Oracle Application Express Workshop
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A Company Profile

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enquiries@sagecomputing.com.au
Course Descriptions
(not a full list of available courses, please see www.sagecomputing.com.au for a full course catalogue)

All courses can be customised to suit client requirements
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Oracle JDeveloper 10.1.3
This course is designed to provide students with the skills and knowledge required to develop a web application using ADF Business Components and ADF Faces (JavaServer Faces) web pages within Oracle JDeveloper 10.1.3.

• JDeveloper Introduction
• JDeveloper IDE
• Database Connections
• Online Database Browser
• Stored Procedure Editor
• Workspaces and Projects
• Offline Database Modelling Tools
• Java Language
• Application Development Framework
• ADF Business Components Diagrammer
• ADF Business Components

• ADF Entity Objects
• ADF Associations
• ADF Domains
• ADF Application Modules
• ADF View Objects
• ADF View Links
• ADF Business Component Java Classes
• ADF Binding Layer and the ADF Model Layer Classes
• ADF Faces
• ADF Form
• ADF Read-Only Table

• ADF Input, Output and Command Components
• ADF Forms, Tables, Trees
• JSF Configuration, Navigation, Managed Beans and Event Handling
• Expression Language
• ADF Page Layout and Menus
• ADF Faces Skins
• Deploying an ADF Application
• Web Security
• ADF Selection, Validator, Converter and Visual Components
• Code Management and Source Control
• Advanced JDeveloper

Oracle 10G - New Features for Developers Workshop
1 day
Aimed at developers, this course is designed to provide the student with an understanding of the new features of Oracle 10G.

• SQL*Plus Enhancements
• Flashback
• Enhanced SQL commands

• New SQL Features
• Data Pump
• PL/SQL Enhancements

• PL/SQL Packages
• Performance Enhancements

Application Express Workshop (previously HTMLDB)
3 days
The course is designed to provide the student with the skills and knowledge required to develop a complete application using Oracle’s Application Express product. The student will develop web interfaces (including forms, reports and charts; addition of validation and customised formatting) to create a small application.

• Product Overview
• SQL Workshop
• Utilities
• Application Builder
• Creating Pages

• Regions and Items
• Page Processing
• Shared Components
• Themes and Templates
• Other Page and Region Types

• Utilities and Reporting
• Advanced Development Techniques
• Administration and Deploying an Application
### Oracle SQL and SQL*Plus Workshop - Oracle 10G Rel2

This course is designed to provide the student with a basis for developing systems using the Oracle database. The SQL language is covered from simple to complex constructs. Guidelines are provided on writing SQL for optimum performance and ease of maintenance.

<table>
<thead>
<tr>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Relational Model</td>
</tr>
<tr>
<td>The SQL Language</td>
</tr>
<tr>
<td>SQL<em>Plus and iSQL</em>Plus</td>
</tr>
<tr>
<td>Oracle SQL Developer</td>
</tr>
<tr>
<td>More about SELECT</td>
</tr>
<tr>
<td>Substitution Variables</td>
</tr>
<tr>
<td>Using SQL*Plus for Formatting Output</td>
</tr>
<tr>
<td>Functions</td>
</tr>
<tr>
<td>Joins</td>
</tr>
<tr>
<td>Group and Analytical Functions</td>
</tr>
<tr>
<td>Set Operators</td>
</tr>
<tr>
<td>Subqueries</td>
</tr>
<tr>
<td>Data Manipulation Language</td>
</tr>
<tr>
<td>Database Objects</td>
</tr>
<tr>
<td>Constraints</td>
</tr>
<tr>
<td>Views and Sequences</td>
</tr>
<tr>
<td>Indexes</td>
</tr>
<tr>
<td>Clusters</td>
</tr>
<tr>
<td>Security</td>
</tr>
<tr>
<td>Locking and Read Consistency</td>
</tr>
<tr>
<td>More Advanced SQL</td>
</tr>
</tbody>
</table>

### PL/SQL Workshop

This course is for developers who will be designing or building applications using the Oracle server. It is relevant for developers who are using the Oracle Developer toolset, and for those using alternative front-end products accessing the Oracle database. The course covers basic PL/SQL syntax and the use of server level procedures, functions and triggers.

<table>
<thead>
<tr>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL/SQL Overview</td>
</tr>
<tr>
<td>Basic PL/SQL Syntax</td>
</tr>
<tr>
<td>SQL Statements in PL/SQL</td>
</tr>
<tr>
<td>Procedural Statements - Assignment and Conditional Processing</td>
</tr>
<tr>
<td>Procedural Statements - LOOPS</td>
</tr>
<tr>
<td>Exceptions</td>
</tr>
<tr>
<td>Nested Blocks and Cursors</td>
</tr>
<tr>
<td>Tables, Arrays and Records</td>
</tr>
<tr>
<td>Architecture Overview</td>
</tr>
<tr>
<td>Procedures / Functions</td>
</tr>
<tr>
<td>Execution and Error Handling</td>
</tr>
<tr>
<td>Security and Dependency</td>
</tr>
<tr>
<td>Packages</td>
</tr>
<tr>
<td>More About Packages</td>
</tr>
<tr>
<td>Supplied Packages</td>
</tr>
<tr>
<td>Triggers</td>
</tr>
<tr>
<td>More About Triggers</td>
</tr>
<tr>
<td>Large Objects</td>
</tr>
</tbody>
</table>

### Oracle Forms Developer Workshop

This course is designed for developers who will be designing or building applications using Oracle Form Builder. This is a practical course in which the student builds an application during a series of workshop sessions.

<table>
<thead>
<tr>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Running a Form</td>
</tr>
<tr>
<td>Forms Modules and Storage</td>
</tr>
<tr>
<td>Working in the Builder</td>
</tr>
<tr>
<td>Creating a Form</td>
</tr>
<tr>
<td>Form and Data Block Properties</td>
</tr>
<tr>
<td>Form Layout</td>
</tr>
<tr>
<td>Items</td>
</tr>
<tr>
<td>Introduction to Triggers</td>
</tr>
<tr>
<td>Program Units</td>
</tr>
<tr>
<td>Check Boxes, Radio Groups and List Items</td>
</tr>
<tr>
<td>Other Item Types</td>
</tr>
<tr>
<td>Visual Attributes</td>
</tr>
<tr>
<td>Mouse Events</td>
</tr>
<tr>
<td>Relations</td>
</tr>
<tr>
<td>Alerts and Editors</td>
</tr>
<tr>
<td>Lists of Values</td>
</tr>
<tr>
<td>Record Groups</td>
</tr>
<tr>
<td>Windows and Canvases</td>
</tr>
<tr>
<td>Transaction Processing and Triggers</td>
</tr>
<tr>
<td>Advanced Data Block Properties</td>
</tr>
<tr>
<td>More Trigger Events</td>
</tr>
<tr>
<td>Determining Form Properties</td>
</tr>
<tr>
<td>Timers</td>
</tr>
<tr>
<td>Integrating Multiple Forms Modules in an Application</td>
</tr>
<tr>
<td>Forms Architecture and Java</td>
</tr>
<tr>
<td>Integrating Forms with Reports</td>
</tr>
<tr>
<td>PL/SQL Library Modules</td>
</tr>
<tr>
<td>Managing Application Development</td>
</tr>
<tr>
<td>Menu Modules</td>
</tr>
</tbody>
</table>
Oracle Reports Workshop - 10G
This course is designed for developers who will be designing or building applications using Oracle Reports. This is a practical course in which the student builds a series of reports ranging from simple to complex.

- Product Overview
- The User Interface
- The Designer Interface
- Storage
- Building a Paper Report
- The Data Model Editor
- Other Query Types
- Columns
- Multiple Queries and Links
- The Paper Layout - Basic Objects
- Standard Layouts
- General Paper Layout Properties
- Advanced Paper Layout Properties
- Web Reports
- Displaying Files, Images and Charts
- Matrices
- Parameters
- PL/SQL in Reports
- Report Templates
- Publishing Reports on the Web

Oracle 10G – Database Administration Workshop
This course is designed for Database Administrators. It covers the architecture of the Oracle 10g server, and the procedures required to effectively administrate the database. The course provides a series of practical workshops in which the students can practice the database administration techniques they have learnt.

- Oracle 10g Overview
- Oracle 10g Architecture
- Database Creation
- Startup and Shutdown and Oracle Database
- Oracle Enterprise Manager
- Database Structure
- Managing Tablespaces
- Managing Redo Log Groups and Members
- Database Storage
- Managing Undo
- Security
- Optimisation
- Database Tuning
- The Multi Threaded Server
- Backup and Recovery
- Data Pump

Application Tuning Workshop 10g
This course is designed for Designers, Developers, and Database Administrators, and examines all aspects of tuning SQL statements and applications.

- Defining a Tuning Methodology
- Diagnostic Tools
- Processing an SQL Statement
- Indexes
- Cost Based Optimisation
- Gathering Statistics
- Stored Outlines
- Storage Parameters
- Hash Clusters and Index Clusters
- Optimising PL/SQL
- Optimising Applications through Stored Procedures and Packages
- Optimising Applications through Stored Procedures and Packages
- Optimise using Parallelisation
- Data Design for Performance
- Tuning Tips
- Partitions
- Tuning Tools

Oracle Discoverer Workshop
This course is designed for End Users and examines all aspects of using the latest versions of Oracle Discoverer. Both the web and client server interfaces are covered.

- Oracle Discoverer Overview
- Discoverer Workbooks
- Worksheets and Conditions
- Performing Analysis
- Customising Workbooks and Worksheets
- Printing and Exporting Query Results
- Scheduling and Administration
Oracle Portal Workshop
This course is designed to provide the student with the knowledge and skills required to build corporate portals. The course covers the use of Oracle Portal for content management and includes recommendations and guidelines on the classification and searching of content. The standardisation and customisation of the Portal interface and styles are described. The workshop includes the use of Portal to create simple application components such as forms, reports and graphs. Finally the security management of a corporate portal is considered.

- Product Overview
- Page Groups and Pages
- Styles, Navigation Bars and Templates
- Item Regions and Classification
- Custom Types, Parameters and Events
- Application Components - Forms
- Application Components - Reports
- Shared Component
- Other Components
- Security

Advanced Oracle Portal Workshop
The course is designed to provide the student with the knowledge and skills required to build custom portlets. The course describes the provider and portlet structure and the integration and management of custom portlets within the product. The attendee builds a simple provider and its custom portlets based on an example. The course focuses on PL/SQL portlets to demonstrate the techniques required, but also covers web portlets. Detailed coverage of the Portal API and its use, not only in custom portlets, but to enhance other Portal components is included.

- Programmable Portlets - Concepts
- PL/SQL Providers
- API Services – Session Storage
- API Services – Other Utilities
- PL/SQL Portlets
- Web Providers

Oracle End User Workshop
This course is designed for End Users who require a knowledge of SQL to query the Oracle database. It commences with a description of relational concepts and continues with coverage of the SQL statements required to access information from one or more Oracle Tables. Some basic formatting is also covered.

- The Relational Model
- Structured Query Language
- SQL*Plus
- Oracle SQL Developer
- More About SELECT
- Substitution Variables
- Using SQL*Plus for Formatting Output
- Functions
- Joins
- Group Functions

All our training is conducted at the client site and using the client’s Oracle licences. Sage Computing Services provides all course materials which the attendees retain after the course as a reference.

All Sage trainers are consultants who are using the products in real world situations and can bring a wealth of experience to the classroom.
SECTION 1 - OVERVIEW

The Product
History
Target
Development Approach
Declarative Approach
Extending the Functionality
Versions
Application Components
Application Builder
SQL Workshop
Administration
Workspaces
Applications
Pages

Navigating in the Product
Tabs
Images
Menus
Breadcrumbs
Task List
Detail and Icon Display
Navigation List
Buttons
Navigating Within a Page
Icons
Buttons

Help
Page Help
Online Help Manual
Field Level Help

Developer Comments
An Application Express Application
Creating an Application

1 Hands On - The Development Environment
1.1 Display the product home page
1.2 Login
1.3 Display the Application Builder
1.4 Hands On - Creating an Application
Completing Page Creation
Defining Tabs
Adding Shared Component
Theme
Confirm

SECTION 2 - EDITING AN APPLICATION IN THE BUILDER

Applications and Pages
Applications
The Developer Toolbar
Application Page
The Page Definition
Creating a Page

2 Hands On - Creating a Form and Associated Report

SECTION 3 – REGIONS, ITEMS AND VALIDATION

Regions
Report Attributes
Creating and Modifying Items
Validations

3 Hands On - Refining the Application
3.1 Regions and Items
3.2 Validation
(Note that we would normally create a List of values as a Shared Component.)
SECTION 4 – MORE ADVANCED DEVELOPMENT

Adding Processing
- Processes 43
- Branching 43
- Example – File Upload: Conditionally Displaying Regions 45

Session State
- Referencing Session State 46
- Clearing Session State 46
- Viewing Session State 46
- Creating Page Links 47
- Creating an Application – Standards 48
- Copying Common Objects 48
- Inheriting Common Objects 49

Security
- Authentication 49
- Public Pages 50
- Authorisation 50
- Session State Protection 50
- Enabling Session State Protection 50
- Managing Session State Protection 51

Page Zero Items 51
Themes and Templates
- Templates 52
- Themes 52

The Application Express API 53
Recommendations 53

4 Hands On – More Advanced Development Techniques 54
- Trees 54
- Creating Links 56
- Themes and Templates 60
Section 1 - Overview

The Product

History

Oracle Application Express (APEX) was previously known as HTMLDB (and before that as Project Marvel). It provides a wizard driven development environment for building small to medium web applications. The product is contained entirely within the Oracle database and accessed via a web browser for both development and deployment.

The product is based on the definition of meta data which is used by a series of PL/SQL packages to generated HTML pages.

Target

The product appears to be targeted at small to medium systems development. This allows small systems development to be better controlled, and for the data to reside in an Oracle database. The development environment is hosted centrally but provides independent workspaces in which developers can operate in a way that is isolated from other users.

Development Approach

Declarative Approach
The majority of development is performed by entering values into a series of wizards to create the basic objects, and then adjusting the properties of the objects using definition screens. A great deal of functionality can be created in the product without performing any coding.

Extending the Functionality
The product also provides the ability to extend the native functionality using PL/SQL, HTML and JavaScript coding. This provides a more experienced developer with the opportunity to develop more sophisticated functionality with the product.

An Application Programming Interface (API) is provided to allow developers to perform more complex tasks.

Versions

The product is supplied on the Oracle 10g companion disk. It is designed to operate in an Oracle 10g database but can also be installed in an Oracle 9i database.

In addition to being available as a companion product to the Oracle server, Oracle Application Express is packaged with the Oracle Express Edition of the database and will be automatically installed with that product.
Application Components

The product has three main functional areas. The grouping of the options is slightly different in the Database Express Edition of the product, however the functionality is the same.

Application Builder

Application Builder is the main development tool. It allows the development of web applications. Each application is comprised of a number of pages and associated objects such as navigation bars, menus, list of values and templates.

SQL Workshop

SQL Workshop provides an environment in which SQL statements can be entered and submitted, and database objects can be browsed, created, altered and dropped. It also provides utilities for importing and exporting data.

Administration

The component provides a web based administration interface. This is used by the workspace administrator for monitoring and managing a workspace and its users.

Workspaces

A workspace is an independent development area. Each workspace is independent from the others. It can contain multiple applications.

In Application Express 2.2 a workspace can be used by a number of developers. A workspace is accessed by entering the workspace name, and a username and password from the login page. These development usernames are stored in the APEX repository. The workspace name and username are not case sensitive. The password is case sensitive.

If you are using this version you should already have created a workspace as part of the setup steps.

In the version which is installed with Oracle Express Edition each database user has a distinct workspace.
Applications

A workspace can contain one or more Applications. An application is comprised of a set of pages and a number of shared components which may be used by one of more of the pages.

Pages

Each page definition represents an HTML page that will be displayed to the application’s users. The definition of a page comprises three main areas:

- Page Rendering
- Page Processing
- Shared Components

Navigating in the Product

Tabs

The three tabs displayed on each screen allow you to select any of the three major product components to work with. (Not available in the Oracle Database Express Edition version)

Images

Click on an image to drill down to the next level of detail for that component. For example clicking on the Application Builder Image will display a list of available applications.

Menus

Drop down menus can be used to navigate directly to the screen you require.

Breadcrumbs

A breadcrumbs link is displayed below the tabs on each page. You can navigate by clicking on the required page link in the breadcrumbs display.

Click here to return to the main Application Builder page.
Task List

Most Application Express pages display a task list on the right of the page. This provides a list of commonly performed tasks. Click on a link to perform the task.

<table>
<thead>
<tr>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete this Application</td>
</tr>
<tr>
<td>Copy this Application</td>
</tr>
<tr>
<td>Manage Page Groups</td>
</tr>
<tr>
<td>Manage Page Locks</td>
</tr>
<tr>
<td>View Application Reports</td>
</tr>
<tr>
<td>Manage Export Repository</td>
</tr>
<tr>
<td>Manage Supporting Object Definitions</td>
</tr>
</tbody>
</table>

Detail and Icon Display

Many screens can be displayed in Icon or Detail view.

Click on Details and then the Go button to change the display view.

Navigation List

Some pages contain a drop down list item that allows you to navigate to associated pages. For example, from the Page definition screen you can select Export from the list, and then click on the Go button to navigate to the Page Export screen.

Buttons

Some pages provide buttons which allow you to scroll through a number of objects of the same type. For example, in the Page Definition screen you can use the Next and Previous buttons to select the Page you want to work with.

You can also enter the number of a specific page and click on the Go button.
Navigating Within a Page

**Icons**
In version 2.2 of the product, icons are provided to allow you to restrict the information displayed on the Page Definition screen.

Display all sections           Display only Regions

**Buttons**
Pages which contain a large amount of information display additional buttons which restrict the information displayed within a page. Clicking on a button will display only that particular section of the page.

Click here to display only the security section of the page.

**Help**

**Page Help**
The right side of some Application Express development pages contains an information panel. This provides helpful information to assist you in using the page. It also contains a checkbox that allows you to return to the current page after applying changes.

Online Help Manual
The Help link in the navigation bar displays a Users Guide. The guide is context sensitive and has a Find facility to allow you to search for a particular topic.

Field Level Help
Clicking on the label of a field displays pop up context sensitive help. An asterisk is displayed next to the label of mandatory fields.

Developer Comments
Developer comments can be added using the icon on the right of the screen.
An Application Express Application

An Application Express application may contain a number of pages, which can be accessed using links, menus or tabs.

If you are running the application as a user with developer privileges the development toolbar will be displayed at the bottom of the screen. This can be used to make changes to the application. Non privileged users will not see this toolbar.

Creating an Application

There are three main methods available for creating an Application Express application.

- Create Application
  
  This allows you to create an application from scratch, or based on the design pattern provided by an existing application.

- Create from Spreadsheet
  
  When you create an application based on a spreadsheet, the spreadsheet data can be imported from a comma or tab delimited file or pasted into the Application Express screen.

- Demonstration Application
  
  When you select this option a list of available demonstration applications will be displayed. Demonstration applications are designed to teach you about various techniques such as shopping cart concepts and webservices.

(An application can also be imported from an Application Express export file.)
1 Hands On - The Development Environment

1.1 Display the product home page

Note that some steps depend on which version of the product you have installed. If you are using the provided server then you are using Oracle Application Express Release 2.2.

The development environment is displayed in a web browser. Access the product as follows:

Oracle Application Express Release 2.2

http://server:port/pls/apex

Example:


OR

Oracle Express Edition

http://server:port/apex

Example:

http://127.0.0.1:8080/apex/

or you can invoke the product from the Start menu:-

Start

Programs

Oracle10g Express Edition

Go to Database Home Page

1.2 Login

Oracle Application Express Release 2.2

Login to the HR workspace with a username of HR and password of HRADMIN.
Oracle Express Edition

Login with a username of HR and password of HRADMIN. You may have to change your password when you first log in.

1.3 Display the Application Builder

For this workshop we will focus on the Application Builder part of the product.

Click on the Application Builder image.

Your screen should appear similar to the following. Note that if you are running Express Edition you will not see the tabs or sample application.

Since we are focusing on the Application Builder the functionality from this point will be the same. Do not be concerned if there are slight differences in the screen layouts/contents.
1.4 Hands On - Creating an Application

1) Click on the Create button in the main Application Builder page.

The Create Application Wizard will be displayed.

2) Select Create Application and then click on the Next button.

The following screen will be displayed.

3) Enter a Name of AUSOUG_HR. Leave the default values for the other properties. Click on the Next button.
The Create Application wizard leads you through a series of steps in which you can add pages containing various types of components to your application. The example described in this workshop creates an application based on a single table.

Initially the application contains no pages. If you select anything other than a blank page you will be prompted to enter the table or view on which the page component should be based.

If you set the Include Analysis Pages checkbox on, then additional summary reports and charts will be automatically created for you.

4) Click on the Report and Form image

A field will be displayed into which you can enter a table name.

5) Enter a table name of EMPLOYEES and click on the Include Analysis Pages checkbox to set it on.

6) Click on the Add Page button

If you do not select analysis pages, the page you have specified will be created and you can continue to add additional pages.

If you set the Include Analysis Pages checkbox on you can select one or more columns that can be used as Group By columns in reports and charts.
Creating Analysis Pages

For each one of these columns the wizard will create an additional chart and report.

7) Select JOB_ID and DEPARTMENT_ID and then click on the Next button.

The next step allows you to specify the columns which should be aggregated, and the aggregate function to apply. You only have the choice of Sum or Average from the wizard.

8) Select SALARY and COMMISSION_PCT and ensure both checkboxes are on. Click on the Next button.

9) Leave the Chart types as their default values. Click on the Next button.

10) When you click on the Next button a confirmation page will be displayed. Click on the Add Analysis Pages button to confirm your choices.
Completing Page Creation

You will then be returned to the main Application Wizard screen. The pages which have been created so far will be displayed. You can add additional pages, or delete existing pages. Any new pages which you create can be subordinate to one of the pages that have already been created. This forms a navigation hierarchy.

11) Click on the Next button.

Defining Tabs

This screen allows you to specify whether you want no tabs, one level of tabs, or two levels of tabs.

12) For this workshop select one level of tabs and then click on the Next button.

Adding Shared Component

The next step allows you to add shared components such as Navigation bars, Themes and Templates to your application. We will cover shared components later, however it is worth noting at this stage that the addition of shared components from a standard application will assist you in developing applications that conform to your organisational standards.

13) Leave the default value of NO and click on the Next button.

Authentication Scheme

The next step allows you to specify the authentication scheme and language options for the application.

14) If you are using Application Express 2.2 leave the default authentication scheme of Application Express and click on the Next button.

   If you are using Oracle Express Edition leave the default of database.
**Theme**

Themes determine the appearance of your pages. A number of prebuilt themes are available.

15) Select Theme 5 and click on the Next button

**Confirm**

The final step allows you to confirm that you want the application to be created. You can also save the definitions used in this wizard to be used as a design model for future applications.

16) Click on Create to complete the creation of your application.

17) Click on the Run Application image to test the application. If you are using V2.2 of the product you will need to log in. Your username/password will be HR/HRADMIN. Search for an employee, then use the Edit link to change the employee’s details.

18) Click on the Edit Application Link on the Developer Toolbar to return to the development environment.
Section 2 - Editing an Application in the Builder

Applications and Pages

Applications
The Application Builder allows you to work with a single application at any point in time.

If you click on the Application Builder image on the home page it will display a list of all applications in your workspace. Click on the name of an application to display its details.

The Developer Toolbar

You can also edit an existing application from the Developer toolbar, while you are running the application.

The developer toolbar is displayed to users who have developer privileges. It provides a quick method for editing the page. The links provided are as follows:

- **Edit Application** navigates to the Application property screen.
- **Edit Page** allows the current page definition to be edited.
- **Create** displays a screen that allows new Application Express components to be displayed.
- **Session** displays information about session state variables.
- **Debug** displays the page in debug mode. This displays a list of page processing events.
- **Show Edit Links** displays an icon next to each page region. Clicking on the region allows the region to be edited.
Application Page

The main Application page provides links to run the application, edit the application attributes, manage shared components and export and import application components. The tasks list allows you to perform additional tasks, such as deleting the application and displaying reports for the application.

The screen also displays a list of the pages within the application.

Click on the column headings to reorder the page information

Click on the page name to edit a page.

Click here to lock a page. Locking a page prevents other developers from changing it.

When running the application, you can Click on the Edit Page n link on the Developer toolbar to edit the current page.
The Page Definition

There is an area of the Page Definition screen for each of the three sections of information. Note that if you have version 2.2 of the product the Page information is displayed in the Page Rendering section and you have additional icons for restricting the information displayed on the page. In the Express Edition, Click on the Edit Attributes button if you want to amend page properties.

Creating a Page

A page can be created using a number of methods as follows:

- Using the Application wizard.
- From the main Application page click on the Create Page button.
- From any page definition screen click on the Create button.
- From the Create link in the Developer Toolbar

You have the option of creating a single blank page, multiple blank pages, or using the wizard to create a page that contains a component such as a form or a report.

The most commonly used method is to create a page with a component. There are six types of component that can be created in the page. Each of these will result in a different set of steps to follow. You can also choose to create a login page.
2 Hands On - Creating a Form and Associated Report

1) Use the Breadcrumbs link to return to your application page.

One of the most commonly used page components is a query report on a table which is associated with a form for data manipulation. This page wizard creates two pages. These components can be created using the following steps:

2) Click on the Create Page button on the main Application page.

   Select Form. You can just click on the image rather than using the radio button and clicking Next.

   Select Form on a Table with Report.

3) This screen allows you to identify the schema that owns the table you want to maintain. Leave the default value of HR and click on the Next button.

   The next screen allows you to define the table or view on which the form and report should be based. You can enter the name of the table or view or select it from a list by clicking on the List icon to the right of the field.

4) Enter or select the table JOBS. Click on the Next button.
Creating a Form and Associated Report (cont)

The first page that will be created is the report page.

The screen allows you to enter the Page Number and Name, and Region Title. You can also select the template that will be used for the region and the report displayed in the region. These will default to the values set for your application. You can also determine the number of records that will be displayed in the report. The user can scroll to additional records.

5) Change the Page Name, Title and Breadcrumb as follows. Click on the Next button.

You have the option of creating a page without a tab, creating a new tab in an existing set of tabs or using an existing tab.

6) Use an existing tab set and create a new tab. Select the Tab Set EMPLOYEES and enter a new tab label of Jobs.
Creating a Form and Associated Report (cont)

The next step allows you to select the columns that will be included as items in the report. You can also enter a WHERE clause to restrict the data in the report.

7) Include all the columns except JOB_ID. Click on the Next button.

8) On the next page select an Edit icon and click on the Next button.

The next steps create the Form page. This is used to edit information in the table. The first pages are similar to those that were displayed to create the report page.
9) Change the Page Name, Region Title and Breadcrumb Entry as follows and Click Next.

<table>
<thead>
<tr>
<th>Create Form Page</th>
<th>Cancel</th>
<th>&lt; Previous</th>
<th>Next &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner: HR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table Name: JOBS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Page Name: JOBS_DETAIL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region Title: Jobs Detail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region Template: Form Region</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10) Select the tabs for the page. In this case we are choosing to reuse an existing tab page from an existing tab set. Click Next.

<table>
<thead>
<tr>
<th>Create Form Page</th>
<th>Cancel</th>
<th>&lt; Previous</th>
<th>Next &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page: 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tab Options:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not use tabs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use an existing tab set and create a new tab within the existing tab set.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use an existing tab set and reuse an existing tab within that tab set.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tab Set: TS1 (EMPLOYEES)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11) Select the tab you want to use. Notice the Employee tab has not yet been created. Pick the EMPLOYEES tab, we will fix this later. Click Next.

<table>
<thead>
<tr>
<th>Create Form Page</th>
<th>Cancel</th>
<th>&lt; Previous</th>
<th>Next &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page: 9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tab Set: TS1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use Tab: T_EMPLOYEES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select Tab: T_EMPLOYEES</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12) The primary key of the table will be derived from a primary key constraint defined for the table. Leave this as the default of JOB_ID and click Next.

The next screen allows you to identify the mechanism you want to use to supply a default value for the primary key column. You can use an existing database trigger, write a PL/SQL function or use an existing sequence.

13) Choose to use an existing sequence JOB_SEQ, and click Next.

14) Select all the columns and click Next.
15) Allow insert, update and delete. Click Next.

16) The final screen presents a summary of the objects the wizard has created. Click on Finish to create the pages.

17) Click on Run Page

18) Click on the Edit icon to view the details of the president

19) Click on the Edit Page n link in the Developer toolbar to return to the page definition.
20) Click on the link to the Jobs tab.

21) Set the Tab also Current for Page 9. Click on Apply Changes.

22) Click on the Application link in the Breadcrumbs to return to the application page. Run the application and test your new pages.
Section 3 – Regions, Items and Validation

Regions

Each page is made up of one or more regions. The region defines the location and appearance of items and buttons on the page. You can add a new region to an existing page.

Display the page regions in Grid Edit view. This allows you to edit multiple regions in one operation.

Create a new region from a copy of an existing region.

Create a new region.

Display attributes for the region contents (in this case a report).

Display the region definition.
Report Attributes

If your region is a Report region, the Report Attributes Tab allows you to change the appearance and functionality of columns in your report.

Click here to edit the column attributes

- Displays a tick if the column acts as a link
- Displays a tick if the column has been edited
- Column headings can be based on the column names or can be customised or hidden
- Change the position of the column in the report
- Customise the column heading
- Align column data and headings
- Add totals for the column
- Set the checkbox off to hide a column
- Set the checkbox on to allow the user to sort by this column
- Sort order
Creating and Modifying Items

You can modify existing items, or create new items from the Page Rendering section of the Page Definition screen.

Create a new item

View the items in Grid Edit mode

Copy an item

Edit an existing item

The New Item wizard steps you through the creation of an item. The first page allows you to select an item type.
Validations

Page validations allow the contents of a page to be checked against a set of business rules before the page is submitted.

There are a number of types of validation. Some provide commonly used validation criteria which you can select from a predefined list, some require you to enter the validation code yourself.
3 Hands On - Refining the Application

3.1 Regions and Items

1) Use the Breadcrumbs link to return to your application page.

2) Click on the JOBS link to display the definition of the JOBS page.

<table>
<thead>
<tr>
<th>Page</th>
<th>Name</th>
<th>Updated</th>
<th>Updated By</th>
<th>Lock</th>
<th>Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EMPLOYEES</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>EMPLOYEES</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>EMPLOYEES Analysis</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Anze by Job Id</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Job's Chart</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Anze by Department Id</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Department h Chart</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>JOBS</td>
<td>3 minutes ago</td>
<td>hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>JOBS DETAIL</td>
<td>52 minutes ago</td>
<td>hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Login</td>
<td>6 days ago</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) Click on the Report link to display the Report Attributes.

Regions

```
Display Point: Page Template Body (3)
10  Jobs  Report

Display Point: Region Position 01
1  Jobs  Breadcrumb Entry
```
4) Change the Column alignment of min and max salary to Right. Set Sort on for the title, min salary and max salary.

<table>
<thead>
<tr>
<th>Alias</th>
<th>Link</th>
<th>Edit</th>
<th>Heading</th>
<th>Column Alignment</th>
<th>Heading Alignment</th>
<th>Show</th>
<th>Sum</th>
<th>Sort</th>
<th>Sort Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB_ID</td>
<td></td>
<td></td>
<td>Job Title</td>
<td>left</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JOB_TITLE</td>
<td></td>
<td></td>
<td>Min Salary</td>
<td>right</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIN_SALARY</td>
<td></td>
<td></td>
<td>Max Salary</td>
<td>right</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAX_SALARY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When moving the last column further down, it will show up as the first column of your report.
When moving the first column up, it will be moved to the end of your report.

5) Scroll further down the Report attribute page and enable CSV output.

6) Click on the Apply Changes button. It will return you to the Page Definition screen.

7) Use the Next page icon to display your Jobs Detail page

8) Click on P9_MIN_SALARY to display the item definition screen.
9) Display the field as a Text Field With Calculator Popup. Click on the Apply Changes button.

<table>
<thead>
<tr>
<th>Name</th>
<th>Page: 9 JOBS_DETAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Name</td>
<td>PO_MIN_SALARY</td>
</tr>
<tr>
<td>Display As</td>
<td>Text Field with Calculator Popup</td>
</tr>
</tbody>
</table>

3.2 Validation

10) Click on the Add Validation icon.

11) Select Page Level Validation.

12) Select a validation method of PL/SQL.

13) Select a PL/SQL validation method of PL/SQL Expression. Click Next.

14) Enter a validation name of check_sal. Click Next.
15) Enter the following validation clause and error message.

![Validation Clause and Error Message]

**Validation**

```
TO_NUMBER(:PP_MIN_SALARY) <= TO_NUMBER(:PP_MAX_SALARY)
```

**Error Message**

Minimum salary cannot be more than maximum salary

16) Click on the Next Button. Leave this screen with default values then click on Create.

17) Navigate to the page definition screen of your second Employees Page (Page 2). Click on P2_JOB_ID to display the item definition.

![Item Definition]

18) Display the item as a Select List.
19) Scroll further down the item definition page and enter the following list of values.

(Note that we would normally create a List of values as a Shared Component.)

20) Apply your changes.

21) Display the item definition for the Hire Date and set the Display As to Date Picker (DD-MON-YYYY)

22) Apply your changes, then return to the main Application screen and run your application. Test the changes you have made.
Section 4 – More Advanced Development

Adding Processing

Processes

Page processes provide a means to execute application logic associated with the page. This may be at one of a number of processing points, for example when the time the page is rendered or when the page is submitted. They can be used, for example, to populate a page from the database, or to execute a PL/SQL procedure when the page is submitted.

You can create a page process from the Page Rendering or Page Processing part of the screen. The location in which the process will display is dependent on the process point.

Branching

Branching is used to determine the location to which control will be passed when a page is submitted.

Example – File Upload:

In this example we need to load files into the database. Application Express handles the upload of files automatically, but if we want to store additional metadata with the files we need to code it manually. The file item is created as type File Browse...
**Example – File Upload (cont):**

When the user has selected a file and clicks submit the file will be uploaded to a database table.

We have created an additional process that inserts related comments information into a separate table, and also a process to clear out our comments when the screen has been submitted, ready for entry of the next file.

We only fire the code when a file name has been entered.
Conditionally Displaying Regions

A region can be displayed or suppressed depending on a series of conditions. You can select from a list of standard conditions in a drop down list.

Condition Type

- Value of Item in Expression 1 = Expression 2
- Value of Item in Expression 1 Is NULL
- Value of Item in Expression 1 Is NOT NULL
- Value of Item in Expression 1 Is Zero
- Value of Item in Expression 1 Is Not Zero
- Value of Item in Expression 1 Is NULL Or Zero
- Value of Item in Expression 1 Is NOT NULL and the Item Is NOT Zero
- Value of Item in Expression 1 Contains No Spaces
- Value of Item in Expression 1 Is Numeric
- Value of Item in Expression 1 Is Alphanumeric
- Value of Item in Expression 1 Is Contained within Colon Delimited List in Expression 2
- Value of Item in Expression 1 Is NOT Contained within Colon Delimited List in Expression 2
- Value of User Preference in Expression 1 = Expression 2
- Value of User Preference in Expression 1 Is Expression 2
- Current page = Expression 1
- Current Page Is Contained Within Expression 1 (comma delimited list of pages)
- Current Page Is NOT in Expression 1 (comma delimited list of pages)
- Current Page = Page Submitted (this page was posted)
- Current Page = Page Submitted (this page was not the page posted)
- Current Page Is in Printer Friendly Mode
- Current page is NOT in Printer Friendly Mode
- Text in Expression 1 Is Contained in Value of Item in Expression 2
- Text in Expression 1 Is Contained within the Text in Expression 2
- Text in Expression 1 Is NOT Contained within the Text in Expression 2
- Text in Expression 1 = Expression 2 (includes &ITEM substitutions)
- Text in Expression 1 Is Expression 2 (includes &ITEM substitutions)
- User Is Authenticated (not public)
- User Is the Public User (user has not authenticated)

This feature can be used to hide regions that are not available to a public user.
Session State

Referencing Session State

When you submit information in an Application Express application it is automatically saved in the session state. It can then be used in subsequent pages. You can reference items in session state as bind variables using the following syntax:

`:ITEMNAME` as a bind variable in SQL
`v('ITEMNAME')` in PL/SQL
`&ITEMNAME` in static text

Clearing Session State

Session state can be cleared when you call a new page. When you create a branch to a new page you can enter the page numbers for which you want to clear the cache.

Example:

Branch to page 400 and clear the cache for pages 400 and 401.

The settings in this page are used to create a page call that clears the cache in these pages.

You can manually create a page call that clears cache.

Example:

Branch to page 400, clear the cache for pages 400 and 401 and reset pagination.

`f?p=&APP_ID.:400:&APP_SESSION.::NO:RP,400,401`

Viewing Session State

Click on the Session link in the Developer toolbar. A popup screen will display the values in the session state.
Creating Page Links

You can create links between Application Express pages using the following syntax:

\[ f?p=\text{App}:\text{Page}:\text{Session}:\text{Request}:\text{Debug}:\text{ClearCache}:\text{itemNames}:\text{itemValues}:\text{PrinterFriendly} \]

The arguments are as follows:

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>App</td>
<td>The application identifier or alias. Use the substitution string &amp;APP_ID. in preference to hard coding these values.</td>
</tr>
<tr>
<td>Page</td>
<td>The ID or alias of the page you want to display</td>
</tr>
<tr>
<td>Session</td>
<td>The ID of the current session. Use &amp;SESSION. to pass the current session.</td>
</tr>
<tr>
<td>Request</td>
<td>When a user submits a page, by default the request is set to the name of the button that was clicked. Request can also be set to a custom value.</td>
</tr>
<tr>
<td>Debug</td>
<td>If set to YES the page will be displayed in debug mode. A value of No will not display debug information.</td>
</tr>
<tr>
<td>ClearCache</td>
<td>Specifies the items for which the session state should be cleared. You can include any of the following:</td>
</tr>
<tr>
<td></td>
<td>A comma separated list of pages to be cleared.</td>
</tr>
<tr>
<td></td>
<td>A comma separate list of items to be cleared.</td>
</tr>
<tr>
<td></td>
<td>RP This causes pagination to be reset.</td>
</tr>
<tr>
<td>itemNames</td>
<td>A comma separated list of items which should have their values set. This syntax sets the value of the item in the session state.</td>
</tr>
<tr>
<td>itemValues</td>
<td>A comma separate list of the values to which the items should be set.</td>
</tr>
<tr>
<td>PrinterFriendly</td>
<td>Set to YES to display a printer friendly view or NO for a normal view.</td>
</tr>
</tbody>
</table>

The procedure call f is a PL/SQL wrapper for wwv_flow.show.

**Examples:**

Call page 1 in the current application

\[ f?p=\text{APP_ID}.:1:\text{SESSION}. \]

Call page 10 setting the value of P10_PAR_ID to 89

\[ f?p=\text{APP_ID}.:10:\text{APP_SESSION}.:::\text{P10_PAR_ID} :89 \]
Creating an Application – Standards

In order to maintain organisational standards the following techniques can be used for the creation of applications.

A STANDARD workspace should be created. This should contain a standard application:

STANDARD_APP  This application will contain standard objects such as Navigation Bar Entries, common Lists of Values and authentication and authorisation schemes.

When a new workspace is created the STANDARD_APP application should be imported into the workspace.

Copying Common Objects

You can copy the common objects into your application when you use the application creation wizard. Note that the common objects will be copied not inherited.

![Create Application](image)

![Create Application](image)
**Inheriting Common Objects**

Objects can be inherited from a standard application using the Subscription facility.

![Subscription](image)

When the master object is changed you can click on the Refresh button to reload its definition.

Note that objects can only be inherited from applications in the same workspace, or in a different workspace that shares the same schema.

**Security**

There are two types of security that can be implemented in Application Express.

- Authentication
- Authorisation

**Authentication**

Authentication is the process by which a user is validated to Application Express. The authenticated user can be referenced using :APP_USER or v(‘APP_USER’). You can choose from preconfigured authentication schemes, or build your own. Authentication schemes are managed from the Shared Components page.

The following built in schemes are available:

- Application Express Account
- Database Authentication
- LDAP Directory
- No Authentication
- Oracle iAS Single Sign-On

When you create an application which requires authentication, a login page is automatically created for you.
Public Pages

Pages can be specified as public using the list box in the Edit Page screen.

![Authorization Scheme and Authentication options]

Authorisation

Authorisation schemes allow you to control access at a more granular level. They are managed from the Shared Components page.

An authorisation scheme contains a condition that is applied before you can access an object. The condition can be one of a series of standard conditions or a PL/SQL expression returning a Boolean.

The authorisation code can be performed once per page view or once per session.

An authorisation scheme is applied to an object in the Security section of the objects attributes.

Authorisation provides additional security levels once a user is connected.

Session State Protection

Since session state items can be referred to in a URL, it is possible for a malicious user to tamper with session state by modifying URLs. The session state protection feature is designed to prevent this from happening. It utilises checksums to prevent URL tampering.

*Enabling Session State Protection*

By default session state protection is turned off. It can be turned on from the security section of the application attributes.

![Session State Protection options]

Page: 50
Managing Session State Protection

Once enabled, session state protection can be defined for pages, items and application items. Protection levels can be defined in the individual objects or from the session state protection wizard in shared components. Initially all objects will be unprotected. You can view the session state protection settings using the report links on the Set Application Protection page.

Page Zero Items

Page 0 items appear on all pages. This can be used to display common content in your application. Page 0 is not directly displayed itself, only to add content to all pages.

You can conditionally suppress the objects when not required.

Example:

Do not display the menu on pages 7 or 8
Themes and Templates

Templates

Templates determine the visual characteristics of an application. They contain HTML that defines the styles, positions and text associated with the page and components of the page.

Templates are defined for a number of Application Express objects.

- Page
- Region
- Report
- List
- Label
- Breadcrumbs
- Calendar
- Button
- Popup LOV

Themes

A theme contains a set of templates for each of the possible levels. There can be multiple templates for each object type, one of which will be defined as the default template for that type of region or component. The default will be used by the wizards if you do not specify a template, but can be overridden for individual components.
The Application Express API

Oracle provides an application programming interface (API) for performing programming in the Application Express environment.

A number of packages are provided as follows:

- APEX_ITEM
- APEX_APPLICATION
- APEX_UTIL
- APEX_CUSTOM_AUTH
- APEX_COLLECTION
- APEX_PLSQL_JOB
- APEX_MAIL

Note that prior to version 2.2 these APIs will be called HTMLDB_XXXXX. The older name is still supported in version 2.2.

Recommendations

- Take an export of your application at regular intervals.
- Use Lock Page when working on a page.
- Use an artificial, autogenerated column as a primary key.
- Load images and files into the HTMLDB repository as shared objects and reference using #WORKSPACE_IMAGES#filename.
- Do not use hard coded APP_ID.
- Use Fine Grained Access Control (VPD) for limiting rows a user can access.
- Specify normal display characteristics as user interface defaults.
- Update/insert screens can be used for query only by setting items to read only dependent on some condition.
4 Hands On – More Advanced Development Techniques

4.1 Trees

1) Use the Breadcrumbs link to return to your application page.

2) Click on the Shared Component icon.

3) Click on the Trees link in the Navigation group.

4) Click on the Create button.

5) Enter Page Number 2. Enter a page name of Employee Details, and a Region name of Managed Employees. Do not use breadcrumbs on page. Click on the Next button.

6) Enter a tree name of Employees Tree. Start the tree with a static value. Click on the Next button.

7) Choose a standard tree template.

8) Start tree based on static value P2_EMPLOYEE_ID. Click on the Next button.

9) Include the Collapse all and Expand all buttons. Click on the Next button.

10) Accept a table owner of HR. Click on the Next button.

11) Enter a table name of EMPLOYEES. Click on the Next button.

12) The next screen should be changed to appear as follows:

13) Select the link item as follows:

---

Page: 54
14) Do not include a WHERE or ORDER BY clause.

15) Click Finish to create the Region.

16) Edit Page 2.

17) Click on the hidden item P2_TREE_ROOT.

18) Scroll down to the Source section and set it as follows:

```
Source
Source Used: Always, replacing any existing value in session state
Source Type: [application or page item name]
Maintain session state: For session
Source value or expression: P2_EMPLOYEE_ID
```

19) Run your application. Search for Stephen King. Click on the Edit icon next to his name and notice your tree displayed. Click on the name of an employee in the tree to navigate to that employee.

We do not want the Managed Employees region to display when we are creating a new Employee so we will display the region conditionally.

20) Edit Page 2 EMPLOYEES.

21) Click on the managed Employees Tree region
22) Set the Conditional Display as follows.

<table>
<thead>
<tr>
<th>Condition Type</th>
<th>Value of Item in Expression 1 is NOT NULL</th>
</tr>
</thead>
</table>

Expression 1
P2_EMPLOYEE_ID

23) Run your application. Notice that if you click on the button to Create a new employee the tree is not displayed.

4.2 Creating Links

In this workshop you will create a button to display the Employee’s job, and conditionally return to either the Job search screen or the Employee Detail screen.

1) Return to your application page.

2) Edit Page 9 Job Detail. Create a hidden item called P9_FROM.

3) Edit Page 2 EMPLOYEES.

4) Create a new button in the Employees region.

5) Choose Create a button displayed amongst the region’s items.

6) Set the button properties as follows.
7) Click on Create Button

8) Create a new Branch as follows:

9) Click on the Next button, then enter Branch to Page 9 as follows:

10) Only branch when P2_JOB button is pressed.

11) Click on the Create Branch Button
12) Test your application. At this point, the job will be displayed, but when you leave the Job detail screen you will be returned to the Job search screen.

13) Edit the branch you have just created as follows.


15) Edit the existing branch Go To Page 8 and set the Sequence to 2.

16) Create a new branch as follows:

17) Click on the Next button. Enter the next screen as follows.
18) Click on the Next button. Enter the next screen as follows.

19) Click on Create Branch,

20) Edit the Cancel button on Page 9.

21) Set the Optional URL Redirect to No Target
22) Edit the Delete and Apply Changes buttons. Set the conditional display so that they do not display when P9_FROM = EMP.

<table>
<thead>
<tr>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Condition Type</strong></td>
</tr>
<tr>
<td>SQL Expression</td>
</tr>
<tr>
<td>[PL/SQL] [isnull] [isnot null] [not null] [request] [page] [not in] [exists] [true] [false] [never]</td>
</tr>
</tbody>
</table>

Expression 1

*:P9_JOB_ID IS NOT NULL
AND NVL(:P9_FROM, 'JOB') != 'EMP'

23) Run and test your application.

### 4.3 Themes and Templates

1) From your main application page click on the Shared Components image.

2) Click on the Themes link in the User Interface section.

3) Click on the Create button to create a new Theme.

4) Create a Theme from the Repository.

5) Choose Theme 1. Click on the Next button, then on the Create button to finish creating your theme.

6) Click on the Switch Theme button and change to your new theme.

7) Click on the Next button (Ignoring any warnings). Then click on the Switch Theme button.

8) Run your application.