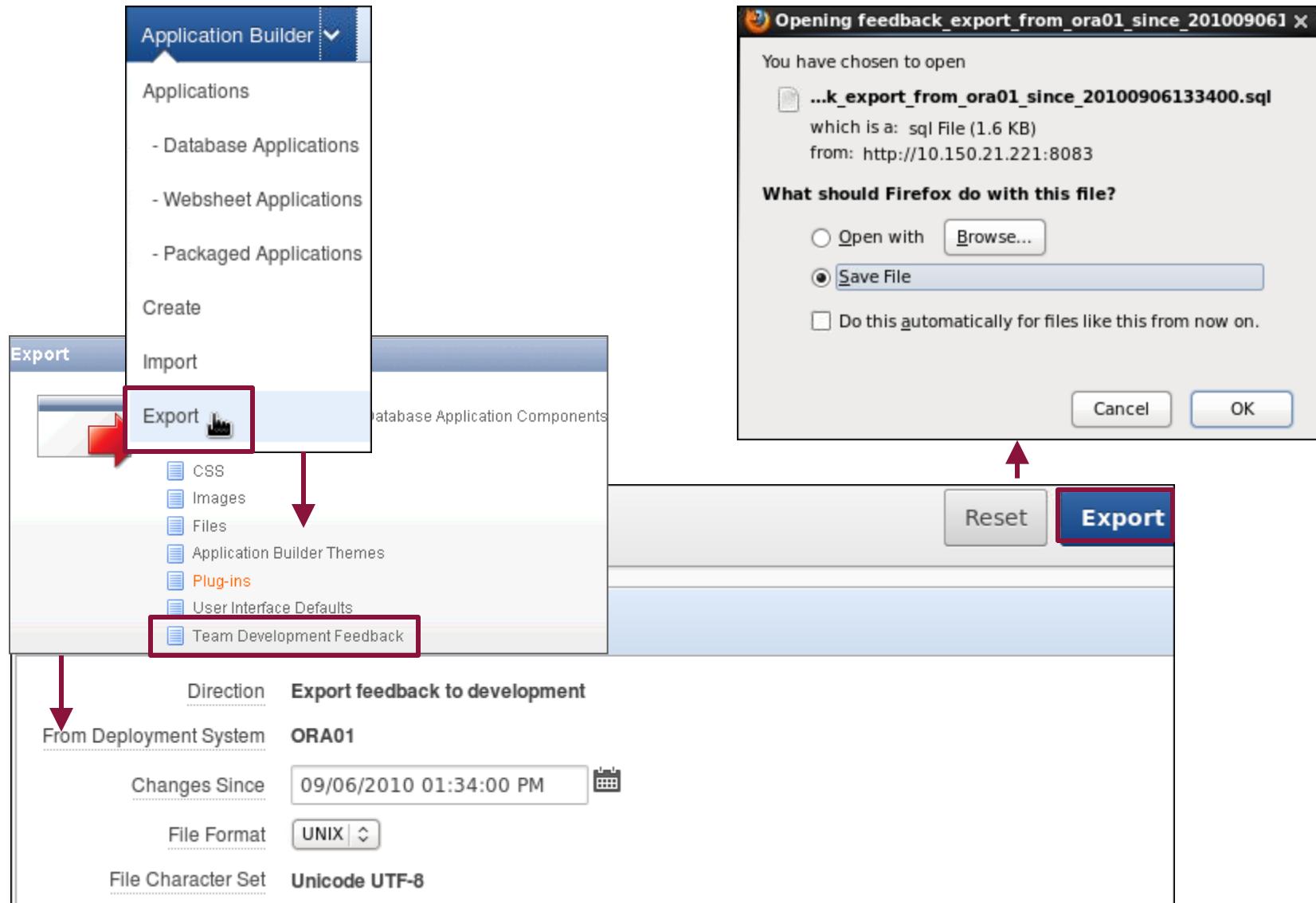
Workspace in the development system

Workspace Identifier:	2382700459930938
Workspace Status:	ASSIGNED
* Workspace Name	ORA02
First Schema Provisioned	ORA02
Feedback Synchronization Source Identifier	ORA02
Allow workspace to be automatically purged	Yes
Resource Consumer Group	
Builder Notification Message	

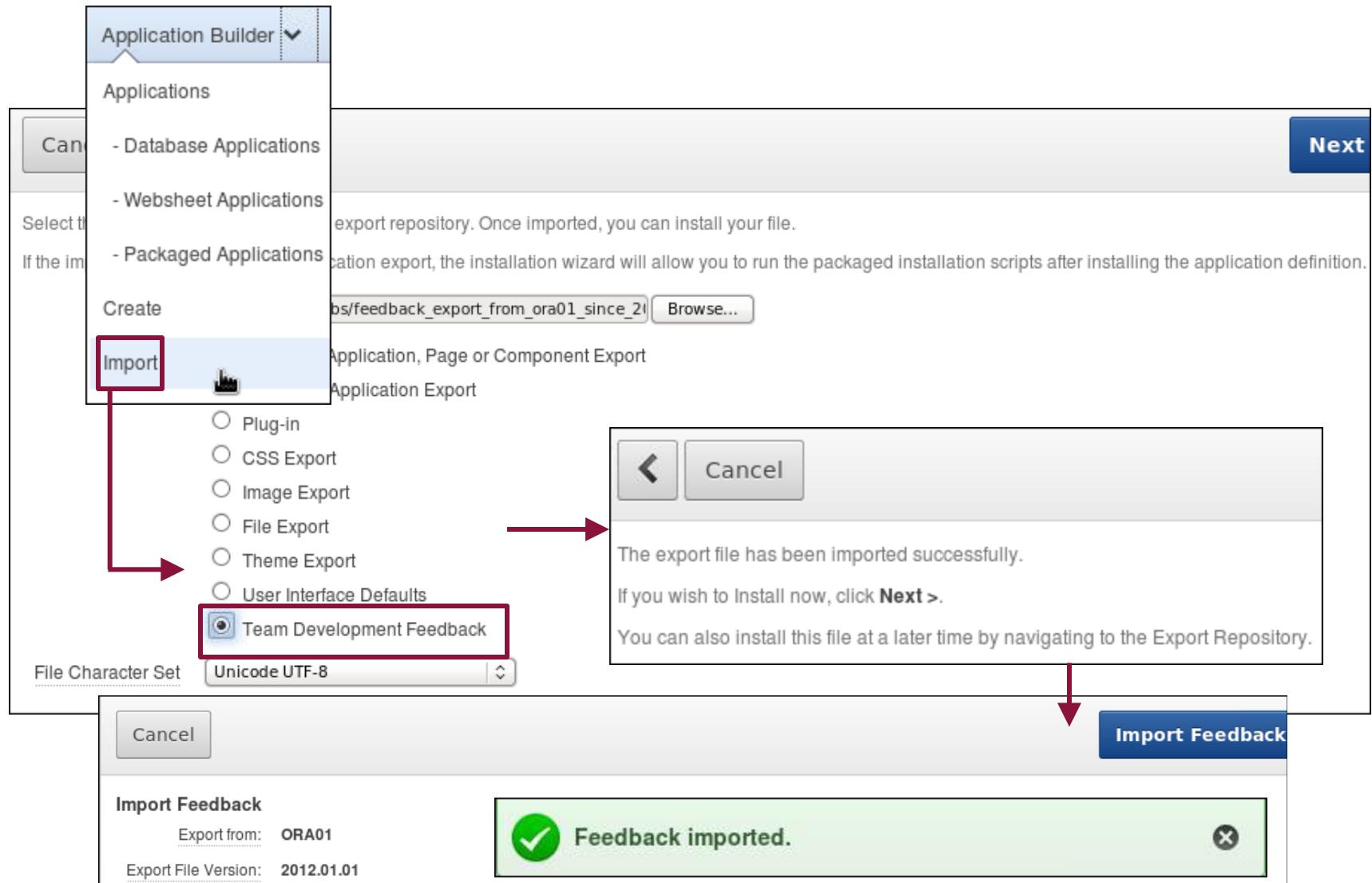
Synchronizing Beta and Development Feedback: Example

- On the test (beta) system:
 1. Create and customize a feedback page in an application.
 2. Review the submit feedback process.
 3. Submit feedback by using the Feedback navigation bar entry.
 4. Export the feedback.
- On the development system:
 1. Import the feedback from production.
 2. Review feedback and follow up.
 3. Export the feedback response.
- On the test system, import the feedback response from development and create a report to show the feedback list.

Exporting the Feedback from Beta System



Importing the Feedback into Development System



Responding to the Feedback

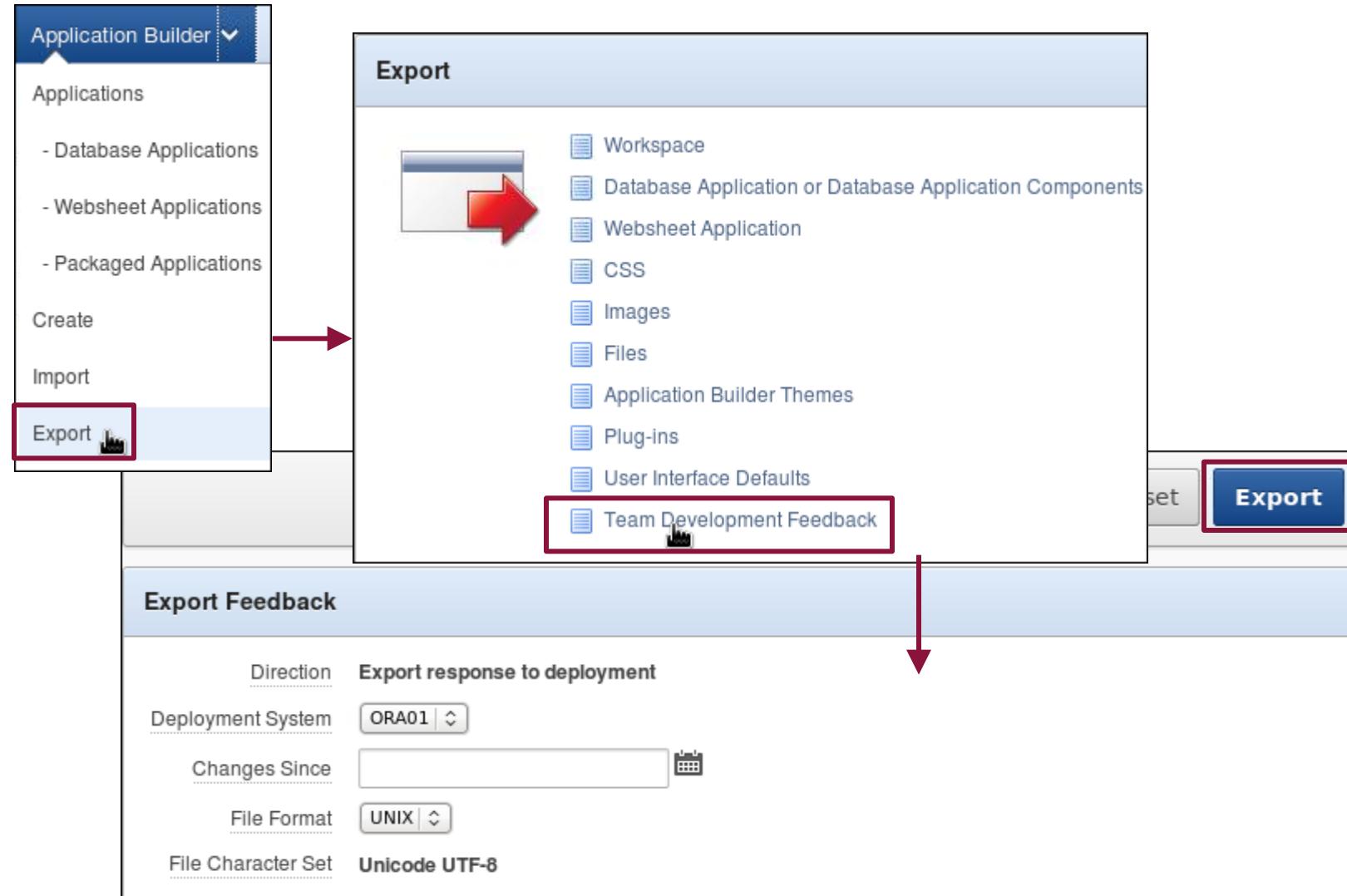
The screenshot shows the Oracle Team Development Feedback interface. At the top, there's a navigation bar with a home icon, 'Team Development', and 'Feedback' selected. Below it is a menu bar with 'Dashboard', 'Feedback' (which is highlighted in blue), 'Calendar', 'By Application', and 'By Filing User'. A search bar with 'Show All' and 'Set' buttons follows. Underneath is a toolbar with a search icon, 'Go', filter icons, and an 'Actions' dropdown.

In the main area, there's a filter section with a search input, a 'Go' button, and two checkboxes: 'Application = 132' (unchecked) and 'Log as To Do' (checked). Below this is a table with columns: Feedback Number, Feedback, Status, Logged As, Application, Page, and Filed By. A row for 'ORA01-6' is selected, showing the feedback content: 'There are 2 feedback links, please remove 1'. The status is 'No status', application is '132', page is '1', and filed by is 'ora01_admin'. A red box highlights the edit icon in the first column of this row.

A red arrow points from the edit icon in the table row to a 'Developer Comment' box. This box contains the text: 'Acknowledged, will be fixed in the next build.' Below it is a 'Public Response' box with the same text: 'Acknowledged, will be fixed in the next build.' To the right of the table, there are buttons for 'Log as To Do' (disabled) and 'Log as Feature'.

	Feedback Number	Feedback	Status	Logged As	Application	Page	Filed By
	ORA01-6	There are 2 feedback links, please remove 1	No status		132	1	ora01_admin

Exporting the Feedback Response from Development System



Importing the Feedback Response into Deployment System

The screenshot shows the Oracle Application Express Import interface. At the top, there are tabs for All Applications, Database Applications, Websheet Applications, Packaged Applications, and a search bar with a Go button. Below the tabs are buttons for Actions, Reset, Import (which is highlighted with a red box), and Create. A red arrow points down from the Import button to a modal dialog.

The main panel has a Cancel button on the left and a Next > button on the right. It contains instructions: "Select the file you wish to import to the export repository. Once imported, you can install your file." and "If the imported file is a packaged application export, the installation wizard will allow you to run the packaged installation scripts after installing the application definition."

Form fields include:

- * Import file: /home/oracle/Downloads/feedback_import_for_ora01.sql (with a Browse... button)
- * File Type:
 - Database Application, Page or Component Export
 - Websheet Application Export
 - Plug-in
 - CSS Export
 - Image Export
 - File Export
 - Theme Export
 - User Interface Definition

A modal dialog titled "Import Feedback" is displayed. It shows "Export from: ORA01" and "Export File Version: 2012.01.01". It contains a list of feedback types with one selected:

- Team Development Feedback

At the bottom of the main panel, there is a "File Character Set" dropdown set to "Unicode UTF-8".

Creating a Feedback Review Report

Use this query

```
select FEEDBACK_NUMBER,FEEDBACK,APPLICATION_NAME,PAGE_NAME,PUBLIC_RESPONSE  
from APEX_TEAM_FEEDBACK
```

Interactive report that shows feedback details and response

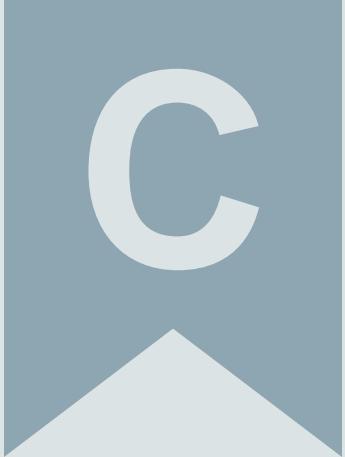
<u>FEEDBACK NUMBER</u> ▼	<u>FEEDBACK</u>	<u>APPLICATION NAME</u>	<u>PAGE NAME</u>	<u>PUBLIC RESPONSE</u>
-	Associate this feedback with an application	-	-	You have not logged into the application.
10	There is no Print option available	Checklist Manager	Home	Please provide test environment.
6	There are 2 feedback links, please remove 1	Feedback	Home	Acknowledged, will be fixed in the next build.
8	Good to add images to the page	Feedback	Home	-
9	Please check the Login Page links	Feedback	Home	-

Summary

In this lesson, you should have learned how to:

- Debug PL/SQL remotely in SQL Developer
- Synchronize beta and development feedback





C

Extending Your Application with User-Defined Error Handling

Objectives

After completing this lesson, you should be able to:

- Upload and execute necessary error handling scripts
- Associate error handling function with your page
- Test error handling for your Page



Error Handling Function

☰ Error Handling

Home

Maintain Departments

⚠ 1 error has occurred

Name is already in use! (Row 11)

Update Departments

<input type="checkbox"/>	Department ID	Department Name	Manager Id	Location Id
<input type="checkbox"/>	10	Administration	200	1700
<input type="checkbox"/>	20	Marketing	201	1800
<input type="checkbox"/>	30	Purchasing	114	1700
<input type="checkbox"/>	40	Human Resources	203	2400
<input type="checkbox"/>	50	Shipping	121	1500
<input type="checkbox"/>	60	IT	103	1400
<input type="checkbox"/>	70	Public Relations	204	2700

<input type="checkbox"/>	90	Executive	100	1700
<input type="checkbox"/>	100	Finance	108	1700
<input type="checkbox"/>	101	Finance	108	1700

1. Creating Constraint Lookup Table

Stores the constraints and messages for user-defined violations.

```
create table CONSTRAINT_LOOKUP
(
  CONSTRAINT_NAME VARCHAR2(30) primary key,
  MESSAGE VARCHAR2(4000) not null
);
```

2. Creating Error Handling Function

```
create or replace function apex_error_handling_example (
    p_error in apex_error.t_error )
    return apex_error.t_error_result
is
    l_result          apex_error.t_error_result;
    l_reference_id   number;
    l_constraint_name varchar2(255);
begin
    l_result := apex_error.init_error_result (p_error => p_error );
    if p_error.is_internal_error then
        if p_error.apex_error_code <> 'APEX.AUTHORIZATION.ACCESS_DENIED' then
            l_result.message := 'An unexpected internal application error has occurred. |||'
                                'Please get in contact with XXX and provide |||'
                                'reference# '||to_char(l_reference_id, '999G999G999G990')|||
                                ' for further investigation.';
            l_result.additional_info := null;
        end if;
    else
        l_result.display_location :=
            case when l_result.display_location = apex_error.c_on_error_page then
                apex_error.c_inline_in_notification
            else l_result.display_location  end;
    .......
```

2. Create Error Handling Function

```
if p_error.ora_sqlcode in (-1, -2091, -2290, -2291, -2292) then
    l_constraint_name := apex_error.extract_constraint_name (p_error => p_error );
    begin
        select message
            into l_result.message
            from constraint_lookup
            where constraint_name = l_constraint_name;
        exception when no_data_found then null;
    end;
end if;
if p_error.ora_sqlcode is not null and l_result.message = p_error.message then
    l_result.message := apex_error.get_first_ora_error_text (p_error => p_error );
end if;
if l_result.page_item_name is null and l_result.column_alias is null then
    apex_error.auto_set_associated_item (
        p_error          => p_error,
        p_error_result => l_result );
end if;
end if;

return l_result;
end apex_error_handling_example;
```

Setting Up an Example to Test Error Handling

1. Add a Unique Constraint.

```
alter table DEPARTMENTS  
add constraint DEPT_DNAME_UK unique (DEPARTMENT_NAME);
```

2. Insert the Constraint and Message into the Constraint Lookup Table.

```
insert into CONSTRAINT_LOOKUP  
(CONSTRAINT_NAME, MESSAGE)  
values  
( 'DEPT_DNAME_UK' , 'Name is already in use!' );
```

Associating the Error Handling Function with Your Page

The image shows two side-by-side panels from the Oracle APEX application builder.

Left Panel (Rendering Configuration):

- Header: Rendering
- Buttons: 1=, 2=, O=, ▲▼
- Section: Page 2: Maintain Departments (highlighted with a blue selection bar)
- Items:
 - Pre-Rendering
 - Regions
 - Content Body
 - Update Departments
 - Columns
 - Attributes
 - Region Buttons
 - CANCEL
 - MULTI_ROW_DELETE
 - SUBMIT
 - ADD
 - Post-Rendering

Right Panel (Error Handling Settings):

 - Header: Save, Play (highlighted with a mouse cursor)
 - Section: Page
 - Buttons: □, ▲▼, ▷, ▶, ▷, ▷
 - Section: - Select -
 - Section: Error Handling
 - In-line Error Notification Text (empty text area)
 - Error Handling Function (text input field containing `apex_error_handling_example`)
 - Help
 - Help Text (text area containing "No help is available for this page.")

Testing the Page for Error Handling

The screenshot shows two views of an Oracle application interface for testing error handling.

Top View: A modal dialog titled "Error Handling" is displayed. It shows a message: "1 error has occurred" with a yellow warning icon, followed by "Name is already in use! (Row 11)". The background shows a navigation menu with "Home" and "Maintain Departments" options, and a table titled "Update Departments".

		Department Id	Department Name	Manager Id
	30	Purchasing	114	1700
	40	Human Resources	203	2400
	50	Shipping	121	1500
	60	IT	103	1400
	70	Public Relations	204	2700
	80	Sales	145	2500
	90	Executive	100	1700
	100	Finance	108	1700
	(null)	Finance	201	1700

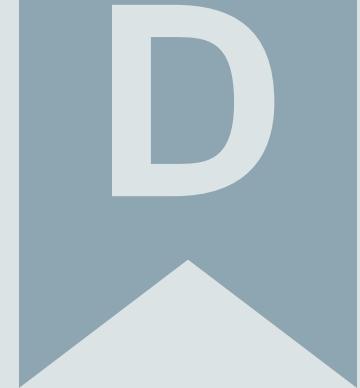
Bottom View: The main application view shows the same table. A row with Department ID (null), Department Name Finance, Manager ID 201, and a blue-highlighted Department ID 1700 is highlighted with a red box. Navigation controls at the bottom include "row(s) 1 - 10 of 2", "Add Row", "Cancel", "Delete", and "Apply Changes".

Summary

In this lesson, you should have learned how to:

- Upload and execute necessary error handling scripts
- Associate error handling function with your page
- Test error handling for your Page





Migrating a Desktop Application to a Responsive Theme

Objectives

After completing this lesson, you should be able to:

- Explain Responsive Web Design
- Create and switch to Theme 25
- Modify application components to take advantage of different responsive options



What Is Responsive Web Design?

Responsive Web Design (RWD) is an approach to web design in which a designer intends to provide an optimal **viewing experience**—easy reading and navigation with a minimum of resizing, panning, and scrolling—**across a wide range of devices** (from desktop computer monitors to mobile phones).
(Wikipedia)

What Is Responsive Web Design?

Desktop UI

Order Management Application

apex Log Out

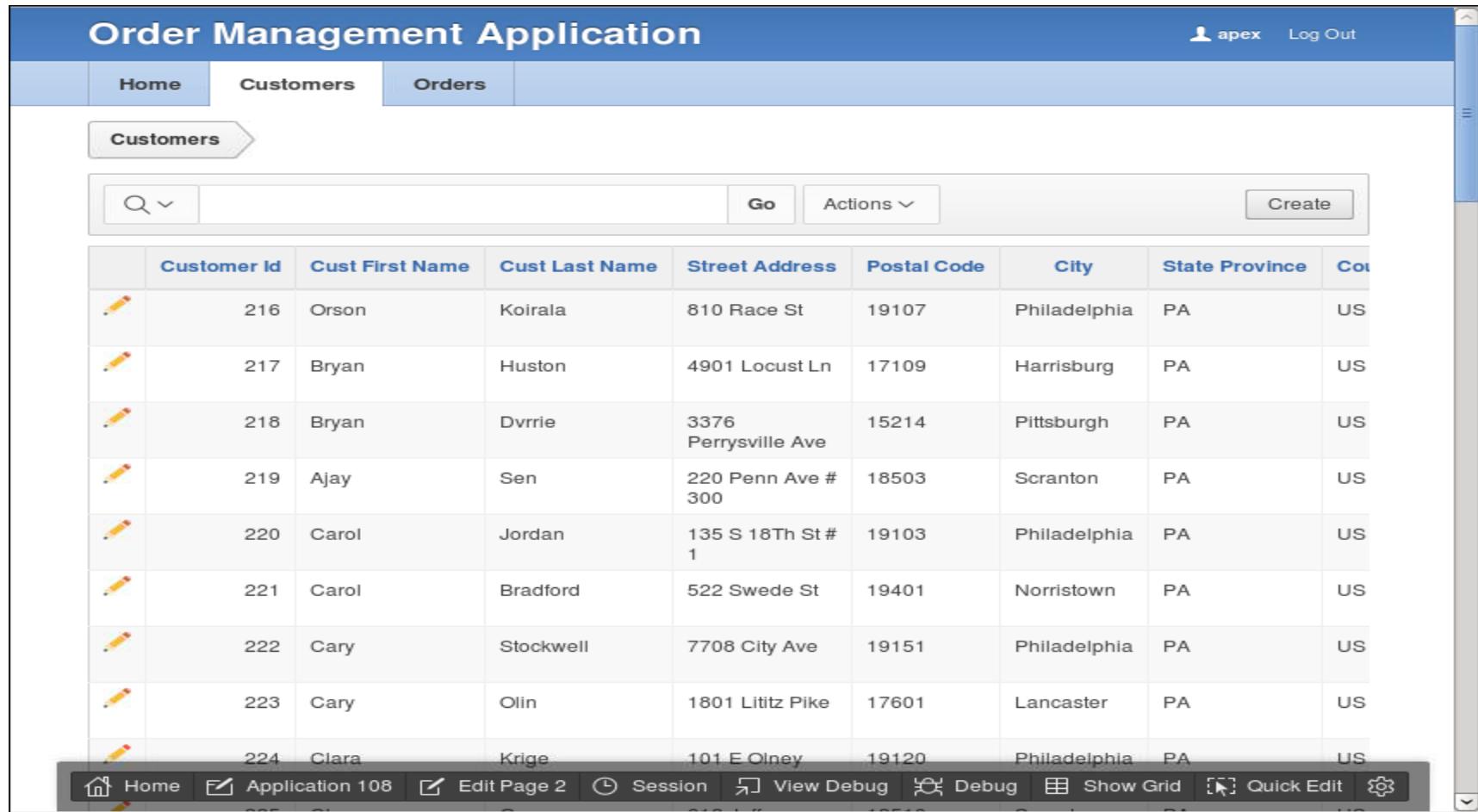
Home Customers Orders

Customers

Go Actions Create

	Customer Id	Cust First Name	Cust Last Name	Street Address	Postal Code	City	State Province	Country
	216	Orson	Koirala	810 Race St	19107	Philadelphia	PA	US
	217	Bryan	Huston	4901 Locust Ln	17109	Harrisburg	PA	US
	218	Bryan	Dvrrie	3376 Perrysville Ave	15214	Pittsburgh	PA	US
	219	Ajay	Sen	220 Penn Ave # 300	18503	Scranton	PA	US
	220	Carol	Jordan	135 S 18Th St # 1	19103	Philadelphia	PA	US
	221	Carol	Bradford	522 Swede St	19401	Norristown	PA	US
	222	Cary	Stockwell	7708 City Ave	19151	Philadelphia	PA	US
	223	Cary	Olin	1801 Lititz Pike	17601	Lancaster	PA	US
	224	Clara	Krige	101 E Olney	19120	Philadelphia	PA	US

Home Application 108 Edit Page 2 Session View Debug Debug Show Grid Quick Edit



What Is Responsive Web Design?

Tablet UI

The screenshot shows a web application titled "Order Management Application". At the top, there is a blue header bar with the title and a user icon labeled "apex Log Out". Below the header is a navigation bar with four tabs: "Home", "Customers", "Orders", and another unlabeled tab. The main content area contains a search bar with a dropdown menu, a button labeled "Go", and a "Actions" dropdown menu. Below these are two buttons: "Create" and a larger "Actions" button. The main table displays customer data with columns: Customer Id, Cust First Name, Cust Last Name, Street Address, and Po. Each row includes a small edit icon. The table data is as follows:

	Customer Id	Cust First Name	Cust Last Name	Street Address	Po
	216	Orson	Koirala	810 Race St	19
	217	Bryan	Huston	4901 Locust Ln	17
	218	Bryan	Dvrrie	3376 Perrysville Ave	15
	219	Ajay	Sen	220 Penn Ave # 300	18
	220	Carol	Jordan	135 S 18Th St # 1	19
	221	Carol	Bradford	522 Swede St	19

At the bottom, there is a footer bar with various navigation links and icons.

Mobile UI

The screenshot shows the same "Order Management Application" interface, but it is displayed in a more compact, mobile-friendly layout. The table structure is identical to the tablet version, showing the same customer data. The table data is as follows:

	Customer Id	Cust First Name	Cust Last Name	Street Address	Po
	216	Orson	Koirala	810 Race St	19
	217	Bryan	Huston	4901 Locust Ln	17
	218	Bryan	Dvrrie	3376 Perrysville Ave	15
	219	Ajay	Sen	220 Penn Ave # 300	18
	220	Carol	Jordan	135 S 18Th St # 1	19
	221	Carol	Bradford	522 Swede St	19

At the bottom, there is a footer bar with various navigation links and icons.

What Is Responsive Web Design?

Tablet UI

Order Management Application

apex Log Out

Home Customers Orders

Customers

Edit CUSTOMERS Cancel Delete Save

Cust First Name
Orson

Cust Last Name
Koirala

Street Address
810 Race St

Postal Code
19107

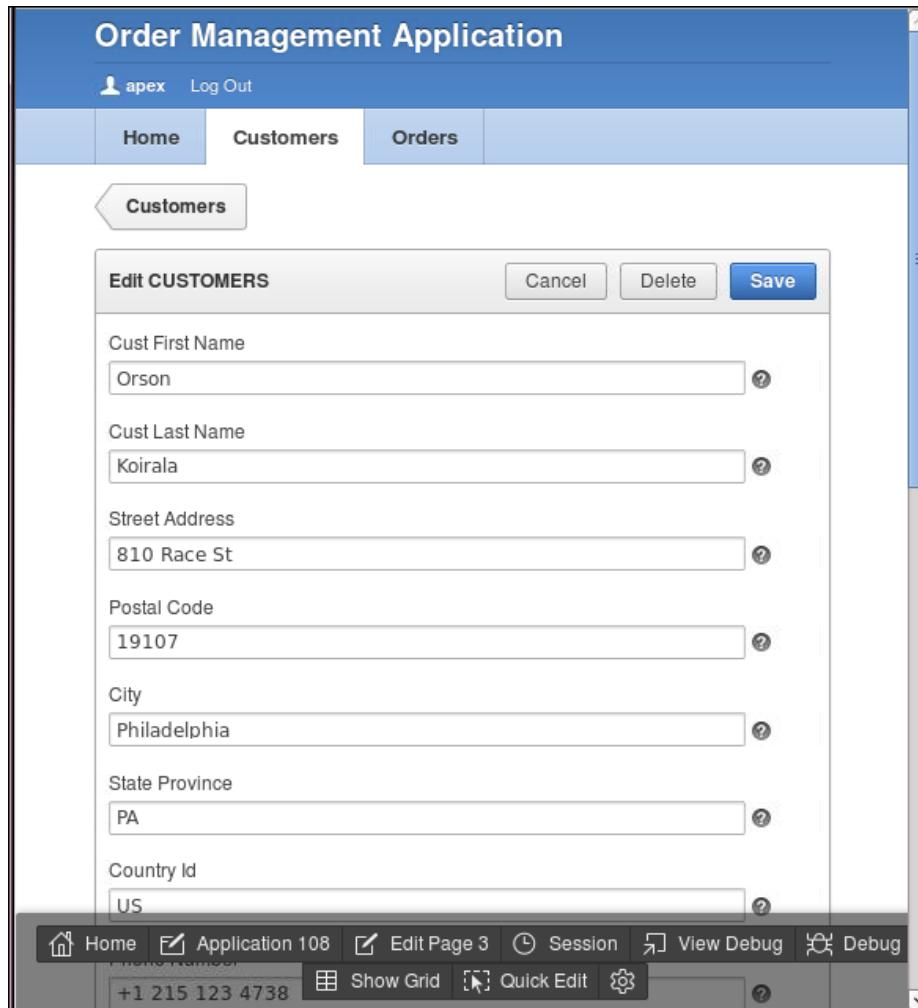
City
Philadelphia

State Province
PA

Country Id
US

Home Application 108 Edit Page 3 Session View Debug Debug

+1 215 123 4738 Show Grid Quick Edit



Mobile UI

Order Management Application

apex Log Out

Home Customers Orders

Customers

Edit Cancel Delete Save

CUSTOMERS

Cust First Name
Orson

Cust Last Name
Koirala

Street Address
810 Race St

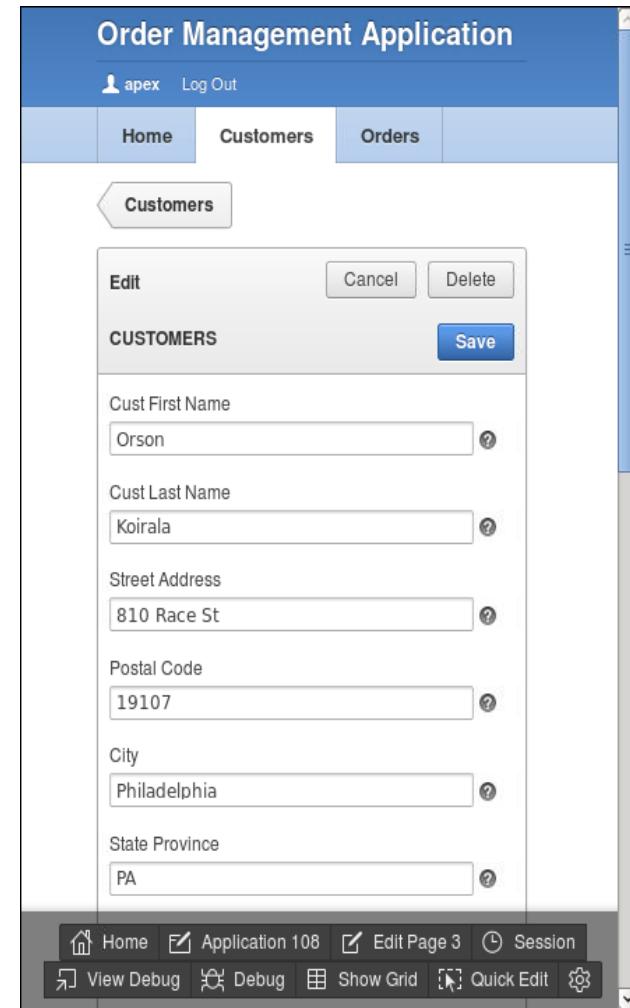
Postal Code
19107

City
Philadelphia

State Province
PA

Home Application 108 Edit Page 3 Session View Debug Debug

Show Grid Quick Edit



Responsive Design Versus Mobile

Responsive

- Develop a single application, one source for application logic, one set of pages
- Similar UI
- Full functionality of application

jQuery Mobile

- Framework designed for mobile devices
- Lightweight and faster loading
- Native look and feel
- Uses wizards to create page components (more comfortable for APEX developers)
- Easily integrated in PhoneGap to develop Hybrid-Native applications

Responsive Design in Oracle APEX

Theme 25

- Support for desktop, tablet, and mobile screen sizes
- Uses flexible Grid Layout that can be used on screen sizes from the largest monitors to mobile devices
- Interactive Reports are displayed appropriately for smaller screens using a scroll bar
- Form labels shift above and item width is standardized when using mobile devices

Theme 25: CSS3 Media Queries

- Styles are defined based on conditions, such as screen size or resolution.
- Relies on browser width to determine layout/device type.

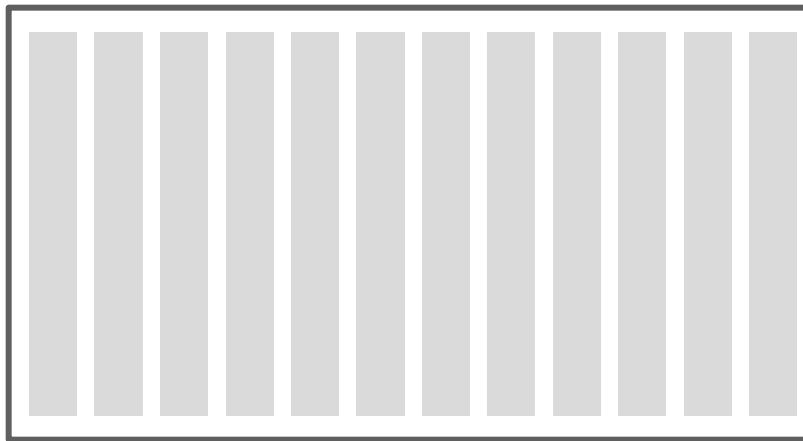
```
@media screen and (min-width: 320px) and (max-width: 479px)  
{...}
```

- Multiple CSS3 media queries are defined to target “cut-off points” and appropriately adjust UI for a given screen size.

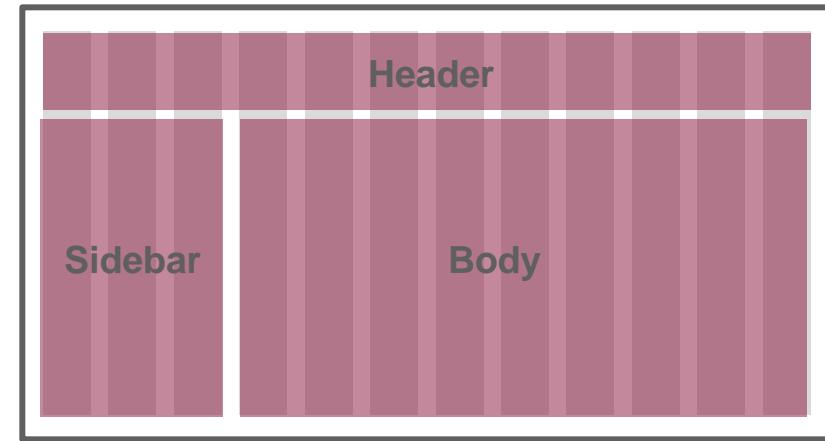
Grid-Based Layout

- Provides a HTML structure to organize page components onto a grid
- Using a grid makes it easier to align and layout page components.

Page with 12-column Grid Layout

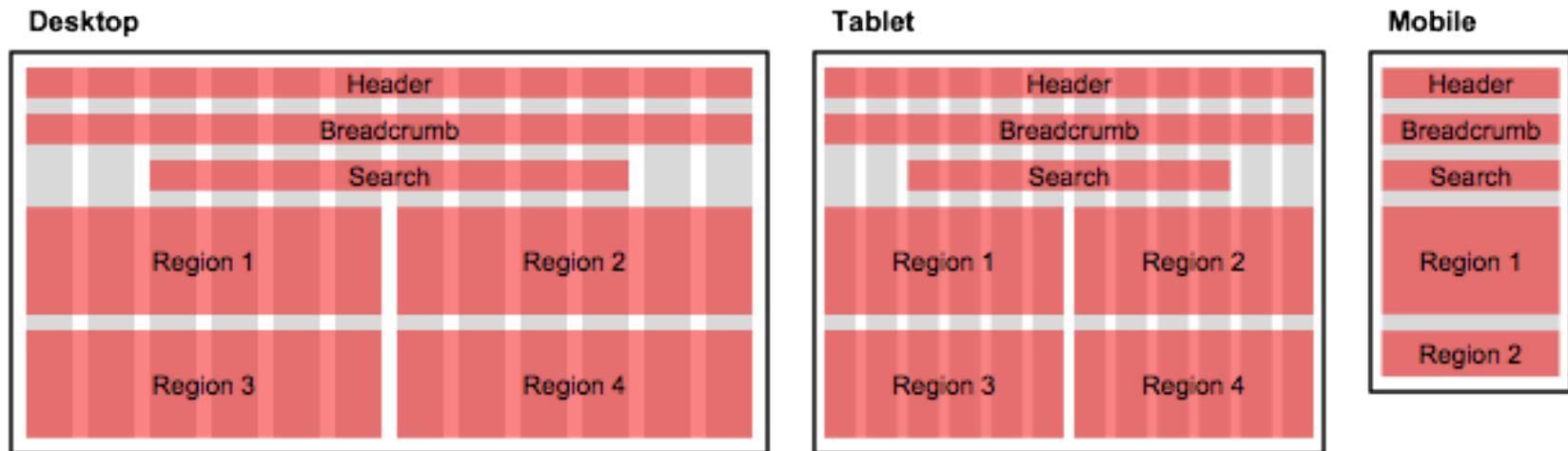


Page components positioned on grid



Grid-Based Layout

In Theme 25, CSS3 media queries can then easily shift or reposition these components.



Migrating an Application to Theme 25

1. Create and Switch to Theme 25 (Review template compatibility)
2. Revise Report Regions: Classic and Interactive
3. Revise Buttons: Large/Icons
4. Revise Forms: Region Template and Page Items
5. Review Grid Layout
6. Change Page Template on Page
7. Use Class Utilities

Creating Theme 25

The screenshot shows the Oracle User Interface Themes creation interface. At the top left is a sidebar titled "User Interface" containing icons and links for "User Interface Attributes", "Themes", "Templates", "Lists of Values", "Shortcuts", "Plug-ins", and "Component Settings". Below the sidebar is a main content area with tabs for "Themes" (selected), "Reports", and "History". The "Themes" tab includes search and filter controls, a "Create >" button, and two theme cards: "Scarlet - 21" and "Blue Responsive - 25 *". A page navigation indicator "1 - 2" is at the bottom right.

User Interface

- User Interface Attributes
- Themes
- Templates
- Lists of Values
- Shortcuts
- Plug-ins
- Component Settings

Themes Reports History

Scarlet - 21 Blue Responsive - 25 *

1 - 2

Switching to Theme 25: Template Conversion Compatibility

Template Type	From Template Class	To Template Class	Status
Breadcrumb	Breadcrumb Menu	Breadcrumb Menu	✓
Button	Button	Button	✓
Label	Required with help	Required (Horizontal - Right Aligned) ▾	Warning: no template found with matching template class
	Optional with help	Optional (Horizontal - Right Aligned) ▾	Warning: no template found with matching template class
List	Vertical Unordered List with Bullets	Vertical Unordered List with Bullets ▾	Warning: multiple matching templates found
Page	Printer Friendly	Printer Friendly	✓
	No Tabs - Right Sidebar (optional / table-based)	No Tabs - Right Sidebar ▾	Warning: multiple matching templates found
	Login	Login	✓
Region	Report Filter - Single Row	Standard Region ▾	Warning: no template found with matching template class
	Form Region	Form Region	✓
	Region without Buttons and Titles	Region without Buttons and Titles	✓
	Sidebar Region	Sidebar Region	✓
	Reports Region	Standard Region ▾	Warning: multiple matching templates found
	Breadcrumb Region	Breadcrumb Region	✓
	Navigation Region	Standard Region ▾	Warning: no template found with matching template class
	Hide and Show Region	Hide and Show Region (Expanded) ▾	Warning: multiple matching templates found
Report	Standard	Standard	✓

Page Template Changes

The screenshot shows the Oracle APEX page template editor interface. On the left, the 'Page 6: Products' page is displayed with its regions and components. An arrow points from the 'Regions' section of the page definition to the 'Page Template' section of the editor. The right side of the screen shows the 'Page' configuration panel with various settings like 'Page Template' set to 'One Level Tabs - Right Side'. Below the editor is a preview of the application page showing a table of products.

Product ID	Product Name	Description	Category	Weight Class	Unit Price	Stock Status	Orderable	Unit Price
1726	LCD Monitor 11/PM	Liquid Cristal Display 11 inch passive monitor. The virtually-flat, high-resolution screen delivers outstanding image quality with reduced glare.	11	3	259	In Stock	orderable	80
1729	Chemicals - RCP	Cleaning Chemicals - 3500 roller clean pads	39	2	+05-00	103094	orderable	80
1733	PS 220V /UK	220V Power supply type - United	19	2	+00-09	102080	orderable	89

Revising Report Regions: Classic Report

The image shows two panels from the Oracle Reports interface:

Region Panel:

- Region: A dropdown menu.
- Buttons: Horizontal alignment (Left, Center, Right), Vertical alignment (Top, Bottom), and a refresh icon.
- Layout Options:
 - Yes (selected)
 - No
- Layout:
 - Sequence: Input field with value 10.
 - Parent Region: A dropdown menu with option "- Select -".
 - Position: A dropdown menu with option "Content Body".
- Appearance:
 - Template: A dropdown menu with option "Standard Region - No Paddi" (highlighted with a red box).
 - Template Options: A dropdown menu with option "Use Template Defaults".
 - CSS Classes: An input field.

Attributes Panel:

- Buttons: Horizontal alignment (Left, Center, Right), Vertical alignment (Top, Bottom), and a refresh icon.
- Layout:
 - Number of Rows Type: Static Value (highlighted with a red box).
 - Number of Rows: Input field with value 15.
- Appearance:
 - Template Type: Theme (highlighted with a red box).
 - Template: A dropdown menu with option "Standard - Alternative" (highlighted with a red box).
 - Template Options: A dropdown menu with option "Use Template Defaults" (highlighted with a red box).
 - CSS Classes: An input field.
 - Show Null Values as: An input field.

Revising Report Regions: Interactive Report

The screenshot shows the Oracle APEX page editor interface. On the left, a sidebar displays configuration options for a report region, including:

- Region: Interactive Report Region
- Page Items to Submit
- Layout:
 - Sequence: 10
 - Parent Region: - Select -
 - Position: Content Body
- Appearance:
 - Template: Interactive Report Region (highlighted with a red box)
 - Template Options: Use Template Defaults
 - CSS Classes

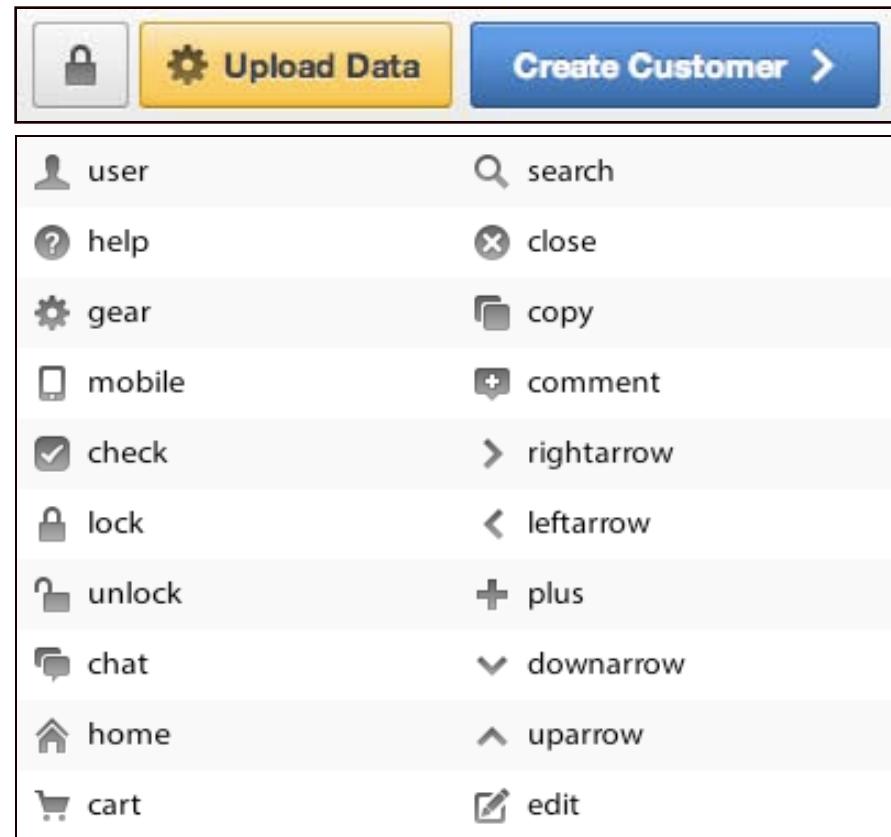
The main content area shows a grid of customer data with the following columns:

	Cust First Name	Cust Last Name	Street Address	Postal Code	City	State Province	Country
217	Bryan	Huston	810 Race St	19107	Philadelphia	PA	US
218	Bryan	Dvrrie	4901 Locust Ln	17109	Harrisburg	PA	US
219	Ajay	Sen	3376 Perrysville Ave	15214	Pittsburgh	PA	US
224	Clara	Krige	220 Penn Ave # 300	18503	Scranton	PA	US
			101 E Olney	19120	Philadelphia	PA	US

At the bottom, a navigation bar includes links for Home, Application 108, Edit Page 2, Session, View Debug, Debug, Show Grid, Quick Edit, and a magnifying glass icon.

Theme 25: Icons

- Developers can easily create buttons with icons without creating custom templates.
- Simply select an icon-compatible button template and specify an icon class.



Revising Buttons

Button

Region: CUSTOMERS

Button Position: Right of Interactive Report Search B

Appearance: Button

Hot: Yes

Template Options: Use Template Defaults

CSS Classes:



Order Management Application

Home Customers Orders Products

Customers

Customer Id Cust First Name Cust Last Name Street Address Postal Code Province Country

216	Orson	Koirala	810 Race St	19107	US
217	Bryan	Huston	4901 Locust Ln	17109	US
218	Bryan	Dvrrie	3376 Perryville Ave	15214	US

Button

Region: CUSTOMERS

Button Position: Right of Interactive Report Search B

Appearance: Large Button - Icon

Hot: Yes

Template Options: Use Template Defaults

CSS Classes: rightarrow

Icon CSS Classes:



Order Management Application

Home Customers Orders Products

Customers

Customer Id Cust First Name Cust Last Name Street Address Postal Code City State Province Country

216	Orson	Koirala	810 Race St	19107	Philadelphia	PA	US
217	Bryan	Huston	4901 Locust Ln	17109	Harrisburg	PA	US
218	Bryan	Dvrrie	3376 Perryville Ave	15214	Pittsburgh	PA	US

Theme 25: Responsive Classes

Easily hide/show content depending on device type.

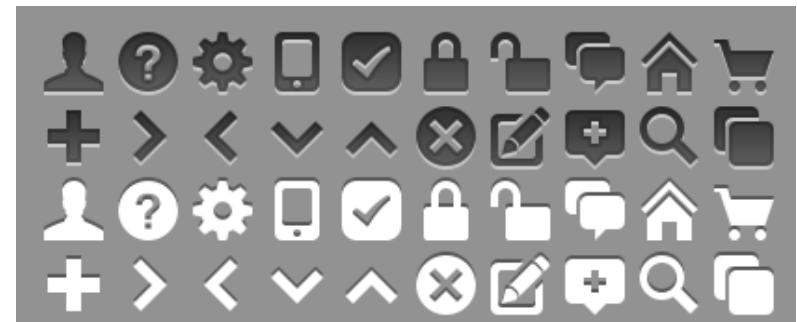
Class	Phones 767px and below	Tablets 979px to 768px	Desktops Default
.visible-phone	Visible	Hidden	Hidden
.visible-tablet	Hidden	Visible	Hidden
.visible-desktop	Hidden	Hidden	Visible
.hidden-phone	Hidden	Visible	Visible
.hidden-tablet	Visible	Hidden	Visible
.hidden-desktop	Visible	Visible	Hidden

Theme 25: High Resolution Display Support

- Support for “Retina Display” devices
- Graphics utilized by the theme are automatically upscaled for devices that use ultra high resolution displays to render web content.



Standard Display

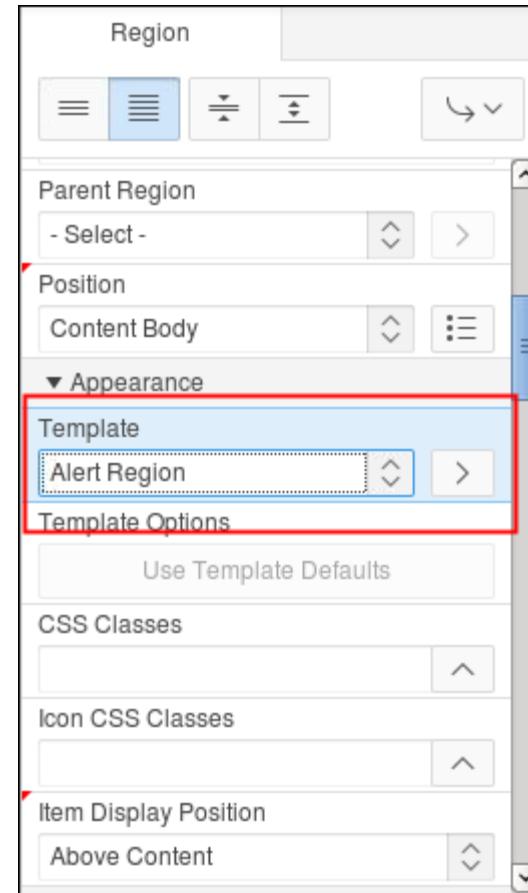


High Resolution Display

Explanation of Grid Layout Definition

Field	Value	Description
Start New Row	Yes	Position the region in a new row.
Column	Automatic	Position the region in a specific grid column. Selecting Automatic uses the next available grid column in the region.
	1-12	Position the region at this specific grid column.
New Column	Yes	Position this region in the next column in the same row.
	New	Position this region in the same column as the previous region.
Column Span	Automatic	Determines how many grid columns should be used by the region. Selecting Automatic balances the available grid columns within all regions in the same grid row.
	1-12	Use this specific number of grid columns for this region.

Revising Forms: Region Template



Revising Forms: Regions

Order Management Application

apex Log Out

Home Customers Orders Products

Customers > Customers

Edit CUSTOMERS

Cust First Name	Orson	?
Cust Last Name	Koirala	?
Street Address	810 Race St	?
Postal Code	19107	?
City	Philadelphia	?
State Province	PA	?
Country Id	US	?
Phone Number	+1 215 123 4738	?
Nls Language	us	?

▼ Grid

Start New Row
Yes No

Column
Automatic

Column Span
Automatic

▼ Advanced

Static ID

Custom Attributes

Revising Forms: Regions

Order Management Application

apex Log Out

Home Customers Orders Products

Customers > Customers

Edit CUSTOMERS

Cust First Name	Orson
Cust Last Name	Koirala
Street Address	810 Race St
Postal Code	19107
City	Philadelphia
State Province	PA
Country Id	US
Phone Number	+1 215 123 4738
Nls Language	us
Nls Territory	AMERICA
Credit Limit	1900
Cust Email	Orson.Koirala@PIPIT.COM

▼ Grid

Start New Row

Yes No

Column

2

Column Span

10

Revising Forms: Page Items

Order Management Application

Home Customers Orders Products

Customers > Customers

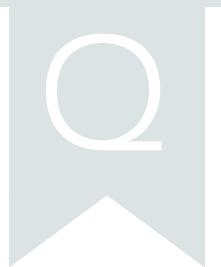
Edit CUSTOMERS

Cust First Name	<input type="text" value="Orson"/>	Cust Last Name	<input type="text" value="Koirala"/>		
Street Address	<div style="border: 1px solid #ccc; padding: 5px;"><p>▼ Grid</p><p>Start New Row</p><table border="1"><tr><td>Yes</td><td>No</td></tr></table><p>Column</p><input type="text" value="1"/> ▼<p>Column Span</p><input type="text" value="2"/> ▼</div>			Yes	No
Yes	No				
Postal Code					
City					
State Province					
Country Id					
Phone Number	<input type="text" value="+1 215 123 4738"/>				
Nls Language	<input type="text" value="us"/>				

Helpful Hints

- Use Automatic for Grid Layout most of the time.
- Use Alert region for small forms.
- Minimize number of columns on a report.
- Minimize use of Popup LOVs and Shuttles.

Quiz



Theme 25 uses CSS3 Media queries to handle how your application will look on different devices and orientations.

- a. True
- b. False

Summary

In this lesson, you should have learned how to:

- Explain what Responsive Web Design is
- Create and switch to Theme 25
- Modify application components to take advantage of different responsive options





E

Making Your Application Accessible

Objectives

After completing this lesson, you should be able to:

- Describe what Web Accessibility means
- Identify issues in applications that have accessibility issues
- Identify changes to your application that will improve its web accessibility



What Is Web Accessibility?

- Provides equal access to users with disabilities
- Includes four principles:
 - Perceivable
 - Operable
 - Understandable
 - Robust

Why Is Web Accessibility Important?

- Up to 16% of the population is disabled
- Removes obstacles between a company and its existing or potential customers
- Allows employers to recruit from a broader pool of talent
- Improves products for everyone (Universal Design)
- New/Existing Procurement and Discrimination Laws in effect

Screen Readers

- What are they?
 - A software application that attempts to identify and interpret what is being displayed on the screen
 - Interpretation is presented to the user with text-to-speech, sound icons, or a Braille output device.
 - Useful for people who are blind, visually impaired, illiterate, or learning disabled
- JAWS from Freedom Scientific is the most popular screen reader.

Turn Screen Reader Mode On

The screenshot shows the Oracle Project Tracking System interface. The main title bar reads "PROJECT TRACKING SYSTEM". The top right corner has links for "Feedback", "Log Out", "Help", and "Home". On the left, there's a sidebar with a menu:

- Home
- Create Employees
- Modify Employee Details
- Manage Projects
- Manage Project Action Items
- Project Documents

Below this menu, there are two more items:

- Admin
- Load Multiple Projects

The main content area is titled "PROJECT_DOCUMENTS Master". It contains a form with a field labeled "Document Type Name" followed by a red asterisk (*) and a text input field. Below the input field are two buttons: "Cancel" and "Create".

A large yellow callout box is overlaid on the left side of the screen, containing the text:

Use a screen reader and browser that supports WAI-ARIA Live Regions

In the bottom right corner of the main content area, there is a red rectangular box highlighting the text "release 1.0 Set Screen Reader Mode On".

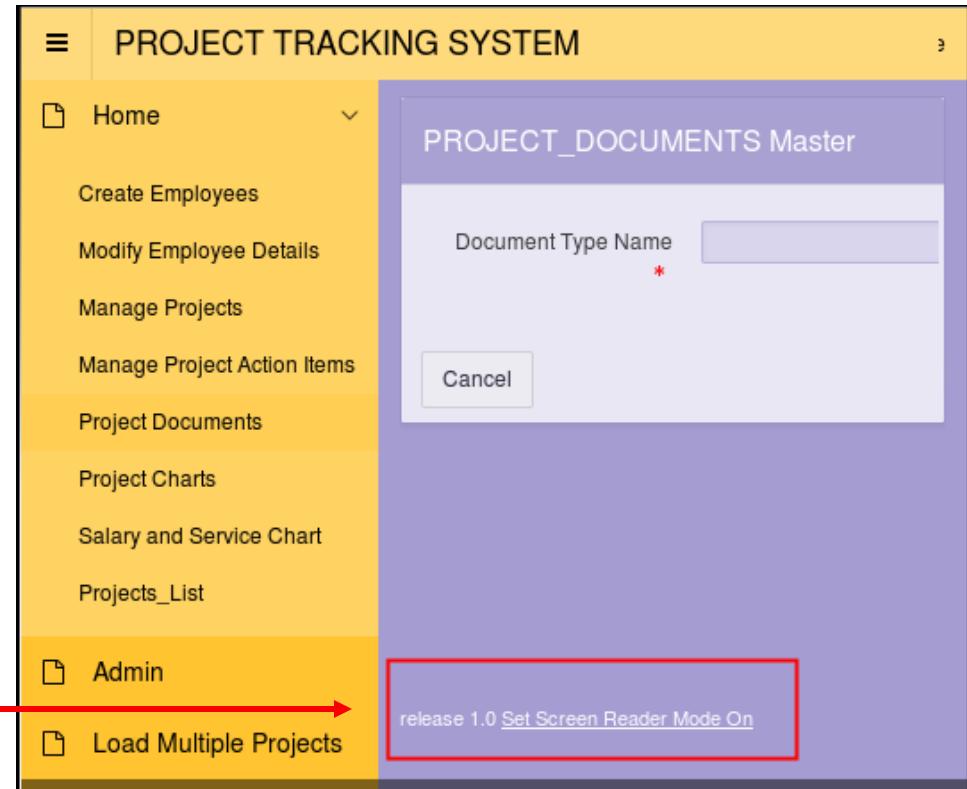
The bottom navigation bar includes links for "Home", "Application 102", "Edit Page 9", "Session", "View Debug", "Debug", "Show Grid", "Quick Edit", "Theme Roller", and a gear icon.

Themes and Templates: Page Template

Page Template:

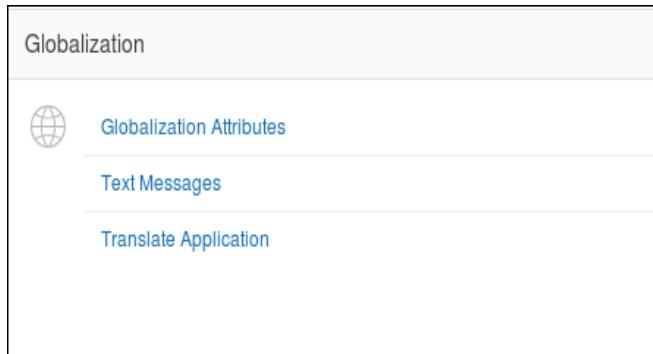
- #SCREEN_READER_TOGGLE# in Footer

```
11      </div>
12      <footer class="t-Footer">
13          #APP VERSION#
14          #CUSTOMIZE#
15          #SCREEN READER TOGGLE#
16          #REGION_POSITION_05#
17      </footer>
18  </div>
19  </div>
20  <div class="t-Body-inlineDialogs">
21      #REGION_POSITION_04#
22  </div>
```



Changing Text of Toggle Message

Add Text Message with user-defined text.



The screenshot shows the Oracle Globalization Attributes interface. On the left, there's a sidebar with 'Globalization' at the top, followed by three main options: 'Globalization Attributes' (selected, indicated by blue text), 'Text Messages' (also in blue), and 'Translate Application'. The main content area is titled 'Create/Edit Text Message'.

Create/Edit Text Message

Messages are designed to provide translation services for use in PL/SQL.

Application: **102 PROJECT TRACKING SYSTEM**

* Name: **SET_SESSION_SCREEN_READER_ON**

Language: English (en)

Used in JavaScript: No

* Text (Example: Tax: %0 Total amount %1): **Screen Reader Mode Off (Enable)**

Buttons at the bottom: Cancel, Create And Create Another, and a prominent blue 'Create Text Message' button.

Themes and Templates: Region Template

Region Template:

- <hn> tags
- class="visuallyhidden"
- role="main"

```
Template ⓘ
↻ ↺ 🔍 ↻ A..
1 <div id="#REGION_STATIC_ID#" #REGION_ATTRIBUTES# class="t-IRR-region #REGION_
role="main" aria-labelledby="#REGION_STATIC_ID#_heading">
2   <h2 class="u-VisuallyHidden" id="#REGION_STATIC_ID#_heading">#TITLE#</h2>
3   #PREVIOUS##BODY##SUB_REGIONS##NEXT#
4 </div>
```

	Employee Id	First Name	Last Name	Email	Phone Number	Mobile Number	Address
	531	Deepthi	Rao	DSR@ORACLE.COM	7654567898	5546897432	Colorado, Texas
	530	Nag	Roberts	nr@oracle.com	7865431235	7865687898	New York, US
	505	Fiorello	LaGuardia	fiorello.laguardia@pts.com	2125553923	1235342653	Hangar Center, Third Floor, Flushing, NY
	504	Frank	O'Hare	frank.ohare@pts.com	7735557693	3157862405	10000 West O'Hare, Chicago, IL

Title not displayed
but read by screen reader

```
<div class="col col-12 " >
<div id="R22292197871948275"  class="t-IRR-region " role="main" aria-labelledby="R2229219787194
  <h2 class="u-VisuallyHidden" id="R22292197871948275_heading">Employees Report</h2>
<div id="R22292197871948275_ir" class="a-IRR-container"><div id="R22292197871948275_worksheet_r
</style>
```

Themes and Templates

Implicit Landmark Support for HTML5 tags in Page Template

Footer Landmark
implicit from
<footer> tag



```
<div class="t-Body">
#SIDE GLOBAL NAVIGATION LIST#
<div class="t-Body-main">
<div class="t-Body-title" id="t_Body_title">
#REGION_POSITION_01#
</div>
<div class="t-Body-content" id="t_Body_content">
#SUCCESS_MESSAGE##NOTIFICATION_MESSAGE##GLOBAL_NOTIFICATION#
<div class="t-Body-contentInner">
#BODY#
</div>
<div class="t-Footer">
#APP VERSION#
#CUSTOMIZE#
#SCREEN READER TOGGLE#
#REGION_POSITION_05#
</div>
</div>
</div>
<div class="t-Body-inlineDialogs">
#REGION_POSITION_04#
</div>
```

Interactive Reports

Summary on <table> tag

	Employee Id	First Name	Last Name	Email
	516	Ward	Johnson	ward.johnson@pts.com
	517	Martin	Johnson	martin.johnson@pts.com
	519	Adams	Henry	adams.henry@pts.com
	521	Miller	Emanuel	miller.emmanuel@pts.com
	522	Kiranmayi	Adapala	ka@oracle.com
	523	Sowmya	Kiran	sk@oracle.com

```
▼<div id="apexir_DATA_PANEL">
  ▼<table summary>
    ▼<tbody>
      ▼<tr>
        ▼<td>
```

Screen reader set to off

```
  ▼<table summary cellpadding="0" cellspacing="0" border="0" class="apexir_WORKSHEET_DATA" id="516294532719523302">
    ▼<tbody>
      ▼<tr>
        ▼<td>
```

```
  ▼<div id="apexir_DATA_PANEL">
    ▼<table summary>
      ▼<tbody>
        ▼<tr>
          ▼<td>
```

Screen reader set to on

```
  ▼<table summary="Region = Employee Report, Report = Primary Default, View = Report, Displayed Rows Start = 1, Displayed Rows End = 10, Total Rows = 14" cellpadding="0" cellspacing="0" border="0" class="apexir_WORKSHEET_DATA" id="516294532719523302">
    ▼<tbody>
      ▼<tr>
        ▼<td>
```

Interactive Reports

Alt tag on Link Column

Link Column

Link Column

* Link Icon

Icon 1 Icon 2 Icon 3 Icon 4 Icon 5
Icon 6 Icon 7 Icon 8

Link Attributes

Target

Page Reset Pagination

Request

Clear Cache

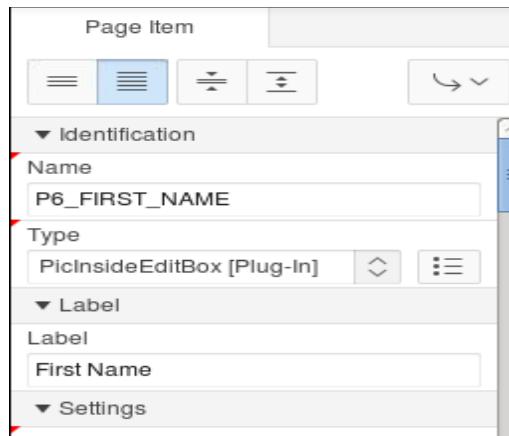
Name Value

Item 1 Value 1

```
<td align="right" headers="EMPNO">
  <a href="f?p=100122:2:14055310343598::NO::P2_EMPNO::7369">
    
  </a>
</td>
```

Forms

Label all Page Items.



```
<div class="col col-12 ">
  <div id="P6_FIRST_NAME_CONTAINER" class="t-Form-fieldContainer rel-col ">
    <div class="t-Form-labelContainer col col-3">
      <label id="P6_FIRST_NAME_LABEL" class="t-Form-label" for="P6_FIRST_NAME">
        First Name
        <span class="u-VisuallyHidden"></span>
      </label>
    </div>
    <div class="t-Form-fieldContainer col col-9">
      <input type="text" id="P6_FIRST_NAME" value="" class="t-Form-field" />
    </div>
  </div>
</div>
```

Forms

Validation Errors

The screenshot shows a web browser window for apexcentral.us.oracle.com:7777/apex/www_flow.accept. A modal dialog box is displayed, indicating "1 error has occurred". The error message is: "Name must have some value. (Go to error)". The browser address bar shows the URL. The main content area is titled "Edit Employee" and contains fields for Name, Job, Manager, and Hire Date. The "Name" field is highlighted in red, indicating it is required. The "Job" field has "SALESMAN" selected. The "Manager" field is empty. The "Hire Date" field contains "20-FEB-81". The right side of the screen displays the generated HTML code for the error message, which includes CSS classes like "uRegion", "uWhiteRegion", "uMessageRegion", and "uNotificationMessage". The error message is enclosed in a

 element with the class "htmlDbUlErr".

```
<section class="uRegion uWhiteRegion uMessageRegion clearfix" id="uNotificationMessage">
  <h1 class="hideMeButHearMe">Error Notification</h1>
  <div class="uRegionContent clearfix">
    <a href="javascript:void(0)" class="uCloseMessage"></a>
    
  <div class="uMessageText">
    "1 error has occurred"
  <ul class="htmlDbUlErr">
    <li>
      "Name must have some value. ("<a href="javascript:apex.item('P2_ENAME').setFocus(); void(0);">Go to error</a>"")</li>
  </ul>
</div>

```

Tabular Forms

Use as Row Header

Column Definition

Column Name	FIRST_NAME
Column Heading	First Name
Show Column	Yes
Heading Alignment	center
Compute Sum	No
Column Alignment	left
Sortable Column	Yes
Column Width	
Use As Row Header	Yes
Include In Export	Yes

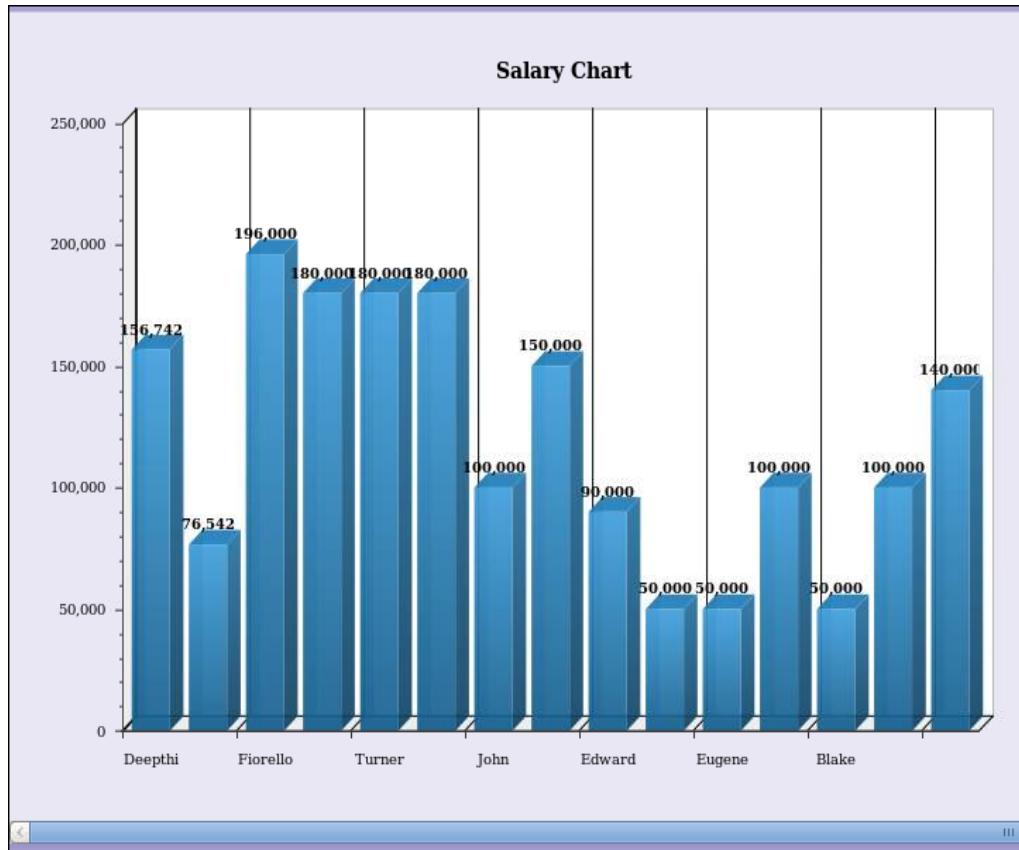
When option set to Yes

```
▼<td headers="ENAME">
  <label for="f03_0001" class="hideMeButHearMe">Name: SMITH</label>
  <input type="text" name="f03" size="16" maxlength="2000" value="SMITH" id="f03_0001" autocomplete="off">
</td>
```

When option set to No

```
▼<td headers="ENAME">
  <label for="f03_0001" class="hideMeButHearMe">Name</label>
  <input type="text" name="f03" size="16" maxlength="2000" value="SMITH" id="f03_0001" autocomplete="off">
</td>
```

Charts



Screen
Reader
Mode On



Salary Chart		
LINK	LABEL	VALUE
-	ADAMS	1100
-	ALLEN	1600
-	BLAKE	2850
-	CLARK	2450
-	FORD	3000
-	JAMES	950
-	JONES	2975
-	KING	5000
-	MARTIN	1250
-	MILLER	1300
-	SCOTT	3000
-	SMITH	800
-	TURNER	1500
-	WARD	1250

High Contrast

To provision High Contrast Mode for users of your own database applications, use:

- Page template #HIGH_CONTRAST_TOGGLE# substitution string
- APEX_UTIL APIs
- f?p syntax REQUEST attribute

Quiz



There is only one way to make an application accessible.

- a. True
- b. False

Summary

In this lesson, you should have learned how to:

- Describe what Web Accessibility means
- Identify issues in applications that have accessibility issues
- Identify changes to your application that will improve its web accessibility

