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E Maximizing Uptime During an Application Express Upgrade

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Preface

This guide explains how to install and configure Oracle Application Express.

• **Audience** (page xi)
• **Documentation Accessibility** (page xi)
• **Related Documents** (page xi)
• **Conventions** (page xii)
• **Third-Party License Information** (page xii)

## Audience

*Oracle Application Express Installation Guide* is intended for anyone responsible for installing Oracle Application Express.

To use this manual, you must have administrative privileges on the computer where you installed your Oracle database and familiarity with object-relational database management concepts.

## Documentation Accessibility


**Access to Oracle Support**

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

## Related Documents

For more information, see these Oracle resources:

• *Oracle Application Express Release Notes*
• *Oracle Application Express App Builder User’s Guide*
• *Oracle Application Express End User’s Guide*
• *Oracle Application Express Administration Guide*
• *Oracle Application Express SQL Workshop Guide*
Conventions

The following text conventions are used in this document:

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

Third-Party License Information

Oracle Application Express contains third-party code. Please see the Oracle Database Licensing Information book for notices Oracle is required to provide.

Note, however, that the Oracle program license that accompanied this product determines your right to use the Oracle program, including the third-party software, and the terms contained in the following notices do not change those rights.
Changes in This Release

This preface contains:

- Changes in Oracle Application Express Release 18.1 (page xiii)

Changes in Oracle Application Express Release 18.1

The following are changes in Oracle Application Express Installation Guide for Oracle Application Express release 18.1.

- Deprecated and Desupported Features (page xiii)
- Other Changes (page xiii)

Deprecated and Desupported Features

See "Deprecated Features" and "Desupported Features" in Oracle Application Express Release Notes.

Other Changes

The following are additional changes in the release:

- All content has been updated to reflect current release functionality.
1

Oracle Application Express Installation Overview

Oracle Application Express Installation Guide describes how to install Oracle Application Express in a on-premises (or local) installation.

How you sign in and access Oracle Application Express depends upon your user role and where Oracle Application Express resides. Oracle Application Express may reside in a local on-premises Oracle Database or in an Oracle Cloud Service.

- **About Accessing Oracle Application Express in Oracle Database Cloud** (page 1-1)
  Learn about accessing Oracle Application Express in Oracle Database Cloud.

- **Understanding the Installation Process** (page 1-1)
  An overview of the Oracle Application Express installation process.

- **Upgrading from a Previous Oracle Application Express Release** (page 1-8)
  Upgrading Oracle Application Express creates new database objects in a new schema and migrates the application metadata to the new release.

- **Choosing a Web Listener** (page 1-12)
  In order to run, Oracle Application Express must have access to a Web listener.

- **About the Oracle Application Express Runtime Environment** (page 1-17)
  Learn about the Oracle Application Express runtime environment.

### 1.1 About Accessing Oracle Application Express in Oracle Database Cloud

Learn about accessing Oracle Application Express in Oracle Database Cloud.

Oracle Application Express is installed and enabled in Oracle Database Cloud services such as Oracle Database Exadata Express Cloud Service and Oracle Database Cloud - Database Schema Service.

Oracle Application Express is available in Exadata Cloud Service and Database Cloud Service. However, you need to manually customize your databases to install and enable Oracle Application Express.

### 1.2 Understanding the Installation Process

An overview of the Oracle Application Express installation process.

- **About Planning Your Installation** (page 1-2)
  Oracle recommends you take the time to carefully plan your installation.
1.2.1 About Planning Your Installation

Oracle recommends you take the time to carefully plan your installation.

The installation process involves the following steps:

1. **Plan your installation:** During the planning phase, you should determine whether to install a full development environment or runtime environment. A full development environment provides complete access to the App Builder development environment to develop applications. A runtime environment is an appropriate choice for production implementations in which you want to run applications that cannot be modified.

   You should also determine which Web listener to use. Available options include the Oracle REST Data Services, Embedded PL/SQL Gateway, or Oracle HTTP Server and mod_plsql.

2. **Verify installation requirements:** the minimum requirements that your system must meet before you install the software.

3. **Install the software:** The required installation steps depend upon which Web listener you decide to use.
1.2.2 About Patch Sets and Point Releases

Patch sets provide bug fixes only. A point release includes bug fixes and incorporates all current patch sets.

Patch sets are a mechanism for delivering fully tested and integrated product fixes. Patch sets provide bug fixes only. Patch sets typically do not include new functionality and they do not require certification on the target system. Patch sets include all of the libraries that have been rebuilt to implement the bug fixes in the set. All of the fixes in the patch set have been tested and are certified to work with each other.

In between major product releases, Oracle may offer a point release. A point release (for example Oracle Application Express release 5.0.3) includes bug fixes and incorporates all current patch sets. Typically, point releases do not introduce new functionality.

1.2.3 About Oracle Application Express Schemas

Lists Oracle Application Express release and the schema name of each release.

The Application Express engine consists of a large number of Oracle tables and thousands of lines of PL/SQL programs residing within their own version specific schema. For each release of Oracle Application Express, this schema has a unique name as described in the Table 1-1 (page 1-3).

### Table 1-1  Oracle Application Express Release and Schema

<table>
<thead>
<tr>
<th>Oracle Application Express Release</th>
<th>Schema Name</th>
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<tbody>
<tr>
<td>Oracle Application Express release 18.1.x</td>
<td>APEX_180100</td>
</tr>
<tr>
<td>Oracle Application Express release 5.1.x</td>
<td>APEX_050100</td>
</tr>
<tr>
<td>Oracle Application Express release 5.0.x</td>
<td>APEX_050000</td>
</tr>
<tr>
<td>Oracle Application Express release 4.2.x</td>
<td>APEX_040200</td>
</tr>
<tr>
<td>Oracle Application Express release 4.1.x</td>
<td>APEX_040100</td>
</tr>
<tr>
<td>Oracle Application Express release 3.2.x</td>
<td>APEX_030200</td>
</tr>
<tr>
<td>Oracle Application Express release 3.1.x and earlier</td>
<td>FLOWS_xxxxxx</td>
</tr>
</tbody>
</table>

1.2.4 About the Installation Process

You can install Oracle Application Express or update from previous release using the same installation procedure and the installation scripts.
The installation script checks for the latest existing Oracle Application Express schema and automatically copies the instance metadata, workspaces, and applications from the previous schema into the current schema. The original schema associated with the previous release is left completely unaltered. Following best practices, Oracle recommends that you create new tablespaces for a new release of Oracle Application Express and follow the appropriate installation instructions as outlined in this document.

### 1.2.5 About Accessing Oracle Application Express

You access the Oracle Application Express development environment, by signing in to a shared work area called a workspace.

How you sign in and access Oracle Application Express depends upon your user role.

A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private. Each workspace has a unique ID and name. An instance administrator can create a workspace manually within Oracle Application Express Administration Services or have users submit requests. Oracle Application Express Administration Services is a separate application for managing an entire Oracle Application Express instance.

Users are divided into four primary roles:

- **Instance administrators** are superusers that manage an entire hosted instance using a separate application called Oracle Application Express Administration Services. Instance administrators manage workspace provisioning, configure features and instance settings, and manage security.

- **Workspace administrators** can perform administrator tasks specific to a workspace such as configuring workspace preferences, managing user accounts, monitoring workspace activity, and viewing log files.

- **Developers** are users who sign in to a workspace and create and edit applications.

- **End users** can only run existing database or Websheet applications.

If you are a developer, an administrator must grant you access to shared work area called a workspace. If you are an Instance administrator, you must sign in to Oracle Application Express Administration Services, determine whether to specify a provisioning mode, create a workspace, and then sign in to that workspace.

#### About Specifying a Provisioning Mode

The Instance administrator determines how the process of provisioning (or creating) a workspace works for a specific Oracle Application Express instance. To determine how provisioning works, an Instance Administrator selects one of the following options on the Instance Settings page:

- **Manual** - In this mode, an Instance administrator creates new workspaces and notifies the Workspace administrator of the login icon.

- **Request** - Users request workspaces directly in a self-service fashion. Users click a link on the login page to access a request form. After the workspace request has been granted, users are automatically emailed the appropriate login information.

- **Request with Email Verification** - In this mode, users request workspaces directly by clicking a link on the login page to access a request form. Each user receives an initial email containing a verification link. Clicking this link validates the
user's email address and then the request is processed. Then another email is sent to the user containing login credentials (that is, the workspace name, username, and password).

About Creating Workspaces and Users

Before you can develop or install applications, an administrator must create a workspace and add Oracle Application Express users. To learn more contact your administrator, or see the "Creating a Workspace and Adding Oracle Application Express Users" section for your Web listener in this document.

1.2.6 Signing In When Workspace Requests Is Enabled

Signing into a workspace requires you first request a workspace and then sign into it.

Note:

This information does not apply to Oracle Database Cloud Service (Database Schema).

If your administrator has enabled workspace requests, signing in to a workspace requires the following steps. First, you request a workspace using a link on the Sign In page. Second, your administrator approves the request and the system send you an email with your sign in credentials. Third, you sign in to your workspace.

Note:

Before users can request a workspace or change their passwords, an Oracle Application Express administrator must configure Oracle Application Express environment preferences.

- Requesting a Workspace from the Sign In Page (page 1-6)
  Learn how to request for a Workspace from the Oracle Application Express Sign In page.

- Signing In To a Workspace (page 1-6)
  Learn how to sign into application upon approval from Oracle Application Express administrator for a workspace request.

- Signing Out of a Workspace (page 1-7)
  Learn how to sign out of an Oracle Application Express workspace.

- Recovering Your Workspace Name (page 1-7)
  Learn how to recover your workspace name.

- Resetting Your Password from the Sign In Page (page 1-7)
  Learn how to reset your password from the Sign In page.
1.2.6.1 Requesting a Workspace from the Sign In Page

Learn how to request for a Workspace from the Oracle Application Express Sign In page.

Note:

Before a user can request a workspace from the Sign In page, your Oracle Application Express administrator must configure Oracle Application Express to support workspace requests.

To request a workspace from the Sign In page:

1. In a web browser, navigate to the Oracle Application Express Sign In page. The Sign In page appears.
2. Under Workspace, click Request a Workspace. The Request Service Wizard appears.
3. Select the type of workspace. Options include:
   - Application Development
   - Packaged Apps Only
4. Follow the on-screen instructions.

1.2.6.2 Signing In To a Workspace

Learn how to sign into application upon approval from Oracle Application Express administrator for a workspace request.

After an Oracle Application Express administrator approves a workspace request, an e-mail arrives with your login credentials (that is, the workspace name, user name, and password).

If your administrator selected Email Verification as the automated method for handling new workspace requests, you might first receive an email containing a verification link. This step ensures that your email is a valid one before the workspace request is approved.

To sign in to Oracle Application Express:

1. In a web browser, navigate to the Oracle Application Express Login page provided in your workspace request email.
2. On the Sign In page:
- In the Workspace field, enter the name of your workspace.
- In the Username field, enter your user name.
- In the Password field, enter your case-sensitive password.

3. Click **Sign In**.

The workspace home page appears.

**Tip:**

Depending on your setup, you might be required to change your password when you sign in for the first time.

### 1.2.6.3 Signing Out of a Workspace

Learn how to sign out of an Oracle Application Express workspace.

To sign out of an Oracle Application Express workspace:

- Select the **Account Menu** in the upper right corner of the window and click **Sign out**.

### 1.2.6.4 Recovering Your Workspace Name

Learn how to recover your workspace name.

If you cannot remember your workspace name, you can request a list of all workspace names associated with your email address.

To find your workspace name:

1. In a web browser, navigate to the Oracle Application Express Sign In page.
   
   The Sign In page appears.

2. On the Sign In page, click **Reset Password**.

3. Click **Find My Workspace**.

4. Enter your email address and click **Find Workspace**.

   You will receive an email listing all workspaces associated with the email address you provided.

### 1.2.6.5 Resetting Your Password from the Sign In Page

Learn how to reset your password from the Sign In page.

**Tip:**

To reset your password from the Sign In page, you must provide your email address and workspace name.
To reset your password from the Sign In Page:

1. In a web browser, navigate to the Oracle Application Express Sign In page. The Sign In page appears.
2. Under Sign in, click **Reset Password**.
3. Enter your email address and workspace name, and click **Reset Password**. You will receive an email containing new passwords for all accounts associated with the email address and workspace name you provided.
4. On the Sign In page, enter your workspace, username, and the new password and click **Sign In**.

**Tip:**

Passwords are case sensitive. Do not copy and paste the new password.

5. On Change Password, enter:
   a. Current Password - Enter the current password provided by the email.
   b. New Password - Enter your new password.
   c. Confirm Password - Enter your new password again.
   d. Click **Apply Changes**.

### 1.3 Upgrading from a Previous Oracle Application Express Release

Upgrading Oracle Application Express creates new database objects in a new schema and migrates the application metadata to the new release.

If you have release 1.5.x, 1.6.x, 2.0.x, 2.2.x, 3.0.x, 3.1.x, 3.2.x, 4.0x, 4.1x, 4.2.x, 5.0x, or 5.1x of Oracle Application Express, following any of the installation scenarios in this guide upgrades your Oracle Application Express instance to release 18.1 and creates Oracle Application Express 18.1 database objects in a new schema and migrates the application metadata to the new release.

- **Sample Upgrade Scenarios** (page 1-9)
  Common upgrade scenarios include upgrading from prior release, upgrading from a point release, and installing an Oracle Database release which include Oracle Application Express.

- **Determining Your Oracle Application Express Release Version** (page 1-10)
  You can view the release version of Oracle Application Express on the workspace home page.

- **About Determining the version of Oracle REST Data Services** (page 1-10)
  You can view the version of Oracle REST Data Services on the About Application Express page.
• About Installing the Oracle Application Express Release Included with the Oracle Database (page 1-10)
   Learn about the Oracle Application Express release included with the Oracle Database release.

• About Upgrading Existing Applications (page 1-11)
   If you install a new release of Oracle Application Express, the installation process updates existing applications to the latest release.

• About Specifying an Application Compatibility Mode (page 1-11)
   You can specify the compatibility mode in the application definition within each application.

• About Testing Requirements (page 1-11)
   Determining the appropriate amount of regression testing when upgrading Oracle Application Express depends upon the complexity, size, and number of applications you are upgrading.

• About Cleaning Up Your Environment (page 1-12)
   Following the successful upgrade of all of the environments to the latest release of Oracle Application Express, you should clean-up the environments.

• About Reverting to a Previous Release (page 1-12)
   You can revert to a previous release of Oracle Application Express.

---

1.3.1 Sample Upgrade Scenarios

Common upgrade scenarios include upgrading from prior release, upgrading from a point release, and installing an Oracle Database release which include Oracle Application Express.

Both Patch sets and point releases are available for download from My Oracle Support. Table 1-2 (page 1-9) lists common upgrade scenarios.

<table>
<thead>
<tr>
<th>Upgrade Scenarios</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade from a prior Oracle Application Express release</td>
<td>Download the latest files from the Downloads page.</td>
</tr>
<tr>
<td>Upgrade from a major Oracle Application Express to point release</td>
<td>Download the point release from My Oracle Support.</td>
</tr>
<tr>
<td>You install Oracle Database which include Oracle Application Express</td>
<td>Download the latest files from the Downloads page.</td>
</tr>
</tbody>
</table>
1.3.2 Determining Your Oracle Application Express Release Version

You can view the release version of Oracle Application Express on the workspace home page.

To determine which release of Oracle Application Express you are currently running:

1. Sign in to Oracle Application Express.
   The Workspace home page appears.
   The current release version displays in bottom right corner.

2. To view the About Application Express page:
   • Locate the Help menu at the top of the page.
   • From the Help menu, select About.
   The About Application Express page appears.

1.3.3 About Determining the version of Oracle REST Data Services

You can view the version of Oracle REST Data Services on the About Application Express page.

If you are using Oracle REST Data Services as your web listener for Oracle Application Express, view the About Application Express page. The version of Oracle REST Data Services (ORDS) will be in the CGI Environment section, next to APEX_LISTENER_VERSION. If APEX_LISTENER_VERSION does not appear, then your Oracle Application Express instance is not using ORDS as its web listener.

1.3.4 About Installing the Oracle Application Express Release Included with the Oracle Database

Learn about the Oracle Application Express release included with the Oracle Database release.

Oracle Application Express is included with the following Oracle Database releases:

• Oracle Database 11g Release 1 (11.1) - Oracle Application Express Release 3.0.
• Oracle Database 11g Release 2 (11.2) - Oracle Application Express Release 3.2.
• Oracle Database 12c Release 1 (12.1) - Oracle Application Express Release 4.2.
• Oracle Database 12c Release 2 (12.2) - Oracle Application Express Release 5.0.

The Oracle Database releases less frequently than Oracle Application Express. Therefore, Oracle recommends updating to the latest Oracle Application Express release available on Oracle Technology Network. To learn more, see the installation instructions for the appropriate Web Listener in your environment.
1.3.5 About Upgrading Existing Applications

If you install a new release of Oracle Application Express, the installation process updates existing applications to the latest release.

The upgrade process is designed to not alter the application user interface or application components. As a result, application components that may impact the user interface are left untouched by the upgrade process. It is the developer’s responsibility to manually review these components and update them, or leave them as is. Examples of components which may impact existing functionality include new features added to interactive reports, charts, certain validations, and so on.

**Tip:**
Charts that use custom XML must be updated manually otherwise the custom XML will be lost.

1.3.6 About Specifying an Application Compatibility Mode

You can specify the compatibility mode in the application definition within each application.

Within each application, you can also specify the Compatibility Mode in the Application Definition. Changing the application Compatibility Mode changes certain runtime behaviors. Compatibility Mode options include Pre 4.1, 4.1, 4.2, 5.0, and 5.1/18.1.

1.3.7 About Testing Requirements

Determining the appropriate amount of regression testing when upgrading Oracle Application Express depends upon the complexity, size, and number of applications you are upgrading.

You should include the majority of complex pages, particularly those that incorporate significant JavaScript or extensive PL/SQL computations or processes. Developers should ensure pages which they manually update based on the Upgrade Application or Advisor are also included in regression tests. Not all remaining pages have to be included in regression testing. Oracle recommends you include a good representation of different page types includes reports, charts, and forms. An application should always be included in regression testing if its compatibility mode was modified post-upgrade.
While regression testing of upgraded applications is imperative to minimize risk of disrupting the end users, it is important that testing is not drawn out for an extended period. As a general rule:

- Step 1: Upgrade your development environment first. Allow developers to review the applications and make initial updates as needed.
- Step 2: Upgrade your QA/Test environment.
- Step 3: Upgrade applications from development are built into this environment.
- Step 4: Upgrade your production environment.
- Step 5: Build upgraded applications into this environment.

### 1.3.8 About Cleaning Up Your Environment

Following the successful upgrade of all of the environments to the latest release of Oracle Application Express, you should clean-up the environments.

Once you start developing with the newer release, the Oracle Application Express schema associated with the prior release can be deleted. If you installed the prior release into a separate tablespace, you can simply drop the specific tablespace. Oracle recommends leaving the older Oracle Application Express schema(s) for a few weeks and then remove them from the development, test, and production environments. This cleanup process releases disk space and ensures that no one accesses an outdated schema using tools such as SQL Developer or SQL*Plus.

### 1.3.9 About Reverting to a Previous Release

You can revert to a previous release of Oracle Application Express.

Because Oracle Application Express creates a new schema for each major release, reverting back to a prior release is a relatively simple process. If you revert to a prior release, any modifications made in the current Oracle Application Express instance are lost. The main task is to switch the public synonyms and grants to point at the previous schema instead of the new schema.

### 1.4 Choosing a Web Listener

In order to run, Oracle Application Express must have access to a Web listener.

- **About Choosing a Web Listener** (page 1-13)
  You can choose any one of the three Web listeners - Oracle REST Data Services, Oracle HTTP Server, and Embedded PL/SQL gateway.

- **Comparing Web Listener Options** (page 1-14)
  Learn about comparing Web listener options for Oracle Application Express.

- **About Oracle REST Data Services** (page 1-14)
  Oracle REST Data Services (formerly Oracle Application Express Listener) is Java-based, can be installed into any supported J2EE compliant Web Server, and is the preferred option for use with Oracle Application Express.

- **About the Embedded PL/SQL Gateway** (page 1-15)
  Oracle XML DB Protocol Server with the embedded PL/SQL gateway installs with Oracle Database.
1.4.1 About Choosing a Web Listener

You can choose any one of the three Web listeners - Oracle REST Data Services, Oracle HTTP Server, and Embedded PL/SQL gateway.

Note:
Oracle HTTP Server and Embedded PL/SQL gateway are considered legacy web listeners and their configuration instructions are in the appendix.

Oracle Application Express uses a simple architecture where pages are dynamically generated using metadata stored within the Oracle Database. There is no code generation or file based compilation. Once fully installed, a Uniform Resource Locator (URL) is defined for both developers and end users to access Oracle Application Express. Users require only a Web browser and the required URL. No additional client software is required.

The Web listener functions as a communications broker between the Web browser and the Oracle Application Express objects in the Oracle database by mapping browser requests into database stored procedure calls. You have a choice of three Web listeners.

- Oracle REST Data Services.
• Embedded PL/SQL gateway (legacy web listener).
• Oracle HTTP Server (deprecated).

1.4.2 Comparing Web Listener Options

Learn about comparing Web listener options for Oracle Application Express.

Table 1-3 (page 1-14) compares Web Listener options for Oracle Application Express.

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Oracle REST Data Services</th>
<th>Embedded PL/SQL Gateway</th>
<th>Oracle HTTP Server with mod_plsql</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image location</td>
<td>File system</td>
<td>Within the database</td>
<td>File system</td>
</tr>
<tr>
<td>Configuration options</td>
<td>GUI interface (ORDS 3.x); Administration pages</td>
<td>Database initialization parameters</td>
<td>Database Access Descriptor (DAD)</td>
</tr>
<tr>
<td>Connection Pool settings</td>
<td>JDBC parameters</td>
<td>SHARED_SERVERS; MAX_SHARED_SERVERS</td>
<td>Min/MaxSpareServers; MaxClients</td>
</tr>
<tr>
<td>Emit RESTful Web Services</td>
<td>Yes (ORDS 3.x Release )</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Support multi-databases</td>
<td>Yes, including Oracle RAC</td>
<td>No</td>
<td>Yes, including Oracle RAC</td>
</tr>
<tr>
<td>Virus scan files</td>
<td>Yes, with integration of ICAP server</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>PDF printing</td>
<td>Yes, included FOP support</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Environment recommendations</td>
<td>All</td>
<td>Development only</td>
<td>All</td>
</tr>
</tbody>
</table>

Note: Deprecated as of Oracle HTTP Server 12c (12.1.3).

1.4.3 About Oracle REST Data Services

Oracle REST Data Services (formerly Oracle Application Express Listener) is Java-based, can be installed into any supported J2EE compliant Web Server, and is the preferred option for use with Oracle Application Express.

It is a free tool that is fully supported against Oracle WebLogic Server, Oracle Glassfish Server, and Apache Tomcat. Oracle REST Data Services is part of the reference architecture used to operate the Oracle Database Cloud Service.

Note:

There are licensing costs associated with Oracle WebLogic Server. Oracle Glassfish Server is a no cost, open-source product.

Using Oracle REST Data Services creates an architecture which consists of:

• A web browser
The major advantage of this architecture is the separation of the mid-tier and the database tier.

**Tip:**

This architecture is appropriate for Oracle Real Application Clusters (Oracle RAC) environments.

### 1.4.4 About the Embedded PL/SQL Gateway

Oracle XML DB Protocol Server with the embedded PL/SQL gateway installs with Oracle Database.

Embedded PL/SQL gateway provides the Oracle database with a Web server and also the necessary infrastructure to create dynamic applications. The embedded PL/SQL gateway runs in the Oracle XML DB Protocol server in the Oracle database and includes the core features of mod_plsql.

The embedded PL/SQL gateway consists of a simple two tier architecture: a Web browser and an Oracle database containing the embedded PL/SQL gateway and Oracle Application Express.

Advantages of the embedded PL/SQL gateway include:

- Ease of configuration
- Included in the database
- No separate server installation

**Where Images Are Stored When Using the Embedded PL/SQL Gateway**

When running Oracle Application Express with the Embedded PL/SQL Gateway, images are stored directly in the database within the Oracle XML DB repository. You can access images by using the WebDAV feature of Oracle XML DB or by using FTP.

### 1.4.5 About Security Considerations When Using the Embedded PL/SQL Gateway

Learn about security considerations when using the embedded PL/SQL gateway.

The embedded PL/SQL gateway runs in the database as part of the Oracle XML DB HTTP listener. The Oracle XML DB HTTP listener and embedded PL/SQL gateway provides the equivalent core features of Oracle HTTP Server and mod_plsql. Because the HTTP Listener runs in the same database where Oracle Application Express is installed, it is not possible to separate the HTTP listener from the database. For this reason, Oracle does not recommend the Embedded PL/SQL Gateway for applications that run on the Internet. Additionally, the embedded PL/SQL gateway does not provide...
the same flexibility of configuration and detailed logging as Oracle REST Data Services or Oracle HTTP Server.

1.4.6 About Oracle HTTP Server with mod_plsql

The Oracle HTTP Server (Apache) with mod_plsql can be placed on the same physical machine as the database, or on a separate physical machine.

**Note:**

mod_plsql is deprecated as of Oracle HTTP Server 12c (12.1.3). For more information, see My Oracle Support Note 1576588.1. Oracle recommends using Oracle REST Data Services instead.

If Oracle HTTP Server is installed on the same physical machine as the database then the Oracle HTTP Server is included as part of the limited-use license included with the Oracle Database license. Otherwise, you must obtain a separate Oracle HTTP Server license.

Using Oracle HTTP Server (Apache) with mod_plsql creates an architecture which consists of:

- a Web browser
- Oracle HTTP Server with mod_plsql
- Oracle Database containing Oracle Application Express

This architecture separates the mid-tier and the database tier.

**Tip:**

This architecture is appropriate for Oracle Real Application Clusters (Oracle RAC) environments.

Where Images Are Stored When Using Oracle HTTP Server

In an Oracle HTTP Server or Oracle Application Server configuration, images are stored on the file system in the location referenced by the alias /i/. If you are upgrading Oracle Application Express from a prior release, you can locate the images directory on the file system, by reviewing the following files and searching for the text alias /i/:

- Oracle HTTP Server distributed Oracle9i Release 2—see the httpd.conf file.
- Oracle Application Server 10g—see the marvel.conf or dads.conf files.
- Oracle HTTP Server distributed with Oracle Database 11g or 12c —see the marvel.conf or dads.conf files.

Specific examples for locating the text alias /i/ can be found in Copying the Images Directory.
1.4.7 Selecting a Web Listener in an Oracle RAC Environment

Learn about selecting a Web listener in an Oracle RAC environment.

When running Oracle Application Express in an Oracle Real Application Clusters (Oracle RAC) environment, Oracle recommends that you use Oracle REST Data Services. Oracle REST Data Services permit you to specify a connection in the service name format, so that one HTTP Server can access all nodes.

1.5 About the Oracle Application Express Runtime Environment

Learn about the Oracle Application Express runtime environment.

As with any software development life cycle, Oracle strongly recommends that you have different environments for development, testing/QA, and production. For testing and production instances, Oracle Application Express supports the ability to install just a runtime version of Oracle Application Express. This runtime environment minimizes the installed footprint and privileges and improves application security since in a runtime instance developers cannot inadvertently update a production application.

An Oracle Application Express runtime environment enables you to run production applications, but it does not provide a Web interface for administration. A runtime environment only includes the packages necessary to run your application, making it a more hardened environment. You administer the Oracle Application Express runtime environment using SQL*Plus or SQL Developer and the APEX_INSTANCE_ADMIN API.

See Also:

"About the Advantages of the Application Express Runtime Environment" in Oracle Application Express App Builder User’s Guide

Scripts are provided to remove or add the developer interface from an existing instance. To learn more, see one of the following for the corresponding type of installation:
See also:

- For Installing Application Express and Configuring Oracle REST Data Services (page 4-1), see "Converting Between Runtime and Full Development Environments (page 4-30)"
- For Installing Application Express and Configuring Embedded PL/SQL Gateway (page A-1), see "Converting Between Runtime and Full Development Environments (page A-29)"
- For Installing Application Express and Configuring Legacy Web Listener – Oracle HTTP Server (page B-1), see "Converting Between Runtime and Full Development Environments (page B-31)"
Oracle Application Express Installation Requirements

Before installing Oracle Application Express you must verify your configuration meets the minimum installation requirements.

- **Oracle Database Requirements** (page 2-1)
  Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

- **Checking the MEMORY_TARGET of the Target Database** (page 2-2)
  Oracle Application Express requires the system global area (SGA) and program global area (PGA) to be at least 300 MB.

- **Browser Requirements** (page 2-3)
  Oracle Application Express requires a JavaScript-enabled browser and supports the current and prior major release of Google Chrome, Mozilla Firefox, Apple Safari, Microsoft Internet Explorer, and Microsoft Edge.

- **Web Listener Requirements** (page 2-3)
  In order to run Oracle Application Express you must have access to certain Web listener releases.

- **Disk Space Requirement** (page 2-3)
  Oracle Application Express disk space requirements are described in this section.

- **Oracle XML DB Requirement** (page 2-4)
  Oracle XML DB must be installed in the Oracle database that you want to use if you are installing a full development environment. Oracle XML DB is not required for runtime only installations. If you are using a preconfigured database created either during an installation or by Database Configuration Assistant (DBCA), Oracle XML DB is already installed and configured.

### 2.1 Oracle Database Requirements

Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

If you are upgrading an Oracle Database version 12.1 CDB, you must download from My Oracle Support the one off patch for bug 20618595. Search for 20618595 on the Patches tab.
2.2 Checking the MEMORY_TARGET of the Target Database

Oracle Application Express requires the system global area (SGA) and program global area (PGA) to be at least 300 MB.

Databases typically use automatic memory management, where the memory can be controlled by the server parameter MEMORY_TARGET. If your database does not use automatic memory management, consult the Oracle Database Administrator's Guide to find out how to configure manual memory parameters (for example, SGA_TARGET, PGA_AGGREGATE_TARGET, SHARED_POOL_SIZE) instead, for a similar result.

To check the MEMORY_TARGET of the target database:

1. Start the database:
   ```sql
   SQL> STARTUP
   ```

2. If necessary, enter the following command to determine whether the system uses an initialization parameter file (initsid.ora) or a server parameter file (spfiledbname.ora):
   ```sql
   SQL> SHOW PARAMETER PFILE;
   ```
   This command displays the name and location of the server parameter file or the initialization parameter file.

3. Determine the current values of the MEMORY_TARGET parameter:
   ```sql
   SQL> SHOW PARAMETER MEMORY_TARGET
   ```

4. If the value is 0, your database is using manual memory management. Consult the Oracle Database Administrator's Guide to learn how to configure an equivalent memory size using manual memory management, instead of continuing with the steps that follow.
   If the system is using a server parameter file, set the value of the MEMORY_TARGET initialization parameter to at least 300 MB:
   ```sql
   SQL> ALTER SYSTEM SET MEMORY_TARGET='300M' SCOPE=spfile;
   ```

5. If the system uses an initialization parameter file, change the value of the MEMORY_TARGET parameter to at least 300 MB in the initialization parameter file (initsid.ora).

6. Shut down the database:
   ```sql
   SQL> SHUTDOWN
   ```

7. Restart the database:
   ```sql
   SQL> STARTUP
   ```
2.3 Browser Requirements

Oracle Application Express requires a JavaScript-enabled browser and supports the current and prior major release of Google Chrome, Mozilla Firefox, Apple Safari, Microsoft Internet Explorer, and Microsoft Edge.

Note:
Microsoft Internet Explorer 11 is the prior major release, with Microsoft Edge being the current Microsoft browser.

2.4 Web Listener Requirements

In order to run Oracle Application Express you must have access to certain Web listener releases.

In order to run Oracle Application Express you must have access to one of the following:

- Oracle REST Data Services release 3.0.12 or later
  Oracle REST Data Services Listener is a Java-based Web server. It features file system caching, offers improved file upload capability, and is certified with Oracle WebLogic Server, Oracle Glassfish Server, and Apache Tomcat.

- Embedded PL/SQL gateway
  Oracle XML DB Protocol Server with the embedded PL/SQL gateway installs with Oracle Database 11g Release 1 (11.1). It provides the database with a Web server and the necessary infrastructure to create dynamic applications.

- Oracle HTTP Server and mod_plsql
  Oracle HTTP Server uses the mod_plsql plug-in to communicate with the Oracle Application Express engine within the Oracle database.

2.5 Disk Space Requirement

Oracle Application Express disk space requirements are described in this section.

Oracle Application Express disk space requirements are as follows:

- Free space for Oracle Application Express software files on the file system: 310 MB if using English only download (apex_18.1_en.zip) and 705 MB if using full download (apex_18.1.zip).
- Free space in Oracle Application Express tablespace: 220 MB
- Free space in SYSTEM tablespace: 100 MB
- Free space in Oracle Application Express tablespace for each additional language (other than English) installed: 60 MB
2.6 Oracle XML DB Requirement

Oracle XML DB must be installed in the Oracle database that you want to use if you are installing a full development environment. Oracle XML DB is not required for runtime only installations. If you are using a preconfigured database created either during an installation or by Database Configuration Assistant (DBCA), Oracle XML DB is already installed and configured.

Tip:

The installer does a prerequisite check for Oracle XML DB and will exit if it is not installed.

Tip:

The installation of Oracle XML DB creates the user ANONYMOUS. In order for Oracle Application Express workspace provisioning to work properly, the ANONYMOUS user must not be dropped from the database.
Utilizing the Multitenant Architecture in Oracle Database 12c or Later

This section outlines the installation choices and different scenarios associated with copying and moving pluggable databases introduced by the Oracle Database 12c or later multitenant architecture with respect to Oracle Application Express (Application Express).

- **Understanding the Installation Choices** (page 3-1)
  Learn about the installation choices in Oracle Application Express.

- **Installing Application Express into Different PDBs** (page 3-2)
  You can install different versions of Oracle Application Express into different PDBs.

- **Plugging in a PDB When Application Express is Installed in the Root Container** (page 3-7)
  Learn about scenarios in which the target database has Application Express installed into the root container, CDB$ROOT - the default installation option.

- **Plugging in a PDB When Application Express Is Not in the Root Container of the Target CDB** (page 3-12)
  The scenarios in this section describe when Application Express is not installed in the root container, CDB$ROOT, by explicitly removing it as described in Uninstalling Application Express 18.1 from a CDB.

### 3.1 Understanding the Installation Choices

Learn about the installation choices in Oracle Application Express.

Oracle Database 12c Release 1 (12.1) introduces the multitenant architecture. This database architecture has a multitenant container database (CDB) that includes a root container, CDB$ROOT, a seed database, PDB$SEED, and multiple pluggable databases (PDBs). Each pluggable database is equivalent to a separate database instance in Oracle Database release 11g. The root container, CDB$ROOT, holds common objects that are accessible to every PDB utilizing metadata links or object links. The seed database, PDB$SEED, is used when creating a new PDB to seed the new database. The key benefit of the Oracle Database 12c or later multitenant architecture is that the database resources, such as CPU and memory, can be shared across all of the PDBs. This architecture also enables many databases to be treated as one for tasks such as upgrades or patches, and backups.

When configuring multitenant architecture, Oracle Application Express is installed in the root container database by default in Oracle Database 12c Release 1 (12.1). In the default installation the root container, CDB$ROOT, includes the APEX_040200 schema to store the common database objects for the Application Express engine such as packages, functions, procedures and views. The seed database, PDB$SEED, also includes the APEX_040200 schema to store the tables that are part of the Application Express engine.
You can create a new PDB by copying PDB$SEED, which includes the APEX_040200 schema with the Application Express tables, and creating metadata links back to the common database objects held in the APEX_040200 schema within the CDB$ROOT. As such there are multiple copies of the Application Express engine tables and only single copies of the Application Express engine packages, functions, procedures and views. Each PDB will have the APEX_040200 schema and have its own copy of the Application Express engine’s tables so that it can hold the metadata for the Application Express applications defined within that PDB.

**Tip:**
Oracle recommends removing Oracle Application Express from the root container database for the majority of use cases, except for hosting companies or installations where all pluggable databases (PDBs) utilize Oracle Application Express and they all need to run the exact same release and patch set of Oracle Application Express.

### 3.2 Installing Application Express into Different PDBs

You can install different versions of Oracle Application Express into different PDBs. Providing Application Express is not installed in the container database, you can install a local Application Express within each PDB as required. When Application Express is installed locally there are no Application Express metadata linked objects and all packages, views, and tables are created within the APEX_180100 schema, within each PDB where Application Express is installed.

- **Uninstalling Application Express 18.1 from a CDB** (page 3-2)
  Learn how to uninstall Application Express from a CDB.
- **Installing Application Express Locally in a PDB** (page 3-3)
  Learn how to install Application Express locally in a PDB.
- **Installing Application Express 18.1 into a CDB** (page 3-5)

### 3.2.1 Uninstalling Application Express 18.1 from a CDB

Learn how to uninstall Application Express from a CDB.

To uninstall Application Express from a CDB:

**Note:**
Installing or removing Application Express from a CDB requires a local connection to the database.

This section describes removing Application Express 18.1 from a CDB. If you wish to remove Oracle Application Express from the CDB that shipped with Oracle Database 12.1, you should use apxremov_con.sql from either $ORACLE_HOME/apex, or from a 4.2.6 APEX distribution.
1. Change to the apex directory in the location where you unzipped the distribution.

2. Start SQL*Plus and connect to the database where Application Express is installed as SYS specifying the SYSDBA role. For example:

   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run apxremov.sql.
   For example:
   ```
   @apxremov.sql
   ```

**Note:**

If you run apxremov.sql after PDBs have been added to the CDB, then Application Express uninstalls from all of the PDBs. Therefore, any applications defined in any of the PDBs will be removed.

**See Also:**

"Changes in This Release (page xiii)"

### 3.2.2 Installing Application Express Locally in a PDB

Learn how to install Application Express locally in a PDB.

Once you have removed Application Express from the container database by following the instructions in "Uninstalling Application Express 18.1 from a CDB (page 3-2)," you can install Application Express locally in a PDB.

To install Application Express locally in a PDB:

1. Change the apex directory in the location where you unzipped the distribution.

2. Start SQL*Plus and connect to the database where Application Express is installed as SYS specifying the SYSDBA role. For example:

   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

   - On UNIX and Linux:
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password

3. Set the container to the PDB you want to install Application Express locally:
   ALTER SESSION SET CONTAINER = <PDB_name>;

4. Select the appropriate installation option.

   **Full development environment** provides complete access to the App Builder environment to develop applications. A **Runtime environment** enables users to run applications that cannot be modified.

   Available installation options include:

   - **Full development environment** - Run `apexins.sql` passing the following four arguments in the order shown:
     ```sql
     @apexins.sql tablespace_apex tablespace_files tablespace_temp images
     ```
     Where:
     - `tablespace_apex` is the name of the tablespace for the Application Express application user.
     - `tablespace_files` is the name of the tablespace for the Application Express files user.
     - `tablespace_temp` is the name of the temporary tablespace or tablespace group.
     - `images` is the virtual directory for Application Express images. To support future Application Express upgrades, define the virtual image directory as `/i/`.

     For example:
     ```sql
     @apexins.sql SYSAUX SYSAUX TEMP /i/
     ```

   - **Runtime environment** - Run `apxrtins.sql` passing the following four arguments in the order shown:
     ```sql
     @apxrtins.sql tablespace_apex tablespace_files tablespace_temp images
     ```
     Where:
     - `tablespace_apex` is the name of the tablespace for the Application Express application user.
     - `tablespace_files` is the name of the tablespace for the Application Express files user.
     - `tablespace_temp` is the name of the temporary tablespace or tablespace group.
     - `images` is the virtual directory for Application Express images. To support future Application Express upgrades, define the virtual image directory as `/i/`.

     For example:
     ```sql
     @apxrtins.sql SYSAUX SYSAUX TEMP /i/
     ```

5. If you are using Oracle REST Data Services, complete the appropriate steps in Installing Application Express and Configuring Oracle REST Data Services.
6. If you are using Oracle HTTP Server, complete the appropriate steps in Installing Application Express and Configuring Embedded PL/SQL Gateway.

7. If you are using Embedded PL/SQL Gateway, run `apex_epg_config.sql` passing the path to the Oracle home and then complete the appropriate steps in Installing Application Express and Configuring Oracle HTTP Server.

**Note:**

*Oracle Database SQL Language Reference* for more information about SQL*Plus

When Application Express installs, it creates three new database accounts:

- **APEX_180100** - The account that owns the Application Express schema and metadata.
- **FLOWS_FILES** - The account that owns the Application Express uploaded files.
- **APEX_PUBLIC_USER** - The minimally privileged account is used for Application Express configuration with Oracle REST Data Services or Oracle HTTP Server and *mod_plsql*.

If you configured RESTful Web services, then these additional accounts are created:

- **APEX_REST_PUBLIC_USER** - The account used when invoking RESTful Services definitions stored in Application Express.
- **APEX_LISTENER** - The account used to query RESTful Services definitions stored in Application Express.

### 3.2.3 Installing Application Express 18.1 into a CDB

To install:

**Note:**

Installing or removing Application Express from a CDB requires a local connection to the database.

1. Change your working directory to the `apex` directory in the location where you unzipped the distribution.

2. Start SQL*Plus and connect to `CDB$ROOT` of the database where Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:

   - **On Windows:**
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**

---

*Oracle*
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

3. Select the appropriate installation option.

Full development environment provides complete access to the App Builder environment to develop applications. A Runtime environment enables users to run applications that cannot be modified.

Available installation options include:

- **Full development environment.** Run `apexins.sql` passing the following four arguments in the order shown:

  ```
  @apexins.sql tablespace_apex tablespace_files tablespace_temp images
  ```

  Where:
  - `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.
  - `tablespace_files` is the name of the tablespace for the Application Express files user.
  - `tablespace_temp` is the name of the temporary tablespace or tablespace group.
  - `images` is the virtual directory for Application Express images. To support future Application Express upgrades, define the virtual image directory as `/i/`.

  Example:
  ```
  @apexins.sql SYSAUX SYSAUX TEMP /i/
  ```

- **Runtime environment.** Run `apxrtins.sql` passing the following arguments in the order shown:

  ```
  @apxrtins.sql tablespace_apex tablespace_files tablespace_temp images
  ```

  Where:
  - `tablespace_apex` is the name of the tablespace for the Application Express application user.
  - `tablespace_files` is the name of the tablespace for the Application Express files user.
  - `tablespace_temp` is the name of the temporary tablespace or tablespace group.
  - `images` is the virtual directory for Application Express images. To support future Application Express upgrades, define the virtual image directory as `/i/`.

  Example:
  ```
  @apxrtins.sql SYSAUX SYSAUX TEMP /i/
  ```

4. If using Oracle REST Data Services, complete appropriate steps in Installing Application Express and Configuring Oracle REST Data Services.

5. If using the Embedded PL/SQL Gateway, complete appropriate steps in Installing Application Express and Configuring Embedded PL/SQL Gateway.
6. If using the Oracle HTTP Server, complete appropriate steps in Installing Application Express and Configuring Oracle HTTP Server.

When Application Express installs, it creates three new database accounts:

- **APEX_180100** - The account that owns the Application Express schema and metadata.
- **FLOWS_FILES** - The account that owns the Application Express uploaded files.
- **APEX_PUBLIC_USER** - The minimally privileged account is used for Application Express configuration with Oracle REST Data Services or Oracle HTTP Server and mod_plsql.

If you configured RESTful Web services, then these additional accounts are created:

- **APEX_REST_PUBLIC_USER** - The account used when invoking RESTful Services definitions stored in Application Express.
- **APEX_LISTENER** - The account used to query RESTful Services definitions stored in Application Express.

### 3.3 Plugging in a PDB When Application Express is Installed in the Root Container

Learn about scenarios in which the target database has Application Express installed into the root container, CDB$ROOT - the default installation option.

This section describes scenarios in which the target database has Application Express installed into the root container, CDB$ROOT - the default installation option. Note there are multiple scenarios related to where the database being plugged in originated from and how Application Express was configured in the originating database.

- **Scenario 1: Plug-in Non-CDB with Application Express** (page 3-7)
  Plug-in a Non-CDB with Application Express.

- **Scenario 2: Plug-in PDB with a Common Application Express from Another CDB** (page 3-8)
  Plug-in a PDB with Application Express from another CDB.

- **Scenario 3: Plug-in PDB with a Local Application Express from Another CDB** (page 3-8)
  Plug-in a PDB with local Application Express from another CDB.

- **Scenario 4: Plug-in Non-CDB or PDB with No Application Express** (page 3-9)
  Plug-in a Non-CDB or PDB if the Application Express is not installed.

- **Working with Incompatible Application Express Versions** (page 3-9)
  Learn how to work with the incompatible versions of Application Express.

### 3.3.1 Scenario 1: Plug-in Non-CDB with Application Express

Plug-in a Non-CDB with Application Express.

If you are upgrading from a previous Oracle Database release, then you first need to upgrade to a Oracle Database 12c non-CDB (or standalone database) or later and then plug the database into your CDB. Alternatively, if you have configured a non-CDB Oracle Database 12c or later, you may now want to plug this database into a CDB. In
both cases, the originating database has Application Express installed and was not formerly a PDB.

As described in the Oracle Database Installation Guide for your operating system, when plugging in a standalone database you need to run the `$ORACLE_HOME/rdbms/admin/noncdb_to_pdb.sql` script. This script creates the necessary metadata linked objects, instead of local objects and recompiles the database objects for all common database options, including Application Express.

After installing Application Express, you need to configure the Web listener for the PDB.

If the version of Application Express installed in the originating database (which is now a PDB) is different from what is installed into the root container of the target, an error will be raised when trying to open the PDB.

### 3.3.2 Scenario 2: Plug-in PDB with a Common Application Express from Another CDB

Plug-in a PDB with Application Express from another CDB.

If you are copying or moving a PDB from an existing Oracle Database 12c or later where the originating CDB had Application Express installed in the root container, you will not need to perform any additional steps, other than configuring the Web listener for the PDB.

Assuming Application Express release 18.1 is installed, the `APEX_180100` schema within the PDB being plugged in already has the metadata linked objects defined and will compile without error against the metadata linked objects within the target CDB.

If the version of Application Express installed in the originating database is different from what is installed in the root container of the target an error is raised when trying to open the PDB.

### 3.3.3 Scenario 3: Plug-in PDB with a Local Application Express from Another CDB

Plug-in a PDB with local Application Express from another CDB.

If you are copying or moving a PDB from an existing Oracle Database 12c or later where Application Express was not installed in the root container but is installed locally, then you need to perform additional steps before the PDB can be opened without errors.

Assuming Application Express release 18.1 is installed, the `APEX_180100` schema within the PDB being plugged in contains all of the Application Express database objects and has no metadata linked objects. Therefore, you need to run `SORACLE_HOME/rdbms/admin/apex_to_common.sql` to remove the common objects and create the metadata links for the packages, views and so forth.

To replace local objects with metadata links in the PDB:

1. Change your working directory to `SORACLE_HOME/rdbms/admin`. 

---

Chapter 3  
Plugging in a PDB When Application Express is Installed in the Root Container  
3-8
2. Start SQL*Plus and connect to the database where Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Set the container to the PDB to be configured:
   ```sql
   ALTER SESSION SET CONTAINER = <PDB_name>;
   ```

4. Run `apex_to_common.sql`. For example:
   ```sql
   @apex_to_common.sql
   ```

If the version of Application Express installed in the originating database is different from what is installed in the root container of the target an error is raised when trying to open the PDB.

### 3.3.4 Scenario 4: Plug-in Non-CDB or PDB with No Application Express

Plug-in a Non-CDB or PDB if the Application Express is not installed.

If you are plugging in a non-CDB, or copying or moving a PDB from another CDB, and Application Express is not installed in the originating database or PDB then a warning is raised in the alert log when opening the PDB in the target database.

In this scenario, the Application Express schema, such as `APEX_180100` for Application Express release 18.1, will not be present in the originating database or PDB being plugged in. In order to open the PDB without issue and be able to run Application Express within the new PDB, you must install Application Express into the originating database or PDB before attempting to plug in to the target database. You should install the same version of Application Express into the originating database or PDB as the version installed into the target database.

### 3.3.5 Working with Incompatible Application Express Versions

Learn how to work with the incompatible versions of Application Express.

If the version of Application Express in the root container, `CDB$ROOT`, is not the same as the Application Express version in the PDB then an error is raised every time the PDB is opened preventing normal database operations within the PDB. The PDB can only be opened in restricted mode by users with RESTRICTED SESSION privilege, until the versions are compatible.

- [Patching or Upgrading Application Express in the CDB](#) (page 3-10)
  Learn how to patch or upgrade Application Express in the root container.
3.3.5.1 Patching or Upgrading Application Express in the CDB

Learn how to patch or upgrade Application Express in the root container.

If the version of Application Express in the PDB is a later minor release version than the version of Application Express in the root container (for example, the PDB contains Application Express release 4.2.6 and the CDB contains Application Express release 4.2.5) then you must patch the version of Application Express in the root container to be able to open the PDB without error. If the major version of Application Express in the PDB is higher than the version in the CDB (for example the PDB has Application Express release 18.1 and the CDB has Application Express release 4.2) then you must upgrade the version of Application Express in the CDB to be able to open the PDB without error.

To patch Application Express in the root container:

1. Download the appropriate patch from My Oracle Support.
2. Unzip and extract the installation files.
3. Change your working directory to where the installation files were extracted
4. Start SQL*Plus and connect to the database where Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
5. Run `apxpatch_con.sql` for example:
   ```
   @apxpatch_con.sql
   ```
6. Follow the instructions outlined in the Patch Set Notes for updating the images directory based on the Web Server you are using. If you are using the Embedded PL/SQL Gateway, run `apxldimg_con.sql` for example:
   ```
   @apxldimg_con.sql
   ```

Tip:
To upgrade Application Express in the root container, see Reinstalling Application Express into a CDB.
3.3.5.2 Patching or Upgrading Application Express in a PDB

Learn patch or upgrade Application Express in a PDB.

If the minor version of Application Express in the PDB is lower than the version of Application Express in the root container (for example the PDB has Application Express release 4.2.0 and the CDB has Application Express release 4.2.6) then it will be necessary to patch the version of Application Express in the PDB. If the major version of Application Express in the PDB is lower than the version in the root container (for example, the PDB has Application Express release 4.2 and the CDB has Application Express release 18.1) then the version of Application Express in the PDB will need to be upgraded.

- **Patching Application Express in a PDB** (page 3-11)
  Learn how to patch Application Express in a PDB.

- **Upgrading Application Express in a PDB** (page 3-12)
  Learn how to upgrade Application Express in a PDB.

3.3.5.2.1 Patching Application Express in a PDB

Learn how to patch Application Express in a PDB.

To patch Application Express in a PDB:

1. Download the appropriate patch from My Oracle Support.
2. Unzip and extract the installation files.
3. Change your working directory to where the installation files were extracted.
4. Start SQL*Plus and connect to the database where Application Express is installed as SYS specifying the SYSDBA role. For example:
   - **On Windows:**
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
5. Run `apxpatch.sql` using `catcon.pl` like the following example:
   ```
   host &OH_HOME/perl/bin/perl -I
   &OH_HOME/rdbms/admin &OH_HOME/rdbms/admin/catcon.pl -b apxpatch -c '<PDB_name>'
apxpatch.sql
   ```
   Where:
   - `&OH_HOME` represents the full path to the Oracle home
   - `<PDB_name>` is the name of the PDB you are patching
6. Follow the instructions outlined in the patch set notes for updating the images directory based on the Web Server you are using. If you are using the Embedded PL/SQL Gateway, run `apex_epg_config.sql` for example:
ALTER SESSION SET CONTAINER = <PDB_name>;
@apex_epg_config.sql

3.3.5.2.2 Upgrading Application Express in a PDB

Learn how to upgrade Application Express in a PDB.

To upgrade Application Express in a PDB:

1. Unzip and extract the installation files.
2. Change your working directory to where the installation files were extracted
3. Start SQL*Plus and connect to the database where Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
4. Run `apexins_nocdb.sql` or `apxrtins_nocdb.sql` using `catcon.pl` like the following example:
   ```
   host &OH_HOME/perl/bin/perl -I
   &OH_HOME/rdbms/admin &OH_HOME/rdbms/admin/catcon.pl -b apexins -c '<PDB_name>'
   apexins_nocdb.sql --pSYSAUX --pSYSAUX --pTEMP --p/i/ --p1,2,3
   ```
   Where:
   - `&OH_HOME` represents the full path to the Oracle home
   - `<PDB_name>` is the name of the PDB you are patching
5. Follow the instructions outlined in the patch set notes for updating the images directory based on the Web Server you are using.

3.4 Plugging in a PDB When Application Express Is Not in the Root Container of the Target CDB

The scenarios in this section describe when Application Express is not installed in the root container, `CDB$ROOT`, by explicitly removing it as described in Uninstalling Application Express 18.1 from a CDB.

In such cases, you can optionally install a local Application Express into each PDB independently. If Application Express is installed into a PDB it is considered to be installed locally and has no metadata linked objects. There are multiple scenarios related to where the database being plugged in originated from and how Application Express was configured in the originating database.

- **Scenario 1: Plug-in a Non-CDB with Application Express** (page 3-13)
  Plug-in a Non-CDB with Application Express.
3.4.1 Scenario 1: Plug-in a Non-CDB with Application Express

Plug-in a Non-CDB with Application Express.

If you are upgrading from a previous Oracle Database release then you need to upgrade to Oracle Database 12c or later non-CDB (or standalone database) and then plug the database into your CDB. Alternatively you may have configured a non-CDB Oracle Database 12c or later that you now want to plug into a CDB. In both cases, the originating database had Application Express installed and was not formerly a PDB.

As described in the Oracle Database Installation Guide for your operating system, when plugging in a standalone database you need to run the $ORACLE_HOME/rdbms/admin/noncdb_to_pdb.sql script. This script creates the necessary metadata linked objects (instead of local objects) and recompiles the database objects for all common database options. However, because Application Express has been removed from the root container, the script will not create any metadata links for any of the Application Express objects. The script does not change the Application Express installation from the originating database and no additional steps are needed other than configuring the Web listener depending on the type of Web listener you are using.

3.4.2 Scenario 2: Plug-in PDB with Common Application Express from Another CDB

Plug-in a PDB with Application Express from another CDB.

If you are copying or moving a PDB from an existing Oracle Database 12c where the originating CDB had Application Express installed in the root container, then an error is raised whenever you try to open the PDB. The error is due to the originating PDB included metadata links to objects in the originating root container which cannot be recompiled because the target root container does not include Application Express. You will not be able to open the PDB unless you remove Application Express from the PDB or if Application Express is already installed in the target root container. Oracle does not support installing Application Express in the root container if it contains PDBs with locally installed Application Express.
3.4.3 Scenario 3: Plug-in PDB with a Local Application Express from Another CDB

Plug-in a PDB with local Application Express from another CDB.

If you are copying or moving a PDB from an existing Oracle Database 12c or later where the originating PDB had a local Application Express installed (not in the CDB) then you do not need to perform any additional steps, other than configuring the Web listener in the PDB depending on the type of Web listener you are using.

Assuming Application Express release 18.1 is installed, the `APEX_180100` schema within the PDB being plugged in already has all of the Application Express objects defined locally and no metadata links.

3.4.4 Scenario 4: Plug-in a Non-CDB or PDB with No Application Express

Plug-in a Non-CDB or PDB if Application Express is not installed.

If you are plugging in a non-CDB, or copying or moving a PDB from another CDB, where Application Express was not installed in the originating database or PDB then you do not need to perform any additional steps. There will be no Application Express engine schema, such as `APEX_180100`, within the PDB, and the PDB can be started without error.
Installing Application Express and Configuring Oracle REST Data Services

This section describes how to install Oracle Application Express by downloading a ZIP file from the Oracle Technology Network and then downloading and installing Oracle REST Data Services.

These instructions apply to both new and upgrade installations.

- **Oracle Database Requirements** (page 4-2)
  Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

- **Oracle REST Data Services Requirement** (page 4-3)
  Oracle Application Express release 18.1 requires Oracle REST Data Services release 3.0.12 or later.

- **About Patching Oracle Application Express** (page 4-3)
  If you are already running Oracle Application Express, then check the Oracle Application Express page on the Oracle Technology Network for information about patch set releases or later releases of Oracle Application Express.

- **Performing Pre-installation Tasks for Oracle Application Express** (page 4-3)
  Review and perform pre-installation tasks before installing Oracle Application Express.

- **Downloading and Installing Oracle Application Express** (page 4-4)
  Learn about downloading and installing Oracle Application Express.

- **Downloading and Installing Oracle REST Data Services** (page 4-11)
  Learn about downloading and installing Oracle REST Data Services.

- **Configuring Oracle REST Data Services** (page 4-13)
  Configuring Oracle REST Data Services requires that you copy the images directory, run a configuration to configure RESTful Services, configure static files support, and secure Oracle REST data service.

- **Enabling Network Services in Oracle Database 11g or Later** (page 4-15)
  You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.

- **Performing Security Tasks** (page 4-19)
  Oracle recommends you configure and use Secure Sockets Layer (SSL) to ensure that passwords and other sensitive data are not transmitted in clear text in HTTP requests.

- **Controlling the Number of Concurrent Jobs** (page 4-19)
  Learn about specifying the number of concurrently running jobs.
4.1 Oracle Database Requirements

Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

If you are upgrading an Oracle Database version 12.1 CDB, you must download from My Oracle Support the one off patch for bug 20618595. Search for 20618595 on the Patches tab.
4.2 Oracle REST Data Services Requirement

Oracle Application Express release 18.1 requires Oracle REST Data Services release 3.0.12 or later.

Note:
For the REST Enabled SQL feature, a remote database must be running Oracle REST Data Services release 17.4 or later. ORDS Based RESTful Services in SQL Workshop requires 17.4 or later.

4.3 About Patching Oracle Application Express

If you are already running Oracle Application Express, then check the Oracle Application Express page on the Oracle Technology Network for information about patch set releases or later releases of Oracle Application Express.


4.4 Performing Pre-installation Tasks for Oracle Application Express

Review and perform pre-installation tasks before installing Oracle Application Express.

Before installing Oracle Application Express, Oracle recommends that you complete the following steps:

1. Review and satisfy all Oracle Application Express installation requirements.

2. If you are actively using Oracle Application Express and upgrading the current installation then shut down with normal or immediate priority the Oracle Database instances where you plan to install Oracle Application Express. On Oracle Real Application Clusters (Oracle RAC) systems, shut down all instances on each node.

An alternative to shutting down the database is to prevent all users from accessing Oracle Application Express when upgrading your installation from a previous release of Oracle Application Express. Oracle only recommends this option in high availability production environments where planned outages are not available. For all other scenarios, the database should be shut down.

To disable access to Oracle Application Express when an existing installation is using Oracle REST Data Services, shut down the appropriate application server where Oracle REST Data Services is deployed.

Once you have prevented access from Oracle Application Express users, you should log in to SQL*Plus as SYS, connecting to the database where Oracle Application Express is installed, and query V$SESSION to ensure there are no long running sessions which would interfere with the upgrade process.

3. Back up the Oracle Database installation.
Oracle recommends that you create a backup of the current Oracle Database installation before you install Oracle Application Express. You can use Oracle Database Recovery Manager, which is included in the Oracle Database installation, to perform the backup.

4. **Start the Oracle Database instance that contains the target database.**

After backing up the system, you must start the Oracle instance that contains the target Oracle Database. Do not start other processes such as a Web listener. However, if you are performing a remote installation, make sure the Web listener for the remote database has started.

```
Note:

If you are connecting to a remote database, then start the Web listener.
```

### 4.5 Downloading and Installing Oracle Application Express

Learn about downloading and installing Oracle Application Express.

How you install Oracle Application Express depends upon by the type of database you into which you are installing. This section describes how to download and install Oracle Application Express.

- **Installing Application Express** (page 4-4)
  Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page.

- **Creating or Updating Your Instance Administration Account** (page 4-7)
  Learn how to create or update Instance Administrator account.

- **Restarting Processes** (page 4-9)
  Restart the processes that you stopped before you began the installation.

- **Configuring the APEX_PUBLIC_USER Account** (page 4-9)
  It is important to correctly configure the APEX_PUBLIC_USER account to enable proper operation of Oracle Application Express.

---

**See Also:**

"Utilizing the Multitenant Architecture in Oracle Database 12c or Later (page 3-1)."

### 4.5.1 Installing Application Express

Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page.

To install Oracle Application Express:
1. For installations where the development will be in English only, download the file `apex_18.1_en.zip` from the Oracle Application Express download page. If the development will include languages other than English, download `apex_18.1.zip` from the Oracle Application Express download page. See: http://www.oracle.com/technetwork/developer-tools/apex/downloads/index.html

Note that the actual file name may differ if a more recent release has shipped since this document was published.

2. Unzip downloaded zip file:
   - If English only, unzip `apex_18.1_en.zip` as follows, preserving directory names:
     - UNIX and Linux: `$ unzip apex_18.1_en.zip`
     - Windows: Double click the file `apex_18.1_en.zip` in Windows Explorer
   - If multiple languages, unzip `apex_18.1.zip` as follows, preserving directory names:
     - UNIX and Linux: `$ unzip apex_18.1.zip`
     - Windows: Double click the file `apex_18.1.zip` in Windows Explorer

   **Note:**
   You should keep the directory tree where you unzip the files short and not under directories that contain spaces. For example, within Windows unzip to `C:\TEMP`.

3. Change your working directory to `apex`.

4. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

5. Disable any existing password complexity rules for the default profile.

6. Select the appropriate installation option.

   **Full development environment** provides complete access to the App Builder environment to develop applications. A **Runtime environment** enables users to run applications that cannot be modified.

   Available installation options include:
   - **Full development environment**. Run `apexins.sql` passing the following four arguments in the order shown:
     ```
     @apexins.sql tablespace_apex tablespace_files tablespace_temp images
     ```
Where:

- `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.
- `tablespace_files` is the name of the tablespace for the Oracle Application Express files user.
- `tablespace_temp` is the name of the temporary tablespace or tablespace group.
- `images` is the virtual directory for Oracle Application Express images. For installations using EPG, `/i/` is the required value for the images argument. To support future Oracle Application Express upgrades, define the virtual image directory as `/i/`.

Example:

```
@apexins.sql SYSAUX SYSAUX TEMP /i/
```

**Note:**

If you receive the following error, exit SQL*Plus and change your working directory to where you unzipped the installation file, for example `C:\TEMP` in Windows, before starting SQL*Plus:

```
SP2-0310: unable to open file "apexins.sql"
```

**Runtime environment.** Run `apxrtins.sql` passing the following arguments in the order shown:

```
@apxrtins.sql tablespace_apex tablespace_files tablespace_temp images
```

Where:

- `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.
- `tablespace_files` is the name of the tablespace for the Oracle Application Express files user.
- `tablespace_temp` is the name of the temporary tablespace or tablespace group.
- `images` is the virtual directory for Oracle Application Express images. To support future Oracle Application Express upgrades, define the virtual image directory as `/i/`.

Example:

```
@apxrtins.sql SYSAUX SYSAUX TEMP /i/
```

When Oracle Application Express installs, it creates three new database accounts:

- **APEX_180100** - The account that owns the Oracle Application Express schema and metadata.
- **FLOWS_FILES** - The account that owns the Oracle Application Express uploaded files.
• **APEX_PUBLIC_USER** - The minimally privileged account is used for Oracle Application Express configuration with Oracle REST Data Services or Oracle HTTP Server and mod_plsql.

If you configured RESTful Web services, then these additional accounts will be created:

• **APEX_REST_PUBLIC_USER** - The account used when invoking RESTful Services definitions stored in Oracle Application Express.

• **APEX_LISTENER** - The account used to query RESTful Services definitions stored in Oracle Application Express.

If you are upgrading from a previous release, then FLOWS_FILES already exists and APEX_PUBLIC_USER is created if it does not already exist.

### 4.5.2 Creating or Updating Your Instance Administration Account

Learn how to create or update Instance Administrator account.

This section describes how to create or update your Instance Administrator account.

**Tip:**
Skip this section if you are upgrading from a previous release of Oracle Application Express. In an upgrade scenario, the Instance Administrator account and password is preserved and carried over from the prior release.

• **What Is an Instance Administrator?** (page 4-7)
  Instance administrators are superusers that are responsible for managing an entire Oracle Application Express instance, including managing workspace provisioning, configuring features and instance settings, and managing security.

• **About apxchpwd.sql** (page 4-7)
  Running the apxchpwd.sql script enables you to create or update your Instance Administrator account.

• **Running apxchpwd.sql** (page 4-8)
  Run the apxchpwd.sql script to create and update your Instance Administrator account.

### 4.5.2.1 What Is an Instance Administrator?

Instance administrators are superusers that are responsible for managing an entire Oracle Application Express instance, including managing workspace provisioning, configuring features and instance settings, and managing security.

To perform these tasks, an Instance administrator signs in to the Oracle Application Express Administration Services application.

### 4.5.2.2 About apxchpwd.sql

Running the apxchpwd.sql script enables you to create or update your Instance Administrator account.
You must run the `apxchpwd.sql` script in the following scenarios:

- **New Oracle Application Express installations** - Run `apxchpwd.sql` to create an Instance Administrator account and password.
- **Converting of a runtime environment to a development environment** - Run `apxchpwd.sql` to change the Instance Administrator account password.
- **Changing Your Instance Administrator Password** - Run `apxchpwd.sql` to change the password for an existing Instance Administrator account.
- **Unlocking Your Instance Administrator Account** - Run `apxchpwd.sql` to unlock an existing Instance Administrator account.

**Tip:**

You do not need to run `apxchpwd.sql` when upgrading from a previous release of Oracle Application Express. In an upgrade scenario, the Instance Administrator account password is preserved and carried over from the prior release.

### 4.5.2.3 Running `apxchpwd.sql`

Run the `apxchpwd.sql` script to create and update your Instance Administrator account.

To create or update your Instance Administrator account:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - **On Windows:**
     ```sql
     \sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```bash
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run `apxchpwd.sql`. For example:

   ```bash
   @apxchpwd.sql
   ```

   Follow the on-screen instructions. You will be prompted to provide a username, password, and email address. If the account username does not exist, it will be created for you.
4.5.3 Restarting Processes

Restart the processes that you stopped before you began the installation.

After you install Oracle Application Express, you must restart the processes that you stopped before you began the installation.

4.5.4 Configuring the APEX_PUBLIC_USER Account

It is important to correctly configure the APEX_PUBLIC_USER account to enable proper operation of Oracle Application Express.

- **About the APEX_PUBLIC_USER Account** (page 4-9)
  The APEX_PUBLIC_USER account is created with a random password in a new installation of Oracle Application Express.

- **Unlocking the APEX_PUBLIC_USER Account** (page 4-9)
  Unlock the APEX_PUBLIC_USER account by running a SQL statement.

- **Changing the Password for the APEX_PUBLIC_USER Account** (page 4-10)
  Change the password for the APEX_PUBLIC_USER account by running a SQL statement.

- **About Password Expiration in Oracle Database 11g and Later** (page 4-10)
  You can set the PASSWORD_LIFE_TIME parameter to unlimited by altering APEX_PUBLIC_USER to prevent password expiration. To do this create another profile in which the PASSWORD_LIFE_TIME parameter is set to unlimited and alter the APEX_PUBLIC_USER account and assign it to the new profile.

4.5.4.1 About the APEX_PUBLIC_USER Account

The APEX_PUBLIC_USER account is created with a random password in a new installation of Oracle Application Express.

You must change the password for this account before configuring the database access descriptor (DAD) in a new installation.

4.5.4.2 Unlocking the APEX_PUBLIC_USER Account

Unlock the APEX_PUBLIC_USER account by running a SQL statement.

**Tip:**

If you are upgrading from a prior release of Oracle Application Express, this step is unnecessary.

To unlock the APEX_PUBLIC_USER account:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. If Oracle Application Express is installed in the CDB, ensure you connect to CDB$ROOT. For example:
   - On Windows:
4.5.4.3 Changing the Password for the APEX_PUBLIC_USER Account

Change the password for the APEX_PUBLIC_USER account by running a SQL statement.

Tip:

If you are upgrading from a prior release of Oracle Application Express, this step is unnecessary.

To change the password for the APEX_PUBLIC_USER account:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. If Oracle Application Express is installed in the CDB, ensure you connect to CDB$ROOT. For example:

   • On Windows:
     
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

   • On UNIX and Linux:
     
     ```sh
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Run the following statement:

   ```sql
   ALTER USER APEX_PUBLIC_USER ACCOUNT UNLOCK
   ```

   Where `new_password` is the new password you are setting for APEX_PUBLIC_USER. You will use this password when creating the DAD in the sections that follow.

4.5.4.4 About PasswordExpiration in Oracle Database 11g and Later

You can set `PASSWORD_LIFE_TIME` parameter to unlimited by altering APEX_PUBLIC_USER to prevent password expiration. To do this create another profile in which the `PASSWORD_LIFE_TIME` parameter is set to unlimited and alter the APEX_PUBLIC_USER account and assign it to the new profile.

In the default profile in Oracle Database 11g or later, the parameter `PASSWORD_LIFE_TIME` is set to 180. If you are using Oracle Database 11g or later with Oracle Application Express, this causes the password for APEX_PUBLIC_USER to expire in 180 days. As a
result, your Oracle Application Express instance will become unusable until you change the password.

4.6 Downloading and Installing Oracle REST Data Services

Learn about downloading and installing Oracle REST Data Services.

- **Downloading Oracle REST Data Services** (page 4-11)
  Learn how to download Oracle REST Data Services.

- **About Configuring Oracle REST Data Services Behind a Reverse Proxy or LoadBalancer** (page 4-12)
  When Oracle Application Express is running behind a reverse proxy or load balancer, it is important to communicate the original HTTP hostname and protocol as seen by the user's browser to the Application Express engine.

- **Web Server HTTP POST Request Limits** (page 4-12)
  Learn about Web Server HTTP POST request limits.

- **Disabling Oracle XML DB Protocol Server** (page 4-13)
  If you were previously using the embedded PL/SQL gateway and now want to use Oracle REST Data Services, you need to disable the Oracle XML DB Protocol Server.

---

**See Also:**

*Oracle REST Data Services Installation, Configuration, and Development Guide*

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4.6.1 Downloading Oracle REST Data Services

Learn how to download Oracle REST Data Services.

**Tip:**

By default, the context root for accessing Oracle Application Express through Oracle REST Data Services is /ords. If you wish to have a context root of /apex for accessing Oracle Application Express, rename the ords.war file to apex.war before installing Oracle REST Data Services. See "Installing Oracle REST Data Services" in *Oracle REST Data Services Installation, Configuration, and Development Guide*.

To download Oracle REST Data Services:

1. Download the latest release of Oracle REST Data Services from the following site:


   Note that the version.number in the file name reflects the current release number.
2. Unzip the downloaded zip file into a directory (or folder) of your choice:
   • UNIX and Linux: `unzip ords.version.number.zip`
   • Windows: Double-click the file `ords.version.number.zip` in Windows Explorer

3. Copy the images directory, `apex/images`, from the Oracle Application Express software ZIP to a location on the file system where Oracle REST Data Services is installed.

4. See Oracle REST Data Services Installation, Configuration, and Development Guide and follow and complete all installation and configuration steps.

5. For Oracle Database 12c or later multitenant architecture, ensure that you configure the connection using the service name of the specific pluggable database (PDB) you want to access. Do not use the service name of the `{CDB$ROOT}` unless you are configuring Oracle REST Data Services to address PDBs through the URL. See Oracle REST Data Services Installation, Configuration, and Development Guide for more information.

4.6.2 About Configuring Oracle REST Data Services Behind a Reverse Proxy or Load Balancer

When Oracle Application Express is running behind a reverse proxy or load balancer, it is important to communicate the original HTTP hostname and protocol as seen by the user’s browser to the Application Express engine.

The Application Express engine uses this information to generate valid URLs in HTML responses and HTTP redirects that the user's browser can successfully follow. The exact configuration steps depend on your Java EE application server. For example, for Oracle WebLogic Server, this is accomplished using Oracle WebLogic Server Proxy Plug-Ins. To learn more, see your Java EE application server documentation.

4.6.3 Web Server HTTP POST Request Limits

Learn about Web Server HTTP POST request limits.

When running Oracle REST Data Services in standalone mode or within a Tomcat Java Container, size limits are being imposed on POST requests which are not file uploads. Application Express users will encounter these limits when uploading data in SQL Workshop using Copy and Paste or when using Copy and Paste while building an Application from Spreadsheet.

- When running Oracle REST Data Services in **Standalone Mode**, the default limit is 10MB for ORDS 3.0.9 and above. It is recommended to increase the limit as follows:

  Set the Java System property `org.eclipse.jetty.server.Request.maxFormContentSize` to a higher value in bytes. You can set this property upon startup of Oracle REST Data Services. For example:
  ```java
  java -Dorg.eclipse.jetty.server.Request.maxFormContentSize=3000000 -jar ords.war
  ```

- When running on Apache Tomcat, the default limit is 2 megabytes. Adjust Apache Tomcat's `maxPostSize` parameter to change that limit.
4.6.4 Disabling Oracle XML DB Protocol Server

If you were previously using the embedded PL/SQL gateway and now want to use Oracle REST Data Services, you need to disable the Oracle XML DB Protocol Server.

To disable Oracle XML DB Protocol Server:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     
     • On UNIX and Linux:
     ```
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Run the following command:
   ```sql
   EXEC DBMS_XDB.SETHTTPPORT(0);
   ```

4.7 Configuring Oracle REST Data Services

Configuring Oracle REST Data Services requires that you copy the images directory, run a configuration to configure RESTful Services, configure static files support, and secure Oracle REST data service.

How to configure RESTful Services in a new installation is discussed in the following section.

- **Copying the Images Directory** (page 4-14)
  Whether you are loading a new installation or upgrading from a previous release, you must copy the images directory from the top level of the apex\images directory, for example C:\TEMP, to the location used by your Oracle REST Data Services installation.

- **Configuring RESTful Services** (page 4-14)
  In a new installation or upgrade of Oracle Application Express, you must run the configuration script apex_rest_config.sql to configure RESTful Services.

- **Configuring Static File Support** (page 4-15)
  For configuring static files, you must run apex_rest_config.sql after a new installation or upgrade of Oracle Application Express.

- **Securing Oracle REST Data Service** (page 4-15)
  In a configuration for Oracle Application Express, Oracle recommends setting the parameter `security.requestValidationFunction` to `wwv_flow_epg_include_modules.authorize`. 
4.7.1 Copying the Images Directory

Whether you are loading a new installation or upgrading from a previous release, you must copy the images directory from the top level of the apex\images directory, for example C:\TEMP, to the location used by your Oracle REST Data Services installation.

During an upgrade, you overwrite your existing images directory. Before you begin the upgrade, to ensure that you can revert to the previous version, Oracle recommends that you create a copy of your existing images directory for Oracle Application Express, indicating the release number of the images (for example, images_5_1).

4.7.2 Configuring RESTful Services

In a new installation or upgrade of Oracle Application Express, you must run the configuration script apex_rest_config.sql to configure RESTful Services.

Once configured, the instance administrator can control the availability of the feature. If the instance administrator has disabled RESTful Services for this Application Express instance, RESTful Services are not available for this instance and the RESTful Services icon does not display.

To configure RESTful Services in Oracle Application Express:

1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     
     ```
     \system_drive:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run apex_rest_config.sql. For example:
   
   ```
   @apex_rest_config.sql
   ```

   When Prompted, enter a password for the APEX_LISTENER and APEX_REST_PUBLIC_USER accounts.

   When configuring RESTful Services in Oracle Application Express, it creates two new database accounts.
   
   - **APEX_LISTENER** - The account used to query RESTful Services definitions stored in Oracle Application Express.
   - **APEX_REST_PUBLIC_USER** - The account used when calling RESTful Services definitions stored in Oracle Application Express.
4.7.3 Configuring Static File Support

For configuring static files, you must run `apex_rest_config.sql` after a new installation or upgrade of Oracle Application Express.

Oracle Application Express enables application developers to include static files with their applications. Static files can be associated with a workspace, an application, a plug-in, or an application theme. When using Oracle REST Data Services as your web listener, static files are served using RESTful service module built into Oracle Application Express. Therefore, you must run `apex_rest_config.sql` after a new installation or upgrade of Oracle Application Express.

4.7.4 Securing Oracle REST Data Service

In a configuration for Oracle Application Express, Oracle recommends setting the parameter `security.requestValidationFunction` to `wwv_flow_epg_include_modules.authorize`.

Set parameter `security.requestValidationFunction` to `wwv_flow_epg_include_modules.authorize` activates the white list of callable procedures which ships with Oracle Application Express and prohibits calls to other procedures.

4.8 Enabling Network Services in Oracle Database 11g or Later

You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.

- **When and Why Network Services Must be Enabled** (page 4-15) Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.

- **Granting Connect Privileges Prior to Oracle Database 12c** (page 4-16) Demonstrates how to grant connect privileges to any host for the APEX_180100 database user.

- **Granting Connect Privileges in Oracle Database 12c or Later** (page 4-17) Procedures `CREATEACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.

- **Troubleshooting an Invalid ACL Error** (page 4-18) Learn how to identify a invalid ACL error by running the query.

4.8.1 When and Why Network Services Must be Enabled

Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.
By default, the ability to interact with network services is disabled in Oracle Database 11g Release 2 or later. Therefore, if you are running Oracle Application Express with Oracle Database 11g Release 2 or later, you must use the new `DBMS_NETWORK_ACL_ADMIN` package to grant connect privileges to any host for the `APEX_180100` database user. Failing to grant these privileges results in issues with:

- Sending outbound mail in Oracle Application Express. Users can call methods from the `APEX_MAIL` package, but issues arise when sending outbound email.
- Using Web services in Oracle Application Express.
- PDF report printing.

Tip:
To run the examples described in this section, the compatible initialization parameter of the database must be set to at least 11.1.0.0.0. By default a 11g or 12c database will already have the parameter set properly, but a database upgraded to 11g or 12c from a prior version may not. For information about changing database initialization parameters, see “Creating and Configuring an Oracle Database” in Oracle Database Administrator’s Guide.

4.8.2 Granting Connect Privileges Prior to Oracle Database 12c

Demonstrates how to grant connect privileges to any host for the `APEX_180100` database user.

The following example demonstrates how to grant connect privileges to any host for the `APEX_180100` database user. This example assumes you connected to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role.

```sql
DECLARE
    ACL_PATH  VARCHAR2(4000);
BEGIN
    -- Look for the ACL currently assigned to '*' and give APEX_180100
    -- the "connect" privilege if APEX_180100 does not have the privilege yet.
    SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

    IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_180100', 'connect') IS NULL THEN
        DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH, 'APEX_180100', TRUE, 'connect');
    END IF;

EXCEPTION
    -- When no ACL has been assigned to '*'.
    WHEN NO_DATA_FOUND THEN
        DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('power_users.xml',
            'ACL that lets power users to connect to everywhere',
            'APEX_180100', TRUE, 'connect');
        DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('power_users.xml', '*');
END;
```
The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

DECLARE
  ACL_PATH  VARCHAR2(4000);
BEGIN
  -- Look for the ACL currently assigned to 'localhost' and give APEX_180100
  -- the "connect" privilege if APEX_180100 does not have the privilege yet.
  SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = 'localhost' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;
  IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_180100', 'connect') IS NULL THEN
    DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH, 'APEX_180100', TRUE, 'connect');
  END IF;
EXCEPTION
  -- When no ACL has been assigned to 'localhost'.
  WHEN NO_DATA_FOUND THEN
    DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('local-access-users.xml', 'ACL that lets users to connect to localhost', 'APEX_180100', TRUE, 'connect');
    DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('local-access-users.xml','localhost');
END;
/
COMMIT;

4.8.3 Granting Connect Privileges in Oracle Database 12c or Later

Procedures CREATE_ACL, ASSIGN_ACL, ADD_PRIVILEGE and CHECK_PRIVILEGE in DBMS_NETWORK_ACL_ADMIN are deprecated in Oracle Database 12c. Oracle recommends to use APPEND_HOST_ACE.

The following example demonstrates how to grant connect privileges to any host for the APEX_180100 database user. This example assumes you connected to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role.

BEGIN
  DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
    host => '*',
    ace => xs$ace_type(privilege_list => xs$name_list('connect'),
                      principal_name => 'APEX_180100',
                      principal_type => xs_acl.ptype_db));
END;
/

The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

BEGIN
  DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
    host => 'localhost',
    ace => xs$ace_type(privilege_list => xs$name_list('connect'),
                      principal_name => 'APEX_180100',
                      principal_type => xs_acl.ptype_db));
4.8.4 Troubleshooting an Invalid ACL Error

Learn how to identify an invalid ACL error by running the query.

If you receive an ORA-44416: Invalid ACL error after running the previous script, use the following query to identify the invalid ACL:

```
REM Show the dangling references to dropped users in the ACL that is assigned REM to ":*":
SELECT ACL, PRINCIPAL
FROM DBA_NETWORK_ACLS NACL, XDS_ACE ACE
WHERE HOST = ":*": AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL AND
  NACL.ACLID = ACE.ACLID AND
  NOT EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);
```

Next, run the following code to fix the ACL:

```
DECLARE
  ACL_ID   RAW(16);
  CNT      NUMBER;
BEGIN
  -- Look for the object ID of the ACL currently assigned to ":*":
  SELECT ACLID INTO ACL_ID FROM DBA_NETWORK_ACLS
  WHERE HOST = ":*": AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

  -- If just some users referenced in the ACL are invalid, remove just those
  -- users in the ACL. Otherwise, drop the ACL completely.
  SELECT COUNT(PRINCIPAL) INTO CNT FROM XDS_ACE
  WHERE ACLID = ACL_ID AND
  EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);
  IF (CNT > 0) THEN
    FOR R IN (SELECT PRINCIPAL FROM XDS_ACE
      WHERE ACLID = ACL_ID AND
      NOT EXISTS (SELECT NULL FROM ALL_USERS
      WHERE USERNAME = PRINCIPAL)) LOOP
      UPDATE XDB.XDB$ACL
      SET OBJECT_VALUE =
      DELETEXML(OBJECT_VALUE,
      '/*/ACL/ACE[PRINCIPAL="||R.PRINCIPAL||"]'
      WHERE OBJECT_ID = ACL_ID;
    END LOOP;
  ELSE
    DELETE FROM XDB.XDB$ACL WHERE OBJECT_ID = ACL_ID;
  END IF;
END;
/
REM commit the changes.
COMMIT;
```
Once the ACL has been fixed, you must run the first script in this section to apply the ACL to the APEX_180100 user.

4.9 Performing Security Tasks

Oracle recommends you configure and use Secure Sockets Layer (SSL) to ensure that passwords and other sensitive data are not transmitted in clear text in HTTP requests.

Without the use of SSL, passwords could potentially be exposed, compromising security.

SSL is an industry standard protocol that uses RSA public key cryptography in conjunction with symmetric key cryptography to provide authentication, encryption, and data integrity.

4.10 Controlling the Number of Concurrent Jobs

Learn about specifying the number of concurrently running jobs.

- About Managing the Number of Concurrent Jobs (page 4-19)
  Learn about managing maximum number of concurrently running jobs.

- Viewing the Number of JOB_QUEUE_PROCESSES (page 4-19)
  You can view number of JOB_QUEUE_PROCESSES in three ways.

- Changing the Number of JOB_QUEUE_PROCESSES (page 4-20)
  You can change the number of JOB_QUEUE_PROCESSES by running a SQL statement in SQL*Plus.

4.10.1 About Managing the Number of Concurrent Jobs

Learn about managing maximum number of concurrently running jobs.

JOB_QUEUE_PROCESSES determine the maximum number of concurrently running jobs. In Oracle Application Express transactional support and SQL scripts require jobs. If JOB_QUEUE_PROCESSES is not enabled and working properly, you cannot successfully execute a script.

4.10.2 Viewing the Number of JOB_QUEUE_PROCESSES

You can view number of JOB_QUEUE_PROCESSES in three ways.

- Viewing JOB_QUEUE_PROCESSES in the Installation Log File (page 4-20)
  Learn how to view the JOB_QUEUE_PROCESSES in the installation log files.

- Viewing JOB_QUEUE_PROCESSES in Oracle Application Express (page 4-20)
  Learn how to view the number of JOB_QUEUE_PROCESSES on the About page in Application Express.

- Viewing JOB_QUEUE_PROCESSES from SQL*Plus (page 4-20)
  Learn how to view the number of JOB_QUEUE_PROCESSES from SQL*Plus by running the following SQL statement.
4.10.2.1 Viewing JOB_QUEUE_PROCESSES in the Installation Log File

Learn how to view the JOB_QUEUE_PROCESSES in the installation log files.

4.10.2.2 Viewing JOB_QUEUE_PROCESSES in Oracle Application Express

Learn how to view the number of JOB_QUEUE_PROCESSES on the About page in Application Express.

To view the About Application Express page:
1. Sign in to Oracle Application Express.
2. Locate the Help menu at the top of the page.
3. From the Help menu, select About.

The About Application Express page appears. The current number JOB_QUEUE_PROCESSES displays at the bottom of the page.

4.10.2.3 Viewing JOB_QUEUE_PROCESSES from SQL*Plus

Learn how to view the number of JOB_QUEUE_PROCESSES from SQL*Plus by running the following SQL statement.

SELECT VALUE FROM v$parameter WHERE NAME = 'job_queue_processes'

4.10.3 Changing the Number of JOB_QUEUE_PROCESSES

You can change the number of JOB_QUEUE_PROCESSES by running a SQL statement in SQL*Plus.

To update the number of JOB_QUEUE_PROCESSES:
1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   • On Windows:
     \sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
   • On UNIX and Linux:
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
2. In SQL*Plus run the following SQL statement:
   ALTER SYSTEM SET JOB_QUEUE_PROCESSES = <number>

For example, running the statement ALTER SYSTEM SET JOB_QUEUE_PROCESSES = 20 sets JOB_QUEUE_PROCESSES to 20.
4.11 About Running Oracle Application Express in Other Languages

You can install a single instance of Oracle Application Express with one or more of translated versions.

The Oracle Application Express interface is translated into German, Spanish, French, Italian, Japanese, Korean, Brazilian Portuguese, Simplified Chinese, and Traditional Chinese. A single instance of Oracle Application Express can be installed with one or more of these translated versions. Developers can choose to run the Application Express development environment in any of the installed languages by simply selecting the language from the App Builder log in screen or home page.

In order to install other languages you must use the apex_18.1.zip file which contains the extra files referenced below. If you previously downloaded apex_18.1_en.zip, then you do not need to re-install Oracle Application Express. Simply download apex_18.1.zip and unzip the file into the same directory where you unzipped apex_18.1_en.zip.

The translated version of Oracle Application Express should be loaded into a database that has a character set that supports the specific language. If you attempt to install a translated version of Oracle Application Express into a database that does not support the character encoding of the language, the installation may fail or the translated Oracle Application Express instance may appear corrupt when run. The database character set AL32UTF8 supports all the translated versions of Oracle Application Express.

You can manually install translated versions of Oracle Application Express using SQL*Plus. The installation files are encoded in AL32UTF8.

Note:
Regardless of the target database character set, to install a translated version of Oracle Application Express, you must set the character set value of the NLS_LANG environment variable to AL32UTF8 before starting SQL*Plus.

The following examples illustrate valid NLS_LANG settings for loading Oracle Application Express translations:

American_America.AL32UTF8
Japanese_Japan.AL32UTF8

4.12 Installing Translated Versions of Oracle Application Express

Learn about installing translated versions of Oracle Application Express.

- About Installing Translated Versions of Oracle Application Express (page 4-22) You must run load_lang.sql script to run a translated version of Oracle Application Express.
4.12.1 About Installing Translated Versions of Oracle Application Express

You must run `load_lang.sql` script to run a translated version of Oracle Application Express.

Whether you are installing for the first time or upgrading from a previous release, you must run the `load_lang.sql` script to run a translated version of Oracle Application Express.

The installation scripts are located in subdirectories identified by a language code in the unzipped distribution `apex/builder`. For example, the German version is located in `apex/builder/de` and the Japanese version is located in `apex/builder/ja`. Within each directory, there is a language loading script identified by the language code (for example, `load_de.sql` or `load_ja.sql`).

4.12.2 Installing a Translated Version of Oracle Application Express

Learn how to install a translated version of Oracle Application Express.

To install a translated version of Oracle Application Express:

1. Set the NLS_LANG environment variable, making sure that the character set is `AL32UTF8`. For example:
   - Bourne or Korn shell:
     ```
     NLS_LANG=American_America.AL32UTF8
     export NLS_LANG
     ```
   - C shell:
     ```
     setenv NLS_LANG American_America.AL32UTF8
     ```
   - For Windows based systems:
     ```
     set NLS_LANG=American_America.AL32UTF8
     ```

2. Navigate to the directory under `apex/builder` based on the language you need to install. For example for German, navigate to `apex/builder/de`. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the `SYSDBA` role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE: \ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute the following statement:

   ```
   ALTER SESSION SET CURRENT_SCHEMA = APEX_180100;
   ```
4. Execute the appropriate language specific script. For example:

```
@load_lang.sql
```

Where `lang` is the specific language (for example, `load_de.sql` for German or `load_ja.sql` for Japanese).

### 4.13 Creating a Workspace and Adding Oracle Application Express Users

Before you can develop or install applications, you must create a workspace, add Oracle Application Express users, and sign in to your workspace.

- **About Workspaces and Users** *(page 4-23)*
  A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private.

- **Accessing Administration Services Using Oracle REST Data Services** *(page 4-24)*
  Sign in to Oracle Application Express Administration Services using the `ADMIN` account and password created or reset during the installation process.

- **Creating a Workspace Manually** *(page 4-25)*
  Sign in to Oracle Application Express Administration Services to create workspace manually.

- **Creating Oracle Application Express Users** *(page 4-26)*
  Sign into Oracle Application Express Administration Services using an administrator password. From `Manage Workspaces`, click `Manage Developers and Users`, and click `Create User`. Enter the appropriate information.

- **Signing into a Workspace Using Oracle REST Data Services** *(page 4-27)*
  Learn how to sign in to a workspace using the Oracle REST Data Services.

#### 4.13.1 About Workspaces and Users

A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private.

You access the Oracle Application Express home page by logging in to a workspace using a JavaScript enabled Web browser.

Each workspace has a unique ID and name. An instance administrator can create a workspace manually within Oracle Application Express Administration Services or have users submit requests. Oracle Application Express Administration Services is a separate application for managing an entire Oracle Application Express instance.
4.13.2 Accessing Administration Services Using Oracle REST Data Services

Sign in to Oracle Application Express Administration Services using the ADMIN account and password created or reset during the installation process.

To manually create a workspace and user accounts, you sign in to a separate application for managing an entire Oracle Application Express instance called Oracle Application Express Administration Services.

To access Oracle Application Express Administration Services:

1. In a Web browser, navigate to the Oracle Application Express Administration Services application.

   **Tip:**

   By default, the context root for accessing Oracle Application Express through Oracle REST Data Services is /ords. If you wish to have a context root of /apex for accessing Oracle Application Express, rename the ords.war file to apex.war before installing Oracle REST Data Services. See "Installing Oracle REST Data Services" in Oracle REST Data Services Installation, Configuration, and Development Guide.

   Because your setup uses Oracle REST Data Services go to:

   http://hostname:port/apex/apex_admin

   Where:

   hostname is the name of the system where Oracle REST Data Services is installed.

   port is the port number assigned when configuring Oracle REST Data Services. In a default installation, this number is 8080. To learn more, see Oracle REST Data Services Installation, Configuration, and Development Guide.

   apex is the service name defined when configuring Oracle REST Data Services.

2. On the Sign In page:

   • Username - Enter admin.

   • Password - Enter the Oracle Application Express administrator account password you specified in Creating or Updating Your Instance Administration Account.

   • Click Sign In to Administration.

   Note that, depending on your setup, you might be required to change your password when you log in for the first time.
4.13.3 Creating a Workspace Manually

Sign in to Oracle Application Express Administration Services to create workspace manually.

To manually create a workspace you sign in to a separate application called Oracle Application Express Administration Services. You sign in to Oracle Application Express Administration Services using the ADMIN account and password created or reset during the installation process.

To create an Oracle Application Express workspace manually:

1. Access Oracle Application Express Administration Services.

Oracle Application Express Administration Services appears. Next, create a workspace.

2. Click Manage Workspaces.


The Create Workspace Wizard appears.

4. For Identify Workspace, enter the following:
   a. Workspace Name - Enter a unique workspace name.
   b. Workspace ID - Leave Workspace ID blank to have the new Workspace ID automatically generated. A Workspace ID must be a positive integer greater than 100000.
   c. Workspace Description - Enter a workspace description.
   d. Click Next.

5. For Identify Schema, specify whether you are re-using an existing schema or creating a new one.

   If you are using an existing schema:
   a. For Re-use existing schema, select Yes.
   b. Select a schema from the list.
   c. Click Next.

   If you are creating a new schema:
   a. For Re-use existing schema, select No.
   b. Enter a schema name and password.
   c. Specify a space quota.
   d. Click Next.

6. For Identify Administrator, enter the Workspace administrator information and click Next.

7. Confirm your selections and click Create Workspace.
4.13.4 Creating Oracle Application Express Users

Sign into Oracle Application Express Administration Services using an administrator password. From Manage Workspaces, click Manage Developers and Users, and click Create User. Enter the appropriate information.

To create an Oracle Application Express user account:

1. Access Oracle Application Express Administration Services.
   Oracle Application Express Administration Services appears.
2. Click the Manage Workspaces icon.
3. Click Manage Developers and Users.
4. Click Create User.
5. Under User Attributes, enter the appropriate information. Fields marked with an asterisk are required.

Tip:

To learn more about a specific attribute, click the item label. When Help is available, the item label changes to red when you pass your cursor over it and the cursor changes to an arrow and question mark.

6. Under Account Privileges:
   a. Workspace - Select a workspace from the list.
   b. Default Schemas - Specify the default schema used for data browsing, application creation, and SQL script execution.
      When using workspaces that have more than one schema available, this schema is the default. This setting does not control security, only the user's preference.
   c. User is an administrator - Specify if this user should have workspace administrator privileges.
      Administrators are given access to all components. Additionally, they can manage user accounts, groups, and development services. Components may not be available if they are switched off by Instance Administrators.
   d. User is a developer - Specify if this user should have developer privileges.
      Developers must have access to either App Builder, SQL Workshop, or both. These components may not be available if they are switched off by the Instance Administrator.
   e. App Builder Access - Determines whether a developer has access to the App Builder.
   f. SQL Workshop Access - Determines whether a developer has access to the SQL Workshop.
   g. Team Development Access - Determines whether a developer has access to the Team Development.
h. **Set Account Availability** - Select *Locked* to prevent the account from being used. Select *Unlocked* to allow the account to be used.

If the user has exceeded the maximum log in failures allowed, specified in Workspace Preferences, then their account will be locked automatically.

7. Under Password:
   - **Password** - Enter a case sensitive password.
   - **Confirm Password** - Enter the password again.
   - **Require Change of Password On First Use** - Select *No* to allow the user to use the same password until it expires. Select *Yes* to require the user to change the password immediately when logging in the first time.

8. Click **Create User** or **Create and Create Another**.

### 4.13.5 Signing into a Workspace Using Oracle REST Data Services

Learn how to sign in to a workspace using the Oracle REST Data Services.

Use your credentials (that is, your workspace name, user name and password) to sign in to the workspace.

To sign in to your workspace:

1. In a Web browser, navigate to the Oracle Application Express Sign In page. Because your setup uses Oracle REST Data Services, go to:

   http://hostname:port/apex/

   Where:
   - *hostname* is the name of the system where Oracle REST Data Services is installed.
   - *port* is the port number assigned when configuring Oracle REST Data Services. In a default installation, this number is 8080. To learn more, see *Oracle REST Data Services Installation, Configuration, and Development Guide*.
   - *apex* is the service name defined when configuring Oracle REST Data Services.

   The Sign In page appears.

2. On the Sign In page, enter:
   - **Workspace** - Enter the name of your workspace.
   - **Username** - Enter your user name.
   - **Password** - Enter your case-sensitive password.

3. Click **Sign In**.

Note that, depending on your setup, you might be required to change your password when you log in for the first time.
4.14 Performing Post Installation Tasks for Upgrade Installations

Once you have verified that your upgrade installation was successful and all upgraded applications function properly, you should remove schemas from prior Oracle Application Express installations.

- **About Removing Prior Oracle Application Express Installations** (page 4-28)
  Learn about removing schemas from a prior installation by verifying if a prior installation exists.
- **Verifying if a Prior Installation Exists** (page 4-28)
  Run the SQL query to verify if a prior Oracle Application Express installation exists.
- **Removing Schemas from Prior Installations** (page 4-29)
  Start SQL*Plus and connect to database and execute a statement to remove schemas from prior installations.
- **Removing Schemas from Prior Installations in a CDB** (page 4-29)
  Use catcon.pl to remove schemas of prior installations in a CDB.
- **Fixing Invalid ACL in Oracle Database 11g or Later** (page 4-30)
  Learn how to fix an invalid ACL if you are running Oracle Database 11g or later.

See Also:

"Upgrading from a Previous Oracle Application Express Release" (page 1-8)

4.14.1 About Removing Prior Oracle Application Express Installations

Learn about removing schemas from a prior installation by verifying if a prior installation exists.

The database users associated with schemas from prior installations are privileged users and should be removed when they are no longer necessary. Removing schemas from a prior installation is a two step process. First you verify if a prior installation exists and then you remove the schemas.

4.14.2 Verifying if a Prior Installation Exists

Run the SQL query to verify if a prior Oracle Application Express installation exists.

To verify if a prior installation exists:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS. For example:
   - On Windows:
2. Run the following query:

```sql
SELECT username
FROM dba_users
WHERE ( username LIKE 'FLOWS\________' ESCAPE '\'
  OR username LIKE 'APEX\________' ESCAPE '\'
) AND username NOT IN ( SELECT schema
  FROM dba_registry
  WHERE comp_id = 'APEX' );
```

If the results contain entries in the form `FLOWS_XXXXXX` or `APEX_XXXXXX` where `XXXXXX` represents six numbers, those entries are candidates for removal.

### 4.14.3 Removing Schemas from Prior Installations

Start SQL*Plus and connect to database and execute a statement to remove schemas from prior installations.

To remove schemas from prior installations:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:

   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

   - On UNIX and Linux:
     ```bash
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Execute a statement similar to the following example:

   ```sql
   DROP USER APEX_050100 CASCADE;
   ```

### 4.14.4 Removing Schemas from Prior Installations in a CDB

Use `catcon.pl` to remove schemas of prior installations in a CDB.

To remove schemas from prior installations, run a command using the following example:

```bash
$ORACLE_HOME/perl/bin/perl -I $ORACLE_HOME/rdbms/admin $ORACLE_HOME/rdbms/admin/catcon.pl -b drop_apex050100 -- --x'drop user APEX_050100 cascade'
```
4.14.5 Fixing Invalid ACL in Oracle Database 11g or Later

Learn how to fix an invalid ACL if you are running Oracle Database 11g or later.

After following the instructions in "About Removing Prior Oracle Application Express Installations" (page 4-28), you may need to fix an invalid ACL if you are running Oracle Database 11g or later and you enabled network services for the prior Oracle Application Express schema.

To fix an invalid ACL:

1. Change your working directory to the apex directory where you unzipped the installation software.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
3. Execute a statement similar to the following:
   ```sql
   EXEC DBMS_NETWORK_ACL_ADMIN.DELETE_PRIVILEGE('power_users.xml', 'APEX_040200');
   ```

4.15 About Performance Optimization Tasks

Learn about performance optimization.

Performance of web applications heavily depends on their size and how often a browser has to request static content like images, CSS and JavaScript files. To improve performance, most web servers support on-the-fly HTTP response compression and provide settings that enable you to configure on how long browsers can cache a file before requesting it again. The HTTP response compression is usually implemented using gzip encoding, while browser file caching is enabled by issuing Cache-Control HTTP response header.

Please see your web server documentation to learn how to enable response compression and browser file caching. For optimal performance of the Oracle Application Express development environment and Oracle Application Express applications, Oracle recommends enabling gzip compression of files in the virtual images directory (for example, /i/) and responses from the database access descriptor as well as allowing browsers to cache files from the virtual images directory for at least 12 hours.

4.16 Converting Between Runtime and Full Development Environments

Learn about converting between runtime and full development environments.
This section describes how to convert between runtime and full development environments.

- **About Runtime and Full Development Environments** (page 4-31)
  An Oracle Application Express runtime environment enables users to run a production application without supporting the ability to change or edit the application.

- **Converting a Runtime Environment to a Full Development Environment** (page 4-31)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdvins.sql`.

- **Converting a Full Development Environment to a Runtime Environment** (page 4-32)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdevrm.sql`.

### 4.16.1 About Runtime and Full Development Environments

An Oracle Application Express runtime environment enables users to run a production application without supporting the ability to change or edit the application.

A runtime environment includes only the packages necessary to run your applications, making it a more hardened environment. It does not provide a web interface for administration.

You administer an Oracle Application Express runtime environment using SQL*Plus or SQL Developer and the `APEX_INSTANCE_ADMIN` API.

### 4.16.2 Converting a Runtime Environment to a Full Development Environment

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdvins.sql`.

To convert an Oracle Application Express runtime environment to a full development environment:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - **On Windows:**
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run `apxdvins.sql`. For example:
Follow the instructions in Creating or Updating Your Instance Administration Account.

### 4.16.3 Converting a Full Development Environment to a Runtime Environment

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdevrm.sql`.

**Tip:**

Before converting a full development environment to a runtime environment, export all Websheet applications. When you convert a development environment to runtime, existing Websheet data grids and reports will be deleted from all workspaces. Converting the environment back to a full development environment will not restore these Websheet data grids or reports.

To convert an Oracle Application Express full development environment to a runtime environment:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - **On Windows:**
     ```sql
     \sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```bash
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run `apxdevrm.sql`. For example:

   ```sql
   @apxdevrm.sql
   ```
Installing Application Express and Configuring Embedded PL/SQL Gateway

Install Oracle Application Express by downloading a ZIP file from Oracle Technology Network and then configuring Embedded PL/SQL Gateway.

This section describes how to install Oracle Application Express by downloading a ZIP file from Oracle Technology Network and then configuring the embedded PL/SQL gateway. Embedded PL/SQL gateway is an alternative Web listener. These instructions apply to both new and upgrade installations.

• Oracle Database Requirements (page A-2)
  Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

• About Patching Oracle Application Express (page A-2)
  If you are already running Oracle Application Express, then check the Oracle Application Express page on the Oracle Technology Network for information about patch set releases or later releases of Oracle Application Express.

• Performing Pre-installation Tasks for Oracle Application Express (page A-2)
  Review and perform pre-installation tasks before installing Oracle Application Express.

• Downloading and Installing Oracle Application Express (page A-3)
  Learn how to download and install Oracle Application Express.

• Configuring the Embedded PL/SQL Gateway (page A-8)
  To configure the embedded PL/SQL gateway, you run a configuration script and unlock the ANONYMOUS account.

• Enabling Network Services in Oracle Database 11g or Later (page A-14)
  You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.

• Performing Security Tasks (page A-17)
  Oracle recommends you configure and use Secure Sockets Layer (SSL) to ensure that passwords and other sensitive data are not transmitted in clear text in HTTP requests.

• Controlling the Number of Concurrent Jobs (page A-18)
  Learn about specifying the number of concurrently running jobs.

• About Running Oracle Application Express in Other Languages (page A-19)
  You can install a single instance of Oracle Application Express with one or more of translated versions.

• Installing Translated Versions of Oracle Application Express (page A-20)
  Learn about installing translated versions of Oracle Application Express.
• **About Configuring the SHARED_SERVERS Parameter** (page A-21)
  Achieve acceptable performance when using the embedded PL/SQL gateway by setting the `SHARED_SERVERS` database initialization parameter to a reasonable value.

• **Creating a Workspace and Adding Oracle Application Express Users** (page A-22)
  Before you can develop or install applications, you must create a workspace, add Oracle Application Express users and sign in to your workspace.

• **Performing Post Installation Tasks for Upgrade Installations** (page A-26)
  Remove schemas from prior Oracle Application Express installations.

• **About Performance Optimization Tasks** (page A-29)
  Learn about performance optimization.

• **Converting Between Runtime and Full Development Environments** (page A-29)
  Learn how to convert between runtime and full development environments.

---

### A.1 Oracle Database Requirements

Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

If you are upgrading an Oracle Database version 12.1 CDB, you must download from My Oracle Support the one off patch for bug 20618595. Search for 20618595 on the Patches tab.

### A.2 About Patching Oracle Application Express

If you are already running Oracle Application Express, then check the Oracle Application Express page on the Oracle Technology Network for information about patch set releases or later releases of Oracle Application Express.


### A.3 Performing Pre-installation Tasks for Oracle Application Express

Review and perform pre-installation tasks before installing Oracle Application Express.

Before installing Oracle Application Express, Oracle recommends that you complete the following steps:

1. Review and satisfy all Oracle Application Express installation requirements.
2. If you are actively using Oracle Application Express and upgrading the current installation then shut down with normal or immediate priority the Oracle Database instances where you plan to install Oracle Application Express. On Oracle Real Application Clusters (Oracle RAC) systems, shut down all instances on each node.

An alternative to shutting down the database is to prevent all users from accessing Oracle Application Express when upgrading your installation from a previous release of Oracle Application Express. Oracle only recommends this option in high availability production environments where planned outages are not available. For all other scenarios, the database should be shut down.

To disable access to Oracle Application Express when an existing installation is using the Embedded PL/SQL Gateway, disable the Oracle XML DB Protocol Server by setting the HTTP port to 0. Start SQL*Plus, connect as SYS to the database where Oracle Application Express is installed, and run:

```
EXEC DBMS_XDB.SETHTTPPORT(0);
```

Once you have prevented access from Oracle Application Express users, you should log in to SQL*Plus as **SYS**, connecting to the database where Oracle Application Express is installed, and query **V$SESSION** to ensure there are no long running sessions which would interfere with the upgrade process.

3. Back up the Oracle Database installation.

Oracle recommends that you create a backup of the current Oracle Database installation before you install Oracle Application Express. You can use Oracle Database Recovery Manager, which is included in the Oracle Database installation, to perform the backup.

4. Start the Oracle Database instance that contains the target database.

After backing up the system, you must start the Oracle instance that contains the target Oracle Database. Do not start other processes such as a Web listener. However, if you are performing a remote installation, make sure the Web listener for the remote database has started.

![Note:]

If you are connecting to a remote database, then start the Web listener.

### A.4 Downloading and Installing Oracle Application Express

Learn how to download and install Oracle Application Express.

This section describes how to download and install Oracle Application Express. How you install Oracle Application Express depends upon by the type of database you into which you are installing.

- **Downloading and Installing Application Express** (page A-4)
  Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page.

- **Creating or Updating Your Instance Administration Account** (page A-6)
  Learn how to create or update your Instance Administrator account.
A.4.1 Downloading and Installing Application Express

Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page.

To install Oracle Application Express:

1. For installations where the development will be in English only, download the file `apex_18.1_en.zip` from the Oracle Application Express download page. If the development will include languages other than English, download `apex_18.1.zip` from the Oracle Application Express download page. See:


   Note that the actual file name may differ if a more recent release has shipped since this document was published.

2. Unzip downloaded zip file:
   
   - If English only, unzip `apex_18.1_en.zip` as follows, preserving directory names:
     - UNIX and Linux: `$ unzip apex_18.1_en.zip`
     - Windows: Double click the file `apex_18.1_en.zip` in Windows Explorer
   
   - If multiple languages, unzip `apex_18.1.zip` as follows, preserving directory names:
     - UNIX and Linux: `$ unzip apex_18.1.zip`
     - Windows: Double click the file `apex_18.1.zip` in Windows Explorer

   Note: You should keep the directory tree where you unzip the files short and not under directories that contain spaces. For example, within Windows unzip to `C:\TEMP`.

3. Change your working directory to `apex`.

4. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   
   - On Windows:
     
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
     
See Also:

"Utilizing the Multitenant Architecture in Oracle Database 12c or Later (page 3-1)."
• On UNIX and Linux:

```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```


6. Select the appropriate installation option.

**Full development environment** provides complete access to the App Builder environment to develop applications. A **Runtime environment** enables users to run applications that cannot be modified.

Available installation options include:

• **Full development environment.** Run `apexins.sql` passing the following four arguments in the order shown:

```
@apexins.sql tablespace_apex tablespace_files tablespace_temp images
```

Where:

— `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.

— `tablespace_files` is the name of the tablespace for the Oracle Application Express files user.

— `tablespace_temp` is the name of the temporary tablespace or tablespace group.

— `images` is the virtual directory for Oracle Application Express images. For installations using EPG, `/i/` is the required value for the images argument. To support future Oracle Application Express upgrades, define the virtual image directory as `/i/`.

Example:

```
@apexins.sql SYSAUX SYSAUX TEMP /i/
```

**Note:**

If you receive the following error, exit SQL*Plus and change your working directory to where you unzipped the installation file, for example `C:\TEMP` in Windows, before starting SQL*Plus:

```
SP2-0310: unable to open file "apexins.sql"
```

• **Runtime environment.** Run `apxrtins.sql` passing the following arguments in the order shown:

```
@apxrtins.sql tablespace_apex tablespace_files tablespace_temp images
```

Where:

— `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.

— `tablespace_files` is the name of the tablespace for the Oracle Application Express files user.
– `tablespace_temp` is the name of the temporary tablespace or tablespace group.
– `images` is the virtual directory for Oracle Application Express images. To support future Oracle Application Express upgrades, define the virtual image directory as `/i/`.

Example:

```
@apxrtins.sql SYSAUX SYSAUX TEMP /i/
```

When Oracle Application Express installs, it creates three new database accounts:

- **APEX_180100** - The account that owns the Oracle Application Express schema and metadata.
- **FLOWS_FILES** - The account that owns the Oracle Application Express uploaded files.
- **APEX_PUBLIC_USER** - The minimally privileged account is used for Oracle Application Express configuration with Oracle REST Data Services or Oracle HTTP Server and `mod_plsql`.

**Note:**

In an environment where EPG is used to access Oracle Application Express, the existing minimally privileged account `ANONYMOUS` is used.

If you are upgrading from a previous release, then `FLOWS_FILES` already exists and `APEX_PUBLIC_USER` is created if it does not already exist.

**Tip:**

Oracle Application Express must be installed from a writable directory on the file system. See "Reviewing a Log of an Installation Session (page C-1)."

### A.4.2 Creating or Updating Your Instance Administration Account

Learn how to create or update your Instance Administrator account.

This section describes how to create or update your Instance Administrator account.

**Tip:**

Skip this section if you are upgrading from a previous release of Oracle Application Express. In an upgrade scenario, the Instance Administrator account and password is preserved and carried over from the prior release.
A.4.2.1 What Is an Instance Administrator?

Instance administrators are superusers that are responsible for managing an entire Oracle Application Express instance, including managing workspace provisioning, configuring features and instance settings, and managing security.

To perform these tasks, an Instance administrator signs in to the Oracle Application Express Administration Services application.

A.4.2.2 About apxchpwd.sql

Run the apxchpwd.sql script to create or update your Instance Administrator account.

Running the apxchpwd.sql script enables you to create or update your Instance Administrator account. You must run the apxchpwd.sql script in the following scenarios:

- **New Oracle Application Express installations** - Run apxchpwd.sql to create an Instance Administrator account and password.
- **Converting of a runtime environment to a development environment** - Run apxchpwd.sql to change the Instance Administrator account password.
- **Changing Your Instance Administrator Password** - Run apxchpwd.sql to change the password for an existing Instance Administrator account.
- **Unlocking Your Instance Administrator Account** - Run apxchpwd.sql to unlock an existing Instance Administrator account.

Tip:

You do not need to run apxchpwd.sql when upgrading from a previous release of Oracle Application Express. In an upgrade scenario, the Instance Administrator account password is preserved and carried over from the prior release.

A.4.2.3 Running apxchpwd.sql

Run the apxchpwd.sql script to create and update your Instance Administrator account.

To create or update your Instance Administrator account:
1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     
```
SYSTEM_DRIVE:\ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```
   
   - On UNIX and Linux:
     
```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

If Application Express was installed in a CDB, change your container to the PDB where you want to change the Administrator account password. For example: alter session set container = 'PDB1'

3. If Application Express was installed in a CDB, change your container to the PDB where you want to change the Administrator account password. For example:
   
```
alter session set container = 'PDB1';
```

4. Run apxchpwd.sql. For example:

```
@apxchpwd.sql
```

Follow the on-screen instructions. You will be prompted provide a username, password, and email address. If the account username does not exist, it will be created for you.

A.4.3 Restart Processes

Restart the processes that you stopped before you began the installation.

After you install Oracle Application Express, you must restart the processes that you stopped before you began the installation.

A.5 Configuring the Embedded PL/SQL Gateway

To configure the embedded PL/SQL gateway, you run a configuration script and unlock the ANONYMOUS account.

The embedded PL/SQL gateway installs with the Oracle Database 11g and later. However, you must configure it before you can use it with Oracle Application Express. To configure the embedded PL/SQL gateway, you run a configuration script and unlock the ANONYMOUS account.

Note:

The Oracle XML DB Protocol Server with the Embedded PL/SQL Gateway is not supported before Oracle Database 11g.
• **Running the apex_epg_config.sql Configuration Script** (page A-9)
  Run the `apex_epg_config.sql` script. Then, unlock the ANONYMOUS account.

• **Updating the Images Directory When Upgrading from a Previous Release** (page A-10)
  Run the `apex_epg_config.sql` script to update the images directory.

• **Verifying the Port Assigned to HTTP on the Oracle XML DB HTTP Server** (page A-11)
  Start SQL* Plus and connect to the database and enter the statement to verify the port number assigned to HTTP on the Oracle XML DB HTTP Server.

• **Verifying the Oracle XML DB Protocol Server Port** (page A-12)
  Start SQL* Plus and connect to the database and enter the statement to verify the port number where the Oracle XML DB Protocol Server is running.

• **Enabling Oracle XML DB Protocol Server** (page A-12)
  Start SQL* Plus and connect to the database and run a SQL statement to enable Oracle XML DB Protocol Server.

• **Configuring Static File Support** (page A-13)
  For configuring static files, you must run `apex_rest_config.sql` after a new installation or upgrade of Oracle Application Express.

• **About Configuring Embedded PL/SQL Gateway Behind a Reverse Proxy or Load Balancer** (page A-13)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. Execute the PL/SQL block.

---

**See Also:**

- “Choosing a Web Listener (page 1-12)”
- “About the Embedded PL/SQL Gateway (page 1-15)”

---

### A.5.1 Running the apex_epg_config.sql Configuration Script

Run the `apex_epg_config.sql` script. Then, unlock the ANONYMOUS account.

You configure the embedded PL/SQL gateway by running the configuration script `apex_epg_config.sql`. Then, you unlock the ANONYMOUS account.

To run the `apex_epg_config.sql` configuration script:

---

**WARNING:**

This script has to be executed only on the database server. It's not possible to perform a remote connect to the database server. The database server should have access to the specified directory. It's also not possible to map a network directory.

1. Change your working directory to the apex directory where you unzipped the Oracle Application Express software.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. If you are configuring a PDB, enter the following statement:
   ```
   ALTER SESSION SET CONTAINER = <PDB_NAME>;
   ```

4. Run `apex_epg_config.sql` passing the file system path to the base directory where the Oracle Application Express software was unzipped as shown in the following example:
   - On Windows:
     ```
     @apex_epg_config.sql SYSTEM_DRIVE:\temp
     ```
   - On UNIX and Linux:
     ```
     @apex_epg_config.sql /tmp
     ```

5. Enter the following statement to unlock the **ANONYMOUS** account:
   ```
   ALTER USER ANONYMOUS ACCOUNT UNLOCK;
   ```

### A.5.2 Updating the Images Directory When Upgrading from a Previous Release

Run the `apex_epg_config.sql` script to update the images directory.

If you are upgrading Oracle Application Express from a previous release, you must run the `apex_epg_config.sql` script to update the images directory.

**Tip:**

If this is a new installation, this step is unnecessary. The images will be loaded by running `apex_epg_config.sql` as described in the prior section.

To run the `apex_epg_config.sql` script:

1. Change your working directory to the apex directory where you unzipped the Oracle Application Express software.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
A.5.3 Verifying the Port Assigned to HTTP on the Oracle XML DB HTTP Server

Start SQL* Plus and connect to the database and enter the statement to verify the port number assigned to HTTP on the Oracle XML DB HTTP Server.

The embedded PL/SQL gateway runs in the Oracle XML DB Protocol Server in the Oracle database.

To verify the port number assigned to HTTP on the Oracle XML DB HTTP Server:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     
   ```
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```
   - On UNIX and Linux:
     
   ```
   $ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

2. Enter the following statement to verify the port number:

   ```
   SELECT DBMS_XDB.GETHTTPPORT FROM DUAL;
   ```

   If the port number returns 0, the Oracle XML DB HTTP Server is disabled.
A.5.4 Verifying the Oracle XML DB Protocol Server Port

Start SQL* Plus and connect to the database and enter the statement to verify the port number where the Oracle XML DB Protocol Server is running.

The Embedded PL/SQL Gateway runs in the Oracle XML DB Protocol Server in the Oracle database. You can determine if the Oracle XML DB Protocol Server is enabled by verifying the associated port number.

To verify the port number where the Oracle XML DB Protocol Server is running:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Enter the following statement to verify the port number:
   ```
   SELECT DBMS_XDB.GETHTTPPORT FROM DUAL;
   ```
   If the port number returns 0, the Oracle XML DB Protocol Server is disabled.

3. To enable the Oracle XML DB Protocol Server.

A.5.5 Enabling Oracle XML DB Protocol Server

Start SQL* Plus and connect to the database and run a SQL statement to enable Oracle XML DB Protocol Server.

The embedded PL/SQL gateway runs in the Oracle XML DB Protocol Server in the Oracle database.

To enable Oracle XML DB Protocol Server:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Enter a statement similar to the following:
   ```
   EXEC DBMS_XDB.SETHTTPPORT(port);
   ```
For example:

EXEC DBMS_XDB.SETHTTPPORT(8080);

Note:

Port numbers less than 1024 are reserved for use by privileged processes on many operating systems. To enable the XML DB HTTP listener on a port less than 1024, such as 80, review the documentation.

A.5.6 Configuring Static File Support

For configuring static files, you must run `apex_rest_config.sql` after a new installation or upgrade of Oracle Application Express.

Oracle Application Express enables application developers to include static files with their applications. Static files can be associated with a workspace, an application, a plug-in, or an application theme. When using the embedded PL/SQL gateway as your web listener, the necessary configuration to support static files is performed as part of the embedded PL/SQL gateway configuration.

A.5.7 About Configuring Embedded PL/SQL Gateway Behind a Reverse Proxy or Load Balancer

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. Execute the PL/SQL block.

If Oracle Application Express is running behind a reverse proxy or load balancer, you set the CGI environment variables `PROTOCOL` and `HTTP_HOST`. For embedded PL/SQL gateway, you must call the following PL/SQL block:

1. Change your working directory to the `apex` directory where you unzipped the installation software.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - **On Windows:**
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```bash
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
3. Execute the following PL/SQL block:
   ```sql
   BEGIN
   DBMS_EPG.set_dad_attribute (dad_name => 'APEX', attr_name => 'cgi-environment-list'),
   ```
A.6 Enabling Network Services in Oracle Database 11g or Later

You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.

- **When and Why Network Services Must be Enabled** (page A-14)
  Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.

- **Granting Connect Privileges Prior to Oracle Database 12c** (page A-15)
  Demonstrates how to grant connect privileges to any host for the APEX_180100 database user.

- **Granting Connect Privileges in Oracle Database 12c or Later** (page A-16)
  Procedures `CREATE_ACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.

- **Troubleshooting an Invalid ACL Error** (page A-16)
  Learn how to identify a invalid ACL error by running the query.

A.6.1 When and Why Network Services Must be Enabled

Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.

By default, the ability to interact with network services is disabled in Oracle Database 11g Release 2 or later. Therefore, if you are running Oracle Application Express with Oracle Database 11g Release 2 or later, you must use the new `DBMS_NETWORK_ACL_ADMIN` package to grant connect privileges to any host for the APEX_180100 database user. Failing to grant these privileges results in issues with:

- Sending outbound mail in Oracle Application Express.
  Users can call methods from the `APEX_MAIL` package, but issues arise when sending outbound email.

- Using Web services in Oracle Application Express.

- PDF report printing.
A Tip:

To run the examples described in this section, the compatible initialization parameter of the database must be set to at least 11.1.0.0.0. By default a 11g or 12c database will already have the parameter set properly, but a database upgraded to 11g or 12c from a prior version may not. For information about changing database initialization parameters, see “Creating and Configuring an Oracle Database” in Oracle Database Administrator’s Guide.

A.6.2 Granting Connect Privileges Prior to Oracle Database 12c

Demonstrates how to grant connect privileges to any host for the APEX_180100 database user.

The following example demonstrates how to grant connect privileges to any host for the APEX_180100 database user. This example assumes you connected to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role.

```sql
DECLARE
    ACL_PATH  VARCHAR2(4000);
BEGIN
    -- Look for the ACL currently assigned to '*' and give APEX_180100
    -- the "connect" privilege if APEX_180100 does not have the privilege yet.

    SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

    IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_180100', 'connect') IS NULL THEN
        DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH, 'APEX_180100', TRUE, 'connect');
    END IF;

EXCEPTION
    -- When no ACL has been assigned to '*'.
    WHEN NO_DATA_FOUND THEN
        DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('power_users.xml',
            'ACL that lets power users to connect to everywhere',
            'APEX_180100', TRUE, 'connect');
        DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('power_users.xml','*');
    END;
/
COMMIT;
```

The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

```sql
DECLARE
    ACL_PATH  VARCHAR2(4000);
BEGIN
    -- Look for the ACL currently assigned to 'localhost' and give APEX_180100
    -- the "connect" privilege if APEX_180100 does not have the privilege yet.

    SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = 'localhost' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;
```
IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_180100', 'connect') IS NULL THEN
    DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH, 'APEX_180100', TRUE, 'connect');
END IF;

EXCEPTION
-- When no ACL has been assigned to localhost.
WHEN NO_DATA_FOUND THEN
    DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('local-access-users.xml', 'ACL that lets users to connect to localhost', 'APEX_180100', TRUE, 'connect');
    DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('local-access-users.xml', 'localhost');
END;
/
COMMIT;

A.6.3 Granting Connect Privileges in Oracle Database 12c or Later

Procedures CREATE_ACL, ASSIGN_ACL, ADD_PRIVILEGE and CHECK_PRIVILEGE in DBMS_NETWORK_ACL_ADMIN are deprecated in Oracle Database 12c. Oracle recommends to use APPEND_HOST_ACE.

The following example demonstrates how to grant connect privileges to any host for the APEX_180100 database user. This example assumes you connected to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role.

BEGIN
    DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
        host => '*',
        ace => xs$ace_type(privilege_list => xs$name_list('connect'),
                           principal_name => 'APEX_180100',
                           principal_type => xs_acl.ptype_db));
END;
/

The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

BEGIN
    DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
        host => 'localhost',
        ace => xs$ace_type(privilege_list => xs$name_list('connect'),
                           principal_name => 'APEX_180100',
                           principal_type => xs_acl.ptype_db));
END;
/

A.6.4 Troubleshooting an Invalid ACL Error

Learn how to identify a invalid ACL error by running the query.

If you receive an ORA-44416: Invalid ACL error after running the previous script, use the following query to identify the invalid ACL:

REM Show the dangling references to dropped users in the ACL that is assigned REM to '*'.
SELECT ACL, PRINCIPAL
FROM DBA_NETWORK_ACLS NACL, XDS_ACE ACE
WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL AND
    NACL.ACLID = ACE.ACLID AND
    NOT EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);

Next, run the following code to fix the ACL:

DECLARE
    ACL_ID  RAW(16);
    CNT      NUMBER;
BEGIN
    -- Look for the object ID of the ACL currently assigned to '*'
    SELECT ACLID INTO ACL_ID FROM DBA_NETWORK_ACLS
        WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

    -- If just some users referenced in the ACL are invalid, remove just those
    -- users in the ACL. Otherwise, drop the ACL completely.
    SELECT COUNT(PRINCIPAL) INTO CNT FROM XDS_ACE
        WHERE ACLID = ACL_ID AND
        EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);

    IF (CNT > 0) THEN
        FOR R IN (SELECT PRINCIPAL FROM XDS_ACE
            WHERE ACLID = ACL_ID AND
            NOT EXISTS (SELECT NULL FROM ALL_USERS
                WHERE USERNAME = PRINCIPAL)) LOOP
            UPDATE XDB.XDB$ACL
                SET OBJECT_VALUE =
                    DELETEXML(OBJECT_VALUE,
                        '/ACL/ACE[PRINCIPAL="''||R.PRINCIPAL||''"]'
                    )
                WHERE OBJECT_ID = ACL_ID;
        END LOOP;
    ELSE
        DELETE FROM XDB.XDB$ACL WHERE OBJECT_ID = ACL_ID;
    END IF;
END;
/

REM commit the changes.
COMMIT;

Once the ACL has been fixed, you must run the first script in this section to apply the
ACL to the APEX_180100 user.

A.7 Performing Security Tasks

Oracle recommends you configure and use Secure Sockets Layer (SSL) to ensure
that passwords and other sensitive data are not transmitted in clear text in HTTP
requests.

Without the use of SSL, passwords could potentially be exposed, compromising
security.
SSL is an industry standard protocol that uses RSA public key cryptography in conjunction with symmetric key cryptography to provide authentication, encryption, and data integrity.

A.8 Controlling the Number of Concurrent Jobs

Learn about specifying the number of concurrently running jobs.

- About Managing the Number of Concurrent Jobs (page A-18)
  Learn about managing maximum number of concurrently running jobs.

- Viewing the Number of JOB_QUEUE_PROCESSES (page A-18)
  You can view number of JOB_QUEUE_PROCESSES in three ways.

- Changing the Number of JOB_QUEUE_PROCESSES (page A-19)
  You can change the number of JOB_QUEUE_PROCESSES by running a SQL statement in SQL*Plus.

A.8.1 About Managing the Number of Concurrent Jobs

Learn about managing maximum number of concurrently running jobs.

JOB_QUEUE_PROCESSES determine the maximum number of concurrently running jobs. In Oracle Application Express transactional support and SQL scripts require jobs. If JOB_QUEUE_PROCESSES is not enabled and working properly, you cannot successfully execute a script.

A.8.2 Viewing the Number of JOB_QUEUE_PROCESSES

You can view number of JOB_QUEUE_PROCESSES in three ways.

- Viewing JOB_QUEUE_PROCESSES in the Installation Log File (page A-18)
  Learn how to view the JOB_QUEUE_PROCESSES in the installation log files.

- Viewing JOB_QUEUE_PROCESSES in Oracle Application Express (page A-18)
  Learn how to view the number of JOB_QUEUE_PROCESSES on the About page in Application Express.

- Viewing JOB_QUEUE_PROCESSES from SQL*Plus (page A-19)
  Learn how to view the number of JOB_QUEUE_PROCESSES from SQL*Plus by running the following SQL statement.

A.8.2.1 Viewing JOB_QUEUE_PROCESSES in the Installation Log File

Learn how to view the JOB_QUEUE_PROCESSES in the installation log files.

A.8.2.2 Viewing JOB_QUEUE_PROCESSES in Oracle Application Express

Learn how to view the number of JOB_QUEUE_PROCESSES on the About page in Application Express.

To view the About Application Express page:

1. Sign in to Oracle Application Express.
2. Locate the Help menu at the top of the page.
3. From the Help menu, select About.
   The About Application Express page appears. The current number JOB_QUEUE_PROCESSES displays at the bottom of the page.

A.8.2.3 Viewing JOB_QUEUE_PROCESSES from SQL*Plus

Learn how to view the number of JOB_QUEUE_PROCESSES from SQL*Plus by running the following SQL statement.

```
SELECT VALUE FROM v$parameter WHERE NAME = 'job_queue_processes'
```

A.8.3 Changing the Number of JOB_QUEUE_PROCESSES

You can change the number of JOB_QUEUE_PROCESSES by running a SQL statement in SQL*Plus.

To update the number of JOB_QUEUE_PROCESSES:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   • On Windows:
     ```
     SYSTEM_DRIVE:\sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   • On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. In SQL*Plus run the following SQL statement:

   ```
   ALTER SYSTEM SET JOB_QUEUE_PROCESSES = <number>
   ```

   For example, running the statement
   ```
   ALTER SYSTEM SET JOB_QUEUE_PROCESSES = 20
   ```
   sets JOB_QUEUE_PROCESSES to 20.

A.9 About Running Oracle Application Express in Other Languages

You can install a single instance of Oracle Application Express with one or more of translated versions.

The Oracle Application Express interface is translated into German, Spanish, French, Italian, Japanese, Korean, Brazilian Portuguese, Simplified Chinese, and Traditional Chinese. A single instance of Oracle Application Express can be installed with one or more of these translated versions. Developers can choose to run the Application Express development environment in any of the installed languages by simply selecting the language from the App Builder log in screen or home page.

In order to install other languages you must use the apex_18.1.zip file which contains the extra files referenced below. If you previously downloaded apex_18.1_en.zip, then you do not need to re-install Oracle Application Express. Simply download
apex_18.1.zip and unzip the file into the same directory where you unzipped apex_18.1_en.zip.

The translated version of Oracle Application Express should be loaded into a database that has a character set that supports the specific language. If you attempt to install a translated version of Oracle Application Express into a database that does not support the character encoding of the language, the installation may fail or the translated Oracle Application Express instance may appear corrupt when run. The database character set \texttt{AL32UTF8} supports all the translated versions of Oracle Application Express.

You can manually install translated versions of Oracle Application Express using SQL*Plus. The installation files are encoded in \texttt{AL32UTF8}.

\textbf{Note:}

Regardless of the target database character set, to install a translated version of Oracle Application Express, you must set the character set value of the \texttt{NLS_LANG} environment variable to \texttt{AL32UTF8} before starting SQL*Plus.

The following examples illustrate valid \texttt{NLS_LANG} settings for loading Oracle Application Express translations:

\texttt{American_America.AL32UTF8}
\texttt{Japanese_Japan.AL32UTF8}

\section*{A.10 Installing Translated Versions of Oracle Application Express}

Learn about installing translated versions of Oracle Application Express.

- \textbf{About Installing Translated Versions of Oracle Application Express} (page A-20)
  You must run \texttt{load_lang.sql} script to run a translated version of Oracle Application Express.

- \textbf{Installing a Translated Version of Oracle Application Express} (page A-21)
  Learn how to install a translated version of Oracle Application Express.

\subsection*{A.10.1 About Installing Translated Versions of Oracle Application Express}

You must run \texttt{load_lang.sql} script to run a translated version of Oracle Application Express.

Whether you are installing for the first time or upgrading from a previous release, you must run the \texttt{load_lang.sql} script to run a translated version of Oracle Application Express.

The installation scripts are located in subdirectories identified by a language code in the unzipped distribution \texttt{apex/builder}. For example, the German version is located in \texttt{apex/builder/de} and the Japanese version is located in \texttt{apex/builder/ja}. Within each
directory, there is a language loading script identified by the language code (for example, load_de.sql or load_ja.sql).

A.10.2 Installing a Translated Version of Oracle Application Express

Learn how to install a translated version of Oracle Application Express.

To install a translated version of Oracle Application Express:

1. Set the NLS_LANG environment variable, making sure that the character set is AL32UTF8. For example:
   - Bourne or Korn shell:
     
     NLS_LANG=American_America.AL32UTF8
     
     export NLS_LANG
   - C shell:
     
     setenv NLS_LANG American_America.AL32UTF8
   - For Windows based systems:
     
     set NLS_LANG=American_America.AL32UTF8

2. Navigate to the directory under apex/builder based on the language you need to install. For example for German, navigate to apex/builder/de. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
   - On UNIX and Linux:
     
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password

3. Execute the following statement:

   ALTER SESSION SET CURRENT_SCHEMA = APEX_180100;

4. Execute the appropriate language specific script. For example:

   @load_lang.sql

   Where lang is the specific language (for example, load_de.sql for German or load_ja.sql for Japanese).

A.11 About Configuring the SHARED_SERVERS Parameter

Achieve acceptable performance when using the embedded PL/SQL gateway by setting the SHARED_SERVERS database initialization parameter to a reasonable value.

The embedded PL/SQL gateway uses the shared server architecture of the Oracle Database. To achieve acceptable performance when using the embedded PL/SQL gateway, ensure the SHARED_SERVERS database initialization parameter is set to a reasonable value (that is, not 0 or 1). For a small group of concurrent users, Oracle recommends a value of 5 for SHARED_SERVERS.
Consider the following example:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Run the following statement:
   ```
   ALTER SYSTEM SET SHARED_SERVERS = 5 SCOPE=BOTH;
   ```

**A.12 Creating a Workspace and Adding Oracle Application Express Users**

Before you can develop or install applications, you must create a workspace, add Oracle Application Express users and sign in to your workspace.

- **About Workspaces and Users** (page A-22)
  A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private.

- **Accessing Administration Services Using Embedded PL/SQL Gateway** (page A-23)
  You can sign in to Oracle Application Express Administration Services using the ADMIN account and password created or reset during the installation process.

- **Creating a Workspace Manually** (page A-23)
  Sign in to Oracle Application Express Administration Services to create workspace manually.

- **Creating Oracle Application Express Users** (page A-24)
  Sign into Oracle Application Express Administration Services using an administrator password. From **Manage Workspaces**, click **Manage Developers and Users**, and click **Create User**. Enter the appropriate information.

- **Signing into a Workspace Using the Embedded PL/SQL Gateway** (page A-26)
  Learn how to sign in to a workspace using the embedded PL/SQL gateway.

**A.12.1 About Workspaces and Users**

A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private.

You access the Oracle Application Express home page by logging in to a workspace using a JavaScript enabled Web browser.

Each workspace has a unique ID and name. An instance administrator can create a workspace manually within Oracle Application Express Administration Services or
have users submit requests. Oracle Application Express Administration Services is a separate application for managing an entire Oracle Application Express instance.

A.12.2 Accessing Administration Services Using Embedded PL/SQL Gateway

You can sign in to Oracle Application Express Administration Services using the `ADMIN` account and password created or reset during the installation process.

To manually create a workspace and user accounts, you sign in to a separate application for managing an entire Oracle Application Express instance called Oracle Application Express Administration Services. You sign in to Oracle Application Express Administration Services using the `ADMIN` account and password created or reset during the installation process.

To access Oracle Application Express Administration Services:

1. In a Web browser, navigate to the Oracle Application Express Administration Services application.
   Because your setup uses embedded PL/SQL gateway, go to:
   
   http://hostname:port/apex/apex_admin

   Where:

   `hostname` is the name of the system where Oracle XML DB Protocol server is installed.

   `port` is the port number assigned to HTTP on the Oracle XML DB Protocol server. In a default installation, this number is 8080. If you are using the Oracle Database 12c or later multitenant architecture, then each pluggable database (PDB) will have a distinct port number.

   `apex` is the database access descriptor (DAD) defined in the configuration file.

2. On the Sign In page:
   • Username - Enter `admin`.
   • Password - is the database access descriptor (DAD) defined in the configuration file.
   • Click **Sign In to Administration**.

   Note that, depending on your setup, you might be required to change your password when you log in for the first time.

A.12.3 Creating a Workspace Manually

Sign in to Oracle Application Express Administration Services to create workspace manually.

To manually create a workspace you sign in to a separate application called Oracle Application Express Administration Services. You sign in to Oracle Application Express Administration Services using the `ADMIN` account and password created or reset during the installation process.

To create an Oracle Application Express workspace manually:
1. Access Oracle Application Express Administration Services.
   Oracle Application Express Administration Services appears. Next, create a workspace.
2. Click Manage Workspaces.
   The Create Workspace Wizard appears.
4. For Identify Workspace, enter the following:
   a. Workspace Name - Enter a unique workspace name.
   b. Workspace ID - Leave Workspace ID blank to have the new Workspace ID automatically generated. A Workspace ID must be a positive integer greater than 100000.
   c. Workspace Description - Enter a workspace description.
   d. Click Next.
5. For Identify Schema, specify whether you are re-using an existing schema or creating a new one.
   If you are using an existing schema:
   a. For Re-use existing schema, select Yes.
   b. Select a schema from the list.
   c. Click Next.
   If you are creating a new schema:
   a. For Re-use existing schema, select No.
   b. Enter a schema name and password.
   c. Specify a space quota.
   d. Click Next.
6. For Identify Administrator, enter the Workspace administrator information and click Next.
7. Confirm your selections and click Create Workspace.

A.12.4 Creating Oracle Application Express Users

Sign into Oracle Application Express Administration Services using an administrator password. From Manage Workspaces, click Manage Developers and Users, and click Create User. Enter the appropriate information.

To create an Oracle Application Express user account:
1. Access Oracle Application Express Administration Services.
   Oracle Application Express Administration Services appears.
2. Click the Manage Workspaces icon.
3. Click Manage Developers and Users.
4. Click Create User.
5. Under User Attributes, enter the appropriate information. Fields marked with an asterisk are required.

Tip:
To learn more about a specific attribute, click the item label. When Help is available, the item label changes to red when you pass your cursor over it and the cursor changes to an arrow and question mark.

6. Under Account Privileges:
   a. Workspace - Select a workspace from the list.
   b. Default Schemas - Specify the default schema used for data browsing, application creation, and SQL script execution.

      When using workspaces that have more than one schema available, this schema is the default. This setting does not control security, only the user's preference.
   c. User is an administrator - Specify if this user should have workspace administrator privileges.

      Administrators are given access to all components. Additionally, they can manage user accounts, groups, and development services. Components may not be available if they are switched off by Instance Administrators.
   d. User is a developer - Specify if this user should have developer privileges.

      Developers must have access to either App Builder, SQL Workshop, or both. These components may not be available if they are switched off by the Instance Administrator.
   e. App Builder Access - Determines whether a developer has access to the App Builder.
   f. SQL Workshop Access - Determines whether a developer has access to the SQL Workshop.
   g. Team Development Access - Determines whether a developer has access to the Team Development.
   h. Set Account Availability - Select Locked to prevent the account from being used. Select Unlocked to allow the account to be used.

      If the user has exceeded the maximum log in failures allowed, specified in Workspace Preferences, then their account will be locked automatically.

7. Under Password:
   • Password - Enter a case sensitive password.
   • Confirm Password - Enter the password again.
   • Require Change of Password On First Use - Select No to allow the user to use the same password until it expires. Select Yes to require the user to change the password immediately when logging in the first time.

8. Click Create User or Create and Create Another.
A.12.5 Signing into a Workspace Using the Embedded PL/SQL Gateway

Learn how to sign in to a workspace using the embedded PL/SQL gateway.

Use your credentials (that is, your workspace name, user name and password) to sign in to the workspace.

To sign in to your workspace:

1. In a Web browser, navigate to the Oracle Application Express Sign In page. Because your setup uses Embedded PL/SQL Gateway, go to:
   
   http://hostname:port/apex/

   Where:
   
   • hostname is the name of the system where Oracle XML DB Protocol server is installed.
   • port is the port number assigned to HTTP on the Oracle XML DB Protocol server. In a default installation, this number is 8080. If you are using the Oracle Database 12c or later multitenant architecture, then each pluggable database (PDB) will have a distinct port number.
   • apex is the database access descriptor (DAD) defined in the configuration file.
   
   The Sign In page appears.

2. On the Sign In page, enter:
   
   • Workspace - Enter the name of your workspace.
   • Username - Enter your user name.
   • Password - Enter your case-sensitive password.

3. Click Sign In.

   Note that, depending on your setup, you might be required to change your password when you log in for the first time.

A.13 Performing Post Installation Tasks for Upgrade Installations

Remove schemas from prior Oracle Application Express installations.

Once you have verified that your upgrade installation was successful and all upgraded applications function properly, you should remove schemas from prior Oracle Application Express installations.

• About Removing Prior Oracle Application Express Installations (page A-27) Verifying if a prior installation exists and removing the schema.

• Verifying if a Prior Installation Exists (page A-27) Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS and run the query.
• **Removing Schemas from Prior Installations** (page A-28)
  Start SQL*Plus and connect to database and execute a statement to remove schemas from prior installations.

• **Fixing Invalid ACL in Oracle Database 11g or Later** (page A-28)
  Learn how to fix an invalid ACL if you are running Oracle Database 11g or later.

---

**See Also:**

"Upgrading from a Previous Oracle Application Express Release" (page 1-8)

---

### A.13.1 About Removing Prior Oracle Application Express Installations

Verifying if a prior installation exists and removing the schema.

The database users associated with schemas from prior installations are privileged users and should be removed when they are no longer necessary. Removing schemas from a prior installation is a two step process. First you verify if a prior installation exists and then you remove the schemas.

### A.13.2 Verifying if a Prior Installation Exists

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` and run the query.

To verify if a prior installation exists:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS`. For example:
   - **On Windows:**
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```bash
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Run the following query:
   ```sql
   SELECT username FROM dba_users WHERE ( username LIKE 'FLOWS\_______' ESCAPE '\\'
   OR username LIKE 'APEX\_______' ESCAPE '\\' ) AND username NOT IN
   ( SELECT schema FROM dba_registry WHERE comp_id = 'APEX' );
   ```

   If the results contain entries in the form `FLOWS_XXXXXX` or `APEX_XXXXXX` where `XXXXXX` represents six numbers, those entries are candidates for removal.
A.13.3 Removing Schemas from Prior Installations

Start SQL*Plus and connect to database and execute a statement to remove schemas from prior installations.

To remove schemas from prior installations:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Execute a statement similar to the following example:
   ```
   DROP USER APEX_050100 CASCADE;
   ```

A.13.4 Fixing Invalid ACL in Oracle Database 11g or Later

Learn how to fix an invalid ACL if you are running Oracle Database 11g or later.

After following the instructions in “About Removing Prior Oracle Application Express Installations” (page 4-28), you may need to fix an invalid ACL if you are running Oracle Database 11g or later and you enabled network services for the prior Oracle Application Express schema.

To fix an invalid ACL:

1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute a statement similar to the following:
   ```
   EXEC DBMS_NETWORK_ACL_ADMIN.DELETE_PRIVILEGE('power_users.xml', 'APEX_040200');
   ```
A.14 About Performance Optimization Tasks

Learn about performance optimization.

Performance of web applications heavily depends on their size and how often a browser has to request static content like images, CSS and JavaScript files. To improve performance, most web servers support on-the-fly HTTP response compression and provide settings that enable you to configure on how long browsers can cache a file before requesting it again. The HTTP response compression is usually implemented using gzip encoding, while browser file caching is enabled by issuing Cache-Control HTTP response header.

Please see your web server documentation to learn how to enable response compression and browser file caching. For optimal performance of the Oracle Application Express development environment and Oracle Application Express applications, Oracle recommends enabling gzip compression of files in the virtual images directory (for example, /i/) and responses from the database access descriptor as well as allowing browsers to cache files from the virtual images directory for at least 12 hours.

A.15 Converting Between Runtime and Full Development Environments

Learn how to convert between runtime and full development environments.

This section describes how to convert between runtime and full development environments.

- **About Runtime and Full Development Environments** (page A-30)
  An Oracle Application Express runtime environment enables users to run a production application without supporting the ability to change or edit the application.

- **Converting a Runtime Environment to a Full Development Environment in a non-CDB or locally in a PDB** (page A-30)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role and run the `apxdvins.sql`.

- **Converting a Full Development Environment to a Runtime Environment in a non-CDB or locally in a PDB** (page A-31)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role and run the `apxdevrm.sql`.

- **Converting a Runtime Environment to a Full Development Environment in a CDB** (page A-31)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role and run the `apxdvins_con.sql`.

- **Converting a Full Development Environment to a Runtime Environment in a CDB** (page A-32)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role and run the `apxdevrm_con.sql`.
A.15.1 About Runtime and Full Development Environments

An Oracle Application Express runtime environment enables users to run a production application without supporting the ability to change or edit the application.

A runtime environment includes only the packages necessary to run your applications, making it a more hardened environment. It does not provide a web interface for administration.

You administer an Oracle Application Express runtime environment using SQL*Plus or SQL Developer and the APEX_INSTANCE_ADMIN API.

A.15.2 Converting a Runtime Environment to a Full Development Environment in a non-CDB or locally in a PDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run apxdvins.sql.

To convert an Oracle Application Express runtime environment to a full development SQL*Plus or SQL Developer and the APEX_INSTANCE_ADMIN API:

1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:

   • On Windows:
     SYSTEM_DRIVE:\sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password

   • On UNIX and Linux:
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password

3. Run apxdvins.sql. For example:
   @apxdvins.sql

4. Follow the instructions in Creating or Updating Your Instance Administration Account.
A.15.3 Converting a Full Development Environment to a Runtime Environment in a non-CDB or locally in a PDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run the apxdevrm.sql.

**Tip:**

Before converting a full development environment to a runtime environment, export all Websheet applications. When you convert a development environment to runtime, existing Websheet data grids and reports will be deleted from all workspaces. Converting the environment back to a full development environment will not restore these Websheet data grids or reports.

To convert an Oracle Application Express full development environment to a runtime environment in a non-CDB or locally in a PDB:

1. Change your working directory to the apex directory where you unzipped the installation software.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
3. Run apxdevrm.sql. For example:
   ```
   @apxdevrm.sql
   ```

A.15.4 Converting a Runtime Environment to a Full Development Environment in a CDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run the apxdvins_con.sql.

To convert an Oracle Application Express runtime environment to a full development environment in a CDB:

1. Change your working directory to the apex directory where you unzipped the installation software.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
• On Windows:
  ```
  SYSTEM_DRIVE:\ sqlplus /nolog
  SQL> CONNECT SYS as SYSDBA
  Enter password: SYS_password
  ```

• On UNIX and Linux:
  ```
  $ sqlplus /nolog
  SQL> CONNECT SYS as SYSDBA
  Enter password: SYS_password
  ```

3. Run `apxdvins_con.sql`. For example:
   ```
   @apxdvins_con.sql
   ```

4. Follow the instructions in Creating or Updating Your Instance Administration Account.

A.15.5 Converting a Full Development Environment to a Runtime Environment in a CDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdevrm_con.sql`.

Tip:
Before converting a full development environment to a runtime environment, export all Websheet applications. When you convert a development environment to runtime, existing Websheet data grids and reports will be deleted from all workspaces. Converting the environment back to a full development environment will not restore these Websheet data grids or reports.

To convert an Oracle Application Express full development environment to a runtime environment in a CDB:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   ```
   • On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   
   • On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   
3. Run `apxdevrm_con.sql`. For example:
   ```
   @apxdevrm_con.sql
   ```
Installing Application Express and Configuring Legacy Web Listener – Oracle HTTP Server

Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page and then configuring Oracle HTTP Server.

Note:

mod_plsql is deprecated as of Oracle HTTP Server 12c (12.1.3). For more information, please see My Oracle Support Note 1576588.1. Oracle recommends using Oracle REST Data Services instead.

This section describes how to install Oracle Application Express by downloading a ZIP file from Oracle Technology Network (OTN) and then configuring legacy Web listener Oracle HTTP Server with mod_plsql distributed with Oracle Database 11g or Oracle Application Server 10g and Oracle Database 12c or later. These instructions apply to both new and upgrade installations.

- **Oracle Database Requirements** (page B-2)
  Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

- **About Patching Oracle Application Express** (page B-2)
  If you are already running Oracle Application Express, then check the Oracle Application Express page on the Oracle Technology Network for information about patch set releases or later releases of Oracle Application Express.

- **Performing Pre-installation Tasks for Oracle Application Express** (page B-3)
  Review and perform pre-installation tasks before installing Oracle Application Express.

- **Downloading and Installing Oracle Application Express** (page B-3)
  Learn about downloading and installing Oracle Application Express.

- **Configuring the Oracle HTTP Server** (page B-11)
  Configuring Oracle HTTP Server requires that you copy the images directory, edit the dads.conf file, configure static files support, stop and restart Oracle HTTP Server, disable Oracle XML DB Protocol Server, and configuring Oracle HTTP server behind a reverse proxy or load balancer.

- **Enabling Network Services in Oracle Database 11g or Later** (page B-16)
  You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.
• **Performing Security Tasks** (page B-20)
  Oracle recommends you configure and use Secure Sockets Layer (SSL) to ensure that passwords and other sensitive data are not transmitted in clear text in HTTP requests.

• **Controlling the Number of Concurrent Jobs** (page B-20)
  Learn about specifying the number of concurrently running jobs.

• **About Running Oracle Application Express in Other Languages** (page B-22)
  You can install a single instance of Oracle Application Express with one or more of translated versions.

• **Installing Translated Versions of Oracle Application Express** (page B-22)
  Learn about installing translated versions of Oracle Application Express.

• **Creating a Workspace and Adding Oracle Application Express Users** (page B-24)
  Learn about creating workspace and adding Oracle Application Express users.

• **Performing Post Installation Tasks for Upgrade Installations** (page B-28)
  Remove schemas from prior Oracle Application Express installations.

• **About Performance Optimization Tasks** (page B-31)
  Learn about performance optimization.

• **Converting Between Runtime and Full Development Environments** (page B-31)
  Learn how to convert between runtime and full development environments.

---

**See Also:**

"Web Listener Requirements (page 2-3)"

---

### B.1 Oracle Database Requirements

Oracle Application Express release 18.1 requires an Oracle Database release 11.2.0.4 or later, including Enterprise Edition and Express Edition (Oracle Database XE).

If you are upgrading an Oracle Database version 12.1 CDB, you must download from My Oracle Support the one off patch for bug 20618595. Search for **20618595** on the Patches tab.

### B.2 About Patching Oracle Application Express

If you are already running Oracle Application Express, then check the Oracle Application Express page on the Oracle Technology Network for information about patch set releases or later releases of Oracle Application Express.

B.3 Performing Pre-installation Tasks for Oracle Application Express

Review and perform pre-installation tasks before installing Oracle Application Express.

Before installing Oracle Application Express, Oracle recommends that you complete the following steps:

1. Review and satisfy all Oracle Application Express installation requirements.

2. If you are actively using Oracle Application Express and upgrading the current installation, then shut down with normal or immediate priority the Oracle Database instances where you plan to install Oracle Application Express. On Oracle Real Application Clusters (Oracle RAC) systems, shut down all instances on each node.

   An alternative to shutting down the database is to prevent all users from accessing Oracle Application Express when upgrading your installation from a previous release of Oracle Application Express. Oracle only recommends this option in high availability production environments where planned outages are not available. For all other scenarios, the database should be shut down.

   To disable user access to Oracle Application Express when the existing installation uses the Oracle HTTP Server with mod_plsql, you should either shut down the Web server or disable the Application Express Database Access Descriptor of the Web server.

   Once you have prevented access from Oracle Application Express users, you should log in to SQL*Plus as `SYS`, connecting to the database where Oracle Application Express is installed, and query `V$SESSION` to ensure there are no long running sessions which would interfere with the upgrade process.

3. Back up the Oracle Database installation.

   Oracle recommends that you create a backup of the current Oracle Database installation before you install Oracle Application Express. You can use Oracle Database Recovery Manager, which is included in the Oracle Database installation, to perform the backup.

4. Start the Oracle Database instance that contains the target database.

   After backing up the system, you must start the Oracle instance that contains the target Oracle Database. Do not start other processes such as a Web listener. However, if you are performing a remote installation, make sure the Web listener for the remote database has started.

   **Note:**

   If you are connecting to a remote database, then start the Web listener.

B.4 Downloading and Installing Oracle Application Express

Learn about downloading and installing Oracle Application Express.
This section describes how to download and install Oracle Application Express. How you install Oracle Application Express depends upon the type of database you into which you are installing.

- **Installing Application Express** (page B-4)
  Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page.

- **Creating or Updating Your Instance Administration Account** (page B-6)
  Learn how to create or update your instance administrator account.

- **Restarting Processes** (page B-8)
  Restart the processes that you stopped before you began the installation.

- **Configuring the APEX_PUBLIC_USER Account** (page B-8)
  It is important to correctly configure the `APEX_PUBLIC_USER` account to enable proper operation of Oracle Application Express.

---

See Also:

"Utilizing the Multitenant Architecture in Oracle Database 12c or Later (page 3-1)."

### B.4.1 Installing Application Express

Install Oracle Application Express by downloading a ZIP file from the Oracle Application Express download page.

To install Oracle Application Express:

1. For installations where the development will be in English only, download the file `apex_18.1_en.zip` from the Oracle Application Express download page. If the development will include languages other than English, download `apex_18.1.zip` from the Oracle Application Express download page. See:
   

   Note that the actual file name may differ if a more recent release has shipped since this document was published.

2. Unzip downloaded zip file:
   - If English only, unzip `apex_18.1_en.zip` as follows, preserving directory names:
     - UNIX and Linux: `unzip apex_18.1_en.zip`
     - Windows: Double click the file `apex_18.1_en.zip` in Windows Explorer
   - If multiple languages, unzip `apex_18.1.zip` as follows, preserving directory names:
     - UNIX and Linux: `unzip apex_18.1.zip`
     - Windows: Double click the file `apex_18.1.zip` in Windows Explorer
Note:

You should keep the directory tree where you unzip the files short and not under directories that contain spaces. For example, within Windows unzip to C:\TEMP.

3. Change your working directory to apex.

4. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:

   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

5. Disable any existing password complexity rules for the default profile.

6. Select the appropriate installation option.

   **Full development environment** provides complete access to the App Builder environment to develop applications. A **Runtime environment** enables users to run applications that cannot be modified.

   Available installation options include:

   - **Full development environment**. Run `apexins.sql` passing the following four arguments in the order shown:
     ```
     @apexins.sql tablespace_apex tablespace_files tablespace_temp images
     ```
     Where:
     - `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.
     - `tablespace_files` is the name of the tablespace for the Oracle Application Express files user.
     - `tablespace_temp` is the name of the temporary tablespace or tablespace group.
     - `images` is the virtual directory for Oracle Application Express images. For installations using EPG, `/i/` is the required value for the images argument. To support future Oracle Application Express upgrades, define the virtual image directory as `/i/`.

   Example:
   ```
   @apexins.sql SYSAUX SYSAUX TEMP /i/
   ```
Note:

If you receive the following error, exit SQL*Plus and change your working directory to where you unzipped the installation file, for example C:\TEMP in Windows, before starting SQL*Plus:

SP2-0310: unable to open file "apexins.sql"

• Runtime environment. Run apxrtins.sql passing the following arguments in the order shown:

@apxrtins.sql tablespace_apex tablesapce_files tablespace_temp images

Where:

– **tablespace_apex** is the name of the tablespace for the Oracle Application Express application user.
– **tablespace_files** is the name of the tablespace for the Oracle Application Express files user.
– **tablespace_temp** is the name of the temporary tablespace or tablespace group.
– **images** is the virtual directory for Oracle Application Express images. To support future Oracle Application Express upgrades, define the virtual image directory as /i/.

Example:

@apxrtins.sql SYSAUX SYSAUX TEMP /i/

When Oracle Application Express installs, it creates three new database accounts:

• **APEX_180100** - The account that owns the Oracle Application Express schema and metadata.
• **FLAWS_FILES** - The account that owns the Oracle Application Express uploaded files.
• **APEX_PUBLIC_USER** - The minimally privileged account is used for Oracle Application Express configuration with Oracle REST Data Services or Oracle HTTP Server and mod_plsql.

If you configured RESTful Web services, then these additional accounts will be created:

• **APEX_REST_PUBLIC_USER** - The account used when invoking RESTful Services definitions stored in Oracle Application Express.
• **APEX_LISTENER** - The account used to query RESTful Services definitions stored in Oracle Application Express.

If you are upgrading from a previous release, then **FLAWS_FILES** already exists and **APEX_PUBLIC_USER** is created if it does not already exist.

B.4.2 Creating or Updating Your Instance Administration Account

Learn how to create or update your instance administrator account.
This section describes how to create or update your Instance Administrator account.

**Tip:**
Skip this section if you are upgrading from a previous release of Oracle Application Express. In an upgrade scenario, the Instance Administrator account and password is preserved and carried over from the prior release.

- **What Is an Instance Administrator?** (page B-7)
  Instance administrators are superusers that are responsible for managing an entire Oracle Application Express instance, including managing workspace provisioning, configuring features and instance settings, and managing security.

- **About apxchpwd.sql** (page B-7)
  Run the `apxchpwd.sql` script to create or update your Instance Administrator account.

- **Running apxchpwd.sql** (page B-8)
  Run the `apxchpwd.sql` script to create and update your Instance Administrator account.

### B.4.2.1 What Is an Instance Administrator?

Instance administrators are superusers that are responsible for managing an entire Oracle Application Express instance, including managing workspace provisioning, configuring features and instance settings, and managing security.

To perform these tasks, an Instance administrator signs in to the Oracle Application Express Administration Services application.

### B.4.2.2 About apxchpwd.sql

Run the `apxchpwd.sql` script to create or update your Instance Administrator account.

Running the `apxchpwd.sql` script enables your to create or update your Instance Administrator account. You must run the `apxchpwd.sql` script in the following scenarios:

- **New Oracle Application Express installations** - Run `apxchpwd.sql` to create an Instance Administrator account and password.

- **Converting of a runtime environment to a development environment** - Run `apxchpwd.sql` to change the Instance Administrator account password.

- **Changing Your Instance Administrator Password** - Run `apxchpwd.sql` to change the password for an existing Instance Administrator account.

- **Unlocking Your Instance Administrator Account** - Run `apxchpwd.sql` to unlock an existing Instance Administrator account.
Tip:

You do not need to run `apxchpwd.sql` when upgrading from a previous release of Oracle Application Express. In an upgrade scenario, the Instance Administrator account password is preserved and carried over from the prior release.

B.4.2.3 Running `apxchpwd.sql`

Run the `apxchpwd.sql` script to create and update your Instance Administrator account.

To create or update your Instance Administrator account:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run `apxchpwd.sql`. For example:
   ```
   @apxchpwd.sql
   ```

   Follow the on-screen instructions. You will be prompted provide a username, password, and email address. If the account username does not exist, it will be created for you.

B.4.3 Restarting Processes

Restart the processes that you stopped before you began the installation.

After you install Oracle Application Express, you must restart the processes that you stopped before you began the installation. In addition, restart Oracle HTTP Server.

B.4.4 Configuring the APEX_PUBLIC_USER Account

It is important to correctly configure the `APEX_PUBLIC_USER` account to enable proper operation of Oracle Application Express.

- **About the APEX_PUBLIC_USER Account** (page B-9)
  Learn about the random password that is created upon installation in APEX_PUBLIC_USER account.

- **Unlocking the APEX_PUBLIC_USER Account** (page B-9)
  Unlock the APEX_PUBLIC_USER account by running a SQL statement.
• Changing the Password for the APEX_PUBLIC_USER Account (page B-10)
  Change the password for the APEX_PUBLIC_USER account by running a SQL statement.

• About Password Expiration in Oracle Database 11g (page B-10)
  You can set PASSWORD_LIFE_TIME parameter to unlimited by altering APEX_PUBLIC_USER to prevent password expiration.

B.4.4.1 About the APEX_PUBLIC_USER Account

Learn about the random password that is created upon installation in APEX_PUBLIC_USER account.

The APEX_PUBLIC_USER account is created with a random password in a new installation of Oracle Application Express. You must change the password for this account before configuring the database access descriptor (DAD) in a new installation.

B.4.4.2 Unlocking the APEX_PUBLIC_USER Account

Unlock the APEX_PUBLIC_USER account by running a SQL statement.

Tip:

If you are upgrading from a prior release of Oracle Application Express, this step is unnecessary.

To unlock the APEX_PUBLIC_USER account:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. If you are configuring an Oracle Database 12c or later CDB, make sure you are connected to the root container, CDB$ROOT when completing this step.

   For example:

   • On Windows:
     
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

   • On UNIX and Linux:
     
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Run the following statement:

   ```
   ALTER USER APEX_PUBLIC_USER ACCOUNT UNLOCK
   ```
B.4.4.3 Changing the Password for the APEX_PUBLIC_USER Account

Change the password for the APEX_PUBLIC_USER account by running a SQL statement.

Tip:
If you are upgrading from a prior release of Oracle Application Express, this step is unnecessary.

To change the password for the APEX_PUBLIC_USER account:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. If you are configuring an Oracle Database 12c or later CDB, make sure you are connected to the root container, CDB$ROOT when completing this step.

   For example:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Run the following statement:

   ```sql
   ALTER USER APEX_PUBLIC_USER IDENTIFIED BY new_password
   ```

   Where `new_password` is the new password you are setting for APEX_PUBLIC_USER. You will use this password when creating the DAD in the sections that follow.

B.4.4.4 About Password Expiration in Oracle Database 11g

You can set `PASSWORD_LIFE_TIME` parameter to unlimited by altering APEX_PUBLIC_USER to prevent password expiration.

In the default profile in Oracle Database 11g, the parameter `PASSWORD_LIFE_TIME` is set to 180. If you are using Oracle Database 11g with Oracle Application Express, this causes the password for APEX_PUBLIC_USER to expire in 180 days. As a result, your Oracle Application Express instance will become unusable until you change the password.

To prevent this behavior, create another profile in which the `PASSWORD_LIFE_TIME` parameter is set to unlimited and alter the APEX_PUBLIC_USER account and assign it to the new profile.
B.5 Configuring the Oracle HTTP Server

Configuring Oracle HTTP Server requires that you copy the images directory, edit the dads.conf file, configure static files support, stop and restart Oracle HTTP Server, disable Oracle XML DB Protocol Server, and configuring Oracle HTTP server behind a reverse proxy or load balancer.

This section describes how to configure Oracle HTTP Server with mod_plsql.

- **About Copying the Images Directory** (page B-11)
  Learn about the importance of copying the images directory.
- **Copying the Images Directory** (page B-11)
  Learn how to copy images directory.
- **Editing the dads.conf File** (page B-12)
  Learn how to edit dads.conf file.
- **Configuring Static File Support** (page B-14)
  Learn how to configure static file support in Oracle Application Express.
- **Stopping and Restarting Oracle HTTP Server** (page B-14)
  Learn how to stop and restart Oracle HTTP Server.
- **Disabling Oracle XML DB Protocol Server** (page B-15)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run the EXEC DBMS_XDB.SETHTTPPORT(0); command.
- **About Configuring Oracle HTTP Server Behind a Reverse Proxy or Load Balancer** (page B-16)
  Learn about configuring Oracle HTTP server behind a reverse proxy or load balancer.

B.5.1 About Copying the Images Directory

Learn about the importance of copying the images directory.

Whether you are loading a new installation or upgrading from a previous release, you must copy the images directory from the top level of the apex\images directory, for example C:\TEMP, to the location on the file system containing the Oracle home for Oracle HTTP Server.

During an upgrade, you overwrite your existing images directory. Before you begin the upgrade, to ensure that you can revert to the previous version, Oracle recommends that you create a copy of your existing images directory for Oracle Application Express, indicating the release number of the images (for example, images_3_1).

B.5.2 Copying the Images Directory

Learn how to copy images directory.

To locate the images directory on the file system, review the following files for the text alias /i/:

- **Oracle HTTP Server distributed Oracle9i Release 2**—see the httpd.conf file.
- **Oracle Application Server 10g**—see the marvel.conf or dads.conf files.
When you locate the images directory path, rename the existing images directory to a backup location. Doing so enables you to revert to the previous release, if that becomes necessary.

Use the following command syntax to copy the `apex\images` directory from the Oracle Database home to a path in the Oracle HTTP Server home:

- Oracle HTTP Server distributed with Oracle Database 12c or later:
  - Windows:
    ```
    xcopy /E /I APEX_HOME\apex\images ORACLE_HTTPSERVER_HOME\user_projects\domains\base_domain\images
    ```
  - UNIX and Linux:
    ```
    cp -rf $APEX_HOME/apex/images ORACLE_HTTPSERVER_HOME/user_projects/domains/base_domain
    ```

In the preceding syntax examples:
- `APEX_HOME` is the location of where the installation Zip file was unzipped
- `ORACLE_HTTPSERVER_HOME` is the existing Oracle Application Server or Oracle HTTP Server Oracle home

### B.5.3 Editing the dads.conf File

Learn how to edit `dads.conf` file.

The `dads.conf` file contains the information about the Database Access Descriptor (DAD) to access Oracle Application Express.

**Note:**

Within the context of this document, `ORACLE_HTTPSERVER_HOME` is the location where Oracle HTTP Server is installed.

To edit the `dads.conf` file:

1. Use a text editor and open the `dads.conf`.
   - Oracle Application Server 10g:
     - Windows:
       ```
       ORACLE_HTTPSERVER_HOME\Apache\modplsql\conf\dads.conf
       ```
     - UNIX and Linux:
       ```
       ORACLE_HTTPSERVER_HOME/Apache/modplsql/conf/dads.conf
       ```
   - Oracle HTTP Server distributed with Oracle Database 11g:
     - Windows:
       ```
       ORACLE_INSTANCE\config\OHS\chs<1>\mod_plsql
       ```
     - UNIX and Linux:
ORACLE_INSTANCE/config/OHS/ohs1>mod_plsql

- **Oracle HTTP Server 12c:**
  - **Windows:**
    
    ```
    ORACLE_HTTPSERVER_HOME\user_projects\domains\base_domain\config\fmwconfig\components\OHS\instances\ohs1\mod_plsql\dads.conf
    ```
  - **UNIX and Linux:**
    
    ```
    ORACLE_HTTPSERVER_HOME/user_projects/domains/base_domain/config/fmwconfig/components/OHS/instances/ohs1/mod_plsql/dads.conf
    ```

**Note:**

In the examples above, ohs1 refers to the name of the Oracle HTTP Server instance. When running the Oracle HTTP Server Configuration Wizard, the default name is ohs1. It may have been changed to a name other than ohs1.

2. In the `dads.conf` file, replace `ORACLE_HTTPSERVER_HOME`, `host`, `port`, `service_name`, and `apex_public_user_password` with values appropriate for your environment. Note that the `apex_public_user_password` is the password you changed in APEX_PUBLIC_USER Account.

   Note that the path listed is only an example. The path in the `dads.conf` file should reference the file system path described in About Copying the Images Directory.

   ```
   Alias /i/ "ORACLE_HTTPSERVER_HOME/user_projects/domains/base_domain/images/"
   ```

   ```
   <Location /pls/apex>
   Order deny,allow
   AllowOverride None
   PlsqlDatabaseConnectString host:port:service_name ServiceNameFormat
   PlsqlNLSLanguage AMERICAN_AMERICA.AL32UTF8
   PlsqlAuthenticationMode Basic
   SetHandler pls_handler
   PlsqlDocumentTablename wwv_flow_file_objects$
   PlsqlDatabaseUsername APEX_PUBLIC_USER
   PlsqlDefaultPage apex
   PlsqlDatabasePassword apex_public_user_password
   PlsqlRequestValidationFunction wwv_flow_epg_include_modules.authorize
   PlsqlPathAlias r
   PlsqlPathAliasProcedure wwv_flow.resolve_friendly_url
   Allow from all
   </Location>
   ```

**Note:**

`PlsqlPathAlias` and `PlsqlPathAliasProcedure` are required new parameters that must be added to an existing DAD. This is important when upgrading to Application Express release 5.0.

3. Locate the line containing `PlsqlNLSLanguage`. 
The `PlsqlNLSLanguage` setting determines the language setting of the DAD. The character set portion of the `PlsqlNLSLanguage` value must be set to `AL32UTF8`, regardless of whether the database character set is `AL32UTF8`. For example:

```plaintext
... PlsqlNLSLanguage AMERICAN_AMERICA.AL32UTF8 ...
```

4. Save and exit the `dads.conf` file.

### B.5.4 Configuring Static File Support

Learn how to configure static file support in Oracle Application Express.

Oracle Application Express enables application developers to include static files with their applications. Static files can be associated with a workspace, an application, a plug-in, or an application theme. When using the Oracle HTTP Server as your web listener, static files are served using Path Aliasing functionality of the `mod_plsql` plug-in.

### B.5.5 Stopping and Restarting Oracle HTTP Server

Learn how to stop and restart Oracle HTTP Server.

This section describes how to stop and restart Oracle HTTP Server.

- **Stopping and Restarting Oracle HTTP Server with Oracle Database 10g and Lower** (page B-14)
  Learn how to stop and restart Oracle HTTP Server.

- **Stopping and Restarting Oracle HTTP Server 12c** (page B-15)
  Learn how to stop and restart the Oracle HTTP Server distributed with Oracle Database 12c or later.

#### B.5.5.1 Stopping and Restarting Oracle HTTP Server with Oracle Database 10g and Lower

Learn how to stop and restart Oracle HTTP Server.

**Note:**

Within the context of this document, `ORACLE_HTTPSERVER_HOME` is the location where Oracle HTTP Server is installed.

To stop and restart Oracle HTTP Server:

- **Windows:**
  Execute the following:
  
  ```
  ORACLE_HTTPSERVER_HOME\opmn\bin\opmnctl stopproc ias-component=HTTP_Server
  ORACLE_HTTPSERVER_HOME\opmn\bin\opmnctl startproc ias-component=HTTP_Server
  ```

- **UNIX and Linux**
  Execute the following:
B.5.5.2 Stopping and Restarting Oracle HTTP Server 12c

Learn how to stop and restart the Oracle HTTP Server distributed with Oracle Database 12c or later.

To stop and restart the Oracle HTTP Server distributed with Oracle Database 12c or later, enter commands using the following syntax, where **DOMAIN_HOME** is the path to the Oracle HTTP Server domain:

- **Windows:**
  Execute the following:
  ```
  %DOMAIN_HOME%\bin\stopComponent.cmd componentName
  %DOMAIN_HOME%\bin\startComponent.cmd componentName
  ```

- **UNIX and Linux**
  Execute the following:
  ```
  %DOMAIN_HOME%/bin/stopComponent.sh componentName
  %DOMAIN_HOME%/bin/startComponent.sh componentName
  ```

In a default installation, **componentName** is ohs1 but may have been changed when running the Oracle HTTP Server Configuration Wizard.

B.5.6 Disabling Oracle XML DB Protocol Server

Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role and run the `EXEC DBMS_XDB.SETHTTPPORT(0);` command.

If you were previously using the Embedded PL/SQL Gateway and now want to use Oracle HTTP server and mod_plsql, you need to disable the Oracle XML DB Protocol Server.

To disable Oracle XML DB Protocol Server:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as **SYS** specifying the **SYSDBA** role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
• On UNIX and Linux:

```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

2. Run the following command:

```
EXEC DBMS_XDB.SETHTTPPORT(0);
```

### B.5.7 About Configuring Oracle HTTP Server Behind a Reverse Proxy or Load Balancer

Learn about configuring Oracle HTTP server behind a reverse proxy or load balancer.

When Oracle Application Express is running behind a reverse proxy or load balancer, it is important to communicate the original HTTP hostname and protocol as seen by user's browser to the Application Express engine. The engine will use this information to generate valid URL in HTML responses and HTTP redirects that user's browser can successfully follow. For Oracle HTTP server and mod_plsql, use `PlsqlCGIEEnvironmentList` directive in the `dads.conf` configuration file. For example:

```
PlsqlCGIEEnvironmentList REQUEST_PROTOCOL=https
PlsqlCGIEEnvironmentList HTTP_HOST=www.example.com:443
```

### B.6 Enabling Network Services in Oracle Database 11g or Later

You must enable network services in Oracle Database 11g or later versions to send outbound mail, use Web services, or use PDF report printing in Oracle Application Express.

- **When and Why Network Services Must be Enabled** (page B-16)
  Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.

- **Granting Connect Privileges Prior to Oracle Database 12c** (page B-17)
  Demonstrates how to grant connect privileges to any host for the `APEX_180100` database user.

- **Granting Connect Privileges in Oracle Database 12c or Later** (page B-18)
  Procedures `CREATE_ACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.

- **Troubleshooting an Invalid ACL Error** (page B-19)
  Learn how to identify a invalid ACL error by running the query.

### B.6.1 When and Why Network Services Must be Enabled

Enabling network services enables support for sending outbound mail in Oracle Application Express, use of Web services in Oracle Application Express, and PDF report printing.
By default, the ability to interact with network services is disabled in Oracle Database 11g Release 2 or later. Therefore, if you are running Oracle Application Express with Oracle Database 11g Release 2 or later, you must use the new DBMS_NETWORK_ACL_ADMIN package to grant connect privileges to any host for the APEX_180100 database user. Failing to grant these privileges results in issues with:

- Sending outbound mail in Oracle Application Express.
  Users can call methods from the APEX_MAIL package, but issues arise when sending outbound email.
- Using Web services in Oracle Application Express.
- PDF report printing.

**Tip:**
To run the examples described in this section, the compatible initialization parameter of the database must be set to at least 11.1.0.0.0. By default a 11g or 12c database will already have the parameter set properly, but a database upgraded to 11g or 12c from a prior version may not. For information about changing database initialization parameters, see “Creating and Configuring an Oracle Database” in Oracle Database Administrator's Guide.

### B.6.2 Granting Connect Privileges Prior to Oracle Database 12c

Demonstrates how to grant connect privileges to any host for the APEX_180100 database user.

The following example demonstrates how to grant connect privileges to any host for the APEX_180100 database user. This example assumes you connected to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role.

```sql
DECLARE
  ACL_PATH  VARCHAR2(4000);
BEGIN
  -- Look for the ACL currently assigned to '*' and give APEX_180100
  -- the "connect" privilege if APEX_180100 does not have the privilege yet.
  SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
  WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

  IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_180100', 'connect') IS NULL THEN
    DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH, 'APEX_180100', TRUE, 'connect');
  END IF;

EXCEPTION
  WHEN NO_DATA_FOUND THEN
    DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('power_users.xml', 'ACL that lets power users to connect to everywhere', 'APEX_180100', TRUE, 'connect');
    DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('power_users.xml','*');
END;
```
The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

```sql
DECLARE
    ACL_PATH  VARCHAR2(4000);
BEGIN
    -- Look for the ACL currently assigned to 'localhost' and give APEX_180100
    -- the "connect" privilege if APEX_180100 does not have the privilege yet.
    SELECT ACL INTO ACL_PATH FROM DBA_NETWORK_ACLS
    WHERE HOST = 'localhost' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

    IF DBMS_NETWORK_ACL_ADMIN.CHECK_PRIVILEGE(ACL_PATH, 'APEX_180100', 'connect') IS NULL THEN
        DBMS_NETWORK_ACL_ADMIN.ADD_PRIVILEGE(ACL_PATH, 'APEX_180100', TRUE, 'connect');
    END IF;

EXCEPTION
    -- When no ACL has been assigned to 'localhost'.
    WHEN NO_DATA_FOUND THEN
        DBMS_NETWORK_ACL_ADMIN.CREATE_ACL('local-access-users.xml', 'ACL that lets users to connect to localhost', 'APEX_180100', TRUE, 'connect');
        DBMS_NETWORK_ACL_ADMIN.ASSIGN_ACL('local-access-users.xml', 'localhost');
    END;
/
COMMIT;
```

B.6.3 Granting Connect Privileges in Oracle Database 12c or Later

Procedures `CREATE_ACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.

The following example demonstrates how to grant connect privileges to any host for the `APEX_180100` database user. This example assumes you connected to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role.

```sql
BEGIN
    DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
        host => '*',
        ace => xs$ace_type(privilege_list => xs$name_list('connect'),
                           principal_name => 'APEX_180100',
                           principal_type => xs_acl.ptype_db));
END;
/
COMMIT;
```

The following example demonstrates how to provide less privileged access to local network resources. This example enables access to servers on the local host only, such as email and report servers.

```sql
BEGIN
    DBMS_NETWORK_ACL_ADMIN.APPEND_HOST_ACE(
        host => 'localhost',
        ace => xs$ace_type(privilege_list => xs$name_list('connect'),
                           principal_name => 'APEX_180100',
                           principal_type => xs_acl.ptype_db));
END;
/
COMMIT;
```
B.6.4 Troubleshooting an Invalid ACL Error

Learn how to identify a invalid ACL error by running the query.

If you receive an ORA-44416: Invalid ACL error after running the previous script, use the following query to identify the invalid ACL:

REM Show the dangling references to dropped users in the ACL that is assigned REM to '*'.

SELECT ACL, PRINCIPAL
FROM DBA_NETWORK_ACLS NACL, XDS_ACE ACE
WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL AND
NACL.ACLID = ACE.ACLID AND
NOT EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);

Next, run the following code to fix the ACL:

DECLARE
ACL_ID   RAW(16);
CNT      NUMBER;
BEGIN
-- Look for the object ID of the ACL currently assigned to '*'
SELECT ACLID INTO ACL_ID FROM DBA_NETWORK_ACLS
WHERE HOST = '*' AND LOWER_PORT IS NULL AND UPPER_PORT IS NULL;

-- If just some users referenced in the ACL are invalid, remove just those -- users in the ACL. Otherwise, drop the ACL completely.
SELECT COUNT(PRINCIPAL) INTO CNT FROM XDS_ACE
WHERE ACLID = ACL_ID AND
EXISTS (SELECT NULL FROM ALL_USERS WHERE USERNAME = PRINCIPAL);

IF (CNT > 0) THEN
FOR R IN (SELECT PRINCIPAL FROM XDS_ACE
WHERE ACLID = ACL_ID AND
NOT EXISTS (SELECT NULL FROM ALL_USERS
WHERE USERNAME = PRINCIPAL)) LOOP
UPDATE XDB.XDB$ACL
SET OBJECT_VALUE =
DELETEXML(OBJECT_VALUE,
'/ACL/ACE[PRINCIPAL="'||R.PRINCIPAL||'""]')
WHERE OBJECT_ID = ACL_ID;
END LOOP;
ELSE
DELETE FROM XDB.XDB$ACL WHERE OBJECT_ID = ACL_ID;
END IF;
END;
/

REM commit the changes.

COMMIT;
Once the ACL has been fixed, you must run the first script in this section to apply the ACL to the APEX_180100 user.

B.7 Performing Security Tasks

Oracle recommends you configure and use Secure Sockets Layer (SSL) to ensure that passwords and other sensitive data are not transmitted in clear text in HTTP requests.

Without the use of SSL, passwords could potentially be exposed, compromising security.

SSL is an industry standard protocol that uses RSA public key cryptography in conjunction with symmetric key cryptography to provide authentication, encryption, and data integrity.

B.8 Controlling the Number of Concurrent Jobs

Learn about specifying the number of concurrently running jobs.

- **About Managing the Number of Concurrent Jobs** (page B-20)
  Learn about managing maximum number of concurrently running jobs.

- **Viewing the Number of JOB_QUEUE_PROCESSES** (page B-20)
  You can view number of JOB_QUEUE_PROCESSES in three ways.

- **Changing the Number of JOB_QUEUE_PROCESSES** (page B-21)
  You can change the number of JOB_QUEUE_PROCESSES by running a SQL statement in SQL*Plus.

B.8.1 About Managing the Number of Concurrent Jobs

Learn about managing maximum number of concurrently running jobs.

JOB_QUEUE_PROCESSES determine the maximum number of concurrently running jobs. In Oracle Application Express transactional support and SQL scripts require jobs. If JOB_QUEUE_PROCESSES is not enabled and working properly, you cannot successfully execute a script.

B.8.2 Viewing the Number of JOB_QUEUE_PROCESSES

You can view number of JOB_QUEUE_PROCESSES in three ways.

- **Viewing JOB_QUEUE_PROCESSES in the Installation Log File** (page B-21)
  Learn how to view the JOB_QUEUE_PROCESSES in the installation log files.

- **Viewing JOB_QUEUE_PROCESSES in Oracle Application Express** (page B-21)
  Learn how to view the number of JOB_QUEUE_PROCESSES on the About page in Application Express.

- **Viewing JOB_QUEUE_PROCESSES from SQL*Plus** (page B-21)
  Learn how to view the number of JOB_QUEUE_PROCESSES from SQL*Plus by running the following SQL statement.
B.8.2.1 Viewing JOB_QUEUE_PROCESSES in the Installation Log File

Learn how to view the JOB_QUEUE_PROCESSES in the installation log files.

B.8.2.2 Viewing JOB_QUEUE_PROCESSES in Oracle Application Express

Learn how to view the number of JOB_QUEUE_PROCESSES on the About page in Application Express.

To view the About Application Express page:

1. Sign in to Oracle Application Express.
2. Locate the Help menu at the top of the page.
3. From the Help menu, select About.

The About Application Express page appears. The current number JOB_QUEUE_PROCESSES displays at the bottom of the page.

B.8.2.3 Viewing JOB_QUEUE_PROCESSES from SQL*Plus

Learn how to view the number of JOB_QUEUE_PROCESSES from SQL*Plus by running the following SQL statement.

```sql
SELECT VALUE FROM v$parameter WHERE NAME = 'job_queue_processes'
```

B.8.3 Changing the Number of JOB_QUEUE_PROCESSES

You can change the number of JOB_QUEUE_PROCESSES by running a SQL statement in SQL*Plus.

To update the number of JOB_QUEUE_PROCESSES:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
2. In SQL*Plus run the following SQL statement:
   ```sql
   ALTER SYSTEM SET JOB_QUEUE_PROCESSES = <number>
   ```

   For example, running the statement `ALTER SYSTEM SET JOB_QUEUE_PROCESSES = 20` sets JOB_QUEUE_PROCESSES to 20.
B.9 About Running Oracle Application Express in Other Languages

You can install a single instance of Oracle Application Express with one or more of translated versions.

The Oracle Application Express interface is translated into German, Spanish, French, Italian, Japanese, Korean, Brazilian Portuguese, Simplified Chinese, and Traditional Chinese. A single instance of Oracle Application Express can be installed with one or more of these translated versions. Developers can choose to run the Application Express development environment in any of the installed languages by simply selecting the language from the App Builder log in screen or home page.

In order to install other languages you must use the apex_18.1.zip file which contains the extra files referenced below. If you previously downloaded apex_18.1_en.zip, then you do not need to re-install Oracle Application Express. Simply download apex_18.1.zip and unzip the file into the same directory where you unzipped apex_18.1_en.zip.

The translated version of Oracle Application Express should be loaded into a database that has a character set that supports the specific language. If you attempt to install a translated version of Oracle Application Express into a database that does not support the character encoding of the language, the installation may fail or the translated Oracle Application Express instance may appear corrupt when run. The database character set AL32UTF8 supports all the translated versions of Oracle Application Express.

You can manually install translated versions of Oracle Application Express using SQL*Plus. The installation files are encoded in AL32UTF8.

Note:

Regardless of the target database character set, to install a translated version of Oracle Application Express, you must set the character set value of the NLS_LANG environment variable to AL32UTF8 before starting SQL*Plus.

The following examples illustrate valid NLS_LANG settings for loading Oracle Application Express translations:

American_America.AL32UTF8
Japanese_Japan.AL32UTF8

B.10 Installing Translated Versions of Oracle Application Express

Learn about installing translated versions of Oracle Application Express.

- About Installing Translated Versions of Oracle Application Express (page B-23)
  You must run load_lang.sql script to run a translated version of Oracle Application Express.
B.10.1 About Installing Translated Versions of Oracle Application Express

You must run `load_lang.sql` script to run a translated version of Oracle Application Express.

Whether you are installing for the first time or upgrading from a previous release, you must run the `load_lang.sql` script to run a translated version of Oracle Application Express.

The installation scripts are located in subdirectories identified by a language code in the unzipped distribution `apex/builder`. For example, the German version is located in `apex/builder/de` and the Japanese version is located in `apex/builder/ja`. Within each directory, there is a language loading script identified by the language code (for example, `load_de.sql` or `load_ja.sql`).

B.10.2 Installing a Translated Version of Oracle Application Express

Learn how to install a translated version of Oracle Application Express.

To install a translated version of Oracle Application Express:

1. Set the `NLS_LANG` environment variable, making sure that the character set is `AL32UTF8`. For example:
   - Bourne or Korn shell:
     ```
     NLS_LANG=American_America.AL32UTF8
     export NLS_LANG
     ```
   - C shell:
     ```
     setenv NLS_LANG American_America.AL32UTF8
     ```
   - For Windows based systems:
     ```
     set NLS_LANG=American_America.AL32UTF8
     ```

2. Navigate to the directory under `apex/builder` based on the language you need to install. For example for German, navigate to `apex/builder/de`. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute the following statement:
   ```
   ALTER SESSION SET CURRENT_SCHEMA = APEX_180100;
   ```
4. Execute the appropriate language specific script. For example:

```
@load_lang.sql
```

Where `lang` is the specific language (for example, `load_de.sql` for German or `load_ja.sql` for Japanese).

---

**B.11 Creating a Workspace and Adding Oracle Application Express Users**

Learn about creating workspace and adding Oracle Application Express users.

Before you can develop or install applications, you must create a workspace, add Oracle Application Express users and sign in to your workspace.

- **About Workspaces and Users** (page B-24)
  A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private.

- **Accessing Administration Services Using Oracle HTTP Server** (page B-24)
  Learn how to access Oracle Application Express administration services.

- **Creating Oracle Application Express Users** (page B-26)
  Sign into Oracle Application Express Administration Services using an administrator password. From Manage Workspaces, click Manage Developers and Users, and click Create User. Enter the appropriate information.

- **Signing into a Workspace Using the Oracle HTTP Server** (page B-28)
  Learn how to sign in to a workspace using the Oracle HTTP Server.

---

**B.11.1 About Workspaces and Users**

A workspace enables multiple users to work within the same Oracle Application Express installation while keeping their objects, data, and applications private.

You access the Oracle Application Express home page by logging in to a workspace using a JavaScript enabled Web browser.

Each workspace has a unique ID and name. An instance administrator can create a workspace manually within Oracle Application Express Administration Services or have users submit requests. Oracle Application Express Administration Services is a separate application for managing an entire Oracle Application Express instance.

---

**B.11.2 Accessing Administration Services Using Oracle HTTP Server**

Learn how to access Oracle Application Express administration services.

To manually create a workspace and user accounts, you sign in to a separate application for managing an entire Oracle Application Express instance called Oracle Application Express Administration Services. You sign in to Oracle Application Express Administration Services using the `ADMIN` account and password created or reset during the installation process.

To access Oracle Application Express Administration Services:
1. In a Web browser, navigate to the Oracle Application Express Administration Services application.

Because your setup uses Oracle HTTP Server with `mod_plsql` go to:

http://hostname:port/pls/apex/apex_admin

Where:

hostname is the name of the system where Oracle HTTP Server is installed.

port is the port number assigned to HTTP on the Oracle HTTP Server. In a default installation, this number is 7777.

pls is the indicator to use the mod_plsql cartridge.

apex is the database access descriptor (DAD) defined in the `mod_plsql` configuration file.

2. On the Sign In page:

• Username - Enter admin.

• Password - Enter the Oracle Application Express administrator account password you specified in your instance administration account.

• Click Sign In to Administration.

Note that, depending on your setup, you might be required to change your password when you log in for the first time.

• Creating a Workspace Manually (page B-25)

Sign in to Oracle Application Express Administration Services to create workspace manually.

---

See Also:

- “Creating or Updating Your Instance Administration Account (page 4-7)”
- "Oracle Application Express Administration Services" in Oracle Application Express Administration Guide

---

B.11.2.1 Creating a Workspace Manually

Sign in to Oracle Application Express Administration Services to create workspace manually.

To manually create a workspace you sign in to a separate application called Oracle Application Express Administration Services. You sign in to Oracle Application Express Administration Services using the ADMIN account and password created or reset during the installation process.

To create an Oracle Application Express workspace manually:

1. Access Oracle Application Express Administration Services.

Oracle Application Express Administration Services appears. Next, create a workspace.

2. Click Manage Workspaces.
3. Under Workspace Actions, click **Create Workspace**.
   The Create Workspace Wizard appears.

4. For Identify Workspace, enter the following:
   a. Workspace Name - Enter a unique workspace name.
   b. Workspace ID - Leave Workspace ID blank to have the new Workspace ID automatically generated. A Workspace ID must be a positive integer greater than 100000.
   c. Workspace Description - Enter a workspace description.
   d. Click **Next**.

5. For Identify Schema, specify whether you are re-using an existing schema or creating a new one.
   If you are using an existing schema:
   a. For Re-use existing schema, select **Yes**.
   b. Select a schema from the list.
   c. Click **Next**.
   If you are creating a new schema:
   a. For Re-use existing schema, select **No**.
   b. Enter a schema name and password.
   c. Specify a space quota.
   d. Click **Next**.

6. For Identify Administrator, enter the Workspace administrator information and click **Next**.

7. Confirm your selections and click **Create Workspace**.

**B.11.3 Creating Oracle Application Express Users**

Sign into Oracle Application Express Administration Services using an administrator password. From **Manage Workspaces** , click **Manage Developers and Users** , and click **Create User**. Enter the appropriate information.

To create an Oracle Application Express user account:

1. Access Oracle Application Express Administration Services.
   Oracle Application Express Administration Services appears.

2. Click the **Manage Workspaces** icon.

3. Click **Manage Developers and Users**.

4. Click **Create User**.

5. Under User Attributes, enter the appropriate information. Fields marked with an asterisk are required.
6. Under Account Privileges:
   a. **Workspace** - Select a workspace from the list.
   b. **Default Schemas** - Specify the default schema used for data browsing, application creation, and SQL script execution.
      When using workspaces that have more than one schema available, this schema is the default. This setting does not control security, only the user's preference.
   c. **User is an administrator** - Specify if this user should have workspace administrator privileges.
      Administrators are given access to all components. Additionally, they can manage user accounts, groups, and development services. Components may not be available if they are switched off by Instance Administrators.
   d. **User is a developer** - Specify if this user should have developer privileges.
      Developers must have access to either App Builder, SQL Workshop, or both. These components may not be available if they are switched off by the Instance Administrator.
   e. **App Builder Access** - Determines whether a developer has access to the App Builder.
   f. **SQL Workshop Access** - Determines whether a developer has access to the SQL Workshop.
   g. **Team Development Access** - Determines whether a developer has access to the Team Development.
   h. **Set Account Availability** - Select **Locked** to prevent the account from being used. Select **Unlocked** to allow the account to be used.
      If the user has exceeded the maximum log in failures allowed, specified in Workspace Preferences, then their account will be locked automatically.

7. Under Password:
   - **Password** - Enter a case sensitive password.
   - **Confirm Password** - Enter the password again.
   - **Require Change of Password On First Use** - Select **No** to allow the user to use the same password until it expires. Select **Yes** to require the user to change the password immediately when logging in the first time.

8. Click **Create User** or **Create and Create Another**.
B.11.4 Signing into a Workspace Using the Oracle HTTP Server

Learn how to sign in to a workspace using the Oracle HTTP Server.

Use your credentials (that is, your workspace name, user name and password) to sign in to the workspace.

To sign in to your workspace:

1. In a Web browser, navigate to the Oracle Application Express Sign In page.
   
   Because your setup uses Oracle HTTP Server (Apache) and mod_plsql, go to:

   http://hostname:port/pls/apex

   Where:
   
   • hostname is the name of the system where Oracle HTTP Server is installed.

   • port is the port number assigned to HTTP on the Oracle HTTP Server. In a default installation, this number is 7777. You can find information about your Oracle HTTP Server installation's port number from either of the following files:
     
     ORACLE_BASE\ORACLE_HOME\install\portlist.ini
     ORACLE_BASE\ORACLE_HTTPSERVER_HOME\Apache\Apache\conf\httpd.conf

   Be aware that if you change a port number, it is not updated in the portlist.ini file. You can only rely on this file immediately after installation.

   • pls is the indicator to use the mod_plsql cartridge.

   • apex is the database access descriptor (DAD) defined in the mod_plsql configuration file.

   The Sign In page appears.

2. On the Sign In page, enter:

   • Workspace - Enter the name of your workspace.

   • Username - Enter your user name.

   • Password - Enter your case-sensitive password.

3. Click Sign In.

   Note that, depending on your setup, you might be required to change your password when you log in for the first time.

B.12 Performing Post Installation Tasks for Upgrade Installations

Remove schemas from prior Oracle Application Express installations.

Once you have verified that your upgrade installation was successful and all upgraded applications function properly, you should remove schemas from prior Oracle Application Express installations.
• **About Removing Prior Oracle Application Express Installations** (page B-29)
  Learn about removing schemas from a prior installation by verifying if a prior installation exists.

• **Verifying if a Prior Installation Exists** (page B-29)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` and run the query.

• **Removing Schemas from Prior Installations** (page B-30)
  Start SQL*Plus and connect to database and execute a statement to remove schemas from prior installations.

• **Fixing Invalid ACL in Oracle Database 11g or Later** (page B-30)
  Learn how to fix an invalid ACL if you are running Oracle Database 11g or later.

---

**See Also:**

"Upgrading from a Previous Oracle Application Express Release" (page 1-8)"

---

B.12.1 About Removing Prior Oracle Application Express Installations

Learn about removing schemas from a prior installation by verifying if a prior installation exists.

The database users associated with schemas from prior installations are privileged users and should be removed when they are no longer necessary. Removing schemas from a prior installation is a two step process. First you verify if a prior installation exists and then you remove the schemas.

B.12.2 Verifying if a Prior Installation Exists

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` and run the query.

To verify if a prior installation exists:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS`. For example:
   - On Windows:
     ```sql
     \sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYSPassword
     ```
   - On UNIX and Linux:
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYSPassword
     ```

2. Run the following query:

   ```sql
   SELECT username FROM dba_users WHERE (username LIKE 'FLOWS\_______' ESCAPE '\') OR username LIKE 'APEX\_______' ESCAPE '\') AND USERNAME NOT IN (SELECT SCHEMA FROM dba_registry WHERE comp_id = 'APEX');
   ```
If the results contain entries in the form `FLOWS_XXXXXX` or `APEX_XXXXXX` where `XXXXXX` represents six numbers, those entries are candidates for removal.

**B.12.3 Removing Schemas from Prior Installations**

Start SQL*Plus and connect to database and execute a statement to remove schemas from prior installations.

To remove schemas from prior installations:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Execute a statement similar to the following example:
   ```
   DROP USER APEX_050100 CASCADE;
   ```

**B.12.4 Fixing Invalid ACL in Oracle Database 11g or Later**

Learn how to fix an invalid ACL if you are running Oracle Database 11g or later.

After following the instructions in "About Removing Prior Oracle Application Express Installations" (page 4-28), you may need to fix an invalid ACL if you are running Oracle Database 11g or later and you enabled network services for the prior Oracle Application Express schema.

To fix an invalid ACL:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute a statement similar to the following:
   ```
   EXEC DBMS_NETWORK_ACL_ADMIN.DELETE_PRIVILEGE('power_users.xml', 'APEX_040200');
   ```
B.13 About Performance Optimization Tasks

Learn about performance optimization.

Performance of web applications heavily depends on their size and how often a browser has to request static content like images, CSS and JavaScript files. To improve performance, most web servers support on-the-fly HTTP response compression and provide settings that enable you to configure how long browsers may cache a file before requesting it again. The HTTP response compression is usually implemented using gzip encoding (for example, `mod_deflate` in Oracle HTTP Server), while browser file caching is enabled by issuing Cache-Control HTTP response header (for example, using `mod_headers` in Oracle HTTP Server).

See your web server documentation to learn how to enable response compression and browser file caching. For optimal performance of the Oracle Application Express development environment and Oracle Application Express applications, Oracle recommends enabling gzip compression of files in the virtual images directory (for example, `/i/`) and responses from the database access descriptor (for example, `/pls/apex`), as well as allowing browsers to cache files from the virtual images directory for at least 12 hours.

B.14 Converting Between Runtime and Full Development Environments

Learn how to convert between runtime and full development environments.

This section describes how to convert between runtime and full development environments.

- **About Runtime and Full Development Environments** (page B-32)
  An Oracle Application Express runtime environment enables users to run a production application without supporting the ability to change or edit the application.

- **Converting a Runtime Environment to a Full Development Environment in a non-CDB or locally in a PDB** (page B-32)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdvins.sql`.

- **Converting a Full Development Environment to a Runtime Environment in a non-CDB or locally in a PDB** (page B-33)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdevrm.sql`.

- **Converting a Runtime Environment to a Full Development Environment in a CDB** (page B-33)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdvins_con.sql`.

- **Converting a Full Development Environment to a Runtime Environment in a CDB** (page B-34)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdevrm_con.sql`. 
B.14.1 About Runtime and Full Development Environments

An Oracle Application Express runtime environment enables users to run a production application without supporting the ability to change or edit the application.

A runtime environment includes only the packages necessary to run your applications, making it a more hardened environment. It does not provide a web interface for administration.

You administer an Oracle Application Express runtime environment using SQL*Plus or SQL Developer and the APEX_INSTANCE_ADMIN API.

B.14.2 Converting a Runtime Environment to a Full Development Environment in a non-CDB or locally in a PDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run the apxdvins.sql.

To convert an Oracle Application Express runtime environment to a full development environment in a non-CDB or locally in a PDB:

1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     
     ```
     SYSTEM_DRIVE:\sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run apxdvins.sql. For example:

   ```
   @apxdvins.sql
   ```

4. Follow the instructions in Creating or Updating Your Instance Administration Account.
B.14.3 Converting a Full Development Environment to a Runtime Environment in a non-CDB or locally in a PDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run the apxdevrm.sql.

Tip:
Before converting a full development environment to a runtime environment, export all Websheet applications. When you convert a development environment to runtime, existing Websheet data grids and reports will be deleted from all workspaces. Converting the environment back to a full development environment will not restore these Websheet data grids or reports.

To convert an Oracle Application Express full development environment to a runtime environment in a non-CDB or locally in a PDB:

1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Run apxdevrm.sql. For example:
   ```sql
   @apxdevrm.sql
   ```

B.14.4 Converting a Runtime Environment to a Full Development Environment in a CDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and run the apxdvins_con.sql.

To convert an Oracle Application Express runtime environment to a full development environment in a CDB:

1. Change your working directory to the apex directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
• On Windows:
  \sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

• On UNIX and Linux:
  $ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

3. Run `apxdvins_con.sql`. For example:
@apxdvins_con.sql

4. Follow the instructions in Creating or Updating Your Instance Administration Account.

### B.14.5 Converting a Full Development Environment to a Runtime Environment in a CDB

Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role and run the `apxdevrm_con.sql`.

![Tip:]

Before converting a full development environment to a runtime environment, export all Websheet applications. When you convert a development environment to runtime, existing Websheet data grids and reports will be deleted from all workspaces. Converting the environment back to a full development environment will not restore these Websheet data grids or reports.

To convert an Oracle Application Express full development environment to a runtime environment in a CDB:

1. Change your working directory to the `apex` directory where you unzipped the installation software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:

   • On Windows:
     \sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

   • On UNIX and Linux:
     $ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

3. Run `apxdvrm_con.sql`. For example:
@apxdvrm_con.sql
Oracle Application Express Installation Troubleshooting

Learn about troubleshooting Oracle Application Express Installation.

This section contains information on troubleshooting.

- **Reviewing a Log of an Installation Session** (page C-1)
  The `apexins.sql` script creates a log file in the `apex` directory using the naming convention `installYYYY-MM-DD_HH24-MI-SS.log`.

- **Verifying the Validity of an Oracle Application Express Installation** (page C-2)
  Verify the validity of an Oracle Application Express installation by running a query.

- **Downloading and Installing Patches** (page C-2)
  Learn how to download and install patches.

- **Cleaning Up After a Failed Installation** (page C-3)
  Learn about troubleshooting after failed installation.

- **About Images Displaying Incorrectly in Oracle Application Express** (page C-24)
  Learn about troubleshooting if images in Oracle Application Express do not display correctly.

- **About Page Protection Violation** (page C-25)
  A page protection violation may be caused by manual alteration of protected page items.

---

**See Also:**

“Upgrading from a Previous Oracle Application Express Release” (page 1-8)

---

### C.1 Reviewing a Log of an Installation Session

The `apexins.sql` script creates a log file in the `apex` directory using the naming convention `installYYYY-MM-DD_HH24-MI-SS.log`.

In a successful installation, the log file contains the following text:

Thank you for installing Oracle Application Express.
Oracle Application Express is installed in the APEX_180100 schema.

If the log file contains a few errors, it does not mean that your installation failed. Note that acceptable errors are noted as such in the log file.
C.2 Verifying the Validity of an Oracle Application Express Installation

Verify the validity of an Oracle Application Express installation by running a query.

You can verify the validity of an Oracle Application Express installation by running the following query:

```
SELECT STATUS FROM DBA_REGISTRY
WHERE COMP_ID = 'APEX';
```

If the result is `VALID`, you can assume the installation was successful.

C.3 Downloading and Installing Patches

Learn how to download and install patches.

Check the My Oracle Support website for required patch updates for your installation.

To download required patches:

1. Use a web browser to view the My Oracle Support website:
   
   https://support.oracle.com/


   \[\text{Note:}\]

   If you are not a My Oracle Support registered user, click \text{Register here} and follow the registration instructions.

3. On the main My Oracle Support page, click the Patches & Updates tab.

4. In the Patch Search group, select \text{Product or Family} (Advanced).

5. In the Product field, select \text{Oracle Database}.

6. In the Release field select one or more release numbers.

7. Click \text{Search}.

8. Any available patch updates are displayed in the Patch Search page.

9. Select the patch number and click \text{ReadMe}. The README page displays and contains information about the patch set and how to apply the patches to your installation.

10. Return to the Patch Search page, click \text{Download}, and save the file on your system.

11. Use the unzip utility provided with Oracle Database 12c or later to uncompress the Oracle patch updates that you downloaded from My Oracle Support. The unzip utility is located in the \\
    \$ORACLE_HOME/bin directory.
C.4 Cleaning Up After a Failed Installation

Learn about troubleshooting after failed installation.

In a successful installation the following banner displays near the end of the installation:

Thank you for installing Oracle Application Express.
Oracle Application Express is installed in the APEX_180100 schema.

To reinstall, you must either drop the Oracle Application Express database schemas, or run a script to completely remove Application Express from the database, depending upon the installation type.

• Reverting to a Previous Release After a Failed Upgrade Installation (page C-3)
  Learn about reverting to Oracle Application Express to a previous release in the case of a failed upgrade installation.

• Removing Oracle Application Express from the Database (page C-23)
  Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and execute the SQL> @apxremov.sql command.

C.4.1 Reverting to a Previous Release After a Failed Upgrade Installation

Learn about reverting to Oracle Application Express to a previous release in the case of a failed upgrade installation.

In the case of a failed upgrade installation, you may want to revert Oracle Application Express to a previous release and then remove the schemas associated with the current release.

• Verifying If You Have a Previous Release of Oracle Application Express (page C-3)
• Reverting the Images Directory (page C-4)
• Reverting to a Previous Release (page C-4)
• Removing the Oracle Application Express Release 18.1 Schema (page C-22)

C.4.1.1 Verifying If You Have a Previous Release of Oracle Application Express

To verify whether you have a previous release of Application Express:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role. For example:
   • On Windows:
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
• On UNIX and Linux:

```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

2. Execute the following command in SQL*Plus:

```
select username from dba_users
where regexp_like(username,'(FLOWS|APEX)_\d{6}')
and username <> (select table_owner from all_synonyms
    where synonym_name = 'WWV_FLOW'
    and owner = 'PUBLIC')
```

If the query above returns any rows, the database contains a previous release of Oracle Application Express.

C.4.1.2 Reverting the Images Directory

If you altered your images directory, revert it back to the release you want to revert to using the following methods:

- For Oracle REST Data Services or mod_plsql:
  If you altered your images directory, you must point the text alias */i/* back to images directory for the release you want to revert to.

- For Embedded PL/SQL Gateway:
  Run `apex_epg_config.sql` from the release directory you want to revert to, to restore the images of that release. See the Oracle Application Installation Guide for the release you want to revert to and find the section “Updating the Images Directory When Upgrading from a Previous Release.”

C.4.1.3 Reverting to a Previous Release

This section describes how to revert to a Oracle Application Express previous release.

- Reverting to Release 1.5 (page C-5)
- Reverting to Release 1.6 (page C-5)
- Reverting to Release 2.0 (page C-6)
- Reverting to Release 2.2 (page C-6)
- Reverting to Release 3.0 (page C-7)
- Reverting to Release 3.1 (page C-7)
- Reverting to Release 3.2 (page C-8)
- Reverting to Release 4.0 (page C-9)
- Reverting to Release 4.1 (page C-11)
- Reverting to Release 4.2 in a non-CDB (page C-12)
- Reverting to Release 4.2 in a CDB (page C-13)
- Reverting to Release 5.0 in a non-CDB (page C-15)
- Reverting to Release 5.0 in a CDB (page C-17)
• Reverting to Release 5.1 in a non-CDB (page C-18)
• Reverting to Release 5.1 in a CDB (page C-20)

C.4.1.3.1 Reverting to Release 1.5

To revert to a previous Oracle Application Express release 1.5:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   • On Windows:
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
   • On UNIX and Linux:
     $ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
3. Execute the following:
   ALTER SESSION SET CURRENT_SCHEMA = FLOWS_010500;
   exec flows_010500.wwv_flow_upgrade.switch_schemas('APEX_180100','FLOWS_010500');
4. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.2 Reverting to Release 1.6

To revert to a Oracle Application Express release 1.6:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   • On Windows:
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
   • On UNIX and Linux:
     $ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
3. Execute the following:
   ALTER SESSION SET CURRENT_SCHEMA = FLOWS_010600;
   exec flows_010600.wwv_flow_upgrade.switch_schemas('APEX_180100','FLOWS_010600');
4. Depending upon the release you are reverting to, execute the appropriate command in SQL*Plus.
C.4.1.3.3 Reverting to Release 2.0

To revert to a previous Oracle Application Express release 2.0:

1. If you altered your images directory, revert it back to the release you want to revert to.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute the following:
   ```
   ALTER SESSION SET CURRENT_SCHEMA = FLOWS_020000;
   exec flows_020000.wwv_flow_upgrade.switch_schemas( 'APEX_180100', 'FLOWS_020000' );
   ```

4. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.4 Reverting to Release 2.2

To revert to a previous Oracle Application Express release 2.2:

1. If you altered your images directory, revert it back to the release you want to revert to.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute the following:
   ```
   ALTER SESSION SET CURRENT_SCHEMA = FLOWS_020200;
   exec flows_020200.wwv_flow_upgrade.switch_schemas( 'APEX_180100', 'FLOWS_020200' );
   ```

4. See the next section, Removing the Oracle Application Express Release 18.1 Schema.
C.4.1.3.5 Reverting to Release 3.0

To revert to a previous Oracle Application Express release 3.0:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to `apex` in the 3.0 source.
3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

   **On Windows:**
   ```sql
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   **On UNIX and Linux:**
   ```sql
   $ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

4. Execute the following:

   ```sql
   set define ''
   @apexvalidate x x FLOWS_030000
   ALTER SESSION SET CURRENT_SCHEMA = FLOWS_030000;
   exec flows_030000.wwv_flow_upgrade.switch_schemas('APEX_180100','FLOWS_030000');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   declare
   l_apex_version varchar2(30);
   begin
   l_apex_version := flows_030000.wwv_flows_release;
   dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','FLOWS_030000');
   dbms_registry.downgraded('APEX',l_apex_version);
   validate_apex;
   end;
   /
   ```

5. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.6 Reverting to Release 3.1

To revert to a previous Oracle Application Express release 3.1:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to `apex/core` in the 3.1 source.
3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

   **On Windows:**
   ```sql
   ```

```sql
```
SYSTEM_DRIVE:\ sqlplus /nolog  
SQL> SQL> CONNECT SYS as SYSDBA  
Enter password: SYS_password  

On UNIX and Linux:

$ sqlplus /nolog  
SQL> SQL> CONNECT SYS as SYSDBA  
Enter password: SYS_password  

4. Execute the following commands:

@wwv_flow_val.plb  
@wwv_dbms_sql.sql  
@wwv_dbms_sql.plb  

5. Change your working directory to apex in the 3.1 source.

6. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

On Windows:

SYSTEM_DRIVE:\ sqlplus /nolog  
SQL> SQL> CONNECT SYS as SYSDBA  
Enter password: SYS_password  

On UNIX and Linux:

$ sqlplus /nolog  
SQL> SQL> CONNECT SYS as SYSDBA  
Enter password: SYS_password  

7. Execute the following:

set define '"'

@apexvalidate x x FLOWS_030100  
ALTER SESSION SET CURRENT_SCHEMA = FLOWS_030100;  
exec flows_030100.wwv_flow_upgrade.switch_schemas('APEX_180100','FLOWS_030100');  
ALTER SESSION SET CURRENT_SCHEMA = SYS;  
declare  
  l_apex_version varchar2(30);  
begin  
  l_apex_version := flows_030100.wwv_flows_release;  
  dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','FLOWS_030100');  
  dbms_registry.downgraded('APEX',l_apex_version);  
  validate_apex;  
end;  
/

8. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.7 Reverting to Release 3.2

To revert to a previous Oracle Application Express release 3.2:

1. If you altered your images directory, revert it back to the release you want to revert to.

2. Change your working directory to apex/core in the 3.2 source.
3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

   On Windows:
   ```plaintext
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```
   
   On UNIX and Linux:
   ```plaintext
   $ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

4. Execute the following commands:

   ```plaintext
   @wwv_flow_val.plb
   @wwv_dbms_sql.sql
   @wwv_dbms_sql.plb
   ```

5. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

   On Windows:
   ```plaintext
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```
   
   On UNIX and Linux:
   ```plaintext
   $ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

6. Execute the following:

   ```plaintext
   set define ''
   @apexvalidate x x APEX_030200
   ALTER SESSION SET CURRENT_SCHEMA = APEX_030200;
   exec apex.030200.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_030200');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   declare
   l_apex_version varchar2(30);
   begin
   l_apex_version := apex.030200.wwv_flows_release;
   dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_030200')
   dbms_registry.downgraded('APEX',l_apex_version);
   validate_apex;
   end;
   /
   ```

7. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.8 Reverting to Release 4.0

To revert to a previous Oracle Application Express release 4.0:
1. If you altered your images directory, revert it back to the release you want to revert to.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

   On Windows:
   ```sql
   \sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   On UNIX and Linux:
   ```
   $ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

3. Execute the following commands:
   ```
   @wwv_flow_val.sql
   @wwv_flow_val.plb
   @wwv_dbms_sql.sql
   @wwv_dbms_sql.plb
   ```

4. Change your working directory to `apex` in the 4.0 source.

5. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

   On Windows:
   ```sql
   \sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   On UNIX and Linux:
   ```
   $ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

6. Execute the following:
   ```
   set define '^
   @apexvalidate x x APEX_040000
   ALTER SESSION SET CURRENT_SCHEMA = APEX_040000;
   exec apex_040000.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_040000');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   declare
      l_apex_version varchar2(30);
   begin
      l_apex_version := apex_040000.wwv_flows_release;
      dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_040000');
      dbms_registry.downgraded('APEX',l_apex_version);
      validate_apex;
   end;
   /
   ```

7. See the next section, Removing the Oracle Application Express Release 18.1 Schema.
C.4.1.3.9 Reverting to Release 4.1

To revert to a previous Oracle Application Express release 4.1:

1. If you altered your images directory, revert it back to the release you want to revert to.

2. Change your working directory to `apex/core` in the 4.1 source.

3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

   **On Windows:**
   ```
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   **On UNIX and Linux:**
   ```
   $ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

4. Execute the following commands:

   ```
   @wwv_flow_val.sql
   @wwv_flow_val.plb
   @wwv_dbms_sql.sql
   @wwv_dbms_sql.plb
   ```

5. Change your working directory to `apex` in the 4.1 source.

6. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

   **On Windows:**
   ```
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   **On UNIX and Linux:**
   ```
   $ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

7. Execute the following:

   ```
   set define '^'
   @apexvalidate x x APEX_040100
   ALTER SESSION SET CURRENT_SCHEMA = APEX_040100;
   exec apex_040100.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_040100');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   declare
     l_apex_version varchar2(30);
   begin
     l_apex_version := apex_040100.wwv_flows_release;
     dbms_registry.downgradding('APEX','Oracle Application Express','validate_apex','APEX_040100');
     dbms_registry.downgraded('APEX',l_apex_version);
     validate_apex;
   ```
8. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.10 Reverting to Release 4.2 in a non-CDB

To revert to a previous Oracle Application Express release 4.2 in a non-CDB:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to `apex/core` in the 4.2 source.
3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   On Windows:
   ```sql
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```
   On UNIX and Linux:
   ```sql
   $ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```
4. Execute the following commands:
   ```sql
   alter session set current_schema = SYS;
   @core_sys_views.sql
   grant select on sys.wwv_flow_gv$session to APEX_040200;
   @wwv_flow_val.sql
   @wwv_flow_val.plb
   @wwv_dbms_sql.sql
   grant execute on wwv_dbms_sql to APEX_040200;
   @wwv_dbms_sql.plb
   begin
   dbms_utility.compile_schema('APEX_040200');
   end;
   /
   ```
5. Change your working directory to `apex` in the 4.2 source.
6. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   On Windows:
   ```sql
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```
   On UNIX and Linux:
7. Execute the following:

```sql
set define ""
@apexvalidate x x APEX_040200
ALTER SESSION SET CURRENT_SCHEMA = APEX_040200;
exec apex_040200.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_040200');
ALTER SESSION SET CURRENT_SCHEMA = SYS;
declare
  l_apex_version varchar2(30);
begin
  l_apex_version := apex_040200.wwv_flows_release;
  dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_040200');
  dbms_registry.downgraded('APEX',l_apex_version);
  validate_apex;
end;
/
```

8. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.11 Reverting to Release 4.2 in a CDB

To revert to a previous Oracle Application Express release 4.2 in a CDB:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to `apex/core` in the 4.2 source.
3. Create a new text file in that directory named `apx42dgrd1.sql` consisting of the following:

   ```sql
   alter session set current_schema = SYS;
   @core_sys_views.sql
   grant select on sys.wwv_flow_gv$session to APEX_040200;
   @wwv_flow_val.sql
   @wwv_flow_val.plb
   @wwv_dbms_sql.sql
   grant execute on wwv_dbms_sql to APEX_040200;
   @wwv_dbms_sql.plb
   begin
     dbms_utility.compile_schema('APEX_040200');
   end;
   /```

4. Create a second new text file in that directory named `apx42dgrd.sql` consisting of the following:

   ```sql
   set define ""
   whenever sqlerror exit
   ```
column :xe_home new_value OH_HOME NOPRINT
variable xe_home varchar2(255)

set serverout on
begin
    -- get oracle_home
    sys.dbms_system.get_env('ORACLE_HOME',:xe_home);
    if length(:xe_home) = 0 then
        sys.dbms_output.put_line(lpad('-','-80','-'));
        raise_application_error (-20001, 'Oracle Home environment variable not set ');
    end if;
end;
/
whenever sqlerror continue
set termout off
select :xe_home from sys.dual;
set termout on

host ^OH_HOME/perl/bin/perl -I ^OH_HOME/rdbms/admin ^OH_HOME/rdbms/admin/
catcon.pl -b apx42dgrd apx42dgrd1.sql

5. Start SQL*Plus and connect to CDB$ROOT of the database where Oracle Application
   Express is installed as SYS specifying the SYSDBA role:

   On Windows:
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password

   On UNIX and Linux:
   $ sqlplus /nolog
   SQL> SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password

6. Execute the following commands:
   @apx42dgrd.sql

7. Change your working directory to apex in the 4.2 source.

8. Create a new text file in that directory name apx42dgrd1.sql with the following
   contents:
   set define '^^'
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   @apexvalidate x x APEX_040200
   ALTER SESSION SET CURRENT_SCHEMA = APEX_040200;
   exec apex_040200.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_040200');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   declare
       l_apex_version varchar2(30);
   begin
       l_apex_version := apex_040200.wwv_flows_release;
       dbms_registry.downgrading('APEX','Oracle Application
       Express','validate_apex','APEX_040200');
       dbms_registry.downgraded('APEX',l_apex_version);
9. Create a second new text file in that directory named `apx42dgrd.sql` consisting of the following:

```sql
set define ''
whenever sqlerror exit
column :xe_home new_value OH_HOME NOPRINT
variable xe_home varchar2(255)
set serverout on
begin
-- get oracle_home
    sys.dbms_system.get_env('ORACLE_HOME', :xe_home);
    if length(:xe_home) = 0 then
        sys.dbms_output.put_line(lpad('-',80,'-'));
        raise_application_error (-20001, 'Oracle Home environment variable not set');
    end if;
end;
/
whenever sqlerror continue
set termout off
select :xe_home from sys.dual;
set termout on
host 'OH_HOME/perl/bin/perl -I' ^OH_HOME/rdbms/admin ^OH_HOME/rdbms/admin/ catcon.pl -b apx42dgrd apx42dgrd1.sql
```

10. Start SQL*Plus and connect to `CDB$ROOT` of the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:

On Windows:

```
SYSTEM_DRIVE:\ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

On UNIX and Linux:

```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

11. Execute the following:

```
@apx42dgrd.sql
```

12. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

---

C.4.1.3.12 Reverting to Release 5.0 in a non-CDB

To revert to a previous Oracle Application Express release 5.0 in a non-CDB:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to `apex/core` in the 5.0 source.

3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

   On Windows:
   ```
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   On UNIX and Linux:
   ```
   $ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

4. Execute the following commands:

   ```sql
   alter session set current_schema = SYS;
   @wwv_flow_val.sql
   @wwv_flow_val.plb
   begin
     dbms_utility.compile_schema('APEX_050000');
   end;
   /
   set define '^
   @validate_apex x x APEX_050000
   begin
     for i in ( select owner, trigger_name
                  from sys.dba_triggers
                  where owner = 'APEX_050000'
                  and trigger_name like 'WWV_FLOW_UPGRADE_%'
                  order by 1 )
     loop
       sys.dbms_output.put_line('Dropping trigger'||i.owner||'.'||i.trigger_name);
       execute immediate 'drop trigger'||i.owner||'.'||i.trigger_name;
     end loop;
   end;
   /
   ALTER SESSION SET CURRENT_SCHEMA = APEX_050000;
   exec apex_050000.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_050000');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   drop context APEX$SESSION;
   create context APEX$SESSION using APEX_050000.WWV_FLOW_SESSION_CONTEXT;
   declare
     l_apex_version varchar2(30);
     l_schemas sys.dbms_registry.schema_list_t;
   begin
     l_apex_version := apex_050000.wwv_flows_release;
     dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_050000');
     dbms_registry.downgraded('APEX',l_apex_version);
     select username
     bulk collect into l_schemas
     from all_users
     where username in ('FLOWS_FILES','APEX_PUBLIC_USER','APEX_LISTENER','APEX_REST_PUBLIC_USER','APEX_I
```
C.4.1.3.13 Reverting to Release 5.0 in a CDB

To revert to a previous Oracle Application Express release 5.0 in a CDB:

1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to `apex/core` in the 5.0 source.
3. Create a new text file in that directory named `apx50dgrd1.sql` consisting of the following:

```sql
alter session set current_schema = SYS;
@wwv_flow_val.sql
@wwv_flow_val.plb
begin
  dbms_utility.compile_schema('APEX_050000');
end;
/
set define ^
@validate_apex x x APEX_050000
begin
  for i in ( select owner, trigger_name
           from sys.dba_triggers
           where owner        =    'APEX_050000'
           and trigger_name like 'WWV_FLOW_UPGRADE_%'
           order by 1 )
  loop
    sys.dbms_output.put_line('Dropping trigger '||i.owner||'.'||i.trigger_name);
    execute immediate 'drop trigger '||i.owner||'.'||i.trigger_name;
  end loop;
end;
/
ALTER SESSION SET CURRENT_SCHEMA = APEX_050000;
exec apex_050000.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_050000');
ALTER SESSION SET CURRENT_SCHEMA = SYS;
drop context APEX$SESSION;
create context APEX$SESSION using APEX_050000.WWV_FLOW_SESSION_CONTEXT;
declare
  l_apex_version varchar2(30);
  l_schemas sys.dbms_registry.schema_list_t;
begin
  l_apex_version := apex_050000.wwv_flows_release;
  dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_050000');
  dbms_registry.downgraded('APEX',l_apex_version);
end;
```

5. See the next section, Removing the Oracle Application Express Release 18.1 Schema.
select username
    bulk collect into l_schemas
from all_users
where username in
    ('FLOWS_FILES','APEX_PUBLIC_USER','APEX_LISTENER','APEX_REST_PUBLIC_USER','APEX_INSTANCE_ADMIN_USER')
order by 1;
sys.dbms_registry.update_schema_list('APEX', l_schemas);
validate_apex;
end;
/

4. Create a second new text file in that directory named apx50dgrd.sql consisting of the following:

```sql
set define '''
whenever sqlerror exit
column :xe_home new_value OH_HOME NOPRINT
variable xe_home varchar2(255)
set serverout on
begin
    -- get oracle_home
    sys.dbms_system.get_env('ORACLE_HOME',:xe_home);
    if length(:xe_home) = 0 then
        sys.dbms_output.put_line(lpad('¯',80,'¯'));
        raise_application_error (-20001,'Oracle Home environment variable not set');
    end if;
end;
/
whenever sqlerror continue
set termout off
select :xe_home from sys.dual;
set termout on
host ^OH_HOME/perl/bin/perl -I ^OH_HOME/rdbms/admin ^OH_HOME/rdbms/admin/catcon.pl -b apx50dgrd apx50dgrd1.sql
```

5. Start SQL*Plus and connect to CDB$ROOT of the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

On Windows:
```
SYSTEM_DRIVE:\ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

On UNIX and Linux:
```
$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password
```

6. Execute the following commands:

    @apx50dgrd.sql

7. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.14 Reverting to Release 5.1 in a non-CDB

To revert to a previous Oracle Application Express release 5.1 in a non-CDB:
1. If you altered your images directory, revert it back to the release you want to revert to.
2. Change your working directory to apex/core in the 5.1 source.
3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

   On Windows:
   ```
   SYSTEM_DRIVE:\ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

   On UNIX and Linux:
   ```
   $ sqlplus /nolog
   SQL> CONNECT SYS as SYSDBA
   Enter password: SYS_password
   ```

4. Execute the following commands:

   ```
   alter session set current_schema = SYS;
   @wwv_flow_val.sql
   @wwv_flow_val.plb
   begin
   dbms_utility.compile_schema('APEX_050100');
   end;
   /
   set define '^'
   @validate_apex x x APEX_050100
   begin
   for i in ( select owner, trigger_name
               from sys.dba_triggers
               where owner = 'APEX_050100'
               and trigger_name like 'WWV_FLOW_UPGRADE_%'
               order by 1 )
     loop
     sys.dbms_output.put_line('Dropping trigger '||i.owner||'.'||i.trigger_name);
     execute immediate 'drop trigger '||i.owner||'.'||i.trigger_name;
     end loop;
   end;
   /
   ALTER SESSION SET CURRENT_SCHEMA = APEX_050100;
   exec apex_050100.wwv_flow_upgrade.switch_schemas('APEX_180100','APEX_050100');
   ALTER SESSION SET CURRENT_SCHEMA = SYS;
   drop context APEX$SESSION;
   create context APEX$SESSION using APEX_050100.WWV_FLOW_SESSION_CONTEXT;
   declare
   l_apex_version varchar2(30);
   l_schemas sys.dbms_registry.schema_list_t;
   begin
   l_apex_version := apex_050100.wwv_flows_release;
   dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_050100');
   dbms_registry.downgraded('APEX',l_apex_version);
   select username
      bulk collect into l_schemas
   ```
from all_users
where username in
('FLOWS_FILES', 'APEX_PUBLIC_USER', 'APEX_LISTENER', 'APEX_REST_PUBLIC_USER', 'APEX_INSTANCE_ADMIN_USER')
order by 1;
sys.dbms_registry.update_schema_list('APEX', l_schemas);
validate_apex;
end;
/

5. See the next section, Removing the Oracle Application Express Release 18.1 Schema.

C.4.1.3.15 Reverting to Release 5.1 in a CDB

To revert to a previous Oracle Application Express release 5.1 in a CDB:

1. If you altered your images directory, revert it back to the release you want to revert to.

2. Change your working directory to apex/core in the 5.1 source.

3. Create a new text file in that directory named apx51dgrd1.sql consisting of the following:

```sql
alter session set current_schema = SYS;
@wwv_flow_val.sql
@wwv_flow_val.plb
begin
   dbms_utility.compile_schema('APEX_050100');
end;
/

set define ^^
@validate_apex x x APEX_050100
begin
   for i in ( select owner, trigger_name
      from sys.dba_triggers
      where owner = 'APEX_050100'
      and trigger_name like 'WWV_FLOW_UPGRADE_%'
      order by 1 )
   loop
      sys.dbms_output.put_line('Dropping trigger ||i.owner||.||i.trigger_name);
      execute immediate 'drop trigger ||i.owner||.||i.trigger_name;
   end loop;
end;
/
ALTER SESSION SET CURRENT_SCHEMA = APEX_050100;
exec apex_050100.wwv_flow_upgrade.switch_schemas('APEX_180100', 'APEX_050100');
ALTER SESSION SET CURRENT_SCHEMA = SYS;
drop context APEX$SESSION;
create context APEX$SESSION using APEX_050100.WWV_FLOW_SESSION_CONTEXT;
declare
   l_apex_version varchar2(30);
   l_schemas sys.dbms_registry.schema_list_t;
begin
   l_apex_version := apex_050100.wwv_flows_release;
```
dbms_registry.downgrading('APEX','Oracle Application Express','validate_apex','APEX_050100');
dbms_registry.downgraded('APEX', l_apex_version);
select username
  bulk collect into l_schemas
  from all_users
  where username in
  ('FLOWSFILES', 'APEX_PUBLIC_USER', 'APEX_LISTENER', 'APEX_REST_PUBLIC_USER', 'APEX_INSTANCE_ADMIN_USER')
  order by 1;
sys.dbms_registry.update_schema_list('APEX', l_schemas);
validate_apex;
end;
/

4. Create a second new text file in that directory named apx51dgrd.sql consisting of the following:

set define ''
whenever sqlerror exit
  column :xe_home new_value OH_HOME NOPRINT
variable xe_home varchar2(255)
set serverout on
begin
  -- get oracle_home
  sys.dbms_system.get_env('ORACLE_HOME', xe_home);
  if length(xe_home) = 0 then
    sys.dbms_output.put_line(lpad('-', 80, '-'));
    raise_application_error (-20001, 'Oracle Home environment variable not set');
  end if;
end;
/
whenever sqlerror continue
set termout off
select :xe_home from sys.dual;
set termout on
host "^OH_HOME/perl/bin/perl -I ^OH_HOME/rdbms/admin ^OH_HOME/rdbms/admin/catcon.pl -b apx51dgrd apx51dgrd1.sql"

5. Start SQL*Plus and connect to CDB$ROOT of the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

On Windows:

SYSTEM_DRIVE:\ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

On UNIX and Linux:

$ sqlplus /nolog
SQL> CONNECT SYS as SYSDBA
Enter password: SYS_password

6. Execute the following commands:

@apx51dgrd.sql

7. See the next section, Removing the Oracle Application Express Release 18.1 Schema.
C.4.1.4 Removing the Oracle Application Express Release 18.1 Schema

After you have reverted to the prior release you can remove the Oracle Application Express 18.1 schema.

- **Removing the Oracle Application Express Release 18.1 Schema from a Non-CDB** (page C-22)
  Start SQL*Plus and connect to the database and execute `DROP USER APEX_180100 CASCADE;`.

- **Removing the Oracle Application Express Release 18.1 Schema from a CDB** (page C-22)
  Create text files, start SQL*Plus and connect to the database execute
  `@remove_apx181_usr.sql`.

C.4.1.4.1 Removing the Oracle Application Express Release 18.1 Schema from a Non-CDB

Start SQL*Plus and connect to the database and execute `DROP USER APEX_180100 CASCADE;`.

To remove the release 18.1 schema from a non-CDB:

1. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:
   - **On Windows:**
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - **On UNIX and Linux:**
     ```
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

2. Execute the following command:
   ```
   DROP USER APEX_180100 CASCADE;
   ```

Once you have removed the Oracle Application Express 18.1 schema, you can now attempt the upgrade again.

C.4.1.4.2 Removing the Oracle Application Express Release 18.1 Schema from a CDB

Create text files, start SQL*Plus and connect to the database execute
`@remove_apx181_usr.sql`.

To remove the release 18.1 schema from a CDB:

1. Create a new text file named `remove_apx181_usr1.sql` with the following contents:
   ```
   alter session set current_schema = SYS;
   drop user APEX_180100 cascade;
   ```

2. Create a second new text file named `remove_apx181_usr.sql` with the following contents:
set define '^'
whenever sqlerror exit
column :xe_home new_value OH_HOME NOPRINT
variable xe_home varchar2(255)
set serverout on
begin
    -- get oracle_home
    sys.dbms_system.get_env('ORACLE_HOME',:xe_home);
    if length(:xe_home) = 0 then
        sys.dbms_output.put_line(lpad('^-',80,'-'));
        raise_application_error (-20001,
            'Oracle Home environment variable not set');
    end if;
end;
/
set termout off
select :xe_home from sys.dual;
set termout on
host ^OH_HOME/perl/bin/perl -I ^OH_HOME/rdbms/admin ^OH_HOME/rdbms/admin/
catcon.pl -b remove_apx51_usr remove_apx51_usr1.sql

3. Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role:

   - On Windows:
     ```
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```
     $ sqlplus /nolog
     SQL> SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

4. Execute the following command:

   ```
   @remove_apx181_usr.sql
   ```
   Once you have removed the Oracle Application Express 181 schema, you can now attempt the upgrade again.

C.4.2 Removing Oracle Application Express from the Database

Start SQL*Plus and connect to the database where Oracle Application Express is installed as SYS specifying the SYSDBA role and execute the SQL> @apxremov.sql command.

This section describes how to remove the Oracle Application Express schema, synonyms, and users from the database without deleting the database.
To remove Oracle Application Express from the database:

1. Change your working directory to the `apex` directory where you unzipped the Oracle Application Express software.

2. Start SQL*Plus and connect to the database where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```sql
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

3. Execute the following command:
   ```sql
   SQL> @apxremov.sql
   ```

4. After successfully removing Application Express using `apxremov.sql`, you must exit your current SQL*Plus session and reconnect before attempting another install using `apexins.sql`.

---

### C.5 About Images Displaying Incorrectly in Oracle Application Express

Learn about troubleshooting if images in Oracle Application Express do not display correctly.

If images in Oracle Application Express do not display correctly, you may have more than one definition of the `/i` alias. To address this issue:

- If possible, rename the first instance of `/i` to a different alias name.
- Alternatively, copy the images from the directory where Oracle Application Express was downloaded or the images copied for Oracle REST Data Services (ORDS) to the directory defined by the first `/i` alias.
C.6 About Page Protection Violation

A page protection violation may be caused by manual alteration of protected page items.

If this error occurs after installation when trying to log into Oracle Application Express, then stop and start Oracle REST Data Services. If you are unsure of what caused this error, contact the application administrator for assistance.
Upgrading Oracle Application Express within Oracle Database Express Edition

Learn about upgrading Oracle Application Express included with Oracle Database XE.

Oracle Database 11g Express Edition (Oracle Database XE) includes Oracle Application Express release 4.0. Oracle strongly recommends that you upgrade to the latest Oracle Application Express release to take advantage of the latest features. This section describes how to upgrade Oracle Application Express included with Oracle Database XE.

Tip:

Upgrading Oracle Application Express does not change the Oracle Support policy for Oracle Database XE. Oracle Database XE is only supported on the Oracle OTN forums. Oracle Support will not answer questions about Oracle Application Express on Oracle Database XE.

- **Upgrading to the Latest Oracle Application Express Release** (page D-1)
  Learn how to upgrade to the latest Oracle Application Express release.

- **Understanding the Differences Between Later Oracle Application Express Releases** (page D-3)
  Learn about Oracle Database 11g Express Edition that includes Oracle Application Express 4.0 and the difference between 4.0 and later releases.

See Also:

Oracle Database 11g Express Edition OTN site at:


D.1 Upgrading to the Latest Oracle Application Express Release

Learn how to upgrade to the latest Oracle Application Express release.

To upgrade to the latest Oracle Application Express release:

1. Download the latest version of Oracle Application Express from the download page. See:
2. Unzip downloaded zip file:
   - UNIX and Linux: $ unzip filename.zip
   - Windows: Double click filename.zip in Windows Explorer

   **Tip:**
   Keep the directory tree where you unzip the files short and not under directories that contain spaces. For example, within Windows unzip to C:.

3. Change your working directory to `apex`.

4. Start SQL*Plus and connect to the Oracle Database XE where Oracle Application Express is installed as `SYS` specifying the `SYSDBA` role. For example:
   - On Windows:
     ```sql
     SYSTEM_DRIVE:\ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```
   - On UNIX and Linux:
     ```bash
     $ sqlplus /nolog
     SQL> CONNECT SYS as SYSDBA
     Enter password: SYS_password
     ```

   **Tip:**
   Keep the directory tree where you unzip the files short and not under directories that contain spaces. For example, within Windows unzip to C:.

5. Install Oracle Application Express:
   ```sql
   @apexins.sql tablespace_apex tablespace_files tablespace_temp images
   ```

   Where:
   - `tablespace_apex` is the name of the tablespace for the Oracle Application Express application user.
   - `tablespace_files` is the name of the tablespace for the Oracle Application Express files user.
   - `tablespace_temp` is the name of the temporary tablespace or tablespace group.
   - `images` is the virtual directory for Oracle Application Express images. To support future Oracle Application Express upgrades, define the virtual image directory as `/i/`.

   **Example**
   ```sql
   @apexins.sql SYSAUX SYSAUX TEMP /i/
   ```

6. Log back into SQL*Plus (as described in step 4) and load images:
7. Upgrade the Oracle Application Express password by running `apxchpwd.sql`:

```
@apxchpwd.sql
```

When prompted, enter a password for the `ADMIN` account.

8. Navigate to the Oracle Application Express Administration Services application:
   a. In a Web browser, navigate to:
      ```
      http://hostname:port/apex/apex_admin
      ```
      Where:
      - `hostname` is the name of the system where Oracle XML DB Protocol server is installed.
      - `port` is the port number assigned to HTTP on the Oracle XML DB Protocol server. In a default installation, this number is 8080. If you are using the Oracle Database 12c or later multitenant architecture, then each pluggable database (PDB) will have a distinct port number.
      - `apex` is the database access descriptor (DAD) defined in the configuration file.
   b. On the Sign In page:
      - Username - Enter `admin`.
      - Password - Enter the Oracle Application Express administrator account password you specified in step 4.
      - Click **Sign In to Administration**.
      
      Note that, depending on your setup, you might be required to change your password when you log in for the first time.

---

**D.2 Understanding the Differences Between Later Oracle Application Express Releases**

Learn about Oracle Database 11g Express Edition that includes Oracle Application Express 4.0 and the difference between 4.0 and later releases.

Oracle Database 11g Express Edition includes Oracle Application Express 4.0. This section describes the differences between Oracle Application Express release 4.0 and later releases.

- **User Interface Differences** (page D-4)
  Learn about the differences between Oracle Application Express release 4.0 and later releases.
D.2.1 User Interface Differences

Learn about the differences between Oracle Application Express release 4.0 and later releases.

This section describes the differences between Oracle Application Express release 4.0 and later releases:

- **Workspace Home Page** - The Workspace home page displays differently in newer versions of Oracle Application Express. In the newer versions of Application Express, the components displayed on the Workspace home page are **App Builder, SQL Workshop, Team Development, and Packaged Apps**.

- **Administration** - In the newer versions of Oracle Application Express, **Administration** appears as a menu on the Workspace home page.

- **Account** - In the newer versions of Oracle Application Express, the **Account Menu** appears at the top of the Application Express home page and allows you to set the following preferences:
  - Default Schema
  - Default Date Format
  - Enable Legacy Component View
  - Run application in new window - Specify how Application Express manages windows or tabs when running applications from Application Builder
  - Use single window to run all applications - Specify whether different applications reuse the same application runtime window or tab

- **Accessibility Mode** - In the newer versions of Oracle Application Express, the Workspace home page includes **Accessibility Mode** list that allows you to select either **Standard** or **Screen Reader** mode.
Maximizing Uptime During an Application Express Upgrade

Learn how to maximize uptime during an Application Express upgrade.

Previously, Oracle Application Express could only be upgraded by completely disabling application usage for an extended length of time. The following is an overview of the additional steps you can take to keep your applications usable for end users during most portions of an Oracle Application Express upgrade.

This advanced procedure is an alternative to the following “Installing Application Express” subsections of the Oracle Application Express Installation Guide:

- Installing Application Express and Configuring Oracle REST Data Services
- Installing Application Express and Configuring Embedded PL/SQL Gateway
- Installing Application Express and Configuring Oracle HTTP Server

To upgrade the instance, administrators typically run these phases in one step by executing one of the following:

- For full development environment:
  
  \[\text{@apexins.sql\} \text{ tablespace\_apex \text{ tablespace\_files \text{ tablespace\_temp \text{ images}}} \]

- For runtime-only environment:
  
  \[\text{@apxrtins.sql\} \text{ tablespace\_apex \text{ tablespace\_files \text{ tablespace\_temp \text{ images}}} \]

Where:

- \text{tablespace\_apex} is the name of the tablespace for the Oracle Application Express application user.
- \text{tablespace\_files} is the name of the tablespace for the Oracle Application Express files user.
- \text{tablespace\_temp} is the name of the temporary tablespace or tablespace group.
- \text{images} is the virtual directory for Oracle Application Express images.

The upgrade of an Application Express instance runs in four phases:

1. Create database schemas and database objects (tables, packages).
2. Migrate application metadata.
3. Migrate data that runtime applications modify and switch to the new version.
4. Migrate additional log and summary data.

Phases 1 and 4 do not disable end users using the instance. Phase 2 only affects developers who modify applications. Phase 3 affects all access to Application Express.

Oracle now also provides alternative upgrade scripts to run the phases independently. Administrators can use these scripts instead of \text{apexins.sql} and \text{apxrtins.sql}, to
reduce the effective downtime of an Application Express instance from potentially hours to just a few minutes (depending on hardware performance).

Note:

This feature is not supported when Application Express is installed in CDB$ROOT.

Administrators must sequentially execute the following scripts to start phases 1, 2 and 3, respectively. At the end of phase 3, a scheduler job automatically starts to execute phase 4.

To reduce downtime during an Oracle Application Express upgrade:

1. Execute phase 1 script: Development and runtime usage is not affected.
   - For full development environment:
     @apexins1.sql tablespace_apex tablespace_files tablespace_temp images
   - For runtime-only environment:
     @apxrtins1.sql tablespace_apex tablespace_files tablespace_temp images
   Example: @apexins1.sql sysaux sysaux temp /i/

2. Execute phase 2 script: Development is disabled, but runtime usage is not affected.
   - For full development environment:
     @apexins2.sql tablespace_apex tablespace_files tablespace_temp images
   - For runtime-only environment:
     @apxrtins2.sql tablespace_apex tablespace_files tablespace_temp images
   Example: @apexins2.sql sysaux sysaux temp /i/

3. Disable web access for the web listener (Oracle REST Data Services, Embedded PL/SQL Gateway, or Oracle HTTP Server).

4. Execute phase 3 script: Application Express can not be used.
   - For full development environment:
     @apexins3.sql tablespace_apex tablespace_files tablespace_temp images
   - For runtime-only environment:
     @apxrtins3.sql tablespace_apex tablespace_files tablespace_temp images
   Example: @apexins3.sql sysaux sysaux temp /i/

5. Install images of the new Application Express version in your web listener. Administrators can do this while phase 3 is running or even earlier, if the new version's images directory is different to the previous Application Express version's (for example: /i51/ for the new version vs. /i50/ for the old version).
   For details refer to the installation instructions for Oracle REST Data Services, Embedded PL/SQL Gateway, or Oracle HTTP Server.

6. Re-enable web access for the web listener (restart Oracle REST Data Services, Embedded PL/SQL Gateway, or Oracle HTTP Server).
After web access is restarted, developers and users can access the instance again, while phase 4 finishes in the background.

See Also:

- "Installing Application Express and Configuring Oracle REST Data Services (page 4-1)"
- "Installing Application Express and Configuring Embedded PL/SQL Gateway (page A-1)"
- "Installing Application Express and Configuring Legacy Web Listener – Oracle HTTP Server (page B-1)"
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