Oracle® REST Data Services

Installation and Configuration Guide

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Oracle REST Data Services Installation and Configuration Guide, Release 25.4

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Preface

Oracle REST Data Services Developer's Guide explains how to develop applications using Oracle REST Data Services. (Oracle REST Data Services was called *Oracle Application Express Listener* before Release 2.0.6.)

Topics:

- Audience
- Related Documents
- Conventions

- Audience
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- Conventions

Audience

This document is intended for system administrators or application developers who are installing and configuring Oracle REST Data Services. This guide assumes you are familiar with web technologies, especially REST (Representational State Transfer), and have a general understanding of Windows and UNIX platforms.

Related Documents

For more information and resources relating to Oracle REST Data Services, see the following the Oracle Technology Network (OTN) site:

`http://www.oracle.com/technetwork/developer-tools/rest-data-services/`

Conventions

The following text conventions are used in this document:

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

Changes in Release 25.4 Oracle REST Data Services Installation and Configuration Guide

Changes in Oracle REST Data Services 25.4

This section lists the changes in Oracle REST Data Services for 25.4 release.

New Features or Enhancements

- Updated Using Jetty XML Configuration Files section.
- Updated Using OCI Logging Service with Oracle REST Data Services section with new metrics and logging enhancements.

1

Oracle REST Data Services Installation Checklist

This chapter provides information about supported platforms, system requirements, and Database privileges required for using ORDS .

- System Requirements
- Supported Java EE Application Servers
- Supported Oracle APEX Versions
- ORDS Installer Privileges Script
  This section describes about the script file that provides privileges to the user to install, upgrade, repair, and uninstall ORDS.
- Privileges Granted to the Oracle REST Data Services Users
- About the Database Users Used by Oracle REST Data Services
- About Command-Line Interface
- About Online Help

1.1 System Requirements

Oracle REST Data Services system requirements are as follows:

- A currently supported version of Oracle Database as specified in the Oracle Lifetime Support Policy
- Use one of the following:
  - Oracle Java version 17, or 21
  - Oracle GraalVM Enterprise Edition for Java version 17, or 21

> **Note**
>
> On Linux system, if the Oracle Java version is lower than 17, then the installation fails with an error message. For example:
>
> ```
> Error: ORDS requires Java 17 and above to run.
>        Found Java version 11.
>        Please set JAVA_HOME to appropriate version and update PATH
> if necessary.
> ```
>
> So, you must set `JAVA_HOME` to the appropriate version and update the PATH if required.
>
> On Windows system, the user is re-directed to the Java download page.

- Web browser requirements: Refer to Oracle Software Web Browser Support Policy for more information.

> **Note**
>
> Oracle APEX is *not* a prerequisite for using Oracle REST Data Services.
>
> If Oracle APEX is installed and if RESTful services have been configured during the installation (see the step Configuring Oracle REST Data Services in Oracle Application Express Installation Guide), then Oracle REST Data Services supports it.

Platforms Available

ORDS is distributed and available in the following platforms:

- You can download at Downloads
- From Oracle YUM Repository as an RPM package
- In Oracle Container Registry as a ready to run image
- GraalVM Configuration

1.1.1 GraalVM Configuration

To operate, Oracle REST Data Services requires a Java Runtime Environment. Customers can choose to use a supported Oracle GraalVM for improved performance in their runtime environment. It is not mandatory.

However, certain features in ORDS require the Java Runtime Environment to be a GraalVM with specific Graal components installed. The dependent Graal component for such features is mentioned in the documentation section. The most common dependency is on the `Graal.js` component for JavaScript support.

Use `gu list` command to determine the components available:

```
gu list
ComponentId              Version             Component name
Stability
------------------------------------------------------------------------------
----------
graalvm                  23.0.1              GraalVM Core
Supported
icu4j                    23.0.1              ICU4J
Supported
js                       23.0.1              Graal.js
Supported
regex                    23.0.1              TRegex
Supported
```

If the JavaScript component is not listed as an available component, then install it using the `gu install js` command. Refer to GraalVM documentation for more information on the Graal Updater command utility and the capabilities of the various Graal components.

ⓘ **Note**

The ORDS image located at ORDS Docker Image Repository is based on GraalVM with the `Graal.js` component.

ⓘ **Note**

The GraalVM Updater was removed in GraalVM for JDK version 21. It is not planned to embed the JavaScript component in ORDS. However, it is possible to use the plugin framework to embed Graal JS component.

ⓘ **See Also**

- Embedding Graal JavaScript Component
- Plugin Demostration Example

1.2 Supported Java EE Application Servers

Oracle REST Data Services supports the following Java EE application servers:

Application Server	Supported Release
Oracle WebLogic Server	14.1.2 Release
Apache Tomcat	9.0.x Release

1.3 Supported Oracle APEX Versions

Oracle REST Data Services supports the currently supported versions of APEX.

ⓘ **See Also**

The Oracle APEX (Formerly HTML DB) table in the ORACLE INFORMATION-DRIVEN SUPPORT document for supported versions of APEX.

1.4 ORDS Installer Privileges Script

This section describes about the script file that provides privileges to the user to install, upgrade, repair, and uninstall ORDS.

ⓘ **Note**

This script is used when you do not want to use SYS AS SYSDBA to install, upgrade, repair, and uninstall ORDS for Oracle PDB or Oracle 11g.

The Oracle REST Data Services contains a script, ords_installer_privileges.sql which is located in the scripts/installer folder. The script provides the assigned database user the privileges to install, upgrade, repair, and uninstall ORDS in Oracle Database.

Perform the following steps:

1. Using SQLcl or SQL*Plus, connect to the Oracle Database instance. You must have a Database account with appropriate privileges for installing ORDS.
2. Execute the following script providing the database user:

   ```
   SQL> @/path/to/scripts/installer/ords_installer_privileges.sql exampleuser
   SQL> exit
   ```

You must use the specified database user to install, upgrade, repair, and uninstall ORDS.

1.5 Privileges Granted to the Oracle REST Data Services Users

As part of the Oracle REST Data Services installation, privileges are granted to several users and roles:

- ORDS_RUNTIME_ROLE role
  - ORDS_RUNTIME_ROLE is granted EXECUTE on the following packages if these packages are not granted EXECUTE to PUBLIC:
    - SYS.DBMS_LOB
    - SYS.DBMS_SESSION
    - SYS.DBMS_UTILITY
    - SYS.WPIUTL
  - ORDS_RUNTIME_ROLE is granted the necessary ORDS_METADATA object privileges to determine the repository version and to access the connection pool configurations.
- ORDS_PUBLIC_USER user
  - ORDS_PUBLIC_USER is granted connect to allow connection to the database.
  - ORDS_PUBLIC_USER is granted role, ORDS_RUNTIME_ROLE to allow the user to act as an ORDS runtime user
- ORDS_ADMINISTRATOR_ROLE role
  - ORDS_ADMINISTRATOR_ROLE is granted EXECUTE on ORDS_METADATA.ORDS_ADMIN PL/SQL package.
- PUBLIC
  - PUBLIC is granted EXECUTE on ORDS_METADATA.ORDS_REPVERSION view to allow the repository version to be queried by anyone.
  - PUBLIC is granted SELECT on many ORDS_METADATA views.
  - PUBLIC is granted EXECUTE on ORDS_METADATA PL/SQL packages that are available for developer users.
- ORDS_METADATA schema
  - ORDS_METADATA schema is granted on the following packages if these packages are not granted EXECUTE on PUBLIC:
    - SYS.DBMS_ASSERT

    - SYS.DBMS_LOB
    - SYS.DBMS_OUTPUT
    - SYS.DBMS_SCHEDULER
    - SYS.DBMS_SESSION
    - SYS.DBMS_UTILITY
    - SYS.DEFAULT_JOB_CLASS
    - SYS.HTP
    - SYS.OWA
    - SYS.WPG_DOCLOAD
  - ORDS_METADATA is granted SELECT (11g) or READ (12*c* or later) on the following view if it is not granted SELECT or READ to PUBLIC:
    - SYS.SESSION_PRIVS
  - ORDS_METADATA schema is granted EXECUTE on the following packages:
    - SYS.DBMS_CRYPTO
    - SYS.DBMS_METADATA
  - ORDS_METADATA schema is granted SELECT (11g) or READ (12c or later) on the following views:
    - SYS.DBA_OBJECTS
    - SYS.DBA_ROLE_PRIVS
    - SYS.DBA_TAB_COLUMNS
  - ORDS_METADATA schema is granted SELECT including WITH GRANT OPTION on the following views:
    - SYS.USER_CONS_COLUMNS
    - SYS.USER_CONSTRAINTS
    - SYS.USER_OBJECTS
    - SYS.USER_PROCEDURES
    - SYS.USER_TAB_COLUMNS
    - SYS.USER_TABLES
    - SYS.USER_VIEWS
  - ORDS_METADATA schema is granted the following system privileges:
    - ALTER USER
    - CREATE ANY TRIGGER
    - CREATE JOB
    - CREATE VIEW
    - CREATE PUBLIC SYNONYM
    - DROP PUBLIC SYNONYM
  - ORDS_METADATA schema is granted the necessary object privileges to migrate Application Express REST data to ORDS_METADATA tables.

  - ORDS_METADATA schema is granted ORDS_ADMINISTRATOR_ROLE, ORDS_RUNTIME_ROLE roles with administrator option.
- PUBLIC is granted SELECT on many ORDS_METADATA tables and views.
- PUBLIC is granted EXECUTE on PL/SQL packages that are available for users to invoke.
- ORDS_METADATA is granted EXECUTE on the following packages if these packages are not granted EXECUTE to PUBLIC:
  - SYS.DBMS_ASSERT
  - SYS.DBMS_LOB
  - SYS.DBMS_OUTPUT
  - SYS.DBMS_SCHEDULER
  - SYS.DBMS_SESSION
  - SYS.DBMS_UTILITY
  - SYS.DEFAULT_JOB_CLASS
  - SYS.HTP
  - SYS.OWA
  - SYS.WPG_DOCLOAD
- ORDS_METADATA is granted the necessary object privileges to migrate Application Express REST data to ORDS_METADATA tables.

1.6 About the Database Users Used by Oracle REST Data Services

Oracle REST Data Services uses the following database users:

User Name	Required	Description
ORDS_METADATA	Yes	Owner of the PL/SQL packages used for implementing many Oracle REST Data Services capabilities. ORDS_METADATA is where the metadata about Oracle REST Data Services-enabled schemas is stored. It is not accessed directly by Oracle REST Data Services; the Oracle REST Data Services application never creates a connection to the ORDS_METADATA schema.
ORDS_PUBLIC_USER	Yes	User for Oracle REST Data Services to make an initial database connection for handling requests. Depending on the request, the user will proxy to the relevant Oracle REST Data Services-enabled schema or PL/SQL Gateway user to complete the requested action in the database.

1.7 About Command-Line Interface

ORDS release 22.1.0 introduces the ORDS Command-Line Interface that provides the following benefits:

- Create, update, and list your ORDS configuration

- Add additional database pools to your configuration Install/upgrade
- Repair, or uninstall ORDS in the database
- Run ORDS in standalone mode

The preceding functions can be accomplished interactively through prompts, or run silently (non-interactively) using the ORDS commands.

1.8 About Online Help

The online help provides information about the commands along with the available options and arguments. To show the list of ORDS commands, execute the following command:

```
ords --help
```

To show the details of an ORDS command, specify the ORDS command followed by `--help`. If you want additional details for a sub-command, then specify the `--help` after the sub-command.

Syntax:

```
ords <command> --help
```

```
ords <command> <sub-command> --help
```

Examples:

- `ords install --help`
- `ords config --help`

```
ords config set --help
```

2

Installing and Configuring Oracle REST Data Services

This chapter describes how to install, configure, and upgrade Oracle REST Data Services (ORDS).

Topics:

See Also

- Deploying ORDS with High Availability on Oracle Cloud Infrastructure
- Using the Multitenant Architecture with Oracle REST Data Services
- About the Database Users Used by Oracle REST Data Services

2.1 Installing Oracle REST Data Services

You must complete the following steps before installing ORDS.

> **Note**
>
> The procedures in this topic apply to installing Oracle REST Data Services in a non-CDB Database or a PDB. For setting up ORDS in a CDB environment, refer to Using the Multitenant Architecture with Oracle REST Data Services section.
>
> If you are planning to use the Oracle API for MongoDB, then you must install Oracle REST Data Services in a non-CDB or PDB. See Enabling and Configuring the Oracle Database API for MongoDB for more information.

- Downloading ORDS
- Setting Up the Configuration Folder Structure

You can then install ORDS using one of the following options:

- Interactive Command-Line Interface Installation
- Non-Interactive Command-Line Interface Installation (Silent)

- Downloading ORDS
  This section describes how to download ORDS.
- Setting Up the Configuration Folder Structure
  This section describes how to set up the configuration folder structure.
- Interactive Command-Line Interface Installation
- Non-Interactive Command-Line Interface Installation (Silent)
- Configuring ORDS to use with APEX
  APEX requires PL/SQL Gateway access to ORDS.

> **See Also**
>
> - Oracle REST Data Services Downloads
> - Oracle REST Data Services SODA for REST Developer's Guide

2.1.1 Downloading ORDS

This section describes how to download ORDS.

Downloading ORDS Zip file

Download the `ords_<latest>.zip` file from the Oracle REST Data Services (ORDS) download page, and then unzip `ords_<latest>.zip` file into a folder of your choice. The folder you choose to unzip the file is referred to as the ORDS product folder. The ORDS product folder contains a `bin` folder and other folders and files required to run ORDS.

Adding ORDS `bin` folder to your Operating System PATH
Oracle recommends to add the ORDS `bin` folder to your operating system PATH environment variable.

Example for LINUX/UNIX Operating System

```
echo -e 'export PATH="$PATH:/<ords product folder>/bin"' >> ~/.bash_profile
```

Start a new shell to pick up this change.

Example for WINDOWS Operating System
Use a command prompt with administrator privileges.

```
SetX PATH "%PATH%;<ords product folder>\bin"
```

Start a new command prompt to pick up this change.

Example for MAC Operating System

```
echo -e 'export PATH="$PATH:/<ords product folder>/bin"' >> ~/.zprofile
```

Start a new terminal to pick up this change.

Downloading ORDS Using yum

ORDS is published in Oracle Linux (OL) 8 and 9 repositories. System administrators can add this repository to a yum configuration in order to install ORDS and its dependencies.

- OL8 Repo
- OL9 Repo

If the oracle software repository has been added to your yum configuration, then you can download and install ORDS using the following command:

```
sudo yum install ords
```

The preceding command handles all the ORDS dependencies and place the ORDS program in `/usr/local/bin/ords` folder to set up your ORDS configuration and install or upgrade ORDS in the database.

Oracle recommends you to use `/etc/ords/conf` configuration directory. The following comand is used to configure ORDS:

```
ords --config /etc/ords/config install
```

If you want to use a different directory to place your ORDS configurations and you want to use the Linux system service management as system d or system v, then configure the ORDS `config` directory in `/etc/ords.conf` folder.

Installing ORDS Using RPM

If your system where you want to install is not using yum or is not connected to the internet, then you can download the ORDS RPM from the links mentioned in the preceding section (Download ORDS using yum) and install the RPM manually. This does not handle the ORDS dependencies, you must install the java JDK manually. After downloading the RPM file you can install it using the following command:

```
sudo rpm -i ords-22.1.X-X.elX.noarch.rpm
```

This places the ORDS program in `/usr/local/bin/ords` folder to set up your ORDS configuration and install or upgrade ORDS in the database.

To configure your ORDS, we recommend using the configuration directory in `/etc/ords/conf` folder with the following command:

```
ords --config /etc/ords/config install
```

If you want to use a different directory to place your ORDS configurations and you want to use the LINUX system service management as systemd or system v, then configure the ORDS configuration directory in `/etc/ords.conf` folder.

Using ORDS image from Oracle Container Registry

Oracle REST Data Services is available as a Docker image (which also supports Podman) in the Oracle Container Registry. This ORDS image includes GraalVM and an ORDS production release configured for standalone deployment.

> **See Also**
>
> Oracle REST Data Services Docker image

2.1.2 Setting Up the Configuration Folder Structure

This section describes how to set up the configuration folder structure.

- Specifying the New ORDS Configuration Folder

2.1.2.1 Specifying the New ORDS Configuration Folder

New installation has the ORDS configuration files placed in the configuration folder. Configuration files from ORDS release 21.4.x or earlier are migrated to the configuration folder.

You can obtain the configuration folder location using one of the following options:

1. **Command option**:
   Use the `--config` option to specify your configuration folder.

   Example:

   ```
   ords --config /path/to/conf install
   ```

2. **Environment variable**:

   > **Note**
   >
   > This option is preferred if you forget to include the `--config` option when you are using the ORDS command-line Interface.

   - `ORDS_CONFIG`: Create the `ORDS_CONFIG` environment variable.
     Example for LINUX or UNIX operating system:

     ```
     Shell script containing ORDS_CONFIG
     cat example_env
     ```

```
export ORDS_CONFIG=/path/to/conf

echo $ORDS_CONFIG
/path/to/conf
```

3. **Current Working Directory**:
   If the `--config <configuration_folder>` option is not specified, and the `ORDS_CONFIG` environment variable is not defined, then your current working directory is used as the configuration folder.

   Example:

   If your current working directory is `/path/to/conf`, then it uses that location for your configuration folder.

> **Note**
>
> - Oracle highly recommends you to ensure that ORDS does not create the configuration directory in the ORDS product folder. For example, you can have a configuration folder in the following location:
>
>   ```
>   /Users/<user_name>/work/dbtools-dev/config/
>   ```
>
>   The best practice is to have your configuration files separate from the application files, this makes maintenance and upgrades easier and more reliable.
> - The following command is no longer valid:
>
>   Example: `java -jar ords.war install`
>
>   If you specify the legacy commands using `java -jar ords.war`, you get the following warning message:
>
>   **Warning:** Support for executing: `java -jar ords.war` has been deprecated. Please add ords to your PATH and use the ords command instead. Run the following command to add ORDS to your `PATH`:
>
>   *`<Displays an example of adding the bin folder to your PATH>`*
>
>   Start a new terminal to pick up this change. Oracle recommends to add the ORDS product `bin` folder to your path.

2.1.3 Interactive Command-Line Interface Installation

This section explains various scenarios that use the auto-installation feature found in the interactive Command-Line Interface (CLI) installation prompts.

To be prompted for the scenarios discussed in the following sections, you must execute one of the following commands:

Table 2-1 ORDS CLI Commands

ORDS CLI Command	Description
`ords install`	Creates a database pool or upgrades ORDS in existing database pool(s). Generates an upgrade script if more than one database pool exists in the ORDS configuration.
`ords install -i --db-only`	Install or upgrade ORDS that are in the database pools, or specify the database connection. Generates upgrade script if more than one database pool exists in the ORDS configuration. With this command, ORDS configuration is neither created nor updated.
`ords install -i --config-only`	Creates or updates a database pool. This command does not install or upgrade ORDS in the database.

Configuration Folder

Specify the install command without specifying the `--config <CONFIG FOLDER>` option. This assumes that the configuration directory is specified through the environment variable, or you are defaulting to the current working directory.

Example:

- `ords install`
- `ords install -i --config-only`
- `ords install -i --db-only`

Specify the install command using the `--config <CONFIG FOLDER>` option. Depending on the ORDS CLI commanda used, ORDS uses that configuration folder to create or update the configuration or read the existing configuration from that `<CONFIG FOLDER>` location.

Example:

- `ords --config /path/to/myconfig install`
- `ords --config /path/to/myconfig install -i --config-only`
- `ords --config /path/to/myconfig install -i --db-only`

- Auto Installation of ORDS
  Starting with Oracle REST Data Services (ORDS) release 24.1, auto installation feature is introduced.

2.1.3.1 Auto Installation of ORDS

Starting with Oracle REST Data Services (ORDS) release 24.1, auto installation feature is introduced.

Auto-Install operation, discovers the database connections and display them to the user. Creating a database pool is much simpler and default settings are used to minimize the prompting to the user. If a bequeath connection is available, then it is used to retrieve the information from the database, and install or upgrade ORDS in the database without using the credentials of the administrator user.

See Also

Setup Bequeath Connection for Interactive Install

Following are some of the scenarios demonstrating auto-installation feature:

- Scenario 1: New ORDS Configuration and ORDS Installation
- Scenario 2: Single Database Pool (Default Pool)
- Scenario 3: Multiple Database Pools
- Scenario 4: Add or Update Configuration Only
- Scenario 5: Install or Upgrade ORDS in Database Only

- Scenario 1: New ORDS Configuration and ORDS Installation
  This section explains the interactive command-line interface (CLI) installation prompts for creating a new ORDS configuration.
- Scenario 2: Single Database Pool (Default Pool)
- Scenario 3: Multiple Database Pools
- Scenario 4: Add or Update Configuration Only
- Scenario 5: Install or Upgrade ORDS in Database Only
- Creating an Additional Database Pool
- Multiple Options for Database Pool and Standalone Configuration
- Setup Bequeath Connection for Interactive Install

2.1.3.1.1 Scenario 1: New ORDS Configuration and ORDS Installation

This section explains the interactive command-line interface (CLI) installation prompts for creating a new ORDS configuration.

Run the following ORDS CLI command:

```
ords install
```

When you run the preceding command, the interactive inataller detects that an ORDS configuration does not exist. A default database pool is created. Refer to Creating an Additional Database Pool, you are prompted to create the default database pool and to install ORDS in the database.

2.1.3.1.2 Scenario 2: Single Database Pool (Default Pool)

Run the following ORDS CLI command:

```
ords install
```

When you create a new ORDS configuration, a default pool is created. This scenario indicates that there is only one database pool, known as the `default` database pool. You have the option to select the default database pool and upgrade ORDS in the database. You also have the option to create an additional database pool.

Table 2-2 Prompts for Single Database Pool

Prompt	Description

`Enter a number to select the`
`database pool to upgrade ORDS or`
`create an additional database pool`
`    [1] default`
`jdbc:oracle:thin:@DB1?TNS_ADMIN=/`
`path/to/myfolder`
`    [C] Create an additional`
`database pool`
	Refer to
	• Entering a Number to Select the Database Pool
	• Creating an Additional Database Pool

2.1.3.1.3 Scenario 3: Multiple Database Pools

In this scenario, if more than one database pools exist in your configuration, you have the option to upgrade ORDS in an existing database pool, generate an upgrade script, specify the database pool to upgrade ORDS or create an additional database pool.

Displays a list of the database pools in your configuration. The default database pool is displayed first followed by the other database pools in an alphabetical order.

Run the following ORDS CLI command:

```
ords install
```

Table 2-3 Prompts for Multiple Database Pools

Prompt	Description

`Enter a number to select the`
`database pool to upgrade ORDS. Total`
`database pools is 12.`
`Showing only the first 9 database`
`pools. Additional options to`
`Generate script, Specify a database`
`pool,`
`or Create additional database pool.`
`    [1] default`
`jdbc:oracle:thin:@MYPDB?TNS_ADMIN=/`
`path/to/my/folder`
`    [2] exampledb1`
`jdbc:oracle:thin:@DB1?TNS_ADMIN=/`
`path/to/my/folder`
`    [3] exampledb2`
`jdbc:oracle:thin:@DB2?TNS_ADMIN=/`
`path/to/my/folder`
`    [4] exampledb3`
`jdbc:oracle:thin:@DB3?TNS_ADMIN=/`
`path/to/my/folder`
`    [5] fxdb50`
`jdbc:oracle:thin:@//localhost:1521/`
`fxdb50`
`    [6] hrdb105`
`jdbc:oracle:thin:@//`
`myhr.xyzcorp.com:1521/hrdb`
`    [7] sampledb7`
`jdbc:oracle:thin:@//my-`
`dev.sample.com:1523/db7`
`    [8] sampledb8`
`jdbc:oracle:thin:@//my-`
`dev.sample.com:1523/db8`
`    [9] sampledb9`
`jdbc:oracle:thin:@//my-`
`dev.sample.com:1523/db9`
`    [G] Generate script to upgrade`
`ORDS in all the database pools`
`    [S] Specify the database pool`
`name to upgrade ORDS`
`    [C] Create an additional`
`database pool`
`Choose [1]:`
	If the total number of database pools is greater than 9, then the option `Specify the database pool name to upgrade ORDS` is displayed.
	Refer to:
	• Entering a Number to Select the Database Pool
	• Generate an Upgrade Script
	• Specify the Database Pool Name to Upgrade ORDS
	• Creating an Additional Database Pool

2.1.3.1.4 Scenario 4: Add or Update Configuration Only

Run the following ORDS CLI command:

```
ords install -i --config-only
```

Using this scenario, you can update an existing database pool or create a database pool. The `--config-only` option does not perform the install or upgrade ORDS in the database operation.

Table 2-4   Prompts for Add/Update Configuration Only

<table>
<tr><th>Prompt</th><th>Description</th></tr>
<tr><td><pre>
Enter a number to select the
database pool to update, or create
an additional database pool.
   [1] default
jdbc:oracle:thin:@MYPDB?TNS_ADMIN=/
path/to/my/folder
   [2] exampledb1
jdbc:oracle:thin:@DB1?TNS_ADMIN=/
path/to/my/folder
   [3] sampledb7
jdbc:oracle:thin:@//my-
dev.sample.com:1523/db7
   [C] Create an additional database
pool
Choose [1]:
</pre></td><td>Refer to:
• Multiple Options for Database Pool and Standalone Configuration
• Creating an Additional Database Pool</td></tr>
</table>

2.1.3.1.5 Scenario 5: Install or Upgrade ORDS in Database Only

Run the following ORDS CLI command:

```
ords install -i --db-only
```

Using this scenario, you can only install or upgrade ORDS in the database. If more than one database pool exists in your configuration, you have the option to:

- upgrade ORDS in an existing database pool
- generate an upgrade script
- specify the database connection or database pool to install or upgrade ORDS in the database

Displays a list of the database pools in your configuration.

The default database pool is displayed first, followed by the other database pools in alphabetical order. A maximum of 9 database pools are displayed. If the maximum number of database pools is reached, the option "`Specify the database pool name to upgrade ORDS`" is displayed.

Table 2-5 Prompts for Install or Upgrade ORDS in Database Only

Prompt	Description

`Enter a number to select the database pool to upgrade ORDS. Total database pools is 12.`
`Showing only the first 9 database pools. Additional options to Generate script,`
`Specify a database pool or database connection to upgrade ORDS.`
`    [1] default jdbc:oracle:thin:@MYPDB?TNS_ADMIN=/path/to/my/folder`
`    [2] exampledb1 jdbc:oracle:thin:@DB1?TNS_ADMIN=/path/to/my/folder`
`    [3] exampledb2 jdbc:oracle:thin:@DB2?TNS_ADMIN=/path/to/my/folder`
`    [4] exampledb3 jdbc:oracle:thin:@DB3?TNS_ADMIN=/path/to/my/folder`
`    [5] fxdb50 jdbc:oracle:thin:@//localhost:1521/fxdb50`
`    [6] hrdb105 jdbc:oracle:thin:@//myhr.xyzcorp.com:1521/hrdb`
`    [7] sampledb7 jdbc:oracle:thin:@//my-dev.sample.com:1523/db7`
`    [8] sampledb8 jdbc:oracle:thin:@//my-dev.sample.com:1523/db8`
`    [9] sampledb9 jdbc:oracle:thin:@//my-dev.sample.com:1523/db9`
`    [G] Generate script to upgrade ORDS in all the database pools`
`    [S] Specify the database connection to install/upgrade ORDS`
`    [P] Specify the database pool name to upgrade ORDS`
`Choose [1]:`
	If the total number of database pools is greater than 9, then the option `Specify the database pool name to upgrade ORDS` is displayed.
	Refer to:
	• Entering a Number to Select the Database Pool
	• Generate an Upgrade Script
	• Entering a Number to Select the Database Connection
	• Specify the Database Pool Name to Upgrade ORDS

- Entering a Number to Select the Database Pool

2.1.3.1.5.1 Entering a Number to Select the Database Pool

The database pool(s) and its connections are displayed. Enter the number to select the database pool that you want to install or upgrade ORDS in the database. The installer installs

ORDS in the database if ORDS does not exist in the database. The installer upgrades ORDS in the database if the ORDS schema version is less than the ORDS product version that you are using.

2.1.3.1.6 Creating an Additional Database Pool

Create an additional database pool option

The Create an additional database pool option, prompts you for the following information:

- Database pool name
  - If a database pool already exists in your ORDS configuration, then you are prompted for the database pool name.

    > **Note**
    >
    > If you are creating a new ORDS configuration, then you are not prompted for the database pool name since it creates the default database pool.

- Connection information
  - Shows the TNS Net service names from the `tnsnames.ora` file. You have the option to select the TNS Net service name.
    - Automatically locates the `tnsnames.ora` file in your folders
  - Specify the database connection (`Basic`, `TNS` or `Custom URL`).
- Administrator username and password

  > **Note**
  >
  > If you are using Bequeath Connection and the host and servicename or sid exists in the database, then you are not prompted for the administrator username and password.

- Multiple options to update the database pool and standalone configuration
  - Connection information
  - Runtime user `ORDS_PUBLIC_USER` password
  - Default and temporary tablespaces for the ORDS runtime user and the ORDS schema
  - Additional ORDS Feature
  - Standalone Mode Configuration
    - HTTP/HTTPS Protocol
    - Protocol port
    - Certificate Type for HTTPS Protocol
      - Self-Signed Certificate
      - User provides the Certificate
    - APEX Static Resources Location

> **Note**
>
> If APEX exists in the database, then the `APEX static resources location` option is displayed.

The multiple options for the database pool and standalone configuration are displayed and enables you to make any updates. If you are satisfied with the values that are displayed, then select option `A` to accept and continue. If the option contains Accept and Continue - Create configuration and Install ORDS in the database, then the database pool is created and ORDS is installed in the database. If you enable the option `Configure and start ORDS in Standalone Mode`, then the standalone settings are created or updated, and ORDS runs after the installation completes.

Example 2-1 Creating an Additional Database Pool

```
Enter the database pool name: database2

Enter a number to select the TNS Net Service Name to use or specify the
database connection
    [1] TNS name: DB2  SERVICE_NAME=pdb2
    [2] TNS name: DB3  SERVICE_NAME=pdb3
    [3] TNS name: DB4  SERVICE_NAME=pdb4
    [S] Specify the database connection
Choose [1]: 1

Connecting to administrator user: SYS AS SYSDBA for PDB service name: pdb2
using bequeath connection

ORDS is not installed in the database. ORDS installation is required.

Enter a number to update the value or select option A to Accept and Continue
  [1] Connection Type: TNS
  [2] TNS Connection: TNS_NAME=DB2 TNS_FOLDER=/path/to/myfolder
         Administrator User: SYS AS SYSDBA via Bequeath Connect
  [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER): <generate>
  [4] ORDS runtime user and schema tablespaces:  Default: SYSAUX Temporary
TEMP
  [5] Additional Feature: Database Actions
  [6] Configure and start ORDS in Standalone Mode: Yes
  [7]    Protocol: HTTPS
  [8]       HTTPS Port: 8443
  [9]    Certificate Type: Use Self-Signed Certificate
  [10]      SSL Hostname: myhost
  [11]   APEX static resources location: /path/to/apex/images
  [A] Accept and Continue - Create configuration and Install ORDS in the
database
  [Q] Quit - Do not proceed. No changes
Choose [A]:
```

Table 2-6 Creating an Additional Database Pool Prompts

Prompt	Description
`Enter the database pool name: database2`	Prompts for the database pool name if your ORDS configuration already exists and contains a database pool. **Note** If you are creating a new configuration, you are not prompted for the database pool name because it creates the database pool named `default`. Refer to Entering the Database Pool Name

`Enter a number to select the TNS Net Service Name to use or specify the database connection`
`    [1] TNS name: DB2 SERVICE_NAME=pdb2`
`    [2] TNS name: DB3 SERVICE_NAME=pdb3`
`    [3] TNS name: DB4 SERVICE_NAME=pdb4`
`    [S] Specify the database connection`
`Choose [1]:`
	Refer to
	- Entering a Number to Select the TNS Net Service Name to Use or Specify the Database Connection
	- Entering a Number to Select the Database Connection

`Provide database user name with administrator privileges.`
`Enter the administrator username: SYS`
`Enter the database password for SYS AS SYSDBA:`
	Note
	If you are using Bequeath Connection and the host and servicename and sid exists in the database, then you are not prompted for the administrator username or password.

Table 2-6 (Cont.) Creating an Additional Database Pool Prompts

Prompt	Description

`Enter a number to update the value or select option A to Accept and Continue`
`  [1] Connection Type: TNS`
`  [2] TNS Connection: TNS_NAME=DB2 TNS_FOLDER=/path/to/myfolder`
`         Administrator User: SYS AS SYSDBA via Bequeath Connect`
`  [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER): <generate>`
`  [4] ORDS runtime user and schema tablespaces:  Default: SYSAUX Temporary TEMP`
`  [5] Additional Feature: Database Actions`
`  [6] Configure and start ORDS in Standalone Mode: Yes`
`  [7]    Protocol: HTTPS`
`  [8]       HTTPS Port: 8443`
`  [9]    Certificate Type: Use Self-Signed Certificate`
`  [10]      SSL Hostname: myhost`
`  [11]   APEX static resources location: /path/to/apex/images`
`  [A] Accept and Continue - Create configuration and Install ORDS in the database`
`  [Q] Quit - Do not proceed. No changes`
`Choose [A]:`
	Displays the default values highlighted in blue for the database pool.
	Displays the Standalone settings that already exists in the ORDS configuration. These settings are displayed after the option `Configure and start ORDS in Standalone Mode`.
	Refer to Multiple Options for Database Pool and Standalone Configuration

- Entering the Database Pool Name
- Entering a Number to Select the TNS Net Service Name to Use or Specify the Database Connection
- Entering a Number to Select the Database Connection

2.1.3.1.6.1 Entering the Database Pool Name

The database pool name displays when you choose the option `Create an Additional Database Pool`. Specify the database pool name carefully since it sets the mapping pattern.

If you select the option `c` when prompted, then the database pool name prompt is displayed. Enter the database pool name. For example, if the pool name you enter is `database1`, then all the REST requests to that pool starts with`/ords/database1/`.

> **Note**
>
> - The database pool name must only contain lowercase alphabets a-z, digits 0-9, and the characters “-“, “_“ and “.“ .
> - When the database pool is created, the database pool folder is also created along with the pool specific settings, and a wallet to store the database user credentials.
> - The database pool name also sets the mapping pattern.
>
> If you are creating a new ORDS configuration, then you are not prompted for the database pool name.

2.1.3.1.6.2 Entering a Number to Select the TNS Net Service Name to Use or Specify the Database Connection

A list of the TNS net service name and its service name or SID displays if the `tnsnames.ora` file is found in your folder. If the `tnsnames.ora` does not exist in your folder, then the database connection type options are shown.

> **See Also**
>
> Entering a Number to Select the Database Connection

2.1.3.1.6.3 Entering a Number to Select the Database Connection

Select the database connection type.

Table 2-7 Prompts for Selecting the Database Connection

Prompt	Description

`Enter a number to select the database connection type to use`
`  [1] Basic (host name, port, service name)`
`  [2] TNS (TNS alias, TNS directory)`
`  [3] Custom database URL`
`Choose [1]:`
	Refer to:
	• Entering the Basic Connection
	• Entering the TNS Connection
	• Entering the Custom URL Connection

- Entering the Basic Connection
- Entering the TNS Connection
- Entering the Custom URL Connection

2.1.3.1.6.3.1 Entering the Basic Connection

Specify the database host name, database listener port and the service name.

Table 2-8 Entering the Basic Connection Prompts

Prompt	Description
`Enter the database host name [localhost]:`	Refer to Entering the Database Host Name
`Enter the database listen port [1521]:`	Refer to Entering the Database Listener Port
`Enter the database service name [orcl]:`	Refer to Entering the Database Service Name

- Entering the Database Host Name
- Entering the Database Listener Port
  Specify the database port for a basic connection.
- Entering the Database Service Name

2.1.3.1.6.3.1.1 Entering the Database Host Name

Specify the database host name for the basic connection.

2.1.3.1.6.3.1.2 Entering the Database Listener Port

Specify the database port for a basic connection.

2.1.3.1.6.3.1.3 Entering the Database Service Name

Specify the service name. The default value for the service name is obtained from one of the following options in the given sequence:

- The service name setting in the ORDS configuration file. If it is not present, then
- It checks for `ORACLE_PDB` environment variable. If it is undefined, then
- It checks for `ORACLE_SID` environment variable. If it is undefined, then
- It uses `orcl` as the default value.

2.1.3.1.6.3.2 Entering the TNS Connection

Specify the TNS folder location and select the TNS network alias.

Table 2-9 TNS Connection Prompts

Prompt	Description
`Enter the TNS location: /path/to/myfolder`	Refer to Entering the TNS Location

Table 2-9 (Cont.) TNS Connection Prompts

Prompt	Description

`Enter a number to select the TNS`
`Network alias to use`
`  [1] DB1`
`SERVICE_NAME=pdb1`
 	
`  [2] DB2`
`SERVICE_NAME=pdb2`
 	
`  [3] FREEPDB1`
`SERVICE_NAME=freepdb1`
 	
`Choose [1]:`
	Refer to Entering a Number to Select the TNS Network Alias

- Entering the TNS Location
- Entering a Number to Select the TNS Network Alias

2.1.3.1.6.3.2.1 Entering the TNS Location

Specify a valid folder of where the `tnsnames.ora` file is located.

2.1.3.1.6.3.2.2 Entering a Number to Select the TNS Network Alias

Select the TNS alias name from the list of TNS network alias names displayed.

2.1.3.1.6.3.3 Entering the Custom URL Connection

Specify the Custom URL connection.

Table 2-10 Custom URL Connection Prompt

Prompt	Description

`Enter the Custom database URL:`
`    jdbc:oracle:thin:@//`
`localhost:1521/orcl`
	Refer to Entering the Custom Database URL

- Entering the Custom Database URL

2.1.3.1.6.3.3.1 Entering the Custom Database URL

Specify the custom database URL for custom database URL connection.

Example URL formats:

```
jdbc:oracle:<driver>:@//<host>:<port>/<servicename>
jdbc:oracle:thin:@//localhost:1521/orcl

jdbc:oracle:<drivertype>:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=<host>)
(PORT=<port>))(CONNECT_DATA=(SERVICE_NAME=<servicename>)))
jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=localhost)
(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=orcl)))
```

2.1.3.1.7 Multiple Options for Database Pool and Standalone Configuration

If you are creating or updating a database pool, the multiple options display the database pool and standalone configuration prompts. The standalone configuration options display after the `Configure ORDS and start in Standalone Mode` prompt.

> **Note**
>
> If a database pool already exists in your ORDS configuration, then the existing standalone settings are displayed.

Enter the option number to change the value of the setting. When you are satisfied with the values, press the return key to accept and continue.

- Multiple Options with Default Values
- Standalone Configuration
  This section explains how to configure Oracle REST Data Services (ORDS) and run in a standalone mode.

2.1.3.1.7.1 Multiple Options with Default Values

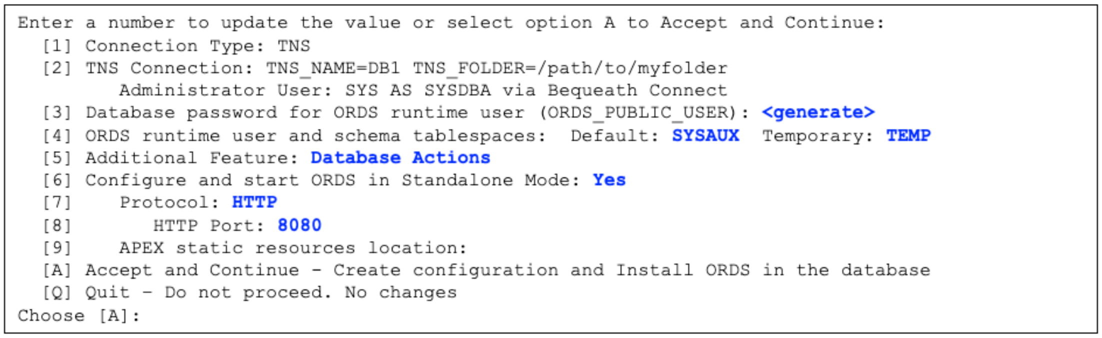
For a new database pool, the following default values are highlighted in blue:

- Generate the Runtime user (`ORDS_PUBLIC_USER`) password
- If you are installing ORDS in the database, the default values for the default tablespace is `SYSAUX` and the temporary tablespace is `TEMP`.

  > **Note**
  >
  > If any of these tablespaces do not exist, then it uses the database default tablespaces.

- The additional feature defaults to `Database Actions`.
- If you are installing ORDS in standalone mode, then `Configure and Start ORDS in Standalone Mode` defaults to `Yes`
- Protocol defaults to `HTTP`
- The default value for Choose is `[A] Accept and Continue`

Figure 2-1   Example of Multiple Options with Default Values



```
Enter a number to update the value or select option A to Accept and Continue:
  [1] Connection Type: TNS
  [2] TNS Connection: TNS_NAME=DB1 TNS_FOLDER=/path/to/myfolder
         Administrator User: SYS AS SYSDBA via Bequeath Connect
  [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER): <generate>
  [4] ORDS runtime user and schema tablespaces:  Default: SYSAUX  Temporary: TEMP
  [5] Additional Feature: Database Actions
  [6] Configure and start ORDS in Standalone Mode: Yes
  [7]    Protocol: HTTP
  [8]       HTTP Port: 8080
  [9]    APEX static resources location:
  [A] Accept and Continue - Create configuration and Install ORDS in the database
  [Q] Quit - Do not proceed. No changes
Choose [A]:
```

Table 2-11   Database Pool and Standalone Configuration Prompts

Prompt	Description
`Connection Type: TNS`	The type of connection. Displays either Basic, TNS or Custom URL. Refer to Entering a Number to Select the Database Connection
`Basic Connection: HOST=localhost PORT=1521 SERVICE_NAME=DB1`	Displays Basic Connection if connection type is Basic. Refer to Entering the Basic Connection
`TNS Connection: TNS_NAME=DB1 TNS_FOLDER=/path/to/myfolder`	Displays TNS Connection if connection type is TNS. Refer to Entering the TNS Connection
`Custom URL Connection: CUSTOM_URL=jdbc:oracle:thin:@//localhost:1521/DB1`	Displays Custom URL Connection if connection type is Custom URL. Refer to Entering the Custom URL Connection
`Database password for ORDS runtime user (ORDS_PUBLIC_USER):` **`<generate>`**	Defaults to generate password. Refer to Entering the Password Option
`ORDS runtime user and schema tablespaces:  Default: SYSAUX Temporary TEMP`	Displays Tablespace option only if installing ORDS in the database. Refer to Entering the Tablespaces
`Additional Feature: Database Actions`	Defaults Additional Feature to Database Actions. Refer to Entering a Number to Select the Additional Feature

Table 2-11 (Cont.) Database Pool and Standalone Configuration Prompts

Prompt	Description
`Configure and start ORDS in Standalone Mode: Yes`	Toggles to `Yes` or `No`. Displays option if installing ORDS in the database and not using the Bequeath Connection. Refer to Standalone Configuration
`Configure ORDS in Standalone Mode: Yes`	Toggles to Yes or No Displays option if using the Bequeath Connection or the configuration only (`--config-only`) option. Refer to Standalone Configuration
`Protocol: `**`HTTP`**	Defaults Protocol to HTTP. Refer to Entering a Number to Use HTTP or HTTPS Protocol
`HTTP Port: `**`8080`**	Defaults HTTP Port to 8080. Displays HTTP Port if protocol is HTTP. Refer to Entering a Number to Use HTTP or HTTPS Protocol
`APEX static resources location: /path/to/apex/images`	Refer to Entering the APEX Static Resources Location
`Accept and Continue - Create configuration and Install ORDS in the database`	Refer to Accept and Continue Option

- Accept and Continue Option
- Entering the Password Option
- Entering the Tablespaces
- Entering a Number to Select the Additional Feature

2.1.3.1.7.1.1 Accept and Continue Option

Once you are done updating and reviewing the values, select option `[A] Accept and Continue`. Accept and Continue includes a message on what is performed. For example, Accept and Continue - `Create configuration and Install ORDS in the database` option creates the database pool and ORDS is installed in the database. If configure ORDS in standalone mode is enabled, then the standalone configuration is also created or updated.

2.1.3.1.7.1.2 Entering the Password Option

The runtime user password for `ORDS_PUBLIC_USER` defaults to generate password. If you want to change the password and specify your own password, select option `S` to specify the password. You are prompted twice for the password.

Table 2-12   Example of the Password Option Prompts

Prompt

```
Enter your choice for the runtime user password (ORDS_PUBLIC_USER)
   [S] Specify your own password
   [G] Generate password
   [C] Cancel - No Changes
Choose [G]: S

Enter the database password for ORDS_PUBLIC_USER:
Confirm password:
```

2.1.3.1.7.1.3 Entering the Tablespaces

The tablespace option only displays if installing ORDS in the database. Specify the default and temporary tablespaces for the ORDS database runtime user and the ORDS schema. The default value for the default tablespace is SYSAUX and the default value for the temporary tablespace is TEMP.

Table 2-13   Example of the Tablespaces prompts

Prompts

```
Enter the default tablespace for ORDS_METADATA and ORDS_PUBLIC_USER
[SYSAUX]:  MYTABLESPACE
```

```
Enter the temporary tablespace for ORDS_METADATA and ORDS_PUBLIC_USER [TEMP]:
```

2.1.3.1.7.1.4 Entering a Number to Select the Additional Feature

Specify the additional feature that you want to enable.

Table 2-14   Example of Additional Features prompts

Prompt

```
Enter a number to select additional feature(s) to enable:
   [1] Database Actions  (Enables all features)
   [2] REST Enabled SQL and Database API
   [3] REST Enabled SQL
   [4] Database API
   [5] None
Choose [1]:
```

2.1.3.1.7.2 Standalone Configuration

This section explains how to configure Oracle REST Data Services (ORDS) and run in a standalone mode.

Table 2-15 Prompts for standalone configuration

Prompt	Description
`Configure and start ORDS in Standalone Mode:`	Toggle the option to `Yes` or `No`. A `Yes` indicates to configure ORDS in a standalone mode. In addition, ORDS runs in a standalone mode after completing the ORDS install or upgrade process. A `No` indicates, do not make any standalone configuration changes and do not run ORDS in a standalone mode. **Note** The `Configure and start ORDS in Standalone Mode` option is displayed only if you are installing ORDS and you are not using the bequeath connection.

Table 2-15 (Cont.) Prompts for standalone configuration

Prompt	Description
`Configure ORDS in Standalone Mode`	You can toggle the option to `Yes` or `No`. A `Yes` indicates to configure ORDS in a standalone mode. A `No` indicates not to make any standalone configuration changes. **Note** • The Configure ORDS in Standalone Mode option displays only if you are using the bequeath connection or the configuration only (`--config-only`) option. • If you have setup your OS environment to use the bequeath connection, then ensure that the `JDK_JAVA_OPTIONS` does not contain the `useOracleHome=true` prior to using the `ords serve` command. Remove `useOracleHome` from the environment variable `JDK_JAVA_OPTIONS` or unset `JDK_JAVA_OPTIONS`. If ORDS is installed in the database, and you want to run ORDS in a standalone mode, then use the `ords serve` command.

- Entering a Number to Use HTTP or HTTPS Protocol
- Entering the HTTPS Port
- Entering a Number to Select the Certificate Type

- HTTPS Protocol and Use Self-Signed Certificate
- HTTPS Protocol and Use my SSL Certificate
- Entering the APEX Static Resources Location
- Generate an Upgrade Script
- Specify the Database Pool Name to Upgrade ORDS

2.1.3.1.7.2.1 Entering a Number to Use HTTP or HTTPS Protocol

Displays the HTTP/HTTPS Protocol prompts. Select the protocol (HTTP or HTTPS) that you want to use.

> **Note**
>
> Oracle highly recommends to run ORDS in a standalone mode with HTTPS versus HTTP.

- Entering the HTTP Port

2.1.3.1.7.2.1.1 Entering the HTTP Port

Specify the HTTP port. The default HTTP port is 8080.

2.1.3.1.7.2.2 Entering the HTTPS Port

Specify the HTTPS port. The default HTTPS port is 8443.

Table 2-16 HTTPS Protocol Prompts

Prompt	Description

`Enter a number to select the protocol`
`[1] HTTP`
`[2] HTTPS`
`Choose [1]:`
	Select the protocol (HTTP or HTTPS) that you want to use.

`Enter the HTTPS port [8443]:`	Specify the HTTPS port. The default HTTPS port is 8443.

`Enter a number to select the certificate type`
`[1] Use self-signed certificate (generates automatically)`
`[2] Use my SSL certificate (requires SSL certificate and SSL certificate private key)`
`Choose [1]: 1`
	Refer to:
	• Entering a Number to Select the Certificate Type
	• HTTPS Protocol and Use Self-Signed Certificate
	• HTTPS Protocol and Use my SSL Certificate

2.1.3.1.7.2.3 Entering a Number to Select the Certificate Type

You have the option to select the self-signed certificate that generates automatically when running ORDS in standalone mode, or you provide the SSL certificate which requires both the SSL Certificate and its private key.

2.1.3.1.7.2.4 HTTPS Protocol and Use Self-Signed Certificate

Selecting the prompt `Use self-signed certificate` prompts you for the SSL hostname.

Table 2-17 Example of Use Self-Signed Certificate

Prompt

```
Enter a number to select the certificate type
    [1] Use self-signed certificate (generates automatically)
    [2] Use my SSL certificate (requires SSL certificate and SSL certificate
private key)
  Choose [1]: 1

  Enter the SSL hostname: myhost
```

ORDS generates the Self-Signed Certificate when running ORDS in a standalone mode.

The value entered here is stored in the `standalone.https.host` configuration setting. The Self-Signed Certificate is generated only once and the Common Name value for that certificate is taken from the `standalone.https.host` configuration setting. Changing the `standalone.https.host` after the Self-Signed Certificate is generated does not change the Common Name in that certificate.

Table 2-18 HTTPS Protocol and Use Self-Signed Certificate Prompts

Prompt	Description
`Certificate Type: Use Self-Signed Certificate`	
`SSL Hostname: myhost`	Specify the SSL Hostname.

2.1.3.1.7.2.5 HTTPS Protocol and Use my SSL Certificate

Selecting Use my SSL Certificate requires you to provide an existing SSL certificate and its private key.

Example of Use my SSL Certificate

```
Enter a number to select the certificate type
   [1] Use self-signed certificate (generates automatically)
   [2] Use my SSL certificate (requires SSL certificate and SSL certificate
private key)
Choose [1]: 2

 Enter the path for the SSL Certificate: /path/to/mycertificate.crt
 Enter the path for the SSL Certificates private key: /path/to/mycert.der
```

Table 2-19 HTTPS Protocol and Use my SSL Certificate Prompts

Prompt	Description
`Certificate Type: Use my SSL Certificate`	Refer to Entering a Number to Select the Certificate Type
`Path for the SSL Certificate: /path/to/mycert.crt`	Refer to Entering the Path for the SSL Certificate
`Path for the SSL Certificate private key: /path/to/mycert.der`	Refer to Entering the Path for the SSL Certificate's Private Key

- Entering the Path for the SSL Certificate
- Entering the Path for the SSL Certificate's Private Key

2.1.3.1.7.2.5.1 Entering the Path for the SSL Certificate

Specifying the SSL certificate file location and filename.

Example:

```
/path/to/mycert.crt
```

2.1.3.1.7.2.5.2 Entering the Path for the SSL Certificate's Private Key

Specifying the SSL certificate's private key file location and filename.

Example

```
/path/to/mycert.der
```

2.1.3.1.7.2.6 Entering the APEX Static Resources Location

ORDS detects if APEX is installed in the database and if the database user `APEX_PUBLIC_USER` exists. If found, then it displays the APEX static resources location option. Provide the folder location of the APEX images.

2.1.3.1.7.2.7 Generate an Upgrade Script

Selecting the option `[G] Generate script to upgrade ORDS in all the database pools`, prompts you for the script location and generates the upgrade script. The upgrade script contains ORDS non-interactive (silent) command to upgrade ORDS in the database and includes the database pool to use. You can run this script in your shell environment.

Table 2-20 Prompts for generating a script to upgrade ORDS

Prompts

```
  Enter a number to select the database pool to upgrade ORDS. Total database
pools is 12. Showing only the first 9 database pools.
  Additional options to Generate script, Specify a database pool, or Create
additional database pool.
    [1] default      jdbc:oracle:thin:@MYPDB?TNS_ADMIN=/path/to/my/folder
    [2] exampledb1   jdbc:oracle:thin:@DB1?TNS_ADMIN=/path/to/my/folder
    [3] exampledb2   jdbc:oracle:thin:@DB2?TNS_ADMIN=/path/to/my/folder
    [4] exampledb3   jdbc:oracle:thin:@DB3?TNS_ADMIN=/path/to/my/folder
    [5] fxdb50       jdbc:oracle:thin:@//localhost:1521/fxdb50
    [6] hrdb105      jdbc:oracle:thin:@//myhr.xyzcorp.com:1521/hrdb
    [7] sampledb7    jdbc:oracle:thin:@//my-dev.sample.com:1523/db7
    [8] sampledb8    jdbc:oracle:thin:@//my-dev.sample.com:1523/db8
    [9] sampledb9    jdbc:oracle:thin:@//my-dev.sample.com:1523/db9
    [G] Generate script to upgrade ORDS in all the database pools
    [S] Specify the database pool name to upgrade ORDS
    [C] Create an additional database pool
  Choose [1]: G

  Enter the location to store the ORDS upgrade script [/path/to/scripts]:
Generating upgrade script...

Completed generating upgrade script at /path/to/scripts/
ords_upgrade_db_pools_2024-03-24_161653_46492
```

If you are using the bequeath connection and ORDS exist in the database based on your database pool connection information such as host, port, servicename/sid, then the non-interactive (silent) command includes the `--bequeath-connect` option.

Example:

```
ords --config /path/to/myconfig install --db-pool exampledb1 --bequeath-
connect --db-only
```

Otherwise, you must replace the `--admin-user <username>` with the administrator user, and the `--password-stdin < <file>` with a file that contains the administrator password.

Example:

```
ords --config /path/to/myconfig install --db-pool <pool> --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool <pool> --admin-user ADMIN --
db-only --password-stdin < /path/to/special.txt
```

Example of the Generated Upgrade Script

```
# ------------------------------------------------------------
# Date       : 24 Mar 2024 16:27:05
# Release    : Oracle REST Data Services 24.1.0.r0822130
# Type       : Generated Upgrade Script
# -----------------------------------------------------------

# -----------------------------------------------------------
# Database   : Oracle Database 23c Free
# DB Version : 23.3.0.23.09
# Install/upgrade command using --bequeath-connect option
# -----------------------------------------------------------

ords --config /path/to/myconfig install --bequeath-connect --db-only
ords --config /path/to/myconfig install --db-pool exampledb1 --bequeath-
connect --db-only
ords --config /path/to/myconfig install --db-pool exampledb2 --bequeath-
connect --db-only
ords --config /path/to/myconfig install --db-pool exampledb3 --bequeath-
connect --db-only
ords --config /path/to/myconfig install --db-pool fxdb50 --bequeath-connect --
db-only

# -----------------------------------------------------------
# Install/upgrade command using --db-only option
# -----------------------------------------------------------

ords --config /path/to/myconfig install --db-pool hrdb105 --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool sampledb7 --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool sampledb8 --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool sampledb9 --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool testdb111 --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool testdb222 --admin-user
<username> --db-only --password-stdin < <file>
ords --config /path/to/myconfig install --db-pool testdb333 --admin-user
<username> --db-only --password-stdin < <file>
```

2.1.3.1.7.2.8 Specify the Database Pool Name to Upgrade ORDS

The option `Specify the database pool name to upgrade ORDS` prompts you for the database pool name. If the database pool name exists in your ORDS configuration, then ORDS is upgraded in the database.

Example:

```
Enter the database pool name: db1
```

2.1.3.1.8 Setup Bequeath Connection for Interactive Install

You can use the bequeath connection to install and upgrade Oracle REST Data Services in the database.

The bequeath connection enables ORDS to connect directly to an Oracle database bypassing the network listener. You can then execute ORDS on the same server as the database.

Administrator username and password are not required for using the bequeath connection. To use the bequeath connection, set the following environment variables:

- `ORACLE_HOME`
- `ORACLE_SID`
- `LD_LIBRARY_PATH (points to the $ORACLE_HOME/lib)`

You can then execute one of the following ORDS CLI commands to install ORDS:

> **Note**
>
> `--java-options "-DuseOracleHome=true"` option is mandatory for using the bequeath connection to install/upgrade, repair or uninstall ORDS.

- `ords --java-options "-DuseOracleHome=true" install -i --bequeath-connect`
  Creates a database pool or upgrades ORDS that are in the database pool(s).
- `ords --java-options "-DuseOracleHome=true" install -i --bequeath-connect --db-only`
  Install or upgrade ORDS that are in the database pools, or specify the database connection. Here, the configuration is not created or updated.

2.1.4 Non-Interactive Command-Line Interface Installation (Silent)

The non-interactive command-line interface (CLI) installation or silent installation, performs the following tasks:

- Creates or updates the ORDS configuration files
- Installs or upgrades the ORDS schema
- Creates the ORDS proxy user and the related objects in the Database

The non-interactive installation command does not run ORDS in standalone mode. If you want to run ORDS in standalone mode, then it must be followed by the `ords serve` command.

> **Note**
>
> If you have setup your OS environment to use the bequeath connection, then ensure that the `JDK_JAVA_OPTIONS` does not contain the `useOracleHome=true` prior to using the `ords serve` command. Remove `useOracleHome` from the environment variable `JDK_JAVA_OPTIONS` or unset `JDK_JAVA_OPTIONS`.

If you provide the command-line options for the non-interactive installation and if you are missing a required option (for example: Basic connection requires the `db-port` option), then an error message is displayed.

The `--db-pool <pool_name>` option specifies the database pool to create or update. If the `--db-pool` option is omitted, then it defaults to the `default` database pool.

- Non-interactive (Silent) ORDS Operations Using the Bequeath Connection
- Understanding Command Options for Command-Line Interface Installation
- Using Input Redirection

2.1.4.1 Non-interactive (Silent) ORDS Operations Using the Bequeath Connection

You can use the bequeath connection to install or upgrade, repair and uninstall Oracle REST Data Services in the database.

The bequeath connection enables ORDS to connect directly to an Oracle database bypassing the network listener. You can then execute ORDS on the same server as the database.

Using the bequeath connection, administrator username, and password are not required. Set the following environment variables to use the bequeath connection:

- `ORACLE_HOME`
- `ORACLE_SID`
- `LD_LIBRARY_PATH (points to the $ORACLE_HOME/lib)`

> **Note**
>
> `--java-options "-DuseOracleHome=true"` option is mandatory for using the bequeath connection to install/upgrade, repair or uninstall ORDS.

Examples using ORDS install command using the `--bequeath` option:

Example 2-2 Basic Connection

```
ords --java-options "-DuseOracleHome=true" --config <PATH TO CONFIG> install
--db-pool <POOL NAME> --
bequeath-connect --db-hostname <DB HOST> --db-port <DB PORT> --
db-servicename <DB SERVICENAME> --proxy-user --feature-sdw true
--log-folder <LOG FOLDER> --password-stdin < <PATH TO FILE>
```

Example 2-3 TNS Connection

```
ords --java-options "-DuseOracleHome=true" --config <PATH TO CONFIG> install
--db-pool <POOL NAME> --
bequeath-connect --db-tns-alias <TNS ALIAS> --db-tns-dir <TNS
FOLDER> --proxy-user --feature-sdw true --log-folder <LOG
FOLDER> --password-stdin < <PATH TO FILE>
```

Example 2-4 Custom URL Connection

```
ords --java-options "-DuseOracleHome=true" --config <PATH TO CONFIG> install
--db-pool <POOL NAME> --
bequeath-connect --db-custom-url <Custom URL> --proxy-user --
feature-sdw true --log-folder <LOG FOLDER> --password-stdin <
<PATH TO FILE>
```

> **Note**
>
> If you omit `--db-pool` option, then the settings are written to the `default` pool settings file.

Example of the ords install `--db-only` command to upgrade an existing database pool.

```
ords --java-options "-DuseOracleHome=true" --config <PATH TO CONFIG> install
--db-pool <POOL NAME> --bequeath-connect --db-only
```

> **Note**
>
> If you omit `--db-pool` option, the upgrade occurs using the `default` pool.

Example of the ords install repair command using an existing database pool:

```
ords --java-options "-DuseOracleHome=true" --config <PATH TO CONFIG> install
repair --db-pool <POOL NAME> --bequeath-connect
```

> **Note**
>
> If you omit `--db-pool` option, the repair occurs using the `default` pool.

Example using ords uninstall command using an existing database pool:

```
ords --java-options "-DuseOracleHome=true" --config <PATH TO CONFIG>
uninstall --db-pool <POOL NAME> --bequeath-connect
```

> **Note**
>
> If you omit `--db-pool` option, the uninstall occurs using the `default` pool.

2.1.4.2 Understanding Command Options for Command-Line Interface Installation

Table 2-21 Command Options for Command-Line Interface Installation

Options	Description
`--admin-user <USERNAME>`	Specifies the user with privileges to install or upgrade ORDS in the database, or obtains the ORDS status information.
`--bequeath-connect`	Specifies that bequeath connect that enables clients to connect directly to an Oracle database bypassing the network listener. This is when the client is on the same server as the database. Refer to Oracle REST Data Services documentation to setup your environment to use the --bequeath-connect option.
`--config <CONFIG_PATH>`	Specifies the path to the folder containing the configuration files.
`--config-only`	Specifies to create or update the configuration only.
`--db-only`	Specifies to install or upgrade ORDS in the database and not to create or update the configuration files.
`--db-pool <POOL_NAME>`	Specifies the name of the database pool to create, update or use. If the `db-pool` option is omitted, then the `default` database pool is used.

Table 2-21 (Cont.) Command Options for Command-Line Interface Installation

Options	Description
`--db-custom-url <URL>`	Specifies the custom database url for the database connection.
`--db-hostname <HOST>`	Specifies the database host name.
`--db-port <PORT>`	Specifies the database port.
`--db-servicename <SERVICENAME>`	Specifies the database service name.
`--db-sid <SID>`	Specifies the database SID.
`--db-tns-alias <ALIAS_NAME>`	Specifies the TNS alias name that exists in the `tnsnames.ora` file.
`--db-tns-dir <TNS_DIR>`	Specifies the folder where the `tnsnames.ora` file is located.
`--feature-db-api <BOOLEAN>`	Specifies if you want to enable DB API feature. Possible values are: `true` or `false`. • If the value is set to `true`, then DB API feature is enabled. • If the value is set to `false`, then DB API feature is disabled. Returns an error if the specified options are `--feature-sdw true` and `--feature db-api false`.
`--feature-rest-enabled-sql <BOOLEAN>`	Specifies if you want to enable REST-Enabled SQL feature. Possible values are: `true` or `false`. • If the value is set to `true,` then the REST-Enabled SQL feature is enabled. • If the value is set to `false`, then the REST-Enabled SQL feature is disabled. Returns an error if the specified options are `--feature-sdw true` and `--feature-rest-enabled-sql false`.
`--feature-sdw <BOOLEAN>`	Specifies if you want to enable Database Actions feature. Possible values are: `true` or `false`. • If the value is set to `true`, then the Database Actions feature is enabled. • If the value is set to `false`, then the Database Actions feature is disabled. If the option is set to `true`, then the following settings are set to `true` in the configuration file: • `database.api.enabled` • `restEnabledSql.active` Returns an error if `--feature-sdw true` and any of following options are specified, and are set to `false`: • `--feature-db-api` • `--feature-rest-enabled-sql`

Table 2-21 (Cont.) Command Options for Command-Line Interface Installation

Options	Description
`--gateway-mode <MODE>`	Specifies the PL/SQL gateway mode. Possible values are: `proxied`, `direct`, or `disabled`. Default value is `disabled`. Where: • `disabled`- PL/SQL gateway is not allowed. • `direct` - The PL/SQL gateway call is performed directly as the user identified by `db.username` (located in the `pool.xml` setting). • `proxied` - The PL/SQL gateway call is performed by proxying from the run-time user (`db.username` is located in the `pool.xml`) to the relevant schema configured by `ords_admin.config_plsql_gateway`.
`--gateway-user <USER>`	Specifies the user that exists in the Oracle database and has privileges to access the stored procedures.
`--interactive, -i`	Prompts user for all the required information.
`--help, -h`	Shows how to use the command.
`--legacy-config <FOLDER>`	Specify the legacy configuration folder to migrate to the revised configuration structure.
`--legacy-context <STRING>`	Specifies the context (example: `ords`, `apex`, and so on.) that was used in the legacy configuration.
`--log-folder`	Writes the logs from the install, upgrade, repair or uninstall to the log folder. If this option is omitted, then the output is written to standard output.
`--password-stdin`	To run the ORDS install, upgrade, repair, or uninstall command non-interactively, use this option to read the password value from standard input when redirecting input to a file or here document.
`--pdb-exclude <(PDB...)>`	Specifies the option applicable for CDB. List of PDBs that are excluded from the ORDS install/ upgrade, or repair.
`--pdb-open-readwrite-all`	Specifies the option applicable for CDB. Specifies whether to open all PDBs in read write mode if their status is either closed or read only.
`--pdb-open-readwrite <(PDB...)>`	Specifies the option applicable for CDB. List of PDBs that are read-only or closed to be open for read/ write to install, upgrade, repair, or uninstall ORDS.
`--pdb-skip-readonly`	Specifies the option applicable for CDB. Skips PDBs that are read-only. If this option is omitted, an error message is returned informing the user that the PDB(s) are read-only for install or upgrade ORDS. Excludes `PDB$SEED` since it is open for read/ write.
`--pdb-skip-closed`	Specifies the option applicable for CDB. Skips PDBs that are closed (mounted). If this option is omitted, an error message is returned informing the user that the PDB(s) are closed for installation/ upgradation of ORDS.

Table 2-21 (Cont.) Command Options for Command-Line Interface Installation

Options	Description
`--proxy-user`	Specifies the password of the ORDS database user (`ORDS_PUBLIC_USER`) that is in a file or in a `here` document when redirecting the standard input.
`--proxy-user-tablespace <TABLESPACE>`	Specifies the option applicable for ORDS install. The default tablespace for proxy user (For example: `ORDS_PUBLIC_USER`). If this option is omitted, then the defaulted database default tablespace is used.
`--proxy-user-temp-tablespace <TABLESPACE>`	Specifies the option applicable for an ORDS install. The temporary tablespace for proxy user (For example: `ORDS_PUBLIC_USER`). If this option is omitted, then the defaulted database temporary tablespace is used.
`--schema-tablespace <TABLESPACE>`	Specifies the default tablespace for `ORDS_METADATA` schema. If this option is omitted, then the defaulted database default tablespace is used.
`--schema-temp-tablespace <TABLESPACE>`	Specifies the option applicable for an ORDS install. The temporary tablespace for `ORDS_METADATA` schema. If this option is omitted, then the defaulted database temporary tablespace is used.

2.1.4.3 Using Input Redirection

This section describes how to redirect the standard input using the here command or to a file.

Redirect STDIN to a file

Redirect STDIN to a file that contains the password. In the following example, the file must contain two passwords. Each password must be on a separate line.

Example:

```
$ cat password.txt
firstpassword
secondpassword
```

The first password belongs to the first user on the command line (for example: `SYS`). The second password belongs to the second user on the command line (for example: `proxy-user`).

```
ords --config <configuration_folder> install --db-pool <pool_name> --admin-
user <username> --proxy-user
--db-hostname <host> --db-port <port_number> --db-servicename <service_name>
--log-folder <log_folder> --feature-sdw <boolean> --password-stdin <
<filename>
```

Example:

```
ords --config /path/to/conf install --db-pool db1 --admin-user SYS --proxy-user --db-hostname localhost
--db-port 1521 --db-servicename orcl --log-folder /path/to/logs --feature-sdw true
--password-stdin < password.txt
```

Redirect Standard Input Using Here Document

Redirect STDIN using the Here document (also known as heredoc) for the password(s). The heredoc consists of the '<<' redirection operator followed by a delimiter token.

Each password must be on a separate line and it is ended by the delimiter token.

Example:

The first password belongs to the first user on the command line (for example: `SYS`). The second password belongs to the second user on the command line (for example: `proxy-user`).

```
ords --config <configuration_folder> install --db-pool <pool_name> --admin-user <username> --proxy-user --db-hostname
 <host> --db-port <port_number> --db-servicename <service_name> --log-folder
<log_folder> --feature-sdw <boolean>
--password-stdin << EOF
<password1>
<password2>
EOF
```

```
ords --config /path/to/conf install --db-pool db1 --admin-user SYS --proxy-user --db-hostname
localhost --db-port 1521 --db-servicename orcl --log-folder /path/to/logs --feature-sdw true
--password-stdin << EOF
<password1>
<password2>
EOF
```

2.1.5 Configuring ORDS to use with APEX

APEX requires PL/SQL Gateway access to ORDS.

To configure ORDS to use with APEX, once APEX installation is completed, run the following command:

Note

If you have a single database pool (for example: pool named default), then omit the `--db-pool` option.

```
ords --config <config path> config --db-pool <pool name> set
plsql.gateway.mode proxied
```

Example 2-5

```
ords --config /path/to/config config set plsql.gateway.mode proxied
```

```
ords --config /path/to/config config --db-pool db1 set plsql.gateway.mode
proxied
```

Restart ORDS, you can then access APEX from the ORDS landing page:

```
http://<host>:<port>/ords
```

2.2 Repairing the Oracle REST Data Services Installation

If you want to check that the Oracle REST Data Services installation is valid, specify the repair command.

Note

To repair ORDS in the database, the ORDS product version must be the same version as the ORDS installed schema version in the database.

Example of repair command to prompt for information:

```
ords [--config <folder>] install repair --interactive [--log-folder <folder>]
```

If you have an existing configuration, you may choose to select from a list of database pools. You also have the option to specify the database connection for ORDS to be installed. You are prompted to provide the administrator username and password.

Example

```
Oracle REST Data Services - Interactive Repair

  Enter a number to select the database pool to use or specify the database
connection
    [1] default      jdbc:oracle:thin:@//localhost:1521/orcl
    [2] sales          jdbc:oracle:thin:@//localhost:1521/pdb1
    [S] Specify the database connection
```

```
Choose [1]:
Provide database user name with administrator privileges.
  Enter the administrator username: SYS
  Enter the database password for SYS AS SYSDBA:
```

Note

If you install Oracle REST Data Services before APEX run the following command to ensure that the ORDS configuration for your database pool contains the PL/SQL gateway mode setting and is set to `proxied`.

If you have a single database pool (for example: pool named `default`), then omit the `--db-pool` option.

```
ords --config <config_path> --db-pool <pool_name> get
plsql.gateway.mode
```

Run the following command to set `plsql.gateway.mode` value to `proxied`:

```
ords --config <config_path> config --db-pool <pool_name> set
plsql.gateway.mode proxied
```

- Command Options for Repair CLI
  This section describes the interactive and non-interactive install repair CLI commands used to repair the ORDS schema in the database.

2.2.1 Command Options for Repair CLI

This section describes the interactive and non-interactive install repair CLI commands used to repair the ORDS schema in the database.

Table 2-22 Command Options for Repair CLI

Command	Description
`--admin-user <string>`	Specifies the user with privileges to install, upgrade, or uninstall ORDS in the database.
`--bequeath-connect`	Specifies that the bequeath connect enables clients to connect directly to an Oracle database bypassing the network listener. This occurs if client is on the same server as the database.
`--db-custom-url <url>`	Specifies the custom database url for the database connection.
`--db-hostname <string>`	Specifies the database host name.
`--db-pool <string>`	Specifies the name of the database connection pool.
`--db-port <int>`	Specifies the database port.
`--db-servicename <string>`	Specifies the database service name.
`--db-sid <string>`	Specifies the system identifier which is a unique name that identifies the database.

Table 2-22 (Cont.) Command Options for Repair CLI

Command	Description
`--db-tns-alias <string>`	Specifies the TNS alias name that exist in the `tnsnames.ora` file.
`--db-tns-dir <folder>`	Specifies the folder where the `tnsnames.ora` file is located.
`-h, --help`	Shows how to use and provides information of the command.
`-i, --interactive`	Prompts for the required information.
`--log-folder <folder>`	Writes the logs from the install, upgrade or uninstall to the log folder. If this option is omitted, then the output is written to standard output.
`--password-stdin`	Specifies to use this option to read the password value from standard input when redirecting input to a file or `here` document when you run the ords install or uninstall command non-interactively, If the `--password-stdin` option and the redirection symbol ("<" or "<<") are omitted, then you are prompted for the password(s) for the command option(s) that require the password.
`--pdb-exclude <string...>`	Specifies the list of PDBs that are excluded from the ORDS install, upgrade, or repair. This option only applies to the CDB.
`--pdb-open-readwrite <string...>`	Specifies the list of PDBs that are read only or closed to be open for read write for ORDS install, upgrade, repair or uninstall. This option only applies to the CDB.
`--pdb-open-readwrite-all`	Specifies to open all PDBs in read write mode if their status is either closed or read only. This option only applies to the CDB.
`--pdb-skip-closed`	Skips PDBs that are closed (mounted). This option only applies to the CDB.
`--pdb-skip-readonly`	Skips PDBs that are read-only. This option only applies to the CDB.

2.3 Upgrading Oracle REST Data Services

This section describes how to upgrade to Oracle REST Data Services latest release.

Upgrading from ORDS 22.1.x or Later

If you are upgrading from ORDS 22.1.x or later releases, then refer to the following sections:

- Interactive Command-Line Interface Installation
- Non-Interactive Command-Line Interface Installation (Silent)

Upgrading from ORDS 21.4.x or earlier releases

If you are upgrading from ORDS 21.4.x or earlier releases, then refer to Migrate Configuration and Upgrade from ORDS 21.4.x or Earlier Releases

- Migrate Configuration and Upgrade from ORDS 21.4.x or Earlier Releases
  This section describes how to upgrade from ORDS 21.4.x or earlier releases.

2.3.1 Migrate Configuration and Upgrade from ORDS 21.4.x or Earlier Releases

This section describes how to upgrade from ORDS 21.4.x or earlier releases.

To upgrade to ORDS 22.x from ORDS 21.4.x or earlier releases:

Provide the location of your configuration files that were used from your previous ORDS release (21.4.x or earlier). If you do not know the location, then specify the command using your previous ORDS release (21.4.x or earlier).

```
java -jar /path/to/earlierRelease/ords.war configdir
```

Example:

```
java -jar /path/to/earlierRelease/ords.war configdir

INFO   The config.dir value is /path/to/legacy/conf
```

In the preceding example `/path/to/legacy/conf` is configuration location

You can upgrade to ORDS 22.x release from ORDS 21.4.x or earlier releases in the following two ways:

- Interactive Upgrade
- Silent Upgrade

- Interactive Upgrade
- Silent Upgrade
- Upgrading the Multiple Database Pools

2.3.1.1 Interactive Upgrade

Interactive Upgrade

Specify the following install command to migrate your configuration, and to upgrade ORDS in your specified database:

```
ords --config <folder> install -i --legacy-config <folder> --log-folder
    <folder>
```

Table 2-23 Interactive Upgrade Commands

Command Options	Description
`--config <folder>`	Specifie the configuration folder to store your migrated configuration files. Your configuration folder must not be in the same location as your legacy configuration folder. Otherwise, an error occurs.
`-i` or `--interactive`	Specifies to run the command in interactive mode. You are then prompted for the information.
`--legacy-config <folder>`	Specifies to provide the location of your configuration files that you used for ORDS 21.4.x or earlier releases.
`--log-folder <folder>`	Specifies to provide the location to store your log file.

```
ords --config /path/to/new/conf install -i --legacy-config /path/to/legacy/
conf --log-folder /path/to/logs

Oracle REST Data Services 24.x.x.rNNNNNN - Migrate Configuration
Migrating ORDS Configuration files located at /path/to/legacy/conf
...

Legacy configuration files located at /path/to/legacy/conf/ords are no longer
being used
```

```
to configure ORDS or its connection pools.
Your migrated configuration files are now located at /path/to/new/conf

Oracle REST Data Services - Interactive Install

  Enter a number to select the database pool to upgrade ORDS.
  Additional options to Generate script, or Create an additional database
pool.
    [1] default      jdbc:oracle:thin:@//localhost:1521/orcl
    [2] db1          jdbc:oracle:thin:@//localhost:1521/pdb1
    [3] db2          jdbc:oracle:thin:@//localhost:1521/pdb2
    [G] Generate script to upgrade ORDS in all the database pools
    [C] Create an additional database pool
  Choose [1]:
```

A list of the migrated database pools are displayed. The legacy configuration database pool named apex is migrated, and the name is changed to default.

If you have multiple database pools to upgrade, you can either select the option Generate a script to upgrade ORDS in all the database pools, or repeat the install command again excluding the `--legacy-config` option since you have already migrated the configuration.

Example:

```
ords --config /path/to/new/conf install -i --log-folder /path/to/logs
```

See Also

Scenario 3: Multiple Database Pools

2.3.1.2 Silent Upgrade

To do a silent upgrade you must provide the following:

- Legacy configuration location
- The database password for the administrator user

The database password can be in a text file or using a `Here` document. If you are using a text file, then ensure to delete the text file when the upgradation is complete. The legacy configuration database pool named `apex` is migrated, and the name is changed to `default`.

If you omit the `--database-pool <name>` option, then it uses the default database pool to upgrade.

Using a Text File

You can redirect standard input using a text file that contains the password. Delete the text file once you complete the upgrade operation.

```
ords --config <folder> install --admin-user <user> --legacy-config <folder> --
log-folder <folder>
      --password-stdin <  <text-file>
```

Example of using a <text-file> with 1 password

```
The text file contains 1 password for --admin-user <user>

ords --config /path/to/new/conf install --admin-user SYS --legacy-config /
path/to/legacy/conf
--log-folder /path/to/logs --password-stdin < adminpwd.txt
```

Using a Here Document

You can redirect Standard Input using the `Here` document (also known as `heredoc`) for the password(s). The `heredoc` consists of the << redirection operator followed by a delimiter token once the upgrade operation completes. If you are using a script that contains the password(s), then delete the script.

```
ords --config <folder> install --admin-user <user> --legacy-config <folder> --
log-folder <folder> --password-stdin <<  <delimiter-token>
> <password>
> <delimiter-token>


ords --config /path/to/new/conf install --admin-user SYS --legacy-config /
path/to/legacy/conf --log-folder
        /path/to/logs --password-stdin << EOF
> <password for admin-user>
> EOF
```

2.3.1.3 Upgrading the Multiple Database Pools

Oracle highly recommends that if you have multiple database pools that uses a PL/SQL gateway user, then you must also upgrade those database pools using the `ords` install command so that the PL/SQL gateway user is configured in the ORDS schema.

2.4 Uninstalling Oracle REST Data Services

This section describes the interactive and non-interactive uninstallation CLI commands used to uninstall the ORDS schema.

- Interactive Uninstall CLI
- Non-Interactive Uninstall CLI

2.4.1 Interactive Uninstall CLI

The interactive uninstallation CLI prompts you for the necessary information to uninstall the ORDS schema, ORDS proxy user and related database objects from the database.

To be prompted, you must execute one of the following commands:

- Specify the uninstall command only. For example: `$ ords uninstall`

> **Note**
>
> Assumes that the configuration folder is specified through the environment variable or you are defaulting to the current working directory.

- Specify the option `--config <configuration folder>` followed by the uninstall command.
  For example: `$ ords --config /path/to/config uninstall`
- Specify the `--interactive` option.
  For example: `$ ords --config /path/to/config uninstall --interactive`

Table 2-24 Interactive Uninstall Prompts

Prompt Number	Prompt	Description

1.	`Enter a number to select the database pool`
	`to use or create the database pool`
	`[1] default jdbc:oracle:thin:@//`
	`localhost:1521/orcl`
	`[S] Specify the database connection`
	`Choose [1]:`
		Refer to Entering a Number to Select the Database Pool

2.	`Enter a number to select the database`
	`connection type to use`
	`    [1] Basic (host name, port, service`
	`name)`
	`    [2] TNS (TNS alias, TNS directory)`
	`    [3] Custom database URL`
	`  Choose [1]:`
		Refer to Entering a Number to Select the Database Connection Type

3.	`Enter the database host name [localhost]:`	Refer to Entering the Database Host Name
4.	`Enter the database listen port [1521]:`	Refer to Entering the Database Listener Port
5.	`Enter the database service name [orcl]:`	Refer to Entering the Database Service Name
6.	`Enter the TNS location: /path/to/tns`	Refer to Entering the TNS Location

Table 2-24 (Cont.) Interactive Uninstall Prompts

<table>
<tr><th>Prompt Number</th><th>Prompt</th><th>Description</th></tr>
<tr><td>7.</td><td><pre>
Enter a number to select the TNS Network
alias to use
    [1]
DB1 ...CONNECT_DATA=(SERVER=DEDICATED)
(SERVICE_NAME=pdb1)))
    [2]
DB2 ...CONNECT_DATA=(SERVER=DEDICATED)
(SERVICE_NAME=pdb2)))
    [3]
DB3 ...CONNECT_DATA=(SERVER=DEDICATED)
(SERVICE_NAME=pdb3)))
  Choose [1]:
</pre></td><td>Refer to Entering a Number to Select the TNS Network Alias</td></tr>
<tr><td>8.</td><td><pre>
Enter the Custom database URL:
</pre></td><td>Refer to Entering the Custom Database URL</td></tr>
<tr><td>9.</td><td><pre>
Provide database username with
administrator privileges.
    Enter the administrator username: SYS
</pre></td><td>Refer to Entering the Administrator Username</td></tr>
<tr><td>10.</td><td><pre>Enter the database password for SYS AS
SYSDBA:</pre></td><td>Refer to Entering the Database Password for SYS AS SYSDBA</td></tr>
<tr><td>11.</td><td><pre>
ORDS contains 1 enabled/disabled schema: HR

  Uninstall ORDS in the database
    [1] Yes
    [2] No
  Choose [2]:
</pre></td><td>Refer to Entering an Option for Uninstalling ORDS</td></tr>
</table>

- Entering a Number to Select the Database Pool
- Entering a Number to Select the Database Connection Type
  Select the database connection type.
- Entering the Database Host Name
  Specify the database host name for basic connection.
- Entering the Database Listener Port
  Specify the database port for a basic connection.
- Entering the Database Service Name
- Entering the TNS Location
- Entering a Number to Select the TNS Network Alias

- Entering the Custom Database URL
- Entering the Administrator Username
- Entering the Database Password for SYS AS SYSDBA
  Specify the administrator user password.
- Entering an Option for Uninstalling ORDS

2.4.1.1 Entering a Number to Select the Database Pool

You get this prompt only if the configuration pool(s) exists in the configuration folder.

- If you select a database pool, then it bypasses the database connection type and prompts you for the administrator username and password.
- If you select option 2, then you get the prompt number 2.

> **Note**
>
> If the configuration pool(s) does not exist in your configuration folder, then it prompts you for the database connection type.

2.4.1.2 Entering a Number to Select the Database Connection Type

Select the database connection type.

2.4.1.3 Entering the Database Host Name

Specify the database host name for basic connection.

2.4.1.4 Entering the Database Listener Port

Specify the database port for a basic connection.

2.4.1.5 Entering the Database Service Name

Specify the service name. The default value for the service name is obtained from one of the following in the given sequence:

1. The service name setting in the ORDS configuration file. If not present, then
2. It checks for `ORACLE_PDB` environment variable. If undefined, then
3. It checks for `ORACLE_SID` environment variable. If undefined, then
4. It uses `orcl` as the default value.

2.4.1.6 Entering the TNS Location

Specify a valid folder of where the `tnsnames.ora` file is located.

2.4.1.7 Entering a Number to Select the TNS Network Alias

Select the TNS alias name from the list of TNS network alias names displayed.

2.4.1.8 Entering the Custom Database URL

Specify the custom database URL for custom database URL connection.

Example URL formats:

```
jdbc:oracle:<driver>:@//<host>:<port>/<servicename>
jdbc:oracle:thin:@//localhost:1521/orcl

jdbc:oracle:<drivertype>:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=<host>)
(PORT=<port>))(CONNECT_DATA=(SERVICE_NAME=<servicename>)))
jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=localhost)
(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=orcl)))
```

2.4.1.9 Entering the Administrator Username

Specify a user who has installer privileges to install or upgrade ORDS in the database.

> **See Also**
>
> Privileges Granted to the Oracle REST Data Services Users

2.4.1.10 Entering the Database Password for SYS AS SYSDBA

Specify the administrator user password.

2.4.1.11 Entering an Option for Uninstalling ORDS

If the ORDS enabled or disabled schemas exist, and the `--force` command option is not specified, then it displays the enabled or disabled schemas and prompts for a confirmation to uninstall ORDS in the database.

If the `--force` command option is specified, then the uninstall confirmation is not shown,

2.4.2 Non-Interactive Uninstall CLI

The non-interactive uninstall CLI uninstalls the ORDS schema, ORDS proxy user, and related database objects from the database.

Provide the command options for the non-interactive uninstall CLI. If you are missing a required option (for example, `db-port` for a connection), then you are not prompted. Instead, an error is returned.

- Using Input Redirection
- Command options for Uninstall CLI

2.4.2.1 Using Input Redirection

This section describes how to redirect standard input using Here document or to a file.

Redirect Standard Input to a File

Redirect STDIN to a file that contains the password. In the following example, the file contains one password.

Example:

```
$ cat adminpwd.txt
password
```

The password belongs to the administrator user on the command line (for example: SYS). This example assumes that the config folder and the db1 pool already exists.

```
ords --config /path/to/conf uninstall --db-pool db1 --admin-user SYS --log-
folder /path/to/logs --password-stdin < adminpwd.txt
```

Redirect Standard Input using Here Document

Redirect STDIN using the Here document (also known as heredoc) for the password. The heredoc consists of the << redirection operator followed by a delimiter token.

The password must be on a separate line and it is ended by the delimiter token.

Example:

```
ords --config <configuration_folder> uninstall --db-pool <pool_name> --admin-
user <username>
--db-hostname <host> --db-port <port_number> --db-servicename <service_name>
--log-folder <log_folder>
--password-stdin << EOF
<password>
EOF
```

The password belongs to the the administrator user on the command line. (for example: SYS).

```
ords --config /path/to/config uninstall --db-pool db1 --admin-user SYS --db-
hostname
      localhost --db-port 1521 --db-servicename orcl --log-folder /path/to/
logs << EOF
<password>
EOF
```

2.4.2.2 Command options for Uninstall CLI

Table 2-25   Command Options for Uninstall CLI

Options	Description
`--admin-user <USERNAME>`	Specifies the user with privileges to install, upgrade, repair, or uninstall ORDS in the database.
`--bequeath-connect`	Specifies that the bequeath connect enables clients to connect directly to an Oracle database bypassing the network listener. This occurs if client is on the same server as the database.
`--config <CONFIG_PATH>`	Specifies the path to the folder containing the configuration files.

Table 2-25 (Cont.) Command Options for Uninstall CLI

Options	Description
`--db-pool <POOL_NAME>`	Specifies the name of the database pool.
`--db-custom-url <URL>`	Specifies the user specified custom url.
`-db-hostname <HOST>-`	Specifies the database host name.
`--db-port <PORT>`	Specifies the database port.
`--db-servicename <SERVICENAME>`	Specifies the database service name.
`--db-sid <SID>`	Specifies the database SID.
`--db-tns-alias <ALIAS_NAME>`	Specifies the tns alias name that exists in the `tnsnames.ora` file.
`-db-tns-dir <TNS_DIR>-`	Specifies the folder where the `tnsnames.ora` file is located.
`--force`	Specifies that you can uninstall ORDS from the database regardless of the number of ORDS enabled/disabled schemas.
`--help, -h`	Shows how to use the command.
`--interactive, -i`	Prompts the user for all the required information.
`--log-folder`	Writes the logs from the install, upgrade, repair, or uninstall to the log folder. If this option is omitted, then the output is written to the standard output.
`-password-stdin`	Specifies when you want to run the ORDS install or uninstall command non-interactively, you can use this option to read the password value from standard input when redirecting input to a file or `here` document. If the `--password-stdin` option and the redirection symbol ("<" or "<<") are omitted, you are prompted for the password(s) for the command option(s) that requires the password.
`--pdb-open-readwrite-all`	Specifies the option applicable for CDB. Specifies whether to open all PDBs in read write mode if their status is either closed or read only.
`--pdb-open-readwrite <(PDB...)>`	Specifies the option applicable for CDB. Specifies the list of PDBs that are readonly or closed to be open for readwrite to uninstall ORDS.

2.5 Updating the Configuration Settings

The ORDS `config` command is used to update and edit the contents of the global and database pool specific settings in the configuration files.

The `config` command comprises a list of sub-commands. The config command has the `--db-pool` `<POOL_NAME>` option that identifies the database pool to which you want to apply the setting. If this option is omitted, then the default database pool settings get updated.

```
ords config [OPTIONS] [SUB-COMMAND]
```

Where:

- OPTIONS:
  - `--db-pool <string>`: The name of the database connection pool to configure
  - `-h, --help`: Show usage information for the command
- SUB-COMMAND: `delete`, `get`, `info`, `list`, `secret`, `set`, and `user`

Following is the list of sub-commands along with the descriptions:

`info`

Shows the description of the specified key, explaining its purpose. Indicates if it is a sensitive value and what is the default value.

Example: `ords config info <KEY>`

`set`

Sets the `config` key to a value. If you wish the setting to be set at a global level, then use the `--global` option.

Example: `ords config set [--global] <KEY> <VALUE>`

`secret`

Sets the sensitive values (for example: connection pools password). Use `ords config secret` to set the sensitive values. Some values are sensitive (example: `db.password`). Per Oracle Secure Coding Standards such values must not be passed as command line arguments as this leads to leakage of the value (appears in `ps` output).

Example: `ords config secret --password-stdin <KEY> < <file>`

> **Note**
>
> If an attempt is made to do `ords config set` on a sensitive value, an error is returned.

Non-Interactive example:

If the `--password-stdin` option is specified, then the value is read from `stdin`.

Example:

```
ords config secret --password-stdin db.password < secret.txt
```

Interactive Example

If `--password-stdin` is not specified, then the user is prompted to enter and confirm the secret value.

Example:

```
ords config secret db.password
```

`get`

Echo the config value to stdout. If the value is a secret then it's value will be replaced by the text `******`. If you wish to see the plain text of the secret, then use the `--secret` argument.

Example: `ords config get [--global] [--secret] <KEY>`

`list`

Show all explicitly configured values for the pool settings and global settings. Secret values are replaced with the text `******`. Use `--include-defaults` to list all the settings including those with the default values.

Example: `ords config list [--include-defaults]`

The information lists the name of the setting, value, and the source location (global configuration, pool specific configuration, or global/pool wallet. The table includes the columns such as

- `Setting`: Name of the setting
- `Value`: The value of the setting
- `Source`: Location of the global/pool specific setting

For example the output is similar to the following:

```
Configuration: /path/to/conf/

Database pool: default

Setting                        Value                          Source
-------------------            ---------------                ------
db.connectionType              basic                          Pool
db.hostname                    localhost                      Pool
db.password                    ******                         Pool Wallet
db.port                        1521                           Pool
db.servicename                 orcl                           Pool
db.username                    ORDS_PUBLIC_USER               Pool
feature.sdw                    true                           Pool
restEnabledSql.active          true                           Pool
```

The column Source indicates the origin of the setting value which can be any one of the following:

- `Default`: Uses the default value for the setting
- `Global`: The value is specified in the global/settings.xml configuration file
- `Pool`:The value is explicitly configured in the pool
- `Pool Wallet`:The (sensitive) value is explicitly configured in the pool wallet

`user delete`

Deletes the key from the configuration.

Example: `delete [--global]`

`user add`

Add a user and its password and role(s) in the credentials file. If the user already exists, then it is updated.

Non-interactive

Include option `--password-stdin` to read from STDIN. Requires the password file of the user.

Example:

```
ords config user add <USERNAME> <ROLES>
Enter the password:
Confirm password:
```

Interactive

Prompts for the password if `--password-stdin` option is omitted.

Example:

```
ords config user add <USERNAME> <ROLES>
Enter the password:
Confirm password:
```

`user delete`

```
ords config user delete <USERNAME>
```

Delete the specified user.

`user get`

```
ords config user get <USERNAME>
```

Retrieve the specified user.

`user list`

```
ords config user list
```

Lists the users in the credential file.

ⓘ **See Also**

- Understanding the Configurable Settings
- Setting Up the Configuration Folder Structure

3

Configuring Oracle REST Data Services for Multiple Databases

Oracle REST Data Services supports the ability to connect to more than one database. This section describes different strategies for routing requests to the appropriate database.

- Deploying ORDS with Local Configuration
- Deploying ORDS with Central Configuration Server
  This section describes how to deploy ORDS using a central configuration server.
- Deploying ORDS with ETCD
  This section describes how to deploy ORDS using ETCD.

3.1 Deploying ORDS with Local Configuration

By default, ORDS configuration is persisted in the ORDS configuration directory files. These files are best managed using the `ords config` command line command and can be modified manually.

- About the Request URL
- Configuring Additional Databases
- Advanced Routing
- Routing Based on the Request Path
- Routing Based on the Request Hostname

3.1.1 About the Request URL

Oracle REST Data Services supports a number of different strategies for routing requests to the appropriate database. All of these strategies rely on examining the request URL and choosing the database based on some kind of match against the URL. It is useful to recap the pertinent portions of a request URL. Consider the following URL:

```
https://www.example.com/ords/sales/f?p=1:1
```

This URL consists of the following sections:

- Protocol: `https`
- Host Name: `www.example.com`
- Context Root: `/ords`

  The context root is the location at which Oracle REST Data Services is deployed on the application server.
- Request Path: `/sales/f?p=1.1`

  This is the portion of the request URL relative to the context root.

For different applications, it may be important to route requests based on certain prefixes in the request path or certain prefixes in the full request URL.

There are two steps to configuring multiple databases:

1. Configuring the database connection information
2. Configuring which requests are routed to which database

3.1.2 Configuring Additional Databases

When you first configure Oracle REST Data Services, you configure a default database connection named: `default`. You can create additional database connections using the `install` command.

> **Tip**
>
> To see full help for the `install` command type:
>
> ```
> ords install --help
> ```

For adding additional database connection pool, enter the following command:

```
ords --config <configuration folder> install
```

Refer to Interactive Command-Line Interface Installation to create an additional database connecion pool.

> **See Also**
>
> - Interactive Command-Line Interface Installation
> - Installing and Configuring Oracle REST Data Services
> - Routing Based on the Request Path
> - Routing Based on the Request Hostname

3.1.3 Advanced Routing

By default, additional databases are mapped using the database pool name specified while installing ORDS. Alternatively, custom mapping can be performed based on a path prefix or a hostname as described in the following sections. Both *Routing Based on the Request Path* and *Routing Based on the Request Hostname* can be used at the same time in the same database pool configuration. Use of paths and hostname files are not mutually exclusive.

> **Note**
>
> If custom mapping is configured, then default mapping with database pool name is not enabled.

See Also

Configuring Additional Databases

3.1.4 Routing Based on the Request Path

You can create the request routing rules based on the request path using the paths file. To do this, perform the following steps:

1. Open or create a file `<ords_config_folder>/databases/<database_name>/paths`
2. Enter the paths that you want to be served by this database.

Example location of the paths file

```
ords_conf/
+-- databases/
|   +-- db1/
|   |   +-- wallet/
|   |   +-- paths
|   |   +-- pool.xml
|   +-- db2/
|       +-- wallet/
|       +-- paths
|       +-- pool.xml
+-- globals/
```

Example: `ords_conf/databases/db1/paths`

```
sales
```

Example: `ords_conf/databases/db2/pathsords_conf/databases/db2/paths`

```
support
/finance/department1
```

The previous rules match all the following requests:

```
http://example.com/ords/sales --> db1
http://example.com/ords/sales/leads --> db1
https://www.example.com/ords/sales/forecasting.report?month=jan --> db1 (If
www.example.com resolves to the same system as example.com.)

http://example.com/ords/support --> db2
http://example.com/ords/finance/department1 --> db2
```

3.1.5 Routing Based on the Request Hostname

You can create request routing rules based on the hostname using the hostnames file. To do this, perform the following steps:

1. Open or create a file `<ords_config_folder>/databases/<database_name>/hostnames`.
2. Add the hostnames you want to be served by this database.

Example location of hostnames files:

```
ords_conf/
+-- databases/
|   +-- db1/
|   |   +-- wallet/
|   |   +-- hostnames
|   |   +-- pool.xml
|   +-- db2/
|       +-- wallet/
|       +-- hostnames
|       +-- pool.xml
+-- globals/
```

Example: `ords_conf/databases/db1/hostnames`

```
www.example.com
example.org
```

Example `ords_conf/databases/db2/hostnames`

```
foo.bar.com
```

The preceding rules match the requests to their corresponding database connection as follows:

```
http://www.example.com/ords/ --> db1
http://example.org:8080/ords/f?p=1:1 --> db1
https://foo.bar.com/ords/myschema/resource --> db2
```

The preceding rules do not match following requests:

```
http://example.com/ords/ (The hostname is missing the www.)
http://foo.bar.net/ords/myschema/resource --> db2 (hostname is different
```

3.2 Deploying ORDS with Central Configuration Server

This section describes how to deploy ORDS using a central configuration server.

Overview

By default, Oracle REST Data Services (ORDS) configuration resides locally in files such as the `global/settings.xml` and `databases/default/pool.xml` within an ORDS configuration directory. Alternatively, ORDS can acquire its configuration from a REST API called central configuration server API .

The following are the benefits of using a central configuration server API:

- Centrally managed configuration provides a single place to update, manage, and secure ORDS configuration.

- ORDS pools are dynamically loaded as required, this helps in quick startup time for ORDS.

The Central Configuration Server OpenAPI specification defines the following two REST end points:

- Global Configuration Resource
- Pool Configuration Resource

Typically, a central configuration server is required only when you are managing multiple ORDS nodes or Database Pool configurations.

Prerequisites

- Secure REST API that implements the specified central configuration server API
- ORDS global and database pool information is defined in the OpenAPI specification
- OAuth2.0 authorization server (for issuing access tokens)
- Ability to create an Oracle wallet to store the credentials for accessing the secure central configuration

- OpenAPI Specification
- Database Mapping
- Global Configuration Settings
- Database Pool Configuration Settings
- Security
- Starting ORDS in a Central Configuration Deployment

See Also

ORDS Central Configuration OpenAPI

3.2.1 OpenAPI Specification

Refer to ORDS Central Configuration OpenAPI

3.2.2 Database Mapping

When ORDS is deployed using central configuration, only the global configuration settings are initially retrieved. Appropriate pool configuration is retrieved and cached in the subsequent requests only after a request is made to ORDS for which it requires a Database connection. The global configuration resource provides a `search` HREF template for the pool configuration resource. ORDS uses this template to request the pool configuration. The `search` HREF is templated, meaning the `{host}` string is replaced by a value that identifies the specific pool.

You can use one of the following three methods to replace the `{host}` string to specify the appropriate pool configuration:

- Request Host Method
- Header Method
- Direct URL Specification

- Request Host Method
- Header Method
- Direct URL Specification

3.2.2.1 Request Host Method

Request host method is the default method to replace the {host} string in the search href. The host of the ORDS request is used.

This method is useful when the sub domain of the ORDS service can be used to identify which pool configuration to use.

Examples

Global Configuration: The href templated search value provided by the Global configuration

```
 href="https://central-config.example.com:8585/central/v1/config/pool/{host}"
```

Request to ORDS:

```
GET: https://mydatabase.servername.com/ords/hr/employees/
```

Where, `mydatabase.servername.com` is the request host.
ORDS requests the pool configuration from:

```
https://central-config.example.com:8585/central/v1/config/pool/
mydatabase.servername.com
```

3.2.2.2 Header Method

If the sub domain cannot be used to denote the appropriate pool, then a request header can be used. Using the `security.externalHostMappingHeader` setting, the Global configuration specifies the header you want to use.

Examples

Global Configuration:

The href templated search value provided by the Global configuration:

```
href="https://central-config.example.com:8585/central/v1/config/pool/{host}"
```

Request to ORDS:

```
GET: -Header "poolname: mydatabase" https://www.servername.com/ords/hr/
employees/
```

ORDS requests the pool configuration from:

```
https://central-config.example.com:8585/central/v1/config/pool/mydatabase
```

3.2.2.3 Direct URL Specification

Direct URL Specification method is an alternative to the Header Method and aligns with how pool identifiers are retained for file-based configurations. With this method, the pool identifier is specified directly in the request URL. To enable this feature, you must define a new setting in the global configuration `security.externalMappingPathPrefix` and set its value to true.

Global Configuration

The `href` templated search value provided by the global configuration:

```
href="https://central-config.example.com:8585/central/v1/config/pool/{host}"
```

Request to ORDS with a direct URL specification

```
GET: https://www.servername.com/ords/mypool/hr/employees/
```

In this case, `mypool` is the pool identifier included in the request path.

ORDS requests the pool configuration using the following URL:

```
https://central-config.example.com:8585/central/v1/config/pool/mypool
```

3.2.3 Global Configuration Settings

In an ORDS central configuration deployment, global configuration settings must meet the following requirements:

- Must be in a JSON format
- The global settings must be defined in the `settings` object.
- Include a related `Search` link ending with the `{host}` template parameter to describe the Pool configuration resource.

> **See Also**
>
> About the Oracle REST Data Services Configuration Files

Example response for the ORDS global settings

```
{
  "settings": {
    "restEnabledSql.active": true,
    "feature.sdw": true,
    "security.externalHostMappingHeader": "poolname"
  },
  "links": [
    [
      {
        "rel": "collection",
        "href": "https://central-config.example.com:8585/central/v1/config/"
      },
      {
        "rel": "self",
        "href": "https://central-config.example.com:8585/central/v1/config/"
      },
      {
        "rel": "search",
        "href": "https://central-config.example.com:8585/central/v1/config/
pool/{host}",
        "templated": true
      }
    ]
  ]
}
```

3.2.4 Database Pool Configuration Settings

In an ORDS central configuration deployment, pool configuration settings must meet the following requirements:

- Must be in a JSON format
- The pool settings defined in the `database.pool.settings` object.
- When you are configuring a database pool for the Oracle Autonomous Database, pool configuration files must include the contents of its `db.wallet.zip` configuration property encoded in Base64

> **See Also**
>
> About the Oracle REST Data Services Configuration Files

Example 3-1 `db.wallet.zip`

Example pool configuration response with the `db.wallet.zip` file providing a base64 representation of an ADB-S instance wallet.

> **Note**
>
> The `db.username` and `db.password` can be provided as settings. However, it is a best practice to include the credentials in the ADB-S instance wallet before converting it to base64.

> **See Also**
>
> Adding Credentials to an Instance Wallet

```
{
  "database": {
    "pool": {
      "name": "mydatabase",
      "settings": {
        "db.wallet.zip.service":"mydb_low",
        "db.wallet.zip":
"UEsDBBQACAgIAOMid1IAAAAAAAAAAAAAAAALAAAAY3dhbGxldC5zc28BdRuH4TjA...",
        "feature.sdw": true,
        "plsql.gateway.mode": "proxied",
        "restEnabledSql.active": true
      }
    }
  }
}
```

Example 3-2 `db.customURL`

Example pool configuration response with the `db.customURL` providing the pool connection details.

```
{
  "database": {
    "pool": {
      "name": "mydatabase",
      "settings": {
        "db.username" : "ORDS_PUBLIC_USER",
        "db.password" : "ORDS PUBLIC USER PASSWORD",
        "db.connectionType" : "customurl",
        "db.customURL" : "jdbc:oracle:thin:@(description=(retry_count=3)
(address_list=(load_balance=on)
         (address=(protocol=tcp)(host=adb.ap-sydney-1.oraclecloud.com)
(port=1521)))

(connect_data=(service_name=database_pool_1_high.adb.oraclecloud.com)))",
        "feature.sdw": true,
        "plsql.gateway.mode": "proxied",
        "restEnabledSql.active": true
      }
    }
  }
}
```

- Using eTag
- Adding Credentials to an Instance Wallet
  This section describes how to add credentials to an instance wallet.

3.2.4.1 Using eTag

Pool configuration responses should include an `eTag`. To identify any changes to a pool configuration, ORDS uses the eTag. If an `eTag` remains unchanged, then ORDS does not refresh the configuration settings of the pool.

3.2.4.2 Adding Credentials to an Instance Wallet

This section describes how to add credentials to an instance wallet.

Adding the database credentials for an ORDS runtime user can be provided using the `db.username` and `db.password` settings. However, a better method is to include the credentials in the the ADB-S instance wallet and then provide that in base64 format using the `db.wallet.zip` setting.

The following command can be used to include the ORDS runtime user credentials. When prompted, provide the instance wallet password.

```
mkstore -wrl <path to the instance wallet> -createCredential <servicename>
<ORDS Runtime user name>
      <ORDS Runtime user password>
```

3.2.5 Security

The Central Configuration API can be secured using basic authentication or OAuth2. The credentials and other information required to acquire an access token or make basic authentication requests are provided using an ORDS credentials wallet.

ORDS supports the following OAuth2.0 grant types:

- Resource Owner Password Credentials Grant
- Client Credentials Grant

Credentials are stored as a secret in the Oracle wallet. The `mkstore` utility can be used to create the ORDS credentials wallet.

> **Note**
>
> SQLcl provides a `mkstore` command which can be used to create the appropriate ORDS credentials wallet or modify an instance ADB-S instance wallet.

Table 3-1 ORDS Credential Wallet Storage

Secret Alias	Secret Value	Description
`oauth:client_credentials_mode:[Server Name]`	Value must be one of the following: • `basic` • `request_body`	Determines how the client credentials are added to the token request. Default value is `basic`
`oauth:client_id:[Server Name]`	`client_id` of the client application	Used with `grant_type=client_credentials`
`oauth:client_secret:[Server Name]`	Client secret of the client application	Used where `grant_type=client_credentials`
`oauth:grant_type:[Server Name]`	When used, must be one of the following: • `client_credentials` • `password`	The value defaults to `password` when `oauth:username:[hostname]` is included. Otherwise, the default value is `client_credentials`
`oauth:password:[Server Name]`	`password` of the user who needs to be authenticated	Used with `grant_type=password`

Table 3-1 (Cont.) ORDS Credential Wallet Storage

Secret Alias	Secret Value	Description
`oauth:scope:[Server Name]`	Conforms to Access Scope specification as defined in Access Token Scope	OAuth 2.0 scopes to the request access
`oauth:token_endpoint:[Server Name]`	Absolute URL of an access token endpoint as defined in Token Endpoint	ORDS client uses the `POST` method when accessing the token requests
`oauth:username:[Server Name]`	`username` of the user who needs to be authenticated	Used when `grant_type=password`

- Demonstration to Create an Entry of a Wallet for OAuth2.0 Authentication

3.2.5.1 Demonstration to Create an Entry of a Wallet for OAuth2.0 Authentication

The example in this section demonstrates how to set up a wallet with the `mkstore` utility for an OAuth2.0 client credentials grant type.

Setting up a wallet with the SQLcl mkstore utility

```
sql /nolog
SQL> mkstore -wrl /tmp/wallet -create
```

Creating an entry of a wallet for OAuth2.0 Authentication

The Global configuration resource server in this example is `central-config.example.com`.

```
sql /nolog
SQL> mkstore -wrl /tmp/wallet -createEntry oauth:grant_type:central-
config.example.com client_credentials
SQL> mkstore -wrl /tmp/wallet -createEntry oauth:token_endpoint:central-
config.example.com https://myauthserver.com/oauth/token
SQL> mkstore -wrl /tmp/wallet -createEntry oauth:client_id:central-
config.example.com SeqlyQGW4iKgHd@cQ4Xnkg..
SQL> mkstore -wrl /tmp/wallet -createEntry oauth:client_secret:central-
config.example.com SuBNKFsft£t924Dsfgsh..
```

3.2.6 Starting ORDS in a Central Configuration Deployment

ORDS recognizes that a central configuration deployment is required when the following Java options are included in the `ords serve` command.

```
bin/ords --java-options "-Dconfig.url=[ORDS Global Configuration Resource
Location]
-Dconfig.wallet=[ORDS Credentials Wallet Location]" serve
```

Java Options

- `-Dconfig.url`: Provides ORDS with the Global configuration resource and its server is used to reference secrets in the ORDS credentials wallet.
  Example: `-Dconfig.url=https://central-config.example.com:8585/central/v1/config/`
- `-Dconfig.wallet`: Provides ORDS with the ORDS credentials wallet location. Through auto login, it uses the secrets contained in the Oracle wallet to acquire an access token so that the Global and Pool resources can be accessed.
  Example: `-Dconfig.wallet=/tmp/wallet`

You will receive a notification in the command prompt from where the `ords serve` command was issued, indicating that ORDS is running under a central configuration deployment. ORDS then waits for the incoming HTTPS requests for the database pools that have been configured.

- Satisfying the HTTPS Requests

3.2.6.1 Satisfying the HTTPS Requests

ORDS waits for the incoming HTTPS requests for currently configured database pools.

Once the incoming requests arrive, ORDS first determines if the database pool configuration information is cached. If the configuration settings are not available, then ORDS makes a request to the central configuration server to retrieve the pool configuration. The pool is then initialized and the request is handled.

3.3 Deploying ORDS with ETCD

This section describes how to deploy ORDS using ETCD.

Overview

ORDS can retrieve its configuration data from ETCD. The following are the benefits of using ETCD with ORDS:

- You don't need to restart ORDS when you make changes to the configuration settings
- Centralizing data in an ETCD server simplifies the configuration management
- Leverages the robust security features of ETCD
- Distributed architecture of ETCD ensures reliability and scalability

Significance of using ETCD

ETCD is a lightweight, distributed, and highly available key-value store that is widely used in cloud-native applications. ETCD fits seamlessly into ORDS deployments and offers flexibility for the users who want to manage dynamic configurations.

> ⓘ **Note**
>
> ORDS currently supports ETCD version v3.5 or later.

- Prerequisites
- Database mapping
- Configuration Settings
- Starting ORDS with ETCD

3.3.1 Prerequisites

The following are the prerequisites for using ETCD as a configuration source for ORDS:

- Install ETCD on your target server(s). Confirm installation using the following code:

  ```
  etcdctl version
  ```

  Example output:

  ```
  etcdctl version: 3.5.17
  API version: 3.5
  ```

- Configure authentication and authorization. Refer to the ETCD documentation.
- Ensure that you can create an Oracle wallet to store the credentials for accessing ETCD (optional but recommended).

3.3.2 Database mapping

The database mapping mechanism in this configuration, mirrors the approach used in the remote central configuration API. It provides dynamic and efficient handling of multiple database instances.

> ⓘ **See Also**
>
> Database Mapping

Adding Credentials to an Instance Wallet

Oracle highly recommends to include the database credentials in the ADB-S instance wallet and then provide that in base64 format using the `db.wallet.zip` setting.

> ⓘ **See Also**
>
> About the Oracle REST Data Services Configuration Files

3.3.3 Configuration Settings

Similar to the remote central configuration, global and pool configuration settings must meet the following requirements:

- Must be in a JSON format
- The global settings must be defined in the `settings` object.
- The pool settings must be defined in the `database.pool.settings` object.

Global Configuration Settings

The global configuration settings are updated to support ETCD integration.

Example 3-3 Response for the ORDS Global Settings

```
{
  "settings": {
    "restEnabledSql.active": true,
    "feature.sdw": true
  }
}
```

This simplifies the configuration and aligns with the design principles of ETCD.

Database Pool Configuration Settings

`db.wallet.zip`
Example pool configuration response with the `db.wallet.zip` file provides a base64 representation of an ADB-S instance wallet:

> **Note**
>
> The `db.username` and `db.password` can be provided as settings. However, it is a best practice to include the credentials in the ADB-S instance wallet before converting it to base64.

```
{
  "database": {
    "pool": {
      "name": "mydatabase",
      "settings": {
        "db.wallet.zip.service":"mydb_low",
        "db.wallet.zip":
"UEsDBBQACAgIAOMid1IAAAAAAAAAAAAAAAALAAAAY3dhbGxldC5zc28BdRuH4TjA...",
        "feature.sdw": true,
        "plsql.gateway.mode": "proxied",
        "restEnabledSql.active": true
      }
    }
  }
}
```

> **See Also**
>
> Adding Credentials to an Instance Wallet

`db.customURL`
Example pool configuration response with the `db.customURL` providing the pool connection details:

```
{
  "database": {
    "pool": {
      "name": "mydatabase",
      "settings": {
        "db.username" : "ORDS_PUBLIC_USER",
        "db.password" : "ORDS PUBLIC USER PASSWORD",
        "db.connectionType" : "customurl",
        "db.customURL" : "jdbc:oracle:thin:@(description=(retry_count=3)
(address_list=(load_balance=on)
         (address=(protocol=tcp)(host=adb.ap-sydney-1.oraclecloud.com)
(port=1521)))

(connect_data=(service_name=database_pool_1_high.adb.oraclecloud.com)))",
        "feature.sdw": true,
        "plsql.gateway.mode": "proxied",
        "restEnabledSql.active": true
      }
    }
  }
}
```

3.3.4 Starting ORDS with ETCD

ORDS recognizes that an ETCD deployment is required when the following Java options are included in the `ords serve` command:

```
export ETCD_ORDS_USERNAME=etcd-username
export ETCD_ORDS_PASSWORD=etcd-password
bin/ords --java-options "-Dconfig.url=[ETCD Location] -Dconfig.source=etcd"
serve
```

Java Options

- `-Dconfig.url`: Provides ORDS with the ETCD IP address and the port number and its server.
  Example: `-Dconfig.url=https://etcd.example.com:2379`
- `-Dconfig.source`: Specifies the source of the configuration data. If the target of the URI is an ETCD server, then it must be set to `etcd`

You will receive a notification in the command prompt from where the `ords serve` command is issued indicating that ORDS is running with ETCD configuration. ORDS then waits for the incoming HTTPS requests for the database pools that have been configured.

Using ORDS Credential Wallet Storage

Alternatively, use a wallet for secure storage of credentials.

Setting up a wallet with the SQLcl mkstore utility

```
sql /nolog
SQL> mkstore -wrl /tmp/wallet -create
```

Creating an entry of a wallet for basic Authentication

The ETCD server in this example is `etcd.example.com`.

> **Note**
>
> `<etcd-username>:<etcd-password>` must be in base64.

```
sql /nolog
SQL> mkstore -wrl /tmp/wallet -createEntry http:basic:etcd.example.com <etcd-
username>:<etcd-password>
```

Start ORDS with the appropriate Java options:

```
bin/ords --java-options "-Dconfig.url=[ETCD Location]
-Dconfig.wallet=[ORDS-ETCD Credentials Wallet Location]" serve
```

Where the Java option `-Dconfig.wallet`, provides ORDS with the ETCD-ORDS credentials wallet location. Through auto login, it uses the secrets contained in the Oracle wallet to get the basic credentials so that the Global and Pool resources can be accessed.

Example: `-Dconfig.wallet=/tmp/wallet`

Using Prefixing (Recommended)

Using prefixing method is recommended enhance the configuration organization:

```
export ETCD_ORDS_PREFIX=ords-conf-dev
bin/ords --java-options "-Dconfig.url=[ETCD Location] -Dconfig.source=etcd"
serve
```

4 Overview of Schema Level Configuration Override

This section describes schema level configuration override feature.

The schema level configuration override feature provides a mechanism to override configuration properties for a REST enabled schema. This allows authorized database users to customize Oracle REST Data Services (ORDS) on the fly. For example, a database user can use this mechanism to enable or disable an optional feature. Only a predefined subset of database schema level configurations can be overridden, global configurations cannot be overridden.

- Features of Schema Level Configuration Override
  This section lists the features of schema level configuration override.
- Overridable Configuration Properties
  This section lists the overidable configuration properties.
- Use Cases
  This section shows some use cases for using the schema level configuration override feature.
- Scope and Visibility Matrix
  This section describes how to configure the visibility and the scope for the database and schema users.

4.1 Features of Schema Level Configuration Override

This section lists the features of schema level configuration override.

The features of schema level configuration override are as follows:

- Database users can override the configuration property for their schema with the ords PL/SQL API.
- Database administrator can override the configuration property for any schema in the database with our ords_admin PL/SQL API.
- The configuration value is cached for 10 mins. You must wait for 10 minutes before the new value becomes effective.

> **See Also**
>
> - ORDS PL/SQL Package Reference
> - Oracle REST Data Services Administration PL/SQL Package Reference

4.2 Overridable Configuration Properties

This section lists the overidable configuration properties.

Table 4-1 Overridable Configuration Properties

Key	Description	Scope	Setting Override Value

`restEnabledSql.active`	Specifies whether the REST-Enabled SQL service is active. REST- Enabled SQL is a prerequisite for SDW or Database Actions. SDW is disabled if the value is set to `false`.	Schema	`begin`
			`ords.set_property(`
			`p_key =>`
			`'restEnabledSql.active',`
			`p_value  => 'false');`
			`commit;`
			`end;`
			`/`

`feature.sdw`	Specifies whether the Database Actions feature is active.	Schema	`begin`
			`ords_admin.set_property(p_`
			`key => 'feature.sdw',`
			`p_value => 'false');`
			`commit;`
			`end;`
			`/`

`debug.printDebugToScreen`	Specifies whether the error responses include stack trace.	Schema	`begin`
			`ords_admin.set_property(p_`
			`key =>`
			`'debug.printDebugToScreen'`
			`, p_value => 'true');`
			`commit;`
			`end;`
			`/`

`debug.printOWADebug`	Specifies whether the error responses for PL/SQL gateway requests include stack trace.
	Overrides `debug.printDebugToScreen` for PL/SQL gateway requests.
		Database	`begin`
			`ords_admin.set_property(`
			`    p_key =>`
			`'debug.printOWADebug',`
			`p_value => 'true');`
			`commit;`
			`end;`
			`/`

4.3 Use Cases

This section shows some use cases for using the schema level configuration override feature.

Table 4-2 Use Cases of Schema Level Configuration Override feature

Scenario	Solution

An Autonomous Database user wants to debug their ORDS REST Services.	The database user sets the property to `true` for their schema as shown in the following code snippet:
	`ords.set_property(`
	`   p_key =>`
	`'debug.printDebugToScreen',`
	`   p_value  => 'true'`
	`);`

Administrator wants a REST-Enabled schema but not have a REST-Enabled SQL.	The administrator sets the property to `true` for the relevant schema as shown in the following code snippet:
	`ords_admin.set_property(`
	`   p_schema => 'REST_PRODUCTION',`
	`   p_key => 'restEnabledSql.active',`
	`   p_value  => 'true'`
	`);`

Administrator wants to completely disable SDW for a database.	The administrator sets the property for every schema as shown in the following code snippet:
	`ords_admin.set_property(p_schema =>`
	`'s1', p_key =>`
	`'feature.sdw', p_value  => 'false');`
	`ords_admin.set_property(p_schema =>`
	`'s2', p_key =>`
	`'feature.sdw', p_value  => 'false');`

REST-Enabled schema wants to clear a property value that was previously set.	The database user runs the following command:
	`ords.unset_property(p_key =>`
	`'debug.printDebugToScreen');`

4.4 Scope and Visibility Matrix

This section describes how to configure the visibility and the scope for the database and schema users.

Table 4-3 Scope and Visibility Matrix

User Type	Database	Schema
Public	• Only administrator can set a value that applies to all the schemas • `USER_ORDS_PROPERTIES` view shows the value, if it is set • Unprotected REST endpoint shows the value if it is set • Currently used for login message and SDW header and footer	• Administrator and non-administrator user can set a value per schema • There is no default value that automatically applies to a schema • `USER_ORDS_PROPERTIES` view shows the value if it is set • Unprotected REST endpoint shows the value if it is set
PROTECTED	• Only the administrator can set a value that applies for all the schemas • `USER_ORDS_PROPERTIES` view shows the value if it is set • Unprotected REST endpoint does not show value if it is set	• Administrator and non-administrator user can set a value per schema • There is no default value that automatically applies to a schema • `USER_ORDS_PROPERTIES` view shows the value if it is set • Unprotected REST endpoint does not show the value if it is set
PRIVATE	• Only administrator can set the value that applies for all the schemas • `USER_ORDS_PROPERTIES` view does not show a value if it is set • Unprotected REST endpoint does not show a value if it is set	• Only the administrator can set a value per schema • There is no default value that automatically applies to a schema • `USER_ORDS_PROPERTIES` view does not show the value if it is set • Unprotected REST endpoint does not show the value if it is set

5

Miscellaneous Configuration Options of Oracle REST Data Services

This section explains how to configure Oracle REST Data Services for connecting to multiple databases for routing requests, and it refers to other documentation sources for other configuration information.

> **Note**
>
> You must restart Oracle REST Data Services after making any configuration changes. For ensuring High Availability, Oracle recommends that you use a load balancer in front of multiple ORDS instances, so that rolling restarts can be achieved.

Topics:

- Configuring the Custom Error Pages
  This section explains how to configure a custom error page instead of the error page generated by Oracle REST Data Services.
- Managing ORDS Administrator Privilege
- Managing ORDS Runtime Privilege
- Using OAuth2 in Non-HTTPS Environments
- Configuring ORDS Metadata Cache
  This section explains how to configure the ORDS Metadata Cache.
- Configuring ORDS to Connect with OCI Database Tools Connections
  You can configure Oracle REST Data Services (ORDS) to securely connect to your Oracle Database in Oracle Cloud Infrastructure (OCI) by leveraging OCI database tools connections.

5.1 Using the REST Enabled SQL Service with MySQL Database

This section describes the ORDS feature which is only supported with MySQL database running on Oracle Cloud Infrastructure.
You can setup your own ORDS instance to use the REST Enabled SQL Service with a MySQL database over JDBC. The connection details are specified similar to how you specify for other ORDS connection pool. For MySQL JDBC connections, the `db.connectionType` is always `customurl`. The `db.customURL` property must be a valid JDBC connection string for the database. The host machine running the database must be accessible to the host machine with ORDS instance running. The MySQL database accounts to be used must be configured to permit logins from the host machine with ORDS instance running. ORDS supports connecting to Oracle hosted MySQL database servers such as the MySQL Data Service or an Oracle Compute Instance running MySQL server.

- Understanding the Database Credentials Source Setting
- Configuring a Pool for MySQL Database
  Pool configuration is required to use ORDS with MySQL database. You can configure the pool through the ORDS command line interface.

5.1.1 Understanding the Database Credentials Source Setting

For each request received, ORDS creates a JDBC connection for executing the SQL statements in the request. To create the JDBC connection, ORDS can be configured to use the pool connection details, or uses the basic authorization credentials in the request. The credentials are specified using the `db.credentials` source configuration property. Possible values are `POOL` (default value) or `REQUEST`.

> **Note**
>
> To access the REST Enabled SQL Service, a client must have the ORDS SQL developer role.

If you are using the default value as `POOL`, then the credentials in the pool configuration are used for processing any SQL statements in the request. However, the client must provide credentials for an identity management system to authorize them and assign them the SQL developer role. Only then the client can access to the REST Enabled SQL service.

If the value is set to REQUEST, then the username and password specified in the pool configuration are still required. However, these credentials are only used to verify the connection details in the pool, when the pool is used for the first time. The username and password in the basic authorization header are used to make a new JDBC connection with the target database. If a connection is established, then the client is considered to have the SQL developer role. This authorizes them to invoke the REST Enabled SQL service. The new JDBC connection is used during the request lifecycle and then closed.

5.1.2 Configuring a Pool for MySQL Database

Pool configuration is required to use ORDS with MySQL database. You can configure the pool through the ORDS command line interface.

You must configure ORDS to be able to use a MySQL database with Oracle REST Data Services (ORDS) running in a customer managed environment. Depending on where you install Oracle REST Data Services for your customer managed environment, do one of the following:

- If your customer managed environment for Oracle REST Data Services runs in Oracle Cloud Infrastructure, then use an Oracle YUM repository and perform a YUM install of ORDS.
- If your customer managed environment for Oracle REST Data Services runs in some other environment, then download ORDS from the Oracle REST Data Services Download page.

To use ORDS with MySQL database, you do not need any installation to the database, you only need to do a pool configuration. You can configure the pool through the ORDS command line interface.

To configure the pool for MySQL database, perform the following steps:

> **Note**
>
> The credentials in a request are used to execute the SQL statements. The db.username specified in the MySQL database is the user who has all the permissions to create a connection and is used to verify the overall pool configuration details.

```
ords config --db-pool mysql set db.connectionType customurl
ords config --db-pool mysql set db.customURL "jdbc:mysql://10.0.1.23/?
sslMode=REQUIRED"
ords config --db-pool mysql set db.username
user_only_has_permission_to_connect_and_nothing_more
ords config --db-pool mysql set db.credentialsSource request
ords config --db-pool mysql set restEnabledSql.active true
ords config --db-pool mysql secret db.password
```

In the preceding example,

- Any relevant properties for the JDBC driver can be specified in the db.customURL property. In the preceding example, db.customURL value, sslMode is set to REQUIRED, rather than the default value PREFERRED, to ensure a secure connection between ORDS and the MySQL server.
- The database pool is called mysql. However, the pool can have any name. The default pool can be configured as a MySQL connection pool. You can have multiple pools defined for as many MySQL databases you wish to use.

- The `db.username` specified is a MySQL database user who has sufficient permissions to create a connection. This database account is used to verify the overall pool configuration details.
- Configuring ORDS for Supported Containers

5.1.2.1 Configuring ORDS for Supported Containers

This section describes how to use ORDS with connection pool configuration in a supported container for a MySQL database.

Specifying the Configuration Location

When you are running ORDS in a standalone mode using the `ords serve` command, there are options for specifying the configuration directory location. When deploying the `ords.war` in a supported container such as Apache Tomcat or WebLogic Server, the configuration directory location must be specified by setting the `config.url` system property. The mechanism for doing this varies for different container products.

- To set the `config.url` system property before starting Apache Tomcat, run the following command:

  ```
  export JAVA_OPTS="-Dconfig.url=/scratch/my_ords_config"
  ```

- To set `config.url` system property before starting WebLogic Server, run the following command:

  ```
  export JAVA_OPTIONS="-Dconfig.url=/scratch/my_ords_config"
  ```

- Alternatively, use the `ords war` command to create a deployable web application archive file which has the `config.url` context parameter explicitly set and any `jar` files from `lib/ext` folder are included.

MySQL JDBC Jar for ORDS

ORDS does not distribute a MySQL JDBC jar. For ORDS to create a JDBC connection to a MySQL database, the relevant JDBC jar must be in the runtime classpath. Use `OCI YUM mysql-connector-java` or download MySQL Connector/J from `https://www.mysql.com/` and then copy the `jar` file to the relevant location for one of the server modes: Standalone, Apache Tomcat, or WebLogic Server.

> **ⓘ Note**
>
> The minimum required version of MySQL Connector/J is 8.0.27.

The OCI YUM RPM distribution of ORDS creates a symbolic link to the `OCI YUM mysql-connector-java` JDBC jar.

OCI YUM RPM

```
-- Install MySQL Connector/J community edition
sudo yum install mysql-connector-java

-- Confirm JDBC jar is installed
```

```
ls -l /usr/share/java/mysql-connector-java.jar

-- Install ORDS from OCI YUM repository
sudo yum install ords

-- Note that ORDS RPM install will create a symbolic link to ORDS
installation lib/ext/ directory
ls -l /opt/oracle/ords/lib/ext/
```

- ORDS Running in Standalone Mode
- ORDS Deployed in Apache Tomcat
- ORDS Deployed in Weblogic Server

5.1.2.1.1 ORDS Running in Standalone Mode

To be in the runtime classpath when running ORDS in a standalone mode, the MySQL JDBC jar must be first added to the Extension folder. The Extension folder is `lib/ext` directory in the ORDS distribution and is created through the OCI YUM RPM installation process that is outlined in the preceding section.

5.1.2.1.2 ORDS Deployed in Apache Tomcat

> **Note**
>
> When you are using Apache Tomcat, to avoid getting `java.sql.SQLException: No suitable driver` errors, it is necessary to explicitly set the JDBC Driver classname in the pool.
>
> To set the JDBC driver classname in the pool, run the following command:
>
> ```
> ords config --db-pool mysql set jdbc.driverName com.mysql.cj.jdbc.Driver
> ```

To be in the runtime classpath when ORDS is deployed in Apache Tomcat, the MySQL JDBC `jar` must be added to the server classpath or in the deployed web application. Adding the `jar` to the server classpath can be achieved in a number of ways, the most common method is adding the `jar` file to the `$CATALINA_HOME/lib` directory.

See Apache Tomcat documentation for more options and guidelines to determine the most appropriate deployment environment.

To include the JDBC `jar` in the deployed web application, ensure that it is in the the `lib/ext/` folder and uses the `ords war` command to create a deployable web application archive file which has the `config.url` context parameter explicitly set and any `jar` files from `lib/ext` folder included.

> **See Also**
>
> Apache Tomcat 8

5.1.2.1.3 ORDS Deployed in Weblogic Server

To be in the runtime classpath when ORDS is deployed in WebLogic Server, the MySQL JDBC `jar`file must be added to the server classpath or in the deployed web application. One approach to add the `jar` file to the server classpath is to specify the `jar` location in the `WEBLOGIC_CLASSPATH` environment variable in the `commEnv.cmd/sh` script.

See WebLogic Server documentation for more options and guidelines to determine the most appropriate deployment environment.

To include the JDBC `jar` in the deployed web application, ensure that it is in the the `lib/ext/` folder and uses the `ords war` command to create a deployable web application archive file which has the `config.url` context parameter explicitly set and any `jar` files from `lib/ext` included.

> **See Also**
>
> Understanding WebLogic Server Deployment

5.2 Configuring Jetty in ORDS Standalone Mode

This section describes how to configure the Eclipse Jetty Server used in ORDS standalone mode.

In a standalone mode, ORDS uses an embedded Eclipse Jetty server. The default configuration of Jetty is optimised for the most common ORDS use cases. This Jetty server configuration can be modified using certain ORDS settings as defined in Java system properties and also in the Jetty XML configuration in the following directory: `${configuration.directory}/global/standalone/etc`.

> **Note**
>
> These settings have no effect when ORDS is deployed in a container such as Apache Tomcat or Oracle WebLogic Server.

- Using Java System Properties
  This section describes how to provide a Java system property to modify the settings in the Jetty configuration used by ORDS.
- Java System Properties
  This section lists the Java system properties.
- Using Jetty XML Configuration Files
  This section describes how to configure Jetty server for additional functionality using the Jetty XML configuration files.

ⓘ **See Also**

- Eclipse Jetty server
- Understanding the Configurable Settings

5.2.1 Using Java System Properties

This section describes how to provide a Java system property to modify the settings in the Jetty configuration used by ORDS.

To specify a system property, you must use the `{{--java-options}}` at the command line and provide the Java System Property definitions as a parameter.

Example:

Example 5-1 Using the `{{--java-options}}` command line option

```
ords --java-options '-Dthreads.max=300 -Djetty.request.header.size=8192' --
config
      /path/to/config/ serve
```

ⓘ **See Also**

JDK Java Options

5.2.2 Java System Properties

This section lists the Java system properties.

Table 5-1 Java System Properties

Java System Property Name	Description	Default Value
`threads.min`	Specifies the minimum number of threads in the Jetty Server (`id="Server"`) thread pool.	10
`threads.max`	Specifies the maximum number of threads in the Jetty Server (`id="Server"`) thread pool.	200
`threads.timeout`	Specifies the maximum thread idle time in miliseconds for the Jetty Server (`id="Server"`) thread pool. Threads that are idle for longer than this period may be stopped.	60000
`jetty.send.xpoweredBy`	Specifies the `SendXPoweredBy` setting in the Jetty `HttpConfiguration` (`id="httpConfig"`)	false

Table 5-1 (Cont.) Java System Properties

Java System Property Name	Description	Default Value
`jetty.output.buffer.size`	Specifies the `OutputBufferSize` setting in the Jetty `HttpConfiguration (id="httpConfig")`	32768
`jetty.request.header.size`	Specifies the `RequestHeaderSize` setting in the Jetty `HttpConfiguration (id="httpConfig")`	65536
`jetty.response.header.size`	Set the `ResponseHeaderSize` setting in the Jetty `HttpConfiguration (id="httpConfig")`	8192
`jetty.send.server.version`	specifies the `SendServerVersion` setting in the Jetty `HttpConfiguration (id="httpConfig")`	false
`jetty.send.date.header`	Specifies the `SendDateHeader` setting in the Jetty `HttpConfiguration (id="httpConfig")`	false
`jetty.dump.start`	Specifies the `DumpAfterStart` setting in the Jetty Server `(id="Server")`	false
`jetty.dump.stop`	Specifies the `DumpAfterStop` setting in the Jetty Server `(id="Server")`	false

5.2.3 Using Jetty XML Configuration Files

This section describes how to configure Jetty server for additional functionality using the Jetty XML configuration files.

When ORDS is running in a standalone mode, the Eclipse Jetty Home is `${configuration.directory}/global/standalone/`. The Jetty XML syntax can be used to configure the Jetty Server for additional functionality by placing configuration XML files in the Jetty Home `etc` directory. The capability to do this is provided through the Eclipse Jetty server product.

> **See Also**
>
> Eclipse Jetty documentation

Examples

This section provides examples of augmenting Eclipse Jetty Server behaviour for additional functionalily. The following examples show how you can change Eclipse Jetty Server behaviour and not the ORDS behaviour. The location for Jetty XML files to be used by ORDS at the startup in standalone mode is:

```
${configuration.directory}/global/standalone/etc/
```

Example 5-2   Using a specific access log format

When the configuration setting `standalone.access.log` is provided, ORDS can produce an access log.

```
/global/standalone/etc/jetty-access-log.xml
<?xml version="1.0"?>
<!DOCTYPE Configure PUBLIC "-//Jetty//Configure//EN" "http://www.eclipse.org/
jetty/configure.dtd">
<Configure id="Server" class="org.eclipse.jetty.server.Server">
            <Set name="requestLog">
              <New id="RequestLogImpl" 
class="org.eclipse.jetty.server.CustomRequestLog">
                <Arg>/ords/ords-access.log</Arg>
                <Arg>%{remote}a - %u %t "%r" %s %O "%{Referer}i" "%{User-
Agent}i"</Arg>
              </New>
            </Set>
</Configure>
```

Example 5-3   Always returning a certain header in the response

Although this can also be achieved through a Load Balancer or Reverse Proxy in front of ORDS. If you want a specific header to be returned in every response from the ORDS server. Then use the following sample code snippet:

```
/global/standalone/etc/jetty-response.xml
<?xml version="1.0"?>
<!DOCTYPE Configure PUBLIC "-//Jetty//Configure//EN" "http://www.eclipse.org/
jetty/configure.dtd">
<Configure id="Server" class="org.eclipse.jetty.server.Server">
  <Call name="insertHandler">
  <Arg>
    <New class="org.eclipse.jetty.rewrite.handler.RewriteHandler">
      <Get id="Rewrite" name="ruleContainer" />
      <Call name="addRule">
        <Arg>
          <New id="header" 
class="org.eclipse.jetty.rewrite.handler.HeaderPatternRule">
            <Set name="pattern">*</Set>
            <Set name="headerName">Strict-Transport-Security</Set>
            <Set name="headerValue">max-age=31536000;includeSubDomains</Set>
          </New>
        </Arg>
      </Call>
    </New>
  </Arg>
</Call>
</Configure>
```

Note

In Jetty 12.0.x, the `Name` and `Value` methods of the `HeaderPatternRule` class (located in the `org.eclipse.jetty.rewrite.handler` package) have been renamed to `headerName` and `headerValue`. Ensure that your Jetty configuration files reference the appropriate Document Type Definition (DTD), as well as the correct package names, classes, interfaces, or method names for the version of Jetty in use. To confirm which embedded Jetty version your ORDS deployment is running, refer to the relevant ORDS release notes or review your ORDS Standard Output.

5.3 Support for Oracle RAC Fast Connection Failover

Oracle REST Data Services support the Fast Connection Failover (FCF) feature of Oracle Real Application Clusters (Oracle RAC).

Oracle REST Data Services runs with the Universal Connection Pool (UCP) in all the Application Server environments that it supports, such as WebLogic, Tomcat. UCP in turn supports Fast Connection Failover . To enable FCF, Oracle Notification Service (ONS) must to be enabled. To enable ONS, add entries to the list of properties in the Oracle REST Data Services `settings.xml` configuration file as shown in the following code snippet:

```
<entry key="jdbc.enableONS">true</entry>
<entry key= "jdbc.ONSConfig">nodes=racnode1:4200,racnode2:4200\nwalletfile=/
oracle11/onswalletfile</entry>
```

ONS is the messaging facility used to send the Fast Application Notification (FAN) events. When ONS is enabled, Oracle REST Data Services automatically enables FCF. To Enable specific FCF capabilities such as fail over or other advanced FCF capabilities such as load balancing, you need to add entries in the configuration file for the custom connection as shown in the following code snippet:

```
<entry key="db.connectionType">customurl</entry>
<entry key="db.customURL">jdbc:oracle:thin:@(DESCRIPTION=(FAILOVER=ON)
(ADDRESS_LIST=
        (LOAD_BALANCE=ON)(ADDRESS=(PROTOCOL=TCP)(HOST=prod_scan.example.com)
(PORT=1521)))
        (CONNECT_DATA=(SERVICE_NAME=ISPRD)))</entry>
```

After updating the `defaults.xml` configuration file, Oracle REST Data Services need to be restarted for the changes to take effect.

UCP supports Fast Connection Failover. FCF listens and responds to FAN events to deal with the following two scenarios:

- **Unplanned outages**: When RAC detects an instance failure, it generates a FAN Down event which FCF picks up. FCF then terminates all connections to the failed instance and directs all future requests to the surviving RAC instances.
- **Planned outages**: For instance, when a Database Administrator (DBA) wants to gracefully shut down a RAC instance for performing some maintenance activity. The instance shutdown generates a FAN Planned Down event which FCF picks up. FCF then directs all new requests to other RAC instances and **drains** or allows currently active transactions to complete.

> **Note**
>
> Long running transactions may need to be terminated forcefully.

5.4 Configuring ORDS with Kerberos Setup

This section explains how ORDS can be configured to reference a Kerberos file-based ticket cache and make a connection to an Oracle Database Kerberos authenticated user with the ORDS Runtime Privilege.

To configure ORDS with Kerberos setup, perform the following steps:

1. Create a new user using external authentication
2. Set up the environment variables
3. Provide a valid ticket
4. Add ORDS pool settings

1. **Create a New User using External Authentication**

   Create a new Oracle Database user using external authentication (Kerberos) and provision the user as an ORDS runtime user.

   ```
   CREATE USER ORDS_PUBLIC_KRBUSER IDENTIFIED EXTERNALLY AS
   '<kerberos_principal_name>';
   GRANT CONNECT TO "ORDS_PUBLIC_KRBUSER";
   BEGIN
        ORDS_ADMIN.PROVISION_RUNTIME_ROLE(
            p_user => 'ORDS_PUBLIC_KRBUSER',
            p_proxy_enabled_schemas => TRUE);
   END;
   /
   ```

2. **Set up the Environment Variables**

   > **Note**
   >
   > Ensure that you have a Kerberos configuration file `krb5.conf` and a file-based ticket cache

   Set up the following environment variables:

   ```
   export KRB5_CONFIG=<path to krb5.conf>
   export KRB5CCNAME=<path to credential cache>
   ```

3. **Provide a Valid Ticket**

   Provide a valid ticket in the ticket cache to get authenticated when connecting to the Oracle Database.
   `kinit <principal>`

4. **Add ORDS Pool Settings**

Add the following pool settings to the `pool.xml` file using the ticket in the ticket cache:

```
<entry key="oracle.net.authentication_services">(KERBEROS5)</entry>
<entry key="oracle.net.kerberos5_mutual_authentication">true</entry>
```

For example, to run ORDS in standalone mode with Kerberos, execute the following command:

```
ords --java-options “-Djava.security.krb5.conf=$KRB5_CONFIG” serve
```

5.5 Authorizing Oracle REST Data Services to Access Oracle Data Guard Protected Users

To access the database schema objects that are protected by an Oracle Data Vault Realm, it is necessary to grant a proxy user authorization to the Oracle REST Data Services Public User.

The following example authorizes the Oracle REST Data Services Public User, `ORDS_PUBLIC_USER` to proxy the database `HR` user:

```
begin
  DBMS_MACADM.AUTHORIZE_PROXY_USER('ORDS_PUBLIC_USER','HR');
end;
/
```

5.6 Configuring REST-Enabled SQL Service Settings

This section explains how to configure the REST- Enabled SQL service.

> **Note**
>
> Enabling the REST- Enabled SQL service enables authentication against the Oracle REST Data Service enabled database schemas. This makes the database schemas accessible over HTTPS, using the database password. Oracle highly recommends that you provide strong secure database passwords

REST- Enabled SQL service is a feature of Oracle REST Data Service. By default, the REST Enabled SQL service is turned off. To enable the REST- Enabled SQL service and the REST-Enabled SQL Export service, perform the following steps:

1. Run the following command:
   `ords --config <configuration_folder> config [--db-pool <pool_name>] set restEnabledSql.active true`
2. Restart Oracle REST Data Services.

5.7 Configuring the Maximum Number of Rows Returned from a Query

To configure maximum number of rows returned from a query, perform the following steps:

1. Run the following command:
   ```
   ords --config <configuration_folder> config set [--db-pool <pool_name>]
   misc.pagination.maxRows <number>
   ```

   > **Note**
   >
   > The default value for `misc.pagination.maxRows` is 10000.

2. Restart Oracle REST Data Services.

5.8 Configuring ICAP Server Integration for Virus Scan

This section explains how to configure ORDS to integrate with ICAP server for virus scan.

ORDS PL/SQL gateway supports the offloading of virus scanning responsibilities to an Internet Content Adaptation Protocol (ICAP) compliant virus scan server when the files are uploaded. The hostname and port of the virus scan server is specified in the `icap.server`, `icap.port`, and `icap.secure.port` global configuration properties.

APEX uses ORDS PL/SQL gateway. Once configured, this ICAP integration is also applied to file uploads in APEX.

To configure ORDS to integrate with ICAP server, perform the following steps:

1. Run the following command:

   ```
   ords --config <configuration_folder> config [--db-pool <pool_name>] set
   icap.port <number>
   ords --config <configuration_folder> config [--db-pool <pool_name>] set
   icap.server <name_or_ip>
   ```

2. Restart Oracle REST Data Services.

ICAP server must support the following requirements:

- ICAP version 1.0
- Antivirus service named AVSCAN
- Antivirus service that supports action=SCAN
- Previews of at least 4 bytes
- Return header named X-Infection-Found

Once configured, when a file is uploaded through PL/SQL Gateway, ORDS makes a request similar to the following:

```
RESPMOD icap://<icap_server>:<icap_port>/AVSCAN?action=SCAN ICAP/1.0
Host: <icap_server>:<icap_port>
Preview: 4
Allow: 204
Encapsulated: req-hdr=0 res-hdr=153 res-body=200
```

5.9 Configuring the Custom Error Pages

This section explains how to configure a custom error page instead of the error page generated by Oracle REST Data Services.

To configure a custom error page,

1. Run the following command:

   ```
   ords --config /path/to/conf config set error.externalPath /path/to/error/
   pages/folder/
   ```

   Where:

   `/path/to/error/pages/folder` is the path to a folder containing files that define the error pages. The files are stored in `{status}.html` format. Where, `{status}` is the HTTP status code for which you want to create a custom error page.

2. Restart Oracle REST Data Services

Example 5-4   Configuring custom error page for "HTTP 404" status code

To configure a custom error page for the "HTTP 404 – Not Found" status, perform the following steps:

1. Create a file named `404.html`.
2. Save it under `/usr/local/share/ords/error-pages/` folder.
3. Configure the `error.externalPath` parameter to point to `/usr/local/share/ords/errro-pages/` folder.
4. Restart Oracle REST Data Services.

5.10 Managing ORDS Administrator Privilege

Access to the `ORDS_ADMIN` PL/SQL package is provisioned through the `ORDS_ADMINISTRATOR_ROLE`. This role can be provisioned through the `ORDS_ADMIN` package to create additional ORDS administrators.

- Provisioning ORDS_ADMINISTRATOR_ROLE to a User
  This section describes how to provision `ORDS_ADMINISTRATOR_ROLE` role to a user.
- Unprovisioning ORDS_ADMINISTRATOR_ROLE from a User
  This section describes how to unprovision `ORDS_ADMINISTRATOR_ROLE` from a user.

5.10.1 Provisioning ORDS_ADMINISTRATOR_ROLE to a User

This section describes how to provision `ORDS_ADMINISTRATOR_ROLE` role to a user.

You can provision `ORDS_ADMINISTRATOR_ROLE` role to a user by using either the database `GRANT` command or through the `ORDS_ADMIN.PROVISION_ADMIN_ROLE` PL/SQL method (as an ORDS Administrator).

Example 5-5   Using Grant command

```
GRANT ORDS_ADMINISTRATOR_ROLE TO HR_ADMIN;
```

Example 5-6   Using ORDS_ADMIN package method

```
BEGIN
  ORDS_ADMIN.PROVISION_ADMIN_ROLE(
    p_user => 'HR_ADMIN');
END;
/
```

5.10.2 Unprovisioning ORDS_ADMINISTRATOR_ROLE from a User

This section describes how to unprovision `ORDS_ADMINISTRATOR_ROLE` from a user.

As an ORDS administrator, you can unprovision `ORDS_ADMINISTRATOR_ROLE` from a user by either using the database `REVOKE` command or through the `ORDS_ADMIN.UNPROVISION_ROLES` PL/SQL method.

Example 5-7   Using REVOKE command

```
REVOKE ORDS_ADMINSTRATOR_ROLE FROM HR_ADMIN;
```

Example 5-8   Using ORDS_ADMIN package method

```
BEGIN
  ORDS_ADMIN.UNPROVISION_ROLES(
    p_user => 'HR_ADMIN',
    p_administrator_role => TRUE);
 END;
 /
```

5.11 Managing ORDS Runtime Privilege

The `ORDS_RUNTIME_ROLE` database role allows a user to act as a runtime user. A runtime user can manage and configure the runtime connection resources required by an ORDS service instance. The `ORDS_PUBLIC_USER` is one such database user. When additional runtime users are provisioned, it is possible to configure discrete ORDS service instances with different destination addresses and connection pools but hosted on the same Oracle database container.

It is recommended not to re-use a runtime user for any other purpose as it accumulates the grants necessary to proxy to other users. A runtime user only requires the `CREATE SESSION` privilege in addition to the `ORDS_RUNTIME_ROLE` role.

- Provisioning ORDS_RUNTIME_ROLE to a User
  This section describes how to provision `ORDS_RUNTIME_ROLE` role to a user.
- Unprovisioning ORDS_RUNTIME_ROLE from a User
  This section describes how to unprovision the `ORDS_RUNTIME_ROLE` role from a user

5.11.1 Provisioning ORDS_RUNTIME_ROLE to a User

This section describes how to provision `ORDS_RUNTIME_ROLE` role to a user.

As an ORDS administrator, you can provision `ORDS_RUNTIME_ROLE` role to a user by using either the database `GRANT` command or through the `ORDS_ADMIN.PROVISION_ADMIN_ROLE` PL/SQL method.

Example 5-9 Using Grant command

```
GRANT ORDS_RUNTIME_ROLE TO ORDS_PUBLIC_USER_2;
```

Example 5-10 Using ORDS_ADMIN package method

```
BEGIN
  ORDS_ADMIN.PROVISION_RUNTIME_ROLE(
    p_user => 'ORDS_PUBLIC_USER_2');
END;
/
```

5.11.2 Unprovisioning ORDS_RUNTIME_ROLE from a User

This section describes how to unprovision the `ORDS_RUNTIME_ROLE` role from a user

As an administrator, you can unprovision the `ORDS_RUNTIME_ROLE` from a user, by either using the database `REVOKE` command or through the `ORDS_ADMIN.UNPROVISION_ROLES` PL/SQL method.

Example 5-11 Using REVOKE command

```
REVOKE ORDS_RUNTIME_ROLE FROM ORDS_RUNTIME_USER_2;
```

Example 5-12 Using ORDS_ADMIN package method

```
BEGIN
  ORDS_ADMIN.UNPROVISION_ROLES(
    p_user => 'ORDS_RUNTIME_USER_2',
    p_runtime_role => TRUE);
 END;
 /
```

5.12 Using OAuth2 in Non-HTTPS Environments

RESTful Services can be protected with the OAuth2 protocol to control access to nonpublic data. To prevent data snooping, OAuth2 requires all requests involved in the OAuth2 authentication process to be transported using HTTPS. The default behavior of Oracle REST Data Services is to verify that all OAuth2 related requests have been received using HTTPS. It will refuse to service any such requests received over HTTP, returning an HTTP status code of 403 Forbidden.

This default behavior can be disabled in environments where HTTPS is not available as follows:

1. Locate the folder where the Oracle REST Data Services configuration is stored, for example: `/path/to/conf`
2. Execute the following command:
   `ords --config /path/to/conf config set security.verifySSL false`

3. Restart Oracle REST Data Services if it is running.

Note that it is only appropriate to use this setting in development or test environments. It is never appropriate to use this setting in production environments because it will result in user credentials being passed in clear text.

> **Note**
>
> Oracle REST Data Services must be restarted after making configuration changes. See your application server documentation for information on how to restart applications.

5.13 Configuring ORDS Metadata Cache

This section explains how to configure the ORDS Metadata Cache.

As the number of REST services grow, the overhead of querying the database for corresponding metadata can have a negative impact on the overall service performance and throughput. Overtime, the queries for `ORDS_METADATA` views take longer time to complete. These queries are executed for every request. The ORDS metadata cache can help improve the overall response time for REST services when the number of services grow to an extent that querying the `ORDS_METADATA` views for every request becomes expensive. The ORDS metadata cache can temporarily hold a copy of privilege and module metadata in memory to reduce the number of database queries performed when a REST service request is received. The cache is enabled by default so that the changes made to the metadata are applied immediately for any subsequent request.

Table 5-2 Configuration Properties for ORDS Metadata Cache

Property	Data Type	Default Value	Description
`cache.metadata.enabled`	Boolean	`true`	Specifies a setting to enable or disable metadata caching.
`cache.metadata.timeout`	Duration	`1s`	Specifies a setting that determines for how long the metadata record remains in the cache. Longer the duration, it takes longer to view the applied changes.

5.14 Configuring ORDS to Connect with OCI Database Tools Connections

You can configure Oracle REST Data Services (ORDS) to securely connect to your Oracle Database in Oracle Cloud Infrastructure (OCI) by leveraging OCI database tools connections.

This configuration approach, enables you to centralize the management of your database connection details, including the critical credentials for the Oracle runtime user (`ORDS_PUBLIC_USER`) and database wallets. Instead of embedding sensitive information directly in your ORDS configuration files, you can store and manage them securely within the OCI service. This not only simplifies the credential rotation and administration but also eliminates the need to store passwords on the compute instance.

To fetch the connection details from the centralized OCI service, ORDS must first authenticate to OCI. This can be achieved using one of the following two authentication methods:

- **Instance Principal:** For ORDS running on an OCI compute instance.
- **OCI Profile:** For ORDS running on any machine with a configured OCI CLI profile.

Prerequisites

Ensure you have the following requirements

- ORDS version 25.2.0 or higher is installed.
- Oracle Database (for example: Autonomous Database) in your OCI tenancy is installed.
- OCI database tools connection that was created for your target database. This connection must be configured with the database credentials for the ORDS runtime user (for example: `ORDS_PUBLIC_USER`)

  > **See Also**
  >
  > Creating a Connection

- Clean up all connection properties in the Oracle REST Data Services (ORDS) pool configuration that are no longer required. For each pool (using `--db-pool <pool-name>`), run the following commands to remove the outdated properties:

  ```
  ords config --db-pool <pool-name> delete db.hostname

  ords config --db-pool <pool-name> delete db.port

  ords config --db-pool <pool-name> delete db.servicename

  ords config --db-pool <pool-name> delete db.username
  ```

- Using Instance Principal Authentication
  This section describes how to authenticate using instance principal.
- Using OCI Profile Authentication
  This section describes the usage of OCI profile authentication method.

5.14.1 Using Instance Principal Authentication

This section describes how to authenticate using instance principal.

Oracle highly recommends using instance principal method as it is more seamless when ORDS is running on an OCI compute instance such as VM or container instance.

Prerequisites for using Instance Principal method

Your OCI compute instance must be configured as an instance principal, which involves adding it to a dynamic group and creating policies that grant it permission to access the database tools service.

Configuration Steps

Preform the following steps to authenticate using instance principal:

1. Configure the pool to use the Database Tools Connection type:

   ```
   ords config --db-pool <pool-name> set db.connectionType
   databaseToolsConnection
   ords config --db-pool <pool-name> set db.databaseToolsConnection <dbtools-
   connection-ocid>
   ```

2. Set `db.connectionType` to `databaseToolsConnection` and provide the OCID for `databaseToolsConnection`. The `db.authProvider` setting is not required, as it defaults to `oci-instance-principal`.
   Updated sample pool.xml file

   ```
   <?xml version="1.0" encoding="UTF-8"?>
   <!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
   <properties>
       <comment>Pool configuration for OCI DBTools Connection</comment>
       <entry key="db.connectionType">databaseToolsConnection</entry>
       <entry
   key="db.databaseToolsConnection">ocid1.databasetoolsconnection.oc1.eu-
   frankfurt-1.amaaaaaa.....</entry>

       <!-- Other pool settings -->
       <entry key="feature.sdw">true</entry>
       <entry key="restEnabledSql.active">true</entry>
   </properties>
   ```

3. Save the `pools.xml` file and restart ORDS.

ORDS automatically uses the identity of the instance to get authentication for OCI, retrieves the connection details from the specified database tools connection and establishes the database pool.

5.14.2 Using OCI Profile Authentication

This section describes the usage of OCI profile authentication method.

OCI profile authentication method is used when you are running ORDS outside of an OCI compute instance (for example: on-premises, on your local machine, or in another cloud) and you need to connect to a database in OCI.

Prerequisites for OCI Profile authentication

You must have the OCI Command Line Interface (CLI) installed and configured with a profile that has the necessary permissions to access the database tools service.

> **See Also**
>
> - Installing the CLI
> - SDK and CLI Configuration File

Configuration Steps

Perform the following steps to configure OCI CLI profile to authenticate and retrieve the connection details:

1. Configure the pool as follows:

   ```
   ords config --db-pool default set db.connectionType
   databaseToolsConnection
   ords config --db-pool default set db.databaseToolsConnection <dbtools-
   connection-ocid>
   ords config --db-pool default set db.authProvider oci-profile
   ords config --db-pool default set db.ociProfile <your-oci-profile>
   ```

2. Set `db.connectionType` to `databaseToolsConnection`.
3. Set `db.authProvider` to `oci-profile`.
4. Provide the OCID for `db.databaseToolsConnection`.
5. If your OCI CLI profile is not named `DEFAULT`, then specify it using the `db.ociProfile` setting. This step is optional.
   Updated sample pool.xml file

   ```
   <?xml version="1.0" encoding="UTF-8"?>
   <!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
   <properties>
       <comment>Pool configuration for OCI DBTools Connection using OCI
   Profile</comment>
       <entry key="db.connectionType">databaseToolsConnection</entry>
       <entry key="db.authProvider">oci-profile</entry>
       <entry
   key="db.databaseToolsConnection">ocid1.databasetoolsconnection.oc1.iad.amaa
   aaaa.....</entry>

       <!-- To use a specific profile named 'my-work-profile' -->
       <!-- <entry key="db.ociProfile">my-work-profile</entry> -->

       <!-- Other pool settings -->
       <entry key="feature.sdw">true</entry>
       <entry key="restEnabledSql.active">true</entry>
   </properties>
   ```

6. Save the file and restart ORDS.

ORDS uses the credentials from your configured OCI CLI profile to authenticate and retrieve the connection details.

6

Deploying and Monitoring Oracle REST Data Services

This chapter discusses how to deploy and monitor ORDS.

- Deploying Oracle REST Data Services
- Monitoring Oracle REST Data Services

6.1 Deploying Oracle REST Data Services

To deploy Oracle REST Data Service, you can choose one of the following options:

- Serve Commands for Running in Standalone Mode
- Oracle WebLogic Server
- Apache Tomcat
- Oracle Cloud Infrastructure

- Serve Commands for Running in Standalone Mode
  This section describes the serve command options for running in standalone mode.
- Oracle WebLogic Server
- Apache Tomcat
- Oracle Cloud Infrastructure

6.1.1 Serve Commands for Running in Standalone Mode

This section describes the serve command options for running in standalone mode.

Although Oracle REST Data Services supports the Java EE application servers, you also have the option of running it in standalone mode. This section describes how to run Oracle REST Data Services in a standalone mode.

Standalone mode is suitable for development use and is supported in production deployments. Standalone mode, however, has minimal management capabilities when compared to most Java EE application servers and may not have adequate management capabilities for production use in some environments.

> **Note**
>
> If you are planning to use the Oracle API for MongoDB, then you must install Oracle REST Data Services in a standalone mode. See Enabling and Configuring the Oracle Database API for MongoDB for more information.

- Non-Interactive Serve CLI
- Serve Command Options

- Converting a Private Key to DER (Linux and Unix)
- Configuring a Doc Root for Non-APEX Static Resources

6.1.1.1 Non-Interactive Serve CLI

The non-interactive serve CLI reads the standalone settings from the global `settings.xml` file located in the user-specified configuration folder or the default configuration folder. Some standalone settings contain default values if it is a required setting (for example: http port, context path, and so on.) that does not exist.

```
$ ords --config <CONFIG_PATH> serve
$ ords --config <CONFIG_PATH> serve --port 8777 --apex-images /path/to/apex/
images
```

Example:

Create the Standalone Settings

> **Note**
>
> You can configure and start ORDS using the interactive install command.

- You can create, update, or delete the standalone settings using the following config CLI command:

  ```
  ords --config <your configuration folder> config set standalone.context.path /
  ords
  ```
- If you are using APEX, then you must provide the path to APEX images as follows:

  ```
  ords --config <your configuration folder> config set standalone.static.path /
  path/to/apex/images
  ```
- If you are using HTTP protocol, then specify the following command:

  ```
  ords --config <your configuration folder> config set standalone.http.port 8443
  ```
- If you are using a certificate, then specify the following command:

  ```
  ords --config <your configuration folder> config set
  standalone.https.cert /path/to/certificate/mycert.crt
  ords --config <your configuration folder> config set
  standalone.https.cert.key /path/to/certificate/mycert.key
  ```

6.1.1.2 Serve Command Options

Long Option	ShortOption	Description
`--apex-images-context-path <STATIC_CONTEXT_PATH>`		Specifies the context path where APEX static resources are located, defaults to `/i`.

Long Option	ShortOption	Description
`--certificate <SSL_CERTIFICATE_PATH>`		Sets the certificate file for HTTPS, implies `--secure/--ssl` SSL certificate path. If you are providing the SSL certificate, you must specify the certificate location.
`--config <CONFIG_PATH>`	`c <CONFIG_PATH>-`	Specifies the path to the folder containing the configuration files.
`--context-path <CONTEXT_PATH>`		Sets the first part of the path of the URL from which ORDS is served. Defaults to `/ords`
`--document-root <DOCUMENT_ROOT_PATH>`		Specifies the path from which static files are served at the root of the server. The context path takes priority over static files that have the same name.
`--ip-addresses <INTERFACE_IP>`		Specifies ORDS which interface to bind to, use 0.0.0.0 (The default) to bind to all the network interfaces.
`--key <SSL_KEY_PATH>`		Sets the certificate key to use for HTTPS, implies `--secure/-ssl, requires --certificate`. Specifies the SSL certificate key path. If you are providing the SSL certificate, you must specify the certificate key location.
`--port <PORT>`		Specifies the HTTP listen port, default value is 8080. Set the port on which the server should run.
`--secure`		Specifies HTTPS listen port, default value is 8443. Must specify options `--secure --port <PORT>` to use HTTPS. Starts the server with HTTPS capabilities

6.1.1.3 Converting a Private Key to DER (Linux and Unix)

Usually, you would have created a private key and a Certificate Signing Request before obtaining your signed certificate. The private key needs to be converted into DER in order for Oracle REST Data Services to read it properly.

For example, assume that the original private key was created using the OpenSSL tool with a command similar to either of the following:

```
openssl req -new -newkey rsa:2048 -nodes -keyout yourdomain.key -out
yourdomain.csr
```

or

```
openssl genrsa -out private.em 2048
```

In this case, you must run a command similar to the following to convert it and remove the encryption: openssl pkcs8 -topk8 -inform PEM -outform DER -in yourdomain.key -out yourdomain.der -nocrypt

```
openssl pkcs8 -topk8 -inform PEM -outform DER -in yourdomain.key -out
yourdomain.der -nocrypt
```

After doing this, you can include the path to your certificate and and the key of the certificate. Example: `yourdomain.crt, yourdomain.der`, when you are prompted while using the `ords` install interactive command.

You can also add or modify the entries using the following ORDS configuration set commands:

```
ords --config <your configuration folder> config set standalone.https.cert
      /path/to/yourdomain.crt
```

```
ords --config <your configuration folder> config set standalone.https.cert.key
      /path/to/yourdomain.der
```

Verify your configuration settings using the following command:

```
ords --config <your configuration folder> config list
```

Also, ensure that your https port configuration setting, `standalone.https.port` contains a value:

```
ords --config <your configuration folder> config set standalone.https.port
8443
```

6.1.1.4 Configuring a Doc Root for Non-APEX Static Resources

You can configure a doc root for standalone mode to deploy static resources that are outside the `/i` folder that is reserved for APEX static resources.

To do so, execute the following command:

```
ords --config /path/to/conf config set standalone.doc.root /var/www/html.
```

The preceding example makes any resource located within `/var/www/html` available under `http://`*`server:port/`*. For example, if the file `/var/www/html/hello.txt` exists, it will be accessible at `http://`*`server:port`*`/hello.txt`.

The value specified for `standalone.doc.root` is stored in `${config.dir}/global/settings.xml` in the `standalone.doc.root property`. If a custom doc root is not specified, then the default doc root value of `${config.dir}/global/doc_root` is used. Any file placed within this folder is available at the root context.

This approach has the following features and considerations:

- HTML resources can be addressed without their file extension. For example, if a file named `hello.html` exists in the doc root, it can be accessed at the URI `http://`*`server:port`*`/hello`.

- Attempts to address a HTML resource with its file extension are redirected to the location without an extension. For example, if the URI `http://server:port/hello.html` is accessed, then the client is redirected to `http://server:port/hello`.

  The usual practice is to serve HTML resources without their file extensions, so this feature facilitates that practice, while the redirect handles the case where the resource is addressed with its file extension.
- Index pages for folders are supported. If a folder contains a file named `index.html` or `index.htm`, then that file is used as the index page for the folder. For example, if `/var/www/html` contains `/abc/xyz/index.html`, then accessing `http://server:port/abc/xyz/` displays the contents of `index.html`.
- Addressing a folder without a trailing slash causes a redirect to the URI with a trailing slash. For example, if a client accesses `http://server:port/abc/xyz`, then the server issues a redirect to `http://server:port/abc/xyz/`.
- Resources are generated with weak etags based on the modification stamp of the file and with a Cache Control header that causes the resources to be cached for 1 hour.

6.1.2 Oracle WebLogic Server

This section describes how to deploy Oracle REST Data Services on Oracle WebLogic Server. It assumes that you have completed the installation process and are familiar with Oracle WebLogic Server. If you are unfamiliar with domains, managed servers, deployment, security, users and roles, refer to your Oracle WebLogic Server documentation.

Topics:

- About Oracle WebLogic Server
- Configuring Oracle APEX Images
- Launching the Administration Server Console
- Deploying ORDS on Oracle WebLogic Server
- Configuring WebLogic to Handle HTTP Basic Challenges Correctly
- Verifying the State and Health of ords and i

- About Oracle WebLogic Server
- Configuring Oracle APEX Images
- Launching the Administration Server Console
- Deploying ORDS on Oracle WebLogic Server
- Configuring WebLogic to Handle HTTP Basic Challenges Correctly
- Verifying the State and Health of ords and i

6.1.2.1 About Oracle WebLogic Server

You can download Oracle WebLogic Server from Oracle Technology Network.

To learn more about installing Oracle WebLogic Server, see *Oracle Fusion Middleware Getting Started With Installation for Oracle WebLogic Server* and *Oracle Fusion Middleware Installation Guide for Oracle WebLogic Server*.

ⓘ **See Also**

Oracle Fusion Middleware Software Downloads

6.1.2.2 Configuring Oracle APEX Images

This section is only applicable if you are using Oracle APEX. If you are not using Oracle APEX, then you can skip this section that provides details about configuring Oracle APEX Images.

If you are using Oracle APEX, then the Oracle APEX image files for that Oracle APEX version must also be accessible to the end user. It is recommended that you configure the Oracle APEX instance wherever applicable to use the resources from the Oracle Content Network. The use of the Oracle CDN may not be feasible when you are using Oracle APEX in a network that restricts internet access. In such a scenario, you must deploy a web application to provide the Oracle APEX image files.

Before you begin, you must identify the directory where you extracted the Oracle APEX distribution. In the following steps, this directory is referred to as `<apex directory>`. You then define a WebLogic web application which refers to this location and deploy that web application with a context-root value which is the default Oracle APEX image prefix: `i`.Create a directory which is the source for your web archive. In that directory, create a `WEB-INF` directory with the following files:

web.xml

```
<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE web-app PUBLIC
"-//Sun Microsystems, Inc.//DTD Web Application 2.3//EN"
"http://java.sun.com/j2ee/dtds/web-app_2_3.dtd">

<web-app>
 <!-- This Web-App leverages the alternate doc-root functionality in WebLogic
to serve static content
      For WebLogic refer to the weblogic.xml file in this folder
  -->
</web-app>
```

weblogic.xml

```
<weblogic-web-app xmlns="http://www.bea.com/ns/weblogic/weblogic-web-app">
 <!-- This element specifies the context path the static resources are served
from -->
 <context-root>/i</context-root>
 <virtual-directory-mapping>
  <!-- This element specifies the location on disk where the static resources
are located -->
  <local-path>/scratch/apex/apex_21.2_en/images</local-path>
  <url-pattern>/*</url-pattern>
 </virtual-directory-mapping>
</weblogic-web-app>
```

Ensure that the local-path value in the weblogic.xml corresponds to your <apex directory>/images directory.

Where:

- *<apex directory>* is the directory location of Oracle APEX.

Create a Web Application with the `web.xml` and `weblogic.xml` files

```
jar cMf i.war WEB-INF/web.xml WEB-INF/weblogic.xml
```

> **Note**
>
> Do not perform this action in the ORDS product directory. No other `war` file other than `ords.war` should exist in the ORDS product directory.

The created images WAR does not contain the static resources; instead, it references the location where the static resources are stored. Therefore the static resources must be available at the specified path on the server where the WAR is deployed.

Deploy the `i.war` file to your WebLogic Server following the deployment steps that are applicable to your WebLogic Server environment. Once deployed, access the following URL to verify that the content is available:

```
http(s)://hostname:port/i/apex_version.txt
```

In response, the Oracle APEX version you have configured is displayed.

> **Tip**
>
> The `i.war` has a context-root with value `/i`. This is the default Oracle APEX image prefix. If you have configured Oracle APEX with the different image prefix value, then the context-root must be changed to that value.

6.1.2.3 Launching the Administration Server Console

To launch the Administration Server console:

1. Start an Administration Server.
2. Launch the WebLogic Administration Console by typing the following URL in your web browser:

   `http://<host>:<port>/console`

   Where:

   - *<host>* is the DNS name or IP address of the Administration Server.
   - *<port>* is the port on which the Administration Server is listening for requests (port `7001` by default).
3. Enter your WebLogic Administrator username and password.
4. If your domain is in *Production* mode, click the **Lock & Edit** button on the left-pane below the submenu Change Center. If your domain is in *Development* mode, this button does not appear.

6.1.2.4 Deploying ORDS on Oracle WebLogic Server

> **Tip**
>
> The Oracle REST Data Services files, `ords.war` and `i.war`, must be available before you start this task.

> **Note**
>
> When you run ORDS in standalone mode using the ORDS `serve` command, you can specify the location of the configuration directory.
>
> For deploying the `ords.war` in a supported container such as WebLogic Server, you must specify the configuration directory location. To do this, use one of the following approaches:
>
> - The recommended approach is to generate a Web Application archive file with the configuration directory location specified for that `war` file.
> - Set the `config.url` system property in the managed server so that it applies to all the ORDS deployments.
>   To generate the `war` file, use the `ords war` command.
>
>   To set the `config.url` system property, before starting WebLogic Server, run this command: `export JAVA_OPTIONS="-Dconfig.url=/scratch/my_ords_config"`

To deploy:

1. Go to the WebLogic Server Home Page. Below Domain Configuration, select **Deployments**.

   The Summary of Deployments is displayed.
2. Click **Install**.
3. Specify the location of the `ords.war` file and click **Next**.

   The `ords.war` file is located in the folder where you unzipped the Oracle REST Data Services ZIP file.

   > **Tip**
   >
   > WebLogic Server determines the context root from the file name of a WAR archive. If you need to keep backward compatibility, so that URLs are of the form *http://server/apex/...* rather than *http://server/ords/...*, then you must rename `ords.war` to `apex.war` before the deployment.

   The Install Application assistant is displayed.
4. Select **Install this deployment as an application** and click **Next**.
5. Select the servers and/or clusters to which you want to deploy the application or module and click **Next**.

> ✓ **Tip**
>
> If you have not created additional Managed Servers or clusters, you do not see this assistant page.

6. In the Optional Settings, specify the following:
   a. Name - Enter:

      ```
      ords
      ```

   b. Security - Select the following:

      Custom Roles: Use roles that are defined in the Administration Console; use policies that are defined in the deployment descriptor

   c. Source accessibility - Select:

      Use the defaults defined by the deployment's targets

7. Click **Next**.

   A summary page is displayed.

8. Under Additional configuration, select one of the following:
   - **Yes, take me to the deployment's configuration** - Displays the Configuration page.
   - **No I will review the configuration later** - Returns you to the Summary of Deployments page.

9. Review the summary of configuration settings that you have specified.
10. Click **Finish**.
11. Repeat the previous steps to deploy the `i.war` file.

    In the optional settings, specify the following:

    a. Name - Enter:

       ```
       i
       ```

    b. Security - Select:

       Custom Roles: Use roles that are defined in the Administration Console; use policies that are defined in the deployment descriptor

    c. Source Accessibility - Select:

       Use the defaults defined by the deployment's targets

12. If your domain is in Production Mode, then on the Change Center click **Activate Changes**.

Related Topics

- Installing and Configuring Oracle REST Data Services
  This chapter describes how to install, configure, and upgrade Oracle REST Data Services (ORDS).
- Configuring Oracle APEX Images

6.1.2.5 Configuring WebLogic to Handle HTTP Basic Challenges Correctly

By default WebLogic Server attempts to intercept all HTTP Basic Authentication challenges. This default behavior needs to be disabled for Oracle REST Data Services to function correctly. This is achieved by updating the `enforce-valid-basic-auth-credentials` flag. The WebLogic

Server Administration Console does not display the `enforce-valid-basic-auth-credentials` setting. You can use WebLogic Scripting Tool (WLST) commands to check, and edit the value in a running server.

The following WLST commands display the domain settings:

```
connect('weblogic','weblogic','t3://localhost:7001')
cd('SecurityConfiguration')
cd('mydomain')
ls()
```

If the domain settings displayed, contains the following entry:

```
-r--   EnforceValidBasicAuthCredentials             true
```

Then you must set this entry to `false`.

To set the entry to `false`, use the WLST commands as follows:

```
connect('weblogic', 'weblogic', 't3://localhost:7001')
edit()
startEdit()
cd('SecurityConfiguration')
cd('mydomain')
set('EnforceValidBasicAuthCredentials','false')
save()
activate()
disconnect()
exit()
```

> **Note**
>
> WebLogic Server must be restarted for the new settings to take effect.

In the preceding example:

- `weblogic` is the WebLogic user having administrative privileges
- `weblogic` is the password
- `mydomain` is the domain
- The AdminServer is running on the `localhost` and on port `7001`

Related Topics

- WebLogic Server Command Reference

6.1.2.6 Verifying the State and Health of ords and i

In the Summary of Deployments, select the **Control** tab and verify that both the `ords` and `i` State are Active and the Health status is OK.

If `ords` and/or `i` are not Active, then enable them. In the Deployments table, select the check box next to `ords` and/or `i`. Click **Start** and select **Servicing all requests** to make them active.

6.1.3 Apache Tomcat

This section describes how to deploy Oracle REST Data Services on Apache Tomcat.

Topics:

- About Apache Tomcat
- Configuring Oracle APEX Images
- Deploying ORDS on Apache Tomcat

- About Apache Tomcat
- Configuring Oracle APEX Images
- Deploying ORDS on Apache Tomcat

6.1.3.1 About Apache Tomcat

> **Tip**
>
> This section assumes that you have completed the installation process and are familiar with Apache Tomcat. If you are unfamiliar with domains, servers, applications, security, users and roles, see your Apache Tomcat documentation.

You can download Apache Tomcat from:

> **See Also**
>
> Tomcat 8 Software Downloads

6.1.3.2 Configuring Oracle APEX Images

This section is only applicable if you are using Oracle APEX. If you are not using Oracle APEX, then you can skip this section that provides details about configuring Oracle APEX Images.

If you are using Oracle APEX, then the Oracle APEX image files for that Oracle APEX version must also be accessible to the end user. It is recommended that you configure the Oracle APEX instance wherever applicable to use the resources from the Oracle Content Network.

The use of the Oracle CDN may not be feasible when using Oracle APEX in a network that restricts internet access. In such a scenario, you must deploy a web application to provide the Oracle APEX image files.

To configure Oracle APEX Images on Apache Tomcat:

- Copy the contents of the `<apex directory>/images` folder to `<Tomcat directory>/webapps/i/`.

  Where:

  – `<apex directory>` is the directory location of the Oracle APEX distribution.

- *<Tomcat directory>* is the folder where Apache Tomcat is installed.

6.1.3.3 Deploying ORDS on Apache Tomcat

Tip

The Oracle REST Data Services file `ords.war` must be available before you start this task.

Note

When you run ORDS in standalone mode using the ORDS `serve` command, you can specify the location of the configuration directory.

For deploying the `ords.war` in a supported container such as Apache Tomcat, you must specify the configuration directory location. To do this, use one of the following approaches:

- The recommended approach is to generate a Web Application archive file with the configuration directory location specified for that `war` file.
- Set the `config.url` system property in the managed server so that it applies to all the ORDS deployments.
  To generate the `war` file, use the `ords war` command.

  To set the `config.url` system property, before starting Apache Tomcat, run this command: `export JAVA_OPTS="-Dconfig.url=/scratch/my_ords_config"`

To deploy ORDS on Apache Tomcat:

1. Move the `ords.war` file into the `webapps` folder where Apache Tomcat is installed.

   Tip

   Apache Tomcat determines the context root from the file name of a WAR archive. If you need to keep backward compatibility, so that URLs are of the form *http://server/apex/...* rather than *http://server/ords/...*, then you must rename `ords.war` to `apex.war` before moving it into to the `webapps` folder.

2. Access Oracle APEX by typing the following URL in your web browser:

   ```
   http://<hostname>:<port>/ords/
   ```

   Where:

   - *<hostname>* is the name of the server where Apache Tomcat is running.
   - *<port>* is the port number configured for Apache Tomcat application server.

Related Topics

- Installing and Configuring Oracle REST Data Services
  This chapter describes how to install, configure, and upgrade Oracle REST Data Services (ORDS).

- Configuring Oracle APEX Images

6.1.4 Oracle Cloud Infrastructure

As a cloud user, you can deploy Oracle REST Data Services with high availability on Oracle Cloud Infrastructure.

Topics:

- About Oracle Cloud Infrastructure (OCI)
- Configuring ORDS for High Availability on Oracle Cloud Infrastructure
- Advantages of Deploying ORDS with High Availability on Oracle Cloud Infrastructure

- About Oracle Cloud Infrastructure
- Configuring ORDS for High Availability on Oracle Cloud Infrastructure
- Advantages of Deploying ORDS with High Availability on Oracle Cloud Infrastructure

> ⓘ **See Also**
>
> Reference Architecture: Deploying ORDS with High Availability

6.1.4.1 About Oracle Cloud Infrastructure

Oracle Cloud Infrastructure (OCI) is a set of complementary cloud services that enable you to build and run a wide range of applications and services in a highly available hosted environment. Oracle Cloud Infrastructure offers high-performance compute capabilities (as physical hardware instances) and storage capacity in a flexible overlay virtual network that is securely accessible from your on-premises network.

6.1.4.2 Configuring ORDS for High Availability on Oracle Cloud Infrastructure

You can choose to use the following configurations for high availability of ORDS on Oracle Cloud Infrastructure. Your requirements might differ from the configurations described in this section.

- When you create a VCN, determine the number of CIDR blocks required and the size of each block based on the number of resources that you plan to attach to subnets in the VCN. When you design the subnets, consider your traffic flow and security requirements.
- Use Oracle Cloud Guard to proactively monitor and maintain the security of your resources in Oracle Cloud Infrastructure.
- For production applications, the Oracle database instance should be adhering to Oracle Maximum Availability Architecture (MAA) deployment model in OCI.
- When using RAC with the Oracle Database, ensure that the database connection information used by ORDS is pointing to the SCAN listener and not an individual node.
- You can create load balancers with upper and lower bounds to help scale based on the number of requests coming in. It can be as small as 10mbps up to 8000mbps.

6.1.4.3 Advantages of Deploying ORDS with High Availability on Oracle Cloud Infrastructure

Following are the advantages of deploying ORDS on Oracle Cloud Infrastructure:

- Compute, load balancers, and Database Cloud Instances can all scale to handle increased load. Additional instances can be quickly created and added to the Load Balancer configuration with the compute or ORDS tier. For Exadata Cloud Service, the X8M platform can not only scale CPU, but also the nodes can be added to the RAC cluster to add additional computing power.
- Ensure that your subnet and NSG ingress/egress uses very granular rules. To get access to a compute or database tier, use Bastion as a Service, this ensures that only authorized users can access these instances and is also a much more secure method than exposing SSH ports to the public internet.
- For database deployments, adhere to the Oracle Maximum Availability Architecture (MAA) guide.
- Auto-scaling and scaling in general for each compute and database tier helps control costs and you need to pay only for what is being used with no excess or wasted CPU, memory, or instances. Using a flexible load balancer can also control costs.

6.2 Monitoring Oracle REST Data Services

Standard Java runtime environment diagnostic and monitoring tools are used to gain an insight on the health of an Monitoring Oracle REST Data Services (ORDS) instance running in Apache Tomcat, WebLogic Server, or a standalone mode. These tools track the memory and CPU usage, stuck threads, and other resources. ORDS provides additional insight through the ORDS instance API. The metrics available through the instance API makes it possible to check the status (valid or invalid) of the database pools and to gauge how the pools are being used. This helps in determining the actual load on the system and inform configuration changes in the future.

Topics:

- Using the Instance API
- Using OpenTelemetry with Oracle REST Data Services
- ORDS CLI Commands for Managing Pools Using JMX

- Using the Instance API
- Using OpenTelemetry with Oracle REST Data Services
  This section describes how to configure ORDS to use OpenTelemetry.
- ORDS CLI Commands for Managing Pools Using JMX
  This section describes the ORDS CLI commands to list or destroy the connection pools through JMX based pool management.
- Using OCI Monitoring Service with Oracle REST Data Services
  This section describes how to configure ORDS to send metrics to the Oracle Cloud Infrastructure (OCI) monitoring service and configure alarms.
- Using OCI Logging Service with Oracle REST Data Services
  This sections describes how to configure Java logging in ORDS for JSON-formatted output and on how to set up an agent to forward these logs to the OCI logging service.

6.2.1 Using the Instance API

The ORDS instance API service neither provides access to the database nor does it require the client to specify a database user for authentication. However, the ORDS instance returns information on the database pools. The instance API can be used as a basic health check service. To get a summary of the number of valid and invalid database pools, send a GET request to `/ords/_/instance-api/stable/status`. For example: `curl --user sysadmin:oracle http://<server>/ords/_/instance-api/stable/status`. This service returns a count of valid and invalid pools. It also returns links to additional information with more details on the database pools cache.

ORDS can be deployed as a single instance or in a cluster. In a cluster, you must address each instance directly to get the specific information about that specific instance as the database pool statistics for one instance may differ from the other instance. However, if the load balancer routes to each instance in a round robin basis (as recommended), then every instance will have similar pool statistics.

- Enabling the ORDS Instance API
  This section explains how to enable the ORDS instance API.
- Authorization for Using the ORDS Instance API
- API Document

6.2.1.1 Enabling the ORDS Instance API

This section explains how to enable the ORDS instance API.

To enable the ORDS instance API, use the following:

- `ords -config /path/to/config config set -global instance.api.enabled true`
- Restart ORDS

6.2.1.2 Authorization for Using the ORDS Instance API

The System Administrator role is required to use the ORDS instance API. For production environments, it is recommended that a user with this role is configured through the mid-tier.

6.2.1.3 API Document

An OpenAPI description of the ORDS instance API services is available at `http://<server>/ords/_/instance-api/stable/metadata-catalog/openapi.json`.

6.2.2 Using OpenTelemetry with Oracle REST Data Services

This section describes how to configure ORDS to use OpenTelemetry.

ORDS can be configured to provide telemetry data (metrics, logs, and traces) through OpenTelemetry. OpenTelemetry, also known as OTEL in short, is a vendor-neutral open-source observability framework for instrumenting, generating, collecting, and exporting telemetry data to assist in the analysis and tuning of software systems. As an industry standard it is natively supported by a number of vendors.

Configure ORDS to export telemetry data to an OpenTelemetry compliant collector

Perform the following steps to run ORDS to exports telemetry data to an OpenTelemetry collector:

1. Download the latest OpenTelemetry Java Agent.
2. Configure OpenTelemetry Java Agent

> **See Also**
>
> - Download OpenTelemetry Java agent
> - Configure OpenTelemetry Java Agent

3. Add `-javaagent` option using `--java-options` parameter when using ORDS standalone or `CATALINA_OPTS` environment variable for Tomcat.

The following example configures OpenTelemetry agent to export telemetry data to an OpenTelemetry Collector, running on host `otel-collector-host` and running ORDS in a standalone mode:

```
export OTEL_SERVICE_NAME=ords
export OTEL_METRICS_EXPORTER=none
export OTEL_TRACES_EXPORTER=otlp
export OTEL_EXPORTER_OTLP_ENDPOINT=http://otel-collector-host:4317
export JDK_JAVA_OPTIONS=
ords --java-options "-javaagent:/path/to/opentelemetry-javaagent.jar" --
config /path/to/config serve
```

When you deploy ORDS on Apache Tomcat or Oracle WebLogic Server, the same Java Agent and environment variables can be specified. See Apache Tomcat or Oracle WebLogic server documentation for the most appropriate approach to use for that platform.

Configuring OpenTelemetry Collector to export telemetry data to Oracle APM

Oracle APM provides a comprehensive set of features to monitor the applications. It supports OpenTelemetry tracing.

To export telemetry traces to APM, perform the following steps:

1. Create an APM Domain in OCI.
2. Record the `<Data upload endpoint>` of the APM domain.
3. Create and record the `<Private Data Key>` of the APM domain.
4. Install `otelcol`.
   Refer to OpenTelemetry documentation for the installation instructions
5. Configure the `Zipkin` exporter in the `otelcol` configuration file. For example: `/etc/otelcol/config.yaml` on `Linux`. Replace `<Data Upload Endpoint>` and `<Private Data Key>` with the actual endpoints and keys.
   Example code snippet:

Language: yml

```
extensions:
  health_check:
  pprof:
    endpoint: 0.0.0.0:1777
  zpages:
    endpoint: 0.0.0.0:55679

receivers:
  otlp:
    protocols:
      grpc:
      http:

processors:
  batch:

exporters:
  logging:
    verbosity: detailed

  zipkin:
    endpoint: "<Data Upload Endpoint>/20200101/observations/private-span?
dataFormat=zipkin&dataFormatVersion=2&dataKey=<Private Data Key>"

service:
  pipelines:
    traces:
      receivers: [otlp]
      processors: [batch]
      exporters: [logging, zipkin]

    metrics:
      receivers: [otlp]
      processors: [batch]
      exporters: [logging]

  extensions: [health_check, pprof, zpages]
```

6. Run the `otelcol` service with the updated configuration.
   With this configuration, OpenTelemetry Collector (`otelcol`) exports telemetry traces to Oracle APM using the `Zipkin` exporter with the specified `<Data Upload Endpoint>` and `<Private Data Key>`

> **Note**
>
> The `OTEL_xxxx` environment variables are described in detail in OpenTelemetry documentation.

See Also

- OpenTelemetry Documentation
- Apache Tomcat
- Oracle WebLogic Server

6.2.3 ORDS CLI Commands for Managing Pools Using JMX

This section describes the ORDS CLI commands to list or destroy the connection pools through JMX based pool management.

ORDS pool command uses the Java Attach API to connect to the local Java process running ORDS and then lists or destroys the Universal Connection Pools (UCP) through JMX based pool management.

See Also

- JMX based pool management
- Attach API
- Local Monitoring and Management Using JConsole

In order to use the `ords pool` command:

- ORDS must have JMX UCP enabled. It is enabled by default.
- You must specify the Oracle REST Data Services instance process ID.

The `ords pool` command can be used to list the pools or destroy the pools without the need to restart the service.

- **List the pools in a running ORDS instance**:

  Note

  Before running the `list` command, identify the process ID of the ORDS instance. To identify the process ID of the ORDS instance, use the command `jps -ml` to list the running Java processes on the local host.

  Run the following command to list the available pools, specify the identified process ID:

  ```
  ords pool --pid 3459 list
  ```

  In response, the list of available pools is displayed in the console.

- **Destroy a pool in a running ORDS instance**:
  To destroy the specified pool name:

  Run the following destroy command specifying the process ID and the pool name enclosed in double quotes:

  ```
  ords pool --pid 3459 destroy "|pdb2|lo|-2023-05-24T21-28-03.076379Z"
  ```

  A message is displayed indicating that the pool has been destroyed

The pool `|pdb2|lo|-2023-05-24T21-28-03.076379Z` was destroyed.

6.2.4 Using OCI Monitoring Service with Oracle REST Data Services

This section describes how to configure ORDS to send metrics to the Oracle Cloud Infrastructure (OCI) monitoring service and configure alarms.

OCI monitoring service provides comprehensive capabilities for monitoring cloud resources and applications, including metrics and alarms. It uses metrics to monitor resources and alarms for notifying the administrators when the metrics meet the specified triggers. ORDS provides an utility to process the access logs generated by the server and send metrics to the OCI monitoring service. Administrators can utilize OCI dashboard and metrics explorer to monitor and troubleshoot ORDS related issues.

- ords-metrics Utility
  `ords-metrics` is an utility that is used to process the ORDS access logs and send metrics to OCI monitoring service.
- Configuring ORDS to Send Metrics to OCI Monitoring Service
- Enable JMX Metrics
  ORDS provides a range of JMX metrics, which can be sent to the OCI monitoring service when the appropriate JMX metrics groups are enabled in ords-metrics using the `-m` option.
- Configuring OCI Alarms
  This section outlines the steps for configuring alarms in Oracle Cloud Infrastructure (OCI).

6.2.4.1 ords-metrics Utility

`ords-metrics` is an utility that is used to process the ORDS access logs and send metrics to OCI monitoring service.

ords-metrics Utility Options

ords-metrics utility supports the following options:

Option	Description	Required
`-d logdir`	Specifies the access log directory. Default value is `/var/log/ords/access`.	no
`-n namespace`	Specifies the OCI monitoring namespace. Must match the following pattern: `^[a-z][a-z0-9_]*[a-z0-9]$` Default value is: `dbtools_ords`.	no
`-r resource`	Specifies the OCI monitoring resource group. Default value is `ords`.	no
`-c compartment`	Specifies the OCI metric compartment OCID.	yes
`-p profile`	Specifies the OCI profile name. Instance principal is used when this option is not specified.	no
`-a prefix`	Specifies add prefix to the metric name.	no
`-b heartbeat`	Specifies the heartbeat interval in second. Default value is 60. To disable, set the value to 0 .	no
`-H host`	Specifies the hostname. Default value is `FQDN` of the local host.	no
`-t`	Specifies the sent response time metrics (in milliseconds).	no

Option	Description	Required
`-i include`	Specifies the comma separated list of status code or range of code to include. For example: 200, 500-599. Default range is 100-599.	no
`-v`	Specifies verbose mode.	no
`-m jmx`	Specifies a comma separated list of JMX metrics to collect. For example: `jvm`, `os`, `thread`, `ucp`	no
`-o paths`	Specifies a comma separated list of request path to use in a metrics dimension.	no
`-f pidfile`	Specifies the path for ORDS PID file.	no
`-t`	Specifies the sent response time metrics (in milliseconds).	no
`-q`	Exits after processing the existing records	no

Table 6-1 ORDS Metric Name

Name	Description
`HttpStatus<code>`	Specifies the HTTP status code. For example: `HttpStatus200`
`Heartbeat`	Specifies the heartbeat of the `ords-metrics`.

Table 6-2 ORDS Metrics Dimensions

Name	Description
`host`	Specifies the ORDS Hostname.
`availabilityDomain`	Specofies the OCI Instance Availability Domain.
`faultDomain`	Specifies the OCI Instance Fault Domain.
`path`	Specifies the request base path (configurable with `-o` paths).

6.2.4.2 Configuring ORDS to Send Metrics to OCI Monitoring Service

Perform the following steps to configure ORDS to send the metrics to the OCI monitoring service:

1. Enable access log in global `settings.xml` file. The following example configures ORDS to create access logs under the directory `/var/log/ords/access` and retain the files for 10 days:

   ```
   <entry key="standalone.access.log">/var/log/ords/access</entry>
   <entry key="standalone.access.log.retainDays">10</entry>
   ```

2. Configure `ords-metrics` to send metrics to the OCI public monitoring service.
   - **With API key and OCI profile**:
     a. Generate an API key
     b. Create an OCI profile with `key_file` set to the API key.

   c. Run `bin/ords-metrics` with `-d <logdir> -p <profile> -c <compartment> [ -n <namespace> ]`

- **With instance principal:**
   a. Create a dynamic group with matching rules that include the ORDS compute instance
   b. Create a policy granting permissions to the dynamic group to access OCI monitoring service in your compartment
   c. Run `bin/ords-metrics` with `-d <logdir> -c <compartment> [ -n <namespace> ]` on the ORDS instance

6.2.4.3 Enable JMX Metrics

ORDS provides a range of JMX metrics, which can be sent to the OCI monitoring service when the appropriate JMX metrics groups are enabled in ords-metrics using the `-m` option.

JVM Statistics	Description
`jvm`	Specifies the JVM statistics.
`thread`	Specifies the Thread statistics
`os`	Specifies the operating system metrics.
`ucp`	Specifies the UCP Pool metrics.

The following example enables sending `jvm` and `ucp` metrics to OCI monitoring service:

```
ords-metrics -d /var/log/ords/access -c ocid1.compartment... -m jvm,ucp
```

The ords-metrics utility automatically discovers the process ID (PID) of the ORDS process. However, if multiple ORDS processes are running on a system, the `-f` option can be used to specify the PID file for the target ORDS instance.

6.2.4.4 Configuring OCI Alarms

This section outlines the steps for configuring alarms in Oracle Cloud Infrastructure (OCI).

Perform the following steps to configure alarms in OCI:

1. Create an OCI notification topic

   Copy the create alarm script `examples/ords-metrics/create_alarms.sh` to another location and replace the following variables with your desired settings:

   ```
   export alarm_compartment_id=ocid1.compartment...
   export metric_compartment_id=ocid1.compartment...
   export topic_id=ocid1.onstopic...
   export namespace=dbtools_ords
   ```

2. Adjust the alarm thresholds based on your requirement
3. Run the customized `create_alarm.sh` script

6.2.5 Using OCI Logging Service with Oracle REST Data Services

This sections describes how to configure Java logging in ORDS for JSON-formatted output and on how to set up an agent to forward these logs to the OCI logging service.

To fully leverage OCI logging with ORDS, configure ORDS to generate logs in a JSON format and deploy a logging agent to efficiently route these messages. This integration enables centralized log management, real-time monitoring, and seamless adherence to organizational and regulatory compliance requirements.

- Configure Java Logging in ORDS
  This section outlines the steps for configuring Java logging in ORDS.
- Create an agent configuration
  This section explains how to create an agent configuration.

6.2.5.1 Configure Java Logging in ORDS

This section outlines the steps for configuring Java logging in ORDS.

Perform the following steps to configure Java logging in ORDS:

1. Create a `logging.properties` file that configures a `FileHandler` to use `oracle.dbtools.logging.JSONLogFormatter`, enabling the logging messages in JSON format.
   The following sample configuration demonstrates how to set up file-based logging with automatic log rotation and the ORDS JSON log formatter:

```
handlers= java.util.logging.FileHandler, java.util.logging.ConsoleHandler

# Configure the FileHandler
java.util.logging.FileHandler.level = INFO
java.util.logging.FileHandler.pattern = /path/to/ords.log
java.util.logging.FileHandler.limit = 10485760    # 10MB per log file
java.util.logging.FileHandler.count = 10          # Rotate through 10 files
java.util.logging.FileHandler.append = true
java.util.logging.FileHandler.formatter =
oracle.dbtools.logging.JSONLogFormatter
```

2. Before starting ORDS, use the `JDK_JAVA_OPTIONS` environment variable to specify the path to your `logging.properties` file.
   For example:

```
export JDK_JAVA_OPTIONS="-Djava.util.logging.config.file=/path/to/
logging.properties"
ords serve
```

6.2.5.2 Create an agent configuration

This section explains how to create an agent configuration.

Set up a logging agent configuration to route log messages generated by ORDS to the OCI Logging service.

ⓘ **See Also**

Creating an Agent Configuration

7 Using the Multitenant Architecture with Oracle REST Data Services

This section outlines installing, configuring, upgrading and uninstalling Oracle REST Data Services in a multitenant container database.

- Setting Up ORDS in a CDB Environment
- Setting Up ORDS in an Application Container

> **Note**
>
> Oracle API for MongoDB is only supported for installations in a non-CDB Database or PDB. See Installing Oracle REST Data Services for more information on installing Oracle REST Data Services in a non-CDB Database or PDB.

Once ORDS metadata is saved in the database, it is necessary to provide a runtime configuration setting for ORDS to efficiently map requests to the corresponding pluggable databases.

- Setting Up ORDS in a CDB Environment
  This section describes how to setup Oracle REST Data Services (ORDS) into a multitenant container database (CDB) environment.
- Setting Up ORDS in an Application Container
  This section describes how to setup Oracle REST Data Services in an application container.
- Making All PDBs Addressable by Oracle REST Data Services (Pluggable Mapping)

> **See Also**
>
> Making All PDBs Addressable by Oracle REST Data Services (Pluggable Mapping)

7.1 Setting Up ORDS in a CDB Environment

This section describes how to setup Oracle REST Data Services (ORDS) into a multitenant container database (CDB) environment.

Oracle Database 12*c* Release 1 (12.1) introduced 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). A PDB appears to users and applications as if it were a non-CDB. Each PDB is equivalent to a separate database instance in Oracle Database Release 11*g*.

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 you create a new

PDB to seed the new pluggable database. The key benefit of the Oracle Database 12*c* 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.

The installation process when you have multiple releases is described in the following section:

- Installation Enabling Multiple Releases

Preinstallation Tasks for Oracle REST Data Services CDB Installation

- Ensure that the PDBs are open (not mounted/closed) in read/write mode (except for `PDB$SEED`, which remains in read-only mode). For more information, see Oracle Multitenant Administrator's Guide
- Ensure that the default and temporary tablespaces to be used by the `ORDS_METADATA` schema and the `ORDS_PUBLIC_USER` user exist and that you know the tablespace names. The installation procedure creates those users, but it does not create the tablespaces.
- Ensure that when a common user is used for the PL/SQL Gateway, the user has also been explicitly created in the PDB$SEED container otherwise, the installer will not be able to configure the PL/SQL Gateway correctly.

> **Note**
>
> `ORDS_METADATA` and `ORDS_PUBLIC_USER` are installed in the seed container, and the default and temporary tablespaces exist in `PDB$SEED`. If these tablespaces do not already exist, then you must create the tablespaces in `PDB$SEED`. For more information, see Oracle Multitenant Administrator's Guide

- Installation Enabling Multiple Releases
  This section describes the installation process when you have multiple releases of Oracle REST Data Services and patch sets in the PDBs in a multitenant environment.
- Upgrading Oracle REST Data Services in a CDB Environment
- Uninstalling Oracle REST Data Services in a CDB Environment

7.1.1 Installation Enabling Multiple Releases

This section describes the installation process when you have multiple releases of Oracle REST Data Services and patch sets in the PDBs in a multitenant environment.

When Oracle REST Data Services is installed into a CDB, the proxy user, Oracle REST Data Services public user (`ORDS_PUBLIC_USER`) is installed in the root container and is a common user. The `ORDS_METADATA` schema is a local user that contains the metadata for Oracle REST Data Services. Both the `ORDS_METADATA` schema and the `ORDS_PUBLIC_USER` are installed in the seed container (`PDB$SEED`) and all of the pluggable databases.

Since the `ORDS_METADATA` is installed as a local user, this provides you the flexibility of installing multiple Oracle REST Data Services releases in the pluggable databases.

- Command Line Installation
- Interactive Installation
  This section describes the installation prompts for installing Oracle REST Data Services into a CDB to enable multiple Oracle REST Data Services releases.
- Silent Installation

7.1.1.1 Command Line Installation

You must provide the `SYS AS SYSDBA` credentials in the Root (`CDB$ROOT`) container to perform the installation.

7.1.1.2 Interactive Installation

This section describes the installation prompts for installing Oracle REST Data Services into a CDB to enable multiple Oracle REST Data Services releases.

To install Oracle REST Data Services into a CDB to enable multiple Oracle REST Data Services releases, perform the following steps:

Enter the following command:

```
ords --config <CONFIG_FOLDER> install
```

You are prompted for necessary information to create or update the ORDS configuration files, install ORDS schema, ORDS database user, and related database objects in the database. When you are prompted for the connection information, ensure that you specify the connection information to your CDB.

```
Enter a number to select the database connection type to use
    [1] Basic (host name, port, service name)
    [2] TNS (TNS alias, TNS directory)
    [3] Custom database URL
  Choose [1]:
  Enter the database host name [localhost]: myhost
  Enter the database listen port [1521]:    1523
  Enter the database service name [orcl]:   mycdb
```

> **Note**
>
> To use the pluggable mapping feature, see Making All PDBs Addressable by Oracle REST Data Services (Pluggable Mapping) for more information.

> **See Also**
>
> Creating an Additional Database Pool

7.1.1.3 Silent Installation

To perform a silent installation, provide the options on the command-line. Ensure that you specify the connection information to your CDB.

Enter the following command:

```
ords --config <CONFIG_FOLDER> install <OPTIONS>
```

See Also

Non-Interactive Command-Line Interface Installation (Silent)

7.1.2 Upgrading Oracle REST Data Services in a CDB Environment

When you use the latest release of Oracle REST Data Services (ORDS), and ORDS already exists in your database from an earlier ORDS release, then you can upgrade the ORDS schema in the CDB and its pluggable databases (PDBs) using the install command.

For example:

```
ords install --interactive --log-folder <LOG_FOLDER>
```

Note

If you are using the ORDS interactive install command to upgrade ORDS in the CDB, and if ORDS is already installed or upgraded to the current release, then you are not prompted for the information.

- Migrating Oracle REST Data Services in the CDB to Enable Multiple Releases
  This section describes how to migrate Oracle REST Data Services in the CDB to enable multiple releases.

7.1.2.1 Migrating Oracle REST Data Services in the CDB to Enable Multiple Releases

This section describes how to migrate Oracle REST Data Services in the CDB to enable multiple releases.

Starting with release 18.2.0 and later, if you have an Oracle REST Data Services schema and `ORDS_METADATA` that is installed in the `CDB$ROOT` container, then during upgrade it will migrate the common `ORDS_METADATA` schema to your PDBs as a local schema. Oracle database 12.1.0.2 and later releases support this change.

7.1.3 Uninstalling Oracle REST Data Services in a CDB Environment

To uninstall Oracle REST Data Services from a CDB, use the `uninstall` command.

For example:

```
ords uninstall --interactive --log-folder <LOG_FOLDER>
```

Oracle REST Data Services will be removed from the CDB and its pluggable databases (PDBs).

7.2 Setting Up ORDS in an Application Container

This section describes how to setup Oracle REST Data Services in an application container.

Starting with ORDS release 20.2.1, Oracle REST Data Services can be installed or upgraded into an application container using the ORDS SQL scripts provided in the `ords.version.number.zip` file.

An application container consists of an application root where the application is defined and one or more PDBs that share the metadata about the application from the application root. You can have multiple application containers within a CDB and each container can have different versions of Oracle REST Data Services. Installing or upgrading Oracle REST Data Services in an application container is done against the application root container. When an application PDB wants to use the upgraded version, it must synchronize with the application root. Oracle REST Data Services continues to run in the application PDB with the existing version until the application PDB synchronizes with the application root.

Topics:

- Prerequisites for Creating ORDS in an Application Container
- Installing ORDS in the Application Root Container
- Creating an Application Seed
- Creating an Application PDB from the Application Seed
- ORDS Configuration Files Setup
- Running ORDS
- Upgrading ORDS in the Application Container
- Uninstalling ORDS from the Application Container
- Verifying ORDS in the Application Container

- Prerequisites for Creating ORDS in an Application Container
  This section describes the prerequisites for installing ORDS in an application container.
- Installing ORDS in the Application Root Container
  This section describes how to install ORDS in the application root container.
- Creating an Application Seed
  This section describes how to create an application seed.
- Creating an Application PDB from the Application Seed
  This section describes how to create an application PDB that is seeded from the application seed
- Configuring the PLSQL Gateway for APEX
  This section describes how to configure the PL/SQL Gateway to work with APEX, if required. The APEX_PUBLIC_USER must be configured to proxy to the ORDS_PUBLIC_USER to support ORDS RESTful Services from within APEX.
- ORDS Configuration Files Setup
  This section describes how to setup the ORDS configuration files:
- Running ORDS
  This section lists the different methods available to run ORDS after installing ORDS in the application container.
- Upgrading ORDS in the Application Container
  This section describes how to upgrade ORDS in the application container.
- Uninstalling ORDS from the Application Container
  This section describes how to uninstall ORDS from the application container.
- Verifying ORDS in the Application Container
  This section describes how to verify ORDS in the application container.

7.2.1 Prerequisites for Creating ORDS in an Application Container

This section describes the prerequisites for installing ORDS in an application container.

Following prerequisites must be met before you install ORDS in an application container:

- Download ORDS version 20.2.1 or later from Oracle REST Data Services Downloads.
- Extract the ORDS SQL scripts.
- To obtain the ORDS SQL scripts, execute the following commands:

```
unzip ords.version.number.zip ords.war
unzip ords.war 'WEB-INF/lib/ords-installer-*.jar'
unzip  'WEB-INF/lib/ords-installer-*.jar' 'db/*'
mv db scripts
```

The ORDS SQL scripts are located in the scripts folder. The scripts folder contains the subdirectories for the install, upgrade, validate, and uninstall SQL scripts. You can run these SQL scripts using SQLcl, SQL*Plus, or SQL Developer.

- Creating an Application Root Container
  This section describes how to create an application root container.

7.2.1.1 Creating an Application Root Container

This section describes how to create an application root container.

To create an application root container:

1. Ensure that the current container is in `CDB$ROOT`.
2. Use the AS APPLICATION CONTAINER clause of the `CREATE PLUGGABLE DATABASE` statement to create an application container.
3. Open the application container.

Example:

```
CREATE PLUGGABLE DATABASE ords_app_root1 AS APPLICATION CONTAINER ADMIN USER
admin IDENTIFIED BY <admin_password>

FILE_NAME_CONVERT=('pdbseed', 'ords_app_root1');

ALTER PLUGGABLE DATABASE ords_app_root1 OPEN;
```

> **Note**
>
> `ords_app_root1` and the `admin` user in the preceding example can be any valid Oracle identifier.
> If Oracle managed files is enabled in the CDB or the `PDB_FILE_NAME_CONVERT` initialization parameter is set, then omit the `FILE_NAME_CONVERT` clause.
>
> The ORDS users, namely `ORDS_PUBLIC_USER` and `ORDS_METADATA`, must not exist in the seed (for example, `pdbseed`) or cloned pdb.

> **See Also**
>
> Creating an Application Container

7.2.2 Installing ORDS in the Application Root Container

This section describes how to install ORDS in the application root container.

To install ORDS in the application root container, perform the following steps:

1. Connect to the application root container.
2. Run `/path/to/scripts/install/core/ords_app_con_install.sql` command using the following parameters:
   - Log folder (must include the forward slash at the end)
   - Default tablespace for ORDS schema
   - Temporary tablespace for ORDS schema
   - Default tablespace for ORDS proxy user
   - Temporary tablespace for ORDS proxy user
   - ORDS proxy user password
   - Scripts path (requires the fully qualified path to the ORDS scripts)

   > **Note**
   >
   > The tablespaces must already exist in the database.

```
ALTER SESSION SET CONTAINER = ords_app_root1;

@/path/to/scripts/install/core/ords_app_con_install.sql /path/to/logs/ SYSAUX
TEMP SYSAUX TEMP <PASSWORD> /path/to/scripts
```

Where:

The `ords_app_con_install.sql` creates an application named ORDS and assigns the application version to the ORDS product version. The product version format is Year.Quarter.Patch.rJulianDay24HRMM (for example, 20.2.1.r2121800).

The preceding script installs ORDS and creates the following:

- The ORDS schema, `ORDS_METADATA`
- The ORDS proxy user, `ORDS_PUBLIC_USER` and
- The related database objects in the application container

> **See Also**
>
> Verifying ORDS in the Application Container

7.2.3 Creating an Application Seed

This section describes how to create an application seed.

An application seed is used to provision application PDBs with the application root's applications pre-installed.

To create an application seed:

1. Ensure that the current container is in the `CDB$ROOT`.
2. Alter session and set container to the application root.
3. Use the AS SEED clause of the `CREATE PLUGGABLE DATABASE` statement to create an application seed.
4. Sync the ORDS application with the application seed.
5. Compile invalid objects.
6. Open the application seed in a read only mode.

> **Note**
>
> `ords_app_root1` and the `admin` user in the following example can be any valid Oracle identifier.
> If Oracle managed files is enabled in the CDB or the `PDB_FILE_NAME_CONVERT` initialization parameter is set, then omit the `FILE_NAME_CONVERT` clause.

```
ALTER SESSION SET CONTAINER = ords_app_root1;
CREATE PLUGGABLE DATABASE AS SEED ADMIN USER admin IDENTIFIED BY
<admin_password>
FILE_NAME_CONVERT=('pdbseed', 'ords_app_root1_seed');
ALTER PLUGGABLE DATABASE ords_app_root1$seed open;
ALTER SESSION SET CONTAINER = ords_app_root1$seed;
ALTER PLUGGABLE DATABASE application ORDS sync;
begin
  sys.dbms_utility.compile_schema('ORDS_METADATA', FALSE);
end;
/
ALTER PLUGGABLE DATABASE ords_app_root1$seed close immediate;
ALTER PLUGGABLE DATABASE ords_app_root1$seed open read only;
```

> **See Also**
>
> Creating an Application Container

7.2.4 Creating an Application PDB from the Application Seed

This section describes how to create an application PDB that is seeded from the application seed

An application PDB is created by issuing the `CREATE PLUGGABLE DATABASE` statement from the application root.

To create an application PDB from the application seed:

1. Ensure that the current container is in `CDB$ROOT`.
2. Alter session and set the container to the application root.
3. Use the `CREATE PLUGGABLE DATABASE` command to create a PDB from the application seed.

> **Note**
>
> `ords_app_pdb1` and the `admin` user in the following example can be any valid Oracle identifier.
> If Oracle managed files is enabled in the CDB or the `PDB_FILE_NAME_CONVERT` initialization parameter is set, then omit the `FILE_NAME_CONVERT` clause.

```
ALTER SESSION SET CONTAINER=ords_app_root1;
CREATE PLUGGABLE DATABASE ords_app_pdb1 ADMIN USER admin IDENTIFIED BY <admin
password>
FILE_NAME_CONVERT=('ords_app_root1_seed','ords_app_pdb1');
ALTER PLUGGABLE DATABASE ords_app_pdb1 OPEN;
ALTER SESSION SET CONTAINER = ords_app_pdb1;
select app_name, app_version, app_status from dba_applications where app_name
= 'ORDS';
APP_NAME     APP_VERSION         APP_STATUS
--------     ---------------     ------------
ORDS         20.2.1.r2121800     NORMAL
```

> **See Also**
>
> Creating an Application Container

7.2.5 Configuring the PLSQL Gateway for APEX

This section describes how to configure the PL/SQL Gateway to work with APEX, if required. The APEX_PUBLIC_USER must be configured to proxy to the ORDS_PUBLIC_USER to support ORDS RESTful Services from within APEX.

To configure the PL/SQL Gateway:

- Ensure that the current container is in `CDB$ROOT`.

- Alter session and set the container to the application pdb, example: ords_app_pdb1.

  ```
  ALTER SESSION SET CONTAINER = ords_app_pdb1;
  ALTER USER APEX_PUBLIC_USER GRANT CONNECT THROUGH ORDS_PUBLIC_USER;
  begin
    ords_admin.config_plsql_gateway(
        p_runtime_user       => 'ORDS_PUBLIC_USER',
        p_plsql_gateway_user => 'APEX_PUBLIC_USER',
        p_comments           => 'APEX proxied to ORDS');
    commit;
  end;
  /
  ```

Using ORDS CLI command, add the additional setting:

```
ords --config <configuration folder> config set plsql.gateway.mode proxied
```

7.2.6 ORDS Configuration Files Setup

This section describes how to setup the ORDS configuration files:

Topics:

- Specifying the ORDS Configuration Folder
- Creating the ORDS Configuration Files for the Application Root Container

- Specifying the ORDS Configuration Folder
  This section describes how to specify the ORDS configuration folder.
- Creating the ORDS Configuration Files for the Application Root Container
  This section describes how to create the ORDS configuration files for the application root container.

7.2.6.1 Specifying the ORDS Configuration Folder

This section describes how to specify the ORDS configuration folder.

You must provide your configuration folder prior to creating your configuration. Refer to Setting Up the Configuration Folder Structure section for setting-up the folder structure.

7.2.6.2 Creating the ORDS Configuration Files for the Application Root Container

This section describes how to create the ORDS configuration files for the application root container.

To create the ORDS configuration files for the application root container, execute the following install command to create the configuration files:

```
ords --config <configuration folder> install --interactive --config-only --log-
folder <Log Folder>
```

Where the --config-only option must be specified to create the configuration files. There are a list of options displaying the current values, you can change the values. When this list of options are prompted for the service name, specify the application root servicename.

Example 7-1   Creating ORDS Configuration

You are prompted for the necessary information to create a database pool in your ORDS configuration files. When the multiple options prompts are displayed, you must specify the same password that you used for the proxy user, `ORDS_PUBLIC_USER`.

See Also

- Installing ORDS in the Application Root Container
- Multiple Options for Database Pool and Standalone Configuration

Note

If Oracle APEX is installed in your database, then specify the APEX images location. Example:

APEX static resources location: `/path/to/apex/images`.

Oracle recommends to use HTTPS protocol instead of HTTP.

Example 7-2   Using a Basic Connection

```
Oracle REST Data Services - Interactive Install
  Enter a number to select the database connection type to use
    [1] Basic (host name, port, service name)
    [2] TNS (TNS alias, TNS directory)
    [3] Custom database URL
  Choose [1]:
  Enter the database host name [localhost]:
  Enter the database listen port [1521]:
  Enter the database service name [orcl]: ords_app_root1

Specify the Application Root servicename.

  Enter a number to update the value or select option A to Accept and Continue
    [1] Connection Type: Basic
    [2] Basic Connection: HOST=localhost PORT=1521 SERVICE_NAME=ords_app_root1
    [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER): <generate>
    [4] Additional Feature: Database Actions
    [5] Configure for Standalone Mode: Yes
    [6]    Protocol: HTTP
    [7]       HTTP Port: 8080
    [8]   APEX static resources location:
    [A] Accept and Continue - Create database pool
    [Q] Quit - Do not proceed. No changes
  Choose [A]: 3

Select option 3 to update the ORDS_PUBLIC_USER password.

  Enter your choice for the runtime user password (ORDS_PUBLIC_USER)
    [S] Specify your own password
    [G] Generate password
    [C] Cancel - No Changes
  Choose [G]: S

Select option S to specify the password.

  Enter the database password for ORDS_PUBLIC_USER:
Confirm password:

Enter the same password you specified for the ORDS_PUBLIC_USER in section
Installing ORDS in the Application Root
    Container.

Enter a number to update the value or select option A to Accept and Continue
    [1] Connection Type: Basic
    [2] Basic Connection: HOST=localhost PORT=1521 SERVICE_NAME=ords_app_root1
    [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER):
<specified password>
    [4] Additional Feature: Database Actions
    [5] Configure for Standalone Mode: Yes
    [6]    Protocol: HTTP
    [7]       HTTP Port: 8080
    [8]   APEX static resources location:
    [A] Accept and Continue - Create database pool
    [Q] Quit - Do not proceed. No changes
  Choose [A]:

Make any additional changes.

  Enter a number to update the value or select option A to Accept and Continue
    [1] Connection Type: Basic
    [2] Basic Connection: HOST=localhost PORT=1521 SERVICE_NAME=ords_app_root1
    [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER):
<specified password>
    [4] Additional Feature: Database Actions
    [5] Configure for Standalone Mode: Yes
    [6]    Protocol: HTTPS
    [7]       HTTPS Port: 8443
    [8]    Certificate Type: Use my SSL Certificate
    [9]      Path for the SSL Certificate: /path/to/mycert.crt
    [10]      Path for the SSL Certificate private key: /path/to/mycert.der
    [11]   APEX static resources location: /path/to/apex/images
    [A] Accept and Continue - Create database pool
    [Q] Quit - Do not proceed. No changes
  Choose [A]:

Select option A to create your database pool.
```

7.2.7 Running ORDS

This section lists the different methods available to run ORDS after installing ORDS in the application container.

Once you install ORDS in the application container and create the ORDS configuration files, run ORDS using one of the following methods:

- Standalone Mode

- Deploy on Oracle WebLogic Server
- Deploy Oracle REST Data Services on Apache Tomcat

See Also

Deploying Oracle REST Data Services

7.2.8 Upgrading ORDS in the Application Container

This section describes how to upgrade ORDS in the application container.

You can upgrade an application in an application container. These operations are performed in the application root. The application container propagates the application changes to the application PDBs when the application PDBs synchronize with the application in the application root.

Prerequisites:

- ORDS must already be installed in the application container.
- Upgrading ORDS from an earlier release to a new release.

To upgrade ORDS in the application root:

1. In SQLcl or SQL*Plus, connect to the application root.
2. Run `/path/to/scripts/upgrade/ords_app_con_upgrade.sql` with the following parameters:
   - Log folder (must include the forward slash at the end)
   - Scripts path (requires the fully qualified path to the ORDS scripts)

   Note

   The `ords_app_con_upgrade.sql` script upgrades ORDS in the application root container to the release that you are using. For example, if the ORDS application version is 20.2.1.r2121800, and the ORDS upgrade script is 20.3.0.r2601900, then the script upgrades ORDS to release 20.3.0.r2601900 in the application root container.

To synchronize the ORDS application in an application PDB with the upgrade changes in the application root:

1. In SQLcl or SQL*Plus, ensure that the current container is the application PDB.
2. Run the `ALTER PLUGGABLE DATABASE APPLICATION` statement specifying the ORDS application with the SYNC clause.

```
ALTER SESSION SET CONTAINER = ords_app_pdb1;

ALTER PLUGGABLE DATABASE APPLICATION ORDS SYNC;
```

See Also

Verifying ORDS in the Application Container

7.2.9 Uninstalling ORDS from the Application Container

This section describes how to uninstall ORDS from the application container.

You can uninstall an application from an application container. These operations are performed in the application root. The application container propagates the application changes to the application PDBs when the application PDBs synchronize with the application in the application root.

To uninstall ORDS from the application root:

1. In SQLcl or SQL*Plus, connect to the application root.
2. Run `/path/to/scripts/uninstall/core/ords_app_con_uninstall.sql` with the following parameters:
   - Log folder (must include the forward slash at the end)
   - Scripts path (requires the fully qualified path to the ORDS scripts)

```
ALTER SESSION SET CONTAINER = ords_app_root1;
```

```
@/path/to/scripts/uninstall/core/ords_app_con_uninstall.sql /path/to/logs/ /
path/to/scripts
```

To synchronize the application PDB to uninstall the ORDS application:

1. In SQLcl or SQL*Plus, ensure that the current container is the application PDB.
2. Run the `ALTER PLUGGABLE DATABASE APPLICATION` statement specifying the ORDS application with the SYNC clause.

For example:

```
ALTER SESSION SET CONTAINER = ords_app_pdb1;
```

```
ALTER PLUGGABLE DATABASE APPLICATION ORDS SYNC;
```

See Also

Verifying ORDS in the Application Container

7.2.10 Verifying ORDS in the Application Container

This section describes how to verify ORDS in the application container.

To verify the ORDS for install, upgrade, validate, and uninstall in the application container:

- Manually inspect the following log files for any errors:
  - `Install - ordsinstall_<timestamp>.log`
  - `Upgrade - ordsupgrade_<timestamp>.log`
  - `Uninstall - ordsuninstall_<timestamp>.log`

- Query `dba_applications` to verify if the ORDS application exists and its application version is the same as the ORDS product version.

  ```
  SQL> select app_name, app_version, app_status from dba_applications where
  app_name = 'ORDS';

      APP_NAME     APP_VERSION         APP_STATUS
      --------     ---------------     ------------
      ORDS         20.2.1.r2121800     NORMAL
  ```

- Query `dba_app_errors` to check for any errors:

  ```
  SQL> select app_name, app_statement, errornum, errormsg from dba_app_errors
  where app_name = 'ORDS';
  ```

  ```
  no rows selected
  ```

  If you are uninstalling ORDS from the application container, the `APP_STATUS` contains the value `UNINSTALLED`.

7.3 Making All PDBs Addressable by Oracle REST Data Services (Pluggable Mapping)

Pluggable mapping refers to the ability to make all PDBs in a CDB root or in an application root container addressable by Oracle REST Data Services. To use this feature, follow the instructions described in this topic.

If the Oracle REST Data Services configuration file includes the `db.serviceNameSuffix` parameter, this indicates that the Oracle REST Data Services pool points to a CDB root or an application root, and that the PDBs connected to that CDB root or an application root should be made addressable by Oracle REST Data Services. For Pluggable mapping to work, you must specify this parameter setting. You can specify the `db.serviceNameSuffix` parameter at a pool-specific level or at a global level. If you set the parameter to a global level, then you can apply it to all the database pool configurations that define a CDB connection. Also, the Database Actions landing page (`<server-name>:<port-number>/ords/sql-developer`) displays a prompt for the PDB name, if you set the parameter to a global level.

The value of the `db.serviceNameSuffix` parameter must correspond to the value of the DB_DOMAIN database initialization parameter, based on the following rules:

- If the DB_DOMAIN value is blank, then the `db.serviceNameSuffix` parameter must also be an empty string.
- If the DB_DOMAIN value is not blank, then the `db.serviceNameSuffix` parameter must have a value starting with a period (.).

To set the value of the `db.serviceNameSuffix` parameter:

1. In SQLcl or SQL*Plus, connect to the root as a user with SYSDBA privileges.
2. Check the value of the `DB_DOMAIN` database initialization parameter.

   ```
   SQL> show parameter DB_DOMAIN
   ```

3. Exit SQLcl or SQL*Plus.

   ```
   SQL> exit
   ```

4. If the `db.serviceNameSuffix` parameter value is not defined, enter a command in the following format to add an entry to the configuration file:

```
ords --config /path/to/config config --db-pool pool-name set "db.serviceNameSuffix"
".value-of-DB_DOMAIN"
```

Where `pool-name` is one of the following:

- `default` for the default and migrated pool
- <*custom_pool*> as specified during ORDS install

Example 1: You want to make PDBs in a CDB root or an application root addressable globally. Specify global settings by entering the following command:

```
ords --config /path/to/config config set --global "db.serviceNameSuffix" ".value-of-
DB_DOMAIN"
```

> **Note**
>
> The approach shown in Example 1, that is, setting the property for all the pools through the `global/settings.xml` file, works the best for most use cases.

Example 2: You want to make PDBs in a CDB root or an application root addressable for your PL/SQL Gateway, and your pool name is `my_pool`. Enter the following command:

```
ords --config /path/to/conf config --db-pool my_pool set "db.serviceNameSuffix"
".example.com"
```

For example, if the database pointed to by apex has a `DB_DOMAIN` value of `example.com` and contains the two PDBs `pdb1.example.com` and `pdb2.example.com`, the first PDB will be mapped to URLs whose path starts with `/ords/pdb1/`, and the second PDB will be mapped to URLs whose path starts with `/ords/pdb2/`.

Example 3: You want to make PDBs in a CDB root or an application root addressable globally and the DB_DOMAIN is an empty value. Enter the following command to specify `db.serviceNameSuffix` parameter globally:

```
ords --config /path/to/config config set --global "db.serviceNameSuffix" ""
```

8

Installing and Configuring Customer Managed ORDS on Autonomous Database

This section explains how to install and configure Customer Managed Oracle REST Data Services (ORDS) on Autonomous Database.

Topics:

- About Customer Managed Oracle REST Data Services on Autonomous Database
- Preinstallation Tasks
- ORDS Command-Line Interface for Customer Managed ORDS

- About Customer Managed Oracle REST Data Services on Autonomous Database
  When you provision an Autonomous Database instance, by default Oracle REST Data Services (ORDS) is preconfigured and available for the instance. With the default ORDS, Oracle performs any required configuration, patching, and maintenance. Additionally, you can also configure Autonomous Database to use ORDS running in a customer managed environment.
- Preinstallation Tasks
  This section describes the preinstallation tasks.
- ORDS Command-Line Interface for Customer Managed ORDS

8.1 About Customer Managed Oracle REST Data Services on Autonomous Database

When you provision an Autonomous Database instance, by default Oracle REST Data Services (ORDS) is preconfigured and available for the instance. With the default ORDS, Oracle performs any required configuration, patching, and maintenance. Additionally, you can also configure Autonomous Database to use ORDS running in a customer managed environment.

When you use the default ORDS on Autonomous Database, you cannot modify any of the ORDS configuration options. Use a customer managed environment if you want manual control of the configuration and management of Oracle REST Data Services. For example, use this option when your applications require larger connection pools or if you need more control over the ORDS configuration options.

When ORDS runs in a customer managed environment, you are responsible for configuration, patching, and maintenance of ORDS in the customer managed environment. After you configure Autonomous Database to use your customer managed ORDS in addition to the existing autonomously managed ORDS, you can route ORDS HTTPS traffic through your environment. The default Autonomous Database web server and ORDS are still running and ORDS traffic goes to the ORDS running in the customer managed environment. This provides an additional and alternative HTTPS solution for Autonomous Database.

Installing and configuring a customer managed environment for ORDS allows you to run ORDS with configuration options that are not possible using the default Oracle managed ORDS available with Autonomous Database.

Installing and configuring a customer managed environment for ORDS is only supported with Autonomous Database.

> **Note**
>
> - A version of Oracle REST Data Services within one major release of what is running in Autonomous Database (Serverless or Dedicated) is required to use a customer managed environment for ORDS with a version closest to that release. **For example**:
>
>   If your Autonomous Database is currently hosting ORDS version 22.4, then you must be running the latest possible ORDS version with customer managed environment. Maintain the latest version of ORDS as close as possible, for example 23.1 or 22.3 for the best results.
>
>   > **Note**
>   >
>   > The latest version of ORDS can be found in the OCI YUM repository and also at ORDS Downloadable Zip File location.

> **Note**
>
> Web servers should be installed on dedicated systems that are separate from the database servers.

> **See Also**
>
> - Oracle REST Data Services (ORDS) best practices
> - Interactive Command-Line Interface Installation and refer to section *HTTPS Protocol and Use my SSL Certificate* for more information and
> - Adding a Signed SSL Certificate to Oracle REST Data Services

8.2 Preinstallation Tasks

This section describes the preinstallation tasks.

Before you begin:

- Download the wallet from your Oracle Autonomous Database instance.
- If you are using ORDS with Oracle APEX, then you are required to setup the Oracle APEX static resources.

- Downloading Wallet
  You need to configure ORDS to connect to the Autonomous Database. With Oracle REST Data Services (ORDS) running in a customer managed environment, you need to obtain the Autonomous Database wallet on the system that runs the customer managed ORDS.
- Oracle APEX Static Resources
  This section describes how to set up the APEX static resources.

8.2.1 Downloading Wallet

You need to configure ORDS to connect to the Autonomous Database. With Oracle REST Data Services (ORDS) running in a customer managed environment, you need to obtain the Autonomous Database wallet on the system that runs the customer managed ORDS.

- To download the wallet for the Autonomous Database instance, see Download Client Credentials (Wallets) for the detailed steps.

8.2.2 Oracle APEX Static Resources

This section describes how to set up the APEX static resources.

If you are using ORDS and APEX, then setting up the APEX static resources is mandatory. You can setup the APEX static resources by using the Oracle Content Delivery Network (CDN), or downloading APEX and copying the APEX images folder to your environment.

1. Oracle recommends using the Oracle Content Delivery Network to setup the APEX static resources. See Customer Managed ORDS on Autonomous Database for detailed instructions.

   > **Note**
   >
   > You only need to setup APEX static resources once using CDN, then APEX automatically upgrades this for you in the Autonomous Database.

2. Download APEX and configure APEX static resources.
   - Download APEX from the location Oracle APEX Downloads
   - Copy the images directory. See Copying the Images Directory

   > **Note**
   >
   > You must download, maintain, and upgrade the APEX static resources and ensure that the APEX version that you are using is consistent with the APEX version on the Autonomous Database.

> **See Also**
>
> Control Oracle APEX Upgrades

8.3 ORDS Command-Line Interface for Customer Managed ORDS

The ORDS Command-Line Interface (CLI) provides the interactive and silent command `install adb` to automate configuring a Customer Managed ORDS. This includes creating the ORDS configuration in your environment. If you want to use Autonomous Database with Oracle REST Data Services (ORDS) running in a customer managed environment, execute this command. This creates an ORDS runtime database user. ORDS can connect, and provide the privileges to that runtime user. In addition, it creates and provides privileges to the PL/SQL gateway database user used for APEX, PL/SQL Gateway and OWA, and allow connections through the runtime user. The runtime database user and gateway database user are created in the Autonomous Database.

- Interactive Install for ADB Command Line Interface
- Silent Installation of ADB on Command-Line Interface

8.3.1 Interactive Install for ADB Command Line Interface

Use the ORDS Command-Line Interface (CLI) to interactively prompt you for the following information to setup your Customer Managed ORDS.

- Wallet Path
- Net Service Name from tnsnames.ora contained in the wallet zip file
- Administrator user
- Runtime database user
- PL/SQL gateway user
- Additional Database Features
- Standalone options

Examples:

- `ords install adb`
- `ords install adb --interactive [OPTIONS]`
- `ords install adb -i [OPTIONS]`

- Customer Managed ORDS Command Options
- Interactive Installation Prompts
  This section describes the interactive installation prompts to setup your Customer Managed ORDS.

8.3.1.1 Customer Managed ORDS Command Options

Option	Description
`admin-user <DATABASE USER>`	The administrator database user with privileges to create users and grant privileges to database users in the Autonomous Database.
`db-pool <POOL NAME>`	The name of the database connection pool.
`db-user <DATABASE USER>`	The ORDS runtime database user.

Option	Description
`gateway-user <DATABASE USER>`	The PLSQL gateway database user that has privileges to access the stored procedures.
`feature-db-api <BOOLEAN>`	Specifies if you want to enable DB API feature. Possible values are `true` or `false`. • If the value is set to `true`, then DB API feature is enabled. • If the value is set to `false`, then DB API feature is disabled. Returns an error if the specified options are `--feature-sdw true` and `--feature db-api false`.
`feature-rest-enabled-sql <BOOLEAN>`	Specifies if you want to enable REST-Enabled SQL feature. Possible values are `true` or `false`. • If the value is set to `true`, then the REST-Enabled SQL feature is enabled. • If the value is set to `false`, then the REST-Enabled SQL feature is disabled. Returns an error if the specified options `are` `--feature-sdw true` and `--feature-rest-enabled-sql false`.
`feature-sdw <BOOLEAN>`	Specifies if you want to enable Database Actions feature. Possible values are true or false. • If the value is set to true, then the Database Actions feature is enabled. • If the value is set to false, then the Database Actions feature is disabled. If the option is set to true, then the following settings are set to true in the configuration file: • `database.api.enabled` • `restEnabledSql.active` Returns an error if `--feature-sdw true` and any of following options are specified, and are set to false: • `--feature-db-api` • `--feature-rest-enabled-sql`
`-h, --help`	Shows usage information for a command.
`-i, --interactive`	Prompts for the required information.
`log-folder <FOLDER>`	Writes the logs in the folder when creating the users and granting privileges to the user. If this option is omitted, then the output is written to standard output.
`password-stdin`	Reads the password value from standard input when redirecting input to a file or here document.
`wallet <PATH>`	The location of the wallet zip file downloaded from Autonomous Database. Returns an error if the wallet is omitted and the `db.wallet.zip.path` setting does not exist in the ORDS configuration.

Option	Description
`wallet-service-name <NET SERVICE NAME>`	Specifies the net service name in the `tnsnames.ora` file located in the wallet zip file. If the `--wallet-service-name` option is omitted, or if the `db.wallet.zip.service` property is not detected in the ORDS global configuration settings (that is, in the `global.xml` file), then ORDS defaults to using the `<db>_LOW` Consumer Group. This value is retrieved from the `tnsnames.ora file`.

8.3.1.2 Interactive Installation Prompts

This section describes the interactive installation prompts to setup your Customer Managed ORDS.

To setup your Customer Managed ORDS, use the ORDS Command-Line Interface (CLI) to interactively prompt you for the information.

Example:

```
ords install adb --interactive --prompt-password --log-folder <LOG
    FOLDER>
```

Where:

- `--prompt-password`: prompt you for the runtime database user's password and the gateway database user's passwords
- `--prompt-password`: If this option is omitted, then the passwords are generated. Special care should be considered for database user’s password. If you plan to use ORDS on multiple servers and use the same runtime database user and gateway database user, then specify the `--prompt-password` option to ensure that the same passwords are being used.

Table 8-1 Interactive Installation Prompts

Prompt Number	Prompt	Description

1.	`Enter a number to select the database pool to update, or create an additional database pool.`
	`  The selected (or created) database pool will be used to configure a Customer Managed ORDS.`
	`    [1] default      MYADB_MEDIUM  /path/to/myadb/wallet.zip`
	`    [2] Create an additional database pool`
	`  Choose [1]:`
		Refer to Entering a Number to Select the Database Pool

2.	`Enter the database pool name.`	Refer to Entering the Database Pool Name

Table 8-1 (Cont.) Interactive Installation Prompts

Prompt Number	Prompt	Description
3.	`Enter the Autonomous Database Wallet path: /path/to/wallet.zip`	Refer to Entering the Autonomous Database Wallet Path

4.	`Enter a number to select the TNS Network alias to use`
	`    [1] DEMO_LOW         ...service_name=g123_demo_low.adb.oraclecloud....`
	`    [2] DEMO_MEDIUM  ...service_name=g123_demo_medium.adb.oracleclo...`
	`    [3] DEMO_HIGH       ...service_name=g123_demo_high.adb.oraclecloud...`
	`  Choose [1]:`
		Refer to Enter a Number to Select the TNS Network Alias

5.	`Provide database user name with administrator privileges.`
	`    Enter the administrator username [ADMIN]:`
		Enter the Administrator Username

6.	`Enter the database password for ADMIN:`	Enter the Database Password for ADMIN
7.	`Enter the ORDS runtime database username [ORDS_PUBLIC_USER2]:`	Entering the ORDS Runtime Database Username

8.	`Enter the database password for ORDS_PUBLIC_USER2:`
	`Confirm password:`
		Entering the Database Password for ORDS_PUBLIC_USER2

9.	`Enter the PL/SQL Gateway database username:`	Entering the PL/SQL Gateway Database Username

10.	`Enter the database password for ORDS_PLSQL_GATEWAY2:`
	`Confirm password:`
		Enter the Database Password for ORDS_PLSQL_GATEWAY2

Table 8-1 (Cont.) Interactive Installation Prompts

Prompt Number	Prompt	Description

11.	`Connecting to Autonomous database user: ADMIN TNS Service: DEMO_MEDIUM`
	`Retrieving information`	

12.	` Enter a number to select additional feature(s) to enable:`
	`    [1] Database Actions  (Enables all features)`
	`    [2] REST Enabled SQL and Database API`
	`    [3] REST Enabled SQL`
	`    [4] Database API`
	`    [5] None`
	`  Choose [1]:`
		Entering a Number to Select and Enable Additional Feature

13.	`Enter a number to configure and start ORDS in standalone mode`
	`    [1] Configure and start ORDS in standalone mode`
	`    [2] Skip`
	`  Choose [1]:`
		Enter a Number to Configure and Start ORDS

14.	`Enter a number to select the protocol`
	`    [1] HTTP`
	`    [2] HTTPS`
	`  Choose [1]: 2`
		Entering a Number to Use HTTP or HTTPS Protocol

15.	`Enter the APEX static resources location: /path/to/apex/images`	Entering the APEX Static Resources Location

- Entering a Number to Select the Database Pool
- Entering the Database Pool Name
- Entering the Autonomous Database Wallet Path
- Enter a Number to Select the TNS Network Alias
- Enter the Administrator Username
- Enter the Database Password for ADMIN
- Entering the ORDS Runtime Database Username

- Entering the Database Password for ORDS_PUBLIC_USER2
- Entering the PL/SQL Gateway Database Username
- Enter the Database Password for ORDS_PLSQL_GATEWAY2
- Entering a Number to Select and Enable Additional Feature
- Enter a Number to Configure and Start ORDS
- Entering a Number to Use HTTP or HTTPS Protocol
- Entering the HTTPS Port
- Entering a Number to Select the Certificate Type
- HTTPS Protocol and Use Self-Signed Certificate
- HTTPS Protocol and Use my SSL Certificate
- Entering the APEX Static Resources Location

8.3.1.2.1 Entering a Number to Select the Database Pool

This prompt is displayed, if an ORDS configuration exists and contains database pool(s).

You can select a database pool to update, or create an additional database pool for your Customer Managed ORDS.

If option 2 is selected, then Prompt number 2 is displayed. Otherwise, Prompt number 3 is displayed.

> **Note**
>
> If this is the first time you are setting up the Customer Managed ORDS, and the ORDS configuration does not exist, then you are prompted for the wallet location. See Prompt number 3.

8.3.1.2.2 Entering the Database Pool Name

Specify the database pool name.

8.3.1.2.3 Entering the Autonomous Database Wallet Path

Specify the location and filename of the downloaded Autonomous Database wallet.

> **Note**
>
> If this is the first time you are setting up the Customer Managed ORDS, then you are prompted for the wallet location. Otherwise, if an ORDS configuration already exists, then Prompt number 1 is displayed.

8.3.1.2.4 Enter a Number to Select the TNS Network Alias

Select the TNS alias name.

> **Note**
>
> The list of TNS alias names are in the `tnsnames.ora` file located in the `wallet.zip` file.

> **See Also**
>
> Local Naming Parameters in the tnsnames.ora File

8.3.1.2.5 Enter the Administrator Username

Specify a database user with administrator privileges. Defaults the database user to ADMIN.

8.3.1.2.6 Enter the Database Password for ADMIN

Specify the password for administrator database user.

8.3.1.2.7 Entering the ORDS Runtime Database Username

Specify the ORDS runtime database user. Defaults the database user to `ORDS_PUBLIC_USER2`.

8.3.1.2.8 Entering the Database Password for ORDS_PUBLIC_USER2

Prompts for the password if `--prompt-password` option is specified on the command line. Otherwise, the password prompt is not displayed, and the password is generated.

> **Note**
>
> If the runtime database user does not exist in the Autonomous Database, then the runtime database user is created and granted privileges. If the runtime database user already exists in the Autonomous Database, and the runtime user’s password does not match the password in the Autonomous Database, then the runtime database user password is changed.

8.3.1.2.9 Entering the PL/SQL Gateway Database Username

Specify the ORDS PL/SQL gateway database user.

8.3.1.2.10 Enter the Database Password for ORDS_PLSQL_GATEWAY2

Prompts for the password if `--prompt-password` option is specified on the command line. Otherwise, the password prompt is not displayed, and the password is generated.

> **Note**
>
> If the PL/SQL gateway database user does not exist in the Autonomous Database, then the gateway database user is created and granted privileges. If the gateway user already exists in the Autonomous Database, and the gateway user's password does not match the password in the Autonomous Database, then the gateway database user password is changed..

8.3.1.2.11 Entering a Number to Select and Enable Additional Feature

Select the additional feature that you want to enable.

> **See Also**
>
> - About Oracle Database Actions
> - REST- Enabled SQL Service
> - ORDS Database API

8.3.1.2.12 Enter a Number to Configure and Start ORDS

You can configure ORDS to run in standalone mode. In addition, you can start ORDS in standalone mode after setup is completed for Customer Managed ORDS.

8.3.1.2.13 Entering a Number to Use HTTP or HTTPS Protocol

Displays the HTTP/HTTPS Protocol prompts. Select the protocol (HTTP or HTTPS) that you want to use.

> **Note**
>
> Oracle highly recommends to run ORDS in a standalone mode with HTTPS versus HTTP.

- Entering the HTTP Port

8.3.1.2.13.1 Entering the HTTP Port

Specify the HTTP port. The default HTTP port is 8080.

8.3.1.2.14 Entering the HTTPS Port

Specify the HTTPS port. The default HTTPS port is 8443.

Table 8-2 HTTPS Protocol Prompts

Prompt	Description

`Enter a number to select the protocol`
`[1] HTTP`
`[2] HTTPS`
`Choose [1]:`
	Select the protocol (HTTP or HTTPS) that you want to use.

`Enter the HTTPS port [8443]:`	Specify the HTTPS port. The default HTTPS port is 8443.

`Enter a number to select the certificate type`
`[1] Use self-signed certificate (generates automatically)`
`[2] Use my SSL certificate (requires SSL certificate and SSL certificate private key)`
`Choose [1]: 1`
	Refer to:
	• Entering a Number to Select the Certificate Type
	• HTTPS Protocol and Use Self-Signed Certificate
	• HTTPS Protocol and Use my SSL Certificate

8.3.1.2.15 Entering a Number to Select the Certificate Type

You have the option to select the self-signed certificate that generates automatically when running ORDS in standalone mode, or you provide the SSL certificate which requires both the SSL Certificate and its private key.

8.3.1.2.16 HTTPS Protocol and Use Self-Signed Certificate

Selecting the prompt `Use self-signed certificate` prompts you for the SSL hostname.

Table 8-3 Example of Use Self-Signed Certificate

Prompt

`Enter a number to select the certificate type`
`[1] Use self-signed certificate (generates automatically)`
`[2] Use my SSL certificate (requires SSL certificate and SSL certificate private key)`
`Choose [1]: 1`
 	
`Enter the SSL hostname: myhost`

ORDS generates the Self-Signed Certificate when running ORDS in a standalone mode.

The value entered here is stored in the `standalone.https.host` configuration setting. The Self-Signed Certificate is generated only once and the Common Name value for that certificate is taken from the `standalone.https.host` configuration setting. Changing the `standalone.https.host` after the Self-Signed Certificate is generated does not change the Common Name in that certificate.

Table 8-4 HTTPS Protocol and Use Self-Signed Certificate Prompts

Prompt	Description
`SSL Hostname: myhost`	Specify the SSL Hostname.

8.3.1.2.17 HTTPS Protocol and Use my SSL Certificate

Selecting Use my SSL Certificate requires you to provide an existing SSL certificate and its private key.

Example of Use my SSL Certificate

```
Enter a number to select the certificate type
   [1] Use self-signed certificate (generates automatically)
   [2] Use my SSL certificate (requires SSL certificate and SSL certificate 
private key)
Choose [1]: 2

 Enter the path for the SSL Certificate: /path/to/mycertificate.crt
 Enter the path for the SSL Certificates private key: /path/to/mycert.der
```

Table 8-5 HTTPS Protocol and Use my SSL Certificate Prompts

Prompt	Description
`Path for the SSL Certificate: /path/to/mycert.crt`	Refer to Entering the Path for the SSL Certificate
`Path for the SSL Certificate private key: /path/to/mycert.der`	Refer to Entering the Path for the SSL Certificate's Private Key

- Entering the Path for the SSL Certificate
- Entering the Path for the SSL Certificate's Private Key

8.3.1.2.17.1 Entering the Path for the SSL Certificate

Specifying the SSL certificate file location and filename.

Example:

```
/path/to/mycert.crt
```

See Also

Converting a Private Key to DER (Linux and Unix)

8.3.1.2.17.2 Entering the Path for the SSL Certificate’s Private Key

Specifying the SSL certificate’s private key file location and filename.

Example

```
/path/to/mycert.der
```

8.3.1.2.18 Entering the APEX Static Resources Location

This prompt displays only if you are maintaining the APEX static resources.

Note

If you are using the Oracle Content Delivery Network for the APEX static resources, then this prompt is not displayed.

See Also

Oracle APEX Static Resources

8.3.2 Silent Installation of ADB on Command-Line Interface

For silent installation, provide the following command options to setup your Customer Managed ORDS:

- Database Pool: If this option is omitted, then the `default` database pool is used.
- Wallet Path: This is required if this option does not exist in the ORDS configuration database pool.
- Wallet Service Name: The TNS alias name from `tnsnames.ora` file contained in the wallet zip file. If this option is omitted, and the setting `db.wallet.zip.service` does not exist in the ORDS configuration database pool, then the wallet service name defaults to `<DB>_LOW`.
- Administrator username and password (Required)
- Runtime database username and password (Required)
- PL/SQL gateway username and password (Required)
- Additional Database Features

Install ADB Command

```
ords install adb [OPTIONS]
```

- Using Input Redirection

See Also

Customer Managed ORDS Command Options

8.3.2.1 Using Input Redirection

This section describes how to redirect the standard input using the Here document or to a file.

Redirect STDIN to a file

Redirect STDIN to a file that contains the password. In the following example, the file must contain three passwords. Each password must be on a separate line.

Example:

```
ords install adb --admin-user <DATABASE USER> --db-user <DATABASE USER> --
gateway-user <DATABASE
      USER> --wallet <PATH> --wallet-service-name <NET SERVICE NAME> --
feature-sdw <BOOLEAN> --log-folder
      <FOLDER> --password-stdin < filename.txt
```

Where the `filename.txt` contains passwords:

```
<PASSWORD FOR admin-user>
<PASSWORD FOR db-user>
<PASSWORD FOR gateway-user>
```

Starting from left to right, the first password belongs to the first user option (`--admin-user`) on the command line. The second password belongs to the second user option on the command line (`--db-user`) and the third password belongs to the third user (`--gateway-user`) option on the command-line.

Redirect Standard Input Using Here Document

Redirect STDIN using the Here document (also known as heredoc) for the password(s). The heredoc consists of the '<<' redirection operator followed by a delimiter token.

Each password must be on a separate line and it is ended by the delimiter token.

Example:

```
ords install adb --admin-user <DATABASE USER> --db-user <DATABASE USER> --
gateway-user <DATABASE USER>
--wallet <PATH> --wallet-service-name <NET SERVICE NAME> --feature-sdw
<BOOLEAN> --log-folder <FOLDER>
--password-stdin << EOF
<PASSWORD FOR admin-user>
<PASSWORD FOR db-user>
<PASSWORD FOR gateway-user>
EOF
```

Starting from left to right, the first password belongs to the first user option (`--admin-user`) on the command line. The second password belongs to the second user option on the command line (`--db-user`) and the third password belongs to the third user (`--gateway-user`) option on the command-line. The Here document is ended by the token EOF.

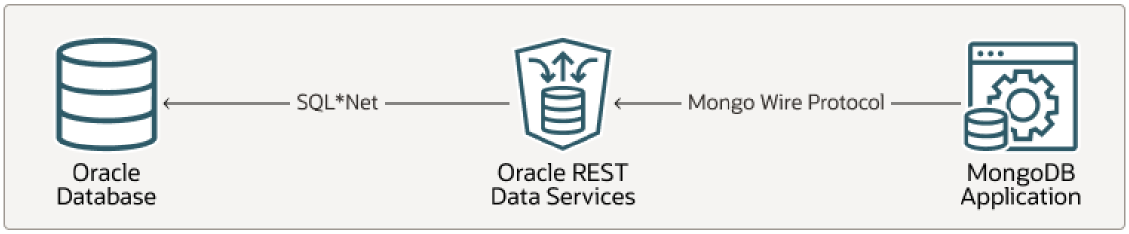
> **Note**
>
> Once the operation is complete, delete the file or script that contains the passwords.

9 Enabling and Configuring the Oracle Database API for MongoDB

This section describes how to enable and configure the Oracle Database API for MongoDB.

Starting with ORDS release 22.3, Oracle REST Data Services supports the Oracle Database API for MongoDB when running in a standalone mode. This enables the use of MongoDB drivers, frameworks, and tools to develop your JSON document-store applications against the Oracle Database. The Oracle Database API for MongoDB, translates the MongoDB wire protocol into SQL statements that are executed using the ORDS connection pools.

Figure 9-1   Architecture Diagram for Oracle Database API for MongoDB



Following points must be considered:

- The MongoDB concept of a database is mapped to the concept of a schema in Oracle Database. Specifically, an ORDS-enabled schema. For example, when you insert a JSON document into a collection in the database `foo`, the API for MongoDB inserts the document into a collection in the ORDS-enabled schema `foo`.
- Authentication and authorization when using the API for MongoDB depends on the Oracle Database users and access controls and not the MongoDB users. When you are connecting a MongoDB client, you must specify the Oracle Database credentials using the LDAP authentication mechanism of MongoDB using the connection options `authMechanism=PLAIN` and `authSource=$external`. The protocol passes the username and password as a plain text and so, TLS/SSL must be enabled using the connection option `tls=true`.
- The Oracle API for MongoDB maps the MongoDB commands to the corresponding SQL statements on the table backing the collection.
  For example, a MongoDB command such as `emp.find({"name":"John"})` is executed against the database using a SQL select statement similar to `select data from emp e where e.data."name" = 'John'`.
- When required, SQL can be executed directly over JSON collections. With this model, you get the speed, flexibility, and ease-of-use of a NoSQL document store while still having the ability to use SQL for analytics and reporting directly over your natively stored JSON data.

- Getting Started
- Requirements
  This section lists the client and database requirements.

- Configurable Settings for MongoDB
  This section lists the editable configuration settings to support the MongoDB API stored in the global configuration, located at `global/settings.xml`.
- Examples
  This section lists some examples that use the `ords config set` command to store the MongoDB settings in the current working directory (CWD) `global/settings.xml` and also provides an example for MongoDB listener settings in `global/settings.xml` file.
- Accessing the Connection Pools
- Logging MongoDB API Access
  This section describes how to enable logging of requests to the MongoDB API.
- Achieving High Peformance
  This section describes the settings that are useful in achieving high performance.

> **See Also**
>
> - Oracle Database API for MongoDB
> - Interactive Command-Line Interface Installation
> - Serve Commands for Running in Standalone Mode

9.1 Getting Started

Perform the following steps to get started to use the Oracle Database API for MongoDB:

1. **Install and configure ORDS**:
   From a command prompt, install and configure ORDS using the following commands:

   > **Note**
   >
   > - If you are installing ORDS against the Autonomous Database, then use the command `ords install adb`.
   > - Oracle API for MongoDB is only supported for installations in a non-CDB database or PDB.

   > **See Also**
   >
   > - Installing Oracle REST Data Services
   > - Installing and Configuring Customer Managed ORDS on Autonomous Database

   a. Install ORDS in a standalone mode in a non-CDB Database or in a PDB.

> **Note**
>
> Oracle API for MongoDB is only supported for installations in a non-CDB database or PDB.

```
ords install
```

b. By default, the Oracle API for MongoDB is not enabled. To enable the API, in your configuration, include the following:

```
ords config set mongo.enabled true
```

c. Start ORDS

```
ords serve
```

When the MongoDB API is enabled, you will get a notification and you get the connect string when ORDS is started.

Log showing that the Oracle API for MongoDB is enabled:
After starting ORDS using the `ords serve` command, the log shows a message similar to the following to verify if the Oracle API for MongoDB is enabled:

```
Disabling document root because the specified folder does not exist: ./
config/global/doc_root
2022-08-17T15:23:04.043Z INFO        Oracle API for MongoDB listening on
port: 27017
2022-08-17T15:23:04.050Z INFO        The Oracle API for MongoDB connection
string is:
mongodb://[{user}:{password}@]localhost:27017/{user}?
authMechanism=PLAIN&authSource=$external&ssl=true&retryWrites=false&loadBal
anced=true
```

2. **Create an ORDS-enabled user**:
Leave the server running and from SQLcl, create an ORDS-enabled user.

> **See Also**
>
> Creation of Users, Authentication, and Authorization

```
create user foo identified by "<Password>";
grant soda_app, create session, create table, create view, create
sequence, create procedure, create job, unlimited tablespace to foo;
connect foo/<Password>
exec ords.enable_schema;
```

3. **Connect to ORDS using the MongoDB shell**:
By default, ORDS uses a self-signed certificate for secure communication. The Mongo API does not allow self-signed certificates, so you cannot directly connect with any Mongo tool or driver to the Mongo API.

The alternatives are as follows:

- Disabling TLS option is specifically for local environments that are not dealing with sensitive data. To disable TLS, you must invoke the following command before starting ORDS:

  ```
  ords config set mongo.tls false
  ords serve
  ```

  > **Note**
  >
  > Mongo API connect string changes to reflect that `mongo.tls` is not enabled. For example: `...ssl=false...`.

- Use the mongo tools and drivers to explicitly disable the requirement for TLS to require a valid signed certificate.

  The settings change depending on the tools and the APIs. For example, the `mongosh` has a ar`--tlsAllowInvalidCertificates` command line argument, whereas `mongoimport` has `--tlsInsecure` command line argument.

  > **See Also**
  >
  > Support for MongoDB APIs, Operations, and Data Types — Reference

- Configure the properties `standalone.https.cert` and `standalone.https.cert.key` to aquire a valid signed cerficate.

Example using `mongosh` without a valid signed certificate:

```
 mongosh  --tlsAllowInvalidCertificates 'mongodb://
foo:<Password>@localhost:27017/foo?
authMechanism=PLAIN&authSource=$external&tls=
true&retryWrites=false&loadBalanced=true'foo> db.createCollection('emp');
    { ok: 1 }
    foo> db.emp.insertOne({"name":"Blake","job": "Intern","salary":30000});
    ...
    foo> db.emp.insertOne({"name":"Smith","job": "Programmer","salary":
60000,"email" : "smith@oracle.com"});
    ...
    foo> db.emp.insertOne({"name":"Miller","job": "Programmer","salary":
70000});
    ...
    foo> db.emp.find({"name":"Miller"});
    [
      {
        _id: ObjectId("6320bfc40dd73b60ef5641b9"),
        name: 'Miller',
        job: 'Programmer',
        salary: 70000
      }
    ]


    foo> db.emp.updateOne({"name":"Miller"}, {$set:
{"email":"miller@oracle.com"}})
```

```
{
  acknowledged: true,
  insertedId: null,
  matchedCount: 1,
  modifiedCount: 1,
  upsertedCount: 0
}
```

4. The data inserted from the MongoDB client can be accessed from SQL:

```
SQL> select json_serialize(e.data)
     from emp e;

JSON_SERIALIZE(E.DATA)
---------------------------------------------------------------------------
-----
{"_id":"6320bfa30dd73b60ef5641b7","name":"Blake","job":"Intern","salary":30
000}
{"_id":"6320bfb30dd73b60ef5641b8","name":"Smith","job":"Programmer","salary
":60000,"email":"smith@oracle.com"}
{"_id":"6320bfc40dd73b60ef5641b9","name":"Miller","job":"Programmer","salar
y":70000,"email":"miller@oracle.com"}

SQL> select e.data."name".string() n,
           e.data."job".string() j
     from emp e
     where e.data."email".string() = 'miller@oracle.com';

N                    J
-------------------- ----------------------
Miller               Programmer
```

9.2 Requirements

This section lists the client and database requirements.

The MongoDB API supports Oracle Database version 21c or later and the Autonomous Oracle Database 19c or later (serverless, dedicated, and cloud@customer). In general, Oracle API for MongoDB supports MongoDB tools and drivers that support the loadBalanced connection option.

See Also

Tools and Drivers for Oracle Database API for MongoDB

9.3 Configurable Settings for MongoDB

This section lists the editable configuration settings to support the MongoDB API stored in the global configuration, located at `global/settings.xml`.

> ⓘ **Note**
>
> Oracle recommends users to use the Oracle REST Data Services command-line interface to edit the configuration files.

Table 9-1 Configuration Settings to Support the Mongo API

Key	Type	Description
`mongo.enabled` (Mandatory property)	boolean	Specifies to enable the API for MongoDB. Default value is `false`. Specifies to enable the API for MongoDB, set the value to `true`.
`mongo.tls`	boolean	Enables the use of the MongoDB API with non-TLS connections (Oracle Database 19c and later).
`mongo.access.log`	path	Specifies the path to the folder where you want to store the API for MongoDB access logs. If the path is not specified, then no access is generated.
`mongo.host`	string	Specifies a comma separated list of host names or IP addresses to identify a specific network interface on which to listen. Default value is `0.0.0.0`.
`mongo.port`	integer	Specifies the API for MongoDB listen port. Default value is `27017`.
`mongo.idle.timeout`	duration	Specifies the maximum idle time for a connection in milliseconds. Default value is `30m`
`mongo.op.timeout`	duration	Specifies the maximum time for a database operation in milliseconds. Default value is `10m`.

> ⓘ **See Also**
>
> - About the Oracle REST Data Services Configuration Files

9.4 Examples

This section lists some examples that use the `ords config set` command to store the MongoDB settings in the current working directory (CWD) `global/settings.xml` and also provides an example for MongoDB listener settings in `global/settings.xml` file.

Examples of using the ords config set command

- `ords config set mongo.tls false`
- `ords config set mongo.enabled true`
- `ords config set mongo.host example.com`
- `ords config set mongo.port 27017`
- `ords config set mongo.idle.timeout 40m`
- `ords config set mongo.op.timeout 15m`

Example of Mongo Listener settings in global/settings.xml

```
<!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
<properties>
<comment>Saved on Wed Jun 15 01:33:58 UTC 2022</comment>
<entry key="debug.printDebugToScreen">true</entry>
. . .
<entry key="mongo.tls">false</entry>
<entry key="mongo.enabled">true</entry>
<entry key="mongo.host">example.com</entry>
<entry key="mongo.port">27017</entry>
<entry key="mongo.idle.timeout">40m</entry>
<entry key="mongo.op.timeout">15m</entry>
. . .
</properties>
```

Examples of using the ords config get command

-
  ```
  ords config get mongo.enabled
  true
  ```

-
  ```
  ords config get mongo.port
  27016
  ```

Using the ords serve Command

Use the ords `serve` command to run in standalone mode.

Note

To enable the Oracle API for MongoDB, prior to running the `serve` command, you must set `mongo.enabled` property to `true`

See Also

- Setting Up the Configuration Folder Structure
- Serve Commands for Running in Standalone Mode

9.5 Accessing the Connection Pools

Oracle REST Data Services supports the ability to connect to more than one database. Multiple named pools can be defined using the install command. Adding a pool creates a corresponding directory under `./databases` within the ORDS configuration directory. An initial install of Oracle REST Data Services typically adds a default database connection pool named `default`.

By default, when you are connecting to the MongoDB API, all database requests are directed to the default connection pool. Optionally, you can route MongoDB API requests to other connection pools using the hostnames file. For example, assume that the database pool named `mydb1` has a configuration directory at `ords_config/databases/mydb1`.

Note

You cannot use multiple pools when mongo.tls key is disabled, only default pool is supported.

If you create the hostname file ords_config/databases/mydb1/hostnames containing two hostnames as follows:

```
www.example.com
example.com
```

Then, the following connection strings routes to mydb1 conection pool instead of the default connection pool:

```
"mongodb://www.example.com:27017/scott?
authMechanism=PLAIN&authSource=$external&ssl=true&retryWrites=false&loadBalanc
ed=true"

"mongodb://example.com:27017/scott?
authMechanism=PLAIN&authSource=$external&ssl=true&retryWrites=false&loadBalanc
ed=true"
```

See Also

- Routing Based on the Request Hostname

9.6 Logging MongoDB API Access

This section describes how to enable logging of requests to the MongoDB API.

By default, requests to the MongoDB API are not logged. To enable logging access to MongoDB API, you must set the configuration property mongo.access.log to a directory path. If the directory path is not absolute, it is resolved relative to the the ORDS configuration directory (<ords config>). If the directory does not exist, then ORDS creates the directory on startup. ORDS then adds an access log file entry within this directory each time the MongoDB API is accessed.

Example:

```
ords config set mongo.access.log mongologs
```

This command writes access log files under <ords config>/mongologs/ folder.

9.7 Achieving High Peformance

This section describes the settings that are useful in achieving high performance.

In environments where higher performance or throughput is desired, some ORDS connection pool parameters are required to be configured and tuned.

To achieve higher throughput, the following settings and the values are useful. The optimal tuning of these parameters depend on the requirements of an application:

```
ords config set jdbc.MaxConnectionReuseCount 5000
ords config set jdbc.MaxConnectionReuseTime 900
ords config set jdbc.SecondsToTrustIdleConnection 1
ords config set jdbc.MaxLimit 100
```

Where:

- `MaxConnectionReuseTime`: Enables connections to be gracefully closed and removed from the connection pool after a connection is borrowed a specific number of times.
- `SecondsToTrustIdleConnection`: Sets the time in seconds to trust a recently used or recently tested database connection and skip the validation test during connection checkout.
- `InitialLimit` and `MaxLimits`: Sets the connection pool size in the UCP for the specified connection pool.

10

Migration of Legacy Configuration

This section describes how to migrate the legacy configuration and the URL mapping.

Legacy configuration is any configuration of ORDS for versions starting with 2.x to version 21.4.x. These configurations need to be migrated to the new directory structure for 22.1 and higher versions of ORDS.

- Migrating From Legacy Configurations Using the CLI Installation
  To migrate your applications from legacy configurations, you can use the install command or the migrate config command.
- Migrating URL Mapping

10.1 Migrating From Legacy Configurations Using the CLI Installation

To migrate your applications from legacy configurations, you can use the install command or the migrate config command.

You can migrate your applications from legacy configurations in the following two ways:

Migrating the Configuration and Upgrading ORDS

You use this option when you migrate your legacy configurations (ORDS 21.4.x or earlier versions) to a new configuration structure, and also upgrade ORDS in the database. You can perform this using one of the following two options:

Using the Interactive Install Command

If you use the interactive install command, then it migrates the legacy configurations to the new configuration structure. Then, depending on the options that you selected in the earlier steps of installation, it prompts you to either upgrade ORDS in the database, or create or update additional database pools.

```
ords --config <configuration_folder> install --interactive
--legacy-config <legacy_config_folder> --log-folder <log_folder>
```

Using the Non-Interactive Install Command

If you use the non-interactive install command, then you must specify the required information to migrate the configuration in the command line.

```
ords --config <configuration_folder> install [--db-pool <pool_name>] --admin-
user <user>
 --legacy-config <folder> --log-folder <log_folder> --password-stdin <  <text-
file>
```

Migrating the Configuration Only

You use this option when you only migrate your legacy configurations (ORDS 21.4.x or earlier version) to a new configuration structure, but do not upgrade ORDS to a newer version.

```
ords --config <configuration_folder> migrate config <legacy_config_folder>
```

When migrating the configuration completes, the following message is displayed:

```
Legacy configuration files located at <legacy_config> are no longer being
used to configure ORDS
 or its connection pools. Your migrated configuration files are now located
at <configuration_folder>.
```

10.2 Migrating URL Mapping

The legacy URL mapping file is `/path/to/conf/url-mappings.xml` that contains different types of mappings.

The installer migrates the url-mappings. For each url-mapping that contains the following type, it performs the following:

- `base-path type`: creates a path file for that database-pool containing the base path (single or multiple path segments)
- `base-url type`: creates a hostname file for that database-pool containing the hostname.

The base-path mapping pattern may contain a path that consists of a single segment or multiple segments.

Example:

- `/sales`
- `/pls/hr`

The base-url mapping pattern may contain only the hostname, or it can include the protocol, hostname, and path.

Example:

https://example.com/ords/support

www.sales.com

The ORDS install CLI migrates the `url-mapping.xml` as follows:

For each base-path type mapping (for example, `/sales`), the path is added to the paths file of the pool.

> **Note**
>
> If the paths file does not exist, it is created.

For each base-url type mapping (for example https://example.com/ords/support), the hostname (for example example.com) is added to the hostnames file of the pool.

If the base-url mapping contains a path after the context (for example, `/ords`), then the path (for example, `/support`) is added to the paths file.

> **Note**
>
> If the hostnames or paths files do not exist, then it is created.

> **Note**
>
> A SEVERE warning message is displayed if:
>
> - Duplicate paths or hostnames across different database pools exist
> - The database pool that the mapping points to does not exist
> - The hostname or path is invalid

> **Note**
>
> The name of the directory that contains the `pool.xml` configuration file is used in the request URL path mapping. When you are migrating a `url-mapping.xml` file, the pool name from that file is used as the directory name. There is a possibility that a pool name overlaps with an entry in the paths file from another pool definition. The pool name takes precedence in the request URL mapping.

The following is an example `url-mapping.xml` file:

```
<?xml version="1.0" encoding="UTF-8"?>
<pool-config xmlns="http://xmlns.oracle.com/apex/pool-config">
 <pool name="db1" base-path="/sales" updated="2021-09-23T19:22:19.944Z"/>
 <pool name="db1" base-path="finance/" updated="2021-09-23T19:22:50.189Z"/>
 <pool name="db2" base-url="https://example.com/ords/support"
updated="2021-09-23T19:23:04.751Z"/>
 <pool name="db3" base-path="/pls/hr" updated="2021-09-23T19:23:14.832Z"/>
 <pool name="db4" base-path="employee" updated="2021-09-23T19:23:24.252Z"/>
 <pool name="db5" base-url="www.sales.com"
updated="2021-09-23T19:23:35.322Z"/>
</pool-config>
```

Example after migrating the url-mappings to the database pools folder:

```
+- databases/
  +- db1/
    +- pool.xml
    +- paths     // contains: [sales, finance]
  +- db2/
    +- pool.xml
    +- hostnames // contains: [example.com]
    +- paths     // contains: [support]
  +- db3/
    +- pool.xml
    +- paths     // contains: [/pls/hr]
  +- db4/
    +- pool.xml
    +- paths     // contains: [employee]
  +- db5/
    +- pool.xml
    +- hostnames // contains: [www.sales.com]
```

A

Setting-up a PL/SQL Gateway User

This section describes how to configure:

- PL/SQL gateway user for APEX
- PL/SQL gateway user to serve PL/SQL gateway requests directly

- Configuring a PL/SQL Gateway User for APEX
  This section explains how to configure the PL/SQL gateway user for APEX.
- Configuring a PL/SQL Gateway User to Serve PL/SQL Gateway Requests Directly

A.1 Configuring a PL/SQL Gateway User for APEX

This section explains how to configure the PL/SQL gateway user for APEX.

If you have installed ORDS and APEX, and the APEX PL/SQL gateway user needs to be configured, then perform the following:

1. Repair ORDS.

   > **See Also**
   >
   > Repairing the Oracle REST Data Services Installation

2. Verify if the configuration setting in the database pool is set correctly.

   ```
   ords --config <config path> config --db-pool <pool name> list
   ```

   > **Note**
   >
   > If you have only a single database pool (For example: Pool named `default`), then omit the `--db-pool` option.

   If the setting `plsql.gateway.mode` does not exist or is not set to `proxied`, then run the following command:

   ```
   ords --config <config path> config --db-pool <pool name> set
   plsql.gateway.mode
       proxied
   ```

A.2 Configuring a PL/SQL Gateway User to Serve PL/SQL Gateway Requests Directly

If you want the database pool to serve the PL/SQL gateway requests directly, then specify the options `--gateway-user <database user>` and `--gateway-mode direct` to configure the PL/SQL gateway user.

- Installing/Upgrading the PL/SQL Gateway User
  This section explains how to configure the PL/SQL gateway user while installing or upgrading ORDS.
- Configuring the PL/SQL Gateway User

A.2.1 Installing/Upgrading the PL/SQL Gateway User

This section explains how to configure the PL/SQL gateway user while installing or upgrading ORDS.

To configure the PL/SQL gateway to install or upgrade ORDS, you can use one of the following ways:

- Install/upgrade ORDS and configure PL/SQL gateway in interactive mode
- Install/upgrade ORDS and configure PL/SQL gateway in non-interactive (silent) mode

Install/upgrade ORDS and configure PL/SQL gateway in interactive mode

To install using the interactive mode, use the interactive `ords install -i` command and specify the `--gateway-user` and `--gateway-mode` options.

```
ords --config <config path> install -i --gateway-user <database user> --
gateway-mode direct

ords --config /path/to/config install -i --gateway-user EXAMPLE_USER1 --
gateway-mode direct
```

This command prompts for the connection information and the password of the gateway user. The password of the gateway user must match with the existing password of the database user. The following options are displayed and enables you to make changes:

```
...

Oracle REST Data Services - Interactive Install

  Enter a number to select the database connection type to use
    [1] Basic (host name, port, service name)
    [2] TNS (TNS alias, TNS directory)
    [3] Custom database URL
  Choose [1]:
  Enter the database host name [localhost]:
  Enter the database listen port [1521]:
  Enter the database service name [orcl]: pdb1
  Enter the PL/SQL Gateway database password for EXAMPLE_USER1:
Confirm password:
```

```
Connecting to database user: EXAMPLE_USER1 url: jdbc:oracle:thin:@//
localhost:1521/pdb1
  Provide database user name with administrator privileges.
    Enter the administrator username: sys
  Enter the database password for SYS AS SYSDBA:

Retrieving information.
ORDS is not installed in the database. ORDS installation is required.

  Enter a number to update the value or select option A to Accept and Continue
    [1] Connection Type: Basic
    [2] Basic Connection: HOST=localhost PORT=1521 SERVICE_NAME=pdb1
           Administrator User: SYS AS SYSDBA
    [3] Database password for ORDS runtime user (ORDS_PUBLIC_USER): <generate>
    [4] Database password for ORDS gateway user (EXAMPLE_USER1): *****
    [5] ORDS runtime user and schema tablespaces:  Default: SYSAUX Temporary
TEMP
    [6] Configure and start ORDS in Standalone Mode: Yes
    [7]    Protocol: HTTP
    [8]       HTTP Port: 8080
    [9]   APEX static resources location:
    [A] Accept and Continue - Create configuration and Install ORDS in the
database
    [Q] Quit - Do not proceed. No changes
  Choose [A]:
```

See Also

- Scenario 3: Multiple Database Pools
- Multiple Options with Default Values

Install/upgrade ORDS and configure PL/SQL gateway in non-interactive (silent) mode

To install using the non-interactive mode, use `ords install` command and specify `--gateway-user` and `--gateway-mode` options to configure the PL/SQL gateway user. Additional connection information options and the administrator user is required for the installation and configuration.

```
ords --config <path> install --db-pool <pool name> --admin-user
<administrator user>
--db-hostname <hostname> --db-port <port> --db-servicename <database
servicename>
--gateway-user <username> --gateway-mode direct --password-stdin < secret.txt

ords --config /path/to/config install --db-pool db1 --admin-user SYS
--db-hostname localhost --db-port 1521 --db-servicename pdb1 --gateway-user
EXAMPLE_USER1
--gateway-mode direct --password-stdin < secret.txt
```

See Also

Non-Interactive Command-Line Interface Installation (Silent)

A.2.2 Configuring the PL/SQL Gateway User

You can configure the PL/SQL gateway using either of the following modes :

- Running in interactive mode
- Running in non-interactive (silent) mode

Running in Interactive Mode

To configure the PL/SQL gateway user, use the `ords install -i --config-only` interactive command, specifying `--gateway-user` and `--gateway-mode` options.

```
ords install -i --config-only --gateway-user <username> --gateway-mode direct
```

Running in Non-Interactive (Silent) Mode

To configure the PL/SQL gateway user, use the `ords install --config-only` silent command, specifying `--gateway-user` and `--gateway-mode` options.

```
ords --config <path> install --config-only --db-pool <pool name> --admin-user
<administrator user>
--db-hostname <hostname> --db-port <port> --db-servicename <database
servicename>
--gateway-user <username> --gateway-mode direct --password-stdin < secret.txt
```

For example:

```
ords --config /path/to/config install --config-only --db-pool db1 --admin-
user SYS  --db-hostname localhost
--db-port 1521 --db-servicename pdb1 --gateway-user EXAMPLE_USER1 --gateway-
mode direct --password-stdin < secret.txt
```

B

Non-Interactive ORDS CLI Commands Examples

This section provides some examples for non-interactive install/upgrade, and uninstall.

The following are examples for non-interactive install/upgrade, and uninstall.

The password file must contain the password(s) in the correct order to match the order of the user(s), option(s) that are specified on the command-line.

The following examples can be used for a PDB, CDB. Ensure that the `--db-servicename` option contains the correct value for the servicename for the CDB, PDB.

If the `--log-folder <FOLDER>` option is specified and the log folder does not exist, then the folder is created.

- Non-Interactive Install/Upgrade
  This section explains how to create a proxied APEX_PUBLIC_USER.
- Non-Interactive Install/Upgrade (create a proxied PLSQL Gateway User)
  This section explains how to create a proxied PLSQL Gateway User.
- Non-Interactive Install/Upgrade (specify PLSQL Gateway User and not using RESTful Services)
  This section explains how to specify PLSQL Gateway User not using RESTful Services.
- Non-Interactive Install/Upgrade (disable a configured PLSQL Gateway)
  This section explains how to disable a configured PLSQL Gateway.
- Non-Interactive Uninstall ORDS
  This section explains how to uninstall ORDS in the database.
- config CLI Examples
  This section provides config CLI examples.

B.1 Non-Interactive Install/Upgrade

This section explains how to create a proxied APEX_PUBLIC_USER.

If APEX is installed and the `APEX_PUBLIC_USER` exists in the database, then the APEX_PUBLIC_USER is automatically configured to be a proxied user.

```
cat password.txt
```

```
<password for admin-user>
```

```
<password for proxy-user>
```

```
ords --config /path/to/test/config install --db-pool pdb1 --admin-user SYS --
proxy-user --db-hostname localhost --db-port 1521 --db-servicename orcl --
feature-sdw true --log-folder /path/to/logs --password-stdin < password.txt
```

B.2 Non-Interactive Install/Upgrade (create a proxied PLSQL Gateway User)

This section explains how to create a proxied PLSQL Gateway User.

Specify a PL/SQL gateway user and `--gateway-mode` proxied.

```
ords --config /path/to/test/config install --db-pool pdb2 --admin-user SYS --
proxy-user --db-hostname localhost --db-port 1521 --db-servicename pdb2 --
feature-sdw true --gateway-user EXAMPLE_USER1 --gateway-mode proxied --log-
folder /path/to/logs --password-stdin < password.txt
```

B.3 Non-Interactive Install/Upgrade (specify PLSQL Gateway User and not using RESTful Services)

This section explains how to specify PLSQL Gateway User not using RESTful Services.

Specify a PL/SQL gateway user and --gateway-mode direct. The direct mode indicates that you are only using the PL/SQL GATEWAY and not RESTful Services. The gateway user password is required for direct mode.

```
cat gatewaypwd.txt
```

```
<password for admin-user>
```

```
<password for proxy-user>
```

```
<password for gateway-user>
```

```
ords --config /path/to/test/config install --db-pool pdb3 --admin-user SYS --
proxy-user --db-hostname localhost --db-port 1521 --db-servicename pdb3 --
gateway-user EXAMPLE_USER2 --gateway-mode direct --log-folder /path/to/logs --
password-stdin < gatewaypwd.txt
```

B.4 Non-Interactive Install/Upgrade (disable a configured PLSQL Gateway)

This section explains how to disable a configured PLSQL Gateway.

Disables the proxied PL/SQL gateway user.

```
ords --config /path/to/test/config install --db-pool pdb2 --admin-user SYS --
proxy-user --db-hostname localhost --db-port 1521 --db-servicename pdb2 --
feature-sdw true --gateway-mode disabled --log-folder /path/to/logs --password-
stdin < password.txt
```

B.5 Non-Interactive Uninstall ORDS

This section explains how to uninstall ORDS in the database.

To uninstall ORDS, execute the following commands:

```
cat adminpwd.txt
<password for admin-user>

ords --config /path/to/test/config uninstall --admin-user SYS --db-hostname
localhost --db-port 1521
--db-servicename orcl --log-folder /path/to/logs < adminpwd.txt
```

B.6 config CLI Examples

This section provides config CLI examples.

Non-Interactive Update Wallet

If you want to change the password in the wallet, then specify the following:

```
ords --config /path/to/test/config config secret --password-stdin db.password <
userpwd.txt
```

If you want to view the password in the wallet, then specify the following:

```
ords --config /path/to/test/config config get --secret db.password
```

Where:

`userpwd.txt` contains the password.

> **Note**
>
> If you are changing the wallet for a specific pool, then you must provide the `--db-pool` option. The preceding example updates the default pool.

C

ORDS Legacy Commands and New ORDS CLI Commands

Table C-1 ORDS Legacy and New CLI Commands

Legacy Command	New CLI Command	Description
`java -jar ords.war configdir`	`ords --config /path/to/config <command>` Example of using config option:	Specifies the ORDS configuration folder that contains configuration files.

	`ords --config /path/to/config install <OPTIONS>`
	`ords --config /path/to/config uninstall <OPTIONS>`
		New CLI Command: If the configuration folder is not specified, your current working directory is your configuration folder. The command does not store the configuration location. You must provide the configuration location or use the default configuration location.
		Legacy configuration directory:
		The configuration location is stored in `ords.war` file. When the user executes the ords command, (example: install, setup) and the configuration location exists in `ords.war` file, then it does not prompt for the configuration location.
		Refer to Setting Up the Configuration Folder Structure for more information.

Table C-1 (Cont.) ORDS Legacy and New CLI Commands

Legacy Command	New CLI Command	Description

`java -jar ords.war install advanced`	`/ords install`
	`ords --config /path/to/config install`
	`ords --config /path/to/config install --interactive`
	`ords --config /path/to/config install -i`
		Install ORDS in interactive mode.
		Legacy install advanced:
		Prompts for the configuration information only if the ORDS configuration does not exist.
		Prompts if you want to run in a standalone mode.

`java -jar ords.war install --silent`
`java -jar ords.war install simple`
`java -jar ords.war`
	`ords --config /path/to/config install <OPTIONS>`	Install ORDS in a non-interactive mode. No prompting for new install CLI command if the user provides install options and not specifying the `-i` or `--interactive` option.
		Legacy install simple or no command : (`java -jar ords.war`)
		Prompts for the configuration information only if the ORDS configuration does not exist.
		If the configuration file does not exist and if the default parameter file does not contain any configuration values, then it prompts.

Table C-1 (Cont.) ORDS Legacy and New CLI Commands

Legacy Command	New CLI Command	Description
`java -jar ords.war schema`	`ords --config /path/to/config install`	Install or upgrade ORDS only. The configuration file is not updated. **New CLI Command**: `Enter a number to select the type of installation [1] Install or upgrade ORDS in the database only [2] Create or update a database pool and install/upgrade ORDS in the database [3] Create or update a database pool only Choose [1]`: Option 1 is equivalent.

`java -jar ords.war uninstall advanced`
`java -jar ords.war uninstall`
	`ords uninstall`
	`ords --config /path/to/config uninstall`
	`ords --config /path/to/config uninstall --interactive`
	`ords --config /path/to/config uninstall -i`
		Uninstalls ORDS in interactive mode.

`java -jar ords.war uninstall --silent`
`java -jar ords.war uninstall simple`
	`ords --config /path/to/config uninstall <OPTIONS>`	Uninstall ORDS in non-interactive mode. If you provide uninstall options and not specify the `-i` or `--interactive` option, then you are not prompted for new uninstall CLI command.

`java -jar ords.war set-property <KEY> <VALUE>`	`ords --config /path/to/config config set <KEY> <VALUE>`	Updates the setting in the configuration file. See Updating the Configuration Settings for a list of options.
`java -jar ords.war standalone`	`ords --config /path/to/config serve`	Launch ORDS in standalone mode.
`java -jar ords.war user <USERNAME> ROLES`	`ords --config /path/to/config config user add <NAME> <ROLE>`	Create the user and its roles to provide permission to the ORDS REST Services.

`java -jar ords.war validate`	`ords install repair`
	`ords --config /path/to/conf install repair`
	`ords --config /path/to/conf install repair --interactive`
	`ords --config /path/to/conf install repair -i`
		Repair ORDS in interactive mode.

Table C-1 (Cont.) ORDS Legacy and New CLI Commands

Legacy Command	New CLI Command	Description
`java -jar ords.war validate --silent`	`ords --config /path/to/conf install repair <OPTIONS>`	Repair ORDS in non-interactive mode. There is no prompting for install repair CLI command if user provides install options afer omitting the `-i` or `--interactive` option.

D

About the Oracle REST Data Services Configuration Files

The section describes the Oracle REST Data Services configuration files.

Topics:

- Understanding the Configuration Folder Structure
- Understanding the Configuration File Format
- Understanding the Configurable Settings

This section lists the configuration settings for the `settings.xml` and `pool.xml` configuration files, and secure settings for the wallet.

D.1 Understanding the Configuration Folder Structure

The configuration folder has the following structure:

```
+- global/
    +- settings.xml
    +- credentials
    +- wallet/
    +- standalone/
+- databases/
    +- default/
        +- pool.xml
        +- wallet/
    +- myapp/
         +- hostnames
         +- pool.xml
         +- wallet/
    +- myapp2/
         +- paths
         +- pool.xml
         +- wallet/
```

The global/ folder contains settings that apply across the entire ORDS instance:

- `settings.xml`: Contains settings that are configured across the entire ORDS instance. For example: `debug.printToScreen=true`
- `credentials`: The ORDS user password file

- `wallet/`: Contains an Oracle auto login wallet that contains the instance wide encryption and mac keys previously stored in `security.crypto.enc.password` and `security.crypto.mac.password` configuration settings in `defaults.xml`.
- `standalone/`: Contains standalone mode related resources such as the HTTPS certificate and key.

The `databases/` folder contains database pool configurations.

- Each pool configuration is located in its own folder. The base path url mapping for a pool is inferred from the folder name. If the folder is named `foo/`, then requests can be mapped to the pool by accessing https://server/ords/foo/...
- The database pool folder name must only contain lowercase alphabet a-z, digits 0-9, '-', '.' or '_' character.
- The folder named `default/` is reserved and is used to map requests that are not mapped to any other pool. It is equivalent to the `apex.xml` pool in the old structure.
- The folder named `databases/<pool-name>/wallet/` contains an Oracle auto login wallet that contains the credentials for the database pool. The database username and password must be stored in the wallet. The `db.password` settings must not be used. The wallet must conform to the requirements for ORDS wallets.
- Alternatively, the folder may contain a file named hostname or paths, but not both.

D.2 Understanding the Configuration File Format

Configuration files use the standard Java XML properties file format, where each configuration setting contains a key and a corresponding value. The following is an example of `settings.xml` file:

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE properties SYSTEM "http://java.sun.com/dtd/properties.dtd">
<properties>
<entry key="db.connectionType">basic</entry>
<entry key="db.hostname">localhost</entry>
<entry key="db.port">1521</entry>
<entry key="db.servicename">orcl</entry>
<entry key="jdbc.DriverType">thin</entry>
<entry key="jdbc.InitialLimit">3</entry>
<entry key="jdbc.MinLimit">1</entry>
<entry key="jdbc.MaxLimit">10</entry>
<entry key="jdbc.MaxStatementsLimit">10</entry>
<entry key="jdbc.InactivityTimeout">1800</entry>
<entry key="jdbc.statementTimeout">900</entry>
<entry key="jdbc.MaxConnectionReuseCount">1000</entry></properties>
```

D.3 Understanding the Configurable Settings

This section lists the configuration settings for the `settings.xml` and `pool.xml` configuration files, and secure settings for the wallet.

Note

- Oracle recommends users to use the Oracle REST Data Services command-line interface to edit the configuration files.
- To add or change a *Secure setting*, you must use the ords config secret command.
- To add, change, or delete a setting refer to Updating the Configuration Settings section.
  Example: `ords config secret db.password`

Table D-1 Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`apex.security.administrator.roles`	string	Specifies the comma delimited list of additional roles to assign authenticated APEX administrator type users.	Not applicable	Pool specific
`apex.security.user.roles`	string	Specifies the comma delimited list of additional roles to assign authenticated regular APEX users.	Not applicable	Pool specific
`autoupgrade.api.aulocation`	string	specifies a configuration setting for `AutoUpgrade.jar` location.	Not applicable	Pool specific
`autoupgrade.api.enabled`	boolean	Specifies a configuration setting to enable AutoUpgrade REST API features.	Not applicable	Pool specific
`autoupgrade.api.jvmlocation`	string	Specifies a configuration setting for AutoUpgrade REST API JVM location.	Not applicable	Pool specific
`autoupgrade.api.loglocation`	string	Specifies a configuration setting for AutoUpgrade REST API log location.	Not applicable	Pool specific
`database.api.management.services.disabled`	boolean	Specifies to disable the Database API administration related services. Only applicable when Database API is enabled.	Not applicable	Global
`db.adminUser`	string	Specifies the username for the database account that ORDS uses for administration operations in the database.	Not applicable	Pool specific
`db.cdb.adminUser`	string	Specifies the username for the database account that ORDS uses for the Pluggable Database Lifecycle Management.	Not applicable	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
db.credentialsSource	string	Specifies the source for database credentials when creating a direct connection for running SQL statements. Value can be one of pool or request. If the value is `pool`, then the credentials defined in this pool is used to create a JDBC connection. If the value `request` is used, then the credentials in the request is used to create a JDBC connection and if successful, grants the requestor SQL Developer role. Default value: `pool`	Not applicable	Pool specific
cache.metadata.graphql.expireAfterAccess	duration	Specifies the duration after a GraphQL schema is not accessed from the cache that it expires. Default value: 1 minute	`2m`	Global
cache.metadata.graphql.expireAfterWrite	duration	Specifies the duration after a GraphQL schema is cached that it expires and has to be loaded again. Default value: 2 minutes	`5m`	Not applicable
feature.graphql	string	Specifies which GraphQL features are enabled. Value can be one of: `enabled`, `disable_graphiql` or `disable_all`. • If the value is set to `enabled`, then all the GraphQL features are available. • If the value is set to `disable_graphiql`, then the GraphQL feature is disabled. • If the value is set to `disable_all`, then all the GraphQL features are unavailable. The default value is `enabled`.	`enabled`	Pool specific
cache.metadata.jwks.enabled	boolean	Specifies the setting to enable or disable JWKS caching. Supported values: • `true` • `false` Default value: `true`	`true`	Global
cache.metadata.jwks.initialCapacity	numeric	Specifies the initial capacity of the JWKS cache.	`10`	Global
cache.metadata.jwks.maximumSize	numeric	Specifies the maximum capacity of the JWKS cache.	`10000`	Global

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`cache.metadata.jwks.expireAfterAccess`	duration	Specifies the duration after a JWK is not accessed from the cache that it expires. By default this is disabled.	`2m`	Global
`cache.metadata.jwks.expireAfterWrite`	duration	Specifies the duration after a JWK is cached, that is, it expires and has to be loaded again. Default value: 5 minutes	`5m`	Global
`db.invalidPoolTimeout`	duration	Specifies how long to wait before retrying an invalid pool. Default value: `15m`	Not applicable	Global
`db.poolDestroyTimeout`	duration	Indicates how long to wait to gracefully destroy a pool before moving to forcefully destroy all connections including borrowed ones. Default value: `5m`	Not applicable	Pool specific
`db.wallet.zip`	string	Specifies the wallet archive (provided in BASE64 encoding) containing connection details for the pool.	Not applicable	Pool specific
`db.wallet.zip.path`	string	Specifies the path to a wallet archive containing connection details for the pool.	Not applicable	Pool specific
`db.wallet.zip.service`	string	Specifies the service name in the wallet archive for the pool.	Not applicable	Pool specific
`debug.trackResources`	boolean	Specifies to enable tracking of JDBC resources. If not released causes in resource leaks or exhaustion in the database. Tracking imposes a performance overhead.	Not applicable	Pool specific
`feature.grahpql.max.nesting.depth`	numeric	Specifies the maximum join nesting depth limit for GraphQL queries. Defaults to 5.	`10`	Global
`feature.openservicebroker.exclude`	boolean	Specifies to disable the Open Service Broker services available for the pool.	Not applicable	Pool specific
`feature.sdw`	boolean	Specifies to enable the Database Actions feature.	Not applicable	Pool specific
`http.cookie.filter`	string	Specifies a comma separated list of HTTP Cookies to exclude when initializing an Oracle Web Agent environment.	Not applicable	Pool specific
`instance.api.enabled`	boolean	Specifies the setting to enable or disable the instance API service. The default value is false.	`true`	Global / Pool specific
`jdbc.auth.admin.role`	string	Identifies the database role that indicates that the database user must get the SQL Administrator role.	Not applicable	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`jdbc.cleanup.mode`	Not applicable	Specifies how a pooled JDBC connection and corresponding database session, is released when a request has been processed. Default value: `RECYCLE`	Not applicable	Pool specific
`jdbc.sessionlesstxn.timeout`	duration	Specifies the default timeout for sessionless transactions. Default value: 60 seconds	`60s`	Pool specific
`owa.trace.sql`	boolean	Specifies a boolean property. If it is true, then it causes a trace of the SQL statements performed by Oracle Web Agent to be echoed to the log.	Not applicable	Pool specific
`plsql.gateway.mode`	string	Indicates if the PL/SQL Gateway functionality should be available for a pool or not. Value can be one of `disabled`, `direct`, or `proxied`. • If the value is `direct`, then the pool serves the PL/SQL Gateway requests directly. • If the value is `PLSQL_GATEWAY_CONFIG`, view is used to determine the user to whom to proxy.	`proxied`	Pool specific
`request.traceHeaderName`	string	Specifies the name of the HTTP request header that uniquely identifies the request end to end as it passes through the various layers of the application stack. In Oracle this header is commonly referred to as the ECID (Entity Context ID).	Not applicable	Global
`security.jwt.profile.enabled`	boolean	Specifies whether the JWT Profile authentication is available. Supported values: • `true` • `false` Default value: `true`	`true`	Pool specific
`security.jwks.size`	numeric	Specifies the maximum number of bytes read from the JWK url. Default value: `100000` bytes .	`100000`	Pool specific
`security.jwks.connection.timeout`	duration	Specifies the maximum amount of time before timing-out when accessing a JWK url. Default value: 5 seconds	`5s`	Pool specific
`security.jwks.read.timeout`	duration	Specifies the maximum amount of time reading a response from the JWK url before timing-out. Default value: 5 seconds.	`5s`	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`security.jwks.refresh.interval`	duration	Specifies the minimum interval between refreshing the JWK cached value.	`10s`	Pool specific
`security.jwt.allowed.skew`	duration	Specifies the maximum skew the JWT time claims are accepted. This is useful if the clock on the JWT issuer and ORDS differs by a few seconds. By default, it is disabled.	`10s`	Pool specific
`security.jwt.allowed.age`	duration	Specifies the maximum allowed age of a JWT in seconds, regardless of expired claim. The age of the JWT is taken from the JWT issued at claim. By default, it is disabled.	`1h`	Pool specific
`security.jwt.profile.mode`	Not applicable	Specifies the setting to enable or disable the JWT profile feature. Values can be one of `DISABLED`, `POOL` or `SCHEMA`. • If the value is`SCHEMA`, then JWT profile is defined by OAUTH.CREATE_JWT_PROFILE. • If the value is`POOL`, then JWT profile defined at the pool level is used. • If the value is`DISABLED`, then JWT profile defined at the pool level is used. Default value : `SCHEMA`	`POOL`	Pool specific
`security.jwt.profile.audience`	string	Specifies the expected audience for the JWT token. This value is used to validate the `aud` claim in the JWT token.	`myJWTaudience`	Pool specific
`security.jwt.profile.issuer`	string	Specifies the issuer of the JWT token. This value is used to validate the `iss` claim in the JWT token.	`https://identity.oraclecloud.com/`	Pool specific
`security.jwt.profile.jwk.url`	string	Specifies the URL of the JSON Web Key (JWK) that is used to verify the signature of the JWT token. The JWT URL must use https.	`https://idcs-xxxxxxxxxxxxx.identity.oraclecloud.com/admin/v1/SigningCert/jwk`	Pool specific
`security.jwt.profile.role.claim.name`	string	Specifies the JSON pointer to the claim in the JWT token that contains the roles of the users. This is used for Role-Based Access Control (RBAC) with JWT profiles. The role claim name must be a valid JSON pointer and should start with '/'.	`/roles`	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`security.credentials.attempts`	numeric	Specifies the maximum number of unsuccessful password attempts allowed. Enabled by setting a positive integer value. Defaults to `-1`.	3	Global
`security.credentials.file`	string	Specifies the file where credentials are stored.	Not applicable	Global
`security.credentials.lock.time`	duration	Specifies the period to lock the account that has exceeded maximum attempts. Defaults to `10m` (10 minutes)	`15m`	Global
`security.validationFunctionType`	string	Indicates the type of `security.requestValidationFunction: javascript` or plsql. Defaults to `plsql`.	Not applicable	Pool specific
`standalone.access.log`	string	Specifies the path to the folder to store HTTP request access logs. If not specified, then no access log is generated.	Not applicable	Global
`standalone.binds`	string	Specifies the comma separated list of host names or IP addresses to identify a specific network interface on which to listen. Default value: `0.0.0.0`	Not applicable	Global
`standalone.context.path`	string	Specifies the context path where ords is located. Defaults to `/ords`	Not applicable	Global
`standalone.doc.root`	string	Points to the location where static resources to be served under the / root server path are located.	Not applicable	Global
`standalone.http.port`	numeric	Specifies the HTTP listen port. Default value: `8080`	`8777`	Global
`standalone.https.cert`	string	Specifies the SSL certificate path. If you are providing the SSL certificate, then you must specify the certificate location.	Not applicable	Global
`standalone.https.cert.key`	string	Specifies the SSL certificate key path. If you are providing the SSL certificate, you must specify the certificate key location.	Not applicable	Global
`standalone.https.host`	string	Specifies the SSL certificate hostname to use when you are generating a Self-Signed Certificate. Once a certificate exists, you cannot change the configuration setting to generate a new certificate.	Not applicable	Global
`standalone.https.port`	numeric	Specifies the HTTPS listen port. Default value: 8443	Not applicable	Global

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`standalone.https.san`	boolean	Specifies if the self-signed certificate generated by ORDS in a standalone mode includes a SAN extension. SAN has the same value as defined for the setting `standalone.https.host`.	`false`	Global
`standalone.static.context.path`	string	Specifies the Context path where APEX static resources are located. Default value: `/i`	Not applicable	Global
`standalone.static.path`	string	Specifies the path to the folder containing static resources required by APEX.	Not applicable	Global
`standalone.stop.timeout`	duration	Specifies the period for Standalone Mode to wait until it is gracefully shutdown. Default value: `10s` (10 seconds)	`15s`	Global
`apex.docTable`	string	This parameter is deprecated, instead use `owa.docTable` parameter.	`MYDOCTABLE`	Pool specific
`cache.metadata.timeout`	Duration	Specifies the setting to determine for how long a metadata record remains in the cache. Longer duration means, it takes longer to view the applied changes. The formats accepted are based on the ISO-8601 duration format. Default value: `1s` (1 second)	`5m`	Global
`cache.metadata.enabled`	boolean	Specifies the setting to enable or disable metadata caching. Supported values: • `true` • `false` Default value: `true`	`false`	Global
`database.api.enabled`	boolean	Specifies whether the Database API is enabled. Supported values: • `true` • `false` Default value: `false`	Not applicable	Global
`db.connectionType`	string	The type of connection. Supported values: • `basic` • `tns` • `customurl` • `databaseToolsConnection` for Database tools connections	`databaseToolsConnection`	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
db.databaseToolsConnection	string	Specifies the OCID of the pre-configured OCI database tools connection. Required for database tools type of connections.	ocid1.databasetoolsconnection.oc1.eu-frankfurt-1.amaaaaaa....	Pool specific
db.authProvider	string	Specifies the method of authentication to use. It can be one of oci-instance-principal or oci-profile. Defaults to oci-instance-principal. Optional for database tools type of connections.	oci-profile	Pool specific
db.ociProfile	string	Specifies the name of the profile in your OCI CLI configuration file for authentication. Defaults to DEFAULT. Optional for database tools type of connections, only used when the value of db.authProvider is set to oci-profile.	DEFAULT	Pool specific
db.customURL	string	Specifies the JDBC URL connection to connect to the database.	jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=myhost)(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=ora111.example.com)))	Pool specific
db.hostname	string	Specifies the host system for the Oracle database.	myhostname	Pool specific
db.password	string	Specifies the password of the specified database user	Not applicable	Pool specific secure setting
db.port	numeric	Specifies the database listener port.	1521	Pool specific
db.adminUser.password	string	Specifies the password for the database account that ORDS uses for administration operations in the database.	Not applicable	Pool specific secure setting
db.cdb.adminUser.password	string	Specifies the password for the database account that ORDS uses for the Pluggable Database Lifecycle Management.	Not applicable	Pool specific secure setting
db.servicename	string	Specifies the network service name of the database.	ora111.example.com	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`db.serviceNameSuffix`	string	Specifies that the pool points to a CDB, and that the PDBs connected to that CDB should be made addressable by Oracle REST Data Services (see Making All PDBs Addressable by Oracle REST Data Services (Pluggable Mapping)).	`apex_pu`	Pool specific
`db.sid`	string	Specifies the name of the database.	`ora111`	Pool specific
`db.tnsAliasName`	string	Specifies the TNS alias name that matches the name in the `tnsnames.ora` file.	`MY_TNSALIAS`	Pool specific
`db.tnsDirectory`	string	The directory location of your `tnsnames.ora` file.	`C:\ORACLE\NETWORK\ADMIN`	Pool specific
`db.username`	string	Specifies the name of the database user for the connection.	`APEX_PUBLIC_USER`	Pool specific
`debug.printDebugToScreen`	boolean	Specifies whether to display error messages on the browser. Supported values: • `true` • `false` Default value: `false`	`false`	Global
`debug.printOWADebug`	boolean	Specifies whether to display errors in PL/SQL gateway requests on the browser. If the value is set to `true`, then it overrides `debug.printDebugToScreen` value for PL/SQL gateway requests. Supported values: • `true` • `false` Default value: `false`	`false`	Pool specific
`error.responseFormat`	string	Specifies how the HTTP error responses must be formatted. Supported values: • `html` - Force all responses to be in HTML format • `json` - Force all responses to be in JSON format • `auto` - Automatically determines most appropriate format for the request (default).	`json`	Global
`error.externalPath`	string	Specifies the path to a folder that contains the custom error page.	`/path/to/error/pages/folder/`	Global

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`icap.port`	numeric	Specifies the Internet Content Adaptation Protocol (ICAP) port to virus scan files. Either `icap.port` or `icap.secure.port` are required to have a value.	`1344`	Global
`icap.secure.port`	numeric	Specifies the Internet Content Adaptation Protocol (ICAP) port to virus scan files. Either `icap.port` or `icap.secure.port` are required to have a value. If values for both `icap.port` and `icap.secure.port` are provided, then the value of `icap.port` is ignored.	`1344`	Global
`icap.server`	string	Specifies the Internet Content Adaptation Protocol (ICAP) server name or IP address to virus scan files. The `icap.server` is required to have a value.	`servername`	Global
`jdbc.DriverType`	string	Specifies the JDBC driver type. Supported values: • `thin` • `oci8` Default value: `thin`	`thin`	Pool specific
`jdbc.InactivityTimeout`	numeric	Specifies how long an available connection can remain idle before it is closed. The inactivity connection timeout is in seconds. Defaults to `1800`.	`1800`	Pool specific
`jdbc.InitialLimit`	numeric	Specifies the initial size for the number of connections that will be created. Defaults to `0`. (The default is low, and should probably be set higher in most production environments.)	`10`	Pool specific
`jdbc.MaxConnectionReuseCount`	numeric	Specifies the maximum number of times to reuse a connection before it is discarded and replaced with a new connection. Defaults to `1000`.	`1000`	Pool specific
`jdbc.MaxLimit`	numeric	Specifies the maximum number of connections. Defaults to `10`. (Might be too low for some production environments.)	`20`	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`jdbc.auth.enabled`	boolean	Specifies if the PL/SQL Gateway calls can be authenticated using database users. If the value is `true` then this feature is enabled. If the value is `false`, then this feature is disabled. The default value is `false`. Oracle recommends not to use this feature. This feature used only to facilitate customers migrating from mod_plsql.	`false`	Pool specific
`jdbc.MaxStatementsLimit`	numeric	Specifies the maximum number of statements to cache for each connection. Defaults to `10`.	`10`	Pool specific
`jdbc.MinLimit`	numeric	Specifies the minimum number of connections. Defaults to `2`.	`1`	Pool specific
`jdbc.statementTimeout`	numeric	Specifies a timeout period on a statement. An abnormally long running query or script, executed by a request, may leave it in a hanging state unless a timeout is set on the statement. Setting a timeout on the statement ensures that all the queries automatically timeout if they are not completed within the specified time period. Defaults to `900`.	`900`	Pool specific
`misc.defaultPage`	string	Specifies the default page to display. The Oracle REST Data Services Landing Page.	`apex`	Pool specific
`misc.pagination.maxRows`	numeric	Specifies the maximum number of rows that will be returned from a query when processing a RESTful service and that will be returned from a nested cursor in a result set. Affects all RESTful services generated through a SQL query, regardless of whether the resource is paginated. Defaults to `10000`.	`300`	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`owa.docTable`	string	Specifies the name of the document table used by the file upload. Defaults to `FLOWS_FILES.WWV_FLOW_FILE_OBJECTS$` value. Note For APEX 4.x and above this parameter should not be used.	`MYDOCTABLE`	Pool specific
`procedure.postProcess`	string	Specifies the procedure name(s) to execute after executing the procedure specified on the URL. Multiple procedure names must be separated by commas.	`SCHEMA1.SUBMIT.REQUEST,FINISHTASK`	Pool specific
`procedure.preProcess`	string	Specifies the procedure name(s) to execute prior to executing the procedure specified on the URL. Multiple procedure names must be separated by commas.	`SCOTT.PREPROC1, INITIALIZE, PKG1.PROC`	Pool specific
`procedure.rest.preHook`	string	Specifies the function to be invoked prior to dispatching each Oracle REST Data Services based REST Service. The function can perform configuration of the database session, perform additional validation or authorization of the request. The function is invoked only after authorization has been granted to a protected resource. If the function returns `true`, then processing of the request continues. If the function returns `false`, then processing of the request is aborted and an `HTTP 403 Forbidden` status is returned. If authorization to the protected resource fails, the pre-hook function is not invoked. Instead, ORDS returns an `HTTP 401 Unauthorized Response` status code.	`MYAPP.VALIDATE_REST_CALL`	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
security.disableDefaultExclusionList	boolean	If this value is set to true, then the Oracle REST Data Services internal exclusion list is not enforced. **Note**: The Oracle REST Data Services internal exclusion list blocks the users from accessing the following sys packages: • sys.* • dbms_* • utl_* • owa_* • owa.* • htp.* • htf.* • wpg_docload.* Supported values: • true • false Default value: false Oracle recommends that you do not set this value to true. That is, do not disable the default internal exclusion list. The only possible exception is temporarily disabling the internal exclusion list for debugging purposes.	false	Global
security.exclusionList	string	Specifies a pattern for procedures, packages, or schema names which are forbidden to be directly executed from a browser. Procedure names can contain the wildcard characters asterisk (*) or question mark (?). Use an asterisk (*) to substitute zero or more characters and a question mark (?) to substitute for any one character. **Note**: Separate multiple patterns using commas.	customer_account,bank*, employe?	Global
security.externalMappingPathPrefix	boolean	Enables the use of pool identifiers of a tenant database directly within the URL of the request when trying to access it through a remote configuration.	Not applicable	Global specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
security.inclusionList	string	Specifies a pattern for procedures, packages, or schema names which are allowed to be directly executed from a browser. Procedure names can contain the wildcard characters asterisk (*) or question mark (?). Use an asterisk (*) to substitute zero or more characters and a question mark (?) to substitute for any one character. **Note**: Separate multiple patterns using commas.	apex, p, v, f, wwv_*, y*, c*	Global
security.maxEntries	numeric	Specifies the maximum number of cached procedure validations. Defaults to 2000. Set this value to 0 to force the validation procedure to be invoked on each request.	2000	Global
security.requestAuthenticationFunction	string	Specifies an authentication function to determine if the requested procedure in the URL should be allowed or disallowed for processing. The function should return true if the procedure is allowed; otherwise, it should return false. If it returns false, Oracle REST Data Services will return WWW-Authenticate in the response header.	owa_custom.authorize	Pool specific
security.requestValidationFunction	string	Specifies a validation function to determine if the requested procedure in the URL should be allowed or disallowed for processing. The function should return true if the procedure is allowed; otherwise, return false.	CHECK_VALID_PROCEDURE	Pool specific
security.verifySSL	boolean	Specifies whether HTTPS is available in your environment. Supported values: • true • false Default value: true If you change the value to false, see Using OAuth2 in Non-HTTPS Environments.	true	Global
restEnabledSql.active	boolean	Specifies whether the REST-Enabled SQL service is active. Supported values: • true • false Default value: false	true	Pool specific

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`apex.security.developer.roles`	string	Comma delimited list of additional roles to assign authenticated APEX developer type users. Default value: SQL Developer, OAuth Client Developer	Not applicable	Pool specific
`db.idlePoolTimeout`	duration	Specifies for how long to wait before destroying an idle pool.	Not applicable	Global
`feature.sdw.selfServiceSchema`	boolean	Specifies enable self service schema feature. Default value: `false`	Not applicable	Pool specific
`http.cookie.filter.byValue`	string	Specifies a comma separated list of HTTP Cookie values to exclude when initializing an Oracle Web Agent environment.	Not applicable	Pool specific
`jdbc.ConnectionWaitTimeout`	numeric	Specifies the wait time (in seconds) for a used connection to be released by a client. Default value: 3	Not applicable	Pool specific
`jdbc.MaxConnectionReuseTime`	duration	Specifies the maximum time of a connection that can be reused before it is discarded and replaced with a new connection. Default value: `60s`	Not applicable	Pool specific
`jdbc.driverName`	string	Specifies the name of the JDBC driver to use.	Not applicable	Pool specific
`jdbc.ucp.enableJMX`	boolean	Enables JMX-Based Management in UCP. Default value: `true`	Not applicable	Pool specific
`json.sdo.geometry.output.geojson`	boolean	Specifies that SDO Geometry data must be returned in GeoJSON format. Default value: `false`	Not applicable	Pool specific
`mongo.access.log`	string	Specifies the path to the folder to store API for MongoDB access logs. If `mongo.access.log` is not specified, then the Mongo access log is not generated.	`/path/to/mongo/logs`	Global
`mongo.enabled`	boolean	Enables the API for MongoDB when set to true. Default value: `false`	`true`	Global
`mongo.host`	string	Comma separated list of host names or IP addresses to identify a specific network interface on which to listen. Default value: `0.0.0.0`	`example.com`	Global
`mongo.idle.timeout`	duration	Specifies the maximum idle time for a connection. Default value (in minutes): `30m`	45m	Global

Table D-1 (Cont.) Oracle REST Data Services Configuration Settings

Key	Type	Description	Example	Setting Type
`mongo.op.timeout`	duration	The maximum time a single request will wait on a database operation. Default value (in minutes): `10m`	15m	Global
`mongo.port`	numeric	Specifies listen port of API for MongoDB Wire protocol. Default value: `27017`	Not applicable	Global
`mongo.tls`	boolean	Enables TLS for the API for MongoDB. Note, disabling TLS is strongly discouraged as third parties may be able to observe credentials transmitted by MongoDB clients Default value: `true`	Not applicable	Global
`oracle.jdbc.vectorDefaultGetObjectType`	string	Sets the default return type of `getObject()` methods when the column type is VECTOR. See Oracle JDBC documentation for more information. Default value: `String`	Not applicable	Pool specific
`public.properties.url`	string	Specifies the URL to retrieve the global public properties.	Not applicable	Global
`security.externalHostMappingHeader`	string	Indicates the header name for identifying a tenant database when trying to access it through a remote configuration.	Not applicable	Global
`security.externalSessionTrustedOrigins`	string	Specifies a comma separated list of origins that are trusted to make Cross-Origin Resource Sharing (CORS) request. If this setting is empty or not configured, then no CORS requests are allowed for the PL/SQL gateway and results in a 403 Unauthorized status.	Not applicable	Global
`security.httpsHeaderCheck`	string	Specifies the HTTP request header and value that indicates to ORDS the initial client request was received by a Load Balancer / Reverse Proxy over HTTPS even if the request received by ORDS was sent over HTTP.	`X-Forwarded-Proto: https`	Global
`security.host.headers`	string	Specifies the comma-delimited list of the allowed host names for the requests made to ORDS.	Not applicable	Global
`security.par.enabled`	boolean	Enables or disables the PAR feature. Default value: `true`	Not applicable	Pool specific
`standalone.access.log.retainDays`	numeric	Specifies the number of days before the rotated access log files are deleted. Default value (in days): `90`	Not applicable	Global

ⓘ **See Also**

SODA Entries In ORDS Configuration File

E

ORDS Central Configuration OpenAPI

```
{
  "openapi": "3.0.3",
  "info": {
    "title": "Central Configuration Server API",
    "version": "2024.07.01",
    "description": "<p>Last Update: July 2024</p>\n\nThe Central 
Configuration Server API  provides comprehensive endpoints that allows ORDS 
(Oracle Rest Data Services) to retrieve global and pool-specific 
configurations from the central configuration server. Use this API to setup 
and configure your own central configuration server for ORDS.<p> With 
centralized configurations ORDS nodes will be configured to point to a 
centralized configuration URL that provides access to the configuration 
state, rather than reading the configuration state from a disk based folder.
</p> <p>The configuration server will be specified via a Java System property 
named config.url .  Access to the centralized configuration URL will need to 
be secured. Another system property config.wallet will be used to provide the 
credentials to be used when connecting to the centralized configuration URL.</
p>",
    "license": {
      "name": "ORDS License",
      "url": "https://www.oracle.com/rest"
    }
  },
  "externalDocs": {
    "description": "Find out more about ORDS",
    "url": "https://www.oracle.com/rest"
  },
  "servers": [
    {
      "url": "https://central-config.example.com",
      "description": "Central Configuration Server"
    }
  ],
  "tags": [
    {
      "name": "General",
      "description": "General Endpoints"
    }
  ],
  "paths": {
    "/central/v1/config": {
      "get": {
        "tags": [
          "General"
        ],
        "summary": "Retrieve global configuration",
        "description": "<p>Retrieves the global configuration stored in the 
central configuration server. The global configuration contains settings that 
```

```
apply across the entire ORDS instance.</p><p> Configuration use the standard
JSON properties format, where each configuration setting contains a key and a
corresponding value.</p>",
        "operationId": "getGlobalConfig",
        "parameters": [
          {
            "$ref": "#/components/parameters/AcceptHeader"
          },
          {
            "$ref": "#/components/parameters/AuthorizationHeader"
          },
          {
            "$ref": "#/components/parameters/RequestIdHeader"
          }
        ],
        "responses": {
          "200": {
            "description": "Global configuration returned successfully",
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/GlobalConfigResponse"
                }
              }
            }
          },
          "401": {
            "description": "Unauthorized - Invalid or missing
authentication.Bearer access token was not provided in Authorization header,
token could not be decoded, or token was invalid.",
            "content": {
              "application/json": {
                "example": {
                  "message": "string",
                  "code": "string"
                }
              }
            }
          },
          "404": {
            "description": "Not Found - Global configuration not found",
            "content": {
              "application/json": {
                "example": {
                  "message": "string",
                  "code": "string"
                }
              }
            }
          }
        }
      }
    },
    "/central/v1/config/pool/{host}": {
      "get": {
        "tags": [
          "General"
        ],
        "summary": "Retrieve pool-specific configuration",
        "description": "<p> Retrieves the configuration for a specific pool
from the central server.The pool configuration file contains informations
about a pool. Configuration files use the standard JSON properties format,
where each configuration setting contains a key and a corresponding
value.</p> <p>Note that the response should include an ETag which changes if
the configuration changes.</p>",
        "operationId": "getPoolConfig",
        "parameters": [
          {
            "$ref": "#/components/parameters/AcceptHeader"
          },
          {
            "$ref": "#/components/parameters/AuthorizationHeader"
          },
          {
            "$ref": "#/components/parameters/RequestIdHeader"
          },
          {
            "$ref": "#/components/parameters/IfNoneMatchHeader"
          },
          {
            "name": "host",
            "in": "path",
            "required": true,
            "description": "Identifier for the pool whose configuration is to
be retrieved.",
            "schema": {
              "type": "string",
              "example": "mydatabase"
            }
          }
        ],
        "responses": {
          "200": {
            "description": "Pool configuration returned successfully",
            "headers": {
              "ETag": {
                "description": "ETag for the returned configuration",
                "schema": {
                  "type": "string"
                }
              }
            },
            "content": {
              "application/json": {
                "schema": {
                  "$ref": "#/components/schemas/PoolConfigResponse"
                }
              }
            }
          },
          "304": {
            "description": "Not Modified - The configuration has not changed
since the last request",
            "content": {
              "application/json": {
                "example": {
                  "message": "string",
                  "code": "string"
                }
              }
            }
          },
          "401": {
            "description": "Unauthorized - Invalid or missing
authentication.Bearer access token was not provided in Authorization header,
token could not be decoded, or token was invalid.",
            "content": {
              "application/json": {
                "example": {
                  "message": "string",
                  "code": "string"
                }
              }
            }
          },
          "404": {
            "description": "Not Found - No matching mapping is found for the
requested pool",
            "content": {
              "application/json": {
                "example": {
                  "message": "string",
                  "code": "string"
                }
              }
            }
          }
        }
      }
    }
  },
  "components": {
    "parameters": {
      "AcceptHeader": {
        "name": "Accept",
        "in": "header",
        "required": false,
        "description": "Indicates the media type(s) that ORDS is able to
understand. The central configuration server uses this header to select an
appropriate response format.",
        "schema": {
          "type": "string",
          "example": "application/json"
        }
      },
      "AuthorizationHeader": {
        "name": "Authorization",
        "in": "header",
        "required": true,
        "description": "Contains the credentials to authenticate ORDS with
the server. Typically used to pass a Bearer token.",
        "schema": {
          "type": "string",
          "example": "Bearer abcdef123456"
        }
      },
      "RequestIdHeader": {
        "name": "Request-Id",
        "in": "header",
        "required": true,
        "description": "A unique identifier for the request, which can be
used for tracking and debugging purposes. This ID helps correlate ORDS
requests with server logs.",
        "schema": {
          "type": "string",
          "example": "123e4567-e89b-12d3-a456-426614174000"
        }
      },
      "IfNoneMatchHeader": {
        "name": "If-None-Match",
        "in": "header",
        "required": true,
        "description": "Used to make conditional requests based on the ETag
(entity tag) of a resource. If the ETag matches the current version of the
resource, the server responds with a 304 Not Modified status instead of
returning the resource.",
        "schema": {
          "type": "string",
          "example": "34f7a3113803f8ed3b8fd7ce5656ebec"
        }
      }
    },
    "schemas": {
      "GlobalConfigResponse": {
        "type": "object",
        "properties": {
          "settings": {
            "type": "object",
            "additionalProperties": {
              "type": "string"
            },
            "description": "Key-value pairs of configuration settings. Under
\"Settings\", you can define your custom settings. Please refer to the
following documentation for a better understanding of what configuration
settings are available for the global configuration file [Oracle REST Data
Services Configuration Files](https://docs.oracle.com/en/database/oracle/
oracle-rest-data-services/24.2/ordig/about-REST-configuration-files.html).",
            "example": {
              "restEnabledSql.active": true,
              "feature.sdw": true,
              "security.externalHostMappingHeader": "poolname"
            }
          },
          "links": {
            "type": "array",
            "items": {
              "type": "object",
              "properties": {
                "rel": {
                  "type": "string",
                  "description": "Indicates the relationship of the link to
the current context."
                },
                "href": {
                  "type": "string",
                  "description": "Specifies the URL associated with the link."
                },
                "templated": {
                  "type": "boolean",
                  "description": "Specifies whether the URL is templated
(contains placeholders) or not."
                }
              },
              "required": [
                "rel",
                "href"
              ],
              "example": [
                {
                  "rel": "collection",
                  "href": "http://central-config.example.com:8585/central/v1/
config/"
                },
                {
                  "rel": "self",
                  "href": "http://central-config.example.com:8585/central/v1/
config/"
                },
                {
                  "rel": "search",
                  "href": "http://central-config.example.com:8585/central/v1/
config/pool/{host}",
                  "templated": true
                }
              ]
            },
            "description": "Under \"links\" (Array), each entry represents a
hyperlink related to the configuration, with specific relationships (e.g.,
\"collection\", \"self\", \"search\") and associated URLs. The \"search\"
link is marked as templated, indicating that it contains a placeholder {host}
which can be replaced with an actual value when making a request.\nThis array
contains links relevant to the configuration\n- **rel** (String) Indicates
the relationship of the link to the current context.\n- **href** (String)
Specifies the URL associated with the link.\n- **templated** (Boolean)
Specifies whether the URL is templated (contains placeholders) or not.\n"
          }
        }
      },
      "PoolConfigResponse": {
        "type": "object",
        "properties": {
          "database": {
            "type": "object",
            "properties": {
              "pool": {
                "type": "object",
                "properties": {
                  "name": {
                    "type": "string"
                  },
                  "settings": {
                    "type": "object",
                    "additionalProperties": {
                      "type": "string"
                    },
                    "example": {
                      "db.wallet.zip":
"UEsDBBQACAgIAOMid1IAAAAAAAAAAAAAAAALAAAAY3dhbGxldC5zc28BdRuH4TjA...",
                      "feature.sdw": true,
                      "plsql.gateway.mode": "proxied",
                      "restEnabledSql.active": true
                    },
                    "description": "Please refer to the following
documentation for better understanding of what configuration settings are
available for the pool configuration file [Understanding the Configurable
Settings](https://docs.oracle.com/en/database/oracle/oracle-rest-data-
services/24.2/ordig/about-REST-configuration-files.html)\n"
                  }
                }
              }
            }
          }
        }
      }
    }
  }
}
```

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