

Oracle® Cloud

Migrating Oracle Database Exadata Express Cloud Service Apps to Oracle Cloud Infrastructure



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The Oracle logo, consisting of a solid red square with the word "ORACLE" in white, uppercase, sans-serif font centered within it.

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Learn how to migrate Oracle Application Express applications from Oracle Database Exadata Express Cloud Service to Oracle Autonomous Data Warehouse and Oracle Autonomous Transaction Processing.

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- [About Migration Task Flow](#)

Why Migrate to Oracle Cloud Infrastructure

Oracle encourages you to migrate your existing cloud resources to Oracle Cloud Infrastructure regions. You can gain several advantages by doing so.

In Oracle Cloud, you provision resources in specific regions, which are localized to geographic locations. Certain regions support the Oracle Cloud Infrastructure platform.

Oracle Cloud Infrastructure is Oracle's modern cloud platform that's based on the latest cloud technologies and standards. It provides more consistent performance and better features at lower costs. Oracle continues to invest in Oracle Cloud Infrastructure, including the addition of new regions, services, and features. See [Data Regions for Platform and Infrastructure Services](#).

You can benefit from these additional administrative features when you migrate your cloud resources to Oracle Cloud Infrastructure:

- Organize cloud resources into a hierarchy of logical compartments.
- Create fine-grained access policies for each compartment.

To learn more, see [Upgrade Your Classic Services to Oracle Cloud Infrastructure](#).

About Oracle Cloud Infrastructure

Get familiar with basic Oracle Cloud Infrastructure security, network, and storage concepts.

Cloud resources in Oracle Cloud Infrastructure are created in logical compartments. You also create fine-grained policies to control access to the resources within a compartment.

You create instances within an Oracle Cloud Infrastructure region. You also specify an availability domain (AD), if supported in the selected region.

A virtual cloud network (VCN) is comprised of one or more subnets, and an instance is assigned to a specific subnet. Oracle Cloud Infrastructure does not allow you to reserve specific IP addresses for platform services.

A subnet's security lists permit and block traffic to and from specific IP addresses and ports.

Instances can communicate with resources outside of Oracle Cloud by using Oracle Cloud Infrastructure FastConnect, which provides a fast, dedicated connection to your on-premises network. Alternatively, use an IPSec VPN.

A bucket in Oracle Cloud Infrastructure Object Storage can be used to store files and share them with multiple instances. A user's generated authentication token (auth token) is required to access the bucket.

To learn more, see Key Concepts and Terminology in the Oracle Cloud Infrastructure documentation.

About Migrating to Oracle Autonomous Database

Oracle Autonomous Database delivers self-driving, self-securing, self-repairing database services that scale instantly to meet the demands of mission critical applications.

Oracle Application Express (APEX) on Oracle Autonomous Transaction Processing and Oracle Autonomous Data Warehouse provides a preconfigured, fully managed and secured environment to both develop and deploy world-class applications and RESTful services. Oracle APEX applications, data, and RESTful services can be migrated from Oracle Database Exadata Express Cloud Service to Oracle Autonomous Database.

To learn more, see:

- [Autonomous Database + APEX](#)
- Getting Started with Autonomous Transaction Processing in *Using Oracle Autonomous Transaction Processing*
- Getting Started with Autonomous Data Warehouse in *Using Oracle Autonomous Data Warehouse*
- [Oracle Exadata Express Cloud Service](#) in *Oracle Help Center*

About Migration Task Flow

The following workflow guides you through the steps to migrate from Oracle Database Exadata Express Cloud Service to Oracle Autonomous Transaction Processing or Oracle Autonomous Data Warehouse.

1. Export your apps with APEX Application Archive app and RESTful services with SQL Workshop.
2. Export your database schema to an Oracle Cloud Infrastructure Object Storage Classic container.
3. Move the Data Pump export file from Oracle Cloud Infrastructure Object Storage Classic to Oracle Cloud Infrastructure Object Storage.
4. Connect to Autonomous Database using client credentials and import the schema using the Oracle Data Pump `impdp` utility.
5. Create an APEX workspace in Autonomous Database. This workspace will be used to restore your apps and RESTful services.
6. Restore your APEX apps and workspace files using the APEX Application Archive productivity app.

7. Import your RESTful services using SQL Workshop.
8. Complete Post-Migration tasks in Autonomous Database, if applicable.

Once you have completed these steps, you are able to run your APEX apps. Please note that Oracle Autonomous Database runs Oracle APEX 19.1. Therefore, your apps are upgraded when they are restored. Your apps should run without issue, but should be thoroughly tested. Developers should also go into each app and review the Upgrade Application report within Utilities for any additional upgrades they may want to implement that were not automatically performed.

Prepare to Migrate

Prepare for migration by exporting APEX apps and RESTful services, creating a Data Pump export file that includes database objects and APEX application definitions, and staging the export file in Oracle Cloud Infrastructure Object Storage.

Topics:

- [Export APEX Apps and RESTful Services in Exadata Express](#)
- [Create the Data Pump Export in Exadata Express](#)
- [Stage the Data Pump Export in Object Storage](#)

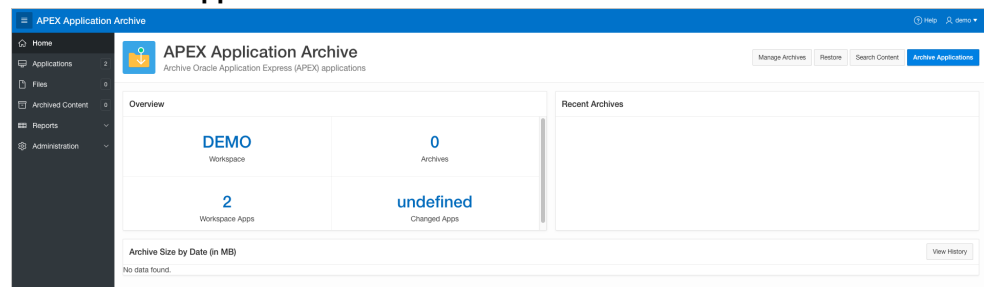
Export APEX Apps and RESTful Services in Exadata Express

The APEX Application Archive productivity app ships with Oracle Application Express (APEX) and allows you to quickly create archives of your apps and workspace resources. These archives are stored in tables which are created if they don't yet exist.

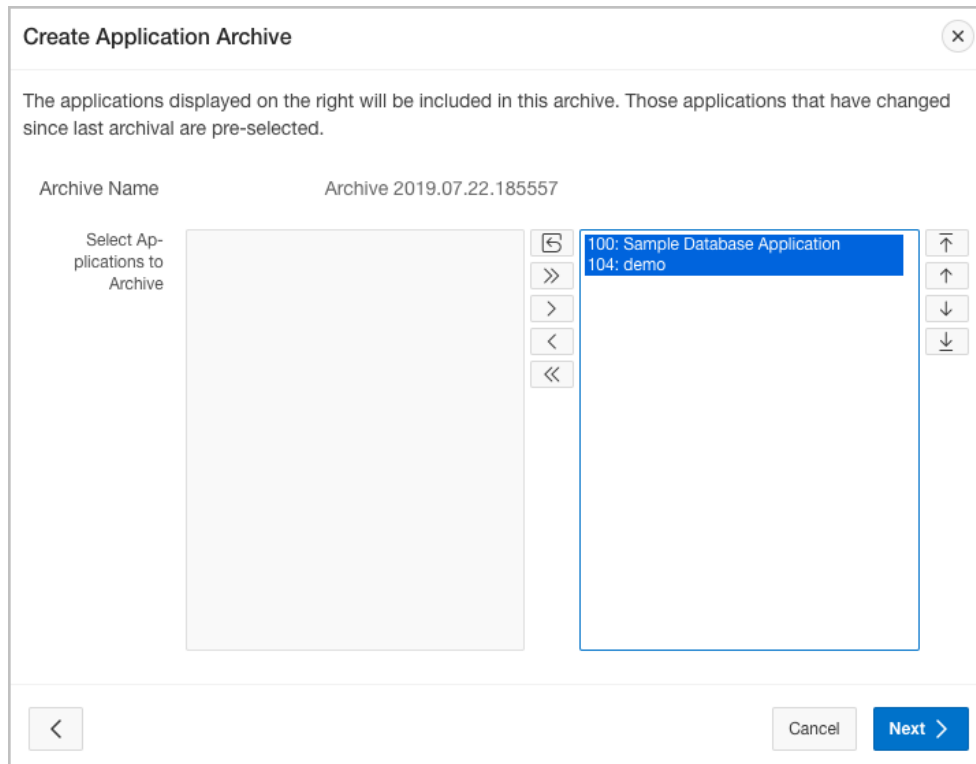
You can archive your apps so they can be moved by doing a schema export from your Exadata Express instance and import into your Autonomous Database instance. In your Autonomous Database instance, you simply install the same APEX Application Archive app, which works against the imported tables, and allows you to easily restore these applications in your new workspace.

To export APEX apps:

1. Log in to your **Exadata Express** workspace.
2. From the App Builder home page, click **Create** and choose **Productivity App**.
3. Find the APEX Application Archive app in the App Gallery list and click **Install App**.
4. Click **Next** and **Install App**.
5. Click **Run App** icon.
6. Accept the defaults and click **Complete Setup**.
7. Click **Archive Applications**.



8. Ensure all applications are in the right side of the shuttle. Click **Next** and then **Create Archive**.



9. Repeat this process for all workspaces you wish to import into your Autonomous Database.

To export RESTful services:

1. Sign in to your Exadata Express workspace and click **SQL Workshop**, then click **APEX RESTful Services**.
2. Click the **Export** button.
3. Choose **All Services** from the RESTful Service select list, then click **Export** and save the SQL file.

Create the Data Pump Export in Exadata Express

In your Oracle Database Exadata Express Cloud Service create a Data Pump export file with the data you want to migrate.

Follow the steps in Export Database Schemas to Oracle Cloud Infrastructure Object Storage Classic in the *Using Oracle Database Exadata Express Cloud Service* to export data structures and data to Object Storage Classic. APEX app definitions archived using the APEX Application Archive productivity app are automatically included in this export.

Once the export file is available (for example, `export.zip`), download it and extract `export.dmp` and `param.helper` files. Examine the `param.helper` text file to identify the APEX tablespace name that was used in your Exadata Express database. You will provide this tablespace name to `impdp` utility later.

For additional information, see:

- Downloading Objects in *Using Oracle Cloud Infrastructure Object Storage Classic*

Stage the Data Pump Export in Object Storage

Follow the steps below to import the Data Pump file, `export.dmp`, to Oracle Cloud Infrastructure Object Storage where Oracle Autonomous Database will be able to access it. This additional step is required as Oracle Database Exadata Express Cloud Service does not support data export directly to Object Storage.

Note:

Oracle recommends that you upload large Data Pump export files using Oracle Cloud Infrastructure CLI rather than the Object Storage console. To learn more, see [Using Multipart Uploads](#) in *Oracle Cloud Infrastructure Documentation*.

1. Sign in to Oracle Cloud Infrastructure.
2. Expand the top left menu and, in the Core Infrastructure section, expand the Object Storage sub-menu and click **Object Storage**.
3. Pick an existing compartment and the existing bucket or create a new bucket.
4. Click on the bucket name and then click **Upload Objects**.
5. Choose the Data Pump export file, `export.dmp`, and click **Upload Objects**.

The screenshot shows the 'Upload Objects' interface in Oracle Cloud Infrastructure. At the top right, there are 'help' and 'cancel' links. Below the title, there is a field for 'OBJECT NAME PREFIX' with the text 'OPTIONAL'. Underneath is a section titled 'CHOOSE FILES FROM YOUR COMPUTER' with a dashed border and the text 'Drop files here or select files'. A file named 'export.dmp' (3.66 MIB) is shown as uploaded. At the bottom, there are 'Upload Objects' and 'Cancel' buttons.

6. After the upload completes, open the context menu for the uploaded `export.dmp`. Click **View Object Details**, and copy the URL Path (URI) value. You will provide this value to the `impdp` utility later.

For additional information, see:

- [Using the Console](#) to upload and download objects in *Managing Objects in Oracle Cloud Infrastructure Documentation*

Migrate Your Apps

Migration involves importing data into your Autonomous Database using Data Pump, creating a new APEX workspace, installing the APEX Application Archive productivity app, restoring APEX apps and workspace files into this workspace, and importing RESTful services.

Topics:

- [Import Schema into Oracle Autonomous Database](#)
- [Create an APEX Workspace in Autonomous Database](#)
- [Install APEX Application Archive Productivity App](#)
- [Restore APEX Apps and Workspace Files](#)
- [Import RESTful Services](#)

Import Schema into Oracle Autonomous Database

Follow the steps below to import the Data Pump file (`export.dmp`) into your Oracle Autonomous Database.

See [To create an auth token](#) in *Managing User Credentials in Oracle Cloud Infrastructure Documentation*. Copy the auth token as it will not be displayed again.

Note:

Oracle recommends to use the Oracle Instant Client downloaded from Autonomous Database service console (Development page, Download Oracle Instant Client link).

1. Sign in to your Oracle Autonomous Transaction Processing or Oracle Autonomous Data Warehouse service console and click **Development**.
2. Click **Download Oracle Instant Client** and save the zip file.
3. Unzip the file and set the `$ORACLE_HOME` environment variable to point to this directory.
4. On the Administration page, click **Download Client Credentials (Wallet)** and save the zip file.
5. Extract the file into `$ORACLE_HOME/network/admin` directory.
6. Inspect the `tnsnames.ora` file included in the zip to see the list of service names to connect to. Identify the "high" service name of the database into which you are migrating.
7. Use SQL*Plus to connect to your Autonomous Database as the ADMIN user using the service name you identified in the previous step.
8. Run the following to create a credential using the `DBMS_CLOUD` package. Replace `OCI_USERNAME` with your Oracle Cloud Infrastructure username and

OCI_AUTH_TOKEN with your Oracle Cloud Infrastructure auth token you created in a previous step.

```
BEGIN
  DBMS_CLOUD.CREATE_CREDENTIAL(
    credential_name => 'def_cred_name',
    username        => 'OCI_USERNAME',
    password        => 'OCI_AUTH_TOKEN'
  );
END;
/
```

- Use `impdp` Data Pump utility to import your Exadata Express export file from Oracle Cloud Infrastructure Object Storage to your Autonomous Database. Replace `SERVICE_NAME` with the "high" service name of your Autonomous Database. Replace `APEX_TABLESPACE` with the Oracle Application Express (APEX) tablespace name used in your Exadata Express database. Replace `EXPORT_FILE_URL` with the URL to the `export.dmp` file uploaded in Object Storage. Enter the password for the ADMIN database user when prompted. Make note of the database user that is created by the import operation.

```
impdp admin@SERVICE_NAME credential=def_cred_name
directory=data_pump_dir
remap_tablespace=APEX_TABLESPACE1:data,APEX_TABLESPACE2:data,... \
dumpfile='EXPORT_FILE_URL' \
parallel=2 transform=segment_attributes:n transform=dwcs_cvt_iots:y
transform=constraint_use_default_index:y \
exclude=cluster,db_link
```

For example:

```
impdp admin@demo_high credential=def_cred_name directory=data_pump_dir
remap_tablespace=APEX_1234567890:data,APEX_12223333444:data \
dumpfile='https://objectstorage.us-phoenix-1.oraclecloud.com/n/.../
b/.../o/export.dmp' \
parallel=2 transform=segment_attributes:n transform=dwcs_cvt_iots:y
transform=constraint_use_default_index:y \
exclude=cluster,db_link
```

Note:

If you encountered the following role grant error, please ignore it:

```
Processing object type SCHEMA_EXPORT/ROLE_GRANT
ORA-39083: Object type ROLE_GRANT failed to create with error:
ORA-01924: role 'C##DBPOD_BUILTIN_USERS_ROLE' not granted or
does not exist
Failing sql is:
GRANT "C##DBPOD_BUILTIN_USERS_ROLE" TO "DEMO"
```

10. Connect to your Autonomous Database as ADMIN using SQL*Plus and reset the password for the database user that was created as a result of the Data Pump import. The password must conform to the Autonomous Database password complexity rules.

```
alter user USERNAME identified by "PASSWORD" account unlock;
```

For additional information, see:


- Import with Oracle Data Pump Version 18.3 or Later in *Using Oracle Autonomous Transaction Processing*
- Import with Oracle Data Pump Version 18.3 or Later in *Using Oracle Autonomous Data Warehouse*
- Creating Users with Autonomous Database in *Using Oracle Autonomous Transaction Processing*
- Creating Users with Autonomous Database in *Using Oracle Autonomous Data Warehouse*

Create an APEX Workspace in Autonomous Database

Follow the steps below to create an Oracle Application Express (APEX) workspace in your Oracle Autonomous Database. To ensure transparent workspace migration, the new workspace uses the same workspace ID as your existing Oracle Database Exadata Express Cloud Service workspace.

1. Sign in to your Oracle APEX workspace in Exadata Express.
2. Click the ? icon in the upper right. Choose **About**, and then copy your Workspace ID.

About Application Express
✕



Application Express

Details

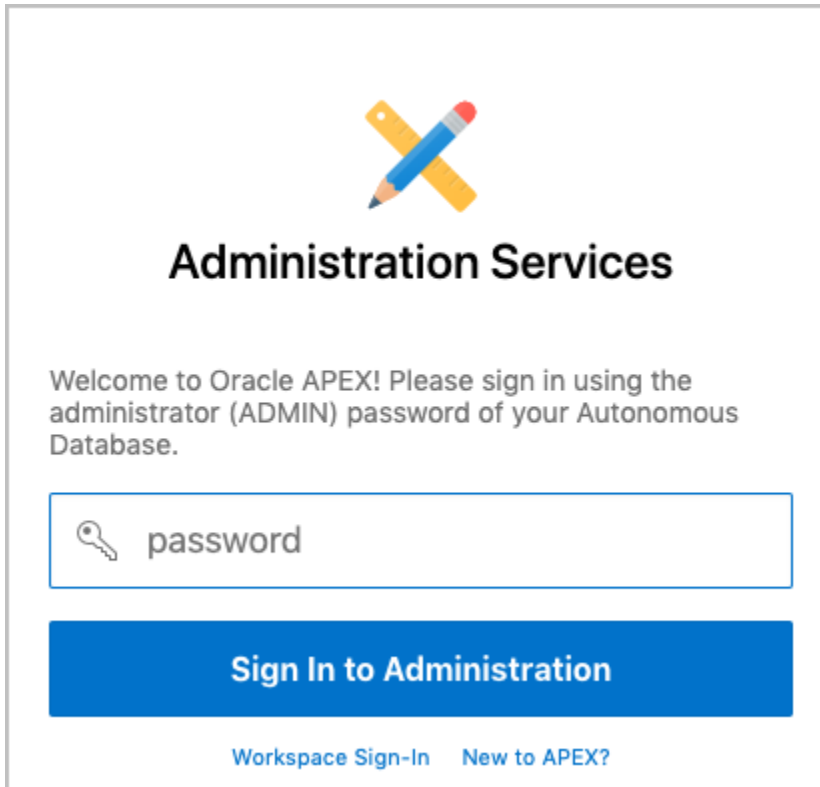
Product Build	18.2.0.00.12
Schema Compatibility	2018.05.24
Last DDL Time	02/27/2019 09:14:13 AM
Host Schema	DSSSRW2W1F
Application Owner	APEX_180200
Workspace ID	24328053779221772
Workspace Name	DEMO

3. Sign in to your Autonomous Database service console.
4. Click **Development** on the left side, then click the **APEX** link. Oracle Application Express Administration Services sign-in page appears.

 **Note:**

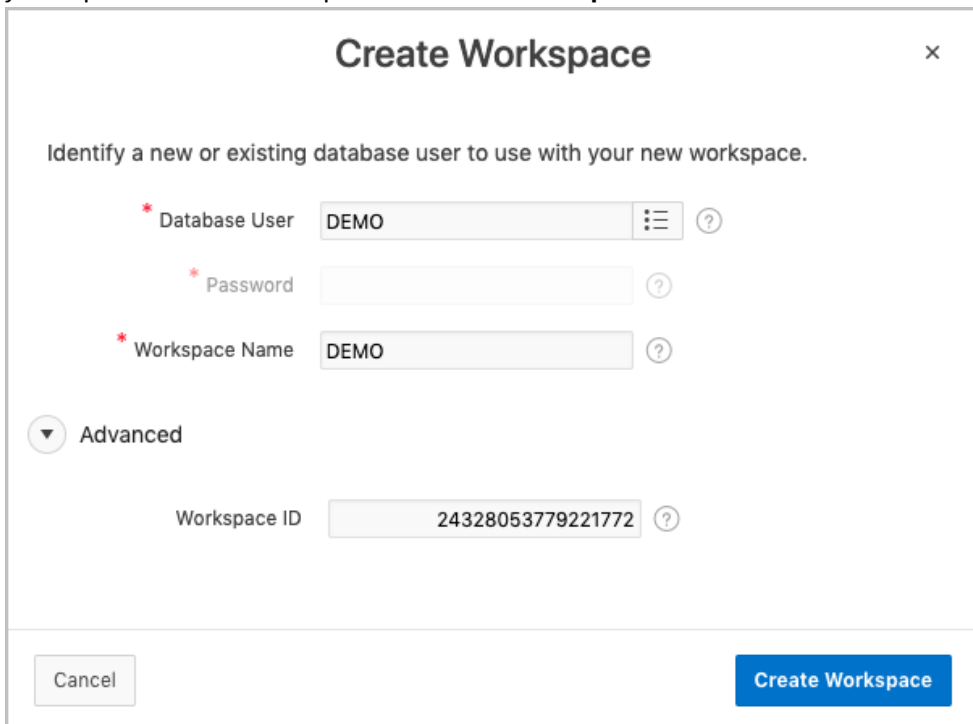
If you already created a workspace, the workspace sign-in page appears instead. In this case, to proceed, click the **Administration Services** link.

5. Enter the Autonomous Database administrator (ADMIN) password on the sign-in page and click **Sign In to Administration**.



The image shows the Oracle APEX Administration Services login page. At the top center is a logo consisting of two crossed pencils, one yellow and one blue. Below the logo is the heading "Administration Services". A welcome message reads: "Welcome to Oracle APEX! Please sign in using the administrator (ADMIN) password of your Autonomous Database." Below this is a password input field with a key icon and the placeholder text "password". A large blue button labeled "Sign In to Administration" is positioned below the password field. At the bottom of the page, there are two links: "Workspace Sign-In" and "New to APEX?".

6. In Administration Services, click **Create Workspace** and select the Database User that you imported. Ensure the Workspace Name matches your Exadata Express workspace. Expand the Advanced section and enter the same Workspace ID as you copied in an earlier step. Click **Create Workspace**.



The image shows the "Create Workspace" dialog box. The title bar reads "Create Workspace" with a close button (X) on the right. The main text says: "Identify a new or existing database user to use with your new workspace." There are three required fields, each with a red asterisk and a help icon (question mark):

- Database User**: A dropdown menu showing "DEMO".
- Password**: An empty text input field.
- Workspace Name**: A text input field containing "DEMO".

Below these fields is an "Advanced" section, indicated by a downward-pointing triangle icon. It contains one field:

- Workspace ID**: A text input field containing the ID "24328053779221772".

At the bottom of the dialog, there are two buttons: "Cancel" on the left and "Create Workspace" on the right.

7. Click the link of the workspace name in the success message. The workspace sign-in page appears with Workspace and Username fields populated. Enter the password for the database user and click **Sign In**.
8. Click **Set APEX Account Password** and enter the same password you just used to sign in to Oracle APEX.

For additional information, see:

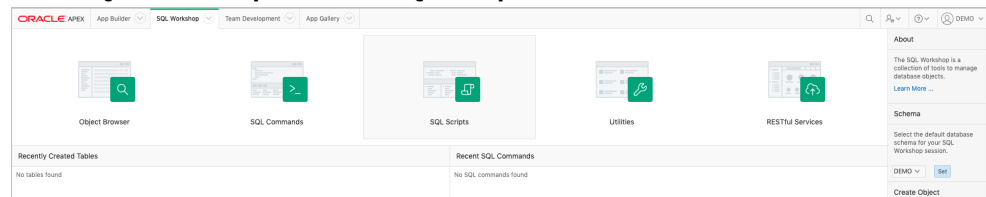
- Creating Oracle Application Express Workspaces Autonomous Transaction Processing in *Using Oracle Autonomous Transaction Processing*
- Creating Oracle Application Express Workspaces in Autonomous Database Warehouse in *Using Oracle Autonomous Data Warehouse*

Install APEX Application Archive Productivity App

You will use APEX Application Archive productivity app to import APEX applications and static workspace files into your Autonomous Database.

Follow the steps below to install APEX Application Archive productivity app in the workspace in your Autonomous Database. Before this app can be installed, you need to remove runtime database objects used by this app in Oracle Database Exadata Express Cloud Service. These objects were automatically imported in a previous step and prevent the latest version of the app from being installed.

1. Sign in to your Oracle Autonomous Transaction Processing or Oracle Autonomous Data Warehouse service console.
2. Click **Development** on the left side, then click the **APEX** link.
3. On the APEX workspace sign in page, enter your Workspace name, Username, and Password, and click **Sign In**.
4. Click **SQL Workshop** and click **SQL scripts**.



5. Click **Upload** and follow the steps to upload this sql script.

```
drop package eba_archive;
drop package eba_archive_fw;

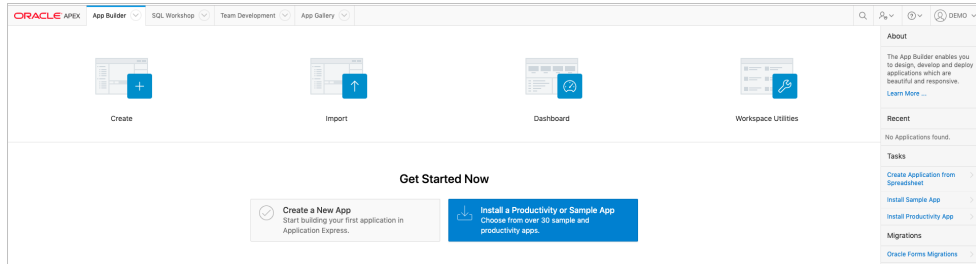
drop sequence eba_archive_seq;

drop table eba_archive_users          cascade constraints;
drop table eba_archive_errors        cascade constraints;
drop table eba_archive_access_levels cascade constraints;
drop table eba_archive_notifications cascade constraints;

drop table eba_archive_error_lookup;

drop table eba_archive_preferences;
```

- Click **Run**. The script should execute successfully.
- Click **App Builder**, then click **Install a Productivity or Sample App**.



- Find the APEX Application Archive app in the App Gallery list and click **Install App**, click **Next**, then click **Install App**.
- Repeat this process for all workspaces you want to import into your Autonomous Database.

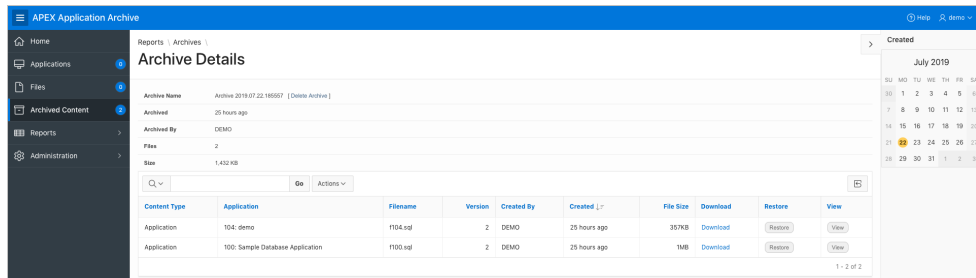
Restore APEX Apps and Workspace Files

You will use APEX Application Archive productivity app to import APEX applications and static workspace files into your Autonomous Database.

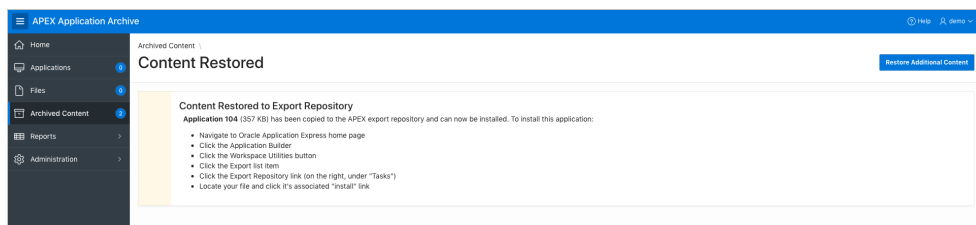
Import Oracle APEX Apps

To import Oracle APEX apps into your Autonomous Database:

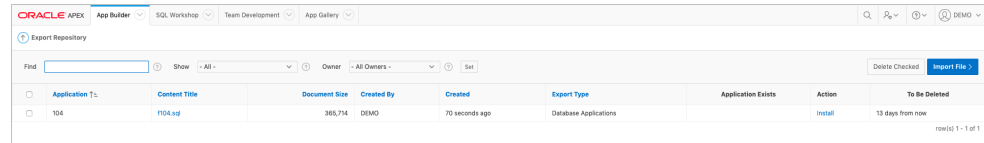
- Run the APEX Application Archive productivity app, sign in using the database user that you imported, and complete the first time setup if prompted.
- Click **Archived Content** and then click **Restore** for the application you want to restore.



The archive is exported to the Export Repository within the APEX App Builder.



- Go back to App Builder. Click **Workspace Utilities** and then click **Export**.
- In the Tasks section, click **Export Repository**.
- Now you should see the application SQL file that you restored. Click **Install** and then select the **Reuse Application ID From Export File** option. Click **Install Application**.



- Repeat this process for all APEX apps you want to import into your Autonomous Database.

Import Static Workspace Files

To import Oracle Application Express (APEX) static workspace files into your Autonomous Database:

- In the APEX Application Archive productivity app, click **Archived Content**.
- Search for "FILES" content type to find the latest archive that contains workspace files. Click **Download**.
- In APEX SQL Workshop, click **SQL Scripts**. Click **Upload** and then upload the archive file.
- Once the file is uploaded, click the **Run** icon associated with this file. Click **Run Now**.
- In APEX App Builder, open the app that uses workspace files.
- Click **Shared Components**, then click **Static Workspace Files** in the Files section. Confirm that the expected workspace files are listed.

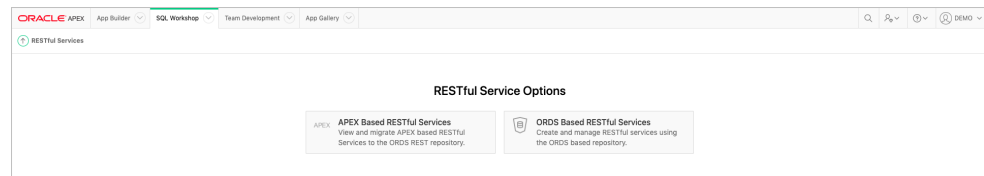
See [Complete the Post-Migration Tasks](#) for additional tasks that may be required before you can run your APEX apps in Autonomous Database.

Import RESTful Services

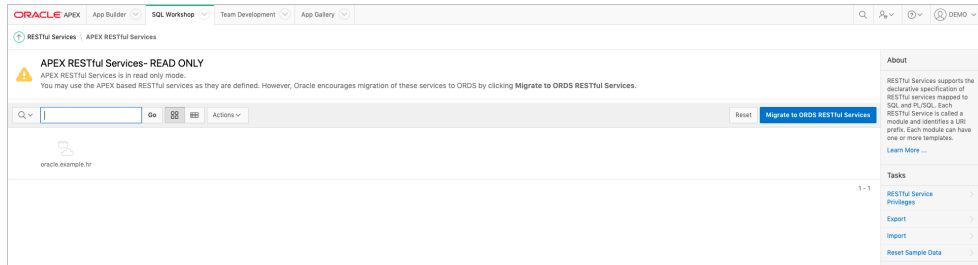
You use APEX SQL Workshop to import RESTful services. Autonomous Database only supports ORDS RESTful services, so you must migrate your RESTful services once imported.

To import RESTful Services into your Autonomous Database:

- Sign in to your Oracle APEX workspace in Autonomous Database.
- In APEX SQL Workshop, click **SQL Scripts**. Click **Upload**, then upload the export SQL file you downloaded from Exadata Express.
- Once the file is uploaded, click the **Run** icon associated with this file, then click **Run Now**.
- Return to SQL Workshop, click **RESTful Services**, then click **APEX Based RESTful Services**.



- Click **Migrate to ORDS RESTful Services**, then click **Migrate**.



6. Return to the RESTful Services page, then click **ORDS Based RESTful Services** to review the migrated modules and privileges.
7. (Optional) On the APEX Based RESTful Services page, delete the modules that have been successfully migrated. Once all legacy modules have been deleted, accessing RESTful Services page will immediately display ORDS RESTful Services.
8. Repeat this process for RESTful Services in all workspaces you want to import to your Autonomous Database.

For additional information, see:

- Developing RESTful Services in Autonomous Database in *Using Oracle Autonomous Transaction Processing*
- Developing RESTful Services in Autonomous Database in *Using Oracle Autonomous Data Warehouse*

Complete the Post-Migration Tasks

You may need to complete additional tasks after migration to Autonomous Database before you can fully utilize your Oracle Application Express (APEX) apps and RESTful services.

Further, review restrictions and limitations for Oracle APEX in Autonomous Database for additional items that may impact your apps.

Topics:

- [Unsupported APEX Authentication Schemes](#)
- [Applications that Send Email](#)

To learn more, see:

- Restrictions and Limitations for Oracle Application Express with Autonomous Transaction Processing in *Using Oracle Autonomous Transaction Processing*
- APEX Restrictions and Limitations Autonomous Database in *Using Oracle Autonomous Data Warehouse*

Unsupported APEX Authentication Schemes

Oracle APEX in Autonomous Database does not support certain application authentication schemes. If your application in Exadata Express uses "Oracle Cloud Identity Management" authentication scheme, you must switch to a different authentication scheme after importing this application into Autonomous Database.

To change authentication scheme for your APEX application in Autonomous Database:

1. Open your application in APEX App Builder.
2. Click **Shared Components**, then click **Authentication Schemes** in the Security section.
3. Click **Create**, click **Next**.
4. Enter the Name for your new authentication scheme and select a supported Scheme Type (for example, "Application Express Accounts").
5. Click **Create Authentication Scheme**.
6. Run the application.

Applications that Send Email

If your applications in Exadata Express send outbound email using `APEX_MAIL` or built-in Application Express dialogs, further configuration is required in Autonomous Database.

To learn more, see:

- APEX Sending Email from APEX Autonomous Database in *Using Oracle Autonomous Transaction Processing*