Oracle® Database

2 Day + PHP Developer's Guide

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Oracle Database 2 Day + PHP Developer's Guide, 11*g* Release 2 (11.2)

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Contents

Preface

Oracle Database 2 Day + PHP Developer's Guide introduces developers to the use of PHP to access Oracle Database.

This preface contains these topics:

- Audience
- Documentation Accessibility
- Related Documents
- Conventions

Audience

Oracle Database 2 Day + PHP Developer's Guide is an introduction to application development using PHP and Oracle Database.

This document assumes that you have a cursory understanding of SQL, PL/SQL, and PHP.

Documentation Accessibility

Deaf/Hard of Hearing Access to Oracle Support Services

To reach Oracle Support Services, use a telecommunications relay service (TRS) to call Oracle Support at 1.800.223.1711. An Oracle Support Services engineer will handle technical issues and provide customer support according to the Oracle service request process. Information about TRS is available at `http://www.fcc.gov/cgb/consumerfacts/trs.html`, and a list of phone numbers is available at `http://www.fcc.gov/cgb/dro/trsphonebk.html`.

Related Documents

For more information, see these Oracle resources:

- *Oracle Database 2 Day Developer's Guide*
- *Oracle Database SQL Language Reference*
- *Oracle Database PL/SQL Language Reference*
- *SQL*Plus User's Guide and Reference*
- *Oracle Database Globalization Support Guide*

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Introducing PHP with Oracle Database

PHP is a popular scripting language that can be embedded in HTML, which makes it particularly useful for Web development.

This chapter has the following topics:

- Purpose
- Overview of the Sample Application
- Resources

Purpose

This document is a tutorial that shows you how to use PHP to connect to Oracle Database, and demonstrates how to use PHP to access and modify data.

Overview of the Sample Application

This document guides you through the development of a sample Human Resources (HR) application for a fictitious company called AnyCo Corp. For this introduction to the PHP language no framework or abstraction layer is used. However, PHP frameworks are becoming popular and they should be evaluated when building any large application.

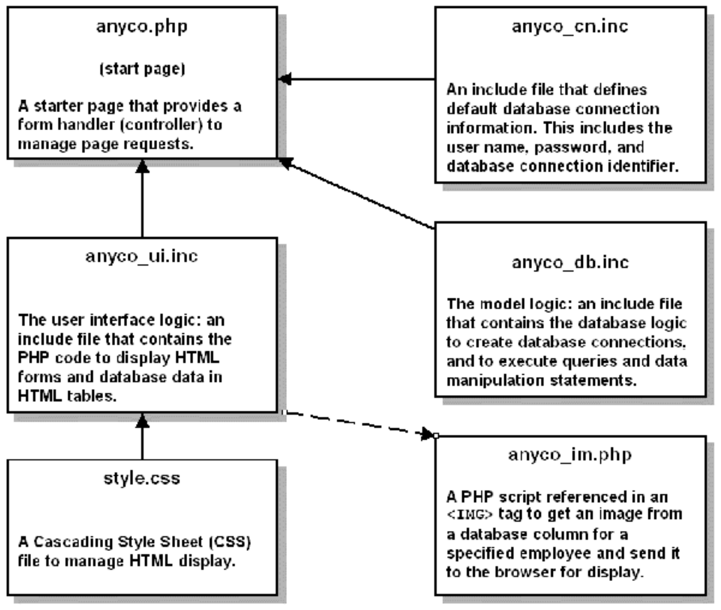
The application manages departmental and employee data stored in the `DEPARTMENTS` and `EMPLOYEES` tables in the HR schema provided with Oracle Database. See *Oracle Database Sample Schemas* for information about this schema.

The complete sample application:

- Establishes a connection to the database using the PHP OCI8 extension
- Queries the database for departmental and employee data
- Displays and navigates through the data
- Shows how to insert, update, and delete employee records
- Handles data exceptions
- Uploads and displays employee photographs

Figure 1-1 shows the relationship among the files developed for this application.

Figure 1–1 Components of the Sample HR Application


anyco.php
(start page)
A starter page that provides a form handler (controller) to manage page requests.
anyco_cn.inc
An include file that defines default database connection information. This includes the user name, password, and database connection identifier.
anyco_ui.inc
The user interface logic: an include file that contains the PHP code to display HTML forms and database data in HTML tables.
anyco_db.inc
The model logic: an include file that contains the database logic to create database connections, and to execute queries and data manipulation statements.
style.css
A Cascading Style Sheet (CSS) file to manage HTML display.
anyco_im.php
A PHP script referenced in an <IMG> tag to get an image from a database column for a specified employee and send it to the browser for display.

The sample application files are:

`anyco.php` This file contains the main logic for the AnyCo application. It contains control logic that determines which page is displayed. It manages session data for navigation. It calls functions in the include files `anyco_cn.inc`, `anyco_db.inc`, and `anyco_ui.inc`.

`anyco_ui.inc` This file contains the functions used to present data and forms in an HTML page.

`anyco_cn.inc` This file contains definitions for database connection information, the database user name, password, and database connection identifier.

`anyco_db.inc` This file contains the database logic to create database connections, execute queries, and execute data manipulation statements.

`anyco_im.php` This file contains logic to retrieve an image from a database column and send it to a Web browser for display as a JPEG image.

`style.css` This file contains Cascading Style Sheet (CSS) definitions for various HTML tags generated by the application. It manages the look and feel of the application.

Files with the suffix `.inc` are PHP code files included in other PHP files.

Files with the suffix `.php` can be loaded in a Web browser.

You can create and edit the PHP application source files in a text editor or any tool that supports PHP development.

The code for each chapter builds on the files completed in the previous chapter.

Resources

The following Oracle Technology Network Web sites provide additional information you may find useful.

- PHP Developer Center at

  `http://www.oracle.com/technology/tech/php/index.html`

- Oracle Database Documentation Library at

  `http://www.oracle.com/technology/documentation`

- Oracle SQL Developer center at

  `http://www.oracle.com/technology/products/database/sql_developer/`

2 Getting Started

This chapter explains how to install and test Oracle Database and PHP environment. It has the following topics:

What You Need

To install your Oracle Database and PHP environment, you need:

- Oracle Database Server which includes the sample data for this tutorial
- Oracle Database Client libraries are included with the Oracle Database software or can be installed using Oracle Instant Client
- Apache HTTP Server which is typically already installed on Linux computers
- PHP - PHP Hypertext Preprocessor
- A text editor for editing PHP code. A code editor such as Oracle JDeveloper with the optional PHP Extension can also be used.

Installing Oracle Database

You should install Oracle Database Server on your computer. The sample data used in this tutorial is installed by default. It is the HR component of the Sample Schemas.

Throughout this tutorial Oracle SQL Developer is the graphical user interface used to perform Database tasks. Oracle SQL Developer is a free graphical tool for database development.

See Also:

- *Oracle Database Sample Schemas* guide for information about the `HR` sample schema.
- Oracle SQL Developer web page

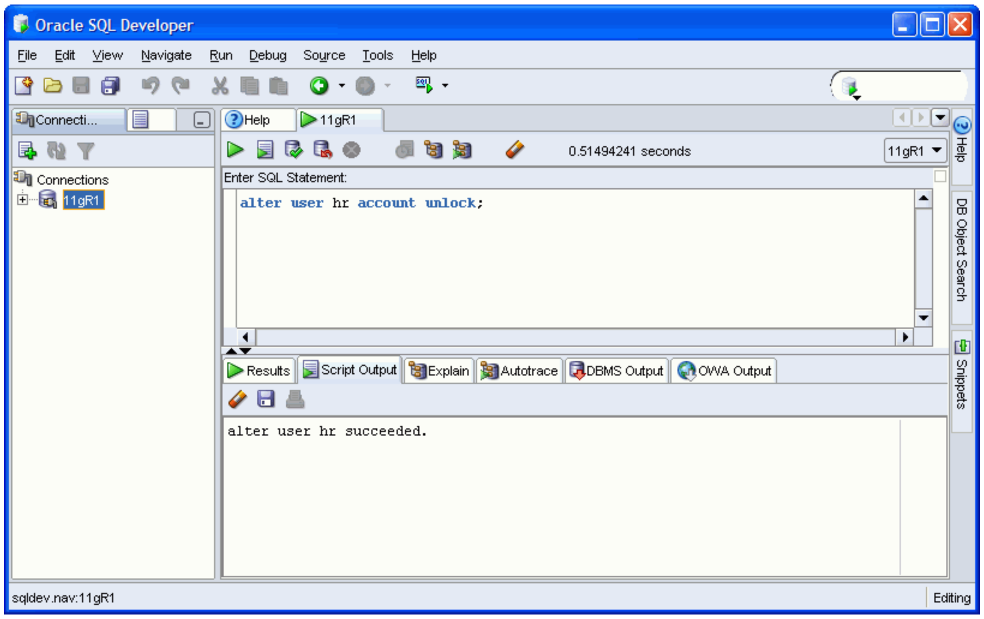
  `http://www.oracle.com/technology/products/database/sql_developer/`

Unlocking the HR User

The PHP application connects to the database as the HR user. You may need to unlock the `HR` account as a user with DBA privileges. To unlock the `HR` user:

1. Open SQL Developer and open a connection to your Oracle database.
2. Login to your Oracle database as **system**.
3. Open SQL Worksheet or SQL*Plus and run the following SQL statement:

```
alter user hr account unlock;
```



```
alter user hr account unlock;
```

```
alter user hr succeeded.
```

For further information about unlocking an Oracle Database account, see Chapter 6, "Managing Users and Security," in the *Oracle Database 2 Day DBA* guide.

See Also:

- Oracle Database documentation

  `http://www.oracle.com/technology/documentation`

Installing Apache HTTP Server

You should install Apache before you install PHP. Apache is typically installed by default on Linux computers. See Testing the Apache Installation on Linux before downloading the Apache software.

Perform the following steps to obtain Apache HTTP Server for Windows or Linux:

1. Enter the following URL in your Web browser:

   `http://httpd.apache.org/download.cgi`

2. For Windows, click the **apache_2.2.12-win32-x86-no_ssl.msi**. For Linux, click **httpd-2.2.12.tar.bz2**.
3. Save the downloaded file in a temporary directory, such as `c:\tmp` on Windows or `\tmp` on Linux.

Installing Apache on Windows

This section describes how to install Apache HTTP Server on Windows.

The file name and extraction directory are based on the current version. Throughout this procedure, ensure you use the directory name for the version you are installing.

You must be the administrator user to install Apache.

To install Apache, double-click the file and follow the wizards.

The default installation directory is likely to be `C:\Program Files\Apache Group`. This is the directory that is assumed for the tutorial exercises. If you install to a different directory, you need to note the directory so you can change the path used in the tutorials.

Starting and Stopping Apache on Windows

You can use the **Start** menu option to start Apache. This opens a console window showing any error messages. Error messages may also be written to `C:\Program Files\Apache Group\Apache2\logs\error.log`.

You can also use the ApacheMonitor utility to start Apache. It will appear as an icon in your System Tray, or navigate to the Apache `bin` directory and double click `ApacheMonitor.exe`. In a default installation, Apache `bin` is located at `c:\Program Files\Apache Group\Apache2\bin`.

You can also use the Windows Services to start Apache. You access Windows Services from the Windows **Start** menu at **Start** > **Control Panel** > **Administrative Tools** > **Services.** Select the **Standard** tab. Right click the Apache2 HTTP Server and then select **Restart**

If you have errors, double check your `httpd.conf` and `php.ini` files.

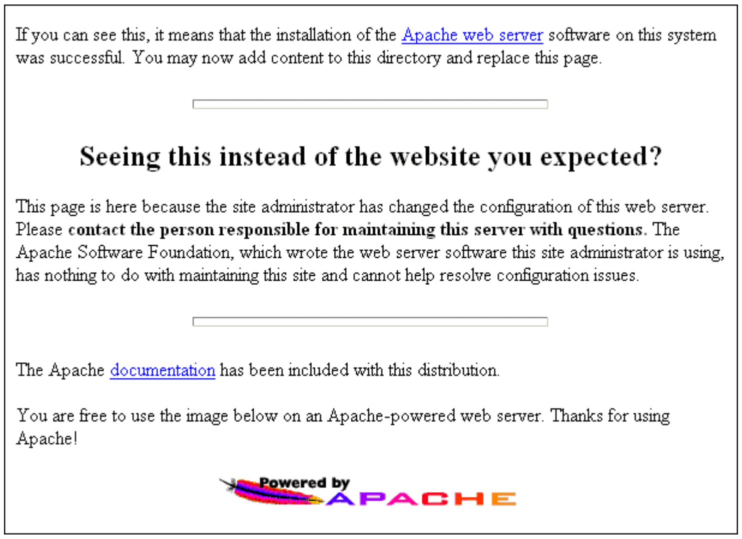
Testing the Apache Installation on Windows

To test the Apache HTTP Server installation:

1. Start your Web browser on the computer on which you installed Apache.
2. Enter the following URL:

   ```
   http://localhost/
   ```

   Your Web browser will display a page similar to the following:



If you can see this, it means that the installation of the Apache web server software on this system was successful. You may now add content to this directory and replace this page.

Seeing this instead of the website you expected?

This page is here because the site administrator has changed the configuration of this web server. Please **contact the person responsible for maintaining this server with questions.** The Apache Software Foundation, which wrote the web server software this site administrator is using, has nothing to do with maintaining this site and cannot help resolve configuration issues.

The Apache documentation has been included with this distribution.

You are free to use the image below on an Apache-powered web server. Thanks for using Apache!

If this page does not appear check your Apache configuration. Common problems are that Apache is not running, or that it is listening on a non-default port.

Installing Apache on Linux

This section describes how to install Apache HTTP Server on Linux.

The file name and extraction directory are based on the current version. Throughout this procedure, ensure you use the directory name for the version you are installing.

Apache is typically already installed on Linux. If you find it is not installed after Testing the Apache Installation on Linux, perform the following steps to install the Apache HTTP Server:

1. Go to the directory where you downloaded the `httpd-2.2.12.tar.bz2` file.
2. Log in as the root user and execute these commands:

```
# tar -jxvf httpd-2.2.12.tar.bz2
# cd httpd-2.2.12
# export ORACLE_HOME=/usr/lib/oracle/app/oracle/product/10.2.0/server
# ./configure \
        --prefix=/usr/local/apache \
        --enable-module=so  \
# make
# make install
```

The option `--enable-module=so` allows PHP to be compiled as a Dynamic Shared Object (DSO). The `--prefix=` option sets the Apache installation directory used by the command `make install`

Starting and Stopping Apache on Linux

You use the apachectl script to start and stop Apache.

Start Apache with the `apachectl` script:

```
# /usr/local/apache/bin/apachectl start
```

Stop Apache with the `apachectl` script:

```
# /usr/local/apache/bin/apachectl stop
```

When you start Apache, you must have ORACLE_HOME defined. Any other required Oracle environment variables must be set before Apache starts too. These are the same variables set by the `$ORACLE_HOME/bin/oracle_env.sh` or the `/usr/local/bin/oraenv` scripts.

For convenience, you could create a script to start Apache as follows:

```
#!/bin/sh
ORACLE_HOME=/usr/lib/oracle/app/oracle/product/10.2.0/server
export ORACLE_HOME
echo "Oracle Home: $ORACLE_HOME"
echo Starting Apache
/usr/local/apache/bin/apachectl start
```

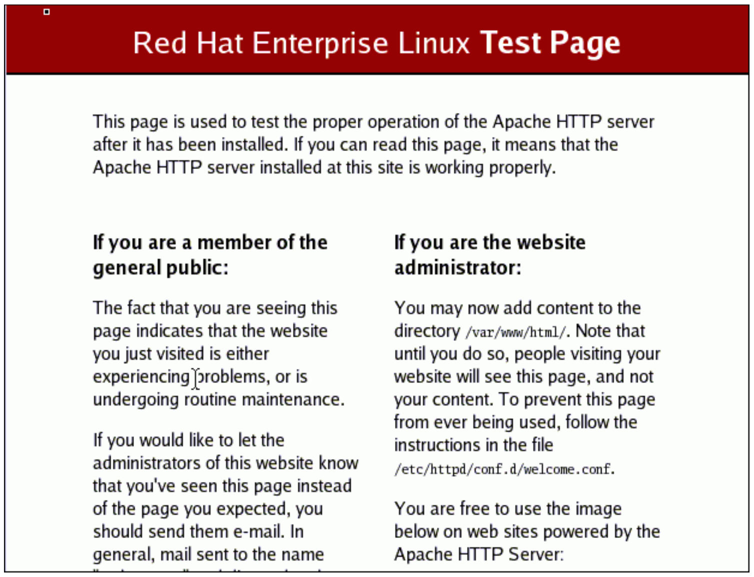
Testing the Apache Installation on Linux

To test the Apache HTTP Server installation:

1. Start your Web browser on the host on which you installed Apache, and enter the following URL:

   ```
   http://localhost/
   ```

   Your Web browser will display a page similar to the following:



Red Hat Enterprise Linux **Test Page**

This page is used to test the proper operation of the Apache HTTP server after it has been installed. If you can read this page, it means that the Apache HTTP server installed at this site is working properly.

If you are a member of the general public:

The fact that you are seeing this page indicates that the website you just visited is either experiencing problems, or is undergoing routine maintenance.

If you would like to let the administrators of this website know that you've seen this page instead of the page you expected, you should send them e-mail. In general, mail sent to the name

If you are the website administrator:

You may now add content to the directory `/var/www/html/`. Note that until you do so, people visiting your website will see this page, and not your content. To prevent this page from ever being used, follow the instructions in the file `/etc/httpd/conf.d/welcome.conf`.

You are free to use the image below on web sites powered by the Apache HTTP Server:

   If this page does not appear, check your Apache configuration. Common problems are that Apache is not running, or that it is listening on a non default port.

2. In the default Apache HTTP Server configuration file, set up a public virtual directory as `public_html` for accessing your PHP files. Use your preferred editor to open the Apache configuration file `/etc/httpd/conf/httpd.conf` (the directory may be different in your installation of Linux), and remove the pound sign (#) at the start of the following line:

   ```
       UserDir public_html
   ```

   In this example, your Apache `httpd.conf` file contains the following lines:

   ```
   <IfModule mod_userdir.c>
       #
       # UserDir is disabled by default since it can confirm the presence
   ```

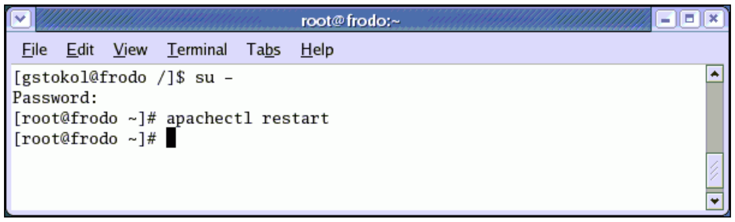
```
    # of a username on the system (depending on home directory
    # permissions).
    #
    #UserDir disable

    #
    # To enable requests to /~user/ to serve the user's public_html
    # directory, remove the "UserDir disable" line above, and uncomment
    # the following line instead:
    #
    UserDir public_html
</IfModule>
```

This enables the Web browser to make an HTTP request using a registered user on the system and to serve files from the `$HOME/public_html` directory of the user. For example:

```
http://localhost/~user/
```

3. To use the new Apache configuration file, in a command window, restart Apache by entering the following commands:

```
su -
Password: <enter your su (root) password>
apachectl restart
```

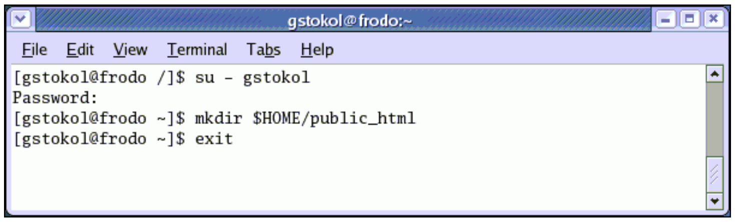


```
[gstokol@frodo /]$ su -
Password:
[root@frodo ~]# apachectl restart
[root@frodo ~]#
```

If the Apache HTTP Server does not start, check the error log files to determine the cause. It may be a configuration error.

4. In the command window, log in (not root) and create a `public_html` subdirectory in the `$HOME` directory with the following command:

```
mkdir $HOME/public_html
```



```
[gstokol@frodo /]$ su - gstokol
Password:
[gstokol@frodo ~]$ mkdir $HOME/public_html
[gstokol@frodo ~]$ exit
```

Installing PHP

Perform the following steps to obtain PHP for Windows or Linux:

1. Enter the following URL in your Web browser:

   http://www.php.net/downloads.php

2. For Windows, click the **5.2.10 zip package** under Windows Binaries. For Linux, click **php-5.2.10.tar.bz2** under Complete Source Code.
3. Save the downloaded file in a temporary directory, such as `c:\tmp` on Windows or `\tmp` on Linux.

Installing PHP on Windows

This section describes how to install PHP on Windows.

The file name and extraction directory are based on the current version. Throughout this procedure, ensure you use the directory name for the version you are installing.

You must be the administrator user to install PHP. To install PHP, perform the following steps:

1. In Windows Explorer, go to the directory where you downloaded the PHP 5.2.10 zip file.
2. Unzip the PHP package to a directory called `C:\php-5.2.10`
3. Copy `php.ini-recommended` to `C:\Program Files\Apache Group\Apache2\conf\php.ini`
4. Edit php.ini to make the following changes:
   - Change `extension_dir` to `C:\php-5.2.10\ext`, which is the directory containing `php_oci8.dll` and the other PHP extensions.
   - Remove the semicolon from the beginning of the line

     extension=php oci8.dll
   - Set the PHP directive, `display_errors`, to `On`. For testing it is helpful to see any problems in your code.
5. Edit the file `httpd.conf` and add the following lines. Make sure you use forward slashes '/' and not back slashes '\':

```
#
# This will load the PHP module into Apache
#
LoadModule php5_module c:/php-5.2.10/php5apache2.dll

#
# This next section will call PHP for .php, .phtml, and .phps files
#
AddType application/x-httpd-php .php
AddType application/x-httpd-php .phtml
AddType application/x-httpd-php-source .phps

#
# This is the directory containing php.ini
#
PHPIniDir "C:/Program Files/Apache Group/Apache2/conf"
```

6. Restart the Apache Server so that you can test your PHP installation.

   You can use the **Start** menu option to start Apache. This opens a console window showing any error messages. Error messages may also be written to `C:\Program Files\Apache Group\Apache2\logs\error.log`.

   You can also use the ApacheMonitor utility to start Apache. It will appear as an icon in your System Tray, or navigate to the Apache `bin` directory and double click `ApacheMonitor.exe`. In a default installation, Apache `bin` is located at `c:\Program Files\Apache Group\Apache2\bin`.

You can also use the Windows Services to start Apache. You access Windows Services from the Windows **Start** menu at **Start** > **Control Panel** > **Administrative Tools** > **Services.** Select the **Standard** tab. Right click the Apache2 HTTP Server and then select **Restart**

If you have errors, double check your `httpd.conf` and `php.ini` files.

Installing PHP on Linux

This section describes how to install PHP on Linux.

The file name and extraction directory are based on the current version. Throughout this procedure, ensure you use the directory name for the version you are installing.

Perform the following steps to install PHP:

1. Go to the directory where you downloaded the `php-5.2.10.tar.bz2` file.
2. Log in as the root user and execute these commands:

```
# tar -jxvf php-5.2.10.tar.bz2
# cd php-5.2.10
# export ORACLE_HOME=/usr/lib/oracle/app/oracle/product/10.2.0/server
# ./configure \
        --with-oci8=$ORACLE_HOME \
        --with-apxs2=/usr/local/apache/bin/apxs \
        --with-config-file-path=/usr/local/apache/conf \
        --enable-sigchild
# make
# make install
```

   Check the value for ORACLE_HOME to ensure it reflects your Oracle version and installation.

   If you are behind a firewall, you may need to set the environment variable `http_proxy` to your proxy server before running `make install`. This enables PHP's PEAR components to be installed.

3. Copy PHP's supplied initialization file:

```
# cp php.ini-recommended /usr/local/apache/conf/php.ini
```

   For testing it is helpful to edit `php.ini` and set the PHP directive, `display_errors`, to `On` so you can see any problems in your code.

4. Edit Apache's configuration file /usr/local/apache/conf/httpd.conf and add the following lines:

```
#
# This next section will call PHP for .php, .phtml, and .phps files
#
AddType application/x-httpd-php .php
AddType application/x-httpd-php .phtml
AddType application/x-httpd-php-source .phps

#
# This is the directory containing php.ini
#
PHPIniDir "/usr/local/apache/conf"
```

If a LoadModule line was not inserted by the PHP install, add it with:

```
LoadModule php5_module modules/libphp5.so
```

5. Restart the Apache Server to test your PHP installation with the following:

   ```
   # /usr/local/apache/bin/apachectl start
   ```

   If there are errors, they will display on your screen. They may also be written to `/usr/local/apache/logs/error_log`. If you have problems, double check your `httpd.conf` and `php.ini` files.

Testing the PHP Installation

To test the PHP installation:

1. Create a subdirectory called `chap2`. To create a directory for your application files, and to change to the newly created directory, enter the following commands in a command window:

   On Windows:

   ```
   mkdir "c:\program files\Apache Group\Apache2\htdocs\chap2"
   cd c:\program files\Apache Group\Apache2\htdocs\chap2
   ```

   On Linux:

   ```
   mkdir $HOME/public_html/chap2
   cd $HOME/public_html/chap2
   ```

   If you create files in a different location, you must change the steps for file editing and execution to match your working directory name and URL.

2. Create a file called `hello.php` that contains the following HTML text:

   ```
   <?php
     echo "Hello, world!";
   ?>
   ```

3. Open a Web browser and enter the following URL in your browser:

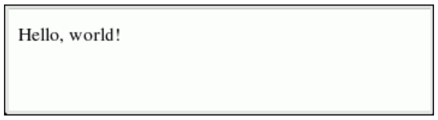
   On Windows:

   ```
   http://localhost/chap2/hello.php
   ```

   On Linux:

   ```
   http://localhost/~<username>/chap2/hello.php
   ```

   The line "Hello, world!" appears in the browser.



Hello, world!

3 Getting Connected

In this chapter, you create HR application files that implement PHP functions to connect and disconnect to the Oracle Database. You also develop a PHP function that enables you to execute a query to validate that a database connection has been successfully established.

This chapter also guides you through the creation and modification of PHP files that call a function to produce the header and footer for the Departments page, where the footer section of the page includes a date and time.

This chapter has the following topics:

- Building the Departments Page
- Connecting to the Database
- Disconnecting from the Database

Note: For simplicity, the user name and password are written into this sample application code. For applications that will be deployed, coding the user name and password strings directly into your application source code is not recommended. Oracle recommends that you use a more secure technique, such as implementing a dialog that prompts the user for the user name and password.

See *Oracle Database Security Guide* and the documentation for your development environment for details on security features and practices.

Building the Departments Page

In this section, you will create the functions and styles for the first screen of your application.

Follow these steps to build the Departments page:

1. To create a directory for your application files, and to change to the newly created directory, enter the following commands in a command window:

   On Windows:

   ```
   mkdir c:\program files\Apache Group\Apache2\htdocs\chap3
   cd c:\program files\Apache Group\Apache2\htdocs\chap3
   ```

   On Linux:

   ```
   mkdir $HOME/public_html/chap3
   ```

```
cd $HOME/public_html/chap3
```

If you create files in a different location, you must change the steps for file editing and execution to match your working directory name and URL.

2. To start developing your application user interface, use your preferred text editor to create a file called `anyco_ui.inc` that contains the two functions `ui_print_header()` and `ui_print_footer()` with their parameters to enable your application Web pages to have consistent header and footer sections:

```
<?php

function ui_print_header($title)
{
  $title = htmlentities($title);
  echo <<<END
  <!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN"
     "http://www.w3.org/TR/html4/strict.dtd">
  <html>
  <head>
    <meta http-equiv="Content-Type"
          content="text/html; charset=ISO-8859-1">
    <link rel="stylesheet" type="text/css" href="style.css">
    <title>Any Co.: $title</title>
  </head>
  <body>
  <h1>$title</h1>
END;
}

function ui_print_footer($date)
{
  $date = htmlentities($date);
  echo <<<END
  <div class="footer">
    <div class="date">$date</div>
    <div class="company">Any Co.</div>
  </div>
END;
}

?>
```

- This application design uses PHP function definitions to enable modular reusable code.
- The functions in `anyco_ui.inc` use a PHP language construct called a "here document." This enables you to place any amount of HTML formatted text between the following two lines:

  ```
  echo <<<END
  END;
  ```

- Do not put leading spaces in the `END;` line. If you do, the rest of the document will be treated as part of the text to be printed.
- Any PHP parameters appearing inside the body of a "here document" are replaced with their values, for example, the `$title` or `$date` parameters.

- The PHP function `htmlentities()` is used to prevent user-supplied text from accidentally containing HTML markup and affecting the output formatting.

3. The PHP file uses a Cascading Style Sheet (CSS) file called `style.css` to specify the presentation style in HTML in the browser.

   Create a `style.css` file in the `chap3` directory with the following CSS text:

```
body
{ background: #CCCCFF;
  color:      #000000;
  font-family: Arial, sans-serif; }

h1
{ border-bottom: solid #334B66 4px;
  font-size: 160%; }

table
{ padding: 5px; }

td
{ border: solid #000000 1px;
  text-align: left;
  padding: 5px; }

th
{ text-align: left;
  padding: 5px; }

.footer
{ border-top: solid #334B66 4px;
  font-size: 90%; }

.company
{ padding-top: 5px;
  float: right; }

.date
{ padding-top: 5px;
  float: left; }
```

4. To call the user interface functions, create the `anyco.php` file with the following text:

```
<?php

require('anyco_ui.inc');

ui_print_header('Departments');
ui_print_footer(date('Y-m-d H:i:s'));

?>
```

   The `require()` PHP command is used to include `anyco_ui.inc`. The new functions can be called to produce HTML output.

5. To test the `anyco.php` file, enter the following URL in your browser:

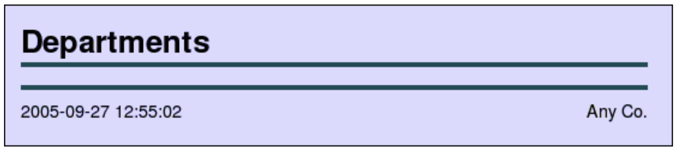
   On Windows:

```
http://localhost/chap3/anyco.php
```

On Linux:

```
http://localhost/~<username>/chap3/anyco.php
```

The resulting Web page is similar to the following:



The date and time appear in the page footer section.

Connecting to the Database

In this section, you will add a database connection to your Departments screen so that you can display Department data.

Follow these steps to add a database connection to your application.

To form a database connection, you use the `oci_connect()` function with three string parameters:

```
$conn = oci_connect($username, $password, $db)
```

The first and second parameters are the database user name and password, respectively. The third parameter is the database connection identifier. The `oci_connect()` function returns a connection resource needed for other OCI8 calls; it returns FALSE if an error occurs. The connection identifier returned is stored in a variable called `$conn`.

1. Edit the `anyco.php` file to add a database connection with the following parameter values:
   - Username is `hr`.
   - Password for this example is `hr`. Remember to use the actual password of your `HR` user.
   - Oracle connection identifier is `//localhost/orcl`.
2. Edit the `anyco.php` file to validate that the `oci_connect()` call returns a usable database connection, write a `do_query()` function that accepts two parameters: the database connection identifier, obtained from the call to `oci_connect()`, and a query string to select all the rows from the `DEPARTMENTS` table.
3. Edit the `anyco.php` file to prepare the query for execution, add an `oci_parse()` call. The `oci_parse()` function has two parameters, the connection identifier and the query string. It returns a statement identifier needed to execute the query and fetch the resulting data rows. It returns `FALSE` if an error occurs.
4. Edit the `anyco.php` file to execute the query, add a call to the `oci_execute()` function. The oci_execute() function executes the statement associated with the statement identifier provided in its first parameter. The second parameter specifies the execution mode. `OCI_DEFAULT` is used to indicate that you do not want statements to be committed automatically. The default execution mode is `OCI_COMMIT_ON_SUCCESS`. The `oci_execute()` function returns `TRUE` on success; otherwise it returns `FALSE`.

5. Edit the `anyco.php` file to fetch all the rows for the query executed, add a `while` loop and a call to the `oci_fetch_array()` function. The `oci_fetch_array()` function returns the next row from the result data; it returns `FALSE` if there are no more rows. The second parameter of the `oci_fetch_array()` function, `OCI_RETURN_NULLS`, indicates that `NULL` database fields will be returned as PHP NULL values.

   Each row of data is returned as a numeric array of column values. The code uses a PHP `foreach` construct to loop through the array and print each column value in an HTML table cell, inside a table row element. If the item value is `NULL` then a nonbreaking space is printed; otherwise the item value is printed.

   After the edits in Steps 1 to 5, the `anyco.php` file becomes:

```
<?php // File: anyco.php

require('anyco_ui.inc');

// Create a database connection
$conn = oci_connect('hr', 'hr', '//localhost/orcl');

ui_print_header('Departments');
do_query($conn, 'SELECT * FROM DEPARTMENTS');
ui_print_footer(date('Y-m-d H:i:s'));

// Execute query and display results
function do_query($conn, $query)
{
  $stid = oci_parse($conn, $query);
  $r = oci_execute($stid, OCI_DEFAULT);

  print '<table border="1">';
  while ($row = oci_fetch_array($stid, OCI_ASSOC+OCI_RETURN_NULLS)) {
    print '<tr>';
    foreach ($row as $item) {
      print '<td>'.
            ($item!== null ? htmlentities($item) : '&nbsp;').'</td>';
    }
    print '</tr>';
  }
  print '</table>';
}

?>
```

6. To test the changes made to `anyco.php`, save the modified `anyco.php` file. In a browser window, enter the following URL:

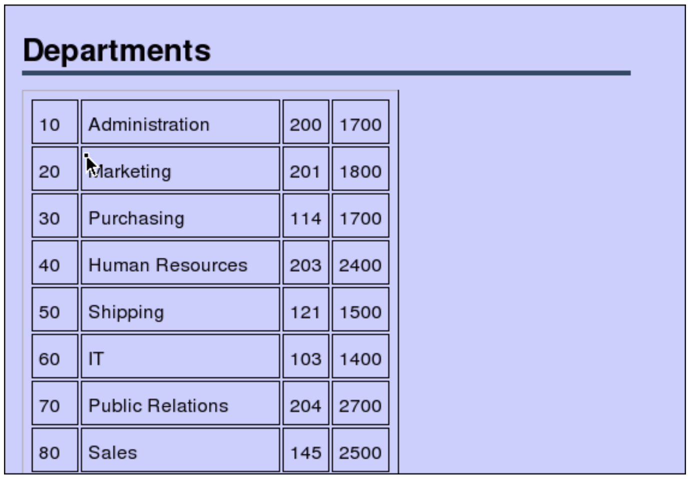
   On Windows:

```
http://localhost/chap3/anyco.php
```

   On Linux:

```
http://localhost/~<username>/chap3/anyco.php
```

   The page returned in the browser window should resemble the following page:



10	Administration	200	1700
20	Marketing	201	1800
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

If you want to query the EMPLOYEES data, you can optionally change the query in the `do_query()` function call to:

```
do_query($conn, 'SELECT * FROM EMPLOYEES');
```

If You Have Connection Problems

Check that the username, password and connection string are valid. The connect string `'//localhost/orcl'` uses the Oracle Easy Connect syntax. If you are using an Oracle Net `tnsnames.ora` file to specify the database you want to connect to, then use the network alias as the third parameter to the `oci_connect()` function.

If you are not seeing errors, set the PHP directive `display_errors` to `ON`, and the `error_reporting` directive to `E_ALL|E_STRICT`.

If you have a PHP code problem and are not using a debugger, you can examine variables using the PHP `var_dump()` function. For example:

```
print '<pre>';
var_dump($r);
print '</pre>';
```

Other Ways to Connect

In some applications, using a persistent connection improves performance by removing the need to reconnect each time the script is called. Depending on your Apache configuration, this may cause a number of database connections to remain open simultaneously. You must balance the connection performance benefits against the overhead on the database server.

Persistent connections are made with the OCI8 `oci_pconnect()` function. Several settings in the PHP initialization file enable you to control the lifetime of persistent connections. Some settings include:

oci8.max_persistent - This controls the number of persistent connections per process.

oci8.persistent_timeout - This specifies the time (in seconds) that a process maintains an idle persistent connection.

oci8.ping_interval - This specifies the time (in seconds) that must pass before a persistent connection is "pinged" to check its validity.

For more information, see the PHP reference manual at

http://www.php.net/manual/en/ref.oci8.php

For information about connection pooling, see *Connection Pooling in OCI* in the *Oracle Call Interface Programmer's Guide* and the *Oracle Database Net Services Administrator's Guide*.

Disconnecting from the Database

The PHP engine automatically closes the database connection at the end of the script unless a persistent connection was made. If you want to explicitly close a non-persistent database connection, you can call the `oci_close()` OCI function with the connection identifier returned by the `oci_connect()` call. For example:

```
<?php

$conn = oci_connect('hr', '<your_password>', '//localhost/orcl');
...
oci_close($conn);

...

?>
```

Because PHP uses a reference counting mechanism for tracking variables, the database connection may not actually be closed until all PHP variables referencing the connection are unset or go out of scope.

4 Querying Data

In this chapter, you extend the Anyco HR application from Chapter 3 by adding information to the Departments page. You also implement the functionality to query, insert, update, and delete employee records in a specific department.

This chapter has the following topics:

Centralizing the Database Application Logic

In this section, you will modify your application code by moving the database access logic into separate files for inclusion in the PHP application.

1. Copy the files that you completed in Chapter 3 to a new `chap4` directory, and change to the newly created directory:

   On Windows:

   ```
   mkdir c:\program files\Apache Group\Apache2\htdocs\chap4
   cd c:\program files\Apache Group\Apache2\htdocs\chap4
   copy ..\chap3\* .
   ```

   On Linux:

   ```
   mkdir $HOME/public_html/chap4
   cd $HOME/public_html/chap4
   cp ../chap3/* .
   ```

2. Using your preferred editor, create a file called `anyco_cn.inc` that defines named constants for the database connection information. This file enables you to change connection information in one place.

   ```
   <?php // File: anyco_cn.inc

   define('ORA_CON_UN', 'hr');             // User name
   define('ORA_CON_PW', 'hr');             // Password
   define('ORA_CON_DB', '//localhost/orcl'); // Connection identifier

   ?>
   ```

   For simplicity, the user name and password are written into this sample application code. For applications that will be deployed, coding the user name and password strings directly into your application source code is not recommended. Oracle recommends that you use a more secure technique, such as implementing a dialog that prompts the user for the user name and password.

See *Oracle Database Security Guide* and the documentation for your development environment for details on security features and practices.

3. Create a file called `anyco_db.inc` that declares functions for creating a database connection, executing a query, and disconnecting from the database. Use the following logic, which includes some error handling that is managed by calling an additional function called `db_error ()`:

```
<?php  // File: anyco_db.inc

function db_connect()
{
  // use constants defined in anyco_cn.inc
  $conn = oci_connect(ORA_CON_UN, ORA_CON_PW, ORA_CON_DB);
  if (!$conn) {
    db_error(null, __FILE__, __LINE__);
  }
  return($conn);
}

function db_do_query($conn, $statement)
{
  $stid = oci_parse($conn, $statement);
  if (!$stid) {
    db_error($conn, __FILE__, __LINE__);
  }

  $r = oci_execute($stid, OCI_DEFAULT);
  if (!$r) {
    db_error($stid, __FILE__, __LINE__);
  }
 $r = oci_fetch_all($stid, $results, null, null,
                    OCI_FETCHSTATEMENT_BY_ROW);
  return($results);
}

// $r is the resource containing the error.
// Pass no argument or false for connection errors

function db_error($r = false, $file, $line)
{
  $err =  $r ? oci_error($r) : oci_error();

  if (isset($err['message'])) {
    $m = htmlentities($err['message']);
  }
  else {
    $m = 'Unknown DB error';
  }

  echo '<p><b>Error</b>: at line '.$line.' of '.$file.'</p>';
  echo '<pre>'.$m.'</pre>';

  exit;
}

?>
```

The `db_do_query()` function in this example uses the `oci_fetch_all()` OCI8 function. The `oci_fetch_all()` function accepts the following five parameters:

- `$stid`, the statement identifier for the statement executed
- `$results`, the output array variable containing the data returned for the query
- The `null` in the third parameter for the number of initial rows to skip is ignored.
- The `null` in the fourth parameter for the maximum number of rows to fetch is ignored. In this case, all the rows for the query are returned. For this example where the result set is not large, it is acceptable.
- The last parameter flag `OCI_FETCHSTATEMENT_BY_ROW` indicates that the data in the `$results` array is organized by row, where each row contains an array of column values. A value of `OCI_FETCHSTATEMENT_BY_COLUMN` causes the `results` array to be organized by column, where each column entry contains an array of column values for each row. Your choice of value for this flag depends on how you intend to process the data in your logic.

To examine the structure of the result array, use the PHP `var_dump()` function after the query has been executed. This is useful for debugging. For example:

```
print '<pre>';
var_dump($results);
print '</pre>';
```

The `db_error()` function accepts three arguments. The `$r` parameter can be false or null for obtaining connection errors, or a connection resource or statement resource to obtain an error for those contexts. The `$file` and `$line` values are populated by using `__FILE__` and `__LINE__`, respectively, as the actual parameters to enable the error message to display the source file and line from which the database error is reported. This enables you to easily track the possible cause of errors.

The db_ `error()` function calls the `oci_error()` function to obtain database error messages.

The `db_error()` function calls the `isset()` function before printing the message. The `isset()` function checks if the message component of the database error structure is set, or if the error is unknown.

4. Edit `anyco_ui.inc`. To format the results of a single row from the `DEPARTMENTS` table query in an HTML table format, insert the following function:

```
function ui_print_department($dept)
{
  if (!$dept) {
    echo '<p>No Department found</p>';
  }
  else {
    echo <<<END
  <table>
  <tr>
    <th>Department<br>ID</th>
    <th>Department<br>Name</th>
    <th>Manager<br>Id</th>
    <th>Location ID</th>
  </tr>
  <tr>
END;
    echo '<td>'.htmlentities($dept['DEPARTMENT_ID']).'</td>';
    echo '<td>'.htmlentities($dept['DEPARTMENT_NAME']).'</td>';
    echo '<td>'.htmlentities($dept['MANAGER_ID']).'</td>';
    echo '<td>'.htmlentities($dept['LOCATION_ID']).'</td>';
    echo <<<END
  </tr>
  </table>
END;
  }
}
```

As noted in Chapter 3, do not prefix `END;` lines with leading spaces. If you do, the rest of the document will be treated as part of the text to be printed.

5. Edit the `anyco.php` file. Include the `anyco_ui.inc` and `anyco_db.inc` files, and call the database functions to query and display information for a department with a `department_id` of 80 by using the following code. The file becomes:

```
<?php // File: anyco.php

require('anyco_cn.inc');
require('anyco_db.inc');
require('anyco_ui.inc');

$query =
  'SELECT   department_id, department_name, manager_id, location_id
   FROM     departments
   WHERE    department_id = 80';

$conn = db_connect();

$dept = db_do_query($conn, $query);
ui_print_header('Departments');
ui_print_department($dept[0]);
ui_print_footer(date('Y-m-d H:i:s'));

?>
```

6. To test the resulting changes to the application, enter the following URL in a browser window:

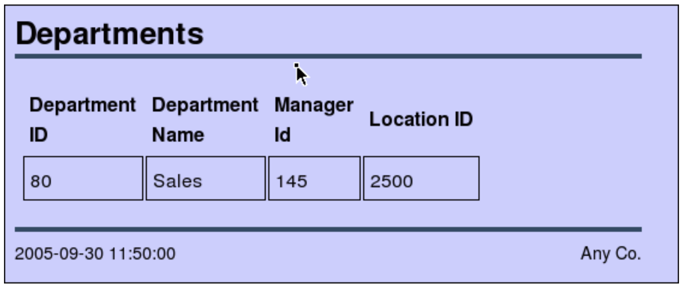
   On Windows:

```
http://localhost/chap4/anyco.php
```

   On Linux:

```
http://localhost/~<username>/chap4/anyco.php
```

   The page returned in the browser window should resemble the following page:



Department ID	Department Name	Manager Id	Location ID
80	Sales	145	2500

Writing Queries with Bind Variables

Using queries with values included in the WHERE clause may be useful for some situations. However, if the conditional values in the query are likely to change it is not appropriate to encode a value into the query. Oracle recommends that you use bind variables.

A bind variable is a symbolic name preceded by a colon in the query that acts as a placeholder for literal values. For example, the query string created in the `anyco.php` file could be rewritten with the bind variable `:did` as follows:

```
$query =
  'SELECT   department_id, department_name, manager_id, location_id
   FROM     departments
   WHERE    department_id = :did';
```

By using bind variables to parameterize SQL statements:

- The statement is reusable with different input values without needing to change the code.
- The query performance is improved through a reduction of the query parse time in the server, because the Oracle database can reuse parse information from the previous invocations of the identical query string.
- There is protection against "SQL Injection" security problems.
- There is no need to specially handle quotation marks in user input.

When a query uses a bind variable, the PHP code must associate an actual value with each bind variable (placeholder) used in the query before it is executed. This process is known as run-time binding.

To enable your PHP application to use bind variables in the query, perform the following changes to your PHP application code:

1. Edit the `anyco.php` file. Modify the query to use a bind variable, create an array to store the value to be associated with the bind variable, and pass the `$bindargs` array to the `db_do_query()` function:

   ```
   <?php // File: anyco.php
   ...

   $query =
   'SELECT   department_id, department_name, manager_id, location_id
    FROM     departments
    WHERE    department_id = :did';

   $bindargs = array();
   // In the $bindargs array add an array containing
   // the bind variable name used in the query, its value, a length
   ```

```
array_push($bindargs, array('DID', 80, -1));

$conn = db_connect();
$dept = db_do_query($conn, $query, $bindargs);

...
?>
```

In this example, the bind variable, called DID, is an input argument in the parameterized query, and it is associated with the value 80. Later, the value of the bind variable will be dynamically determined. In addition, the length component is passed as -1 so that the OCI8 layer can determine the length. If the bind variable was used to return output from the database an explicit size would be required.

2. Edit the `anyco_db.inc` file. Modify the `db_do_query()` function to accept a `$bindvars` array variable as a third parameter. Call the `oci_bind_by_name()` OCI8 call to associate the PHP values supplied in `$bindvars` parameter with bind variables in the query. The function becomes:

```
function db_do_query($conn, $statement, $bindvars = array())
{
  $stid = oci_parse($conn, $statement);
  if (!$stid) {
    db_error($conn, __FILE__, __LINE__);
  }

  // Bind the PHP values to query bind parameters
  foreach ($bindvars as $b) {
    // create local variable with caller specified bind value
    $$b[0] = $b[1];
    // oci_bind_by_name(resource, bv_name, php_variable, length)
    $r = oci_bind_by_name($stid, ":$b[0]", $$b[0], $b[2]);
    if (!$r) {
      db_error($stid, __FILE__, __LINE__);
    }
  }
  $r = oci_execute($stid, OCI_DEFAULT);
  if (!$r) {
    db_error($stid, __FILE__, __LINE__);
  }
  $r = oci_fetch_all($stid, $results, null, null,
       OCI_FETCHSTATEMENT_BY_ROW);
  return($results);
}
```

The binding is performed in the `foreach` loop before the `oci_execute()` is done.

For each entry in `$bindvars` array, the first element contains the query bind variable name that is used to create a PHP variable of the same name; that is, `$$b[0]` takes the value DID in `$b[0]` and forms a PHP variable called `$DID` whose value is assigned from the second element in the entry.

The `oci_bind_by_name()` function accepts four parameters: the `$stid` as the resource, a string representing the bind variable name in the query derived from the first element in the array entry, the PHP variable containing the value to be associated with the bind variable, and the length of the input value.

3. To test the results of the preceding modifications, save the `anyco.php` and `anyco_db.inc` files and enter the following URL:

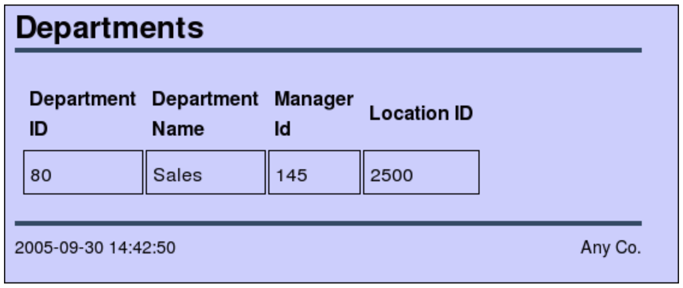
On Windows:

```
http://localhost/chap4/anyco.php
```

On Linux:

```
http://localhost/~<username>/chap4/anyco.php
```

The page returned in the browser window should resemble the following page:



Departments

Department ID	Department Name	Manager Id	Location ID
80	Sales	145	2500

2005-09-30 14:42:50 Any Co.

Navigating Through Database Records

Adding navigation through the database records requires several important changes to the application logic. The modifications require the combination of:

- Including an HTML form to provide **Next** and **Previous** navigation buttons to step through database records.
- Detecting if the HTTP request for the page was posted by clicking the **Next** or **Previous** button.
- Tracking the last row queried by using the HTTP session state. A PHP session is started to maintain state information for a specific client between HTTP requests. The first HTTP request will retrieve the first data row and initialize the session state. A subsequent request, initiated with navigation buttons, combined with the session state from a previous HTTP request, enables the application to set variables that control the next record retrieved by the query.
- Writing a query that returns a subset of rows based on a set of conditions whose values are determined by the application state.

To add navigation through database rows, perform the following steps:

1. Edit the `anyco_ui.inc` file. Add **Next** and **Previous** navigation buttons to the Departments page. Change the `ui_print_department()` function to append a second parameter called `$posturl` that supplies the value for the form attribute `action`. After printing the `</table>` tag include HTML form tags for the **Next** and **Previous** buttons:

```
<?php // File: anyco_ui.inc
...
function ui_print_department($dept, $posturl)
{
  ...
    echo <<<END
  </tr>
  </table>
  <form method="post" action="$posturl">
  <input type="submit" value="< Previous" name="prevdept">
  <input type="submit" value="Next >"     name="nextdept">
  </form>
END;
  }
}

?>
```

2. Edit the `anyco.php` file. To detect if the **Next** or **Previous** button was used to invoke the page and track the session state, call the PHP function `session_start()`, and create a function named `construct_departments()`:

   Move and modify the database access logic into a new `construct_departments()` function, which detects if navigation has been performed, manages the session state, defines a subquery for the database access layer to process, and connects and calls a function `db_get_page_data()`. The file becomes:

```
<?php // File: anyco.php

require('anyco_cn.inc');
require('anyco_db.inc');
require('anyco_ui.inc');

session_start();
construct_departments();

function construct_departments()
{
  if (isset($_SESSION['currentdept']) &&
      isset($_POST['prevdept']) &&
      $_SESSION['currentdept'] > 1) {
    $current = $_SESSION['currentdept'] - 1;
  }
  elseif (isset($_SESSION['currentdept']) &&
          isset($_POST['nextdept'])) {
    $current = $_SESSION['currentdept'] + 1;
  }
  elseif (isset($_POST['showdept']) &&
          isset($_SESSION['currentdept'])) {
    $current = $_SESSION['currentdept'];
  }
  else {
    $current = 1;
  }

  $query = 'SELECT department_id, department_name,
                   manager_id, location_id
            FROM   departments
            ORDER BY department_id asc';

  $conn = db_connect();

  $dept = db_get_page_data($conn, $query, $current, 1);
  $deptid = $dept[0]['DEPARTMENT_ID'];

  $_SESSION['currentdept'] = $current;

  ui_print_header('Department');
  ui_print_department($dept[0], $_SERVER['SCRIPT_NAME']);
  ui_print_footer(date('Y-m-d H:i:s'));
}
```

```
?>
```

The if and elseif construct at the start of the construct_departments() function is used to detect if a navigation button was used with an HTTP post request to process the page, and tracks if the currentdept number is set in the session state. Depending on the circumstances, the variable $current is decremented by one when the previous button is clicked, $current is incremented by one when the **Next** button is clicked, otherwise $current is set to the current department, or initialized to one for the first time through.

A query is formed to obtain all the department rows in ascending sequence of the department_id. The ORDER BY clause is an essential part of the navigation logic. The query is used as a subquery inside the db_get_page_data() function to obtain a page of a number of rows, where the number of rows per page is specified as the fourth argument to the db_get_page_data() function. After connecting to the database, db_get_page_data() is called to retrieve the set of rows obtained for the specified query. The db_get_page_data() function is provided with the connection resource, the query string, a value in $current specifying the first row in the next page of data rows required, and the number of rows per page (in this case one row per page).

After db_get_page_data() has been called to obtain a page of rows, the value of $current is stored in the application session state.

Between printing the page header and footer, the ui_print_department() function is called to display the recently fetched department row. The ui_print_department() function uses $_SERVER['SCRIPT_NAME'] to supply the current PHP script name for the $posturl parameter. This sets the action attribute in the HTML form, so that each **Next** or **Previous** button click calls the anyco.php file.

3. Edit the anyco_db.inc file. Implement the db_get_page_data() function to query a subset of rows:

```
// Return subset of records
function db_get_page_data($conn, $q1, $current = 1,
                 $rowsperpage = 1, $bindvars = array())
{
  // This query wraps the supplied query, and is used
  // to retrieve a subset of rows from $q1
  $query = 'SELECT *
            FROM (SELECT A.*, ROWNUM AS RNUM
                  FROM ('.$q1.') A
                  WHERE ROWNUM <= :LAST)
            WHERE :FIRST <= RNUM';

  // Set up bind variables.
  array_push($bindvars, array('FIRST', $current, -1));
  array_push($bindvars,
             array('LAST', $current+$rowsperpage-1, -1));

  $r = db_do_query($conn, $query, $bindvars);
  return($r);
}
```

The structure of the query in the db_get_page_data() function enables navigation through a set (or page) of database rows.

The query supplied in $q1 is nested as a subquery inside the following subquery:

```
SELECT A.*, ROWNUM AS RNUM FROM $q1 WHERE ROWNUM <= :LAST
```

Remember that the query supplied in `$q1` retrieves an ordered set of rows, which is filtered by its enclosing query to return all the rows from the first row to the next page size (`$rowsperpage`) of rows. This is possible because the Oracle `ROWNUM` function (or pseudocolumn) returns an integer number starting at 1 for each row returned by the query in `$q1`.

The set of rows, returned by the subquery enclosing query `$q1`, is filtered a second time by the condition in the following outermost query:

```
WHERE :FIRST <= RNUM
```

This condition ensures that rows prior to the value in `:FIRST` (the value in `$current`) are excluded from the final set of rows. The query enables navigation through a set rows where the first row is determined by the `$current` value and the page size is determined by the `$rowsperpage` value.

The `$current` value is associated with the bind variable called `:FIRST.` The expression `$current+$rowsperpage-1` sets the value associated with the `:LAST` bind variable.

4. To test the changes made to your application, save the changed files, and enter the following URL in your Web browser:

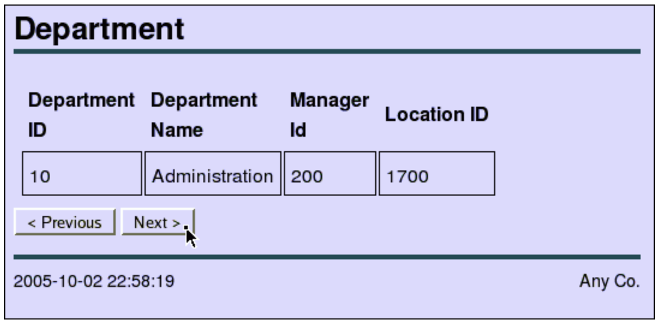
   On Windows:

   ```
   http://localhost/chap4/anyco.php
   ```

   On Linux:

   ```
   http://localhost/~<username>/chap4/anyco.php
   ```

   When you request the `anyco.php` page, the first `DEPARTMENT` table record, the Administration department, is displayed:

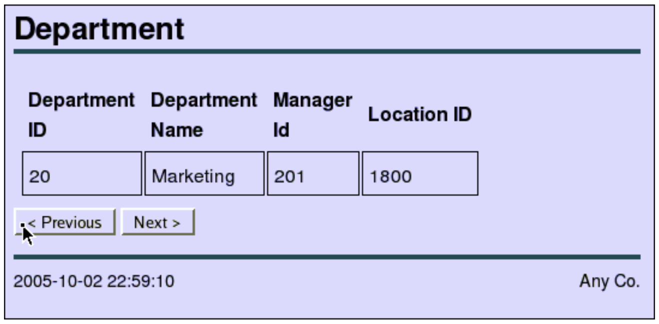


Department

Department ID	Department Name	Manager Id	Location ID
10	Administration	200	1700

2005-10-02 22:58:19 Any Co.

5. To navigate to the next department record (Marketing), click **Next**:

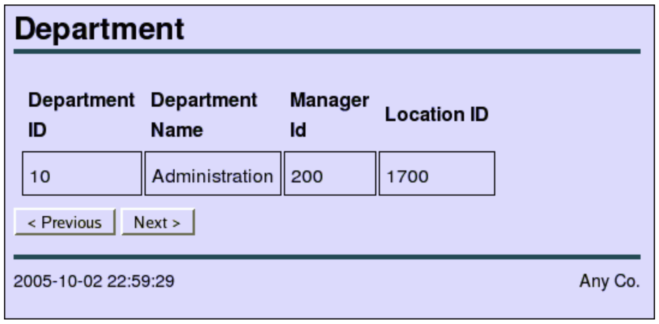


Department

Department ID	Department Name	Manager Id	Location ID
20	Marketing	201	1800

2005-10-02 22:59:10 Any Co.

6. To navigate back to the first department record (Administration), click **Previous**:



Department

Department ID	Department Name	Manager Id	Location ID
10	Administration	200	1700

2005-10-02 22:59:29 Any Co.

You may continue to test and experiment with the application by clicking **Next** and **Previous** to navigate to other records in the `DEPARTMENTS` table, as desired.

> **Note:** If you navigate past the last record in the `DEPARTMENTS` table, an error will occur. Error handling is added in Adding Error Recovery in Chapter 5.

ROWNUM vs ROW_NUMBER()

If you were writing a PHP function with a hard coded query, the ROW_NUMBER() function may be a simpler alternative for limiting the number of rows returned. For example, a query that returns the last name of all employees:

```
SELECT last_name FROM employees ORDER BY last_name;
```

could be written to select rows 51 to 100 inclusive as:

```
SELECT last_name FROM
  SELECT last_name, ROW_NUMBER() OVER (ORDER BY last_name R FROM employees)
  where R BETWEEN 51 AND 100;
```

Extending the Basic Departments Page

The Departments page is extended to include the following additional information:

- The name of the manager of the department
- The number of employees assigned to the department
- The country name identifying the location of the department

The additional information is obtained by modifying the query to perform a join operation between the `DEPARTMENTS`, `EMPLOYEES`, `LOCATIONS`, and `COUNTRIES` tables.

To extend the Departments page, perform the following tasks:

1. Edit the `anyco_ui.inc` file. Modify the `ui_print_department()` function by replacing the Manager ID and Location ID references with the Manager Name and Location, respectively, and insert a Number of Employees field after Department Name. Make the necessary changes in the table header and data fields. The function becomes:

```
function ui_print_department($dept, $posturl)
{
  if (!$dept) {
    echo '<p>No Department found</p>';
  }
  else {
    echo <<<END
  <table>
  <tr>
    <th>Department<br>ID</th>
    <th>Department<br>Name</th>
    <th>Number of<br>Employees</th>
    <th>Manager<br>Name</th>
    <th>Location</th>
  </tr>
  <tr>
END;
  echo '<td>'.htmlentities($dept['DEPARTMENT_ID']).'</td>';
  echo '<td>'.htmlentities($dept['DEPARTMENT_NAME']).'</td>';
  echo '<td>'.htmlentities($dept['NUMBER_OF_EMPLOYEES']).'</td>';
  echo '<td>'.htmlentities($dept['MANAGER_NAME']).'</td>';
  echo '<td>'.htmlentities($dept['COUNTRY_NAME']).'</td>';
  echo <<<END
  </tr>
  </table>
  <form method="post" action="$posturl">
  <input type="submit" value="< Previous" name="prevdept">
  <input type="submit" value="Next >"     name="nextdept">
  </form>
END;
  }
}
```

2. Edit the `anyco.php` file. Replace the query string in `construct_departments()` with:

```
$query =
  "SELECT d.department_id, d.department_name,
       substr(e.first_name,1,1)||'. '|| e.last_name as manager_name,
       c.country_name, count(e2.employee_id) as number_of_employees
   FROM  departments d, employees e, locations l,
         countries c, employees e2
   WHERE d.manager_id = e.employee_id
   AND d.location_id = l.location_id
   AND d.department_id = e2.department_id
   AND l.country_id = c.country_id
   GROUP BY d.department_id, d.department_name,
         substr(e.first_name,1,1)||'. '||e.last_name,
         c.country_name
   ORDER BY d.department_id ASC";
```

The query string is enclosed in double quotation marks to simplify writing this statement, which contains SQL literal strings in single quotation marks.

3. Save the changes to your files, and test the changes by entering the following URL in a Web browser:

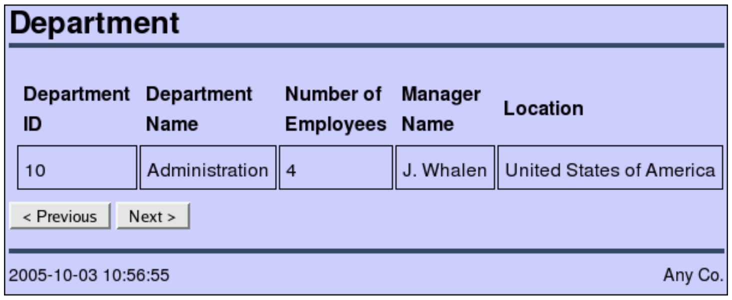
On Windows:

```
http://localhost/chap4/anyco.php
```

On Linux:

```
http://localhost/~<username>/chap4/anyco.php
```

The Web page result should resemble the following output:



Department

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	4	J. Whalen	United States of America

2005-10-03 10:56:55 Any Co.

5

Updating Data

In this chapter, you extend the Anyco HR application with forms that enable you to insert, update, and delete an employee record.

Building the Basic Employees page

In this section, you will extend your application to include a basic employees page.

To display employee records, perform the following tasks:

1. Create the `chap5` directory, copy the application files from `chap4`, and change to the newly created directory:

   On Windows:

   ```
   mkdir c:\program files\Apache Group\Apache2\htdocs\chap5
   cd c:\program files\Apache Group\Apache2\htdocs\chap5
   copy ..\chap4\* .
   ```

   On Linux:

   ```
   mkdir $HOME/public_html/chap5
   cd $HOME/public_html/chap5
   cp ../chap4/* .
   ```

2. Edit the `anyco.php` file. Add a `construct_employees()` function. This function constructs the employee query, calls the `db_do_query()` function to execute the query, and prints the results using the `ui_print_employees()` function:

   ```
   function construct_employees()
   {
     $query =
     "SELECT employee_id,
       substr(first_name,1,1) || '.  '|| last_name as employee_name,
       hire_date,
       to_char(salary, '9999G999D99') as salary,
       nvl(commission_pct,0) as commission_pct
      FROM   employees
   ```

```
    ORDER BY employee_id asc";

  $conn = db_connect();
  $emp = db_do_query($conn, $query);

  ui_print_header('Employees');
  ui_print_employees($emp);
  ui_print_footer(date('Y-m-d H:i:s'));
}
```

There is no need to pass a `$bindargs` parameter to the `db_do_query()` call because this query does not use bind variables. The `db_do_query()` declaration will provide a default value of an empty array automatically. PHP allows functions to have variable numbers of parameters.

3. Edit the `anyco.php` file. Replace the call to `construct_departments()` with a call to `construct_employees()`:

```
<?php // File: anyco.php

require('anyco_cn.inc');
require('anyco_db.inc');
require('anyco_ui.inc');

session_start();
construct_employees();
...
?>
```

4. Edit the `anyco_ui.inc` file. Implement the presentation of employee data in an HTML table by adding a `ui_print_employees()` function:

```
function ui_print_employees($employeerecords)
{
  if (!$employeerecords) {
    echo '<p>No Employee found</p>';
  }
  else {
    echo <<<END
  <table>
  <tr>
    <th>Employee<br>ID</th>
    <th>Employee<br>Name</th>
    <th>Hiredate</th>
    <th>Salary</th>
    <th>Commission<br>(%)</th>
  </tr>
END;
    // Write one row per employee
    foreach ($employeerecords as $emp) {
      echo '<tr>';
      echo '<td align="right">'.
            htmlentities($emp['EMPLOYEE_ID']).'</td>';
      echo '<td>'.htmlentities($emp['EMPLOYEE_NAME']).'</td>';
      echo '<td>'.htmlentities($emp['HIRE_DATE']).'</td>';
      echo '<td align="right">'.
            htmlentities($emp['SALARY']).'</td>';
      echo '<td align="right">'.
            htmlentities($emp['COMMISSION_PCT']).'</td>';
      echo '</tr>';
    }
    echo <<<END
  </table>
END;
  }
}
```

5. Save the changes to the anyco.php and anyco_ui.inc files. Test the result of these changes by entering the following URL in your Web browser:

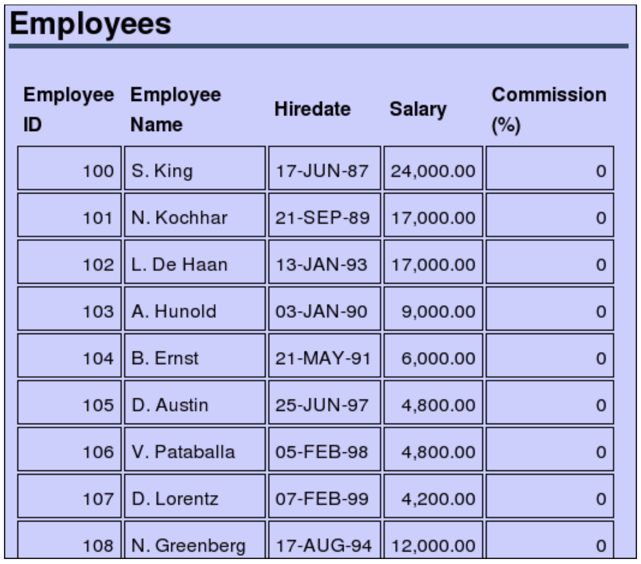
   On Windows:

   ```
   http://localhost/chap5/anyco.php
   ```

   On Linux:

   ```
   http://localhost/~<username>/chap5/anyco.php
   ```

   Examine the result page, and scroll down to view all the employee records displayed in the page:



Employees

Employee ID	Employee Name	Hiredate	Salary	Commission (%)
100	S. King	17-JUN-87	24,000.00	0
101	N. Kochhar	21-SEP-89	17,000.00	0
102	L. De Haan	13-JAN-93	17,000.00	0
103	A. Hunold	03-JAN-90	9,000.00	0
104	B. Ernst	21-MAY-91	6,000.00	0
105	D. Austin	25-JUN-97	4,800.00	0
106	V. Pataballa	05-FEB-98	4,800.00	0
107	D. Lorentz	07-FEB-99	4,200.00	0
108	N. Greenberg	17-AUG-94	12,000.00	0

Extending the Basic Employees Page

In this section, you will extend the basic employees page to include the ability to manipulate employee records.

To enable employee records to be manipulated, perform the following tasks:

1. Edit the anyco.php file. Replace the construct_employees() call with the form handler control logic to manage the requests for showing, inserting, updating, and deleting employee records:

```
<?php // File: anyco.php

require('anyco_cn.inc');
require('anyco_db.inc');
require('anyco_ui.inc');

session_start();
// Start form handler code
if (isset($_POST['insertemp'])) {
  construct_insert_emp();
```

```
}
elseif (isset($_POST['saveinsertemp'])) {
  insert_new_emp();
}
elseif (isset($_POST['modifyemp'])) {
  construct_modify_emp();
}
elseif (isset($_POST['savemodifiedemp'])) {
  modify_emp();
}
elseif (isset($_POST['deleteemp'])) {
  delete_emp();
}
else {
  construct_employees();
}

...
```

2. Edit the `anyco.php` file. Add the `construct_insert_emp()` function:

```
function construct_insert_emp()
{
  $conn = db_connect();

  $query = "SELECT job_id, job_title
            FROM jobs
            ORDER BY job_title ASC";
  $jobs = db_do_query($conn, $query,
                      OCI_FETCHSTATEMENT_BY_COLUMN);

  $query = "SELECT sysdate FROM dual";
  $date = db_do_query($conn, $query,
                      OCI_FETCHSTATEMENT_BY_COLUMN);
  $emp = array(
    'DEPARTMENT_ID' => 10,      // Default to department 10
    'HIRE_DATE' => $date['SYSDATE'][0],
    'ALLJOBIDS' => $jobs['JOB_ID'],
    'ALLJOBTITLES' => $jobs['JOB_TITLE']
    );

  ui_print_header('Insert New Employee');
  ui_print_insert_employee($emp, $_SERVER['SCRIPT_NAME']);
  // Note: The two kinds of date used:
  // 1) SYSDATE for current date of the database system, and
  // 2) The PHP date for display in the footer of each page
  ui_print_footer(date('Y-m-d H:i:s'));
}
```

The `construct_insert_emp()` function executes two queries to obtain default data to be used to populate the Insert New Employee form, which is displayed by the `ui_print_insert_employee()` function.

The `$query` of the `JOBS` table obtains a list of all the existing job IDs and their descriptions in order to build a list for selecting a job type in the HTML form generated by the `ui_print_insert_employee()` function.

The `$query` using `SYSDATE` obtains the current database date and time for setting the default hire date of the new employee.

There are two kinds of date used in the application code, the PHP `date()` function for printing the date and time in the page footer, and the Oracle `SYSDATE` function to obtain the default date and time for displaying in the hire date field of the Employees page and to ensure that text is entered in the correct database format.

The two `db_do_query()` function calls provide an additional parameter value `OCI_FETCHSTATEMENT_BY_COLUMN` to specify that the return type for the query is an array of column values.

3. Edit the `anyco.php` file. Add the `insert_new_emp()` function to insert an employee record into the `EMPLOYEES` table:

```
function insert_new_emp()
{
  $newemp = $_POST;
  $statement =
    "INSERT INTO employees
        (employee_id, first_name, last_name, email, hire_date,
         job_id, salary, commission_pct, department_id)
     VALUES (employees_seq.nextval, :fnm, :lnm, :eml, :hdt, :jid,
            :sal, :cpt, :did)";

  $conn = db_connect();
  $emailid = $newemp['firstname'].$newemp['lastname'];

  $bindargs = array();
  array_push($bindargs, array('FNM', $newemp['firstname'], -1));
  array_push($bindargs, array('LNM', $newemp['lastname'], -1));
  array_push($bindargs, array('EML', $emailid, -1));
  array_push($bindargs, array('HDT', $newemp['hiredate'], -1));
  array_push($bindargs, array('JID', $newemp['jobid'], -1));
  array_push($bindargs, array('SAL', $newemp['salary'], -1));
  array_push($bindargs, array('CPT', $newemp['commpct'], -1));
  array_push($bindargs, array('DID', $newemp['deptid'], -1));

  $r = db_execute_statement($conn, $statement, $bindargs);
  construct_employees();
}
```

The return value from the `db_execute_statement()` function is ignored and not even assigned to a variable, because no action is performed on its result.

4. Edit the `anyco.php` file. Add the `construct_modify_emp()` function to build the HTML form for updating an employee record.

```
function construct_modify_emp()
{
  $empid = $_POST['emprec'];
  $query =
    "SELECT employee_id, first_name, last_name, email, hire_date,
            salary, nvl(commission_pct,0) as commission_pct
     FROM   employees
     WHERE  employee_id = :empid";

  $conn = db_connect();
  $bindargs = array();
  array_push($bindargs, array('EMPID', $empid, -1));

  $emp = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW,
                                    $bindargs);
  ui_print_header('Modify Employee ');
  ui_print_modify_employee($emp[0], $_SERVER['SCRIPT_NAME']);
  ui_print_footer(date('Y-m-d H:i:s'));
}
```

5. Edit the `anyco.php` file. Add the `modify_emp()` function to update the employee record in the `EMPLOYEES` table, using the update form field values:

```
function modify_emp()
{
  $newemp = $_POST;
  $statement =
    "UPDATE employees
     SET   first_name = :fnm, last_name = :lnm, email = :eml,
           salary = :sal, commission_pct = :cpt
     WHERE employee_id = :eid";

  $conn = db_connect();
  $bindargs = array();
  array_push($bindargs, array('EID', $newemp['empid'], -1));
  array_push($bindargs, array('FNM', $newemp['firstname'], -1));
  array_push($bindargs, array('LNM', $newemp['lastname'], -1));
  array_push($bindargs, array('EML', $newemp['email'], -1));
  array_push($bindargs, array('SAL', $newemp['salary'], -1));
  array_push($bindargs, array('CPT', $newemp['commpct'], -1));

  $r = db_execute_statement($conn, $statement, $bindargs);
  construct_employees();
}
```

6. Edit the `anyco.php` file. Add the `delete_emp()` function to delete an employee record from the `EMPLOYEES` table:

```
function delete_emp()
{
  $empid = $_POST['emprec'];
  $statement = "DELETE FROM employees
                WHERE employee_id = :empid";

  $conn = db_connect();
  $bindargs = array();
  array_push($bindargs, array('EMPID', $empid, 10));
  $r = db_execute_statement($conn, $statement, $bindargs);

  construct_employees();
}
```

7. Edit the `anyco.php` file. In the `construct_employees()` function, modify the `db_do_query()` call to supply `OCI_FETCHSTATEMENT_BY_ROW` as the last parameter, and provide `$_SERVER['SCRIPT_NAME']` as second parameter in the `ui_print_employees()` call. The function becomes:

```
function construct_employees()
{
  $query =
  "SELECT employee_id,
    substr(first_name,1,1) || '.  '|| last_name as employee_name,
    hire_date,
    to_char(salary, '9999G999D99') as salary,
    nvl(commission_pct,0) as commission_pct
```

```
     FROM   employees
     ORDER BY employee_id asc";

    $conn = db_connect();
    $emp = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW);

    ui_print_header('Employees');
    ui_print_employees($emp, $_SERVER['SCRIPT_NAME']);
    ui_print_footer(date('Y-m-d H:i:s'));
  }
```

8. Edit the `anyco_db.inc` file. Add `$resulttype` as a third parameter to the `db_do_query()` function. Replace the last parameter value, `OCI_FETCHSTATEMENT_BY_ROW`, in the `oci_fetch_all()` call with a variable, so that callers can choose the output type.

```
function db_do_query($conn, $statement, $resulttype,
                     $bindvars = array())
{
  $stid = oci_parse($conn, $statement);

  ...

  $r = oci_fetch_all($stid, $results, null, null, $resulttype);
  return($results);
}
```

9. Edit the `anyco_db.inc` file. Inside the `db_get_page_data()` function, insert `OCI_FETCHSTATEMENT_BY_ROW` as the third parameter value in the `db_do_query()` call:

```
function db_get_page_data($conn, $q1, $current = 1,
                          $rowsperpage = 1, $bindvars = array())
{

  ...

  $r = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW, $bindvars);
  return($r);
}
```

10. Edit the `anyco_db.inc` file. Add a `db_execute_statement()` function to execute data manipulation statements such as INSERT statements:

```
function db_execute_statement($conn, $statement, $bindvars = array())
{
  $stid = oci_parse($conn, $statement);
  if (!$stid) {
    db_error($conn, __FILE__, __LINE__);
  }

  // Bind parameters
  foreach ($bindvars as $b) {
    // create local variable with caller specified bind value
    $$b[0] = $b[1];
    $r = oci_bind_by_name($stid, ":$b[0]", $$b[0], $b[2]);
    if (!$r) {
      db_error($stid, __FILE__, __LINE__);
    }
  }
  $r = oci_execute($stid);
  if (!$r) {
    db_error($stid, __FILE__, __LINE__);
  }
  return($r);
}
```

11. Edit the `anyco_ui.inc` file. Change the `ui_print_employees()` function to produce an HTML form containing the employee rows. The function becomes:

```
function ui_print_employees($employeerecords, $posturl)
{
  if (!$employeerecords) {
    echo '<p>No Employee found</p>';
  }
  else {
    echo <<<END
  <form method="post" action="$posturl">
  <table>
  <tr>
    <th>&nbsp;</th>
    <th>Employee<br>ID</th>
    <th>Employee<br>Name</th>
    <th>Hiredate</th>
    <th>Salary</th>
    <th>Commission<br>(%)</th>
  </tr>
END;
    // Write one row per employee
    foreach ($employeerecords as $emp) {
      echo '<tr>';
      echo '<td><input type="radio" name="emprec" value="'.
        htmlentities($emp['EMPLOYEE_ID']).'"></td>';
      echo '<td align="right">'.
        htmlentities($emp['EMPLOYEE_ID']).'</td>';
      echo '<td>'.htmlentities($emp['EMPLOYEE_NAME']).'</td>';
      echo '<td>'.htmlentities($emp['HIRE_DATE']).'</td>';
      echo '<td align="right">'.
        htmlentities($emp['SALARY']).'</td>';
      echo '<td align="right">'.
        htmlentities($emp['COMMISSION_PCT']).'</td>';
      echo '</tr>';
    }
    echo <<<END
  </table>
  <input type="submit" value="Modify" name="modifyemp">
  <input type="submit" value="Delete" name="deleteemp">
  &nbsp;&nbsp;
  <input type="submit" value="Insert new employee"
         name="insertemp">
  </form>
END;
  }
}
```

A radio button is displayed in the first column of each row to enable you to select the record to be modified or deleted.

12. Edit the `anyco_ui.inc` file. Add the `ui_print_insert_employee()` function to generate the form to input new employee data:

```
function ui_print_insert_employee($emp, $posturl)
{
  if (!$emp) {
    echo "<p>No employee details found</p>";
  }
  else {
    $deptid = htmlentities($emp['DEPARTMENT_ID']);
    $hiredate = htmlentities($emp['HIRE_DATE']);

    echo <<<END
  <form method="post" action="$posturl">
  <table>
    <tr>
      <td>Department ID</td>
      <td><input type="text" name="deptid" value="$deptid"
                 size="20"></td>
    </tr>
    <tr>
      <td>First Name</td>
      <td><input type="text" name="firstname" size="20"></td>
    </tr>
    <tr>
      <td>Last Name</td>
      <td><input type="text" name="lastname" size="20"></td>
    </tr>
    <tr>
      <td>Hiredate</td>
      <td><input type="text" name="hiredate" value="$hiredate"
                 size="20"></td>
    </tr>
    <tr>
      <td>Job</td>
       <td><select name="jobid">
END;
    // Write the list of jobs
    for ($i = 0; $i < count($emp['ALLJOBIDS']); $i++)
    {
      echo '<option
             label="'.htmlentities($emp['ALLJOBTITLES'][$i]).'"'.
           ' value="'.htmlentities($emp['ALLJOBIDS'][$i]).'">'.
           htmlentities($emp['ALLJOBTITLES'][$i]).'</option>';
    }
    echo <<<END
      </select>
      </td>
    </tr>
    <tr>
      <td>Salary</td>
      <td><input type="text" name="salary" value="1"
                 size="20"></td>
    </tr>
    <tr>
      <td>Commission (%)</td>
      <td><input type="text" name="commpct" value="0"
                 size="20"></td>
    </tr>
  </table>
    <input type="submit" value="Save" name="saveinsertemp">
    <input type="submit" value="Cancel" name="cancel">
  </form>
END;
  }
}
```

13. Edit the `anyco_ui.inc` file. Add the `ui_print_modify_employee()` function to generate the form to update an employee record:

```
function ui_print_modify_employee($empdetails, $posturl)
{
  if (!$empdetails) {
    echo '<p>No Employee record selected</p>';
  }
  else {
    $fnm = htmlentities($empdetails['FIRST_NAME']);
    $lnm = htmlentities($empdetails['LAST_NAME']);
    $eml = htmlentities($empdetails['EMAIL']);
    $sal = htmlentities($empdetails['SALARY']);
    $cpt = htmlentities($empdetails['COMMISSION_PCT']);
    $eid = htmlentities($empdetails['EMPLOYEE_ID']);

    echo <<<END
  <form method="post" action="$posturl">
  <table>
    <tr>
      <td>Employee ID</td>
      <td>$eid</td></tr>
    <tr>
      <td>First Name</td>
      <td><input type="text" name="firstname" value="$fnm"></td>
    </tr>
    <tr>
      <td>Last Name</td>
      <td><input type="text" name="lastname" value="$lnm"></td>
    </tr>
    <tr>
      <td>Email Address</td>
      <td><input type="text" name="email" value="$eml"></td>
    </tr>
    <tr>
      <td>Salary</td>
      <td><input type="text" name="salary" value="$sal"></td>
    </tr>
    <tr>
      <td>Commission (%)</td>
      <td><input type="text" name="commpct" value="$cpt"></td>
    </tr>
  </table>
  <input type="hidden" value="{$empdetails['EMPLOYEE_ID']}"
         name="empid">
  <input type="submit" value="Save" name="savemodifiedemp">
  <input type="submit" value="Cancel" name="cancel">
  </form>
END;
  }
}
```

14. Save the changes to your Anyco application files, and test the changes by entering the following URL in your Web browser:

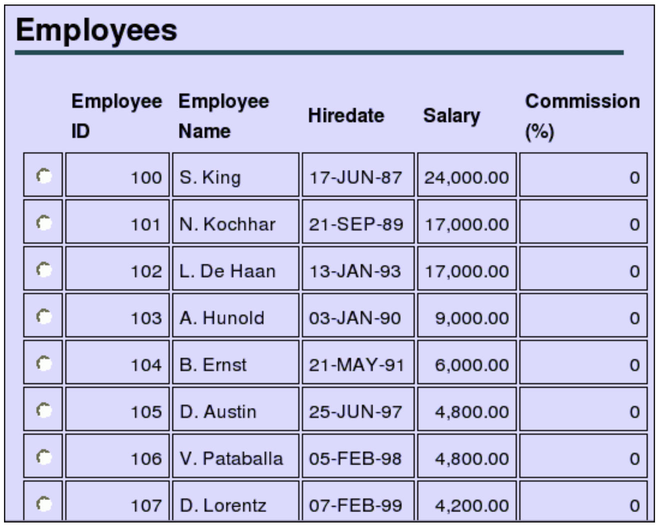
   On Windows:

```
http://localhost/chap5/anyco.php
```

On Linux:

```
http://localhost/~<username>/chap5/anyco.php
```

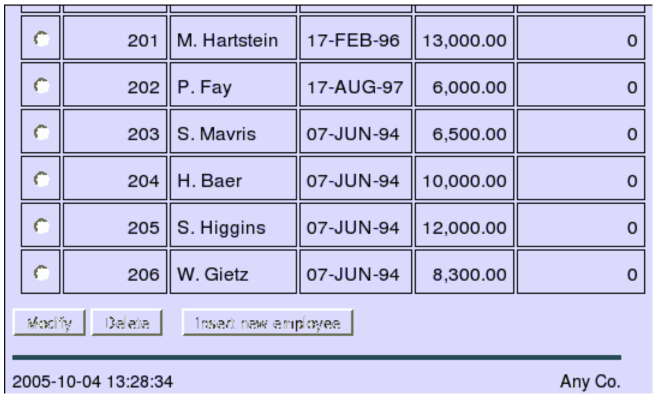
The list of all employees is displayed with a radio button in each row.



Employees

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)
○	100	S. King	17-JUN-87	24,000.00	0
○	101	N. Kochhar	21-SEP-89	17,000.00	0
○	102	L. De Haan	13-JAN-93	17,000.00	0
○	103	A. Hunold	03-JAN-90	9,000.00	0
○	104	B. Ernst	21-MAY-91	6,000.00	0
○	105	D. Austin	25-JUN-97	4,800.00	0
○	106	V. Pataballa	05-FEB-98	4,800.00	0
○	107	D. Lorentz	07-FEB-99	4,200.00	0

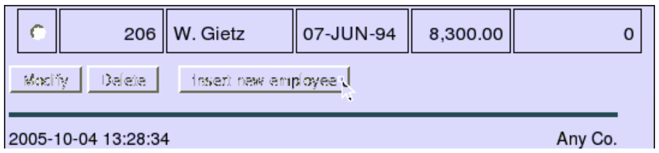
Scroll to the bottom of the Employees page to view the **Modify**, **Delete**, and **Insert new employee** buttons:



○	201	M. Hartstein	17-FEB-96	13,000.00	0
○	202	P. Fay	17-AUG-97	6,000.00	0
○	203	S. Mavris	07-JUN-94	6,500.00	0
○	204	H. Baer	07-JUN-94	10,000.00	0
○	205	S. Higgins	07-JUN-94	12,000.00	0
○	206	W. Gietz	07-JUN-94	8,300.00	0

2005-10-04 13:28:34 Any Co.

15. To insert a new employee record, click **Insert new employee**:



○	206	W. Gietz	07-JUN-94	8,300.00	0

2005-10-04 13:28:34 Any Co.

When you create or modify employee records, you will see that the database definitions require the salary to be greater than zero, and the commission to be less than 1. The commission will be rounded to two decimal places. In the Insert New Employee page, the Department ID field contains 10 (the default), Hiredate contains the current date (in default database date format), Salary contains 1, and Commission (%) contains 0. Enter the following field values:

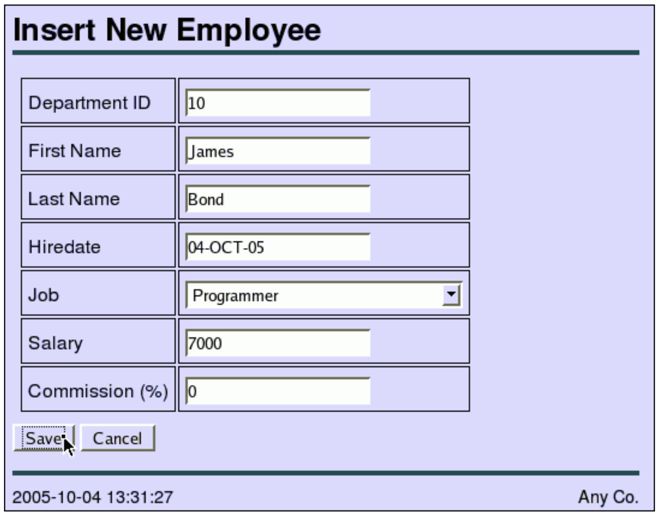
First Name: James

Last Name: Bond

Job: Select Programmer from the list.

Salary: replace the 1 with 7000

Click **Save**.

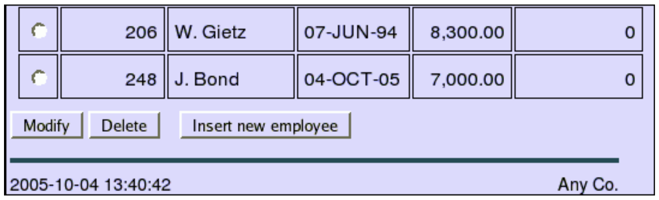


Insert New Employee

Department ID	10
First Name	James
Last Name	Bond
Hiredate	04-OCT-05
Job	Programmer
Salary	7000
Commission (%)	0

2005-10-04 13:31:27 Any Co.

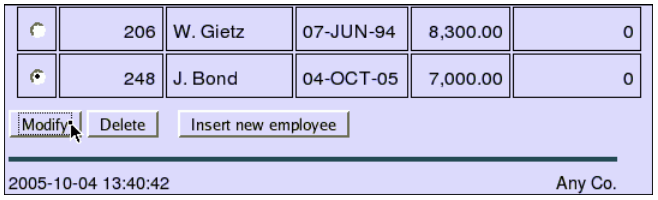
16. When the new employee record is successfully inserted, the Web page is refreshed with the form listing all employees. Scroll the Web page to the last record and check that the new employee record is present. The employee ID assigned to the new record on your system may be different than the one shown in the following example:



○	206	W. Gietz	07-JUN-94	8,300.00	0
○	248	J. Bond	04-OCT-05	7,000.00	0

2005-10-04 13:40:42 Any Co.

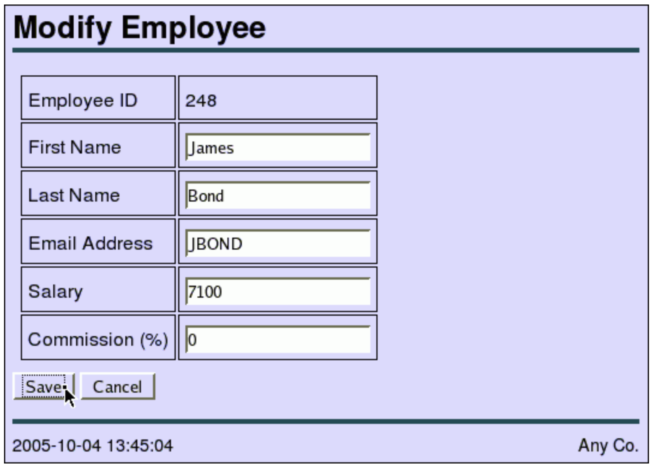
17. To modify the new employee record, select the radio button next to the new employee record, and click **Modify**:



○	206	W. Gietz	07-JUN-94	8,300.00	0
●	248	J. Bond	04-OCT-05	7,000.00	0

2005-10-04 13:40:42 Any Co.

18. In the Modify Employee page, modify the Email Address field to JBOND, increase the Salary to 7100, and click **Save**:

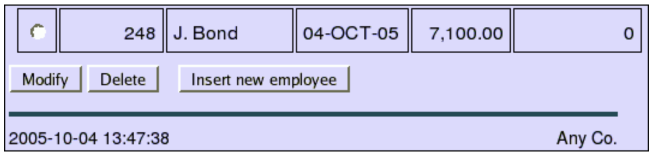


Modify Employee

Employee ID	248
First Name	James
Last Name	Bond
Email Address	JBOND
Salary	7100
Commission (%)	0

2005-10-04 13:45:04 Any Co.

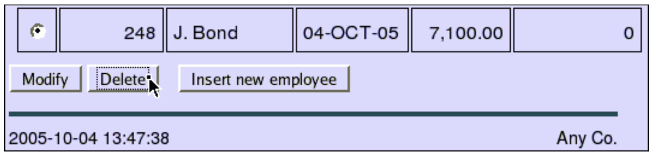
19. Successfully updating the employee record causes the Employees page to be redisplayed. Scroll to the last employee record and confirm that the salary for James Bond is now 7,100:



○	248	J. Bond	04-OCT-05	7,100.00	0

2005-10-04 13:47:38 Any Co.

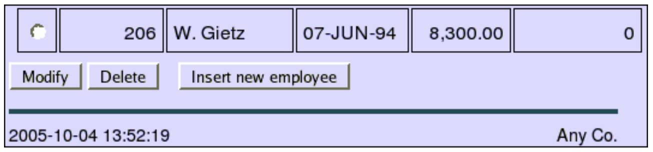
20. To remove the new employee record, select the radio button for the new employee record, and click **Delete**:



●	248	J. Bond	04-OCT-05	7,100.00	0

2005-10-04 13:47:38 Any Co.

On successful deletion, the deleted row does not appear in the list of employee records redisplayed in the Employees page:



○	206	W. Gietz	07-JUN-94	8,300.00	0

2005-10-04 13:52:19 Any Co.

Combining Departments and Employees

In this section, you will modify your application to enable access to both Employees and Departments pages.

To combine the Departments and Employees pages, perform the following tasks:

1. Edit the `anyco.php` file. Modify the query in the `construct_employees()` function to include a `WHERE` clause to compare the `department_id` with a value in a bind variable called `:did`. This makes the page display employees in one

department at a time. Get the `deptid` session parameter value to populate the bind variable:

```
$query =
 "SELECT employee_id,
         substr(first_name,1,1) || '.  '|| last_name as employee_name,
         hire_date,
         to_char(salary, '9999G999D99') as salary,
         nvl(commission_pct,0) as commission_pct
  FROM   employees
  WHERE  department_id = :did
  ORDER BY employee_id asc";

$deptid = $_SESSION['deptid'];
```

2. Edit the `anyco.php` file. In the `construct_employees()` function, update the call to the `db_do_query()` function to pass the bind information:

```
$conn = db_connect();

$bindargs = array();
array_push($bindargs, array('DID', $deptid, -1));

$emp = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW, $bindargs);
```

3. Edit the `anyco.php` file. In the `construct_departments()` function, save the department identifier in a session parameter:

```
$_SESSION['currentdept'] = $current;
$_SESSION['deptid'] = $deptid;
```

   This saves the current department identifier from the Departments page as a session parameter, which is used in the Employees page.

4. Edit the `anyco.php` file. Create a function `get_dept_name()` to query the department name for printing in the Departments and Employees page titles:

```
function get_dept_name($conn, $deptid)
{
  $query =
    'SELECT department_name
     FROM   departments
     WHERE  department_id = :did';

  $conn = db_connect();
  $bindargs = array();
  array_push($bindargs, array('DID', $deptid, -1));
  $dn = db_do_query($conn, $query,OCI_FETCHSTATEMENT_BY_COLUMN, $bindargs);

  return($dn['DEPARTMENT_NAME'][0]);
}
```

5. Edit the `anyco.php` file. Modify the `construct_employees()` function to print the department name in the Employees page heading:

```
$deptname = get_dept_name($conn, $deptid);
ui_print_header('Employees: '.$deptname);
```

6. Edit the `anyco.php` file. Modify the `construct_departments()` function to print the department name in the Departments page heading:

```
$deptname = get_dept_name($conn, $deptid);
```

```
ui_print_header('Department: '.$deptname);
```

7. Edit the `anyco.php` file. Modify the `construct_insert_emp()` function so that the default department is obtained from the session parameter passed in the `$emp` array to the `ui_print_insert_employee()` function. The function becomes:

```
function construct_insert_emp()
{
  $deptid = $_SESSION['deptid'];

  $conn = db_connect();
  $query = "SELECT job_id, job_title FROM jobs ORDER BY job_title ASC";
  $jobs = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_COLUMN);
  $query = "SELECT sysdate FROM dual";
  $date = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_COLUMN);
  $emp = array(
    'DEPARTMENT_ID' => $deptid,
    'HIRE_DATE' => $date['SYSDATE'][0],
    'ALLJOBIDS' => $jobs['JOB_ID'],
    'ALLJOBTITLES' => $jobs['JOB_TITLE']
    );
  ui_print_header('Insert New Employee');
  ui_print_insert_employee($emp, $_SERVER['SCRIPT_NAME']);
  ui_print_footer(date('Y-m-d H:i:s'));
}
```

8. Edit the `anyco.php` file. Modify the final `else` statement in the HTML form handler. The handler becomes:

```
// Start form handler code
if (isset($_POST['insertemp'])) {
  construct_insert_emp();
}
elseif (isset($_POST['saveinsertemp'])) {
  insert_new_emp();
}
elseif (isset($_POST['modifyemp'])) {
  construct_modify_emp();
}
elseif (isset($_POST['savemodifiedemp'])) {
  modify_emp();
}
elseif (isset($_POST['deleteemp'])) {
  delete_emp();
}
elseif (   isset($_POST['showemp'])) {
  construct_employees();
}
elseif (   isset($_POST['nextdept'])
        || isset($_POST['prevdept'])
        || isset($_POST['firstdept'])
        || isset($_POST['showdept'])) {
  construct_departments();
}
else {
  construct_departments();
}
```

9. Edit the `anyco_ui.inc` file. In the `ui_print_department()` function, change the HTML form to enable it to call the Employees page:

```
...
<form method="post" action="$posturl">
<input type="submit" value="First" name="firstdept">
<input type="submit" value="< Previous" name="prevdept">
<input type="submit" value="Next >" name="nextdept">
&nbsp;&nbsp;&nbsp;
<input type="submit" value="Show Employees" name="showemp">
</form>
...
```

10. Edit the `anyco_ui.inc` file. In the `ui_print_employees()` function, change the HTML form to enable it to call the Departments page:

```
...
</table>
<input type="submit" value="Modify" name="modifyemp">
<input type="submit" value="Delete" name="deleteemp">
&nbsp;&nbsp;
<input type="submit" value="Insert new employee" name="insertemp">
&nbsp;&nbsp;
<input type="submit" value="Return to Departments" name="showdept">
</form>
...
```

11. Save the changes to your PHP files. In your browser, test the changes by entering the following URL:

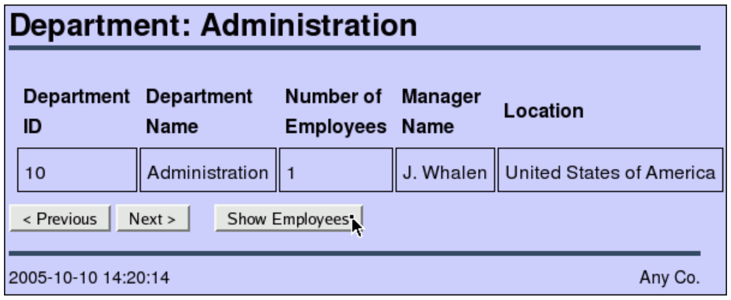
    On Windows:

    ```
    http://localhost/chap5/anyco.php
    ```

    On Linux:

    ```
    http://localhost/~<username>/chap5/anyco.php
    ```

    The Departments page is displayed.

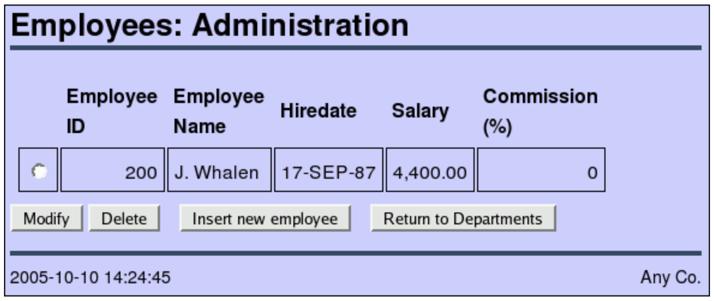


Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	1	J. Whalen	United States of America

2005-10-10 14:20:14 Any Co.

To display a list of employees in the department, click the **Show Employees** button.



Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)
○	200	J. Whalen	17-SEP-87	4,400.00	0

2005-10-10 14:24:45 Any Co.

You can return to the Departments page by clicking the **Return to Departments** button. Experiment by navigating to another department and listing its employees to show the process of switching between the Departments and Employees pages.

Adding Error Recovery

Error management is always a significant design decision. In production systems, you might want to classify errors and handle them in different ways. Fatal errors could be redirected to a standard "site not available" page or home page. Data errors for new record creation might return to the appropriate form with invalid fields highlighted.

In most production systems, you would set the `display_errors` configuration option in the `php.ini` file to `off`, and the `log_errors` configuration option to `on`.

You can use the PHP output buffering functionality to trap error text when a function is executing. Using `ob_start()` prevents text from displaying on the screen. If an error occurs, the `ob_get_contents()` function allows the previously generated error messages to be stored in a string for later display or analysis.

Now you change the application to display error messages and database errors on a new page using a custom error handling function. Errors are now returned from the `db*` functions keeping them silent.

1. Edit the `anyco_db.inc` file. Change the `db_error()` function to return the error information in an array structure, instead of printing and quitting. The function becomes:

```
function db_error($r = false, $file, $line)
{
  $err =  $r ? oci_error($r) : oci_error();

  if (isset($err['message'])) {
    $m = htmlentities($err['message']);
    $c = $err['code'];
  }
  else {
    $m = 'Unknown DB error';
    $c = null;
  }

  $rc = array(
    'MESSAGE' => $m,
    'CODE'    => $c,
    'FILE'    => $file,
    'LINE'    => $line
    );
  return $rc;
}
```

2. Edit the `anyco_db.inc file.` For every call to the `db_error()` function, assign the return value to a variable called `$e` and add a `return false;` statement after each call:

   ```
   if (<error test>)
   {
     $e = db_error(<handle>, __FILE__, __LINE__);
     return false;
   }
   ```

   Make sure to keep the `<error test>` and `<handle>` parameters the same as they are currently specified for each call. Remember that the `__FILE__` and `__LINE__` constants help to pinpoint the location of the failure during development. This is useful information to log for fatal errors in a production deployment of an application.

3. Edit the `anyco_db.inc` file. Add a `$e` parameter to every function to enable the return of error information. Use the `&` reference prefix to ensure that results are returned to the calling function. Each function declaration becomes:

   ```
   function db_connect(&$e) {...}

   function db_get_page_data($conn, $q1, $currrownum = 1, $rowsperpage = 1,
                             &$e, $bindvars = array()) {...}

   function db_do_query($conn, $statement, $resulttype, &$e,
                        $bindvars = array()) {...}

   function db_execute_statement($conn, $statement, &$e,
                                 $bindvars = array()) {...}
   ```

4. Edit the `anyco_db.inc` file. In the `db_get_page_data()` function, change the call to the `db_do_query()` function to pass down the error parameter `$e`:

   ```
   $r = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW, $e, $bindvars);
   ```

5. Edit the `anyco_db.inc` file. Add an `@` prefix to all `oci_*` function calls. For example:

   ```
   @ $r = @oci_execute($stid);
   ```

   The `@` prefix prevents errors from displaying because each return result is tested. Preventing errors from displaying can hide incorrect parameter usage, which may hinder testing the changes in this section. You do not need to add `@` prefixes, but it can effect future results when errors are displayed.

6. Edit the `anyco.php` file. Create a function to handle the error information:

   ```
   function handle_error($message, $err)
   {
     ui_print_header($message);
     ui_print_error($err, $_SERVER['SCRIPT_NAME']);
     ui_print_footer(date('Y-m-d H:i:s'));
   }
   ```

7. Edit the `anyco.php` file. Modify all calls to `db_*` functions to include the additional error parameter:

   Steps 8 to 15 show the complete new functions, so the code changes in this step can be skipped.

   - Change all `db_connect()` calls to `db_connect($err)`.

- Change all `db_do_query()` calls and insert a `$err` parameter as the fourth parameter. For example, the call in `construct_employees()` becomes:

  ```
  $emp = db_do_query($conn, $query,
                     OCI_FETCHSTATEMENT_BY_ROW, $err, $bindargs);
  ```

  Change the other four db_do_query() calls in anyco.php remembering to keep the existing parameter values of each specific call.

- Change the `db_get_page_data()` call and insert a `$err` parameter as the fifth parameter:

  ```
  $dept = db_get_page_data($conn, $query, $current, 1, $err);
  ```

- Change the `db_execute_statement()` calls and insert a `$err` parameter as the third parameter, for example:

  ```
  $r = db_execute_statement($conn, $statement, $err, $bindargs);
  ```

8. Edit the `anyco.php` file. Modify the `construct_departments()` function to handle errors returned. The function becomes:

```
function construct_departments()
{
  if (isset($_SESSION['currentdept']) && isset($_POST['prevdept']) &&
            $_SESSION['currentdept'] > 1)
     $current = $_SESSION['currentdept'] - 1;
  elseif (isset($_SESSION['currentdept']) && isset($_POST['nextdept']))
     $current = $_SESSION['currentdept'] + 1;
  elseif (isset($_POST['showdept']) && isset($_SESSION['currentdept']))
     $current = $_SESSION['currentdept'];
  else
     $current = 1;

  $query =
    "SELECT d.department_id, d.department_name,
            substr(e.first_name,1,1)||'. '|| e.last_name as manager_name,
            c.country_name, count(e2.employee_id) as number_of_employees
     FROM   departments d, employees e, locations l,
            countries c, employees e2
     WHERE  d.manager_id    = e.employee_id
     AND    d.location_id   = l.location_id
     AND    d.department_id = e2.department_id
     AND    l.country_id    = c.country_id
     GROUP BY d.department_id, d.department_name,
              substr(e.first_name,1,1)||'. '||e.last_name, c.country_name
     ORDER BY d.department_id ASC";

  $conn = db_connect($err);

  if (!$conn) {
    handle_error('Connection Error', $err);
  }
  else {
    $dept = db_get_page_data($conn, $query, $current, 1, $err);
    if ($dept === false) {
      // Use === so empty array at end of fetch is not matched
      handle_error('Cannot fetch Departments', $err);
    } else {

      if (!isset($dept[0]['DEPARTMENT_ID']) && $current > 1) {
        // no more records so go back one
```

```
        $current--;
        $dept = db_get_page_data($conn, $query, $current, 1, $err);
      }

      $deptid = $dept[0]['DEPARTMENT_ID'];

      $_SESSION['deptid'] = $deptid;
      $_SESSION['currentdept'] = $current;

      $deptname = get_dept_name($conn, $deptid);
      ui_print_header('Department: '.$deptname);
      ui_print_department($dept[0], $_SERVER['SCRIPT_NAME']);
      ui_print_footer(date('Y-m-d H:i:s'));
    }
  }
}
```

9. Edit the `anyco.php` file. Modify the `construct_employees()` function to handle errors. The function becomes:

```
function construct_employees()
{
  $query =
    "SELECT employee_id,
            substr(first_name,1,1) || '.  '|| last_name as employee_name,
            hire_date,
            to_char(salary, '9999G999D99') as salary,
            nvl(commission_pct,0) as commission_pct
     FROM   employees
     WHERE  department_id = :did
     ORDER BY employee_id asc";

  $deptid = $_SESSION['deptid'];

  $conn = db_connect($err);

  if (!$conn) {
    handle_error('Connection Error', $err);
  }
  else {
    $bindargs = array();
    array_push($bindargs, array('DID', $deptid, -1));
    $emp = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW, $err,
    $bindargs);

    if (!$emp) {
      handle_error('Cannot fetch Employees', $err);
    }
    else {
      $deptname = get_dept_name($conn, $deptid);
      ui_print_header('Employees: '.$deptname);
      ui_print_employees($emp, $_SERVER['SCRIPT_NAME']);
      ui_print_footer(date('Y-m-d H:i:s'));
    }
  }
}
```

10. Edit the `anyco.php` file. Modify the `construct_insert_emp()` function to handle errors. The function becomes:

```
function construct_insert_emp()
{
  $deptid = $_SESSION['deptid'];
  $conn = db_connect($err);
  if (!$conn) {
    handle_error('Connection Error', $err);
  }
  else {
    $query = "SELECT job_id, job_title FROM jobs ORDER BY job_title ASC";
    $jobs = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_COLUMN, $err);
    $query = "SELECT sysdate FROM dual";
    $date = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_COLUMN, $err);

    $emp = array(
      'DEPARTMENT_ID' => $deptid,
      'HIRE_DATE' => $date['SYSDATE'][0],
      'ALLJOBIDS' => $jobs['JOB_ID'],
      'ALLJOBTITLES' => $jobs['JOB_TITLE']
      );

    ui_print_header('Insert New Employee');
    ui_print_insert_employee($emp, $_SERVER['SCRIPT_NAME']);
    ui_print_footer(date('Y-m-d H:i:s'));
  }
}
```

11. Edit the `anyco.php` file. Modify the `insert_new_emp()` function to handle errors. The function becomes:

```
function insert_new_emp()
{
  $statement =
    'INSERT INTO employees
                 (employee_id, first_name, last_name, email, hire_date,
                 job_id, salary, commission_pct, department_id)
     VALUES (employees_seq.nextval, :fnm, :lnm, :eml, :hdt,
            :jid, :sal, :cpt, :did)';

  $newemp = $_POST;

  $conn = db_connect($err);
  if (!$conn) {
    handle_error('Connect Error', $err);
  }
  else {
    $emailid = $newemp['firstname'].$newemp['lastname'];

    $bindargs = array();
    array_push($bindargs, array('FNM', $newemp['firstname'], -1));
    array_push($bindargs, array('LNM', $newemp['lastname'], -1));
    array_push($bindargs, array('EML', $emailid, -1));
    array_push($bindargs, array('HDT', $newemp['hiredate'], -1));
    array_push($bindargs, array('JID', $newemp['jobid'], -1));
    array_push($bindargs, array('SAL', $newemp['salary'], -1));
    array_push($bindargs, array('CPT', $newemp['commpct'], -1));
    array_push($bindargs, array('DID', $newemp['deptid'], -1));

    $r = db_execute_statement($conn, $statement, $err, $bindargs);
    if ($r) {
      construct_employees();
    }
```

```
      else {
        handle_error('Cannot insert employee', $err);
      }
    }
  }
```

12. Edit the `anyco.php` function. Modify the `construct_modify_emp()` function to handle errors. The function becomes:

```
function construct_modify_emp()
{
  if (!isset($_POST['emprec'])) { // User did not select a record
    construct_employees();
  }
  else {
    $empid = $_POST['emprec'];

    $query =
      "SELECT employee_id, first_name, last_name, email, hire_date,
              salary, nvl(commission_pct,0) as commission_pct
       FROM   employees
       WHERE  employee_id = :empid";

    $conn = db_connect($err);
    if (!$conn) {
      handle_error('Connect Error', $err);
    }
    else {
      $bindargs = array();
      array_push($bindargs, array('EMPID', $empid, -1));

      $emp = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_ROW, $err,
             $bindargs);

      if (!$emp) {
        handle_error('Cannot find details for employee '.$empid, $err);
      }
      else {
        ui_print_header('Modify Employee ');
        ui_print_modify_employee($emp[0], $_SERVER['SCRIPT_NAME']);
        ui_print_footer(date('Y-m-d H:i:s'));
      }
    }
  }
}
```

13. Edit the `anyco.php` file. Change the `modify_emp()` function to handle errors. The function becomes:

```
function modify_emp()
{
  $newemp = $_POST;

  $statement =
    "UPDATE employees
     SET    first_name = :fnm, last_name = :lnm, email = :eml,
            salary = :sal, commission_pct = :cpt
     WHERE  employee_id = :eid";

  $conn = db_connect($err);
  if (!$conn) {
    handle_error('Connect Error', $err);
  }
  else {
    $bindargs = array();
    array_push($bindargs, array('EID', $newemp['empid'], -1));
    array_push($bindargs, array('FNM', $newemp['firstname'], -1));
    array_push($bindargs, array('LNM', $newemp['lastname'], -1));
    array_push($bindargs, array('EML', $newemp['email'], -1));
    array_push($bindargs, array('SAL', $newemp['salary'], -1));
    array_push($bindargs, array('CPT', $newemp['commpct'], -1));

    $r = db_execute_statement($conn, $statement, $err, $bindargs);

    if (!$r) {
      handle_error('Cannot update employee '.$newemp['empid'], $err);
    }
    else {
      construct_employees();
    }
  }
}
```

14. Edit the `anyco.php` file. Modify the `delete_emp()` function to handle errors. The function becomes:

```
function delete_emp()
{
  if (!isset($_POST['emprec'])) { // User did not select a record
    construct_employees();
  }
  else {
    $empid = $_POST['emprec'];

    $conn = db_connect($err);
    if (!$conn) {
      handle_error('Connection Error', $err);
    }
    else {
      $statement = "DELETE FROM employees WHERE employee_id = :empid";
      $bindargs = array();
      array_push($bindargs, array('EMPID', $empid, -1));
      $r = db_execute_statement($conn, $statement, $err, $bindargs);

      if (!$r) {
        handle_error("Error deleting employee $empid", $err);
      }
      else {
        construct_employees();
      }
    }
  }
}
```

15. Edit the `anyco.php` file. Modify the `get_dept_name()` function to handle errors. The function becomes:

```
function get_dept_name($conn, $deptid)
{
  $query =
    'SELECT department_name
     FROM   departments
```

```
      WHERE  department_id = :did';

    $conn = db_connect($err);
    if (!$conn) {
      return ('Unknown');
    }
    else {
      $bindargs = array();
      array_push($bindargs, array('DID', $deptid, -1));
      $dn = db_do_query($conn, $query, OCI_FETCHSTATEMENT_BY_COLUMN,
                        $err, $bindargs);
      if ($dn == false)
        return ('Unknown');
      else
        return($dn['DEPARTMENT_NAME'][0]);
    }
  }
```

16. Edit the `anyco_ui.inc` file. Add a new function `ui_print_error()`:

```
function ui_print_error($message, $posturl)
{
  if (!$message) {
    echo '<p>Unknown error</p>';
  }
  else {
    echo "<p>Error at line {$message['LINE']} of "
         ."{$message['FILE']}</p>";  // Uncomment for debugging
    echo "<p>{$message['MESSAGE']}</p>";
  }
  echo <<<END
  <form method="post" action="$posturl">
  <input type="submit" value="Return to Departments" name="showdept">
END;
}
```

Remember not to put leading spaces in the `END;` line. Leading spaces in the `END;` line cause the rest of the document to be treated as part of the text to be printed.

17. Save the changes to your application files. Test the changes by entering the following URL in your browser:

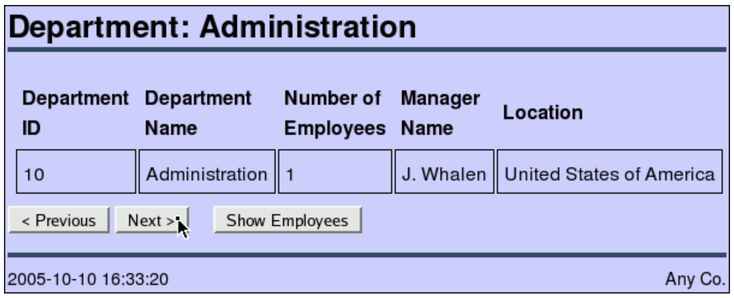
    On Windows:

    ```
    http://localhost/chap5/anyco.php
    ```

    On Linux:

    ```
    http://localhost/~<username>/chap5/anyco.php
    ```

    The Departments page is displayed:

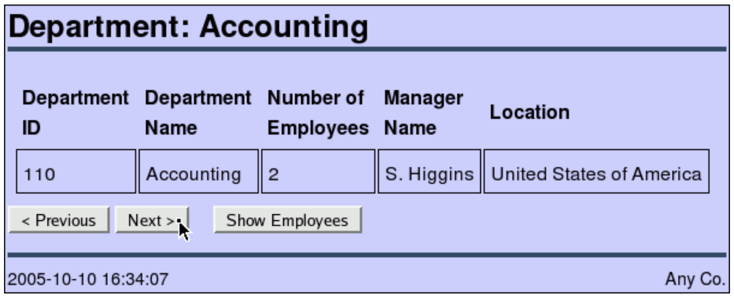


Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	1	J. Whalen	United States of America

2005-10-10 16:33:20 Any Co.

18. Click **Next** to navigate to the last department record, the Accounting department with ID 110. Try to navigate past the last department record by clicking **Next**.



Department: Accounting

Department ID	Department Name	Number of Employees	Manager Name	Location
110	Accounting	2	S. Higgins	United States of America

2005-10-10 16:34:07 Any Co.

The error handling prevents navigation past the last department record.

19. If a new employee is inserted with a salary of 0, or the department ID is changed to one that does not exist, the new error page is shown with the heading "Cannot insert employee".

Further Error Handling

Specific Oracle errors can be handled individually. For example, if a new employee record is created by clicking the **Insert new employee** button on the Employees page, and the Department ID is changed to a department that does not exist, you can trap this error and display a more meaningful message:

1. Edit the `anyco.php` file. Change the error handling in the `insert_new_emp()` function:

```
$r = db_execute_statement($conn, $statement, $err, $bindargs);
if ($r) {
  construct_employees();
}
else {
  if ($err['CODE'] == 2291) {  // Foreign key violated
    handle_error("Department {$newemp['deptid']} does not yet exist",
    $err);
  }
  else {
    handle_error('Cannot insert employee', $err);
  }
}
```

2. Save the changes to your application files. Test the changes by entering the following URL:

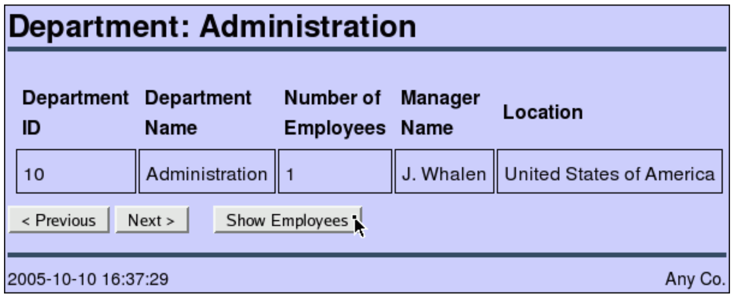
   On Windows:

   `http://localhost/chap5/anyco.php`

   On Linux:

   `http://localhost/~<username>/chap5/anyco.php`

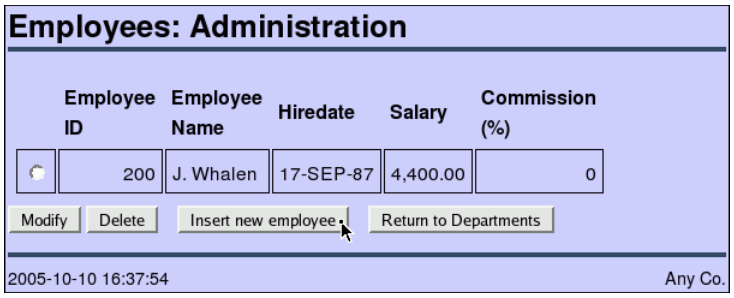
3. In the Departments page, click **Show Employees**.



Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	1	J. Whalen	United States of America

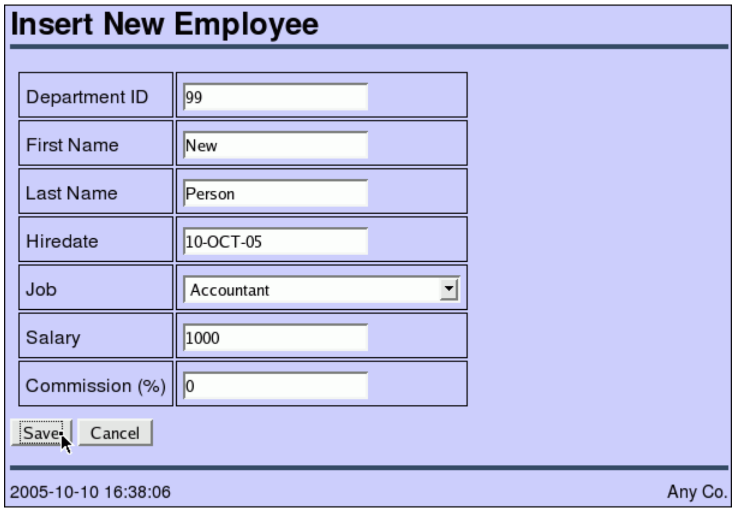
4. In the Employees page, click **Insert new employee**.



Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)
○	200	J. Whalen	17-SEP-87	4,400.00	0

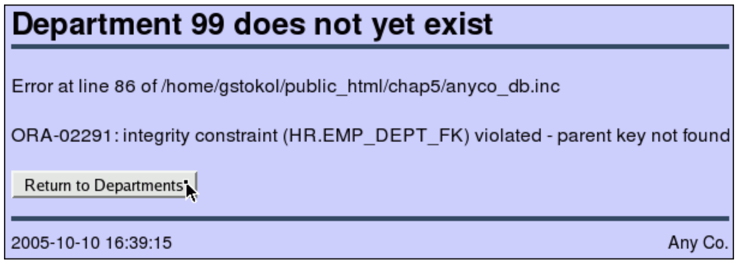
5. In the Insert New Employee page, enter employee details as shown, setting the Department ID to 99, and click **Save**.



Insert New Employee

Department ID	99
First Name	New
Last Name	Person
Hiredate	10-OCT-05
Job	Accountant
Salary	1000
Commission (%)	0

The following error page is displayed:



Department 99 does not yet exist

Error at line 86 of /home/gstokol/public_html/chap5/anyco_db.inc

ORA-02291: integrity constraint (HR.EMP_DEPT_FK) violated - parent key not found

You can click **Return to Departments** to return to the Departments page and then click **Show Employees** to verify that the new employee record has not been added to the Administration department.

6 Executing Stored Procedures and Functions

This chapter shows you how to run stored procedures and functions using PHP and Oracle Database. It has the following topics:

- Using PL/SQL to Capture Business Logic
- Using PL/SQL Ref Cursors to Return Result Sets

The Anyco application is extended with a PL/SQL function to calculate remuneration for each employee, and is further extended with a PL/SQL procedure to return a REF CURSOR of employee records.

Using PL/SQL to Capture Business Logic

Oracle PL/SQL procedures and functions enable you to store business logic in the database for any client program to use. They also reduce the amount of data that must be transferred between the database and PHP and can help improve performance.

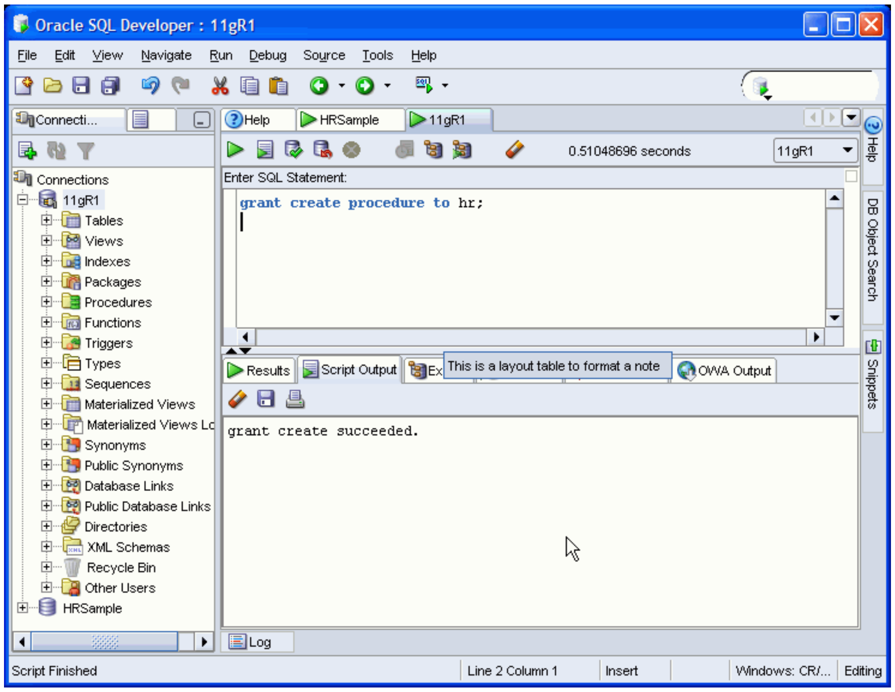
In this section, you will create a PL/SQL stored function to calculate and display the total remuneration for each employee.

To display the total remuneration of each employee, perform the following steps:

The PHP application connects to the database as the HR user. You may need to unlock the `HR` account as a user with DBA privileges. To unlock the `HR` user:

1. Open SQL Developer and open a connection to your Oracle database.
2. Login to your Oracle database as **system**.
3. Open SQL Worksheet or SQL*Plus and run the following `grant` statement to assign the `create procedure` privilege to the `HR` user:

   ```
   grant create procedure to hr;
   ```



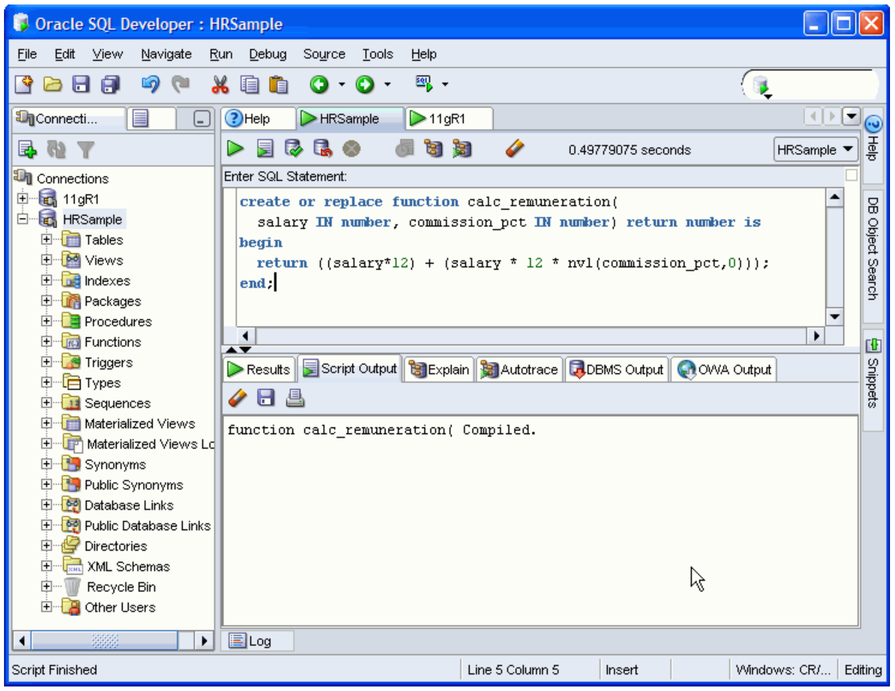
```
grant create procedure to hr;
```

```
grant create succeeded.
```

4. Login to your HR sample schema as `hr`.

5. Open SQL Worksheet or SQL*Plus and enter the following text to create a `calc_remuneration()` function:

```
create or replace function calc_remuneration(
  salary IN number, commission_pct IN number) return number is
begin
  return ((salary*12) + (salary * 12 * nvl(commission_pct,0)));
end;
```



```
create or replace function calc_remuneration(
  salary IN number, commission_pct IN number) return number is
begin
  return ((salary*12) + (salary * 12 * nvl(commission_pct,0)));
end;
```

```
function calc_remuneration( Compiled.
```

6. Create the `chap6` directory, copy the application files from `chap5`, and change to the newly created directory:

   On Windows:

```
mkdir c:\program files\Apache Group\Apache2\htdocs\chap6
cd c:\program files\Apache Group\Apache2\htdocs\chap6
copy ..\chap5\* .
```

   On Linux:

```
mkdir $HOME/public_html/chap6
cd $HOME/public_html/chap6
cp ../chap5/* .
```

7. Edit the `anyco.php` file. Modify the query in the `construct_employees()` function to call the PL/SQL function for each row returned:

```
$query =
 "SELECT employee_id,
        substr(first_name,1,1) || '. '|| last_name as employee_name,
        hire_date,
        to_char(salary, '9999G999D99') as salary,
        nvl(commission_pct,0) as commission_pct,
        to_char(calc_remuneration(salary, commission_pct),'9999G999D99')
          as remuneration
  FROM employees
  WHERE department_id = :did
  ORDER BY employee_id ASC";
```

8. Edit the `anyco_ui.inc` file. In the `ui_print_employees()` function, add a `Remuneration` column to the table, and modify the `foreach` loop to display the remuneration field for each employee:

```
echo <<<END
   <form method="post" action="$posturl">
   <table>
   <tr>
     <th>&nbsp;</th>
     <th>Employee<br>ID</th>
     <th>Employee<br>Name</th>
     <th>Hiredate</th>
     <th>Salary</th>
     <th>Commission<br>(%)</th>
     <th>Remuneration</th>
   </tr>
END;

    // Write one row per employee
    foreach ($employeerecords as $emp) {
      echo '<tr>';
      echo '<td><input type="radio" name="emprec"
                 value="'.htmlentities($emp['EMPLOYEE_ID']).'"></td>';
      echo '<td align="right">'.htmlentities($emp['EMPLOYEE_ID']).'</td>';
      echo '<td>'.htmlentities($emp['EMPLOYEE_NAME']).'</td>';
      echo '<td>'.htmlentities($emp['HIRE_DATE']).'</td>';
      echo '<td align="right">'.htmlentities($emp['SALARY']).'</td>';
      echo '<td align="right">'.htmlentities($emp['COMMISSION_PCT']).'</td>';
      echo '<td align="right">'.htmlentities($emp['REMUNERATION']).'</td>';
      echo '</tr>';
    }
```

9. Save the changes to your application files. In a browser, enter the following URL to test the application:

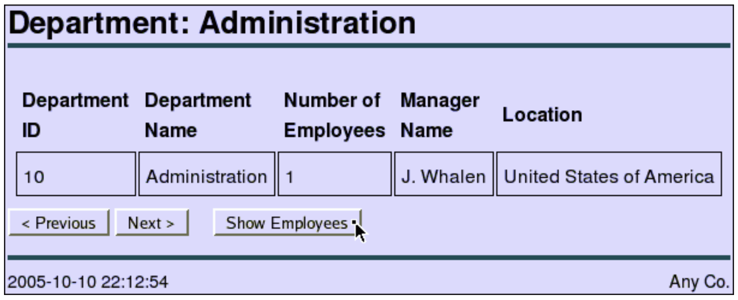
   On Windows:

   ```
   http://localhost/chap6/anyco.php
   ```

   On Linux:

   ```
   http://localhost/~<username>/chap6/anyco.php
   ```

10. In the Departments page, click **Show Employees**.

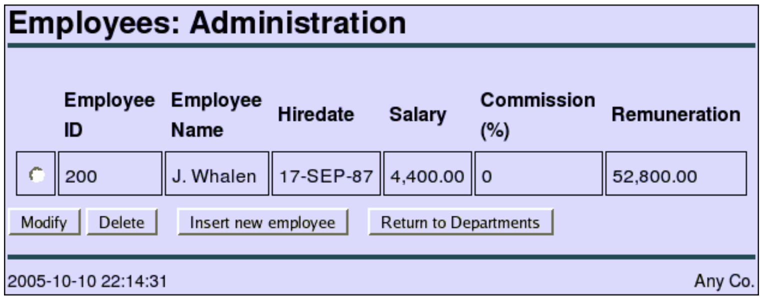


Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	1	J. Whalen	United States of America

2005-10-10 22:12:54 Any Co.

In the Employees page for the department, the employee remuneration is displayed in the last column:



Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)	Remuneration
○	200	J. Whalen	17-SEP-87	4,400.00	0	52,800.00

2005-10-10 22:14:31 Any Co.

Using PL/SQL Ref Cursors to Return Result Sets

Query data can be returned as REF CURSORS from PL/SQL blocks and displayed in PHP. This can be useful where the data set requires complex functionality or where you want multiple application programs to use the same query.

A REF CURSOR in PL/SQL is a type definition that is assigned to a cursor variable. It is common to declare a PL/SQL type inside a package specification for reuse in other PL/SQL constructs, such as a package body.

In this section, you will use a REF CURSOR to retrieve the employees for a specific department.

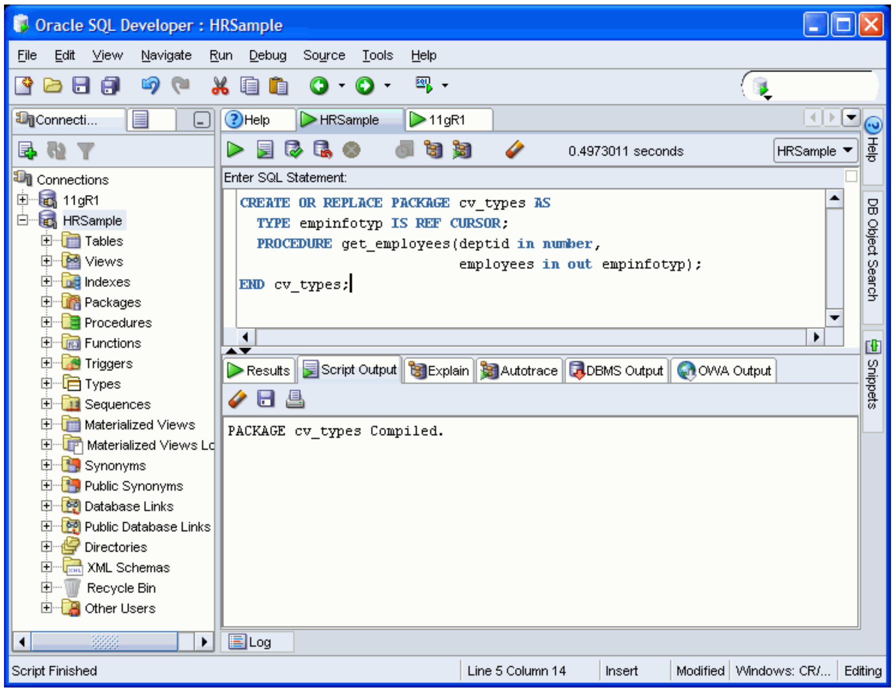
To create a PL/SQL package specification and body, with a REF CURSOR to retrieve employees for a specific department, perform the following steps:

1. Open SQL Developer and login to your HR sample schema as `hr`.
2. Open SQL Worksheet or SQL*Plus and enter the following text to create the `cv_types` PL/SQL package:

```
CREATE OR REPLACE PACKAGE cv_types AS
  TYPE empinfotyp IS REF CURSOR;
  PROCEDURE get_employees(deptid in number,
```

```
                          employees in out empinfotyp);
END cv_types;
```

Click **Run**:



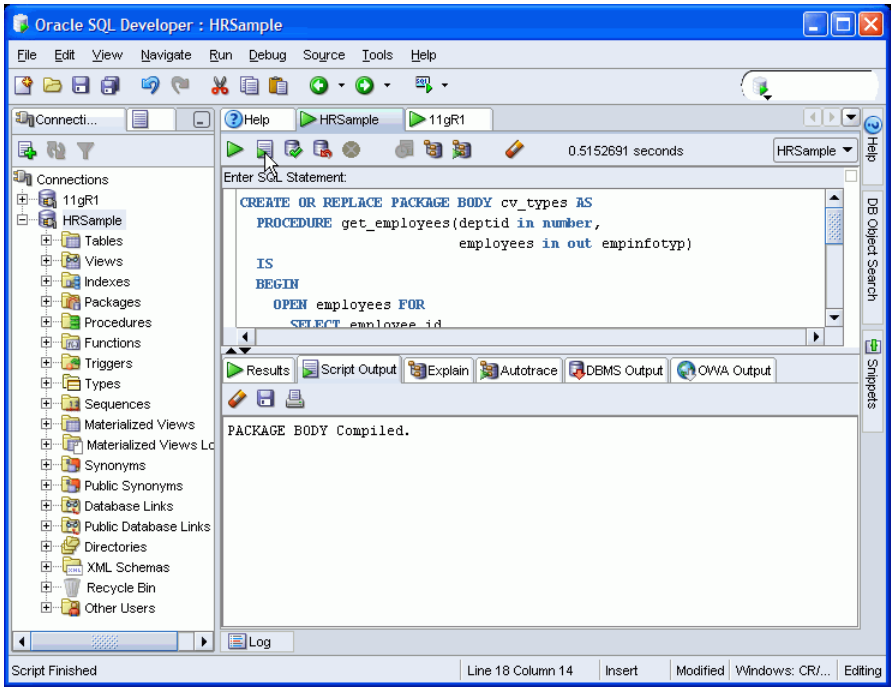
```
CREATE OR REPLACE PACKAGE cv_types AS
  TYPE empinfotyp IS REF CURSOR;
  PROCEDURE get_employees(deptid in number,
                          employees in out empinfotyp);
END cv_types;
```

```
PACKAGE cv_types Compiled.
```

3. In SQL Worksheet enter the following text to create the `cv_types` PL/SQL package body:

```
CREATE OR REPLACE PACKAGE BODY cv_types AS
  PROCEDURE get_employees(deptid in number,
                          employees in out empinfotyp)
  IS
  BEGIN
    OPEN employees FOR
      SELECT employee_id,
        substr(first_name,1,1) || '. '|| last_name as employee_name,
        hire_date,
        to_char(salary, '999G999D99') as salary,
        NVL(commission_pct,0) as commission_pct,
        to_char(calc_remuneration(salary, commission_pct),
                '9999G999D99') as remuneration
      FROM employees
      WHERE department_id = deptid
      ORDER BY employee_id ASC;
  END get_employees;
END cv_types;
```

Click **Run**:



```
CREATE OR REPLACE PACKAGE BODY cv_types AS
  PROCEDURE get_employees(deptid in number,
                          employees in out empinfotyp)
  IS
  BEGIN
    OPEN employees FOR
      SELECT employee_id
```

```
PACKAGE BODY Compiled.
```

4. Edit the `anyco_db.inc` file. Create a new PHP function that calls the PL/SQL packaged procedure:

```
// Use ref cursor to fetch employee records
// All records are retrieved - there is no paging in this example
function db_get_employees_rc($conn, $deptid, &$e)
{
  // Execute the call to the stored procedure
  $stmt = "BEGIN cv_types.get_employees($deptid, :rc); END;";
  $stid = @oci_parse($conn, $stmt);
  if (!$stid) {
    $e = db_error($conn, __FILE__, __LINE__);
    return false;
  }
  $refcur = oci_new_cursor($conn);
  if (!$stid) {
    $e = db_error($conn, __FILE__, __LINE__);
    return false;
  }
  $r = @oci_bind_by_name($stid, ':RC', $refcur, -1, OCI_B_CURSOR);
  if (!$r) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }
  $r = @oci_execute($stid);
  if (!$r) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }
  // Now treat the ref cursor as a statement resource
  $r = @oci_execute($refcur, OCI_DEFAULT);
  if (!$r) {
    $e = db_error($refcur, __FILE__, __LINE__);
    return false;
  }
  $r = @oci_fetch_all($refcur, $employeerecords, null, null,
                              OCI_FETCHSTATEMENT_BY_ROW);
  if (!$r) {
    $e = db_error($refcur, __FILE__, __LINE__);
    return false;
  }
  return ($employeerecords);
}
```

The `db_get_employees_rc()` function executes the following anonymous (unnamed) PL/SQL block:

```
BEGIN cv_types.get_employees($deptid, :rc); END;
```

The PL/SQL statement inside the BEGIN END block calls the stored PL/SQL package procedure `cv_types.et_employees()`. This returns an `OCI_B_CURSOR` REF CURSOR bind variable in the PHP variable `$refcur`.

The `$refcur` variable is treated like a statement handle returned by `oci_parse()`. It is used for execute and fetch operations just as if the SQL query had been done in PHP.

5. Edit the `anyco.php` file. In the `construct_employees()` function, remove the query text and the bind arguments. The function becomes:

```
function construct_employees()
{
  $deptid = $_SESSION['deptid'];
  $conn = db_connect($err);
  if (!$conn) {
    handle_error('Connection Error', $err);
  }
  else {
    $emp = db_get_employees_rc($conn, $deptid, $err);

    if (!$emp) {
      handle_error('Cannot fetch Employees', $err);
    }
    else {
      $deptname = get_dept_name($conn, $deptid);

      ui_print_header('Employees: '.$deptname);
      ui_print_employees($emp, $_SERVER['SCRIPT_NAME']);
      ui_print_footer(date('Y-m-d H:i:s'));
    }
  }
}
```

6. Save the changes to your application files. In a browser, enter the following URL to test the application:

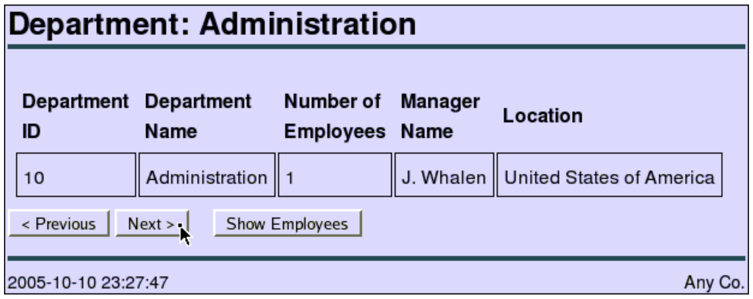
   On Windows:

```
http://localhost/chap6/anyco.php
```

   On Linux:

```
http://localhost/~<username>/chap6/anyco.php
```

7. In the Departments page, click **Next** to navigate to the Marketing department page.

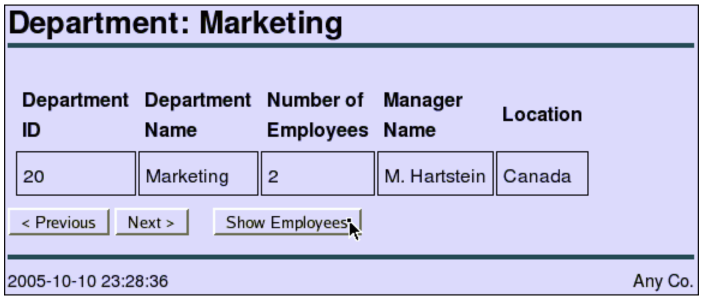


Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	1	J. Whalen	United States of America

2005-10-10 23:27:47 Any Co.

8. In the Marketing department page, click **Show Employees**.

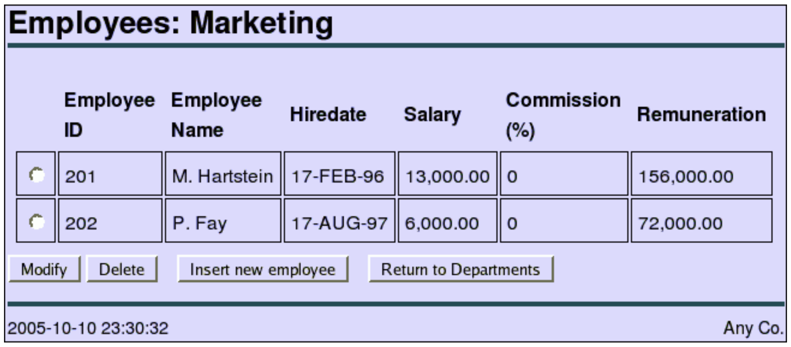


Department: Marketing

Department ID	Department Name	Number of Employees	Manager Name	Location
20	Marketing	2	M. Hartstein	Canada

2005-10-10 23:28:36 Any Co.

In the Employees page for the Marketing department, the employee pages displays as previously:



Employees: Marketing

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)	Remuneration
○	201	M. Hartstein	17-FEB-96	13,000.00	0	156,000.00
○	202	P. Fay	17-AUG-97	6,000.00	0	72,000.00

2005-10-10 23:30:32 Any Co.

7

Loading Images

This chapter shows you how to change the application to upload a JPEG image for new employee records and display it on the Employees page. It has the following topics:

Using BLOBs to Store and Load Employee Images

In this section, you will modify your application code to enable a photo to be stored in the record of an employee.

To enable images of employees to be stored in the employee records, perform the following tasks:

1. Create the `chap7` directory, copy the application files from `chap6`, and change to the newly created directory:

   On Windows:

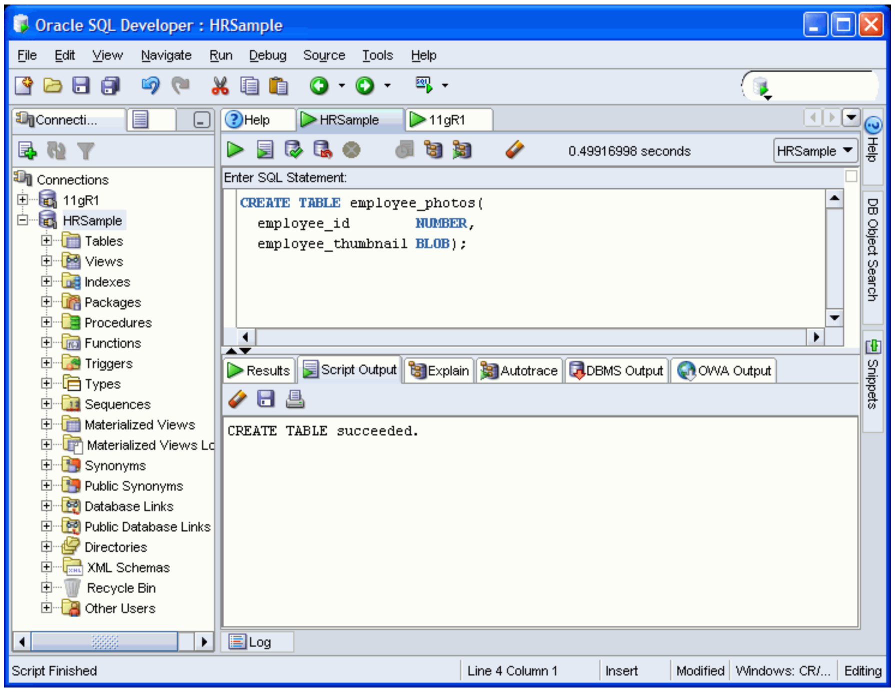
   ```
   mkdir c:\program files\Apache Group\Apache2\htdocs\chap7
   cd c:\program files\Apache Group\Apache2\htdocs\chap7
   copy ..\chap6\* .
   ```

   On Linux:

   ```
   mkdir $HOME/public_html/chap7
   cd $HOME/public_html/chap7
   cp ../chap6/* .
   ```

2. Open SQL Developer and open a connection to your HR sample schema.
3. Login to your HR sample schema as **hr**.
4. Open SQL Worksheet and enter the following `CREATE TABLE` statement to create a new table for storing employee images:

   ```
   CREATE TABLE employee_photos(
     employee_id        NUMBER,
     employee_thumbnail BLOB);
   ```



```
CREATE TABLE employee_photos(
  employee_id        NUMBER,
  employee_thumbnail BLOB);
```

```
CREATE TABLE succeeded.
```

5. The HR user must have the CREATE TABLE privilege to perform this command. If you get an "insufficient privileges" error message, then log out as the HR user, log in as system, and execute the following GRANT command:

   ```
   GRANT create table TO hr;
   ```

   Then log in as HR again to execute the CREATE TABLE statement.

6. Edit the anyco_ui.inc file. Add a Photograph column to the EMPLOYEES table in the ui_print_employees() function:

   ```
   <th>Commission<br>(%)</th>
   <th>Remuneration</th>
   <th>Photograph</th>
   ```

   The data for the Photograph column is populated with an <img> tag whose src attribute is defined as a URL reference to a new anyco_im.php file, which will display the image for each employee record.

7. Edit the anyco_ui.inc file. Add code in the ui_print_employees() function to generate an <img> tag referencing the anyco_im.php file with the employee identifier as a parameter:

   ```
   echo '<td align="right">'
        .htmlentities($emp['REMUNERATION']).'</td>';
   echo '<td><img src="anyco_im.php?showempphoto='.$emp['EMPLOYEE_ID']
        .'" alt="Employee photo"></td>';
   ```

8. Edit the anyco_ui.inc file. To enable images to be uploaded when a new employee record is created, add an enctype attribute to the <form> tag in the ui_print_insert_employee() function:

   ```
   <form method="post" action="$posturl" enctype="multipart/form-data">
   ```

   At the bottom of the form add an upload field with an input type of file:

   ```
   <tr>
   ```

```
  <td>Commission (%)</td>
  <td><input type="text" name="commpct" value="0" size="20"></td>
</tr>
<tr>
  <td>Photo</td>
  <td><input type="file" name="empphoto"></td>
</tr>
```

9. Create the `anyco_im.php file`. This file accepts an employee identifier as a URL parameter, reads the image from the Photograph column for that employee record, and returns the thumbnail image to be displayed:

```
<?php    // anyco_im.php

require('anyco_cn.inc');
require('anyco_db.inc');
construct_image();

function construct_image()
{
  if (!isset($_GET['showempphoto'])) {
    return;
  }

  $empid = $_GET['showempphoto'];

  $conn = db_connect($err);

  if (!$conn) {
    return;
  }

  $query =
    'SELECT employee_thumbnail
     FROM   employee_photos
     WHERE  employee_id = :eid';

  $stid = oci_parse($conn, $query);
  $r = oci_bind_by_name($stid, ":eid", $empid, -1);
  if (!$r) {
    return;
  }
  $r = oci_execute($stid, OCI_DEFAULT);
  if (!$r) {
    return;
  }

  $arr = oci_fetch_row($stid);
  if (!$arr) {
    return;                     // photo not found
  }

  $result = $arr[0]->load();

  // If any text (or whitespace!) is printed before this header is sent,
  // the text is not displayed. The image also is not displayed properly.
  // Comment out the "header" line to see the text and debug.
  header("Content-type: image/JPEG");
  echo $result;
}
```

```
?>
```

The `construct_image()` function uses the `OCI-Lob->load()` function to retrieve the Oracle LOB data, which is the image data. The PHP `header()` function sets the MIME type in the HTTP response header to ensure the browser interprets the data as a JPEG image.

If you want to display other image types, then the `Content-type` needs to be changed accordingly.

10. Edit the `anyco_db.inc` file. Add a new function `db_insert_thumbnail()` to insert an image into the `EMPLOYEE_PHOTOS` table:

```
function db_insert_thumbnail($conn, $empid, $imgfile, &$e)
{
  $lob = oci_new_descriptor($conn, OCI_D_LOB);
  if (!$lob) {
    $e = db_error($conn, __FILE__, __LINE__);
    return false;
  }

  $insstmt =
    'INSERT INTO employee_photos (employee_id, employee_thumbnail)
     VALUES(:eid, empty_blob())
     RETURNING employee_thumbnail into :etn';

  $stmt = oci_parse($conn, $insstmt);
  $r = oci_bind_by_name($stmt, ':etn', $lob, -1, OCI_B_BLOB);
  if (!$r) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }
  $r = oci_bind_by_name($stmt, ':eid', $empid, -1);
  if (!$r) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }
  $r = oci_execute($stmt, OCI_DEFAULT);
  if (!$r) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }

  if (!$lob->savefile($imgfile)) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }
  $lob->free();

  return true;
}
```

To tie the new `EMPLOYEE_PHOTOS` and `EMPLOYEES` tables together, you must use the same employee id in both tables.

11. Edit the `anyco_db.inc` file. Change the `$bindvars` parameter in the `db_execute_statement()` function to `&$bindvars` so that `OUT` bind variable values are returned from the database. At the bottom of the function, add a loop to set any return bind values:

```
function db_execute_statement($conn, $statement, &$e, &$bindvars = array())
{
  ...
  $r = @oci_execute($stid);
  if (!$r) {
    $e = db_error($stid, __FILE__, __LINE__);
    return false;
  }
  $outbinds = array();
  foreach ($bindvars as $b) {
    $outbinds[$b[0]] = $$b[0];
  }
   $bindvars = $outbinds;
   return true;
}
```

12. Edit the `anyco.php` file. Change the INSERT statement in the `insert_new_emp()` function so that it returns the new employee identifier in the bind variable `:neweid`. This value is inserted with the image into the new `EMPLOYEE_PHOTOS` table.

```
$statement =
  'INSERT INTO employees
             (employee_id, first_name, last_name, email, hire_date,
             job_id, salary, commission_pct, department_id)
   VALUES (employees_seq.nextval, :fnm, :lnm, :eml, :hdt,
          :jid, :sal, :cpt, :did)
   RETURNING employee_id into :neweid';
```

Also in the `insert_new_emp()` function, add a call to the `array_push()` function to set a new bind variable `NEWEID` at the end of the list of `array_push()` calls:

```
array_push($bindargs, array('CPT', $newemp['commpct'], -1));
array_push($bindargs, array('DID', $newemp['deptid'], -1));
array_push($bindargs, array('NEWEID', null, 10));
```

Because the value of `NEWID` is being retrieved with the RETURNING clause in the INSERT statement, its initial value is set to `NULL`. The length is set to 10 to allow enough digits in the return value.

13. Edit the `anyco.php` file. In the `insert_new_emp()` function, add a call between the `db_execute_statement()` and `construct_employees()` calls to insert the thumbnail image:

```
$r = db_execute_statement($conn, $statement, $err, $bindargs);
if ($r) {
  $r = db_insert_thumbnail($conn, $bindargs['NEWEID'],
                           $_FILES['empphoto']['tmp_name'], $e);
  construct_employees();
}
```

14. In a browser, enter the following application URL:

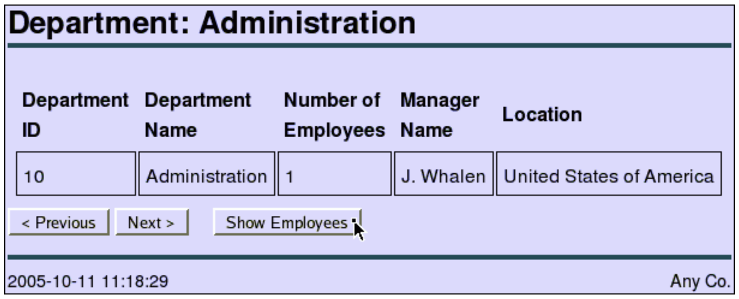
On Windows:

```
http://localhost/chap7/anyco.php
```

On Linux:

```
http://localhost/~<username>/chap7/anyco.php
```

15. In the Departments page, click **Show Employees** to navigate to the Employees page:

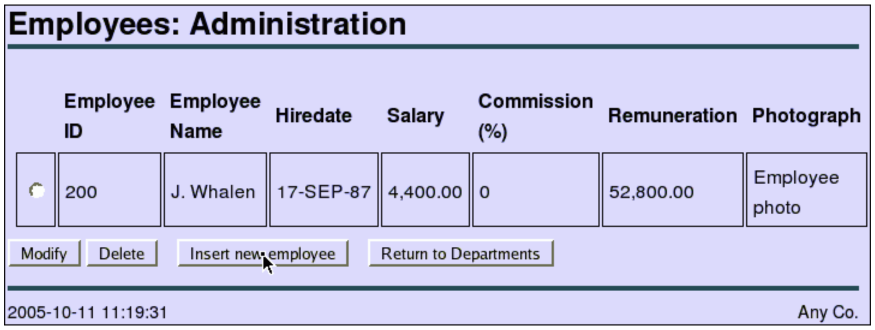


Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	1	J. Whalen	United States of America

2005-10-11 11:18:29 Any Co.

16. In the Employees page, to insert a new employee record click **Insert new employee**:

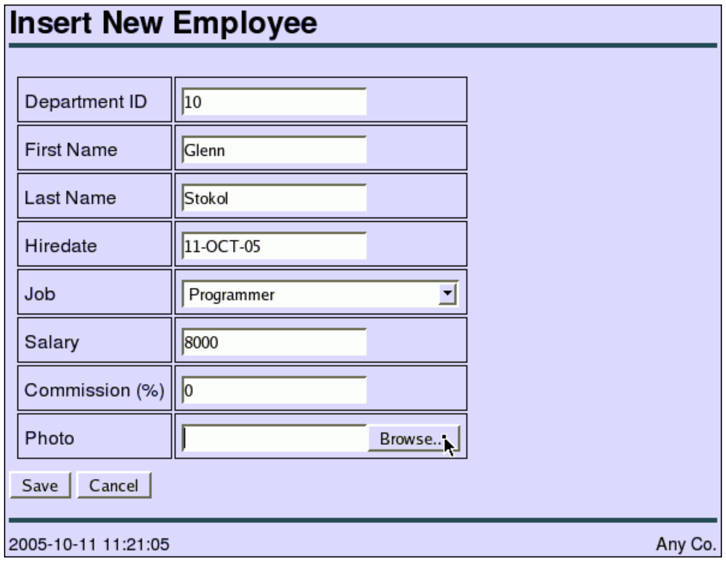


Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)	Remuneration	Photograph
○	200	J. Whalen	17-SEP-87	4,400.00	0	52,800.00	Employee photo

2005-10-11 11:19:31 Any Co.

17. The Insert New Employee form allows you to choose a thumbnail image on your system to be uploaded to the database. Enter your own values in the fields or use the values as shown. Click **Browse**:

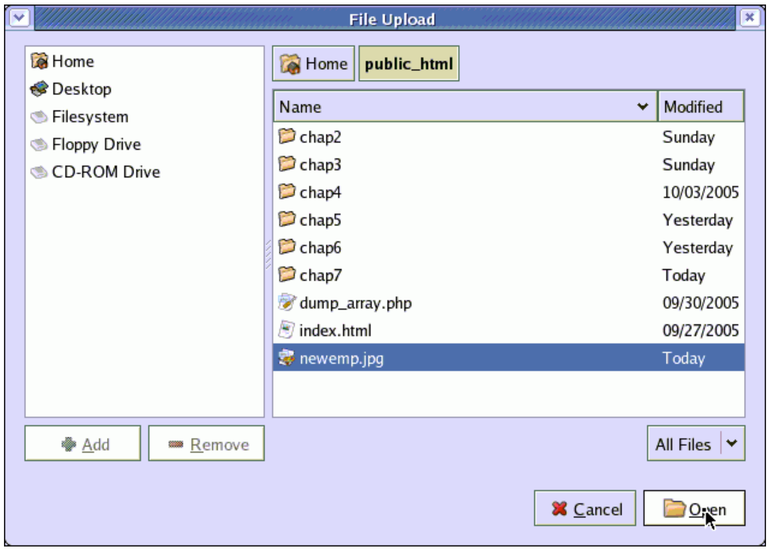


Insert New Employee

Department ID	10
First Name	Glenn
Last Name	Stokol
Hiredate	11-OCT-05
Job	Programmer
Salary	8000
Commission (%)	0
Photo	

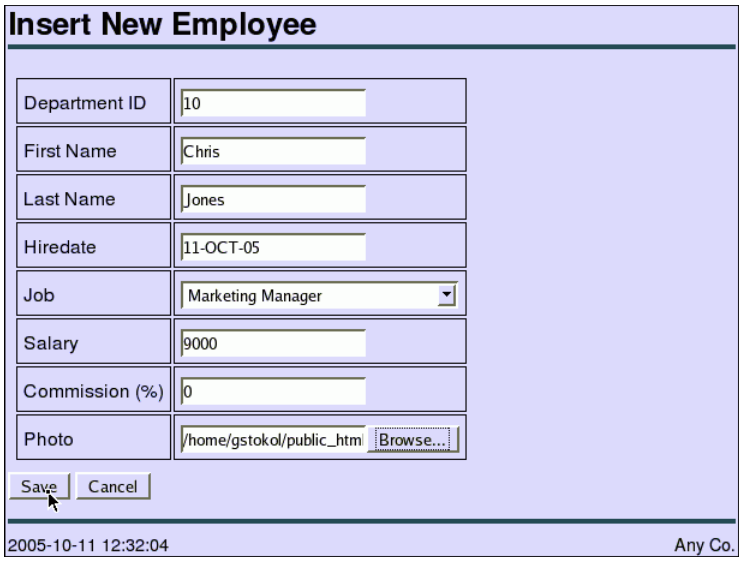
2005-10-11 11:21:05 Any Co.

18. In the File Upload window, browse for and select a JPEG image file, and click **Open**:



Name	Modified
chap2	Sunday
chap3	Sunday
chap4	10/03/2005
chap5	Yesterday
chap6	Yesterday
chap7	Today
dump_array.php	09/30/2005
index.html	09/27/2005
newemp.jpg	Today

19. In the Insert New Employee page, click **Save**:

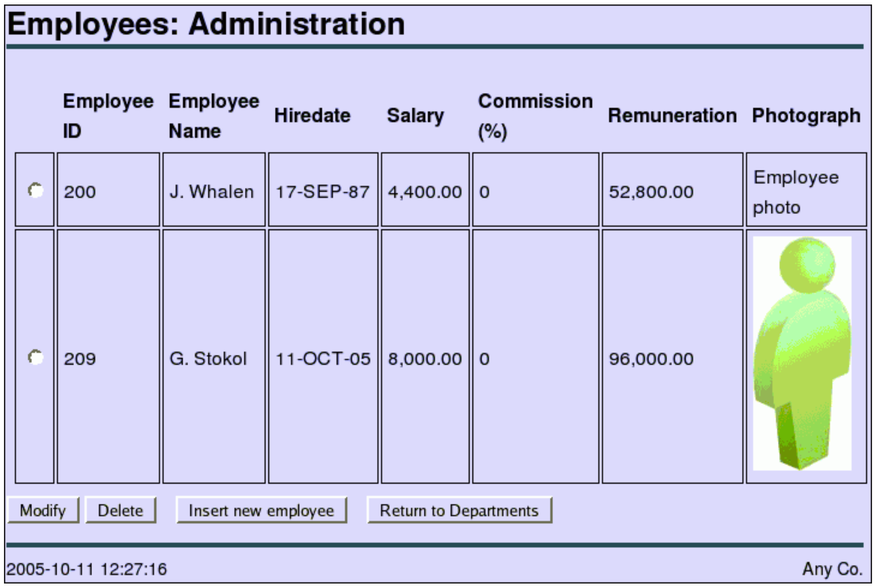


Insert New Employee

Department ID	10
First Name	Chris
Last Name	Jones
Hiredate	11-OCT-05
Job	Marketing Manager
Salary	9000
Commission (%)	0
Photo	/home/gstokol/public_html

2005-10-11 12:32:04 Any Co.

The Employees page is displayed with the new employee record, including the image, which is displayed at its original size:



Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)	Remuneration	Photograph
○	200	J. Whalen	17-SEP-87	4,400.00	0	52,800.00	Employee photo
○	209	G. Stokol	11-OCT-05	8,000.00	0	96,000.00	

2005-10-11 12:27:16 Any Co.

Resizing Images

In this section, you will further modify your application code to create a thumbnail image from a supplied image, and store the thumbnail image in the record of an employee.

You can use the PHP GD graphics extension to resize employee images.

1. Restart Apache. You can either use the ApacheMonitor utility, or you can use Windows Services.

   To use the ApacheMonitor utility, navigate to the Apache `bin` directory and double click `ApacheMonitor.exe`. In a default installation, Apache `bin` is located at `c:\Program Files\Apache Group\Apache2\bin`.

   You can access Windows Services from the Windows **Start** menu at **Start** > **Control Panel** > **Administrative Tools** > **Services.** Select the **Standard** tab. Right click the Apache2 HTTP Server and then select **Restart**.

2. Edit the `anyco_db.inc` file. To resize the image to create a thumbnail image, add the following code before the call to `$lob->savefile($imgfile)` in the `db_insert_thumbnail()` function:

```
$r = oci_execute($stmt, OCI_DEFAULT);
if (!$r) {
  $e = db_error($stid, __FILE__, __LINE__);
  return false;
}

// Resize the image to a thumbnail
define('MAX_THUMBNAIL_DIMENSION', 100);
$src_img = imagecreatefromjpeg($imgfile);
list($w, $h) = getimagesize($imgfile);
if ($w > MAX_THUMBNAIL_DIMENSION || $h > MAX_THUMBNAIL_DIMENSION)
{
  $scale =  MAX_THUMBNAIL_DIMENSION / (($h > $w) ? $h : $w);
  $nw = $w * $scale;
  $nh = $h * $scale;

  $dest_img = imagecreatetruecolor($nw, $nh);
  imagecopyresampled($dest_img, $src_img, 0, 0, 0, 0, $nw, $nh, $w, $h);

  imagejpeg($dest_img, $imgfile);  // overwrite file with new thumbnail

  imagedestroy($src_img);
  imagedestroy($dest_img);
}

if (!$lob->savefile($imgfile)) {
...
```

The `imagecreatefromjpeg()` function reads the JPEG file and creates an internal representation used by subsequent GD functions. Next, new dimensions are calculated with the longest side no larger than 100 pixels. A template image with the new size is created using the `imagecreatetruecolor()` function. Data from the original image is sampled into it with the `imagecopyresampled()` function to create the thumbnail image. The thumbnail image is written back to the original file and the internal representations of the images are freed.

The existing code in the `db_insert_thumbnail()` function uploads the image file to the database as it did in the previous implementation.

3. Enter the following URL in your browser to test the changes in your application:

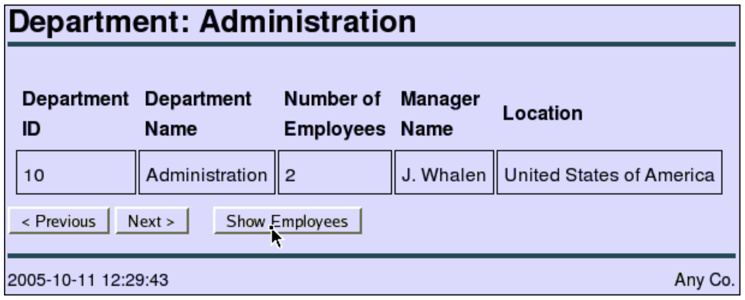
   On Windows:

   ```
   http://localhost/chap7/anyco.php
   ```

   On Linux:

   ```
   http://localhost/~<username>/chap7/anyco.php
   ```

4. In the Departments page, navigate to the Employees page by clicking **Show Employees**:

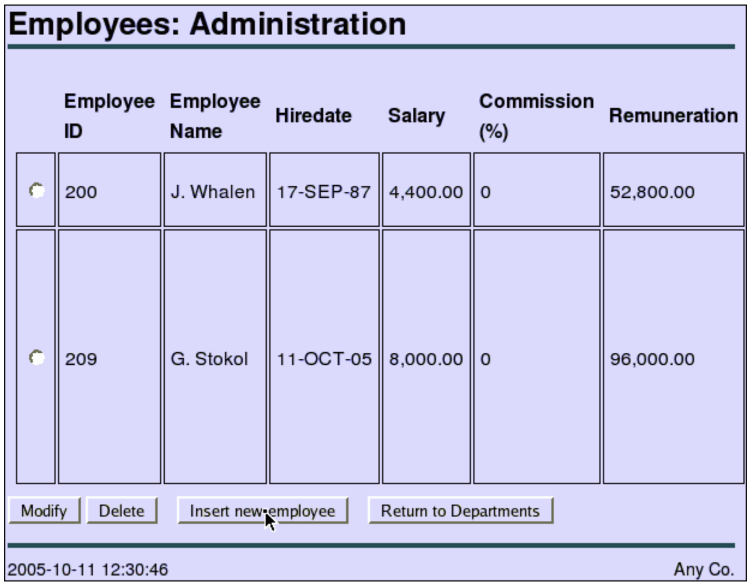


Department: Administration

Department ID	Department Name	Number of Employees	Manager Name	Location
10	Administration	2	J. Whalen	United States of America

2005-10-11 12:29:43 Any Co.

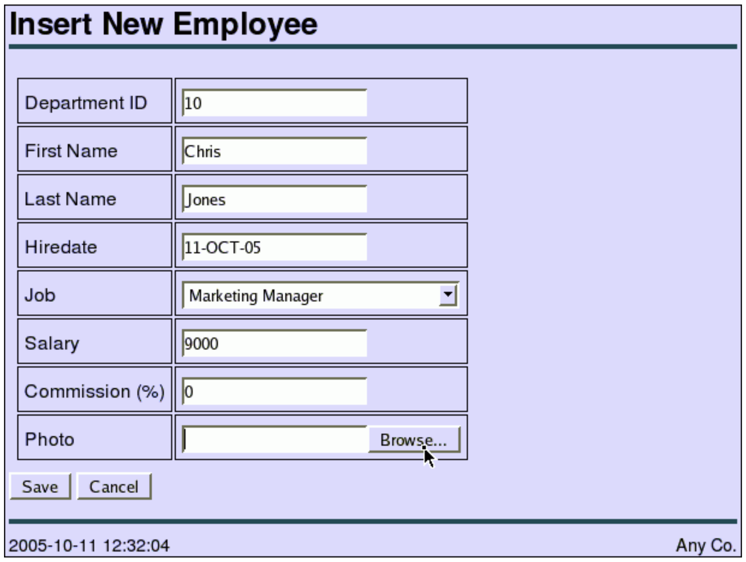
5. In the Employees page, to insert a new employee record, click **Insert new employee**:



Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)	Remuneration
○	200	J. Whalen	17-SEP-87	4,400.00	0	52,800.00
○	209	G. Stokol	11-OCT-05	8,000.00	0	96,000.00

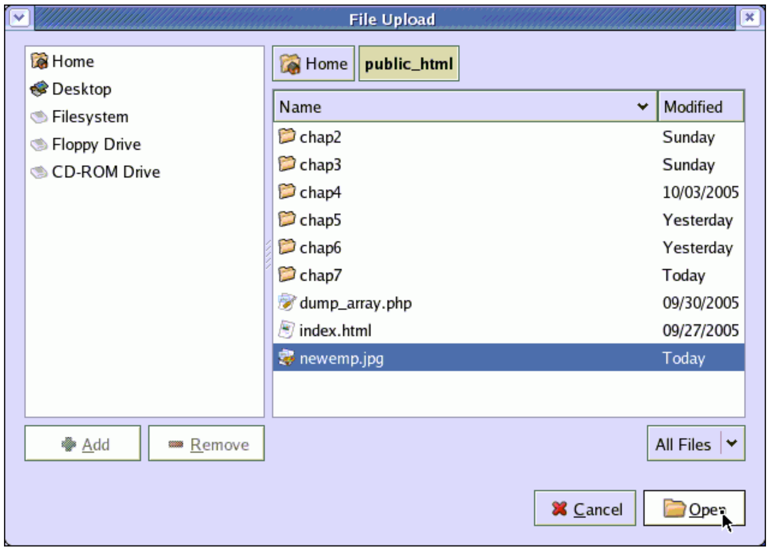
6. Enter the new employee details or use the values shown. To browse for an employee image, click **Browse**:



Insert New Employee

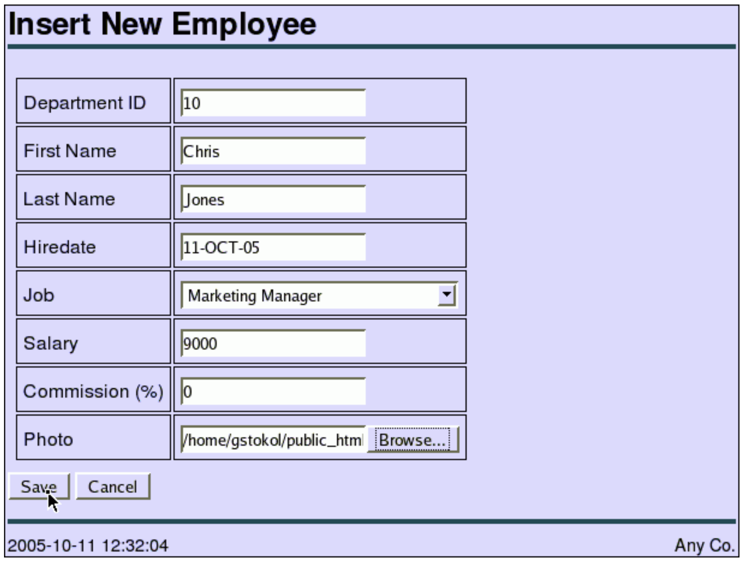
Department ID	10
First Name	Chris
Last Name	Jones
Hiredate	11-OCT-05
Job	Marketing Manager
Salary	9000
Commission (%)	0
Photo	

7. Locate and select a JPEG image with a size larger than 100 pixels, and click **Open**:



Name	Modified
chap2	Sunday
chap3	Sunday
chap4	10/03/2005
chap5	Yesterday
chap6	Yesterday
chap7	Today
dump_array.php	09/30/2005
index.html	09/27/2005
newemp.jpg	Today

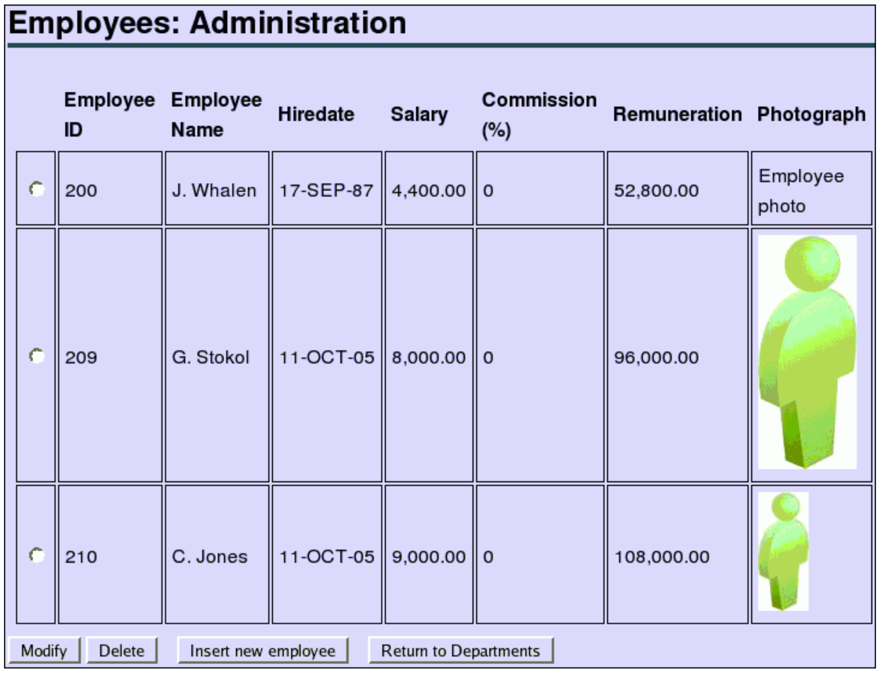
8. In the Insert New Image page, click **Save**:


Insert New Employee

Department ID	10
First Name	Chris
Last Name	Jones
Hiredate	11-OCT-05
Job	Marketing Manager
Salary	9000
Commission (%)	0
Photo	/home/gstokol/public_html

2005-10-11 12:32:04 Any Co.

The Employees page shows the new uploaded JPEG image with a reduced image size, compared to the image loaded before including the image resize code:



Employees: Administration

	Employee ID	Employee Name	Hiredate	Salary	Commission (%)	Remuneration	Photograph
○	200	J. Whalen	17-SEP-87	4,400.00	0	52,800.00	Employee photo
○	209	G. Stokol	11-OCT-05	8,000.00	0	96,000.00	
○	210	C. Jones	11-OCT-05	9,000.00	0	108,000.00	

8 Building Global Applications

This chapter discusses global application development in a PHP and Oracle Database environment. It addresses the basic tasks associated with developing and deploying global Internet applications, including developing locale awareness, constructing HTML content in the user-preferred language, and presenting data following the cultural conventions of the locale of the user.

Building a global Internet application that supports different locales requires good development practices. A locale refers to a national language and the region in which the language is spoken. The application itself must be aware of the locale preference of the user and be able to present content following the cultural conventions expected by the user. It is important to present data with appropriate locale characteristics, such as the correct date and number formats. Oracle Database is fully internationalized to provide a global platform for developing and deploying global applications.

This chapter has the following topics:

Establishing the Environment Between Oracle and PHP

Correctly setting up the connectivity between the PHP engine and the Oracle database is first step in building a global application, it guarantees data integrity across all tiers. Most internet based standards support Unicode as a character encoding, in this chapter we will focus on using Unicode as the character set for data exchange.

PHP uses the OCI8 extension, and rules that apply to OCI also apply to PHP. Oracle locale behavior (including the client character set used in OCI applications) is defined by the `NLS_LANG` environment variable. This environment variable has the form:

```
<language>_<territory>.<character set>
```

For example, for a German user in Germany running an application in Unicode, `NLS_LANG` should be set to

```
GERMAN_GERMANY.AL32UTF8
```

The language and territory settings control Oracle behaviors such as the Oracle date format, error message language, and the rules used for sort order. The character set AL32UTF8 is the Oracle name for UTF-8.

For information on the `NLS_LANG` environment variable, see the Oracle Database installation guides.

When PHP is installed on Apache, you can set `NLS_LANG` in `/etc/profile`:

```
export NLS_LANG GERMAN_GERMANY.AL32UTF8
```

If PHP is installed on Oracle HTTP Server, you must set `NLS_LANG` as an environment variable in `$ORACLE_HOME/opmn/conf/opmn.xml`:

```
<ias-component id="HTTP_Server">
  <process-type id="HTTP_Server" module-id="OHS">
    <environment>
      <variable id="PERL5LIB"
       value="D:\oracle\1012J2EE\Apache\Apache\mod_perl\site\5.6.1\lib"/>
      <variable id="PHPRC" value="D:\oracle\1012J2EE\Apache\Apache\conf"/>
      <variable id="NLS_LANG" value="german_germany.al32utf8"/>
    </environment>
    <module-data>
      <category id="start-parameters">
        <data id="start-mode" value="ssl-disabled"/>
      </category>
    </module-data>
    <process-set id="HTTP_Server" numprocs="1"/>
  </process-type>
</ias-component>
```

You must restart the Web listener to implement the change.

Manipulating Strings

PHP was designed to work with the ISO-8859-1 character set. To handle other character sets, specifically multibyte character sets, a set of "MultiByte String Functions" is available. To enable these functions, you must enable the mbstring extension.

Your application code should use functions such as `mb_strlen()` to calculate the number of characters in strings. This may return different values than `strlen()`, which returns the number of bytes in a string.

Once you have enabled the mbstring extension and restarted the Web server, several configuration options become available. You can change the behavior of the standard PHP string functions by setting `mbstring.func_overload` to one of the "Overload" settings.

For more information, see the PHP mbstring reference manual at

`http://www.php.net/mbstring`

Determining the Locale of the User

In a global environment, your application should accommodate users with different locale preferences. Once it has determined the preferred locale of the user, the application should construct HTML content in the language of the locale and follow the cultural conventions implied by the locale.

A common method to determine the locale of a user is from the default ISO locale setting of the browser. Usually a browser sends its locale preference setting to the HTTP server with the Accept Language HTTP header. If the Accept Language header is NULL, then there is no locale preference information available, and the application should fall back to a predefined default locale.

The following PHP code retrieves the ISO locale from the Accept-Language HTTP header through the `$_SERVER` Server variable.

```
$s = $_SERVER["HTTP_ACCEPT_LANGUAGE"]
```

Developing Locale Awareness

Once the locale preference of the user has been determined, the application can call locale-sensitive functions, such as date, time, and monetary formatting to format the HTML pages according to the cultural conventions of the locale.

When you write global applications implemented in different programming environments, you should enable the synchronization of user locale settings between the different environments. For example, PHP applications that call PL/SQL procedures should map the ISO locales to the corresponding `NLS_LANGUAGE` and `NLS_TERRITORY` values and change the parameter values to match the locale of the user before calling the PL/SQL procedures. The PL/SQL UTL_I18N package contains mapping functions that can map between ISO and Oracle locales.

Table 8–1 shows how some commonly used locales are defined in ISO and Oracle environments.

Table 8–1 Locale Representations in ISO, SQL, and PL/SQL Programming Environments

Locale	Locale ID	NLS_LANGUAGE	NLS_TERRITORY
Chinese (P.R.C.)	zh-CN	SIMPLIFIED CHINESE	CHINA
Chinese (Taiwan)	zh-TW	TRADITIONAL CHINESE	TAIWAN
English (U.S.A)	en-US	AMERICAN	AMERICA
English (United Kingdom)	en-GB	ENGLISH	UNITED KINGDOM
French (Canada)	fr-CA	CANADIAN FRENCH	CANADA
French (France)	fr-FR	FRENCH	FRANCE
German	de	GERMAN	GERMANY
Italian	it	ITALIAN	ITALY
Japanese	ja	JAPANESE	JAPAN
Korean	ko	KOREAN	KOREA
Portuguese (Brazil)	pt-BR	BRAZILIAN PORTUGUESE	BRAZIL
Portuguese	pt	PORTUGUESE	PORTUGAL
Spanish	es	SPANISH	SPAIN

Encoding HTML Pages

The encoding of an HTML page is important information for a browser and an Internet application. You can think of the page encoding as the character set used for the locale that an Internet application is serving. The browser must know about the page encoding so that it can use the correct fonts and character set mapping tables to display the HTML pages. Internet applications must know about the HTML page encoding so they can process input data from an HTML form.

Instead of using different native encodings for the different locales, Oracle recommends that you use UTF-8 (Unicode encoding) for all page encodings. This encoding not only simplifies the coding for global applications, but it also enables multilingual content on a single page.

Specifying the Page Encoding for HTML Pages

You can specify the encoding of an HTML page either in the HTTP header, or in HTML page header.

Specifying the Encoding in the HTTP Header

To specify HTML page encoding in the HTTP header, include the Content-Type HTTP header in the HTTP specification. It specifies the content type and character set. The Content-Type HTTP header has the following form:

```
Content-Type: text/html; charset=utf-8
```

The charset parameter specifies the encoding for the HTML page. The possible values for the charset parameter are the IANA names for the character encodings that the browser supports.

Specifying the Encoding in the HTML Page Header

Use this method primarily for static HTML pages. To specify HTML page encoding in the HTML page header, specify the character encoding in the HTML header as follows:

```
<meta http-equiv="Content-Type" content="text/html;charset=utf-8">
```

The charset parameter specifies the encoding for the HTML page. As with the Content-Type HTTP Header, the possible values for the charset parameter are the IANA names for the character encodings that the browser supports.

Specifying the Page Encoding in PHP

You can specify the encoding of an HTML page in the Content-Type HTTP header by setting the PHP configuration variable as follows:

```
default_charset = UTF-8
```

This setting does not imply any conversion of outgoing pages. Your application must ensure that the server-generated pages are encoded in UTF-8.

Organizing the Content of HTML Pages for Translation

Making the user interface available in the local language of the user is a fundamental task in globalizing an application. Translatable sources for the content of an HTML page belong to the following categories:

- Text strings included in the application code
- Static HTML files, images files, and template files such as CSS
- Dynamic data stored in the database

Strings in PHP

You should externalize translatable strings within your PHP application logic, so that the text is readily available for translation. These text messages can be stored in flat files or database tables depending on the type and the volume of the data being translated.

Static Files

Static files such as HTML and GIF files are readily translatable. When these files are translated, they should be translated into the corresponding language with UTF-8 as the file encoding. To differentiate the languages of the translated files, stage the static files of different languages in different directories or with different file names.

Data from the Database

Dynamic information such as product names and product descriptions is typically stored in the database. To differentiate various translations, the database schema holding this information should include a column to indicate the language. To select the desired language, you must include a WHERE clause in your query.

Presenting Data Using Conventions Expected by the User

Data in the application must be presented in a way that conforms to the expectation of the user. Otherwise, the meaning of the data can be misinterpreted. For example, the date '12/11/05' implies '11th December 2005' in the United States, whereas in the United Kingdom it means '12th November 2005'. Similar confusion exists for number and monetary formats of the users. For example, the symbol '.' is a decimal separator in the United States; in Germany this symbol is a thousand separator.

Different languages have their own sorting rules. Some languages are collated according to the letter sequence in the alphabet, some according to the number of stroke counts in the letter, and some languages are ordered by the pronunciation of the words. Presenting data not sorted in the linguistic sequence that your users are accustomed to can make searching for information difficult and time consuming.

Depending on the application logic and the volume of data retrieved from the database, it may be more appropriate to format the data at the database level rather than at the application level. Oracle Database offers many features that help to refine the presentation of data when the locale preference of the user is known. The following sections provide examples of locale-sensitive operations in SQL.

Oracle Date Formats

The three different date presentation formats in Oracle Database are standard, short, and long dates. The following examples illustrate the differences between the short date and long date formats for both the United States and Germany.

```
SQL> alter session set nls_territory=america nls_language=american;

Session altered.


SQL> select employee_id EmpID,
  2  substr(first_name,1,1)||'.'||last_name "EmpName",
  3  to_char(hire_date,'DS') "Hiredate",
  4  to_char(hire_date,'DL') "Long HireDate"
  5  from employees
  6* where employee_id <105;

     EMPID EmpName                     Hiredate   Long HireDate
---------- --------------------------- ---------- -----------------------------
       100 S.King                      06/17/1987 Wednesday, June 17, 1987
       101 N.Kochhar                   09/21/1989 Thursday, September 21, 1989
       102 L.De Haan                   01/13/1993 Wednesday, January 13, 1993
       103 A.Hunold                    01/03/1990 Wednesday, January 3, 1990
       104 B.Ernst                     05/21/1991 Tuesday, May 21, 1991

SQL> alter session set nls_territory=germany nls_language=german;

Session altered.

SQL> select employee_id EmpID,
  2  substr(first_name,1,1)||'.'||last_name "EmpName",
  3  to_char(hire_date,'DS') "Hiredate",
  4  to_char(hire_date,'DL') "Long HireDate"
  5  from employees
  6* where employee_id <105;

     EMPID EmpName                     Hiredate Long HireDate
---------- --------------------------- -------- ------------------------------
       100 S.King                      17.06.87 Mittwoch, 17. Juni 1987
       101 N.Kochhar                   21.09.89 Donnerstag, 21. September 1989
       102 L.De Haan                   13.01.93 Mittwoch, 13. Januar 1993
       103 A.Hunold                    03.01.90 Mittwoch, 3. Januar 1990
       104 B.Ernst                     21.05.91 Dienstag, 21. Mai 1991
```

Oracle Number Formats

The following examples illustrate the differences in the decimal character and group separator between the United States and Germany.

```
SQL> alter session set nls_territory=america;

Session altered.

SQL> select employee_id EmpID,
  2  substr(first_name,1,1)||'.'||last_name "EmpName",
  3  to_char(salary, '99G999D99') "Salary"
  4  from employees
  5* where employee_id <105

     EMPID EmpName                     Salary
---------- --------------------------- ----------
       100 S.King                       24,000.00
       101 N.Kochhar                    17,000.00
       102 L.De Haan                    17,000.00
       103 A.Hunold                      9,000.00
       104 B.Ernst                       6,000.00

SQL> alter session set nls_territory=germany;

Session altered.

SQL> select employee_id EmpID,
  2  substr(first_name,1,1)||'.'||last_name "EmpName",
  3  to_char(salary, '99G999D99') "Salary"
  4  from employees
  5* where employee_id <105

     EMPID EmpName                     Salary
---------- --------------------------- ----------
       100 S.King                       24.000,00
       101 N.Kochhar                    17.000,00
       102 L.De Haan                    17.000,00
       103 A.Hunold                      9.000,00
       104 B.Ernst                       6.000,00
```

Oracle Linguistic Sorts

Spain traditionally treats *ch*, *ll* as well as *ñ* as unique letters, ordered after *c*, *l* and *n* respectively. The following examples illustrate the effect of using a Spanish sort against the employee names Chen and Chung.

```
SQL> alter session set nls_sort=binary;

Session altered.

SQL> select employee_id EmpID,
  2         last_name "Last Name"
  3  from employees
  4  where last_name like 'C%'
  5* order by last_name

     EMPID Last Name
---------- -------------------------
       187 Cabrio
       148 Cambrault
       154 Cambrault
       110 Chen
       188 Chung
       119 Colmenares

6 rows selected.

SQL> alter session set nls_sort=spanish_m;

Session altered.

SQL> select employee_id EmpID,
  2         last_name "Last Name"
  3  from employees
  4  where last_name like 'C%'
  5* order by last_name

     EMPID Last Name
---------- -------------------------
       187 Cabrio
       148 Cambrault
       154 Cambrault
       119 Colmenares
       110 Chen
       188 Chung

6 rows selected.
```

Oracle Error Messages

The `NLS_LANGUAGE` parameter also controls the language of the database error messages being returned from the database. Setting this parameter prior to submitting your SQL statement ensures that the language-specific database error messages will be returned to the application.

Consider the following server message:

```
ORA-00942: table or view does not exist
```

When the `NLS_LANGUAGE` parameter is set to French, the server message appears as follows:

```
ORA-00942: table ou vue inexistante
```

For more discussion of globalization support features in Oracle Database, see "Working in a Global Environment" in *Oracle Database 2 Day Developer's Guide*.

Index