Oracle Autonomous Transaction Processing Hands-on Lab Guide

ORACLE SOLUTION CENTER

Oracle Autonomous Transaction Processing Hands on Lab Guide

Lab Introduction

In this hands-on lab you will get first-hand experience with Oracle's new Autonomous Transaction Processing (ATP) service. Oracle ATP delivers a self-driving, self-securing, self-repairing database service that can instantly scale to meet demands of mission critical transaction processing and mixed workload applications.

The lab is structured in three sections
- Section 1 – Introduction to ATP
- Section 2 – Focus on DBA activities
- Section 3 – Focus on Developer features

The audience for this hands-on-lab is expected to be database administrators and application developers. The lab expects you to understand the basic concepts of an Oracle database, the UNIX command line and be comfortable using the vi editor or the built in gedit editor.

All attendees must complete the 'Introduction to ATP' section, but then can select labs from the other sections.

Lab software prerequisites

This lab requires you to install the following desktop application so that you can complete this hands-on lab:

- An PDF File reader.
- A VNC viewer. There are many VNC viewer packages both commercial and open source. Suggested packages are TigerVNC viewer or TightVNC Viewer but if you already have a preferred VNC viewer you can use this. TigerVNC viewer has a simpler install process, as it is a standalone executable, but has fewer features.

Some pdf viewers may have trouble correctly copying and pasting the format required for some of the scripts within this guide. All long SQL statements and scripts can be found in the **/home/oracle/labScripts** directory of the supplied VM. Where appropriate the script or SQL filename will be provided by the output of its listing within the guide.

Installing TigerVNC Viewer

Follow these steps to if you want to download and install TigerVNC Viewer.

macOS

A better VNC viewer for macOS is realVNC which can be obtained from
https://www.realvnc.com/en/connect/download/viewer/macos/

Windows 64-bit

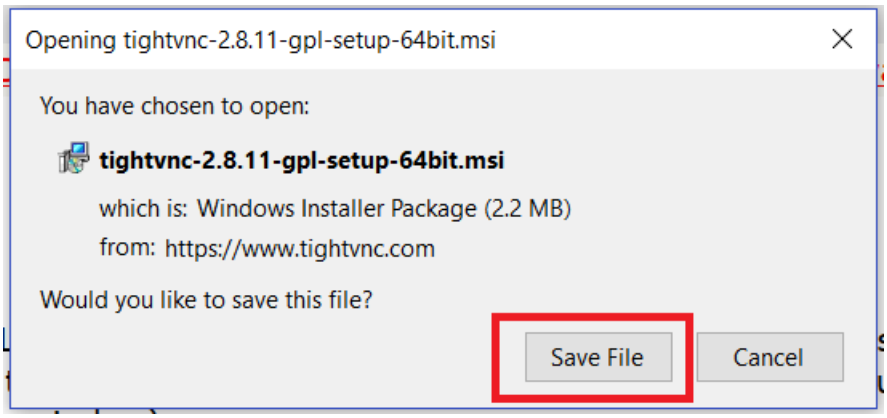
Download 'vncviewer64-1.9.0.exe' from
https://bintray.com/tigervnc/stable/tigervnc/1.9.0#files and save it to your desktop.
It is a self-contained executable file, which requires no further installation.

Installing TightVNC Viewer

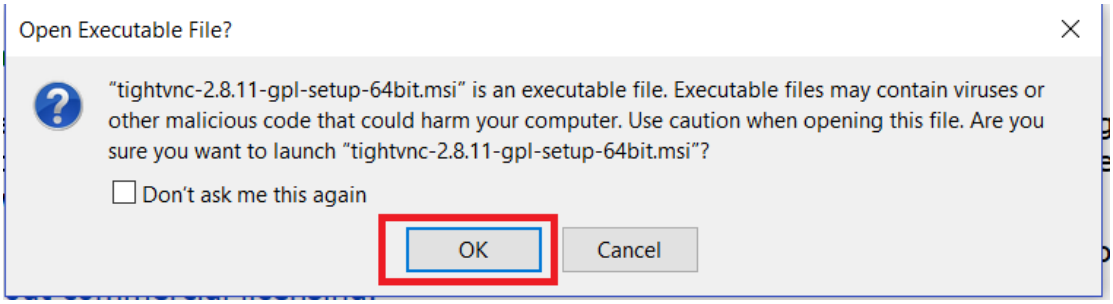
Follow these steps if you want to download and install TightVNC Viewer.

Windows 64-bit
Select the 'Installer for Windows (64-bit)' from
https://www.tightvnc.com/download.php

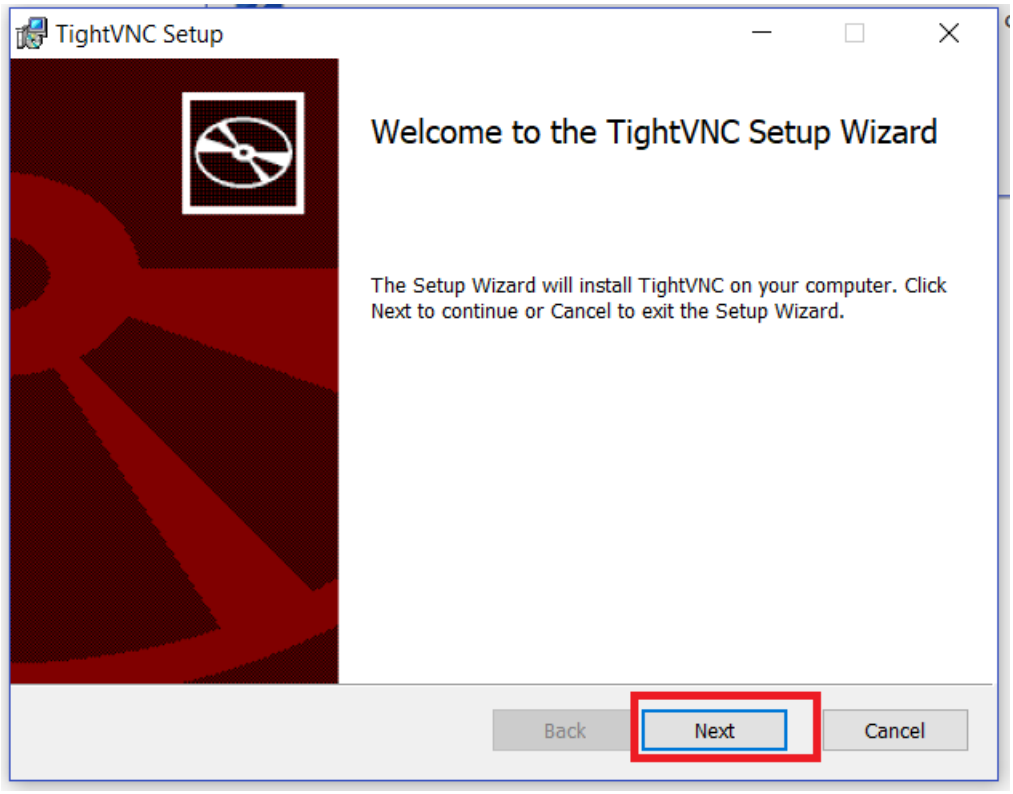
When prompted, select to save the file.



Locate the saved file on your machine and double click to execute. Windows will prompt you to check if you want to open the executable file. Select ok

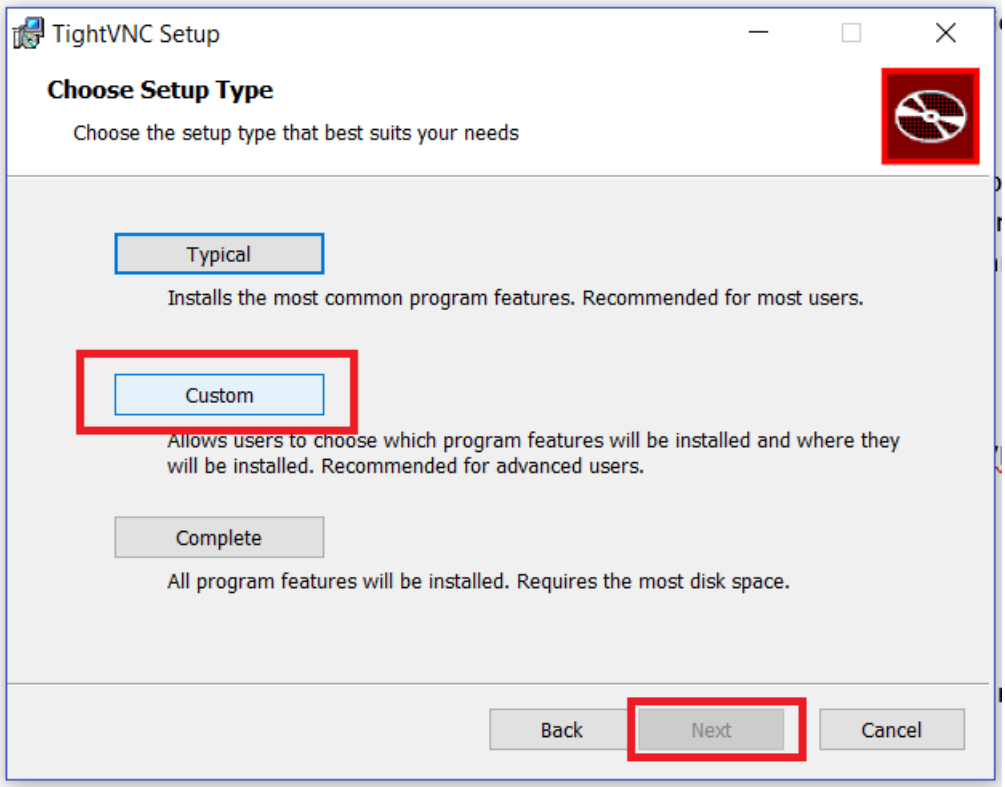


This will start the TightVNC install wizard. Select 'Next' to continue the install.

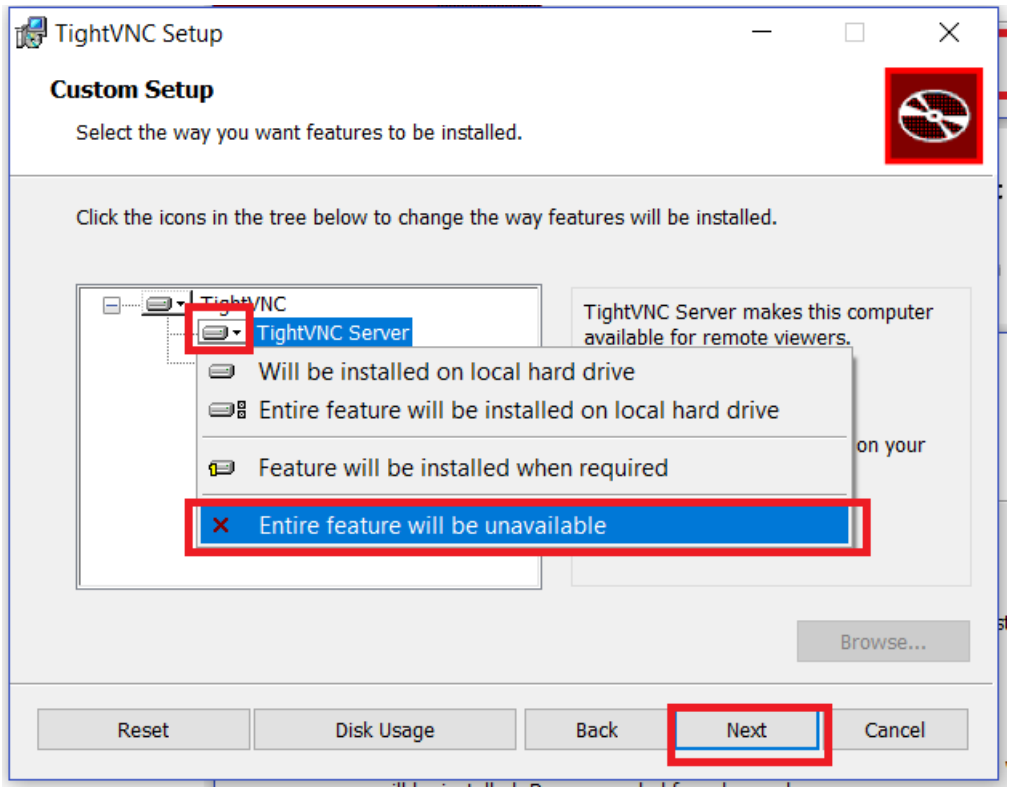


Review and accept the license terms if you agree. Select **Next** to continue.

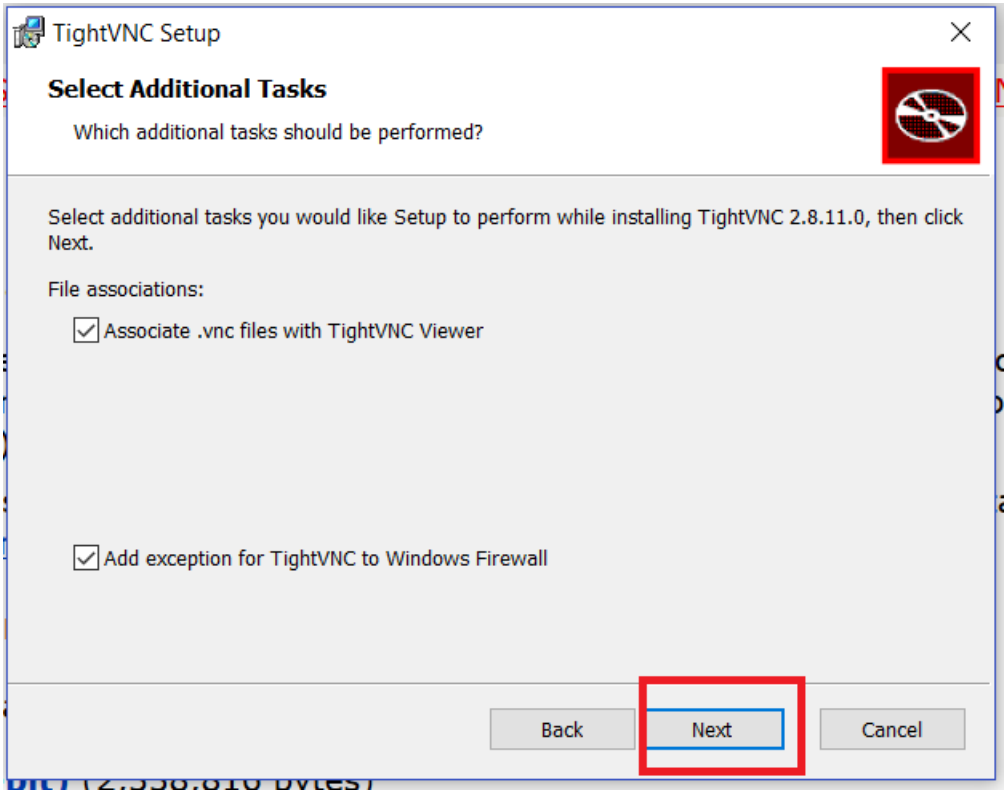
For this lab we only require the TightVNC Viewer, rather than the entire package. Select to carry out a **Custom** installation and select **Next.**



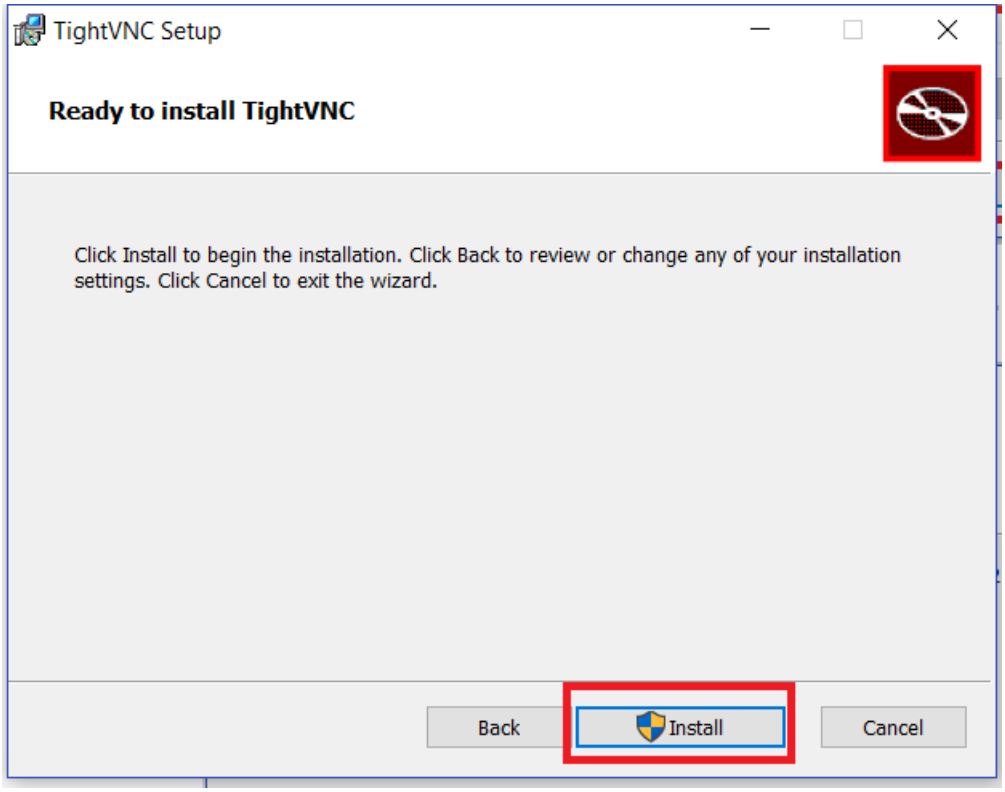
If you do not wish to install the server component, select the drop down next to **TightVNC Server** and select 'X Entire Feature will be unavailable'.



On the 'Select Additional Tasks' screen, choose if you want to change the file associations and the Firewall rules and select 'Next'



Select 'Install'


TightVNC Setup
Ready to install TightVNC
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
Back
Install
Cancel

Section 1 - Introduction to Autonomous Transaction Processing

Lab 1 – Connecting to the Oracle Cloud

Lab 1. Connecting to the Oracle Cloud

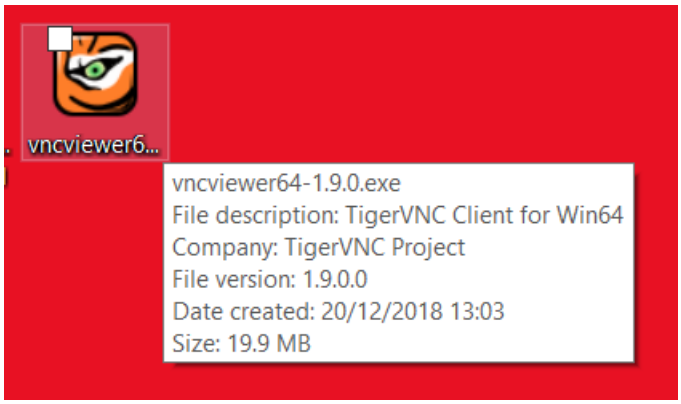
Objectives:

- Learn how to login to the Oracle Cloud Console
- Learn how to provision a new Autonomous Transaction Processing (ATP) Instance

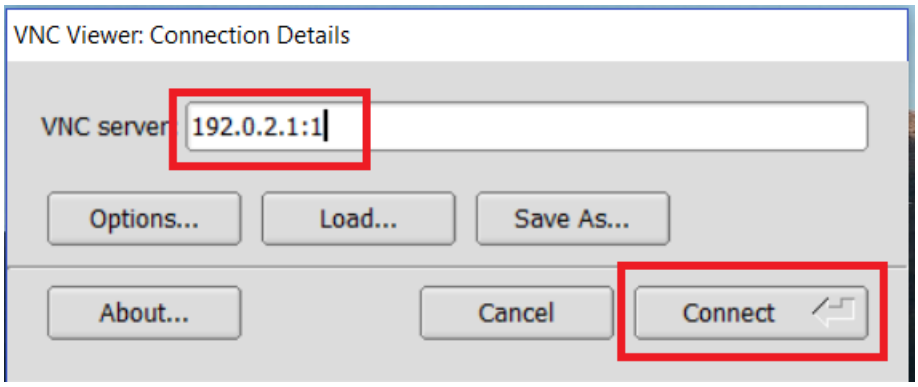
Connecting to your Lab Virtual Machine

To reduce the amount of software that needs to be installed on your local machine we have prepared a Linux virtual machine to act as your desktop.

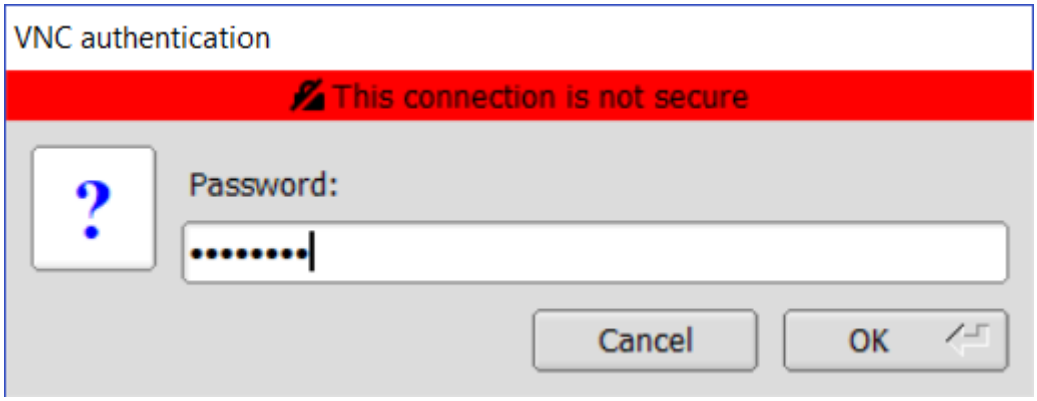
Start TigerVNC viewer (or your choice of VNC viewer) by double clicking on the icon on your local desktop.



Enter connection information provided by your lab leader and select **Connect**. You will use a different IP address than the example in the screenshot below.



Enter the supplied password and hit OK

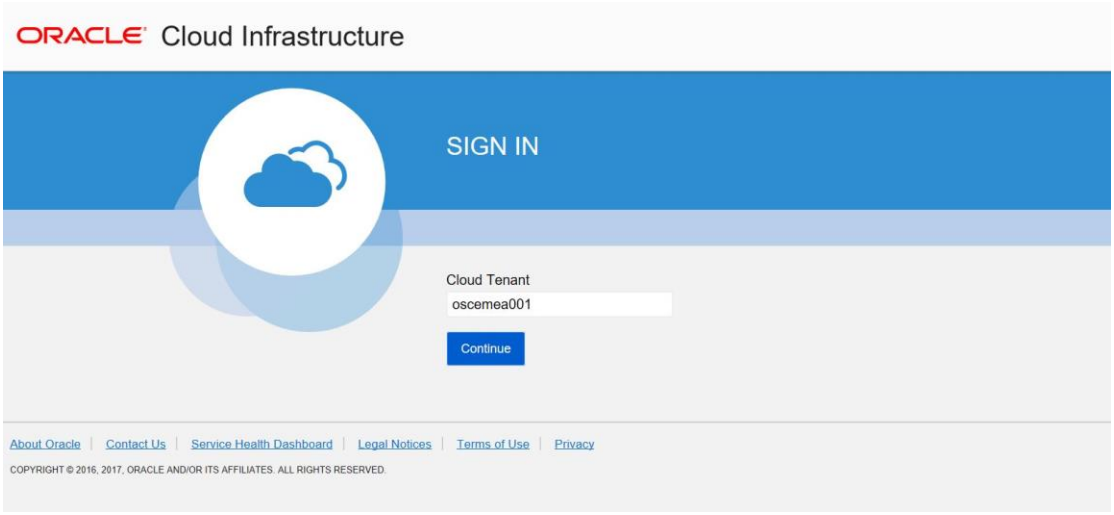


The VNC session will open, and an Oracle Linux desktop session will be displayed.

Signing in to the OCI Console

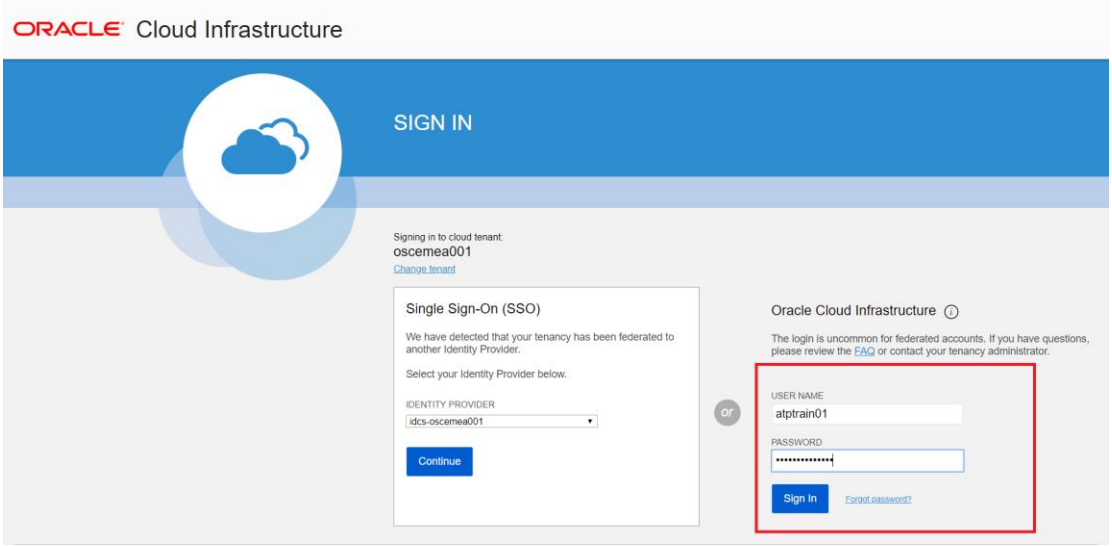
Start Firefox on your Lab VM by double clicking on the Firefox Logo.

Go to the OCI console. https://console.eu-frankfurt-1.oraclecloud.com For this lab we are using the Frankfurt region for our ATP instances, even though other regions may be geographically closer as this is where our tenancy has capacity to support the workshop.



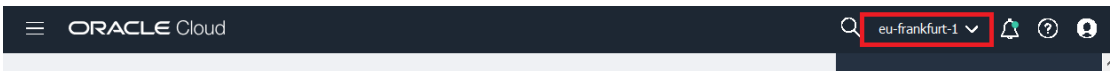
Enter a cloud tenancy of "oscemea001" and click continue.

On the right-hand section of the page under the title "Oracle Cloud Infrastructure" enter your username and password. Click "**Sign In**".



This will bring you to the console home page.

Verify that your region is set to eu-frankfurt-1 on the top right-hand side of your screen, if not, use the dropdown list to select 'eu-frankfurt-1'

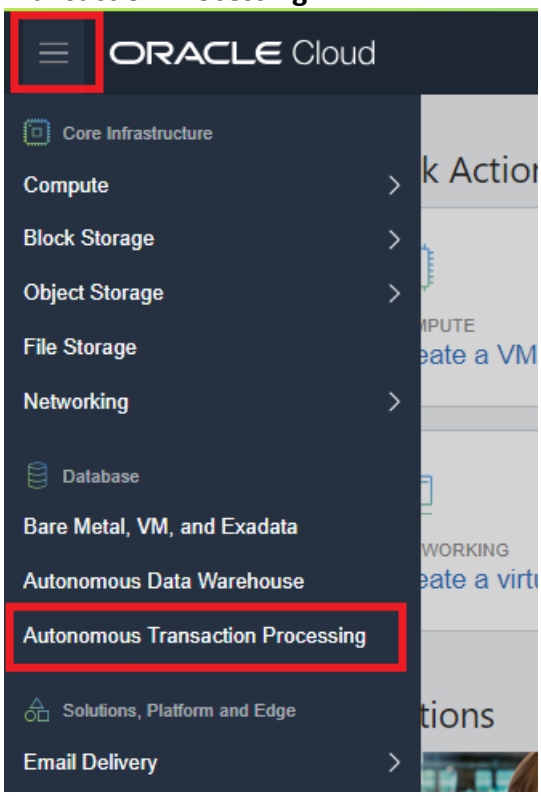


Locating your ATP Instance

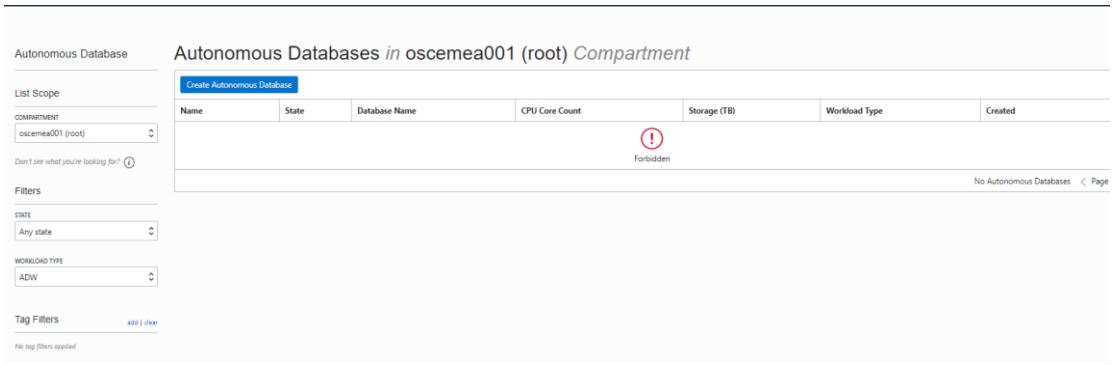
As part of the preparation for this lab, ATP instances have been pre-created. Your lab leader will have demonstrated a provisioning process live and the process is documented using screenshots in Appendix A.

Click on the **MENU** link at the top left of the page.

This will produce a drop-down menu, where you should select "**Autonomous Transaction Processing"**

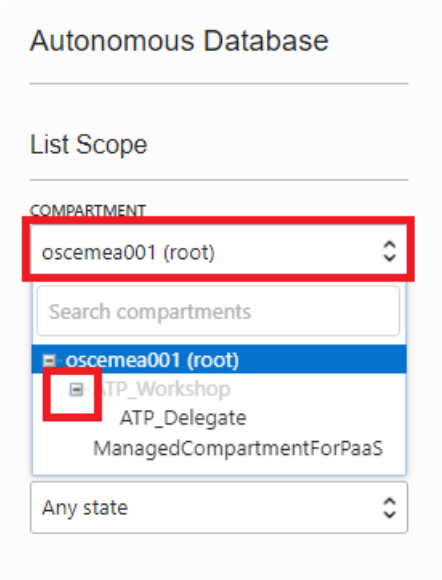


This will take you to the management console page for ATP in the root compartment of the tenancy. The red warning icon "**Forbidden**" indicates that the Policies within the tenancy does not allow your user to create ATP Instances in the root compartment.



To locate your ATP instance in this tenancy you need to select a compartment.

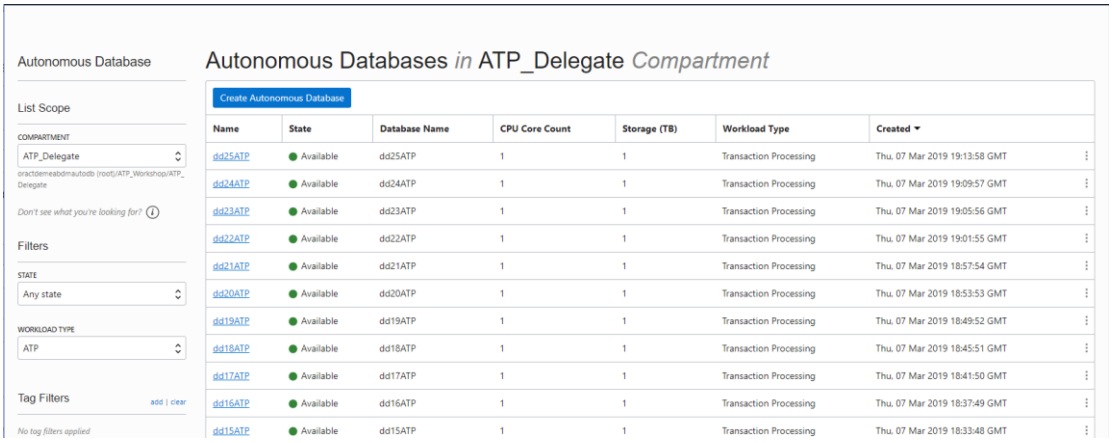
Click on the pulldown menu marked **Compartment.**
In your list of compartments expand **ATP_Workshop** by clicking the **'+'.**
Your instructor will tell you which sub compartment of **ATP_Workshop** to use.



Note – Your list of compartments may be different to the one shown above. In these lab notes we will use the compartment called ATP_Delegate in all the screenshots/ examples. ***Your compartment may be different.***

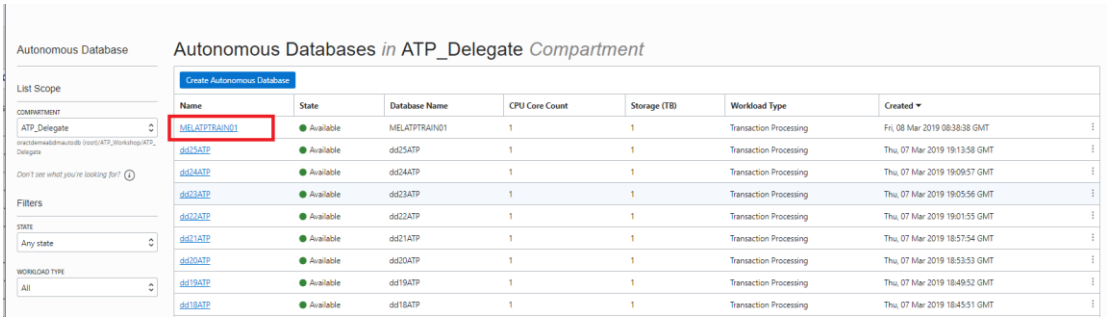
The main page will now change to show the list of ATP instances within your compartment, as shown below:

Note: this lab uses the same tenancy and compartment for all lab attendees. You will see ATP instances listed on this page which have already been created in preparation for your hands-on lab.



Note: the list of instances is sorted by provisioning date, not by name. Refer to your lab information sheet to check which ATP instance has been assigned to you for this lab.

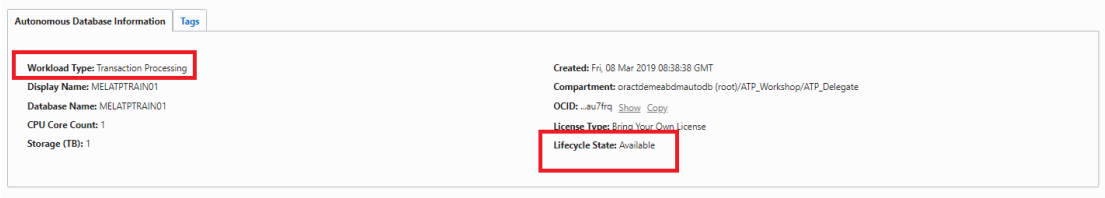
Click on the name of your ATP instance from the list of instances. You may have to scroll down to locate it in the list.



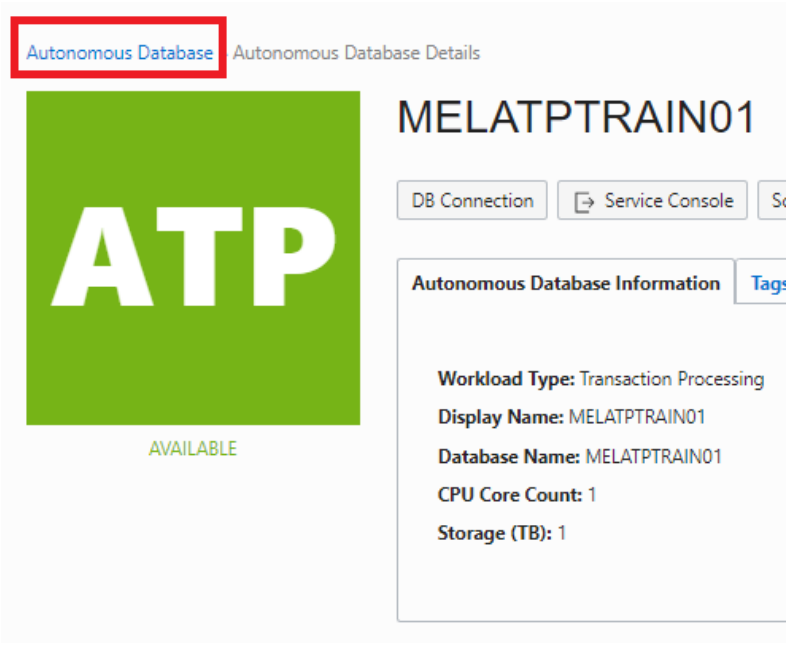
This will display more information about your instance and you should notice the various menu buttons that help you manage your new instance

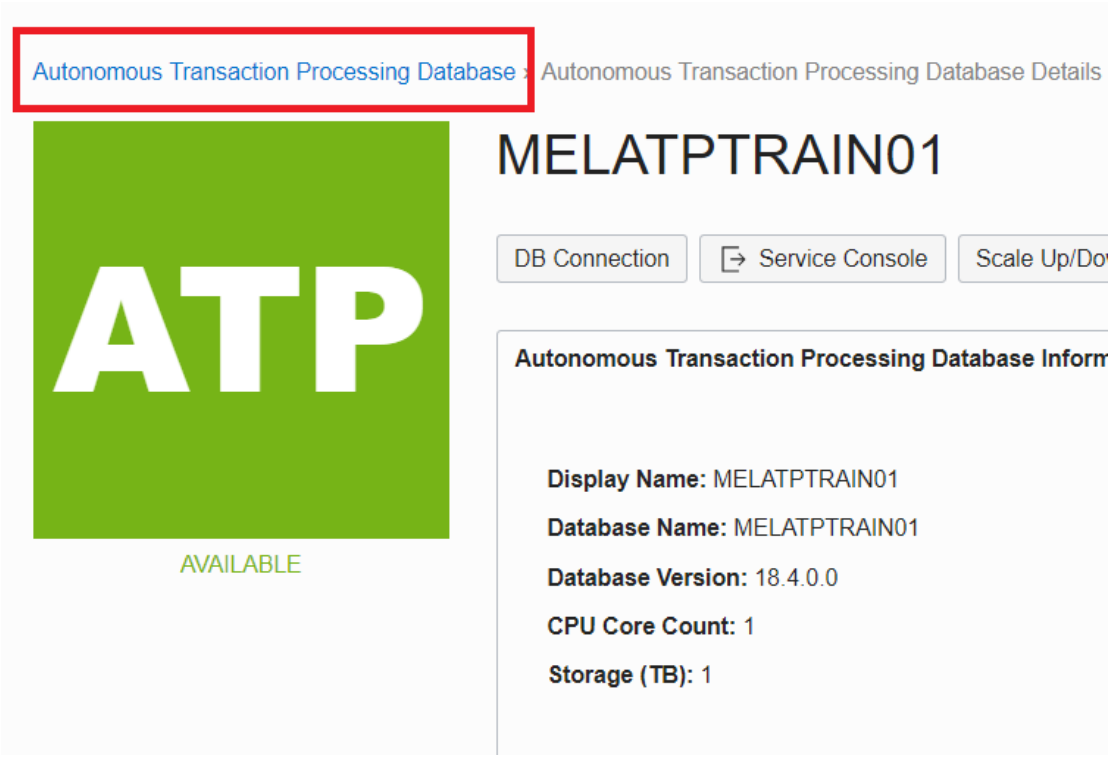
A summary of your instance lifecycle status is shown in the large box on the left.

Additional summary information about your instance is displayed, including the Workload Type . You can also see the Lifecycle Status reported in this region.



Return to the main page which list all your ATP instances by clicking on the Autonomous Database link at the top of the page:





You are now ready to start Lab 2.

Lab 2 - Securely Connecting to Autonomous Transaction Processing

Lab 2. Securely Connecting to Autonomous Transaction Processing

Objectives:

- Learn about the different Consumer Groups in Autonomous Transaction Processing (ATP)
- Learn how to download the credential wallet for your ATP instance
- Learn how to securely connect desktop tools to ATP

Applications and tools connect to ATP databases by using Oracle Net Services (also known as SQL*Net). SQL*Net supports a variety of connection types to ATP databases, including Oracle Call Interface (OCI), ODBC drivers, JDBC OC, and JDBC Thin Driver. Unlike other cloud services you do not get a UNIX command line interface on the system hosting your ATP instance, this reduces the complexity and need of UNIX skills required to administer it.

The sample SQL scripts for this lab are available in your VM under the directory **/home/oracle/labScripts/lab2**.

Managing Priorities on Autonomous Transaction Processing

The priority of user requests in ATP is determined by the database service the user is connected to. Users are required to select a service when connecting to the database. The service names are in the format:

- *database_name*_tpurgent
- *database_name*_tp
- *database_name*_low
- *database_name*_medium
- *database_name*_high

These services map to the LOW, MEDIUM, HIGH, TP and TPURGENT consumer groups. For example, a user connecting to database_name_low service uses the consumer group LOW.

The basic characteristics of these consumer groups are:

- **tpurgent**: The highest priority application connection service for time critical transaction processing operations. This connection service supports manual parallelism.

- **tp**: A typical application connection service for transaction processing operations. Queries run serially.

- **high**: A high priority application connection service for reporting and batch operations with low concurrency requirements. All operations run in parallel (if you have multiple OCPU assigned to your instance) and are subject to queuing.

- **medium**: A typical application connection service for reporting and batch operations. All operations run in parallel and are subject to queuing.

- **low**: A lowest priority application connection service for high concurrency reporting or batch processing operations. Queries run serially.

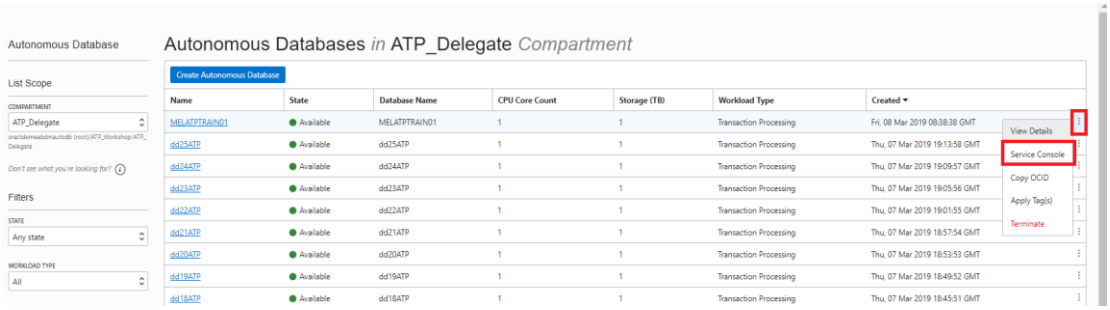
As a database administrator and an application developer you need to select the database service based on your performance, concurrency and parallelism requirements.

Downloading the credentials wallet

As ATP only accepts secure connections to the database, you need to download the wallet file containing your credentials first.

The wallet is downloaded from the ATP service console, or from the "**DB Connection**" button on the instance details page. To access the ATP Service console, find your database on the table listing ATP instances and click on the three vertical dots on the right-hand side.

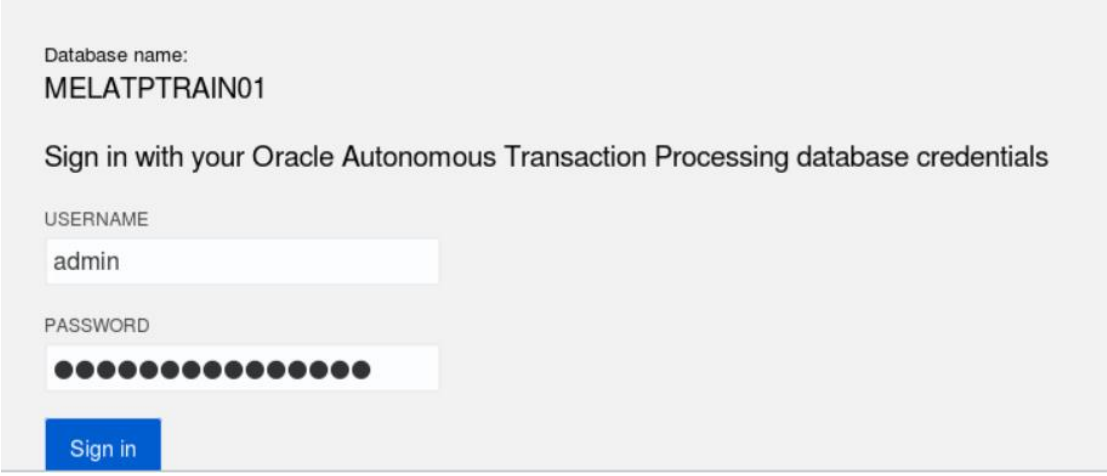
In the pop-up menu select **Service Console.**



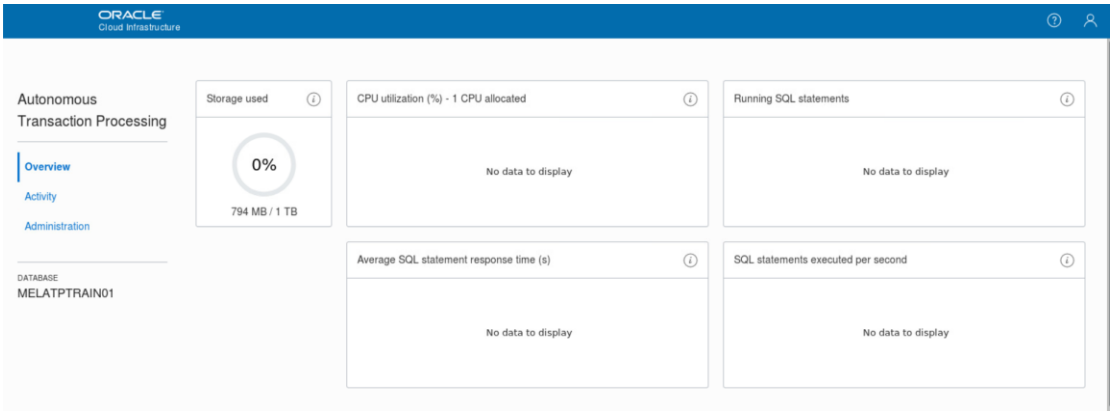
This will open a new browser tab for the Service Console.

If you are prompted to do so, sign in to the service console with the following information.

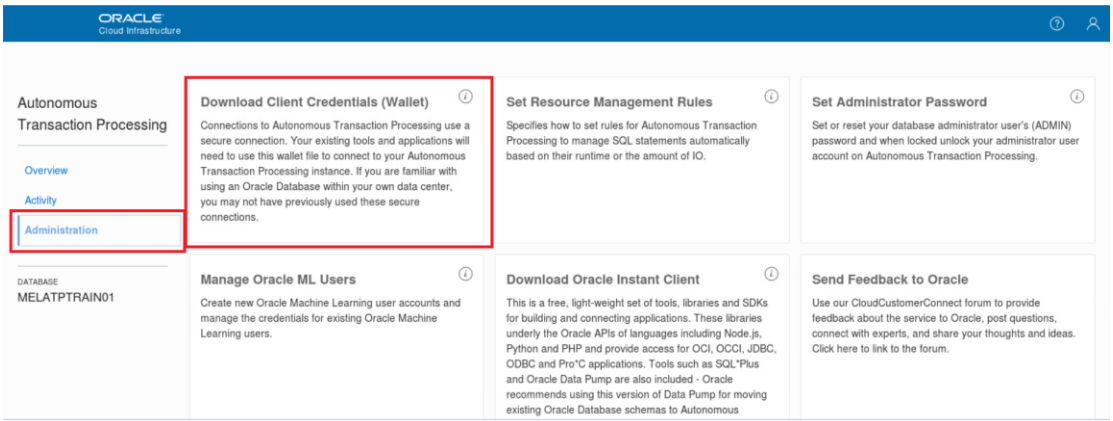
Username: admin
Password: The administrator password you specified during provisioning



You will now see the main **dashboard** page for your instance. As we have not generated any load into the instance, it may have 'No data to display' in the information panes. Later lessons will explore the **Overview** and **Activity** tabs in more detail.



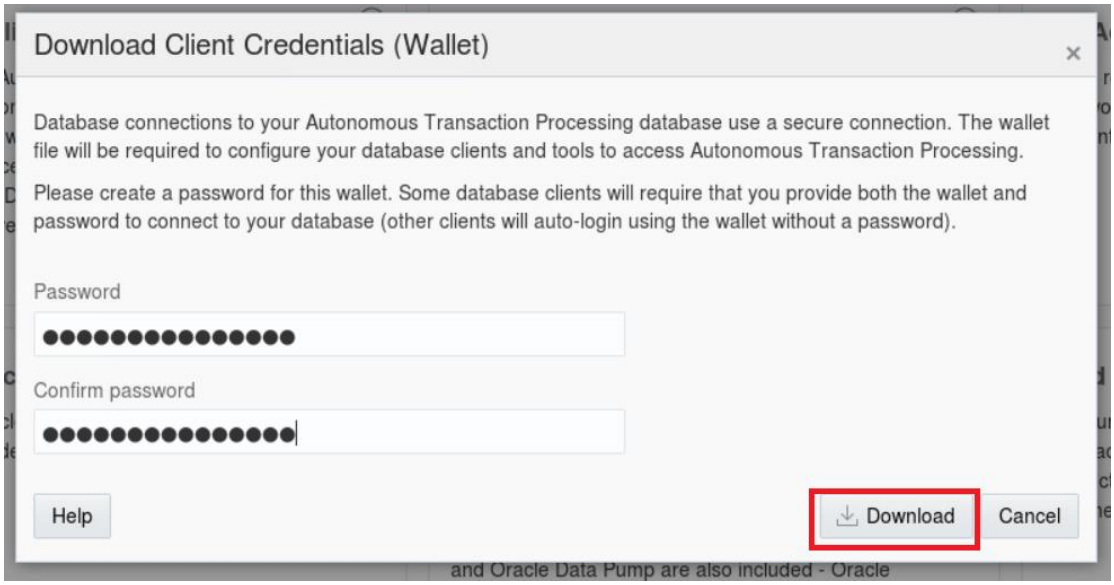
Click the "**Administration**" link in the left-hand side menu and click "**Download Client Credentials**" to download the wallet.



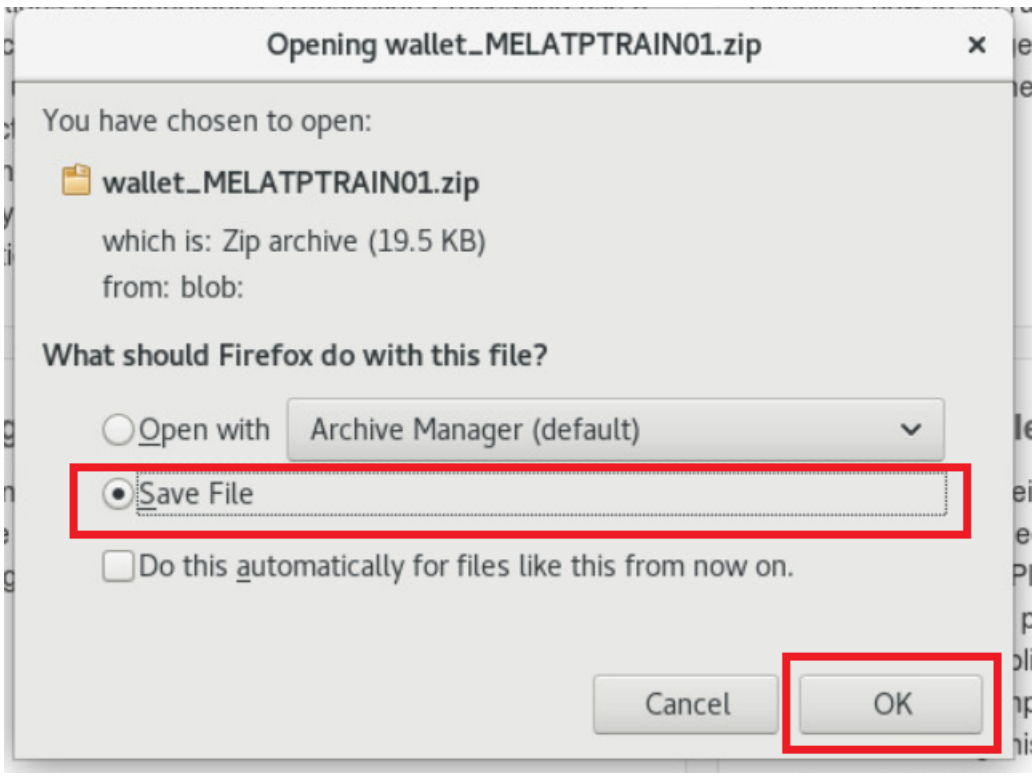
Specify a password for the wallet. Some applications require this password when connecting to the database, for example some JDBC thin applications will require this password to use as the keystore password. Note that this password is separate

from the admin password and can be set to a different value. For this lab, you could use the value ATPwelcome-1234 or another memorable password of your choice.

Click Download to download the wallet file to your lab virtual machine.



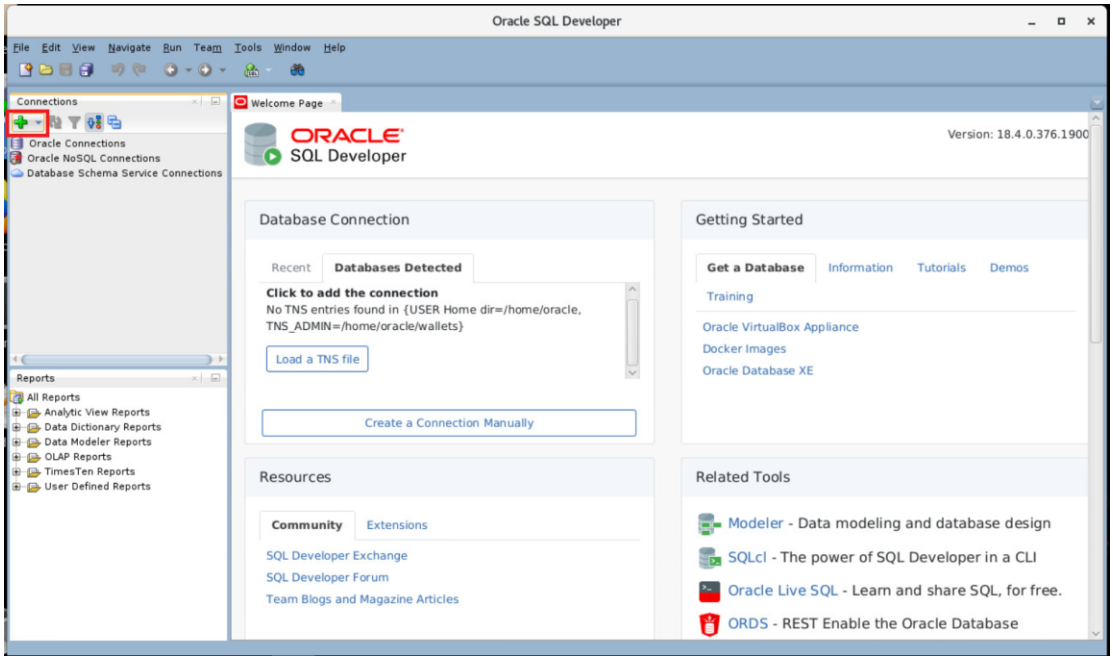
Select to Save the file, and then click ok. This will save the file in the default downloads location $HOME/Downloads



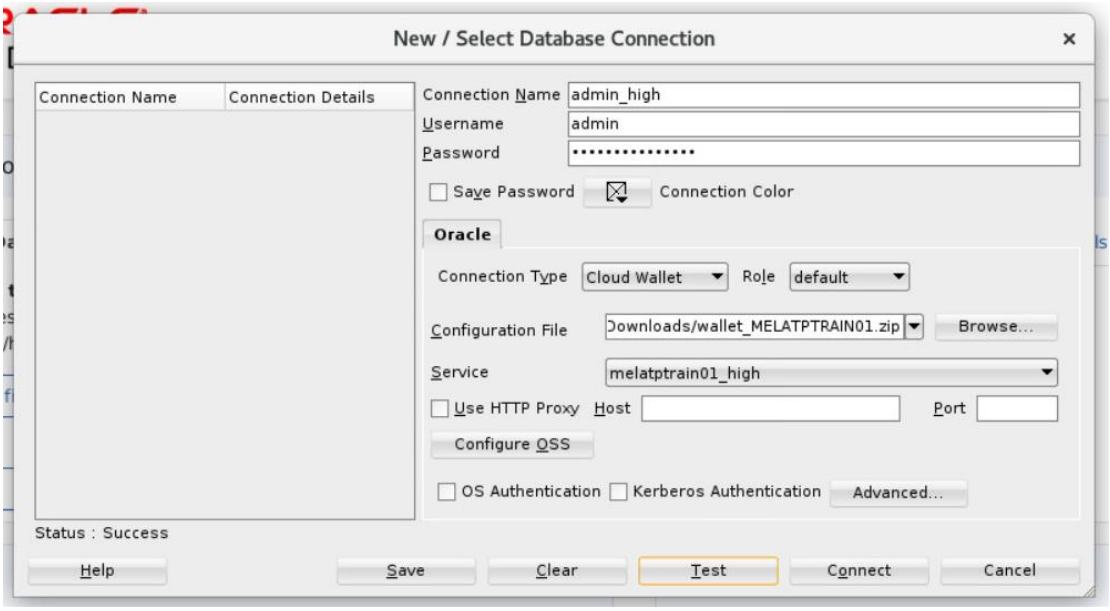
Connecting to the database using SQL Developer

Minimise your Firefox window, and on your Lab VM desktop, start SQL Developer by double clicking on the icon.

Click the Create Connection icon in the Connections toolbox on the top left of the SQL Developer homepage.



This will open the **New/Select Database Connection Screen**. See below the screenshot for information on how to complete this form.



Connection Name: admin_high
Username: admin
Password: The admin password that was specified provisioning process. This will have been provided by your lab leaded.
Connection Type: Cloud Wallet
Configuration File: Enter the full path for the wallet file you downloaded earlier in the lab or click the Browse button to point to the locate the file (by default it will be under your Downloads directory).
Service: You must select the correct service for your ATP Instance. The Wallet will contain the service names for all the ATP databases in the tenancy so this list could be long. Please make sure that you are selecting your database. As discussed previously there are 5 pre-configured database services for each database. Pick *<your databasename>_high* for this lab. For example, if you created a database named **melatptrain01** select **melatptrain01_high** as the service.

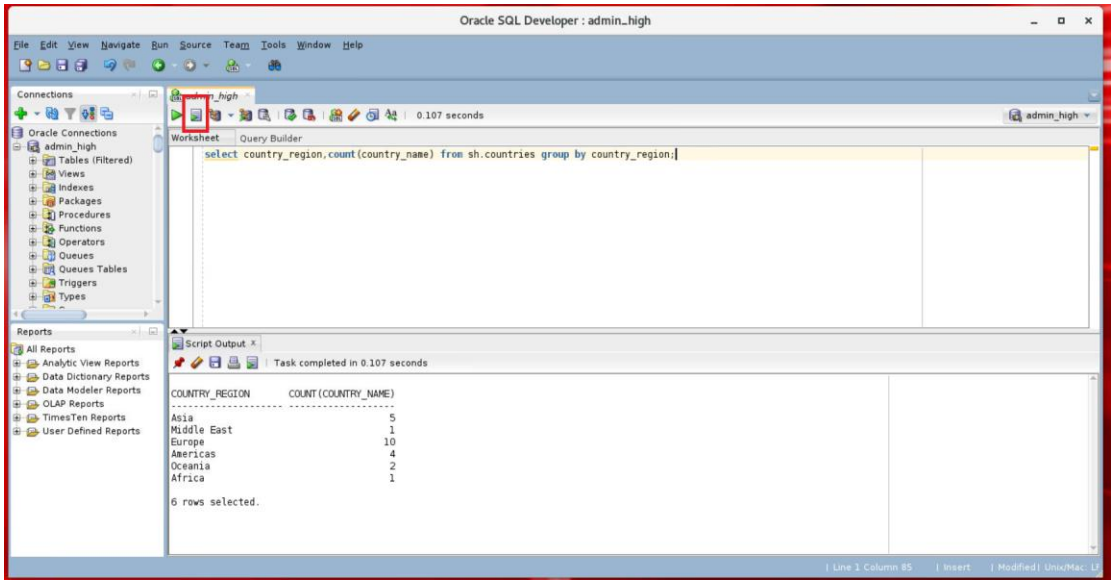
Test your connection by clicking the Test button, if it succeeds save your connection information by clicking Save, then connect to your database by clicking the Connect button.

You can now run a test query using the sample data in the SH schema.

In the SQL Worksheet enter the following SQL:

```
select country_region, count(country_name) from sh.countries group by
country_region;
```

and press the 'Run Script' button or press F5.



Note – You do not have to use GUI tools to access an ATP instance. Other Oracle Client utilities such as SQL Plus can connect to the ATP instance using a wallet.

Section 2 - Focus on DBAs

Lab 3 -
Scaling an ATP Instance

Lab 3. Scaling an Automatic Transaction Processing Instance

Objectives:

- Learn how to scale your Autonomous Transaction Processing (ATP) instance.

Scaling in the context of an ATP database means increasing or decreasing the amount of CPU or storage resources allocated to the service. Scaling an ATP instance is easy, flexible and can be done without any downtime so your applications continue to run unaffected while the scaling operation is in progress.

The sample SQL scripts for this lab are available in your VM under the directory **/home/oracle/labScripts/lab3**.

Scaling your instance

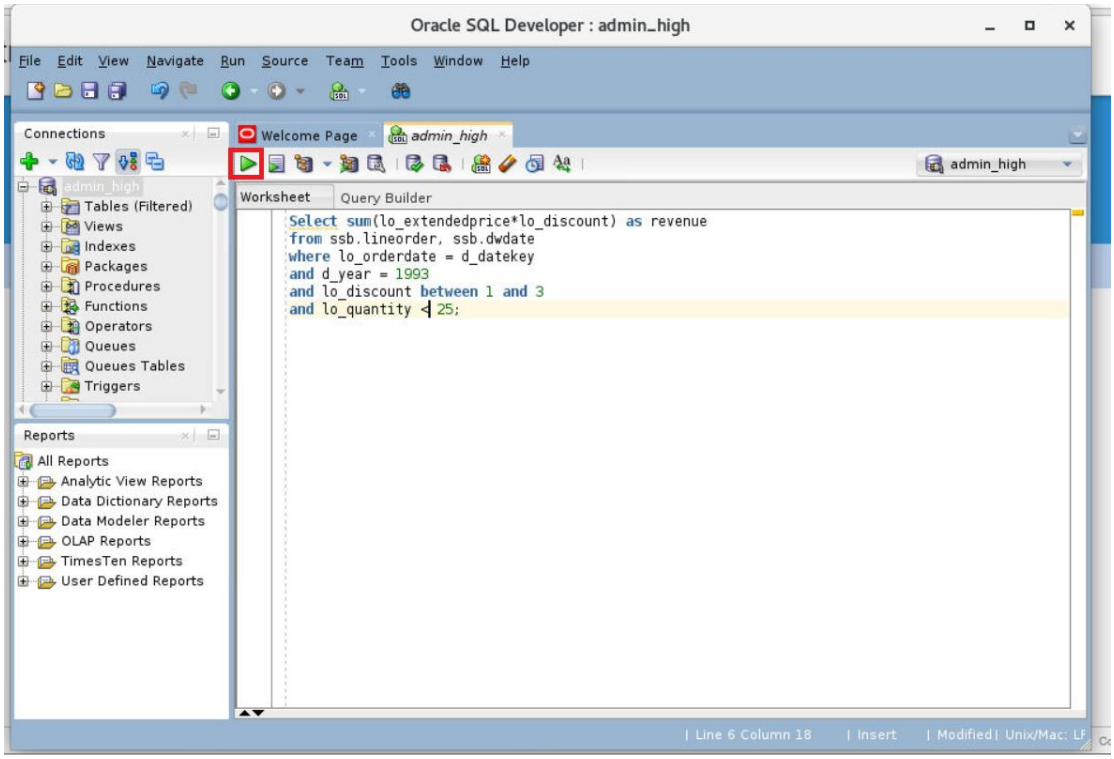
To demonstrate that scaling an instance does not cause downtime we will run a long running query in SQL Developer and alter the number of CPUs available to the ATP instance while the SQL is executing.

Start SQL Developer and open your **admin_high** connection.

Paste the following long running SQL into the SQL Worksheet and select **Run Statement**. It will run for at least 10 minutes, allowing time to carry out the scaling operations while it is still executing. The sql can be found in the file **/home/oracle/labScripts/lab3/lab3_long_running.sql**

```
select sum(lo_extendedprice*lo_discount) as revenue
from ssb.lineorder, ssb.dwdate
where lo_orderdate = d_datekey
and d_yearmonthnum = 199401
and lo_discount between 4 and 6
and lo_quantity between 26 and 35;
```

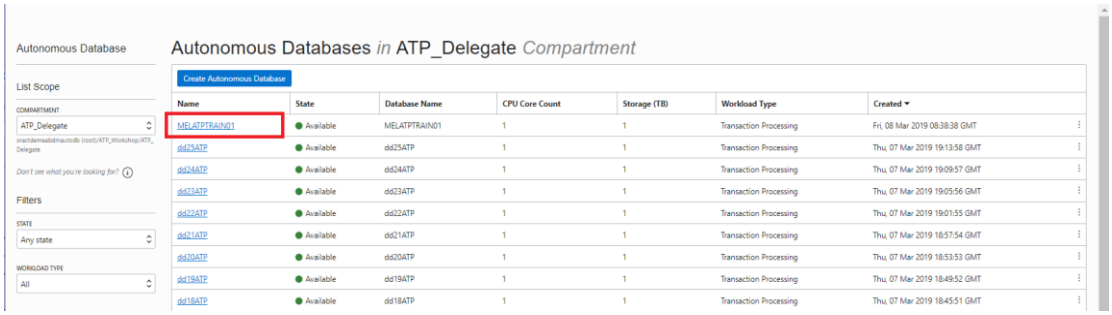
Leave this window open and the statement executing.



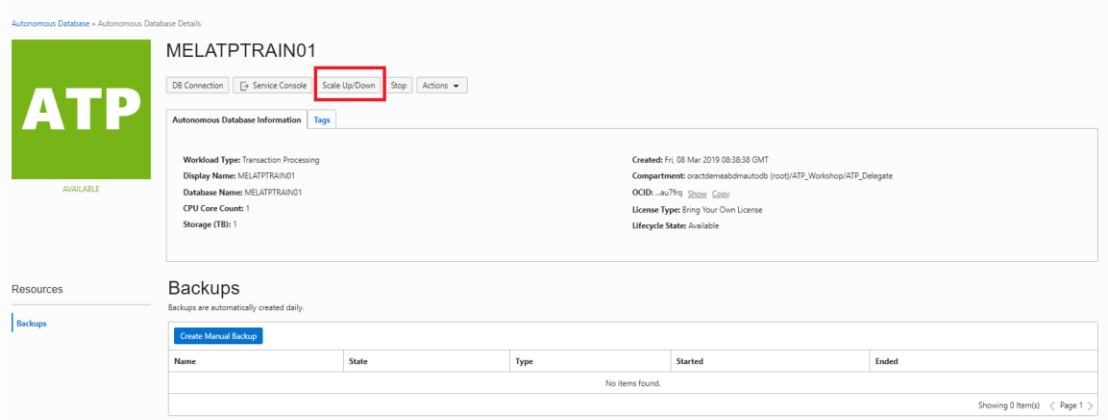
Return to your Firefox window that you used to during the provisioning exercise.

Navigate back to the **Autonomous Transaction Processing** page in the **ATP_Delegate** compartment.

Click on the name of your database to open the instance details screen.

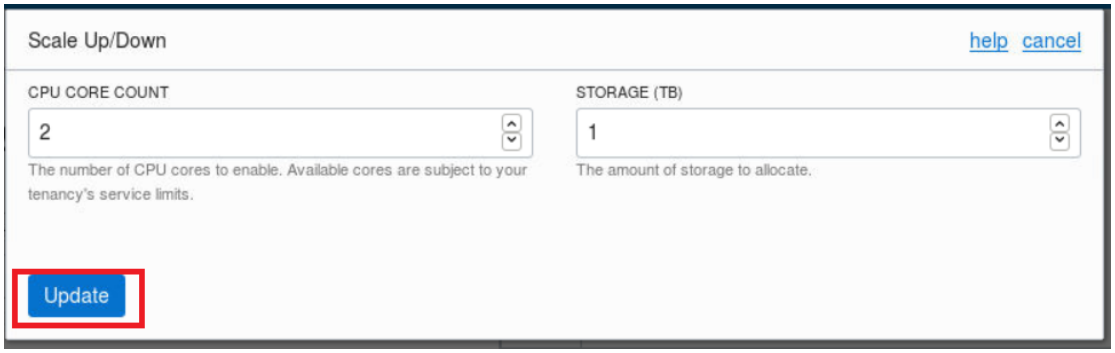


Select the **Scale Up/Down** button.



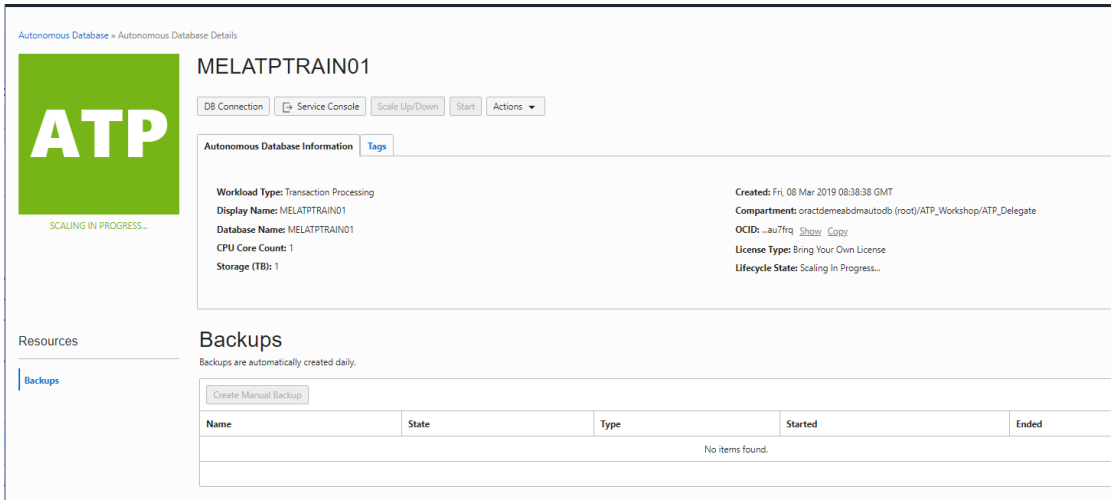
Fill in the form with the following information.

Change the **CPU core count** from 1 to **2 (i.e. you are going to add 1 OCPU)**
Leave **the storage capacity** set at 1



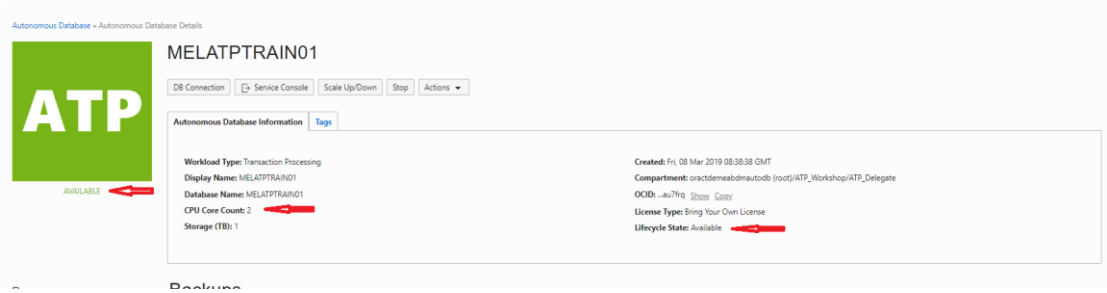
Click "**Update**" after setting the values in the form as shown above.

This will return you to the instance page and the status will now show "**Scaling in progress**" and the **"Scale Up/Down"** button is grayed out.

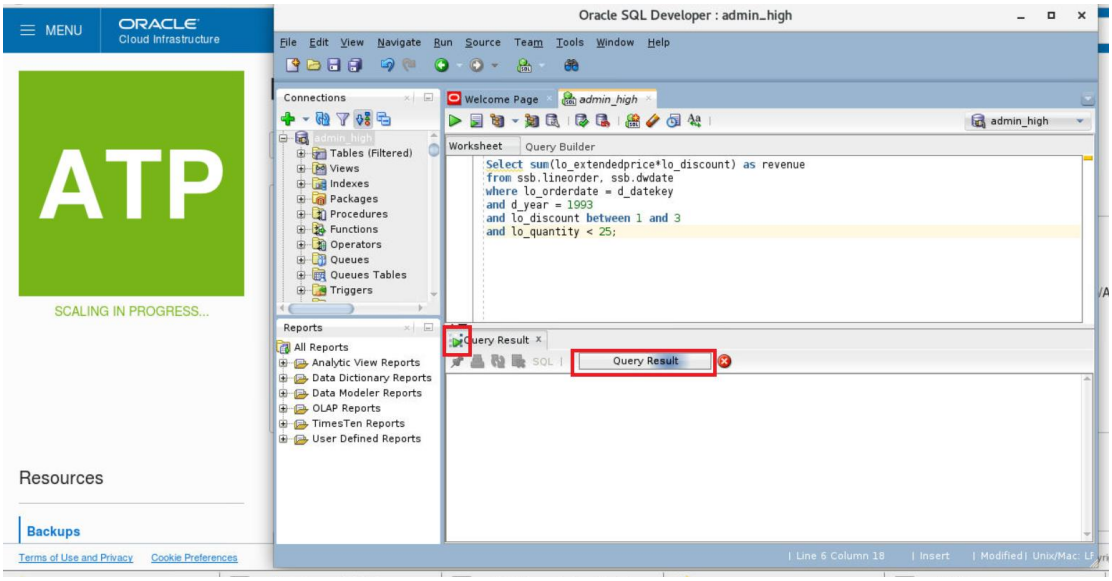


The page will automatically refresh once the scale operation has completed. The Lifecycle state will return to **"Available"**

Note that the “ATP” square remains green during the scaling process. This means that applications can continue running during the scale operation without downtime.



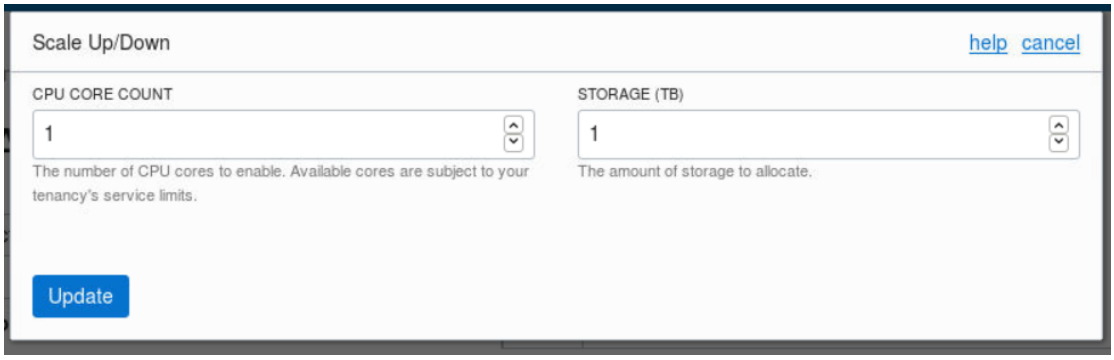
Bring your SQL Developer window back to the foreground. Verify that the query is still executing and has not been interrupted. You can see this by looking at the Query Result Tab, and the Query Result bar will be moving right to left and there will be rotating symbols around the  icon. Once you have verified the query has not been interrupted, proceed to scaling your instance back to 1 OCPU.



Now scale your instance back to 1 OCPU. Return to your Firefox Window.

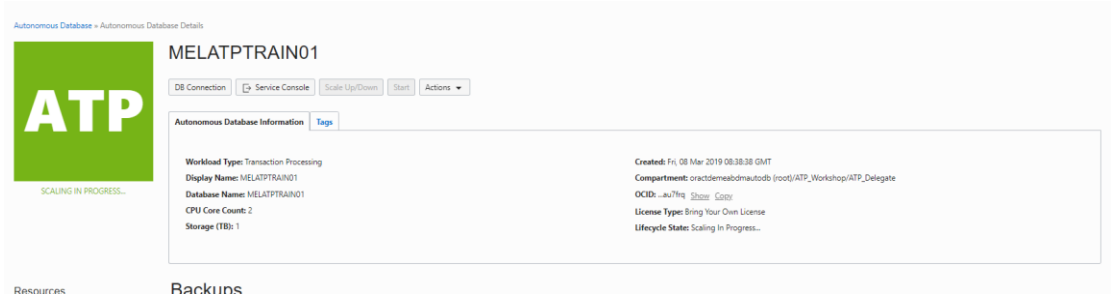
On the Instance Details Screen select **Scale Up/Down** button.
Fill in the form with the following information.

Change the **CPU core count** from 2 to **1 (i.e. you are going to remove 1 OCPU)**
Leave **the storage capacity** set at 1



Click "**Update**" after setting the values in the form as shown above.

This will return you the instance page and the status will now show "**Scaling in progress**" and the **"Scale Up/Down"** button is grayed out.



Bring your SQL Developer window back to the foreground. Verify that the query is still executing and has not been interrupted. You can see this by looking at the Query Result Tab, and the Query Result bar will be moving right to left and there will be rotating symbols around the  icon.

Once the Lifecycle state of your instance has returned to **"Available"** you are now ready to proceed with the next exercise.

Leave this SQL statement executing in the background, it can be used as part of the monitoring lab.

Lab 4 - Managing and monitoring ATP

Lab 4. Managing and Monitoring Autonomous Transaction Processing

Objectives:

- Learn how to use the Autonomous Transaction Processing (ATP) Cloud Service Console
- Learn how to monitor the performance of your ATP instance
- Learn how to monitor to individual SQL statements
- Learn how to stop and start your ATP instance
- Learn about the ATP backup and restore processes

In this section you will use the Cloud Console and the service console to manage and monitor your ATP instance. You will learn how you can stop and start your instance, and how you could recover your database if needed.

You will use the service console to monitor the performance of your ATP instance.

About Backup and Recovery on Autonomous Transaction Processing

ATP automatically backs up your database for you. The retention period for automatic and manual backups is 60 days. You can restore and recover your database to any point-in-time in this retention period.

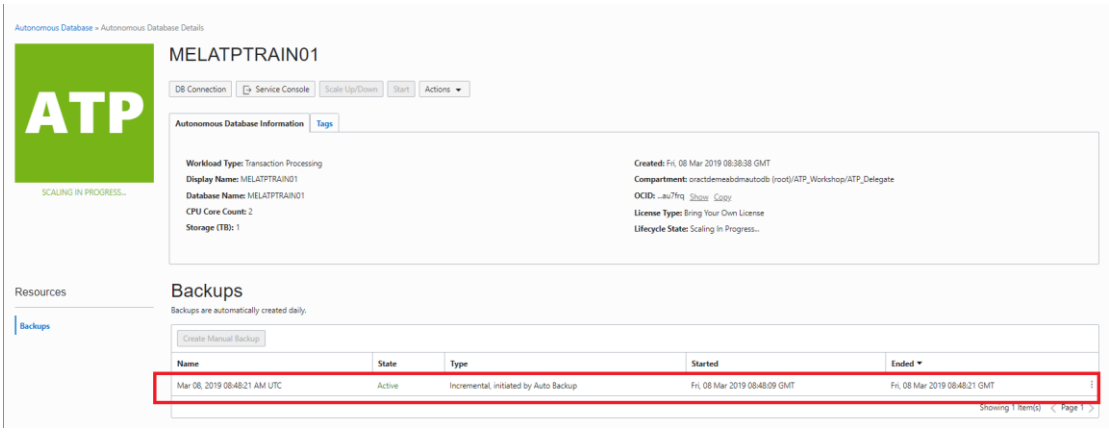
Manual Backups

You do not have to do any manual backups for your database as ATP backs up your database automatically. You can do manual backups using the cloud console; for example, if you want to take a backup before a major change to make restore and recovery faster. The manual backups are put in a Cloud Object Storage bucket in your tenancy, which you must configure before you carry out manual backups. When you initiate a point-in-time recovery ATP decides which backup to use for faster recovery.

Recovery

You can initiate recovery for your ATP database using the cloud console. ATP automatically restores and recovers your database to the point-in-time you specify.

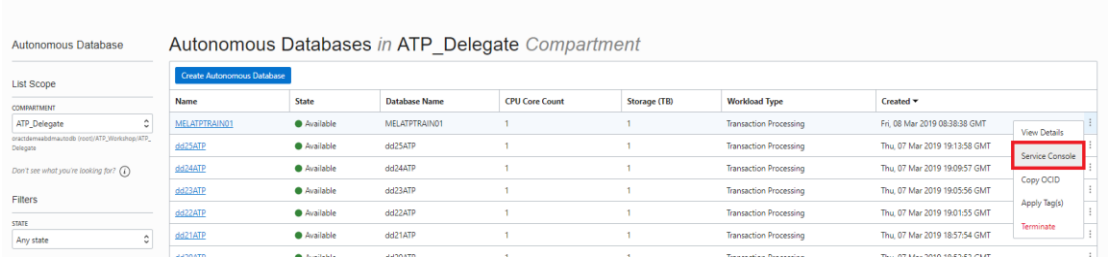
You can see what backups have been created for your instance on the ATP Database Details page. As your instances were only provisioned today, there will be no backups. A sample output is below.



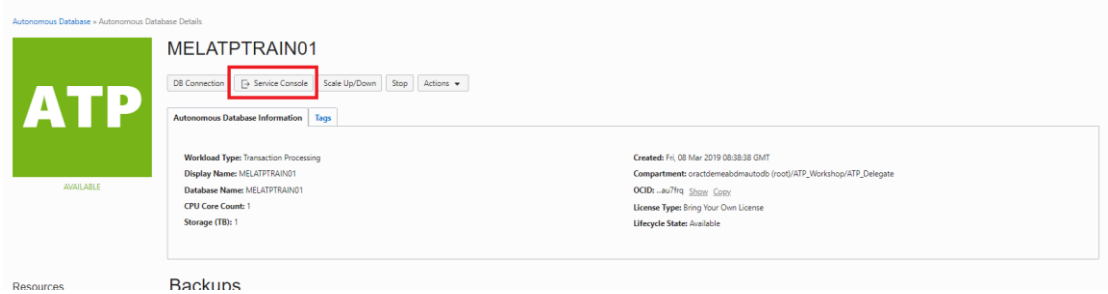
Exploring Service Console

There are two routes to the Service Console:-

1. Connect to the Service Console for your instance by selecting it from the menu next to the name of your ATP instance on the list of ATP Instances in your compartment.

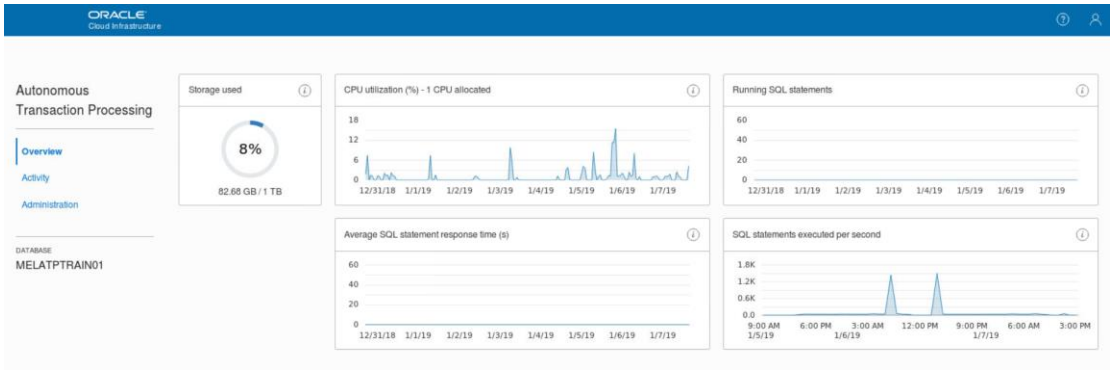


2. Or you can click the name of your instance to open the instance page and select the **'Service Console'** button.



Console Overview

The Overview page shows real-time and historical information about the utilization of the service. Your page may have 'No Data to Display' in the monitoring panes as your instance is newly provisioned.



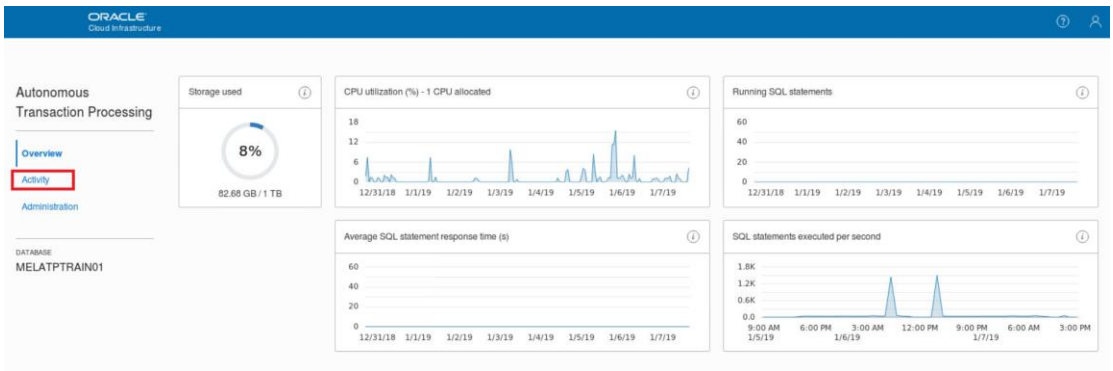
The components on this page are:

- **Storage**: This chart shows the total and used storage capacity of the service. It indicates what percentage of the space is currently in-use.
- **CPU utilization (%):** This chart shows the historical CPU utilization of the service.
- **Running SQL statements**: This chart shows the average number of running SQL statements historically.
- **Average SQL statement response time (s)**: This chart shows the average response time of SQL statements historically.

The default retention period for performance data is eight days. So, the CPU utilization, running statements, and average SQL response time charts show data for up to the last eight days by default.

Activity Page

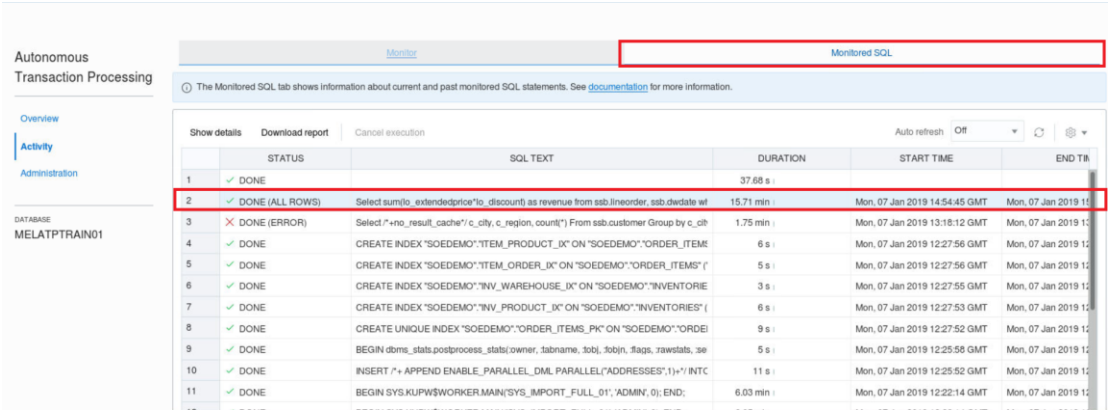
Select the **Activity** link on the left-hand side.



The **Activity** page defaults to a near real time view, which shows performance data for the last hour. Selecting the **'Time Period'** tab allows you to change the time slider to view historic performance data if required.

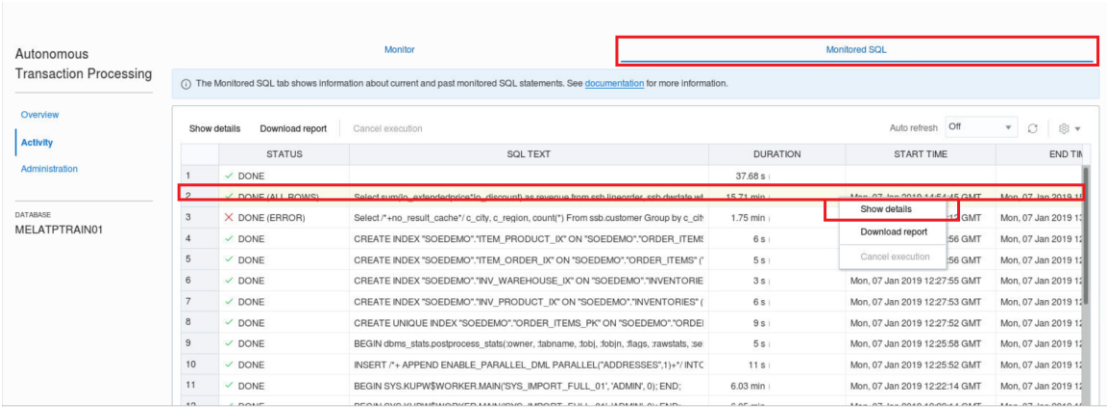
Monitored SQL

Select the **'Monitored SQL'** Tab. If you have the long running SQL statement from the previous lab shown in this table, use it to explore the interface, otherwise, just review the provided screen shots.

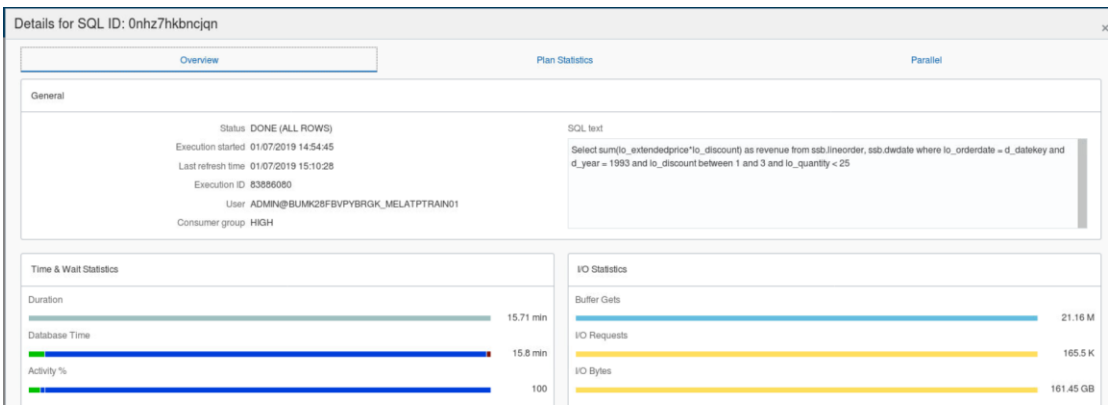


The **Monitored SQL** tab shows information about current and past monitored SQL statements. By default, Real-Time SQL Monitoring automatically starts when a SQL statement runs in parallel, or when it has consumed at least 5 seconds of CPU or I/O time in a single execution.

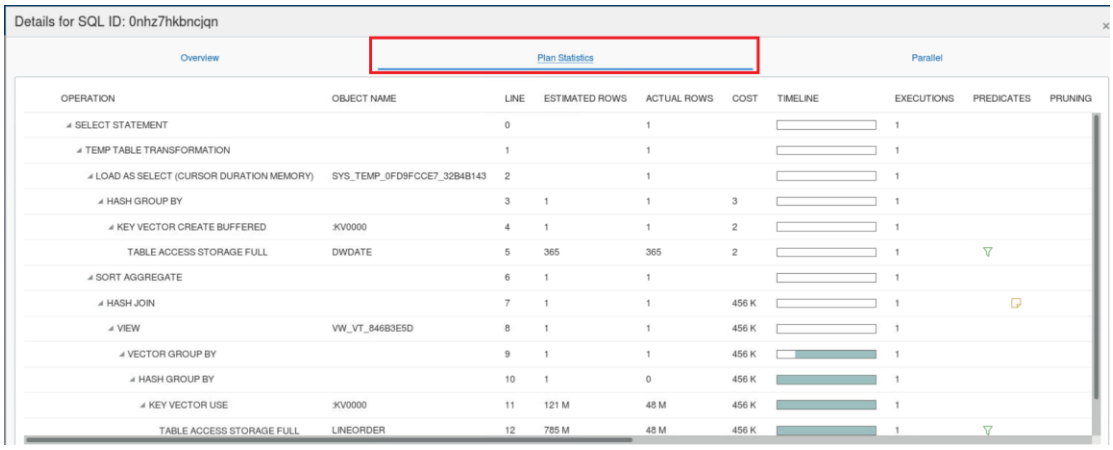
To see the detailed SQL monitor report for a statement, select the statement and right click to bring up the menu and click **Show Details**. This page can take a little while to populate with the data.



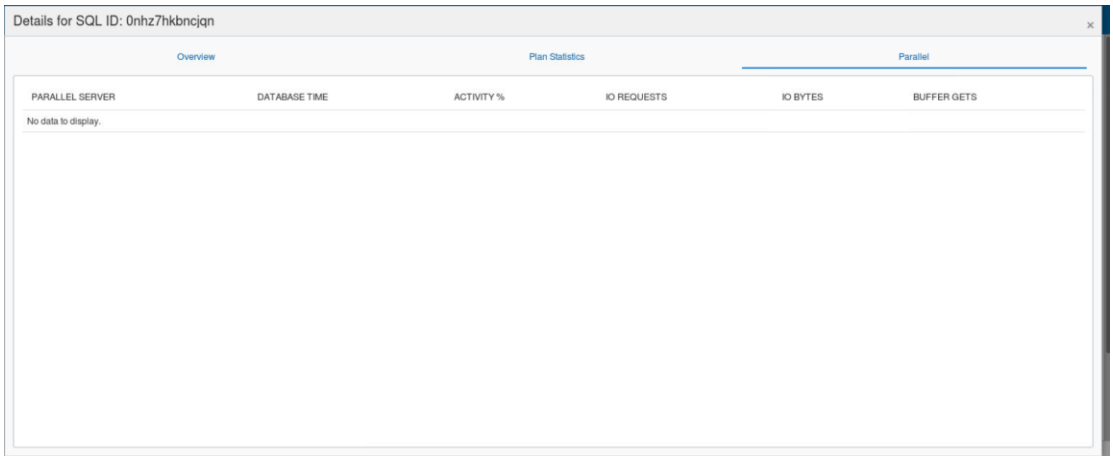
The **Overview** tab shows general information for the statement.



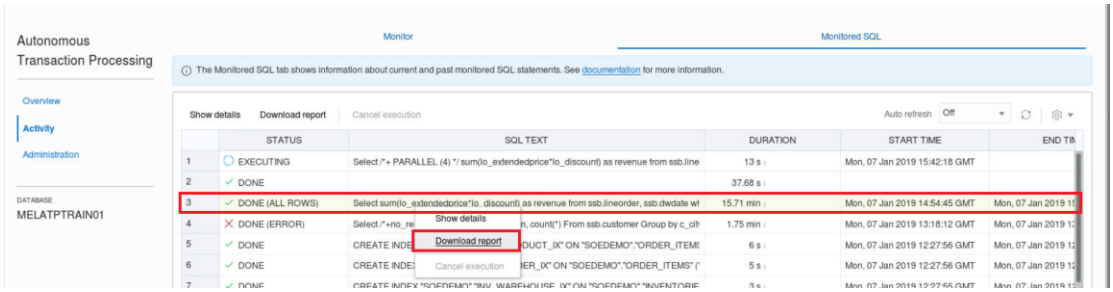
The **Plan Statistics** tab shows the runtime execution plan of the statement.



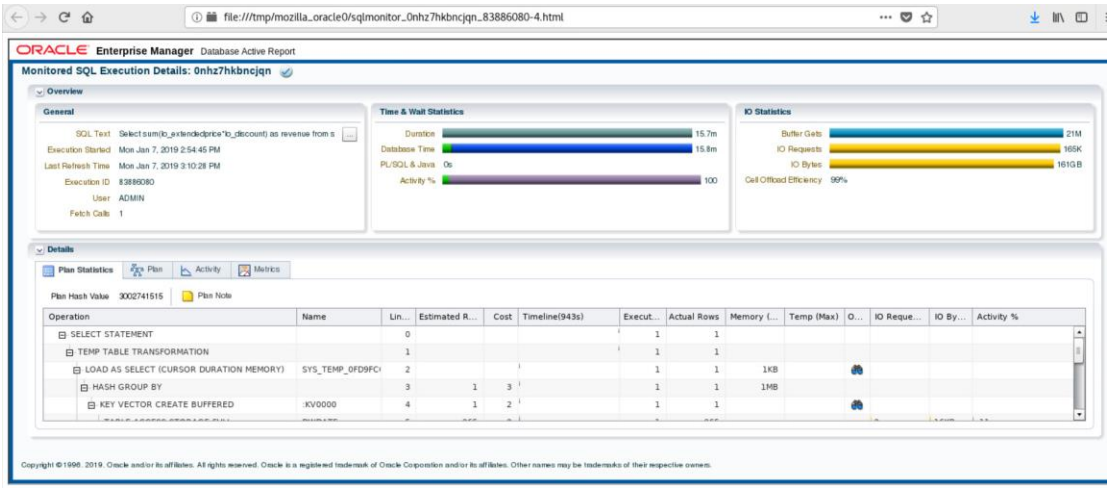
If your statement uses parallel processing this will be documented on the **Parallel** tab



You can download the SQL Monitor report in HTML format by selecting the SQL statement, right clicking to bring up the menu and clicking 'Download report'

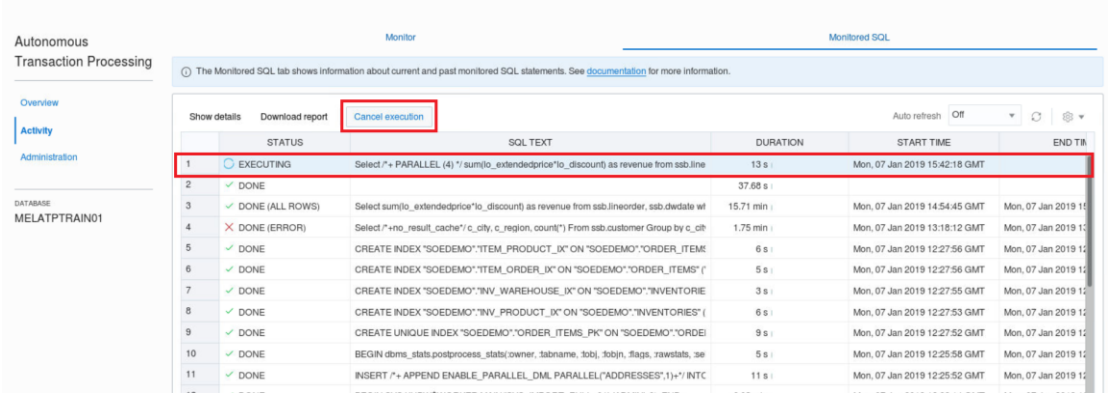


This will download a html document giving details about the SQL statement (note – to view the report you need Adobe Flash plugin in your browser). If you want you can download the report and open it in your Firefox browser.

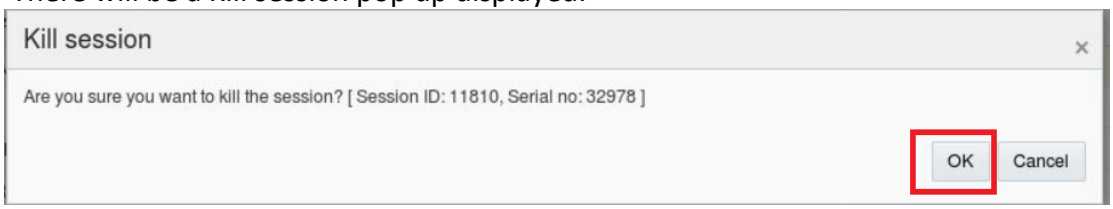


Cancelling Execution

There is a 'Cancel execution' button. This can be used to cancel the execution of currently running SQL statements. This process is shown in screen shot only. Select the running SQL you want to cancel, and select **Cancel Execution**



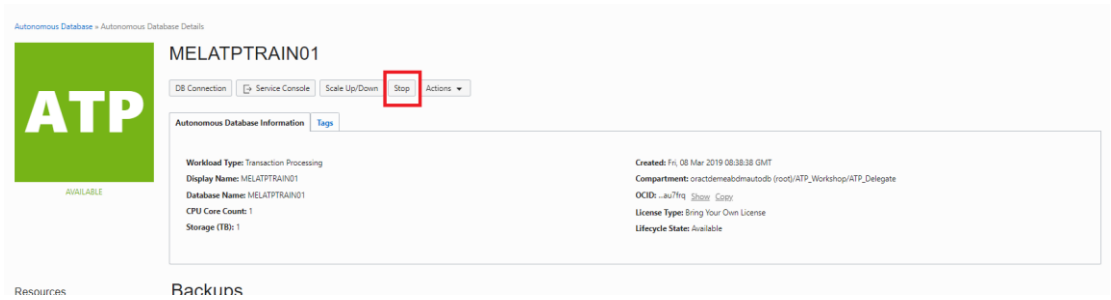
There will be a Kill session pop up displayed.



And then a confirmation window that the session has been marked to be killed.

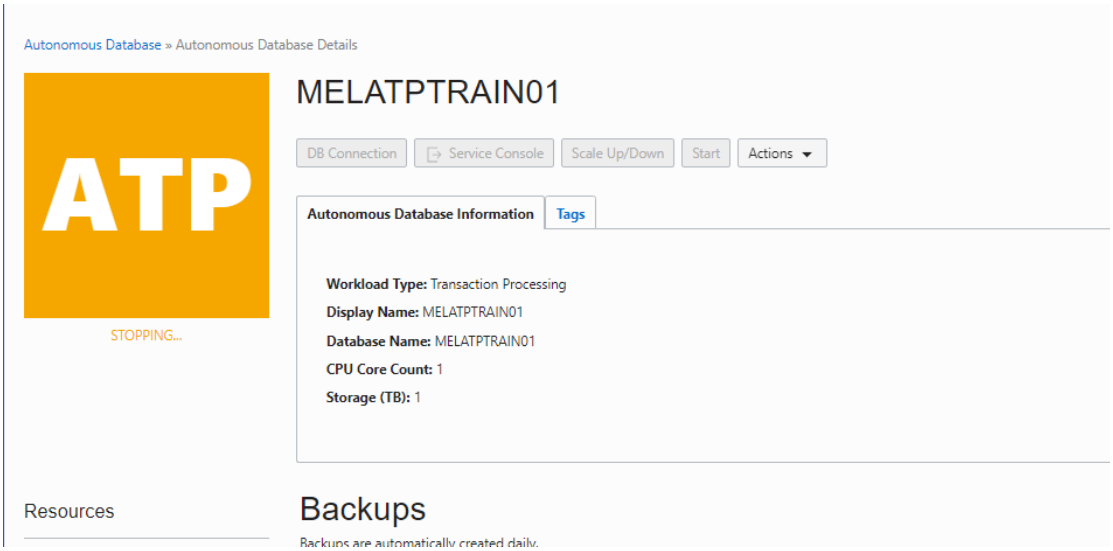
Stopping your ATP instance

Go to the page listing ATP instances in your compartment, which you used during the provisioning exercise and open the name of your ATP instance to open to instance page. Click the **Stop** button.



In the pop-up dialog confirm that you want to stop your instance by clicking on the **Stop** button.

The instance page will now show that your instance is stopping

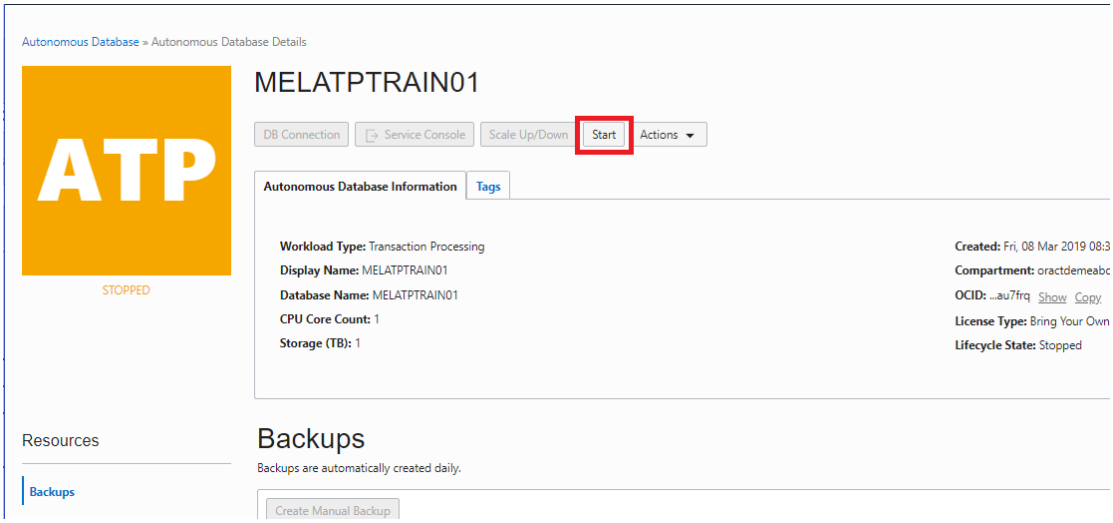


Once the instance has stopped the page will automatically refresh to show the new state

Note that stopping your instance stops metering and charging for your compute resources, based on a full-hour cycle of usage. You can come back later and start your instance instantly anytime.

Starting your ATP instance

Go to the Cloud Console you used during the previous exercise and open the Instances screen. Click the **Start** button.



In the pop-up dialog confirm that you want to start your instance by clicking on the **Start** button.

The instance page will now show that your instance is starting

Starting the instance will take a few minutes. The Lifecycle state will change to Available when the instance has started.

Lab 5 - Data Loading into ATP

Lab 5. Data Loading into Autonomous Transaction Processing

Objectives:

- You will learn how to load a local data file into your Autonomous Transaction Processing (ATP) instance.
- You will learn how to use the DBMS_CLOUD package to load data into your ATP Instance from Object Storage.
- You will use Oracle Data Pump to load data from an export dump file.

You can load data into ATP Database using Oracle Database tools, and Oracle and 3rd party data integration tools.

You can load data:

- From files local to your client computer
- From files stored in a cloud-based object store

For the fastest data loading experience Oracle recommends uploading the source files to a cloud-based object store, such as Oracle Cloud Infrastructure Object Storage, before loading the data into your ATP Database.

To load data from files in the cloud into your ATP database, use the new PL/SQL DBMS_CLOUD package. The DBMS_CLOUD package supports loading data files from the following Cloud sources: Oracle Cloud Infrastructure Object Storage, Oracle Cloud Infrastructure Object Storage Classic, Azure Blob Storage and Amazon AWS S3.

This lab shows how to load data from Oracle Cloud Infrastructure Object Storage using two of the procedures in the DBMS_CLOUD package:

- **Create_credential**: Stores the object store credentials in your ATP database schema. You will use this procedure to create object store credentials in your ATP admin schema.
- **Copy_data**: You will use this procedure to load tables in your admin schema with data from data files staged in the Oracle Cloud Infrastructure.

The sample SQL and shell scripts for this lab are available in your VM under the directory **/home/oracle/labScripts/lab5**.

Loading a file from local storage

In this section you will load a local file from your machine into ATP:

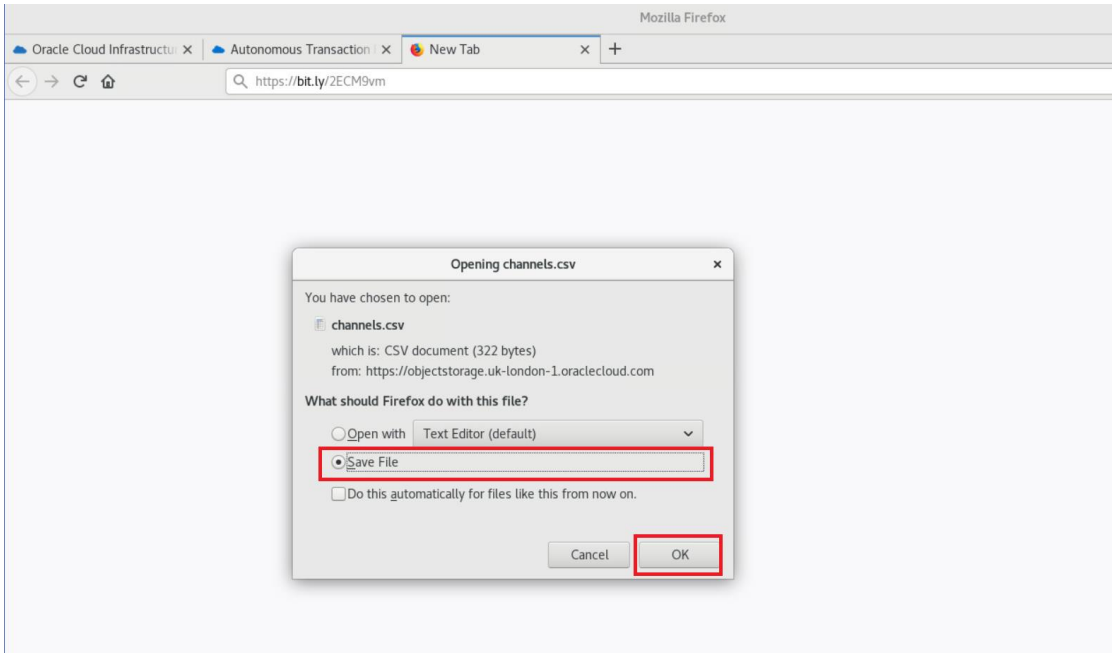
To use as the source file, download this file to your Lab VM using Firefox:

https://objectstorage.uk-london-1.oraclecloud.com/p/Xs-twgmNVIyOrpzCsnuTQIhMVXuiJ_XZ0jJ2VkTeKnw/n/oscemea001/b/DEMO_DATA/o/channels.csv

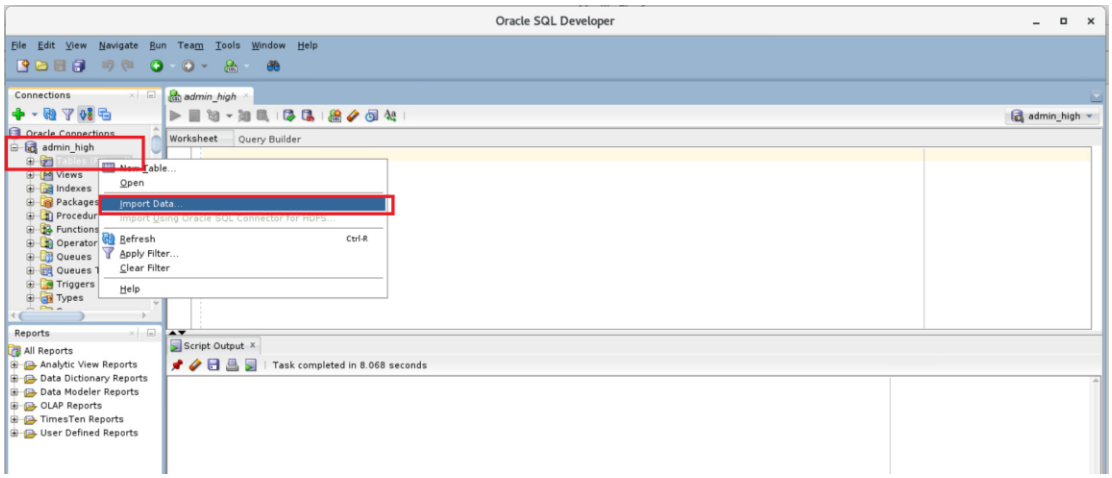
or use this short link

https://bit.ly/2uu7zot

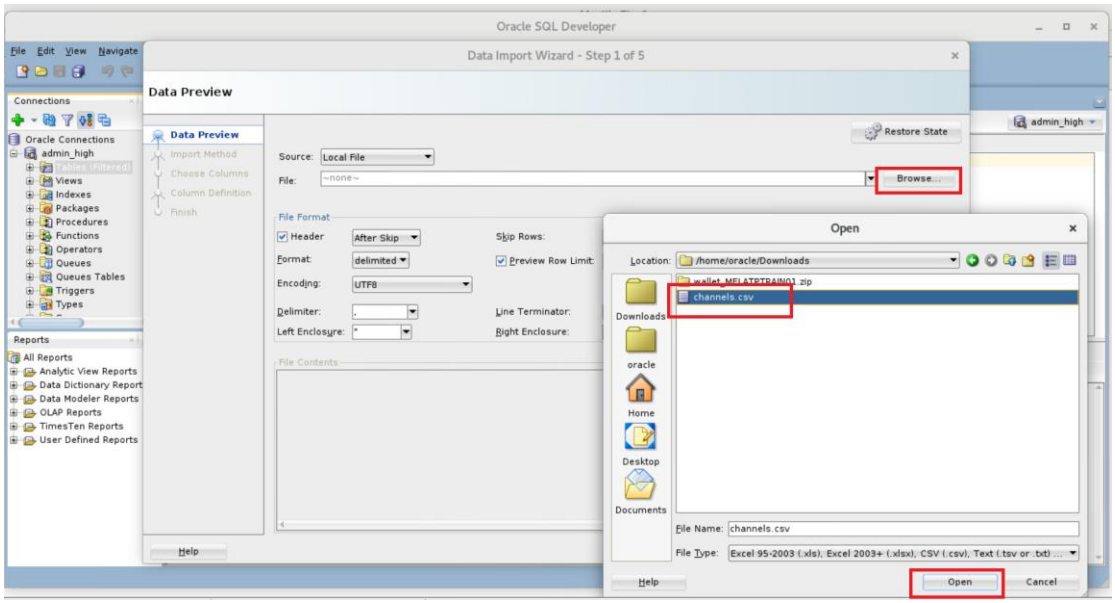
Select **Save File .** This will save the file to default downloads location for the Firefox browser, **$HOME/Downloads.**



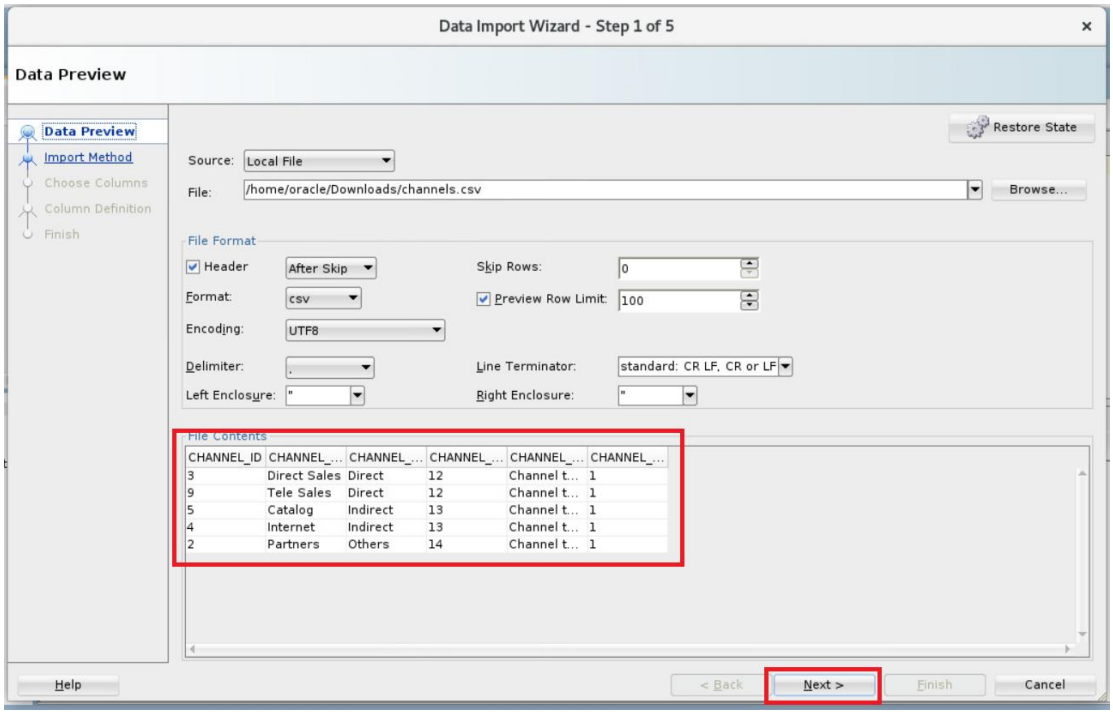
Go to SQL Developer, expand your **admin_high** connection and right click Tables, then click Import Data.



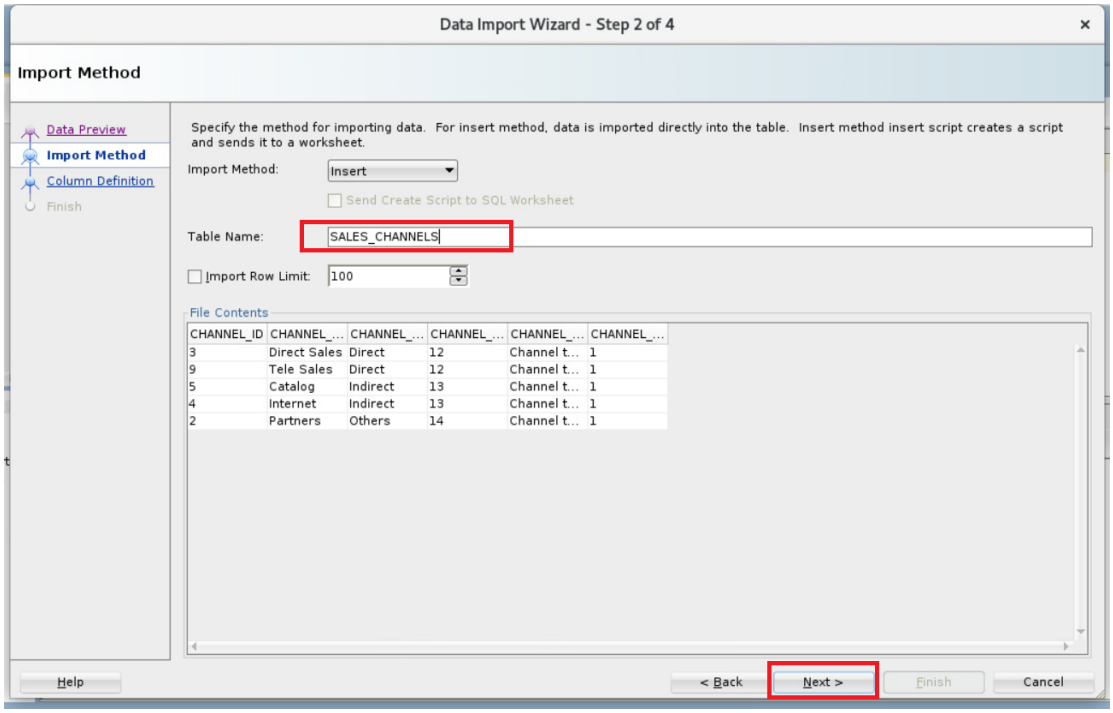
This will open the data import wizard. Click Browse and locate the channels.csv file you downloaded. (It will usually be in the Downloads folder under your home directory).



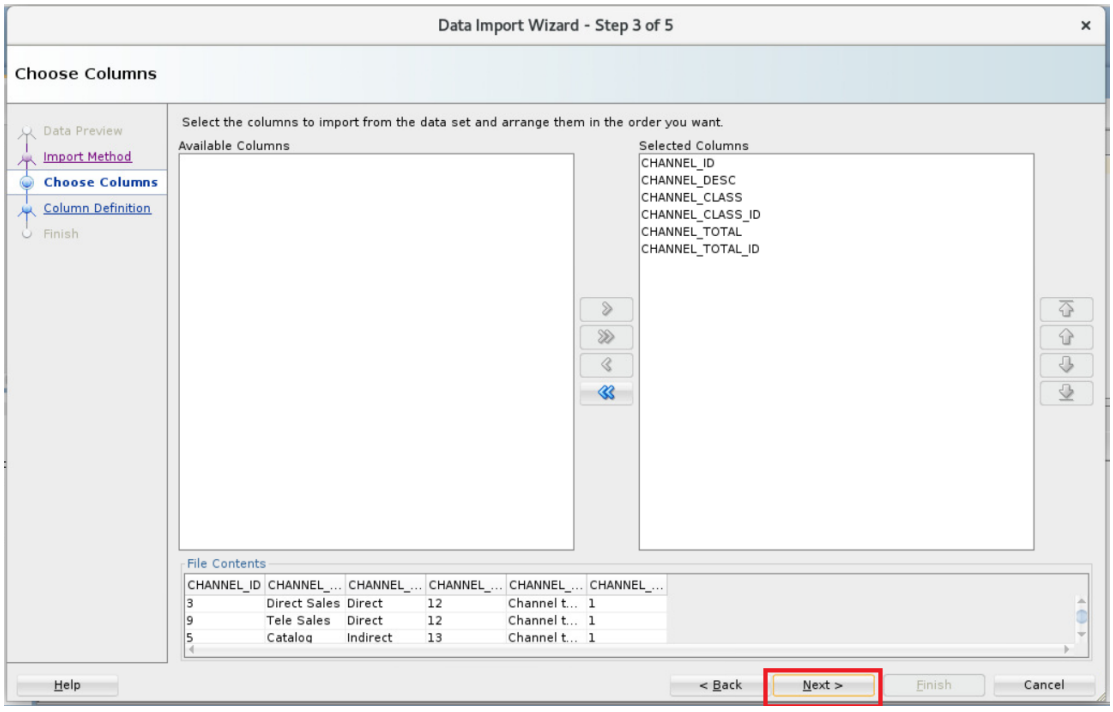
When you select the file you will see the file contents previewed in the import wizard.



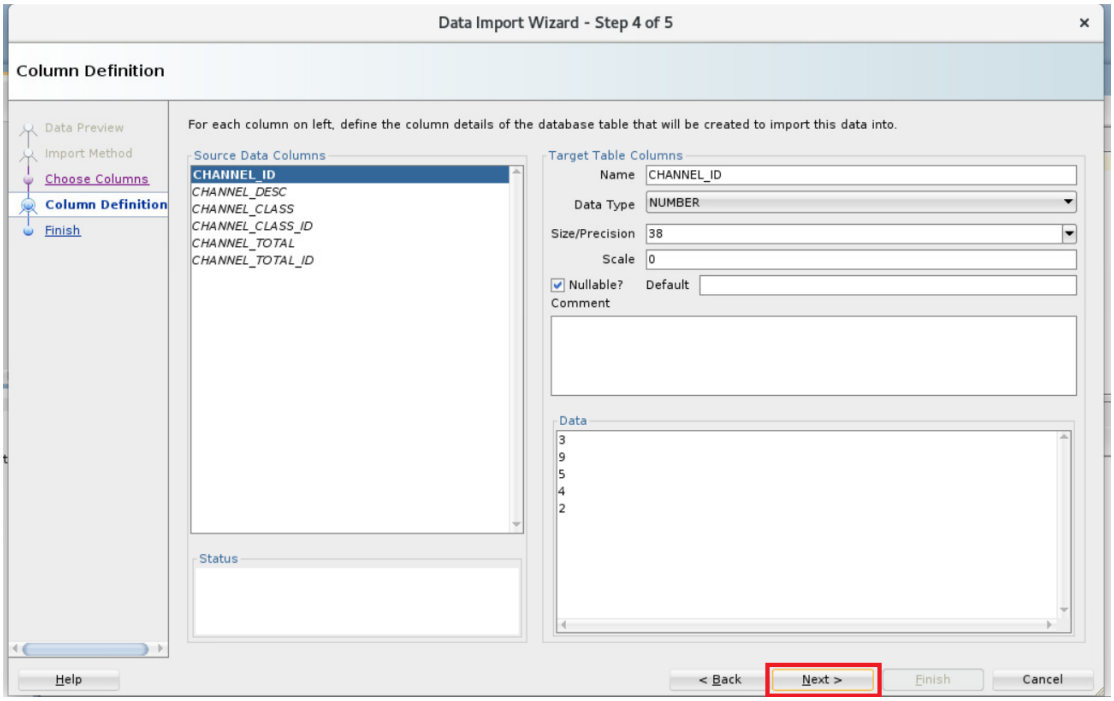
Click Next. In the next screen enter SALES_CHANNELS as the table name you will create and load into.



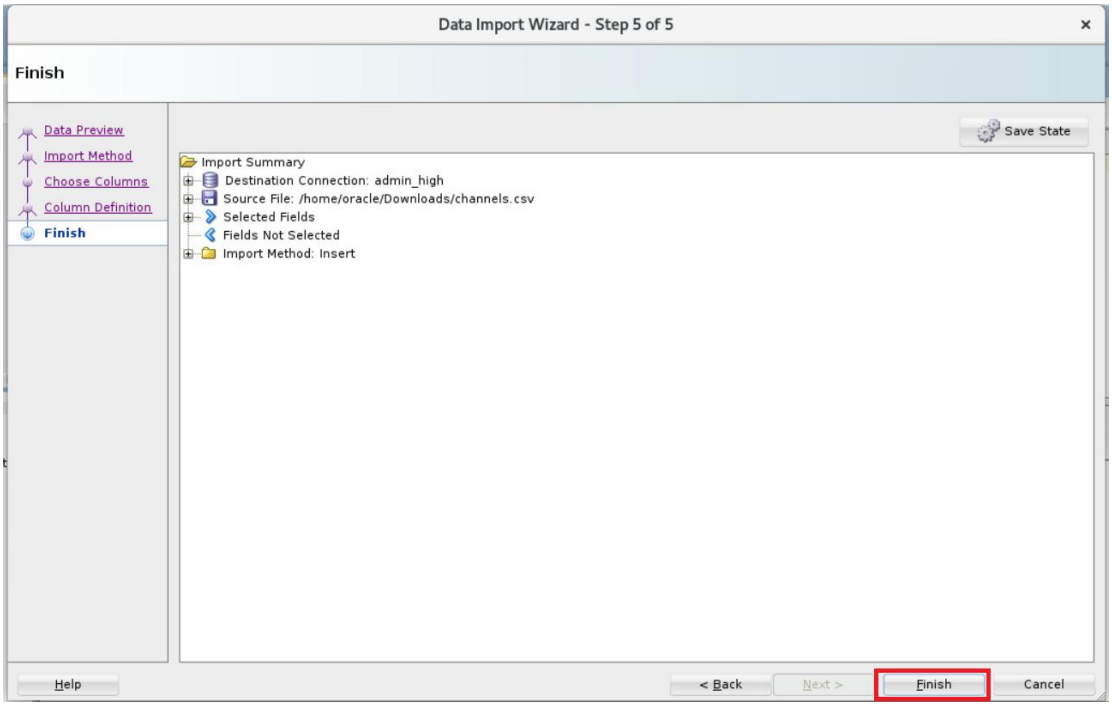
Click Next. The next screen allows you to select the columns you want for this table. For this exercise leave the columns as-is which means the table will have all columns available.



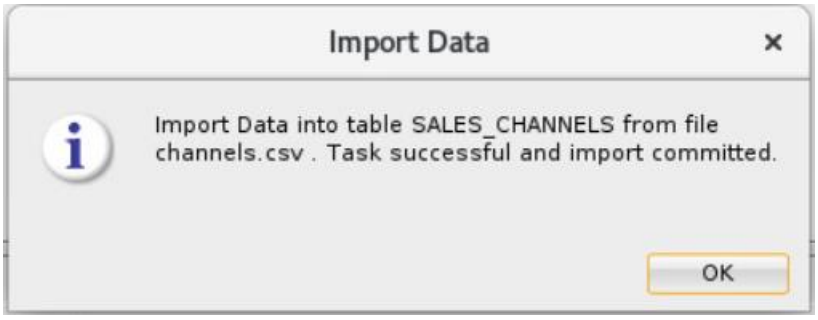
Click Next. The next screen allows you to look at the data types for each column. You can change the data types if you need to. For this exercise leave the data types as default.



Click Next. The next page will display a summary for the import operation.

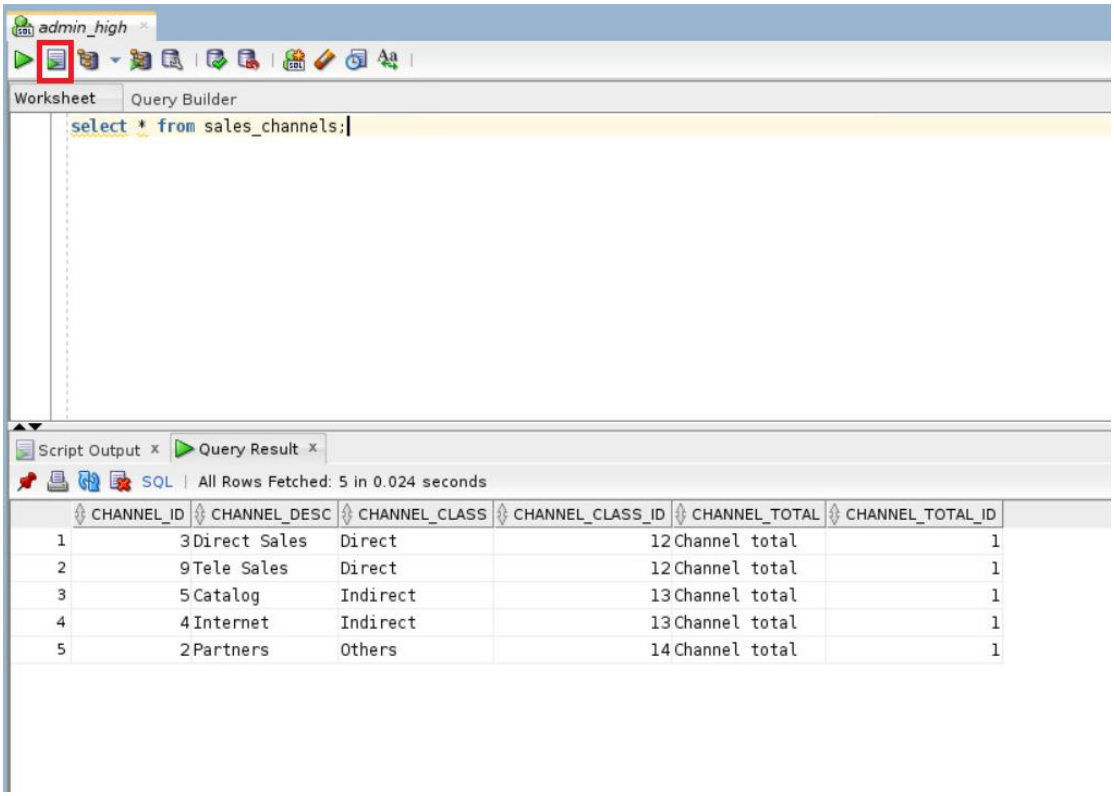


Click Finish to complete the import wizard and start the data load. When the data load finishes you will see a message saying the import was completed.



Your source file is now loaded into ATP. You can run a query on the table in SQL Worksheet to see your data.

```
select * from sales_channels;
```



Loading a file from Object Storage

Information about how the environment was prepared

To load data from the Oracle Cloud Infrastructure Object Storage you will need a Cloud user with the appropriate privileges to read data from the Object Store.
A user 'atp_oss_access' with the right setup and authentication token has been pre-created for you to use in the next step. If you are interested in seeing an outline of how it was setup, this is documented in Appendix B.

Storing your object store authentication token credentials in the database

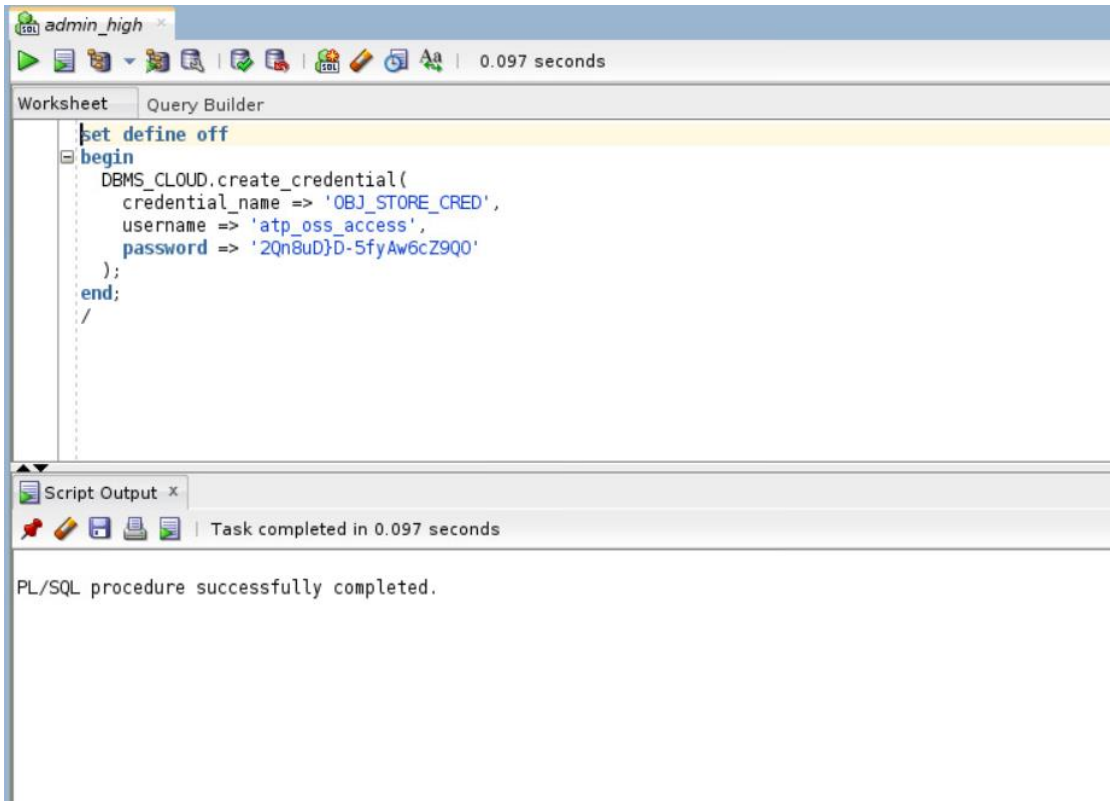
To access data in the Object Store you must enable your database user to authenticate itself with the Object Store using your object store account and authentication token.

You do this by creating a private CREDENTIAL object for your user that stores this information encrypted in your ATP instance. This encrypted connection information is only usable by your user schema.

Within the SQL worksheet of SQL Developer in your **admin_high** connection, execute the following code to store the object store credential in the database:

The below sql can be found in the file
/home/oracle/labScripts/lab5/lab5_create_credential.sql

```
set define off
begin
  DBMS_CLOUD.create_credential(
    credential_name => 'OBJ_STORE_CRED',
    username => 'atp_oss_access',
    password => '2Qn8uD}D-5fyAw6cZ9QO'
  );
end;
/
```



Now you are ready to load data from Object Store

Loading Data from Object Store

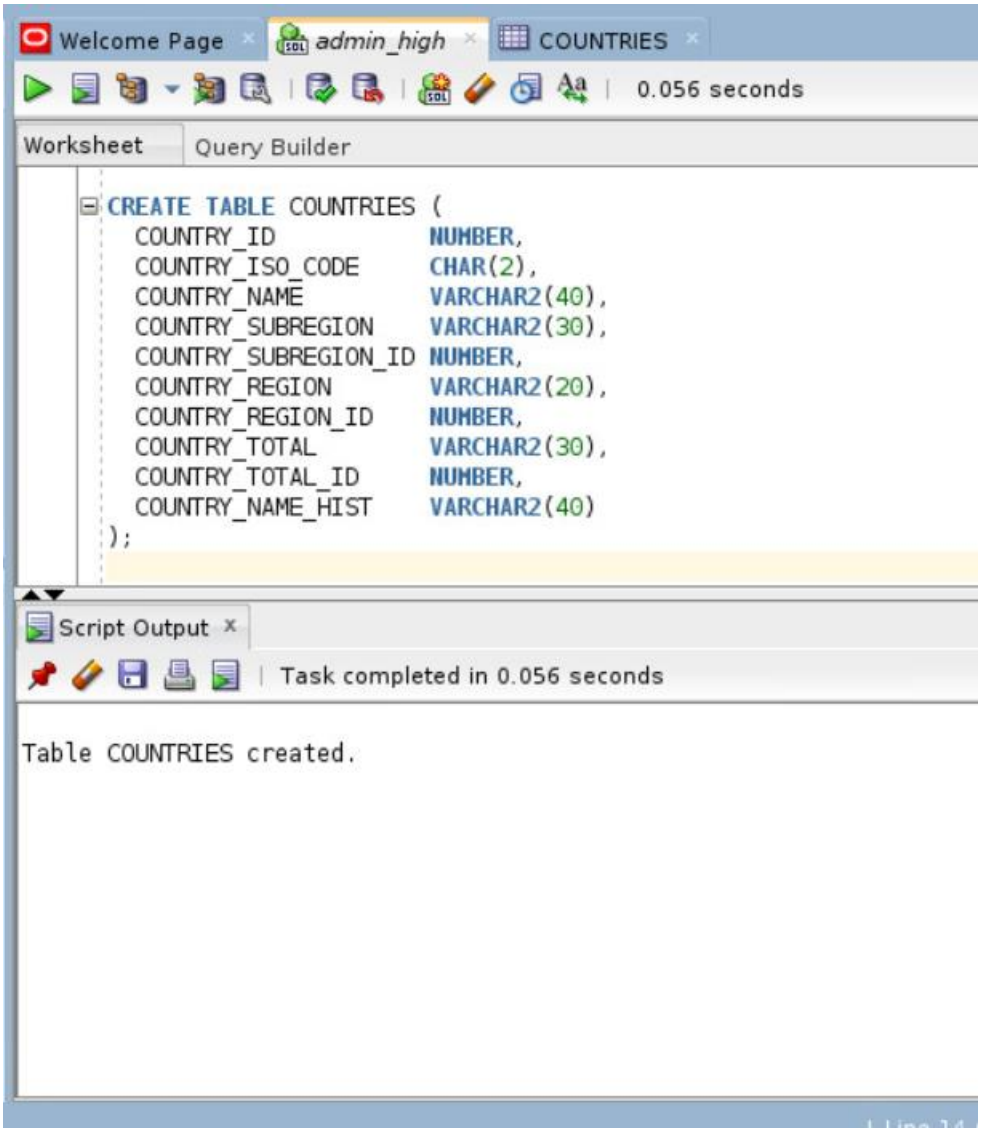
You can use the PL/SQL package DBMS_CLOUD directly to load the data from object store. It can be invoked directly or implicitly by using tools within SQL Developer.

Connect as your admin user in SQL Developer using your **admin_high** connection.

Prepare your destination table by running the create table statement

The sql can be found in **/home/oracle/labScripts/lab5/lab5_create_countries.sql**

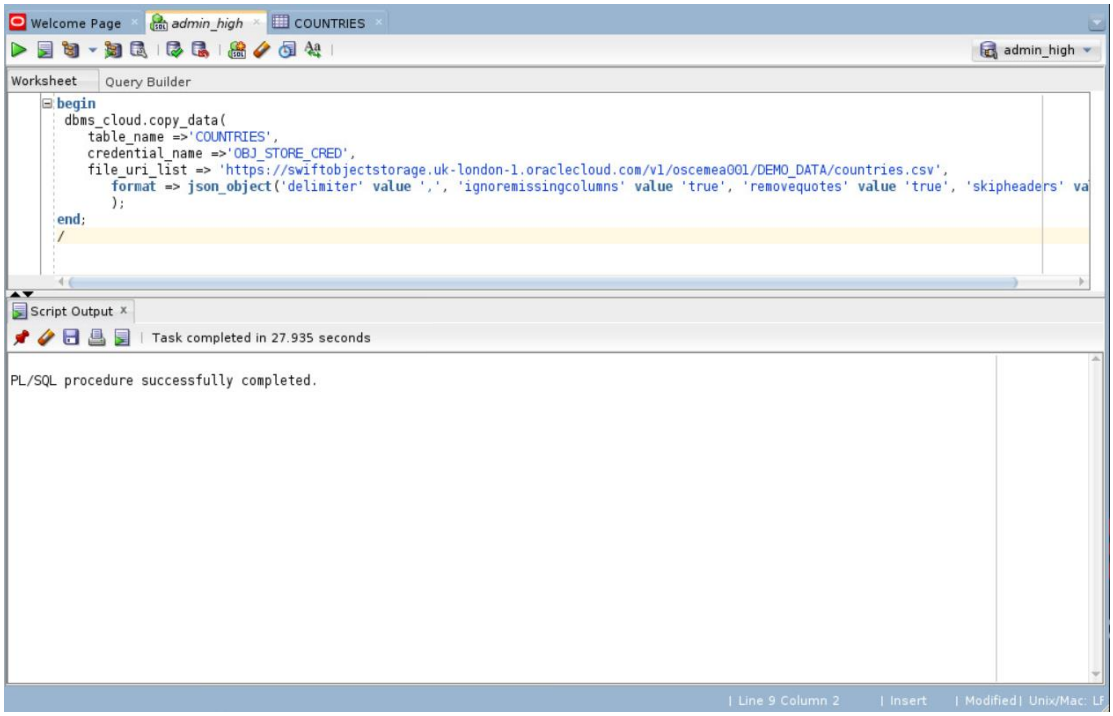
```
CREATE TABLE COUNTRIES (
  COUNTRY_ID            NUMBER,
  COUNTRY_ISO_CODE      CHAR(2),
  COUNTRY_NAME          VARCHAR2(40),
  COUNTRY_SUBREGION     VARCHAR2(30),
  COUNTRY_SUBREGION_ID NUMBER,
  COUNTRY_REGION        VARCHAR2(20),
  COUNTRY_REGION_ID     NUMBER,
  COUNTRY_TOTAL         VARCHAR2(30),
  COUNTRY_TOTAL_ID      NUMBER,
  COUNTRY_NAME_HIST     VARCHAR2(40)
);
```



Next, paste the following code to copy data from object storage using the DBMS_CLOUD package. We use the copy_data procedure of the DBMS_CLOUD package to copy the data (countries.csv) staged in your object store.

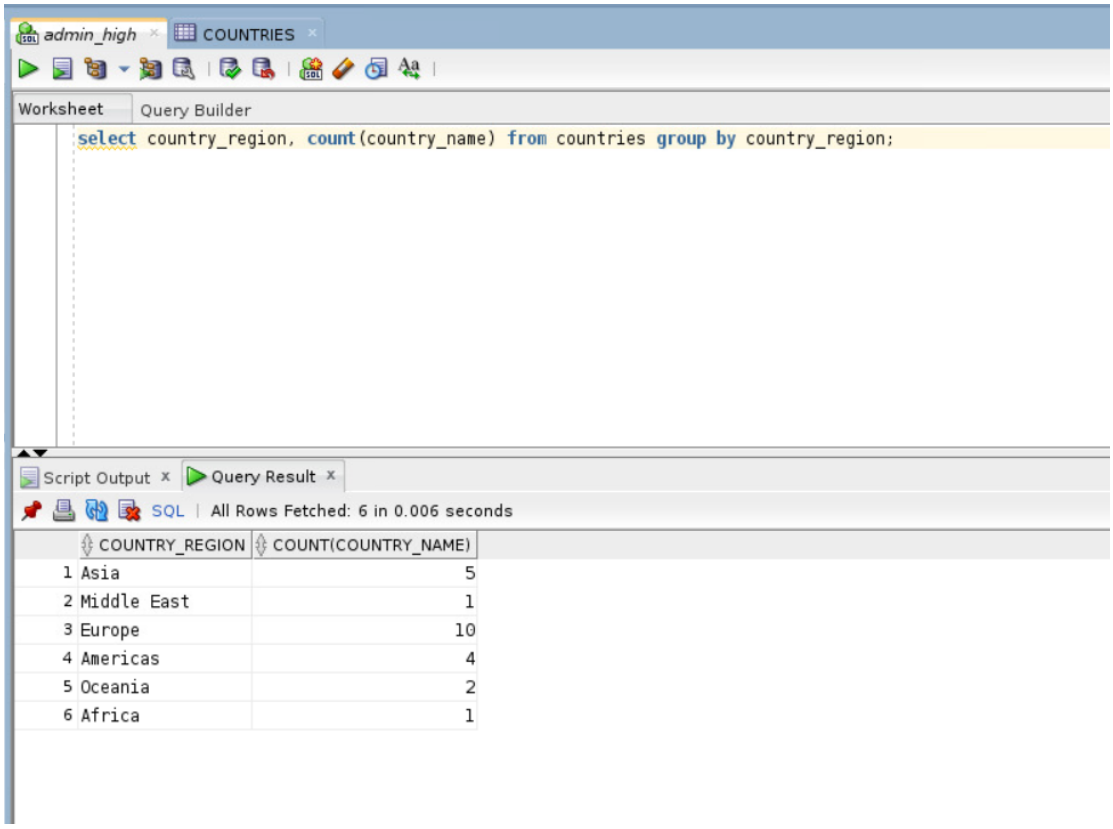
The below sql can be found under **/home/oracle/labScripts/lab5/lab5_dbms_cloud_sample.sql** in your vm.

```
begin
 dbms_cloud.copy_data(
    table_name =>'COUNTRIES',
    credential_name =>'OBJ_STORE_CRED',
    file_uri_list => 'https://swiftobjectstorage.uk-london-
1.oraclecloud.com/v1/oscemea001/DEMO_DATA/countries.csv',
       format => json_object('delimiter' value ',',
'ignoremissingcolumns' value 'true', 'removequotes' value 'true',
'skipheaders' value '1')
       );
end;
/
```



You can verify that the data has loaded by running a simple query on your COUNTRIES table.

```
select country_region, count(country_name) from countries group by
country_region;
```



Importing a Data Pump Export

How the Data Pump Export was Prepared

To simulate migrating from an on-premise platform to the cloud, this export was generated on an Oracle SPARC SuperCluster in an on-premise data center, following the documentation https://docs.oracle.com/en/cloud/paas/atp-cloud/atpug/load-data.html#GUID-30DB1EEA-DB45-49EA-9E97-DF49A9968E24

The export command used was:

```
$ expdp system/MyDemoPa55word exclude=cluster,db_link parallel=8
schemas=soe dumpfile=exp_soe_150_%u.dmp directory=mnet
```

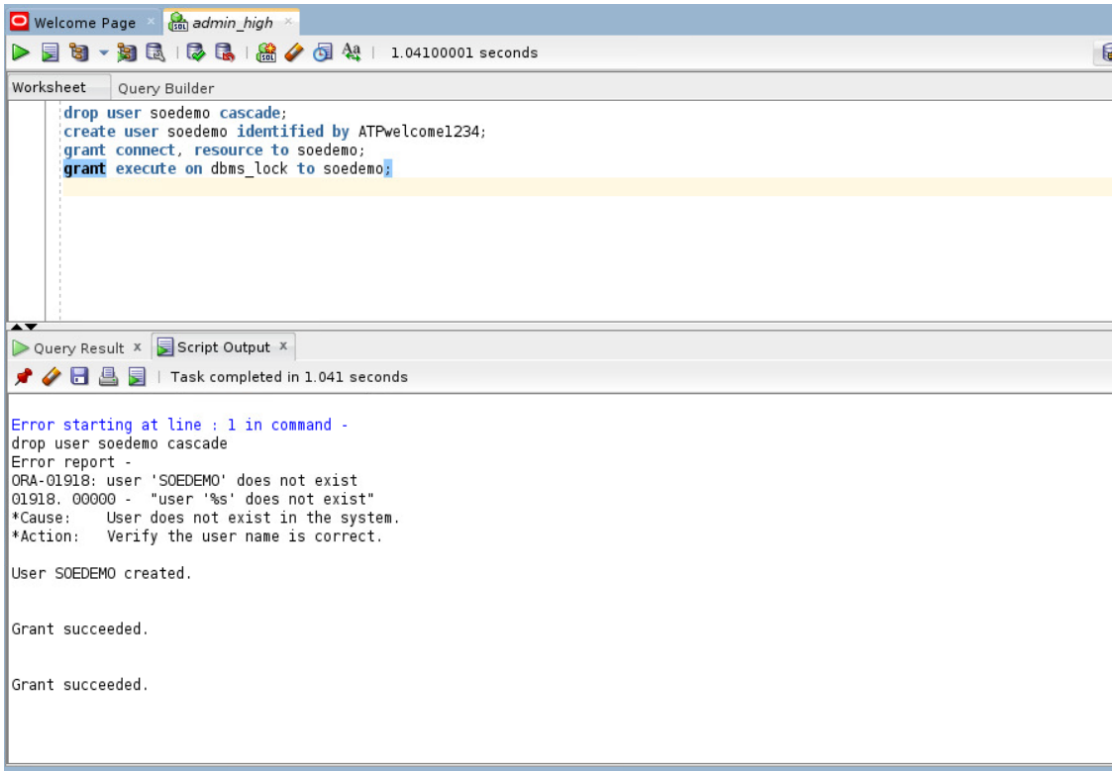
This created an export dump consisting of 8 files. The files were uploaded to an Object Storage bucket within the tenancy used for this lab.

The source schema was a Swingbench SOE schema, scaled at 150MB.

Creating the Destination Schema

We are going to re-map the schema from the one in the dumpfiles to a new schema. Within the SQL worksheet of SQL Developer in your **admin_high** connection, execute the following code to drop any existing schema with the same name, and create your new schema. This sql can be found in the file **/home/oracle/labScripts/lab5/lab5_create_user.sql**

```
drop user soedemo cascade;
create user soedemo identified by ATPwelcome1234;
grant connect, resource to soedemo;
grant execute on dbms_lock to soedemo;
```



Running Data Pump

Now go to a terminal window in your TigerVNC session connected to the LAB VM.

The location of the wallet file directory is not mandated by the cloud software. For this lab we will use the directory **/home/oracle/wallets** to store our wallet file. The wallet zip file should still be available on your system under your **$HOME/Downloads** directory from the previous labs. If not, then you will have to download it again via the admin console.

```
cd $HOME
cp $HOME/Downloads/wallet_*.zip wallets
cd $HOME/wallets
unzip wallet_*.zip
```

```
[oracle@demo-long-v4 ]$ cd $HOME
[oracle@demo-long-v4 ]$ cp $HOME/Downloads/wallet_*.zip wallets
[oracle@demo-long-v4 ]$ cd $HOME/wallets
[oracle@demo-long-v4 ]$ unzip wallet_*.zip
Archive:  wallet_MELATPTRAIN01.zip
  inflating: cwallet.sso
  inflating: tnsnames.ora
  inflating: truststore.jks
  inflating: ojdbc.properties
  inflating: sqlnet.ora
  inflating: ewallet.p12
  inflating: keystore.jks
[oracle@demo-long-v4 ]$
```

Next you edit the sqlnet.ora to set the wallet location to your /home/oracle/wallets directory

```
WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA =
(DIRECTORY="/home/oracle/wallets")))
SSL_SERVER_DN_MATCH=yes
```

Verify that LD_LIBRARY_PATH includes the instantclient_18_3 directory

```
echo $LD_LIBRARY_PATH
```

```
[oracle@demo-long-v4 wallets]$ echo $LD_LIBRARY_PATH
/home/oracle/instantclient_18_3
```

If not set it using the command

```
export LD_LIBRARY_PATH=/home/oracle/instantclient_18_3
```

Verify the TNS_ADMIN environment variable is set to /home/oracle/wallets

```
echo $TNS_ADMIN
```

```
[oracle@demo-long-v4 ~]echo $TNS_ADMIN
/home/oracle/wallets
[oracle@demo-long-v4 ~]
```

If not set it using the command

```
export TNS_ADMIN=/home/oracle/wallets
```

```
[oracle@demo-long-v4 wallets]$ export TNS_ADMIN=/home/oracle/wallets
```

Go to the Oracle Instant Client directory

```
cd $HOME/instantclient_18_3
```

This installation of Oracle Instant Client includes both the Basic package and the Tools package to allow us to run impdp.

The impdp command that for your import is based on the following information. The %U in the dump file expands to a 2-digit incrementing integer starting with 01.

Connection string: admin/<your admin password>@<your database>_high
Directory: data_pump_dir
Credential: OBJ_STORE_CRED (the same credential we used to load a file from object_storage)
REMAP_SCHEMA: SOE:SOEDEMO
Dumpfile: https://swiftobjectstorage.uk-london-1.oraclecloud.com/v1/oscemea001/DEMO_DATA/exp_atp_soe_150_%U.dmp
Parallel: 8

To this lab simpler, there is a wrapper shell script which collects your password and connect string and calls the 'impdp' executable. In the UNIX terminal in your VM change directory to /home/oracle/labScripts/lab5. Then execute the script lab5_import_wrapper.sh, giving the admin password and connect string on the command line.

```
cd /home/oracle/labScripts/lab5
./lab5_import_wrapper.sh <admin password> <connect string>
```

The script will list the generated impdp command. Review this and enter 'Y' if you are happy to proceed.

```
[oracle@demo-long-v4 ]$ cd /home/oracle/labScripts/lab5
[oracle@demo-long-v4 ]$ ./lab5_import_wrapper.sh ATPwelcome-1234 MELATPTRAIN01_h
igh
This is the import command that has been generated
impdp admin/ATPwelcome-1234@MELATPTRAIN01_high directory=data_pump_dir credentia
l=OBJ_STORE_CRED REMAP_SCHEMA=SOE:SOEDEMO dumpfile=https://swiftobjectstorage.uk
-london-1.oraclecloud.com/v1/oscemea001/DEMO_DATA/exp_atp_soe_150_%U.dmp PARALLE
L=8
Do you want to run it [Y/N]
Y

Import: Release 18.0.0.0.0 - Production on Fri Feb 1 13:11:39 2019
Version 18.3.0.0.0

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Connected to: Oracle Database 18c Enterprise Edition Release 18.0.0.0.0 - Produc
tion
```
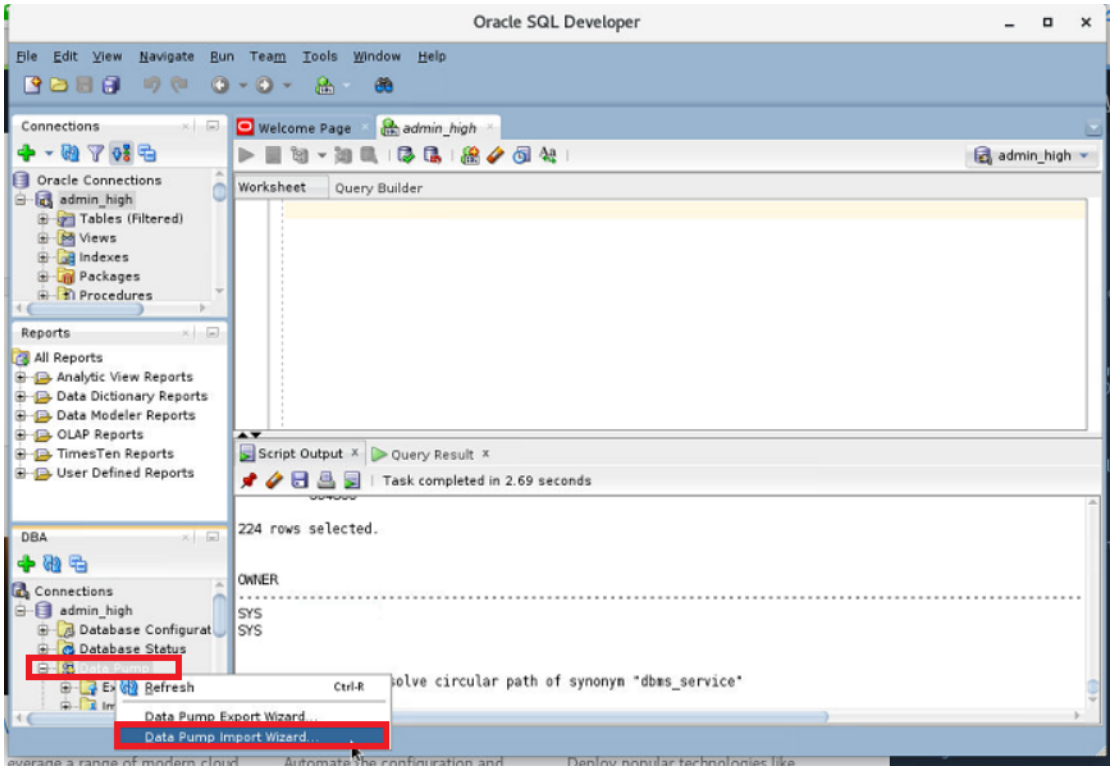

This import should take under 10 minutes to complete.

You will observe some errors during the import schema creation phase. One is because the schema already exists. The other is the schema originally had the ‘manage scheduler’ privilege, which cannot be granted by the admin user in your ATP instance. There may also be a compilation error on the Package ‘ORDERENTRY’.

Note: You could also have carried out the import using the Oracle SQL Developer 'Data Pump Import Wizard'



You have successfully tested three methods of loading data into your ATP instance. For a list of all the possible methods, see the product documentation https://docs.oracle.com/en/cloud/paas/atp-cloud/atpug/load-data.html

Lab 6 - DBA Exploration of ATP with SQL Developer

Lab 6. DBA Exploration of ATP with SQL Developer

Objectives:

- Explore the DBA view for Autonomous Transaction Processing (ATP) in SQL Developer

In this lab you will get an overview of the DBA view in SQL Developer and how to explore configuration and settings in your ATP environment. As part of the autonomous nature of ATP, some of these settings cannot be adjusted by the DBA.

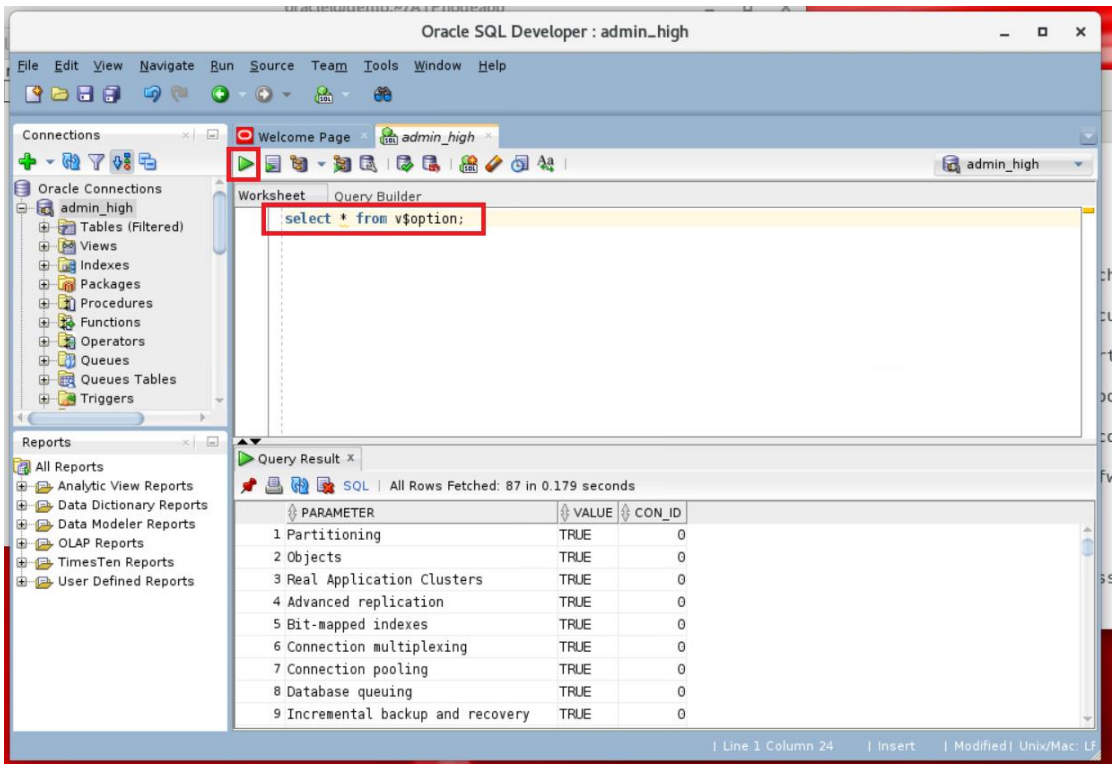
For this lab make sure you use you “ADMIN” user connection. Regular user accounts will not be able to view any system configuration information.

ATP includes many of the database options that are widely used in your databases and applications.

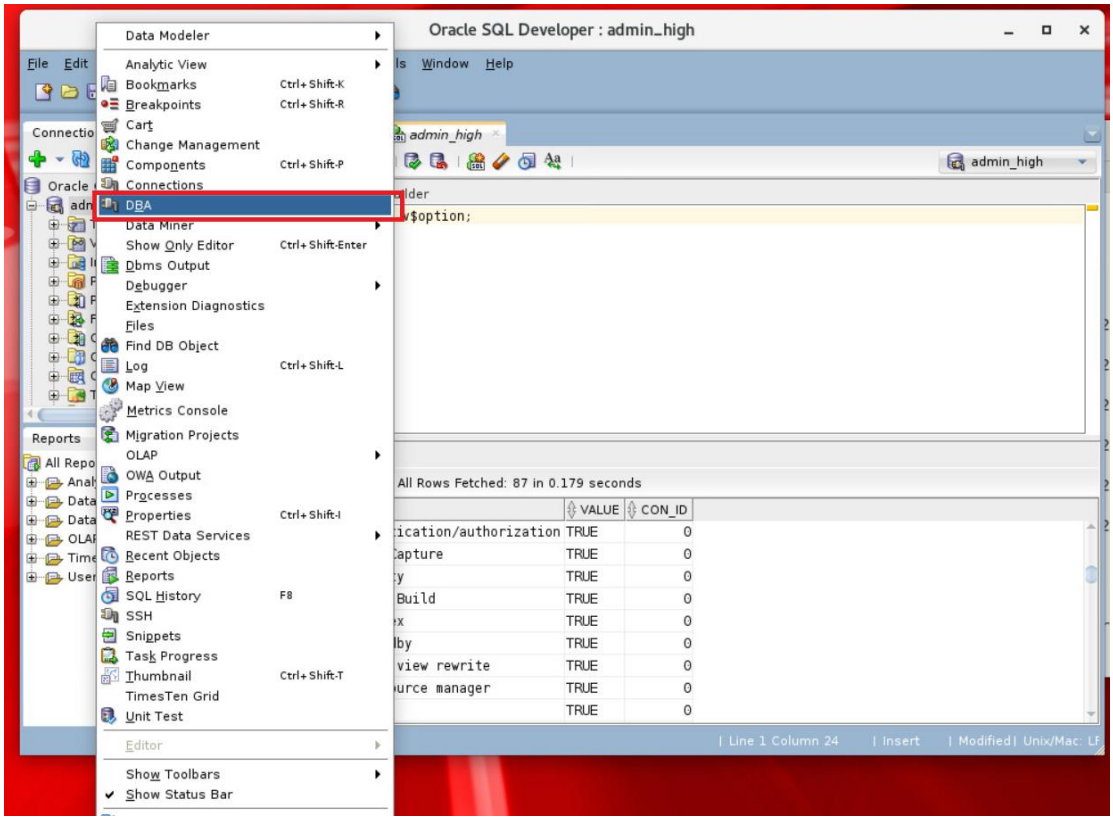
Start SQL Developer. Connect to your **admin_high** connection.

In your SQL worksheet run the following command to get a list of options in your ATP instance.

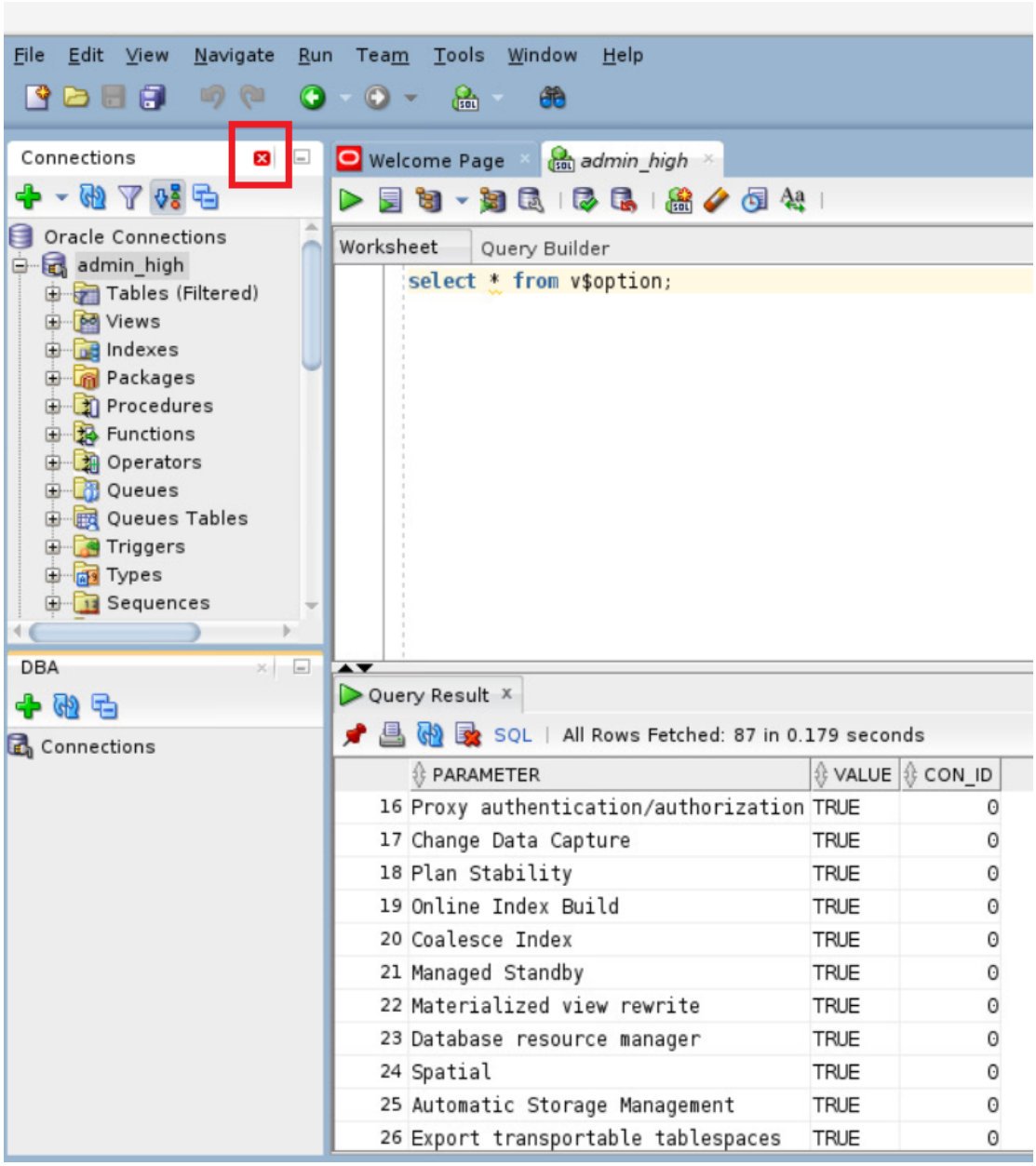
```
select * from v$option;
```



Next you will examine the DBA view in SQL Developer. In the main screen select **View->DBA. If you cannot see the DBA option under View, go to "Window" and select "Reset Window to Factory Setting",** this should let you see the DBA option under View.

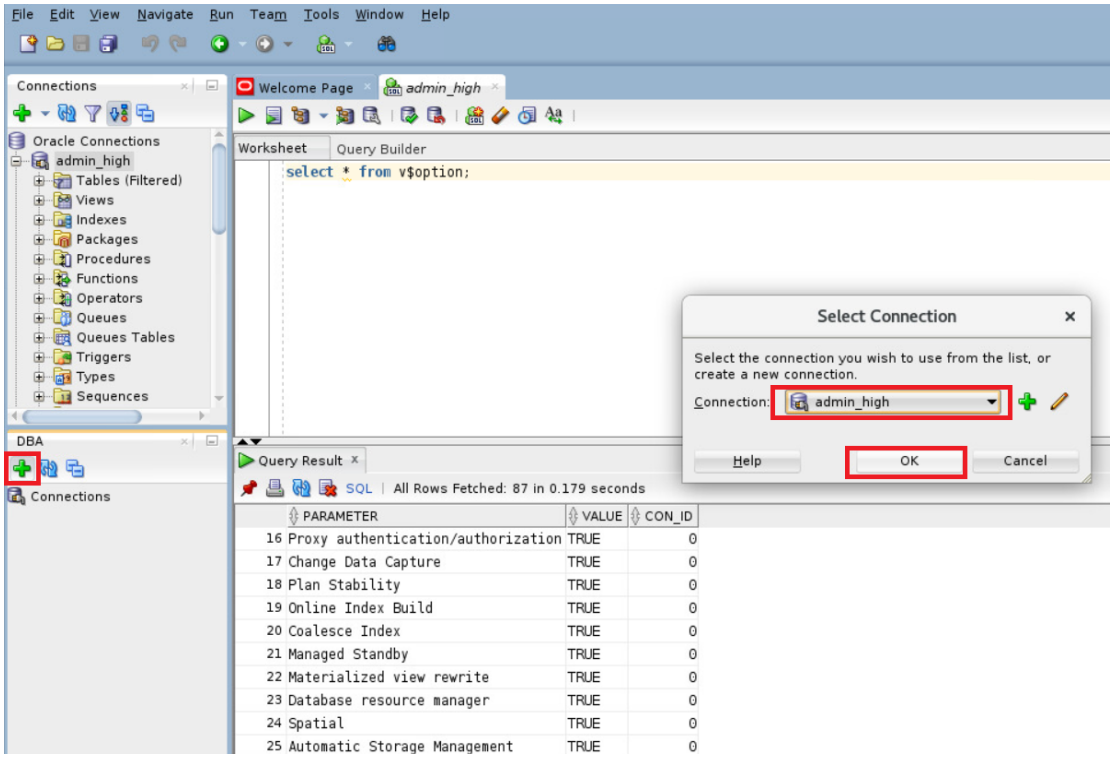


The DBA view appears in the bottom left pane. If you need more space to examine the DBA view you can close the Connections window or any other un-needed windows by clicking the **'X'** on their menu bar.

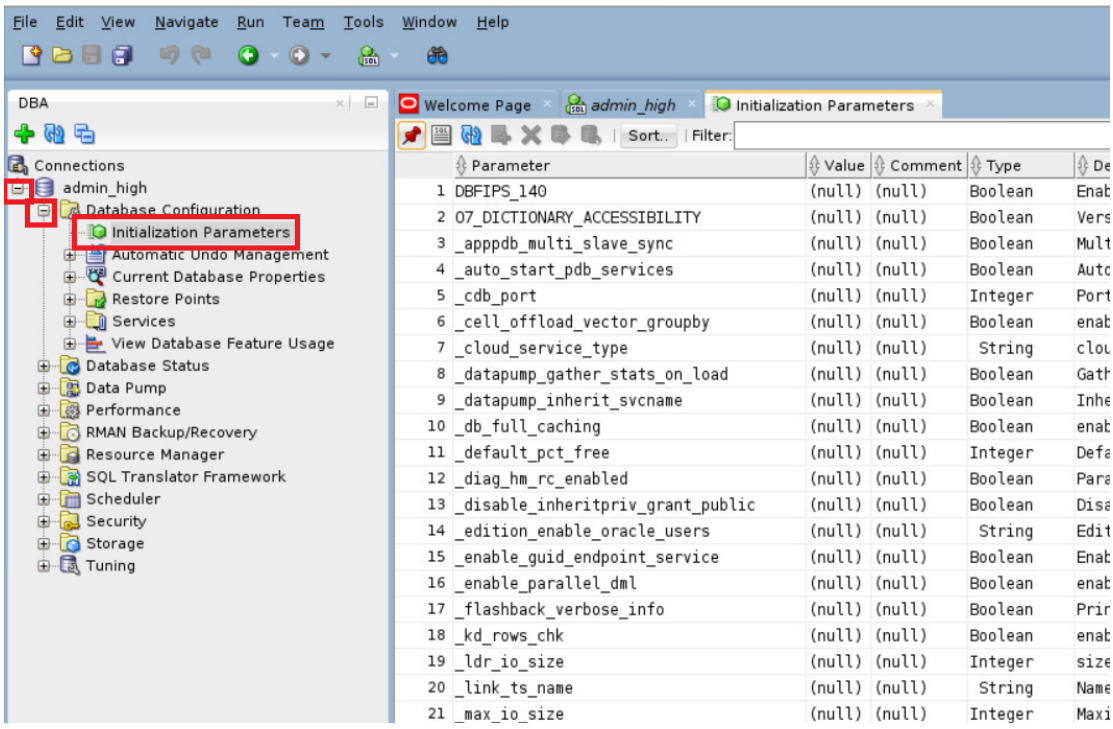


Click the connections green plus sign in the DBA view menu.

On the connection menu pop up, select your **admin_high** connection and select **OK**.

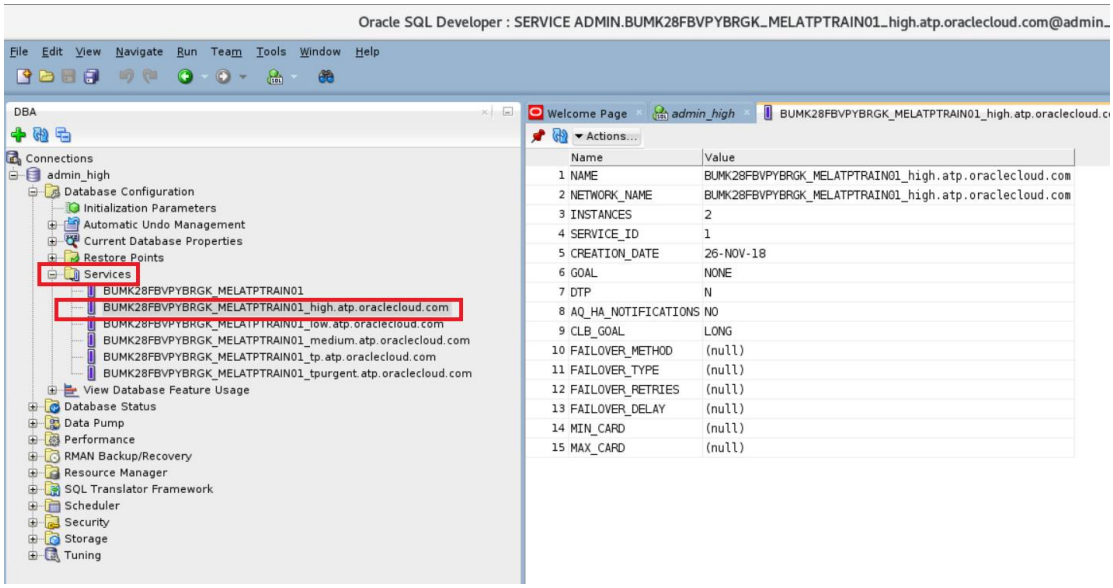


Expand your **admin_high** connection by clicking on the **'+'** symbol.
Expand the **Database Configuration** by clicking on the **'+'** symbol.
View the Initialization parameters by clicking on **Initialization Parameters**.

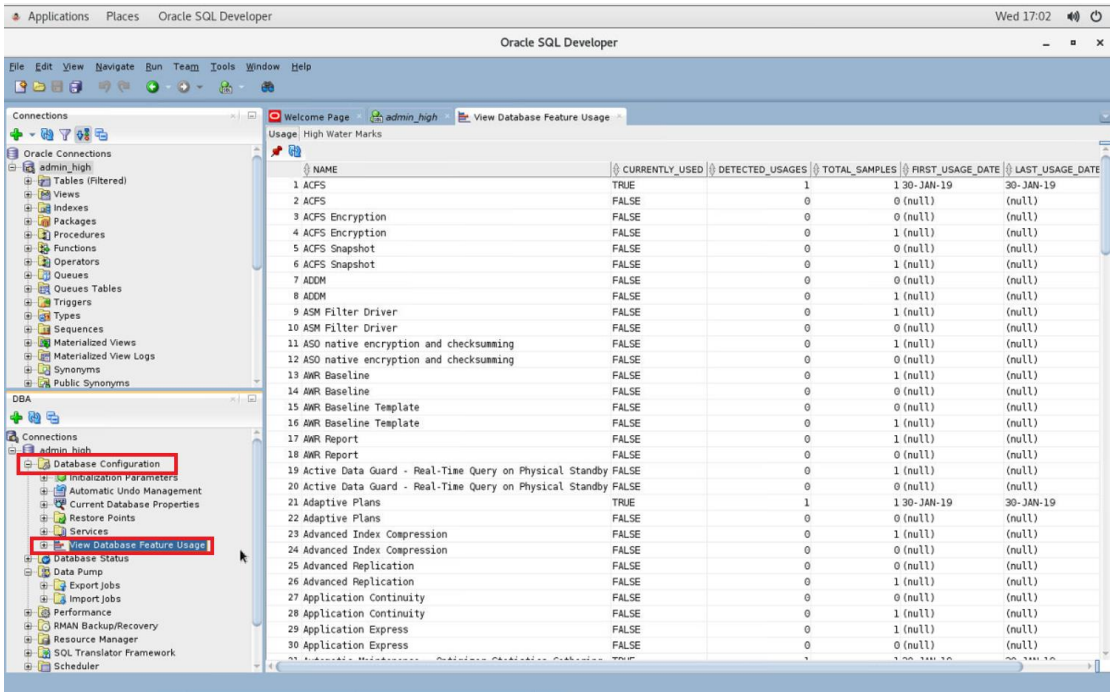


Expand **Services** by clicking on the '**+**'

You can see the services that are configured for your ATP instance.



In **View Database Features Usage** you can see the features that have been marked as in use. This view is not real-time and so you may not have any features marked as in use in your ATP instance.

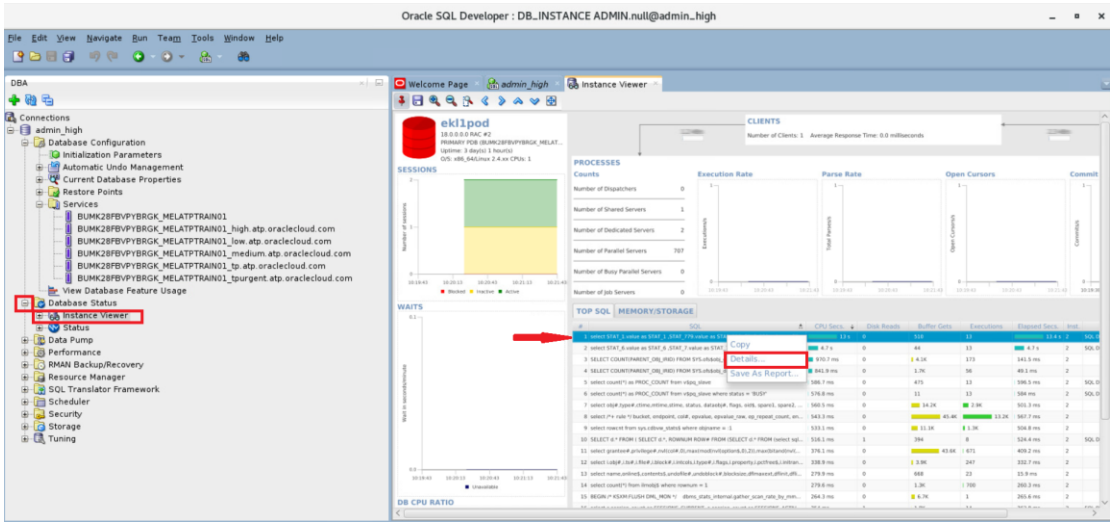


Expand **Database Status** by clicking on '**+**' and double click on **Instance Viewer.**

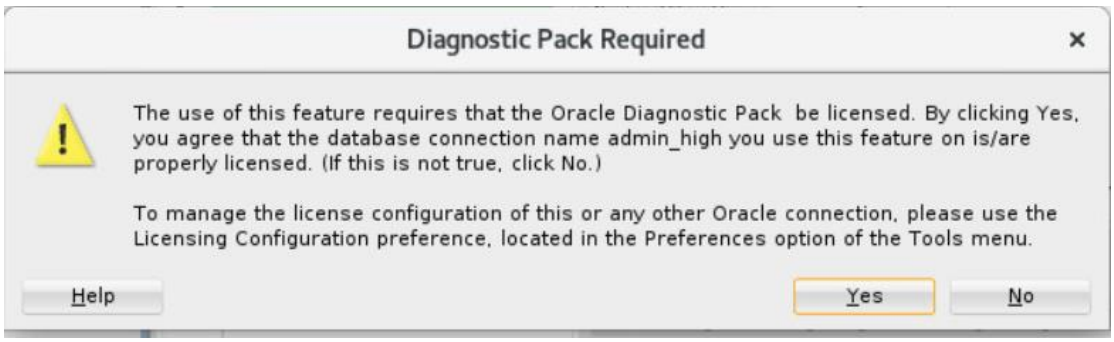
This displays a lot of information about the instance such as usage,configuration as well as the TOP SQL running on the instance.

You can **select a SELECT STATEMENT from TOP SQL, right click and select Details**.

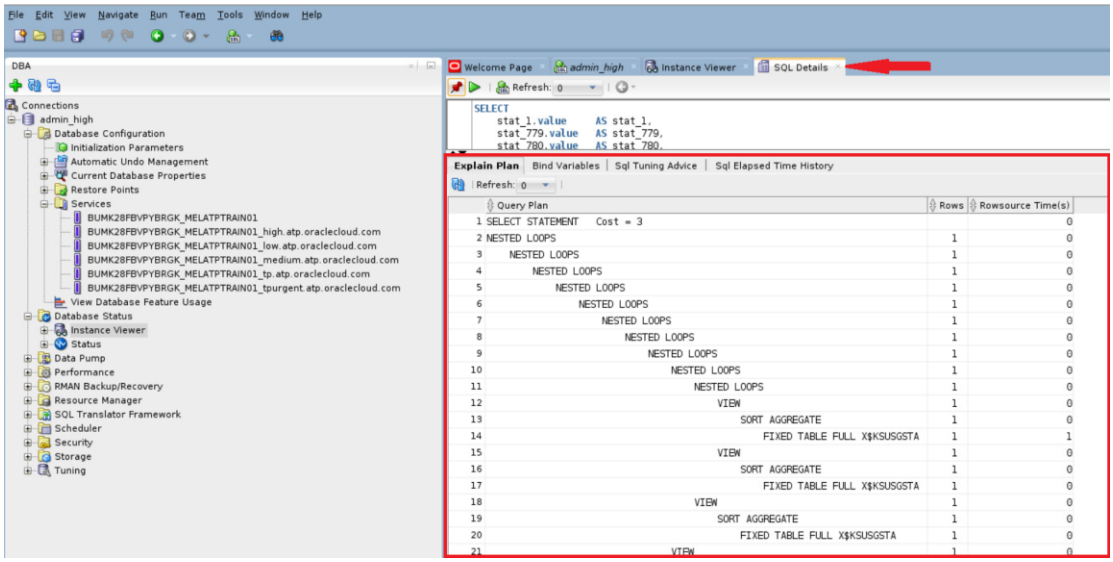
Since your instance was started it has not run many user SQL statements. This means that you may not have any statements that have interesting Explain Plan or paralleism.



You may receive a warning about Diagnostic Pack and/or Tuning Pack Click **Yes** on these popups to continue the lab.

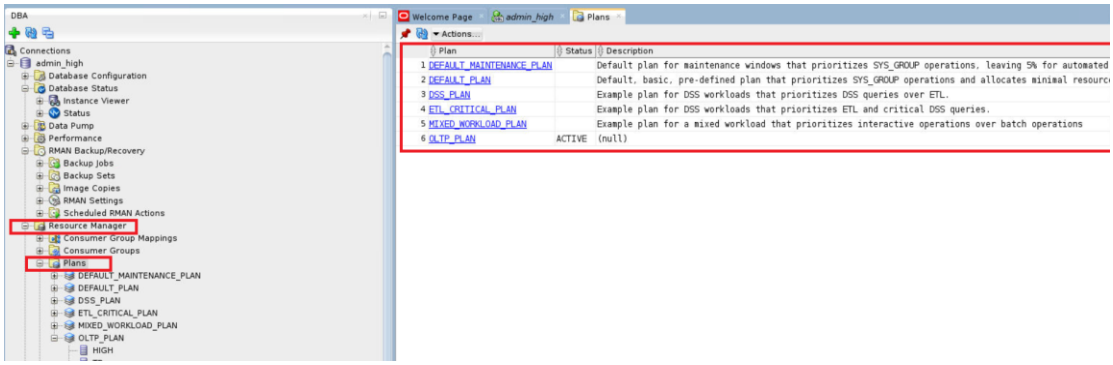


This will create a new tab in the main window called SQL Detail. You can see examine the explain plan for your SQL here.

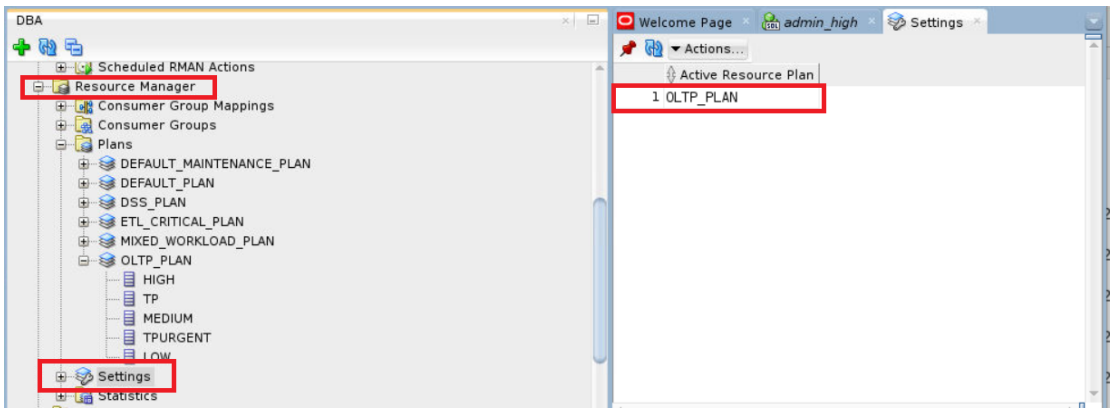


The **Resource Manager** menu contains information about different consumer groups and plans defined, and the current plan in effect. Explore the entries here, most of them will have contextual activities if you select and right click on them.

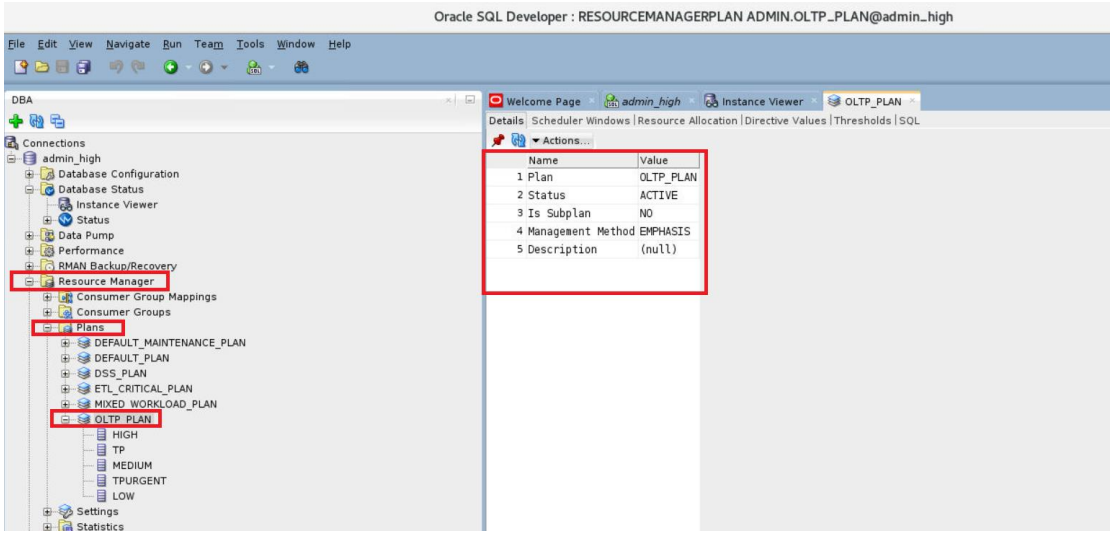
Verify which plan is active by selecting **Plans.**



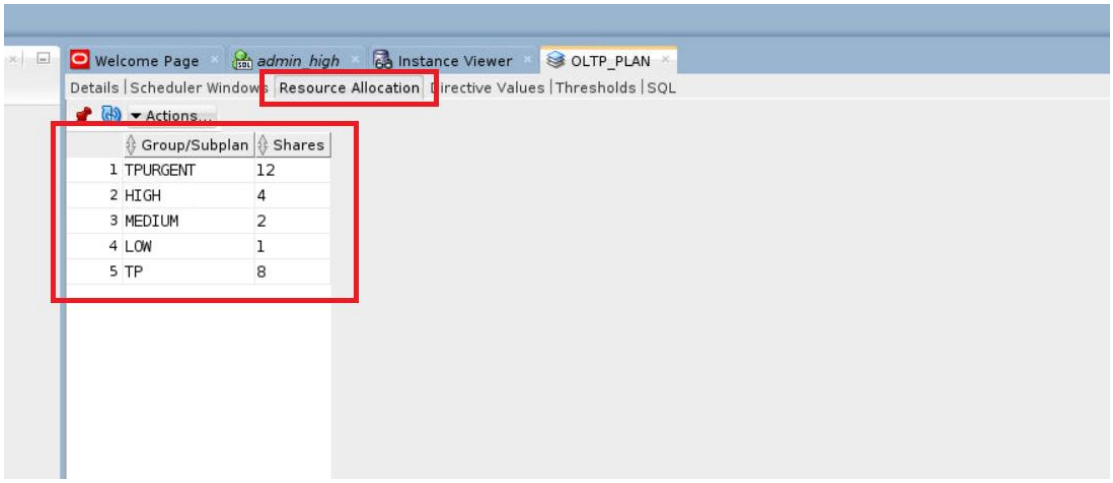
This information is also available under the **Settings** link under **Resource Manager**.



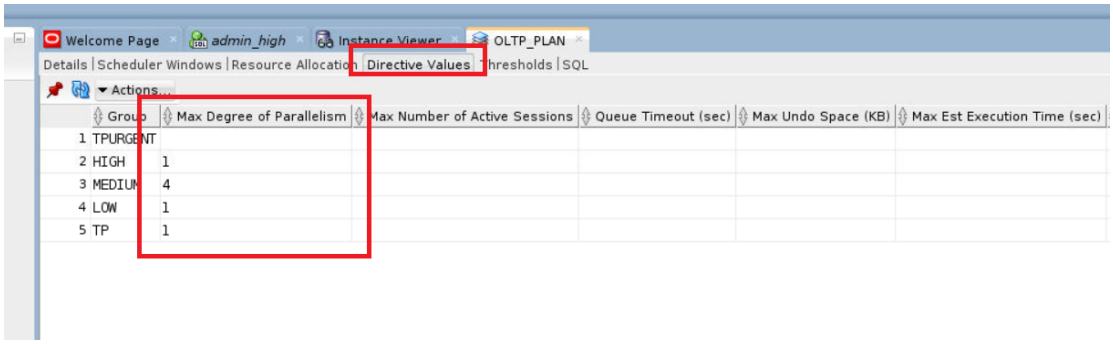
Select **Resource Manager** -> **Plans-> OLTP_PLAN**
This will populate the main pane with an overview of the **OLTP_PLAN**



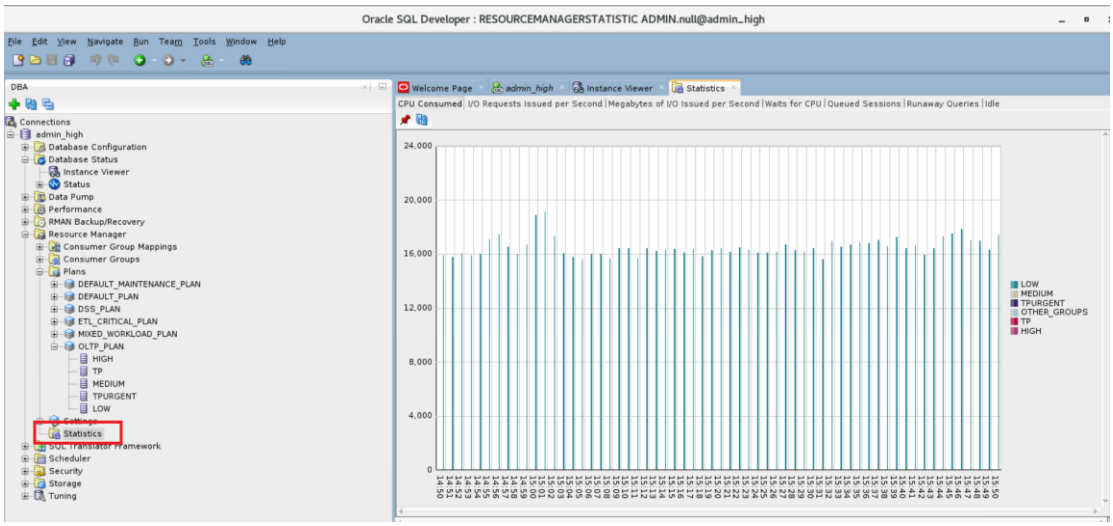
Select the **Resource** Allocation tab to see how the resources are shared between the groups.



Select the **Directive Values** tab to see the Maximum degree of parallelism associated with each group.

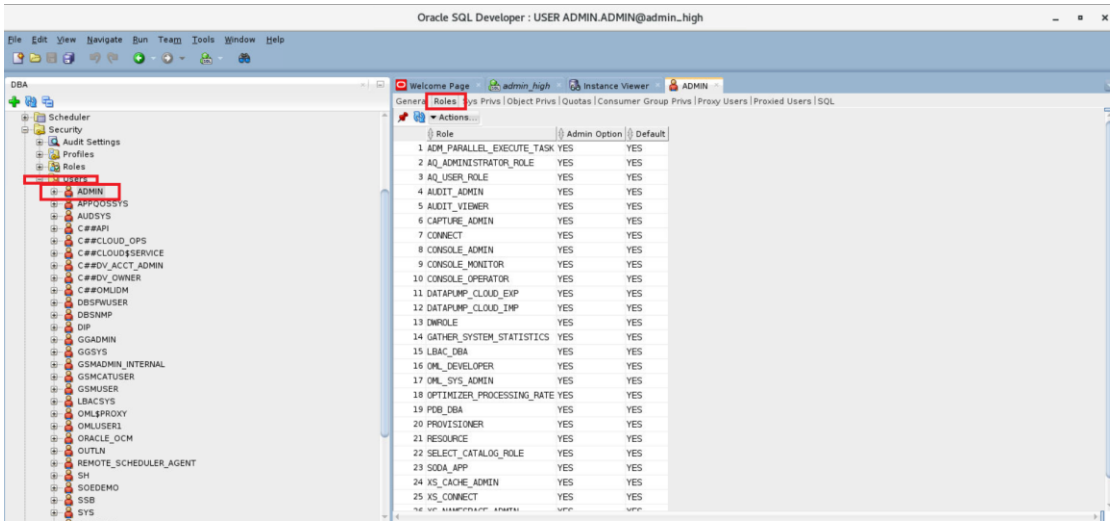


Resource Manager->Statistics provides graphical views into system usage by plan group. Double click on Statistics and select the tabs to explore the screens.

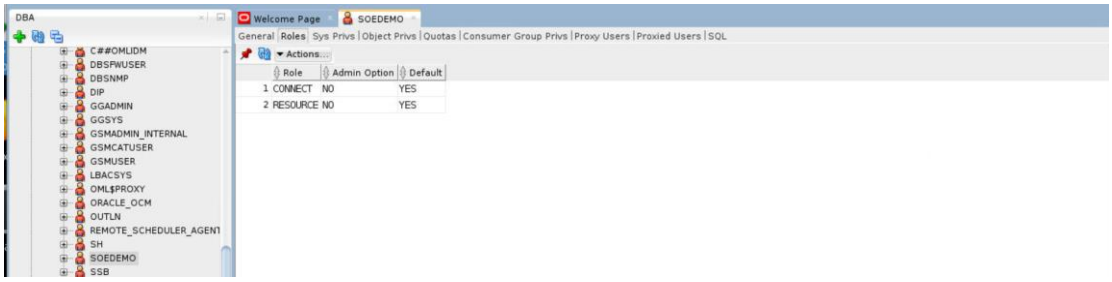


In the Security Section you can examine the users in the database and their roles and privileges.

Select **Security -> Users -> Admin** and list the roles associated with this user.



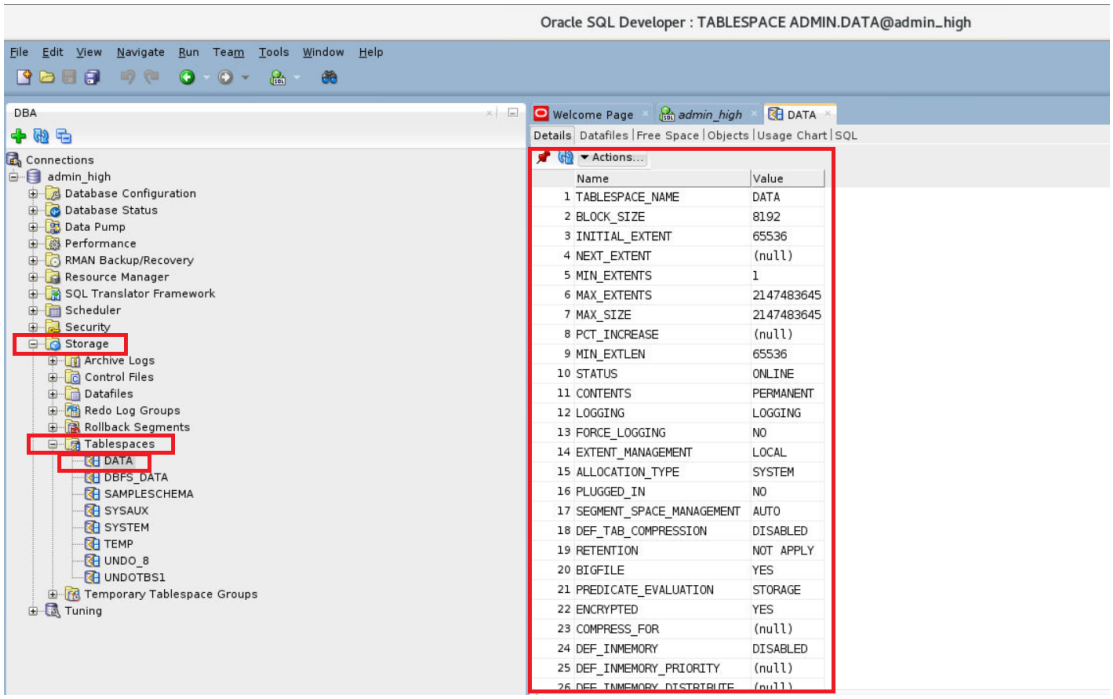
Compare this list with that of the SOEDEMO user if you created it in a previous lab.



You could also view the System privileges assigned to these users.

The **Storage** section can be used to display all the storage characteristics of the ATP database. Most of these characteristics cannot be changed, as the Autonomous Database automatically manages and optimizes storage for the service. You can still examine how the tablespace is configured.

Select **Storage -> Tablespaces -> Data**
This view may take a long time to refresh. Any data in a database will be stored in the DATA Tablespace. Below is a screenshot of the parameters of the DATA Tablespace . Examine the different entries in this area.



This concludes the SQL Developer Lab. SQL Developer is a very comprehensive powerful tool and you should continue to explore the different benefits it offers.

Lab 7- Workload testing and analysis using Swingbench with ATP

Lab 7: Workload testing and analysis using Swingbench with Autonomous Transaction Processing (optional)

Objectives:

- Using Swingbench to demo and analyse workloads with Autonomous Transaction Processing (ATP)

You can optionally run some small tests to familiarize yourself with the tool and connecting it to ATP.

Swingbench is a suite of utilities developed by Dominic Giles that creates Oracle Database objects and data, creating workloads that can then be monitored or used for testing in OLTP and Datawarehouse environments. It is written in Java and so can be run on many platforms. It is a free tool and provided without licenses and support. Among the many uses for Swingbench is the ability to provide a comprehensive demo of the database and its associated tools and functionality. At the end of this lab you can find links to much more information on Swingbench and its use.

The sample shell scripts for this lab are available in your VM under the directory **/home/oracle/labScripts/lab7**.

Preparing to use Swingbench

In your TigerVNC connection to your Lab VM, open a terminal window.

Verify that you have java 1.8 available in your environment. The precise build is not important.

```
java -version
```

```
$ java -version
openjdk version "1.8.0_191"
OpenJDK Runtime Environment (build 1.8.0_191-b12)
OpenJDK 64-Bit Server VM (build 25.191-b12, mixed mode)
```

We have already downloaded and unzipped Swingbench to your Lab VM.

Normally the first step of using Swingbench is to create a schema for your benchmark using one of the provided benchmark generators, for example, oewizard for the Order Entry benchmark. As part of Lab 5, you imported a schmea 'SOEDEMO' which was a benchmark schema generated using the Swingbench utility '**oewizard',** so we can skip this step.

Verify your schema is usable

Verify your schema imported correctly by running the Swingbench utility script with the validate parameter. There is a wrapper script available **/home/oracle/labScripts/lab7/lab7_charbench_validate.sh**. Edit this script, making sure to select your wallet file and correct connect string, changing the values in black :

```
#!/bin/bash
export PATH=$PATH:$HOME/swingbench/bin
sbutil -soe \
-cf $HOME/wallets/wallet_MELATPTRAIN01.zip \
-cs MELATPTRAIN01_medium  \
-u soedemo \
-p ATPwelcome1234 \
-val
```

Execute the script.

```
cd /home/oracle/labScripts/lab7
./lab7_charbench_validate.sh
```

```
$ cd /home/oracle/labScripts/lab7
$ ./lab7_charbench_validate.sh
There appears to be an issue with the current Order Entry Schema. Please see below.
-------------------------------------------------
|Object Type    |     Valid|   Invalid|   Missing|
-------------------------------------------------
|Table          |        10|         0|         0|
|Index          |        26|         0|         0|
|Sequence       |         5|         0|         0|
|View           |         2|         0|         0|
|Code           |         0|         1|         0|
-------------------------------------------------
List of missing or invalid objects.
Invalid Code : ORDERENTRY,
```

If there is an invalid package error then you should recompile it in SQL Developer

```
alter package soedemo.orderentry compile body;
alter package soedemo.orderentry compile;
```

To see how many rows were inserted on each table use the script **/home/oracle/labScripts/lab7/lab7_charbench_tables.sh.** Edit this script, making sure to select your wallet file and correct connect string, changing the values in black :

```
#!/bin/bash
export PATH=$PATH:$HOME/swingbench/bin
sbutil -soe \
-cf $HOME/wallets/wallet_MELATPTRAIN01.zip \
-cs MELATPTRAIN01_medium  \
-u soedemo \
-p ATPwelcome1234 \
```

```
-tables
```

And then run it.

```
cd /home/oracle/labScripts/lab7
./lab7_charbench_tables.sh
```

The results from the script should be similar to below. You may have to expand your terminal window to get the formatting to fit the width:

```
[oracle@demo-long-v4 ]$ cd /home/oracle/labScripts/lab7
[oracle@demo-long-v4 ]$ ls
lab7_charbench_high.sh    lab7_charbench_stats.sh   lab7_charbench_validate.sh
lab7_charbench_medium.sh  lab7_charbench_tables.sh  lab7_compile_orderentry.sql
[oracle@demo-long-v4 ]$ ./lab7_charbench_tables.sh
Order Entry Schemas Tables
-----------------------------------------------------------------------------------------------------------------
|Table Name                |              Rows|            Blocks|          Size|   Compressed?|  Partitioned?|
-----------------------------------------------------------------------------------------------------------------
|CUSTOMERS                 |           150,000|             2,747|       256.0MB|              |           Yes|
|LOGON                     |           357,448|             1,619|       256.0MB|              |           Yes|
|ORDER_ITEMS               |           644,281|             5,184|       256.0MB|              |           Yes|
|ORDERS                    |           214,469|             3,165|       256.0MB|              |           Yes|
|ADDRESSES                 |           225,000|             2,795|       256.0MB|              |           Yes|
|CARD_DETAILS              |           225,000|             1,880|       256.0MB|              |           Yes|
|INVENTORIES               |           894,824|             2,153|        17.0MB|      Disabled|            No|
|PRODUCT_DESCRIPTIONS      |             1,000|                34|         320KB|      Disabled|            No|
|PRODUCT_INFORMATION       |             1,000|                28|         256KB|      Disabled|            No|
|ORDERENTRY_METADATA       |                 4|                 4|          64KB|      Disabled|            No|
|WAREHOUSES                |             1,000|                 7|          64KB|      Disabled|            No|
-----------------------------------------------------------------------------------------------------------------
                                                  Total Space          1.5GB
```

If you will be conducting performance testing with Swingbench it is recommended that you collect statistics. Edit the script **/home/oracle/labScripts/lab7/lab7_charbench_stats.sh** making sure to select your wallet file and correct connect string, changing the values in black :

```
#!/bin/bash
export PATH=$PATH:$HOME/swingbench/bin
sbutil -soe \
-cf $HOME/wallets/wallet_MELATPTRAIN01.zip \
-cs MELATPTRAIN01_medium  \
-u soedemo \
-p ATPwelcome1234 \
-stats
```

And then run it.

```
./lab7_charbench_stats.sh
```

```
$ ./lab7_charbench_stats.sh
Collecting statistics for the schema
Collected statistics in : 0:08:07.933
```

Running Swingbench

You are ready to run Swingbench workloads on ATP. Workloads are simulated by users submitting transactions to the database. This is configured by an xml file. You can fine tune the benchmark (e.g. transaction mix) or set standard parameters such as username and password by editing this file. You can also override some of these values using the command line.

Run the workload against the _medium service

We are overriding the following load related parameters
-rt specifies the total run time of the benchmark in hours and minutes.
-uc specifies the number of users who will connect to the system.
-r specifies the output file for the summary results.

Please note: charbench will place a high load on the database, so don't run for long periods of time. The command below will terminate the run automatically after three minutes. You can stop running charbench at any time with Ctrl C.

Generate load on your database by running the charbench utility. Do this by running the script **/home/oracle/labScripts/lab7/lab7_charbench_medium.sh**. Edit the script to contain your wallet and connect string information, highlighted below in black, before running it. Ensure that you are connecting to the **_medium** service for your database.

```
#!/bin/bash
export PATH=$PATH:$HOME/swingbench/bin
charbench -c $HOME/swingbench/configs/SOE_Server_Side_V2.xml  \
-cf $HOME/wallets/wallet_MELATPTRAIN01.zip \
-cs MELATPTRAIN01_medium \
-u soedemo \
-p ATPwelcome1234 \
-rt 0:03 \
-uc 32 \
-r /home/oracle/labScripts/lab7/medium32.xml
```

The benchmark will run for 3 minutes before completing.

```
$ ./lab7_charbench_medium.sh
Author  :       Dominic Giles
Version :       2.6.0.1082

Results will be written to /home/oracle/labScripts/lab7/medium32.xml.
Hit Return to Terminate Run...

Time            Users   TPM     TPS

2:20:38 PM      0       8483    44
Completed Run.
```

Examine the performance of your benchmark by reviewing the summary information at the start of the output xml file using the command

```
head -12 /home/oracle/labScripts/lab7/medium32.xml
```

```
(base) [oracle@demo-long bin]$ head -12 medium32.xml
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<Results xmlns="http://www.dominicgiles.com/swingbench">
    <Overview>
        <BenchmarkName>"Order Entry (PLSQL) V2"</BenchmarkName>
        <Comment>Version 2 of the SOE Benchmark running in the database using PL
/SQL</Comment>
        <TimeOfRun>Jan 14, 2019 5:08:47 PM</TimeOfRun>
        <TotalRunTime>0:03:00</TotalRunTime>
        <TotalLogonTime>0:00:07</TotalLogonTime>
        <TotalCompletedTransactions>1066</TotalCompletedTransactions>
        <TotalFailedTransactions>0</TotalFailedTransactions>
        <AverageTransactionsPerSecond>5.92</AverageTransactionsPerSecond>
        <MaximumTransactionRate>409</MaximumTransactionRate>
```

Note the following summary results from your file

TotalCompletedTransactions	
AverageTransactionsPerSecond	
MaximumTransactionRate	

Run the workload against the _high service

Now we will run the same test again using the **'_high**' service, and specifying a different output file high32.xml

Do this by running the script **/home/oracle/labScripts/lab7/lab7_charbench_high.sh**. Edit the script to contain your wallet and connect string information, highlighted below in black, before running it. Ensure that you are connecting to the **_high** service for your database.

```
#!/bin/bash
export PATH=$PATH:$HOME/swingbench/bin
charbench -c $HOME/swingbench/configs/SOE_Server_Side_V2.xml  \
-cf $HOME/wallets/wallet_MELATPTRAIN01.zip \
-cs MELATPTRAIN01_high \
-u soedemo \
-p ATPwelcome1234 \
-rt 0:03 \
-uc 32 \
-r /home/oracle/labScripts/lab7/high32.xml
```

```
$ ./lab7_charbench_high.sh
Author  :       Dominic Giles
Version :       2.6.0.1082

Results will be written to /home/oracle/labScripts/lab7/high32.xml.
Hit Return to Terminate Run...

Time            Users   TPM     TPS

5:21:06 PM      0       9080    145
Completed Run.
```

Review the summary information from the output high32.xml file using the command `head -12`

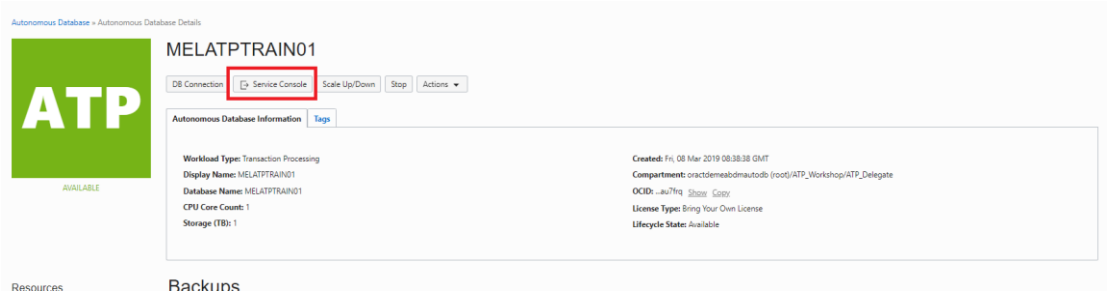
```
head -12 /home/oracle/labScripts/lab7/high32.xml
```

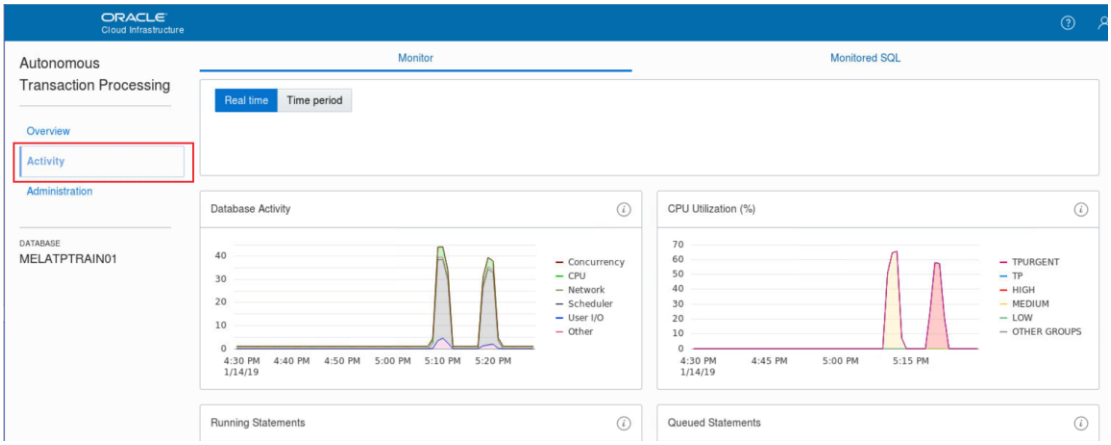
```
(base) [oracle@demo-long bin]$ head -12 high32.xml
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<Results xmlns="http://www.dominicgiles.com/swingbench">
    <Overview>
        <BenchmarkName>"Order Entry (PLSQL) V2"</BenchmarkName>
        <Comment>Version 2 of the SOE Benchmark running in the database using PL
/SQL</Comment>
        <TimeOfRun>Jan 14, 2019 5:18:05 PM</TimeOfRun>
        <TotalRunTime>0:03:00</TotalRunTime>
        <TotalLogonTime>0:00:07</TotalLogonTime>
        <TotalCompletedTransactions>1003</TotalCompletedTransactions>
        <TotalFailedTransactions>0</TotalFailedTransactions>
        <AverageTransactionsPerSecond>5.57</AverageTransactionsPerSecond>
        <MaximumTransactionRate>395</MaximumTransactionRate>
```

TotalCompletedTransactions	
AverageTransactionsPerSecond	
MaximumTransactionRate	

It is not expected that your benchmarks will have identical results, as there will be slight variances due to the short run times we are using for this demonstration. Unless there were transactions from resource consumer groups that have higher resource shares running at the same time, both the benchmark runs using _high and the _medium services will have had access to all the resources in the instance, and are both services that can support high concurrency. Unless your instance was under CPU pressure they should have similar results.

You can review the load on your system during the benchmark using the Service Console.





Want to learn more about Swingbench?

Visit http://www.dominicgiles.com/swingbench.html to see more usage instructions. See his blog at http://www.dominicgiles.com/blog/blog.html for more tips, tricks and innovations.

Section 3- Focus on Developers

Lab 8 -
Using Node.js with ATP

Lab 8: Using Node.js with Autonomous Transaction Processing

Objectives:

- Learn how to build Node.js applications and connect them to an Oracle Autonomous Transaction Processing (ATP) database service

The following lab will use the following pre-installed software and libraries on your VM:

- Python 3.7
- Node.js
- Git
- libaio
- node
- npm

Creating your first Node.js application

Open a terminal and navigate to the **/home/oracle/labScripts/lab8** directory. Run the following commands to show the versions of node and npm installed:

```
node -v
npm -v
```

```
[oracle@LABVM61 ~]$ cd /home/oracle/labScripts/lab8
[oracle@LABVM61 lab8]$ node -v
v6.14.3
[oracle@LABVM61 lab8]$ npm -v
3.10.10
[oracle@LABVM61 lab8]$
```

In the lab8 directory you will find all the node scripts that we are going to use for this lab. In a terminal window use cat to display the first script we are going to run, which is test.js

```
cat test.js
```

The script contents are shown below

```
const http = require('http');

const hostname = '127.0.0.1';
const port = 3000;
```

```
const server = http.createServer((req, res) => {
  res.statusCode = 200;
  res.setHeader('Content-Type', 'text/plain');
  res.end('Hello World\n');
});

server.listen(port, hostname, () => {
  console.log(`Server running at http://${hostname}:${port}/`);
});
```

Now run your first Node.js application. This application will simply print a message on a web browser.

In your terminal window from the **/home/oracle/labScripts/lab8** directory run:

```
node test.js
```

```
[oracle@LABVM61 lab8]$ node test.js
Server running at http://127.0.0.1:3000/
```

Open up a new browser or browser tab and in the address bar enter:
http://127.0.0.1:3000/

You will see your first Node.js application running.

To terminate your Node.js program, **hit Ctrl-C** in your terminal window where you were running 'node test.js'

Configuring Node.js for use with ATP

For the next step of the lab we need to make use of several node.js libraries that will be used to run the remaining lab examples. The libraries have already been installed on the VM using the npm utility. They are listed below for your information only:

- oracledb (Oracle database libraries)
- async (Libraries for working with asynchronous JavaScript)
- app (Libraries for web application development)
- express (Libraries for mobile applications)

We need to ensure the wallet file for your ATP instance is available and unzipped in the /home/oracle/wallets directory. It should still be available on your system under your $HOME/Downloads directory from the previous labs. If not, then you will have to download it again via the admin console.

```
cd $HOME
cp $HOME/Downloads/wallet_*.zip wallets
cd $HOME/wallets
unzip wallet_*.zip
```

```
[oracle@demo-long wallets]$ pwd
/home/oracle/wallets
[oracle@demo-long wallets]$ ls
wallet_MELATPTRAIN01.zip
[oracle@demo-long wallets]$ unzip wallet_MELATPTRAIN01.zip
Archive:  wallet_MELATPTRAIN01.zip
  inflating: cwallet.sso
  inflating: tnsnames.ora
  inflating: truststore.jks
  inflating: ojdbc.properties
  inflating: sqlnet.ora
  inflating: ewallet.p12
  inflating: keystore.jks
[oracle@demo-long wallets]$ ls -l
total 60
-rw-r--r--. 1 oracle dba  6661 Jan  9 17:10 cwallet.sso
-rw-r--r--. 1 oracle dba  6616 Jan  9 17:10 ewallet.p12
-rw-r--r--. 1 oracle dba  3240 Jan  9 17:10 keystore.jks
-rw-r--r--. 1 oracle dba    87 Jan  9 17:10 ojdbc.properties
-rw-r--r--. 1 oracle dba   114 Jan  9 17:10 sqlnet.ora
-rw-r--r--. 1 oracle dba  6359 Jan  9 17:10 tnsnames.ora
-rw-r--r--. 1 oracle dba  3335 Jan  9 17:10 truststore.jks
-rw-r--r--. 1 oracle dba 19916 Jan  9 17:10 wallet_MELATPTRAIN01.zip
[oracle@demo-long wallets]$
```

Several files need to be updated to reflect correct paths and names.

Edit the **ojdbc.properties** (open with vi or your favourite editor) to reflect the location of the wallet file. The line entry in the file should be as below, where **/home/oracle/wallets** should be the directory where your wallet files are located:

```
oracle.net.wallet_location=(SOURCE=(METHOD=FILE)(METHOD_DATA=(DIRECTO
RY="/home/oracle/wallets")))
```

Edit the **sqlnet.ora** file to reflect the location of the wallet file. The line entry in the file should be as below, the directory where your wallet files are located:

```
WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA =
(DIRECTORY="/home/oracle/wallets")))
SSL_SERVER_DN_MATCH=yes
```

We need to ensure that the TNS_ADMIN environment variable points to the wallet directory. Use the echo command to check the current value:

```
echo $TNS_ADMIN
```

```
[oracle@LABVM61 ~]$ echo $TNS_ADMIN
/home/oracle/wallets
[oracle@LABVM61 ~]$
```

In our case the variable is already set to point to /home/oracle/wallets.
If you wanted to change the value of TNS_ADMIN it can be done using the below command:

```
TNS_ADMIN=/home/oracle/wallets; export TNS_ADMIN
```

```
[oracle@demo-long nodejs]$ TNS_ADMIN=/home/oracle/wallets; export TNS_ADMIN
[oracle@demo-long nodejs]$ echo $TNS_ADMIN
/home/oracle/wallets
[oracle@demo-long nodejs]$
```

In Node.js scripts you can specify database credentials directly within the script, but it is easier to create one file that contains the credentials and then call this file in your Node.js scripts. That way you can independently change the credentials without having to update all your programs.

Look at the file in the **/home/oracle/labScripts/lab8** directory called **dbconfig.js**. The file is also listed below in your guide. This is a common file containing database credentials. It will be called from all Node.js scripts we run. Using vi (or other editor) edit the **dbconfig.js** file, replace the red text with your specific credential information, do not change anything else:

```
module.exports= {

dbuser: 'admin',
dbpassword: 'ATPwelcome-1234',
connectString: 'melatptrain01_tp'
}
```

dbuser = admin (or another user account if you created another user)
dbpassword = admin's (or other users) password
connectString = your database **_tp** service name. This must match an entry in the tnsnames.ora from your wallet.

Connect to an ATP Database with Node.js

The next Node.js script we will use is **connectatp.js**. It will connect to your database and, if successful, display the username used to connect in a browser (address **http://localhost:4001/**). From the lab8 directory view the script in your terminal, using the cat command:

```
cat connectatp.js
```

The script is also listed below. The first few lines call Node libraries including the oracledb library. The third line calls the **dbconfig.js** that contains your database credentials. It is important to make sure the dbconfig.js file is in the same directory or the app will not find the database credentials.

```
var http = require('http');
var oracledb = require('oracledb');
var dbConfig = require('./dbconfig.js');
let error;
let user;

    oracledb.getConnection({
        user: dbConfig.dbuser,
        password: dbConfig.dbpassword,
```

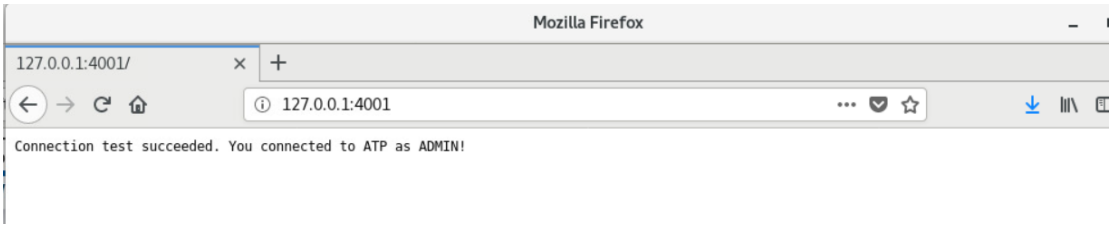
```
        connectString: dbConfig.connectString
    },
    function(err, connection) {
        if (err) {
            error = err;
            return;
        }
        connection.execute('select user from dual', [], function(err,
result) {
            if (err) {
                error = err;
                return;
            }
            user = result.rows[0][0];
          console.log(`Check to see if your database connection
worked at  http://localhost:4001/`);
            error = null;
            connection.close(function(err) {
                if (err) {
                    console.log(err);
                }
            });
        })
    }
);


http.createServer(function(request, response) {
    response.writeHead(200, {
        'Content-Type': 'text/plain'
    });
    if (error === null) {
        response.end('Connection test succeeded. You connected to ATP
as ' + user + '!');
    } else if (error instanceof Error) {
        response.write('Connection test failed. Check the settings
and redeploy app!\n');
        response.end(error.message);
    } else {
        response.end('Connection test pending. Refresh after a few
seconds...');
    }
}).listen(4001);
```

To execute the code, in a terminal window, go to the **/home/oracle/labScripts/lab8** directory and run the following command `node connectatp.js`. The script will wait on the command line and the application will listen on port 3050 for a http connection. Follow the instruction to check the connection status using Firefox while the script is running.

```
node connectatp.js
```

```
[oracle@demo-long-v4 ]$ cd /home/oracle/labScripts/lab8
[oracle@demo-long-v4 ]$ node connectatp.js
Check to see if your database connection worked at  http://localhost:4001/
```

Go to your browser and the address 127.0.0.1:4001. You should see:



Exit your application by returning to your terminal window and entering **<CTRL><C>.**

Using Node.js script to select from an ATP database

In the Node.js script **atpselect.js** you will run the same query we ran in Lab 2 on the SH schema, to test SQL through Node.js. The code below is the contents of **atpselect.js.** Notice again the library calls at the beginning to load the oracle library and the file with your connection information.

```
var oracledb = require('oracledb');
var dbConfig = require('./dbconfig.js');

    oracledb.getConnection({
        user: dbConfig.dbuser,
        password: dbConfig.dbpassword,
        connectString: dbConfig.connectString
    },
  function(err, connection) {
    if (err) {
      console.error(err.message);
      return;
    }
    connection.execute(
      // The statement to execute
             `Select count(*), co.country_name, co.country_region
           From sh.countries co, sh.customers cu
           where co.country_id=cu.country_id group by
co.country_region, co.country_name
           order by co.country_region`,
                     // The callback function handles the SQL
execution results
                   function(err, result) {
                         if (err) {
                              console.error(err.message);
                              doRelease(connection);
                    return;
        }
        console.log(result.rows);
        doRelease(connection);
      });
  });

// Note: connections should always be released when not needed
 function doRelease(connection) {
   connection.close(
       function(err) {
             if (err) {
                   console.error(err.message);
             }
       });
}
```

To run the code, in a terminal, go to the **/home/oracle/labScripts/lab8** and view the code. Once you have view the code, run the following command to execute it:

```
node atpselect.js
```

You will see the following on your terminal:

```
[oracle@LABVM61 lab8]$ cd /home/oracle/labScripts/lab8
[oracle@LABVM61 lab8]$ node atpselect.js
[ [ 88, 'South Africa', 'Africa' ],
  [ 403, 'Argentina', 'Americas' ],
  [ 832, 'Brazil', 'Americas' ],
  [ 2010, 'Canada', 'Americas' ],
  [ 18520, 'United States of America', 'Americas' ],
  [ 712, 'China', 'Asia' ],
  [ 624, 'Japan', 'Asia' ],
  [ 597, 'Singapore', 'Asia' ],
  [ 383, 'Denmark', 'Europe' ],
  [ 3833, 'France', 'Europe' ],
  [ 8173, 'Germany', 'Europe' ],
  [ 7780, 'Italy', 'Europe' ],
  [ 708, 'Poland', 'Europe' ],
  [ 2039, 'Spain', 'Europe' ],
  [ 91, 'Turkey', 'Europe' ],
  [ 7557, 'United Kingdom', 'Europe' ],
  [ 75, 'Saudi Arabia', 'Middle East' ],
  [ 831, 'Australia', 'Oceania' ],
  [ 244, 'New Zealand', 'Oceania' ] ]
[oracle@LABVM61 lab8]$
```

Using Node.js script to select from an ATP database with a bind variable

Bind variables are commonly used in Node.js scripts and supported within the Oracle database. The following example shows how to bind a variable within Node.js code. The **atpselectwithbindvariable.js** script is listed below.

Note the section on binding the variable and also that we explicitly release connections at the end of the script, so resources are not wasted.

```
var oracledb = require('oracledb');
var dbConfig = require('./dbconfig.js');

    oracledb.getConnection({
        user: dbConfig.dbuser,
        password: dbConfig.dbpassword,
        connectString: dbConfig.connectString
    },
  function(err, connection) {
    if (err) {
      console.error(err.message);
      return;
    }
    connection.execute(
      // The statement to execute
             `SELECT CUST_ID, CUST_FIRST_NAME, CUST_LAST_NAME
           FROM sh.customers WHERE CUST_ID = :id`,[5992],

                    { outFormat: oracledb.OBJECT  // query result
format
```

```
                    },
                     // The callback function handles the SQL
execution results
                    function(err, result) {
                          if (err) {
                               console.error(err.message);
                               doRelease(connection);
                     return;
        }
        console.log(`We are specifically looking for customer ID
5992`);
        console.log(result.rows);
        doRelease(connection);
      });
  });

 // Note: connections should always be released when not needed
 function doRelease(connection) {
   connection.close(
       function(err) {
             if (err) {
                    console.error(err.message);
             }
 });
}
```

To run the code, in the terminal, go to the **/home/oracle/labScripts/lab8** directory and run the below script:

```
node atpselectwithbindvariable.js
```

Check the results on your terminal.

```
[oracle@LABVM61 lab8]$ cd /home/oracle/labScripts/lab8
[oracle@LABVM61 lab8]$ node atpselectwithbindvariable.js
We are specifically looking for customer ID 5992
[ { CUST_ID: 5992,
    CUST_FIRST_NAME: 'Brett',
    CUST_LAST_NAME: 'Hackett' } ]
[oracle@LABVM61 lab8]$
```

Using JSON data in an ATP database

You can create tables in the Oracle database that have JSON columns. In this example you will drop and create the table **`j_purchaseorder`**. You use the SQL condition **`is json`** as a check constraint to ensure that data inserted into a column is (well-formed) JSON data. Oracle recommends that you always use an **`is_json`** check constraint when you create a column intended for JSON data. In this example you will use the constraint **ensure_json** and the **is_json** check. The script **atpcreatejsontable.js**, which is listed below, creates the table and constraints**.** Examine the syntax around table manipulation and JSON data.

```
var async = require('async');
var oracledb = require('oracledb');
var dbConfig = require('./dbconfig.js');
```

```
var doconnect = function(cb) {
    oracledb.getConnection({
        user: dbConfig.dbuser,
        password: dbConfig.dbpassword,
        connectString: dbConfig.connectString
    },
    cb);
};

var dorelease = function(conn) {
  conn.close(function (err) {
    if (err)
      console.error(err.message);
  });
};

var dodrop = function (conn, cb) {
  conn.execute(
    `BEGIN
       EXECUTE IMMEDIATE 'DROP TABLE j_purchaseorder';
       EXCEPTION WHEN OTHERS THEN
       IF SQLCODE <> -942 THEN
         RAISE;
       END IF;
     END;`,
    function(err) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log("Table dropped");
        return cb(null, conn);
      }
    });
};

var docreate = function (conn, cb) {
  conn.execute(
    "CREATE TABLE j_purchaseorder (po_document VARCHAR2(4000)
CONSTRAINT ensure_json CHECK (po_document IS JSON))",
    function(err) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log("Table created");
        return cb(null, conn);
      }
    });
};

async.waterfall(
  [
    doconnect,
    dodrop,
    docreate
  ],
  function (err, conn) {
    if (err) { console.error("In waterfall error cb: ==>", err,
"<=="); }
    if (conn)
      dorelease(conn);
```

```
});
```

To run the code, from your terminal window, go to the directory **/home/oracle/labScripts/lab8** and run the following command:

```
node atpcreatejsontable.js
```

The output will simply be two lines in the terminal, indicating the table was dropped and then created.

```
[oracle@vm61 lab8]$ cd /home/oracle/labScripts/lab8
[oracle@vm61 lab8]$ node atpcreatejsontable.js
Table dropped
Table created
[oracle@vm61 lab8]$
```

In the following script you will extend the previous app and manipulate JSON data into Oracle objects for updating, analysis, inserts and deletes from the database.

Examine the following code from the file **atpselectjson.js**

```
var async = require('async');
var oracledb = require('oracledb');
var dbConfig = require('./dbconfig.js');

var doconnect = function(cb) {
    oracledb.getConnection({
        user: dbConfig.dbuser,
        password: dbConfig.dbpassword,
        connectString: dbConfig.connectString
    },
    cb);
};

var dorelease = function(conn) {
  conn.close(function (err) {
    if (err)
      console.error(err.message);
  });
};

var dodrop = function (conn, cb) {
  conn.execute(
    `BEGIN
       EXECUTE IMMEDIATE 'DROP TABLE j_purchaseorder';
       EXCEPTION WHEN OTHERS THEN
       IF SQLCODE <> -942 THEN
         RAISE;
       END IF;
     END;`,
    function(err) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log("Table dropped");
        return cb(null, conn);
```

```
      }
    });
};

var docreate = function (conn, cb) {
  conn.execute(
    "CREATE TABLE j_purchaseorder (po_document VARCHAR2(4000)
CONSTRAINT ensure_json CHECK (po_document IS JSON))",
    function(err) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log("Table created");
        return cb(null, conn);
      }
    });
};

var checkver = function (conn, cb) {
  if (conn.oracleServerVersion < 1201000200) {
    return cb(new Error('This example only works with Oracle Database
12.1.0.2 or greater'), conn);
  } else {
    return cb(null, conn);
  }
};

var doinsert = function (conn, cb) {
  var data = { "userId": 1, "userName": "Chris", "location":
"Australia" };
  var s = JSON.stringify(data);
  conn.execute(
    "INSERT INTO j_purchaseorder (po_document) VALUES (:bv)",
    [s], // bind the JSON string for inserting into the JSON column.
    { autoCommit: true },
    function (err) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log("Data inserted successfully.");
        return cb(null, conn);
      }
    });
};

var dojsonquery = function (conn, cb) {
  console.log('1. Selecting JSON stored in a VARCHAR2 column');
  conn.execute(
    "SELECT po_document FROM j_purchaseorder WHERE JSON_EXISTS
(po_document, '$.location')",
    function(err, result) {
      if (err) {
        return cb(err, conn);
      } else {
        var js = JSON.parse(result.rows[0][0]);  // just show first
record
        console.log('Query results: ', js);
        return cb(null, conn);
      }
    });
};
```

```
var dorelationalquerydot = function (conn, cb) {
  console.log('2. Using dot-notation to extract a value from a JSON
column');
  conn.execute(
    "SELECT po.po_document.location FROM j_purchaseorder po",
    function(err, result) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log('Query results: ', result.rows[0][0]);  // just
show first record
        return cb(null, conn);
      }
    });
};

var dorelationalquery = function (conn, cb) {
  console.log('3. Using JSON_VALUE to extract a value from a JSON
column');
  conn.execute(
    "SELECT JSON_VALUE(po_document, '$.location') FROM
j_purchaseorder",
    function(err, result) {
      if (err) {
        return cb(err, conn);
      } else {
        console.log('Query results: ', result.rows[0][0]);  // just
show first record
        return cb(null, conn);
      }
    });
};

async.waterfall(
  [
    doconnect,
    checkver,
    dodrop,
    docreate,
    doinsert,
    dojsonquery,
    dorelationalquerydot,
    dorelationalquery
  ],
  function (err, conn) {
    if (err) { console.error("In waterfall error cb: ==>", err,
"<=="); }
    if (conn)
      dorelease(conn);
   });
```

To run the code, from your terminal, go to **/home/oracle/labScripts/lab8** and run the code:

```
node atpselectjson.js
```

The terminal will show the output of the JSON manipulation functions that were defined in the code. Please review the code to see more detail on how the functions were used.

```
[oracle@vm61 lab8]$ cd /home/oracle/labScripts/lab8
[oracle@vm61 lab8]$ node atpselectjson.js
Table dropped
Table created
Data inserted successfully.
1. Selecting JSON stored in a VARCHAR2 column
Query results:  { userId: 1, userName: 'Chris', location: 'Australia' }
2. Using dot-notation to extract a value from a JSON column
Query results:  Australia
3. Using JSON_VALUE to extract a value from a JSON column
Query results:  Australia
[oracle@vm61 lab8]$
```

This concludes the Node.js Lab. You have successfully worked with Node.js to create several simple applications demonstrating connectivity between Node.js and the ATP database.

Lab 9 -
Using Python with ATP

Lab 9: Using Python with Autonomous Transaction Processing

Objectives:

- Run basic Python code that interacts with an Oracle Autonomous Transaction Processing (ATP) Database

The objective of this lab is to run database operations against an Oracle ATP Database using Python. This lab will not teach you how to code in Python.

You will need to be comfortable editing files in a Linux environment.

The sample Python scripts which are used in this lab are available in your VM under the directory **/home/oracle/labScripts/lab9**.

Verify Your Lab Environment

The Lab VM that you are using has the following pre-requisite software installed for you

- Anaconda
- Python 3.7.1
- Oracle Instant Client

Connect to your Lab VM using TigerVNC.

Verify that Python is available on your PATH and is in the **anaconda3** directory structure.

```
which python
```

```
$ which python
~/anaconda3/bin/python
```

Verify the version of Python is 3.7.1

```
python --version
```

```
$ python -version
Python 3.7.1
```

Verify the version of pip is 18.1

```
pip --version
```

```
$ pip -version
pip 18.1 from /home/oracle/anaconda3/lib/python3.7/site-packages/pip (python 3.7)
```

We need to ensure the wallet file for your ATP instance is available and unzipped in the /home/oracle/wallets directory. It should still be available on your system under your $HOME/Downloads directory from the previous labs. If not, then you will have to download it again via the admin console.

```
cd $HOME
cp $HOME/Downloads/wallet_*.zip wallets
cd $HOME/wallets
unzip wallet_*.zip
```

Next you edit the sqlnet.ora to set the wallet file location

```
WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA =
(DIRECTORY="/home/oracle/wallets")))
SSL_SERVER_DN_MATCH=yes
```

Configuring Python to run with ATP and sample scripts

For Python to work with ATP, the Python Oracle libraries must be installed. Verify that they are available using

```
pip list |grep -i oracle
```

```
$ pip list |grep -i oracle
cx-Oracle                         7.0.0
```

Set TNS_ADMIN to the location of your wallet

```
export TNS_ADMIN=$HOME/wallets
```

Open a terminal and move to the python lab, where the scripts are staged.

```
cd $HOME/labScripts/lab9
```

Executing SELECT statements

Execute a simple select (same select as on previous labs) through a Python script.

The python script **select.py** is the first script we are going to run. The script is listed in its entirety below. Using vi (or other editor) edit the script and change the connection credentials in the **con** line of the script (highlighted in black below) to reflect your account/password@connectstring information.

```
import cx_Oracle

## Edit the below line to contain your password and connect string
con = cx_Oracle.connect('admin/ATPwelcome-1234@MELATPTRAIN01_high')
##


sql = "select country_region, count(country_name) from sh.countries
group by country_region"
```

```
cur = con.cursor()
cur.execute(sql)
result = cur.fetchall()
print (result)
cur.close()
con.close()
```

Once you have edited your Python code execute it from the directory where the file is located:

```
python select.py
```

```
$ cd /home/oracle/labScripts/lab9
$ python select.py
[('Asia', 5), ('Middle East', 1), ('Europe', 10), ('Americas', 4), ('Oceania', 2),
('Africa', 1)]
```

A slight variation to the script will allow the results to be displayed in a loop one at a time on a new line until all results are displayed, unlike the previous code which prints all the results at once.

Edit file in the lab9 directory called **selectloop.py** by changing the connection credentials in the **con** line below to reflect your account/password@connectstring information. The complete selectloop.py program is listed below.

```
import cx_Oracle

## Edit the below line to contain your password and connect string
con = cx_Oracle.connect('admin/ATPwelcome-1234@MELATPTRAIN01_high')
##


cur = con.cursor()
sql = "select country_region, count(country_name) from sh.countries
group by country_region"
cur.execute(sql)
for result in cur:
      print (result)
cur.close()
con.close()
```

Execute the new script using the command python selectloop.py

```
python selectloop.py
```

You should receive the result.

```
$cd /home/oracle/labScripts/lab9
$python selectloop.py
('Asia', 5)
('Middle East', 1)
('Europe', 10)
('Americas', 4)
('Oceania', 2)
('Africa', 1)
```

To demonstrate some of the different ways to query and display results in Python, the **querytypes.py** script performs a query and then displays results in three different ways. The output of the scripts provides a brief description of the results display process.

Edit the file called **querytypes.py** by changing the connection credentials in the **con** line below to reflect your account/password@connectstring information. Examine the querytypes.py script below (or by viewing it from the terminal) before running it.

```
from __future__ import print_function
import cx_Oracle


## Edit the below line to contain your password and connect string
con = cx_Oracle.connect('admin/ATPwelcome-1234@MELATPTRAIN01_high')
##



sql = "select s_city,s_region,count(*) from ssb.supplier \
group by s_city,s_region order by count(*)"

print("Get all rows and then display all the results one row at a
time - this may take a few minutes")
cursor = con.cursor()
for result in cursor.execute(sql):
    print(result)
print()

print("Fetch one row at a time using fetchone - do this twice to show
2 results")
cursor.execute(sql)
row = cursor.fetchone()
print(row)
row = cursor.fetchone()
print(row)
print()

print("Fetch 3 rows using fetchmany -  displayed all at once")
cursor.execute(sql)
res = cursor.fetchmany(numRows=3)
print(res)
con.close()
```

Execute your Python script. It will take a few minutes to completion and will display a long output

```
python querytypes.py
```

Sample output

```
$ cd /home/oracle/labScripts/lab9
$ python querytypes.py
Get all rows and then display all the results one row at a time - this may take a
few minutes
('UNITED ST9', 'AMERICA     ', 7792)
('GERMANY  1', 'EUROPE      ', 7812)
('ETHIOPIA 8', 'AFRICA      ', 7841)
('ETHIOPIA 0', 'AFRICA      ', 7842)
```

Creating database objects

The goal of this section is to create a table using Python. The **createtable.py** will try to drop the table in case it already exists, and then create the new table.

Remember to edit the script to change the connection credentials in the **con** line below to reflect your account/password@connectstring information. The createtable.py is listed below. View it before running the script.

```
import cx_Oracle

## Edit the below line to contain your password and connect string
con = cx_Oracle.connect('admin/ATPwelcome-1234@MELATPTRAIN01_high')
##



droptable = "DROP TABLE DEMO_COUNTRIES"

createtable = "CREATE TABLE DEMO_COUNTRIES ( \
  COUNTRY_ID           NUMBER, \
  COUNTRY_ISO_CODE     CHAR(2), \
  COUNTRY_NAME         VARCHAR2(40), \
  COUNTRY_SUBREGION    VARCHAR2(30), \
  COUNTRY_SUBREGION_ID NUMBER, \
  COUNTRY_REGION       VARCHAR2(20), \
  COUNTRY_REGION_ID    NUMBER, \
  COUNTRY_TOTAL        NUMBER(9), \
  COUNTRY_TOTAL_ID     NUMBER, \
  COUNTRY_NAME_HIST    VARCHAR2(40) \
)"
checkobject = "select object_name, object_type, created from
user_objects where object_name='DEMO_COUNTRIES'"
cur = con.cursor()
try:
    cur.execute(droptable)
except cx_Oracle.DatabaseError:
    print ("Table does not exist")

print ("Executed drop table statement")
cur.execute(createtable)
print ("Executed create table statement")
cur = con.cursor()
print ("Checking the table exists in user_objects")
cur.execute(checkobject)
result = cur.fetchall()
print (result)
cur.close()
con.close()
```

Execute your Python script

```
python createtable.py
```

```
$ cd /home/oracle/labScripts/lab9
$ python createtable.py
Executed drop table statement
```

```
Executed create table statement
Checking the table exists in user_objects
[('DEMO_COUNTRIES', 'TABLE', datetime.datetime(2019, 1, 17, 16, 41, 37))]
```

Using Python to Insert and Update data

The **insertupdate.py** script will:

- Drop the table if it already exists so this script can be run multiple times giving the same results.
- Create the table.
- Insert data into the table
- Update data in the table.

Remember to change the connection credentials in the **con** line (shown below) to reflect your account/password@connectstring information in the **insertupdate.py** script.

```
import cx_Oracle


## Edit the below line to contain your password and connect string
con = cx_Oracle.connect('admin/ATPwelcome-1234@MELATPTRAIN01_high')
##


droptable = "DROP TABLE DEMO_COUNTRIES"

createtable = "CREATE TABLE DEMO_COUNTRIES ( \
  COUNTRY_ID            NUMBER , \
  COUNTRY_ISO_CODE      CHAR(2) , \
  COUNTRY_NAME          VARCHAR2(40), \
  COUNTRY_SUBREGION     VARCHAR2(30), \
  COUNTRY_SUBREGION_ID NUMBER, \
  COUNTRY_REGION        VARCHAR2(20), \
  COUNTRY_REGION_ID     NUMBER , \
  COUNTRY_TOTAL         NUMBER(9), \
  COUNTRY_TOTAL_ID      NUMBER, \
  COUNTRY_NAME_HIST     VARCHAR2(40) \
)"
checktable="select * from DEMO_COUNTRIES"
# Try to drop the table ignore exception in case table does not
exist.
cur = con.cursor()
try:
    cur.execute(droptable)
except cx_Oracle.DatabaseError:
    print ("Table does not exist")

print ("Executed drop table statement")
# Create our Table
cur.execute(createtable)
print ("Executed create table statement")
cur = con.cursor()
#here we insert data into the table, commit and query it
cur = con.cursor()
```

```
statement = 'insert into demo_countries(country_id, country_name,
country_region) values (:2, :4, :7)'
cur.execute(statement, (1, 'Paraguay', 'South America'))
con.commit()
print ("Inserted data about Paraguay")
cur.execute(checktable)
result = cur.fetchall()
print (result)

#here we update data in the table and query it
cur = con.cursor()
statement = 'update demo_countries set country_name = :1 where
country_name = :2'
cur.execute(statement, ("Republic of Paraguay", "Paraguay"))
con.commit()
print ("Updating contry name to Republic of Paraguay")
cur.execute(checktable)
result = cur.fetchall()
print (result)
cur.close()
con.close()
```

Execute your script using **python insertupdate.py**

```
python insertupdate.py
```

```
$ cd /home/oracle/labScripts/lab9
$ python insertupdate.py
Executed drop table statement
Executed create table statement
Inserted data about Paraguay
[(1, None, 'Paraguay', None, None, 'South America', None, None, None, None)]
Updating contry name to Republic of Paraguay
[(1, None, 'Republic of Paraguay', None, None, 'South America', None, None, None,
None)]
```

Removing hard coded connect strings

In the previous scripts, the credential information for the ATP service was a hard coded **cx_Oracle.connect** call. This is non-secure and hard to manage should something change with the credentials. With the Python os library it is possible to define an operating system environment variable with the credential information and then simply read that variable from inside the Python script. This provides a more secure mechanism to provide credentials and an easy way to reduce code changes due to database service changes.

To set the environment variable with your login credentials run the following in your command prompt window. The environment variable name is your choice, however as it will be referenced in the code later, for this Python lab you must use **atp_connect**.

```
export atp_connect=<your user>/<your password>@<connect string>
```

For example:

```
$ export atp_connect=admin/ATPwelcome-1234@melatptrain01_tp
```

The next script will re-run the first select statement we ran in select.py but instead of hardcoding the connection credentials it will call the environment variable to get the connection information. To allow this, we will need to import the os library in Python. The script **selectconnectstring.py** is listed below.

```
import cx_Oracle
import os
connectstring = os.getenv('atp_connect')
print ("Got the following value for atp_connect")
print (connectstring)
con = cx_Oracle.connect(connectstring)
sql = "select country_region, count(country_name) from sh.countries
group by country_region"
cur = con.cursor()
cur.execute(sql)
result = cur.fetchall()
print (result)
cur.close()
con.close()
```

Set your operating system environment variable **atp_connect** to the connect string for your database and execute the code using **python selectconnectstring.py**.

```
export atp_connect=admin/ATPwelcome-1234@melatptrain01_tp
python selectconnecstring.py
```

```
$ cd /home/oracle/labScripts/lab9
$ export atp_connect=admin/ATPwelcome-1234@melatptrain01_tp
$ python selectconnectstring.py
Got the following value for atp_connect
admin/ATPwelcome-1234@melatptrain01_tp
[('Asia', 5), ('Middle East', 1), ('Europe', 10), ('Americas', 4), ('Oceania', 2),
('Africa', 1)]
```

Passing parameters

The **variables.py** script relies on the previous labs being successful. It will use the same Operating System variable for the connect string, and the DEMO_COUNTRIES table that you used previously. You will call a Python script and pass it three parameters. Passing parameters to a Python script requires using the **sys** library so the script includes an **import sys** statement. This is a very simple script with limited checking and error handling, so parameters must be passed exactly as shown or the script will return an error. The parameters passed will be inserted into the table, and the updated table contents will be displayed. The **variables.py** script is listed below:

```
import cx_Oracle
import os
import sys

connectstring = os.getenv('atp_connect')
con = cx_Oracle.connect(connectstring)
print ("Got the following value for atp_connect")
print (connectstring)
```

```
checktable='select country_id, country_name, country_region  from
demo_countries'
inserttable='insert into demo_countries(country_id, country_name,
country_region) values (:2, :4, :7)'

# Check that 3 arguments are passed in from the command line
if (len(sys.argv) < 4 or len(sys.argv) > 4):
    print (" This script requires exactly 3 parameters and received
", str(sys.argv))
    print (" A working example:  python variables.py 10 France
Europe")
    exit(1)

# Check that the first argument is a whole number
try:
      check = int(sys.argv[1])
except:
      print(" Error: Argument one needs to be a whole number ")
      print (" A working example:  python variables.py 10 France
Europe")
      exit(1)


print ("Arguments provided:", sys.argv[1]," ",sys.argv[2]," ",
sys.argv[3] )
id = sys.argv[1]
country = sys.argv[2]
region = sys.argv[3]

# Check that the target table exists
checkobject = "select count(table_name) from user_tables where
table_name = upper('demo_countries')"
cur = con.cursor()
try:
      cur.execute(checkobject)
      result = cur.fetchall()
      if(int(result[0][0]) < 1):
            print ("Error: Table does not exist. Please run
createTable.py first")
            exit(1)
except cx_Oracle.DatabaseError:
      print ("Error: Table does not exist. Please run createtable.py
first")
      exit(1)


print ("Inserting your data")
cur = con.cursor()
cur.execute(inserttable, (id, country, region))
con.commit()
print ("Selecting from DEMO_COUNTRIES")
for result in cur.execute(checktable):
    print (result)
print()
cur.close()
con.close()
```

Ensure you have the connect string set as **atp_connect**, and that when you execute the script you provide three parameters, the first of which must be numeric. E.g. **python variables.py 10 Finland Europe**

```
export atp_connect=admin/ATPwelcome-1234@melatptrain01_tp
python variables.py 10 Finland Europe
```

You should expect the following output

```
$ export atp_connect=admin/ATPwelcome-1234@melatptrain01_tp
$ python variables.py 10 Finland Europe
Got the following value for atp_connect
admin/ATPwelcome-1234@melatptrain01_tp
Arguments provided: 10   Finland   Europe
Inserting your data
Selecting from DEMO_COUNTRIES
(10, 'Finland', 'Europe')
(1, 'Republic of Paraguay', 'South America')
```

Optional – Using Anaconda/Jupyter/Python with ATP

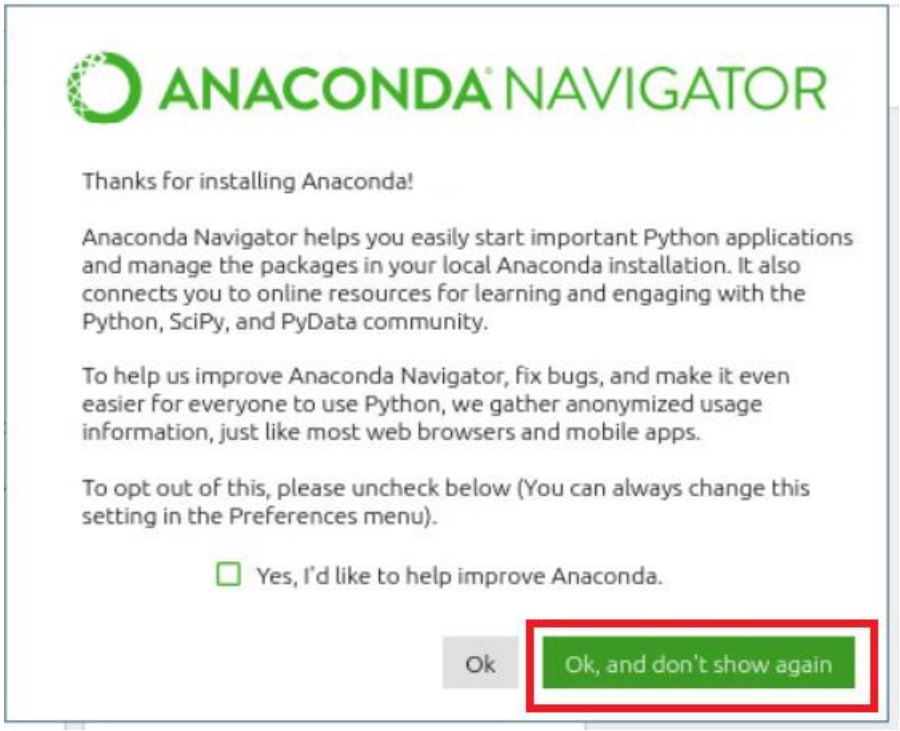
Integrated Development Environments (IDEs) are very popular with the development community. Among the most popular for Python are the combination of Anaconda/Jupyter or Spyder. Installing this environment is out of scope for this Hands on Lab, and so the required software is pre-installed in your Lab VM.

To start Anaconda, enter the following command in your terminal window.

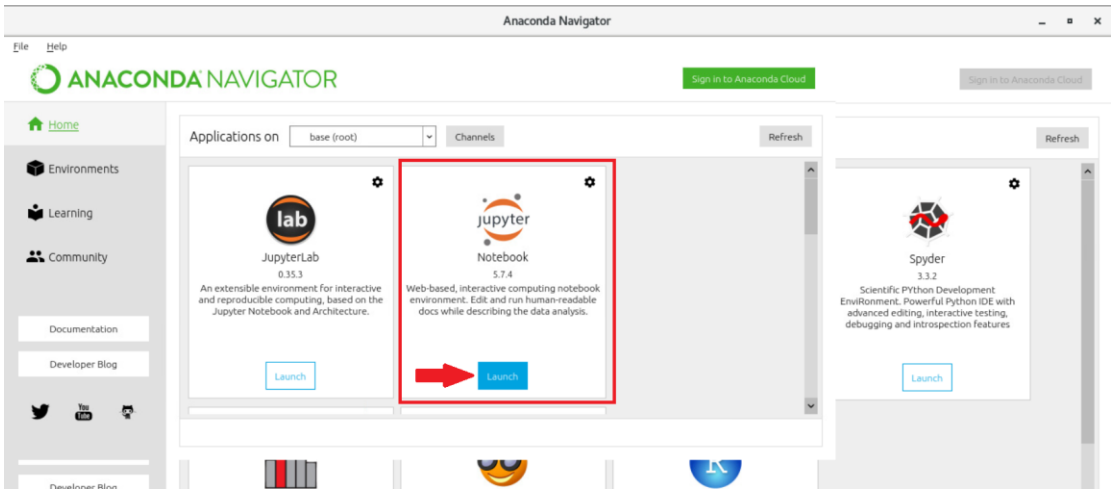
```
$HOME/anaconda3/bin/anaconda-navigator
```

This will start the Anaconda Navigator GUI.

The first time you start Anaconda you will get a message box, select **'OK, and don't show again'**



Locate **Jupyter Notebook** in Anaconda Navigator and select **Launch**.

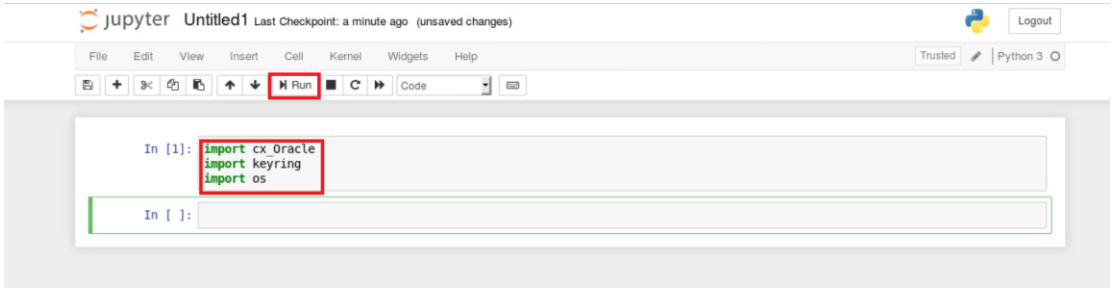


A new browser page will open, running Jupyter. Select **New** and then **Python 3**

This will open a new Python notebook. Python is an interpreted language, so we must load libraries to use every time an environment is started up. Libraries are loaded with the import command.

Copy the 3 import statements below and paste them directly in the box next to the **In[]:** prompt, then select **Run**.

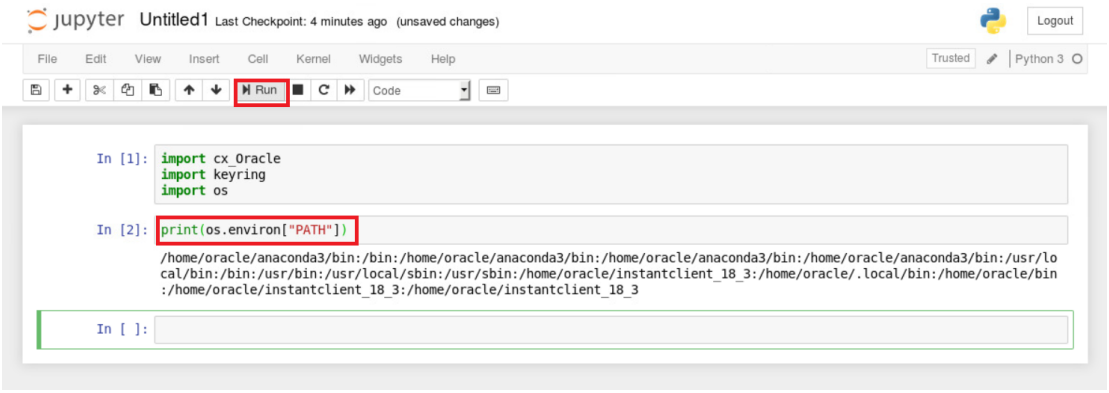
```
import cx_Oracle
import keyring
import os
```



The import commands will not produce any output.

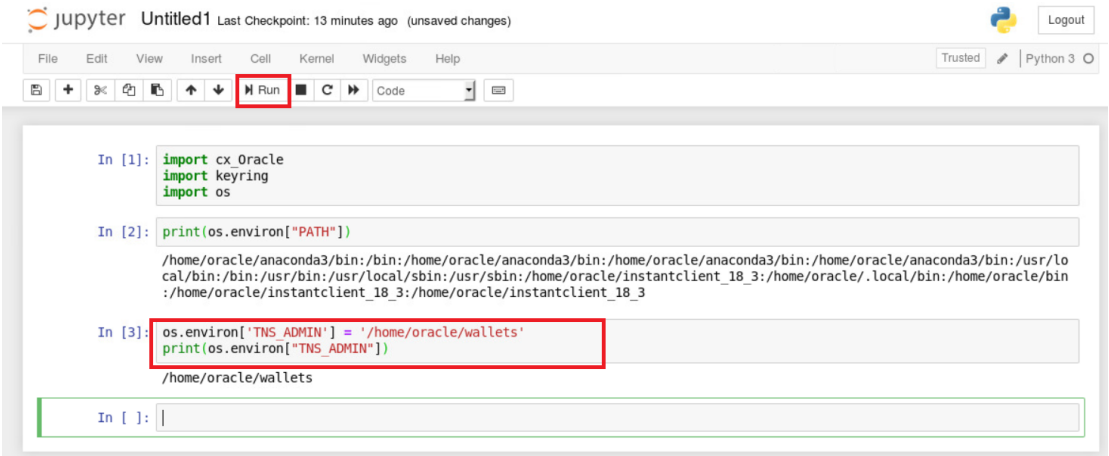
Run a simple command to display your PATH. Run the following command (copy and paste next to the **In[]** prompt and select **Run**):

```
print(os.environ["PATH"])
```



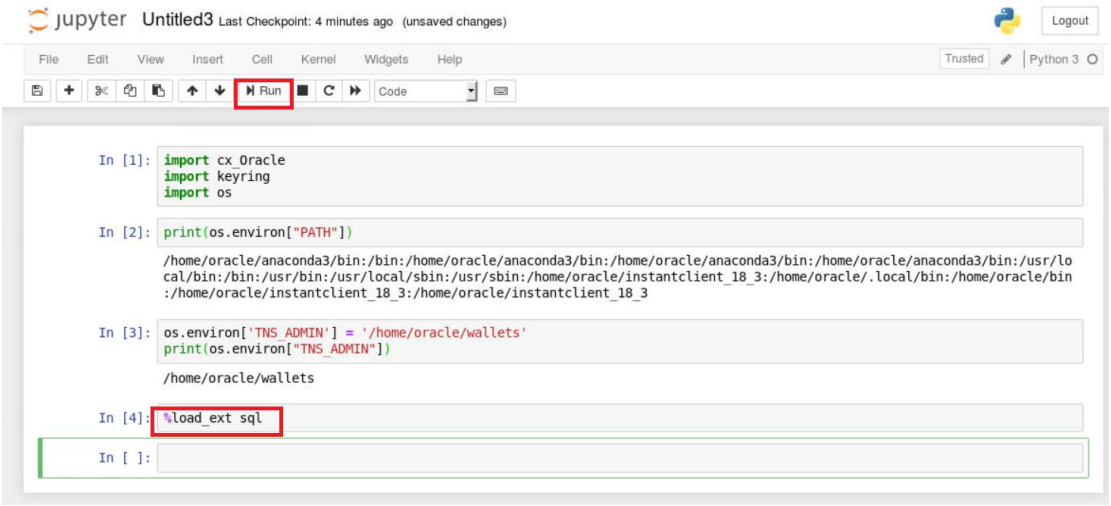
To connect to the database, it must be able to locate the wallet files. The TNS_ADMIN variable must be set to the location of your unzipped wallet files. Below we set and then check the variable (the first command sets it, the second displays it back). Run the following command (copy and paste next to the **In[]** prompt and select **Run**):

```
os.environ['TNS_ADMIN'] = '/home/oracle/wallets'
print(os.environ["TNS_ADMIN"])
```



To make SQL calls to ATP, we need to load an additional library to support calls to external sql databases. Run the command below (copy and paste next to the **In[]** prompt, make sure to include the % and select **Run**):

```
%load_ext sql
```



Next we will connect to the ATP database using a user name, password and service. Use your admin account and password created when the ATP database was created. The format of the command is (replace the black portion with your database and users information):

```
%sql oracle+cx_oracle://user:password@service
```

So your command would look like similar to this:

```
%sql oracle+cx_oracle://admin:ATPwelcome-1234@melatptrain01_tp
```

Enter your command next to the **In[]** prompt, make sure to include the % and select **Run**.

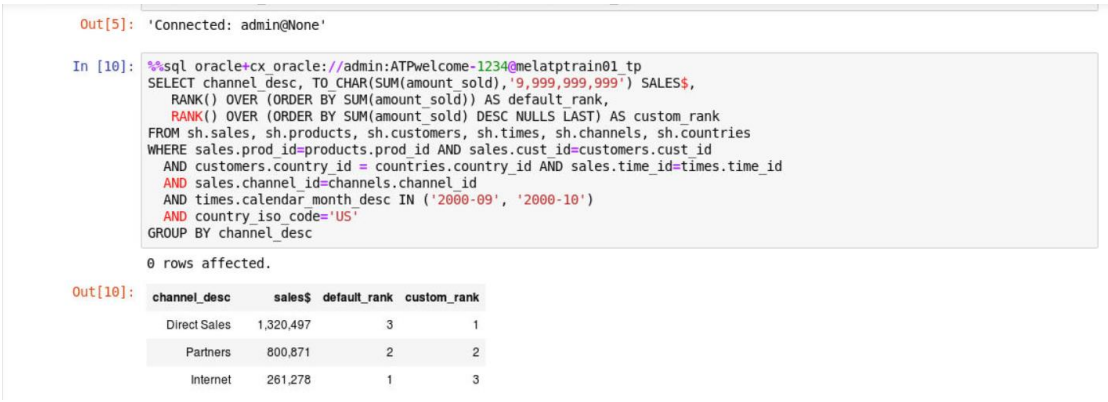
When the connection succeeds you will get the message 'Connected: admin@None'

To run a query, once connected use the **oracle+cx** library calls followed by the SQL statement (notice there is no ';' at the end of the statement). The SQL below is the same one we ran in previous labs.

The statement below can be found in **/home/oracle/labScripts/lab9/select.jupyter**. Copy this files content into the Jupyter box, replace the connection detail with your connection details, and click Run.

```
%%sql oracle+cx_oracle://admin:ATPwelcome-1234@melatptrain01_tp
SELECT channel_desc, TO_CHAR(SUM(amount_sold),'9,999,999,999')
SALES$,
   RANK() OVER (ORDER BY SUM(amount_sold)) AS default_rank,
   RANK() OVER (ORDER BY SUM(amount_sold) DESC NULLS LAST) AS
custom_rank
FROM sh.sales, sh.products, sh.customers, sh.times, sh.channels,
sh.countries
WHERE sales.prod_id=products.prod_id AND
sales.cust_id=customers.cust_id
```

```
  AND customers.country_id = countries.country_id AND
sales.time_id=times.time_id
  AND sales.channel_id=channels.channel_id
  AND times.calendar_month_desc IN ('2000-09', '2000-10')
  AND country_iso_code='US'
GROUP BY channel_desc
```



Out[5]: 'Connected: admin@None'

In [10]:
```
%%sql oracle+cx_oracle://admin:ATPwelcome-1234@melatptrain01_tp
SELECT channel_desc, TO_CHAR(SUM(amount_sold),'9,999,999,999') SALES$,
   RANK() OVER (ORDER BY SUM(amount_sold)) AS default_rank,
   RANK() OVER (ORDER BY SUM(amount_sold) DESC NULLS LAST) AS custom_rank
FROM sh.sales, sh.products, sh.customers, sh.times, sh.channels, sh.countries
WHERE sales.prod_id=products.prod_id AND sales.cust_id=customers.cust_id
  AND customers.country_id = countries.country_id AND sales.time_id=times.time_id
  AND sales.channel_id=channels.channel_id
  AND times.calendar_month_desc IN ('2000-09', '2000-10')
  AND country_iso_code='US'
GROUP BY channel_desc
```

0 rows affected.

Out[10]:

channel_desc	sales$	default_rank	custom_rank
Direct Sales	1,320,497	3	1
Partners	800,871	2	2
Internet	261,278	1	3

You can issue DDL commands via Jupyter. Next we will create a simple table. As in the last example copy the contents from the file **/home/oracle/labScripts/lab9/create-table.jupyter** below, replace the black text with your database and connection information, paste it in the box, and click Run.

```
%%sql oracle+cx_oracle://admin:ATPwelcome-1234@melatptrain01_tp
CREATE TABLE J_COUNTRIES (
  COUNTRY_ID            NUMBER,
  COUNTRY_ISO_CODE      CHAR(2),
  COUNTRY_NAME          VARCHAR2(40),
  COUNTRY_SUBREGION     VARCHAR2(30),
  COUNTRY_SUBREGION_ID NUMBER,
  COUNTRY_REGION        VARCHAR2(20),
  COUNTRY_REGION_ID     NUMBER,
  COUNTRY_TOTAL         NUMBER(9),
  COUNTRY_TOTAL_ID      NUMBER,
  COUNTRY_NAME_HIST     VARCHAR2(40)
)
```

In [14]:
```
%%sql oracle+cx_oracle://admin:ATPwelcome-1234@melatptrain01_tp
CREATE TABLE J_COUNTRIES (
  COUNTRY_ID            NUMBER,
  COUNTRY_ISO_CODE      CHAR(2),
  COUNTRY_NAME          VARCHAR2(40),
  COUNTRY_SUBREGION     VARCHAR2(30),
  COUNTRY_SUBREGION_ID NUMBER,
  COUNTRY_REGION        VARCHAR2(20),
  COUNTRY_REGION_ID     NUMBER,
  COUNTRY_TOTAL         NUMBER(9),
  COUNTRY_TOTAL_ID      NUMBER,
  COUNTRY_NAME_HIST     VARCHAR2(40)
)
```

0 rows affected.

Out[14]: []

You will not get a message saying the table was created. You can check it created by querying the USER_OBJECTS view. The below statement can be copied from the **/home/oracle/labScripts/lab9/check-table.jupyter** script, replace the black text with your database and connection information in the script and paste it in the box and click Run.

```
%%sql oracle+cx_oracle://admin:ATPwelcome-1234@melatptrain01_tp
SELECT OBJECT_NAME, OBJECT_TYPE from USER_OBJECTS
where OBJECT_NAME='J_COUNTRIES'
```

This concludes the lab on using Python with ATP.

Lab 10 - Using Docker Containers with ATP

Lab 10: Using Docker Containers with Autonomous Transaction Processing

Objectives:

- To build a Docker container running a Node.js application microservice.
- Connect this microservice to an Autonomous Transaction Processing (ATP) Database service running in the Oracle cloud.
- Package your Docker container image for deployment.

Microservices and Docker containers are very popular development and deployment environments. We will use a Node.js application, deploy it as a Docker container and show how ATP can be used as data management for these applications.

In a previous lab you ran Node.js scripts to learn the basics of Node.js and ATP. In this lab you will deploy a Node.js simple storefront application inside a Docker container which accesses information stored in an ATP database. You will create your Docker container from a build file available from Github.

Once your Docker image is built you will customize it to access your ATP database, and then package your customized image for deployment as a Docker image. This lab builds on an Oracle Learning Lab located here. For any updates please refer to this site. As we are downloading a pre-created image, some values are hardcoded.

We have already downloaded the sample Node.js application from
https://github.com/cloudsolutionhubs/ATPnodeapp
and installed it on the VM under **/home/oracle/ATPDocker**

Please pay close attention to names that cannot be changed and those that need to be changed.

The microservice will connect to the ATP database you created using the Oracle instantclient. The service has a hard-coded requirement for the 12.1.0.2.0 instantclient libraries. We have downloaded these libraries and placed them in the **/home/oracle/ATPDocker** directory on your VM.

As the application uses hardcoded paths we need to copy the ATP wallet file from your ATP database to the '**/home/oracle/ATPDocker/wallet_NODEAPPDB2**' and unzip it (see lab 8 on instructions how to do this if needed). The below commands assume your ATP wallet zip file has previously been copied to the /home/oracle/wallets directory from previous labs. Note the '.' at the end of the cp command.

```
cd /home/oracle/ATPDocker/wallet_NODEAPPDB2
cp /home/oracle/wallets/<wallet_file>.zip .
unzip <wallet_file>.zip
```

```
$ cd /home/oracle/ATPDocker/wallet_NODEAPPDB2
$ cp /home/oracle/wallets/wallet_MELATPTRAIN01.zip .
$ unzip wallet_MELATPTRAIN01.zip
Archive:  wallet_MELATPTRAIN01.zip
  inflating: cwallet.sso
  inflating: tnsnames.ora
  inflating: truststore.jks
  inflating: ojdbc.properties
  inflating: sqlnet.ora
  inflating: ewallet.p12
  inflating: keystore.jks
```

Edit the sqlnet.ora and change the wallet location to reference the TNS_ADMIN environment variable.

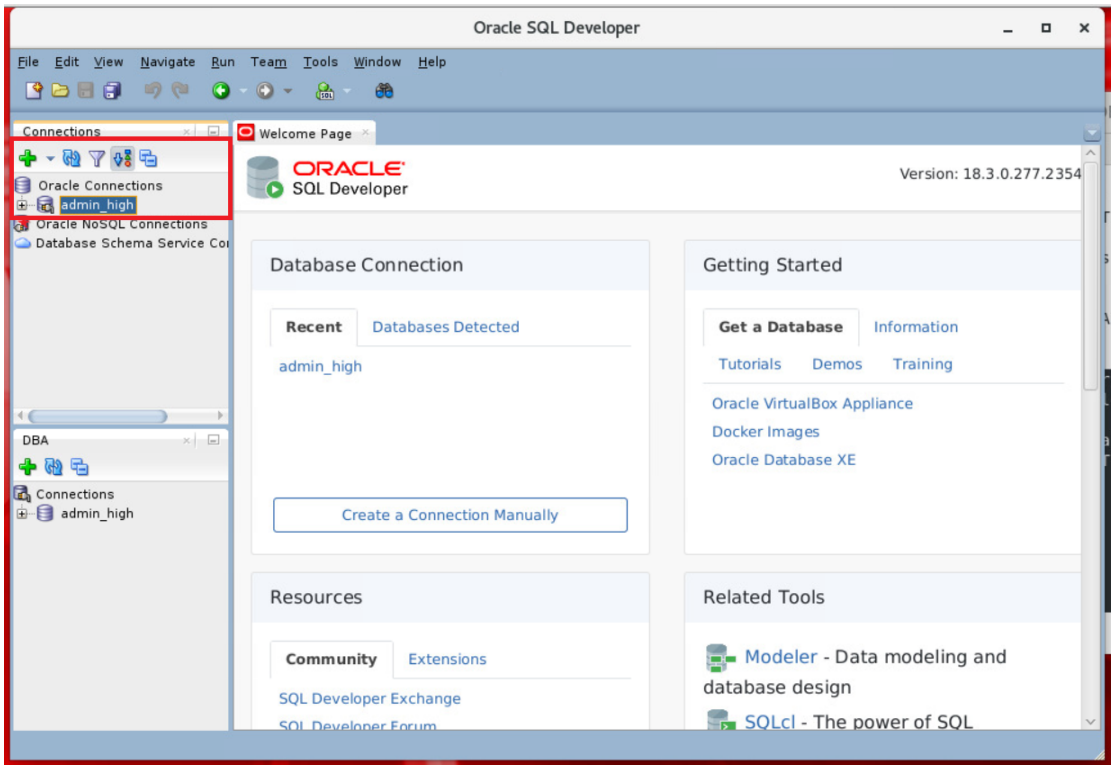
```
WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA =
(DIRECTORY="$TNS_ADMIN")))
SSL_SERVER_DN_MATCH=yes
```

Populating the ATP Database for the Docker/Node.js application

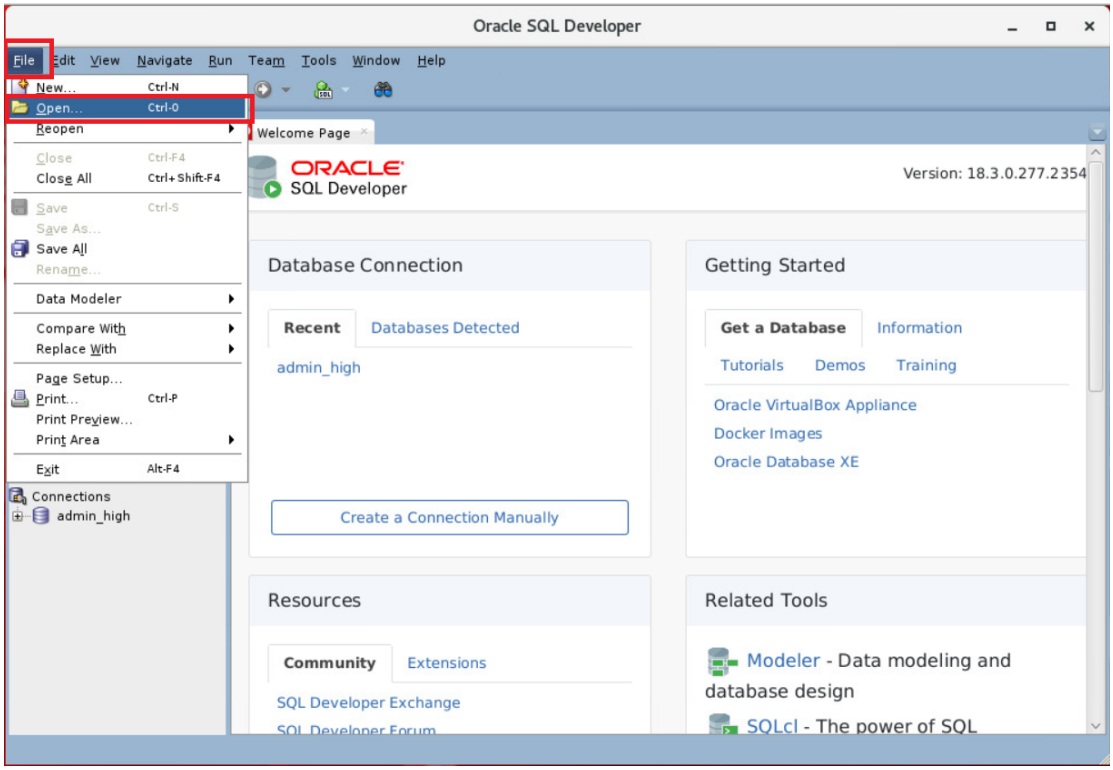
For this simple lab, we are going to deploy the application into the admin schema and connect as the admin schema. This is not best practice for production applications.

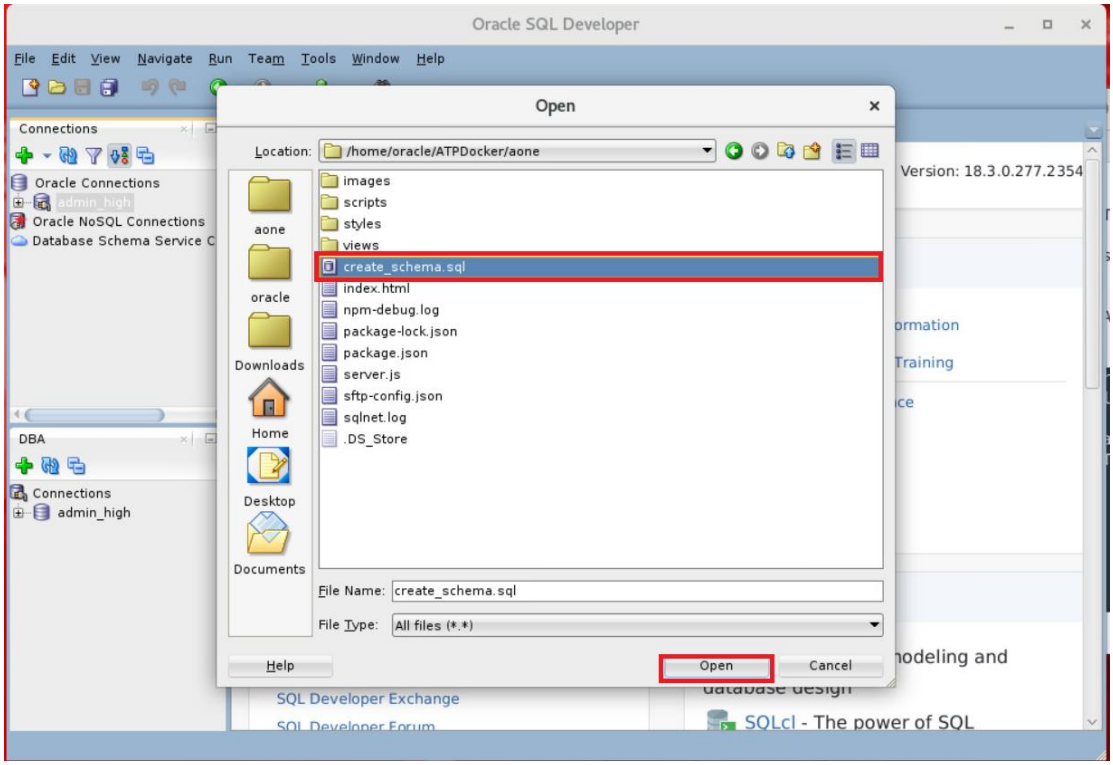
The application that will be deployed in the container accesses specific tables in the ATP database that need to be created and populated. The complete SQL to perform this task is located in the **create_schema.sql** file located in the **/home/oracle/ATPDocker/aone** directory.

The easiest way to execute this script is through SQL Developer. Start SQL Developer if you do not already have it open. Under Connections open a connection to your ATP instance as admin. Refer to Lab 2 for more detailed instructions if you have not configured this as part of Lab2.

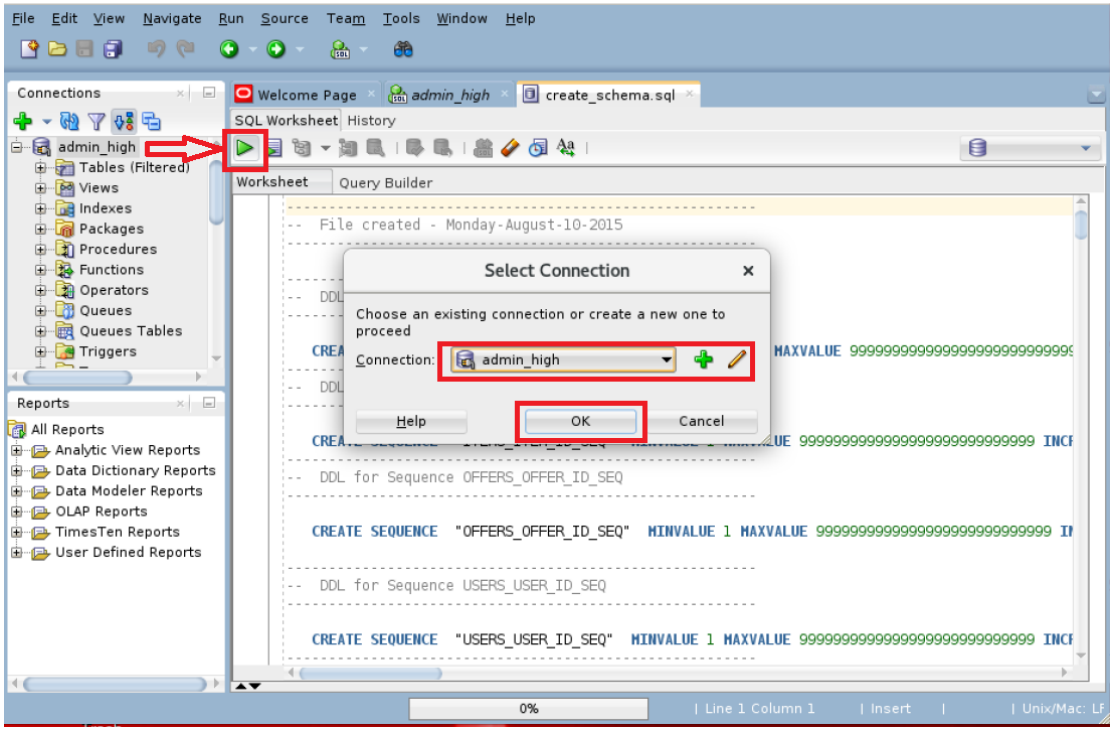


Select file open and navigate to **/home/oracle/ATPDocker/aone,** select **create_schema.sql** and click **open**.

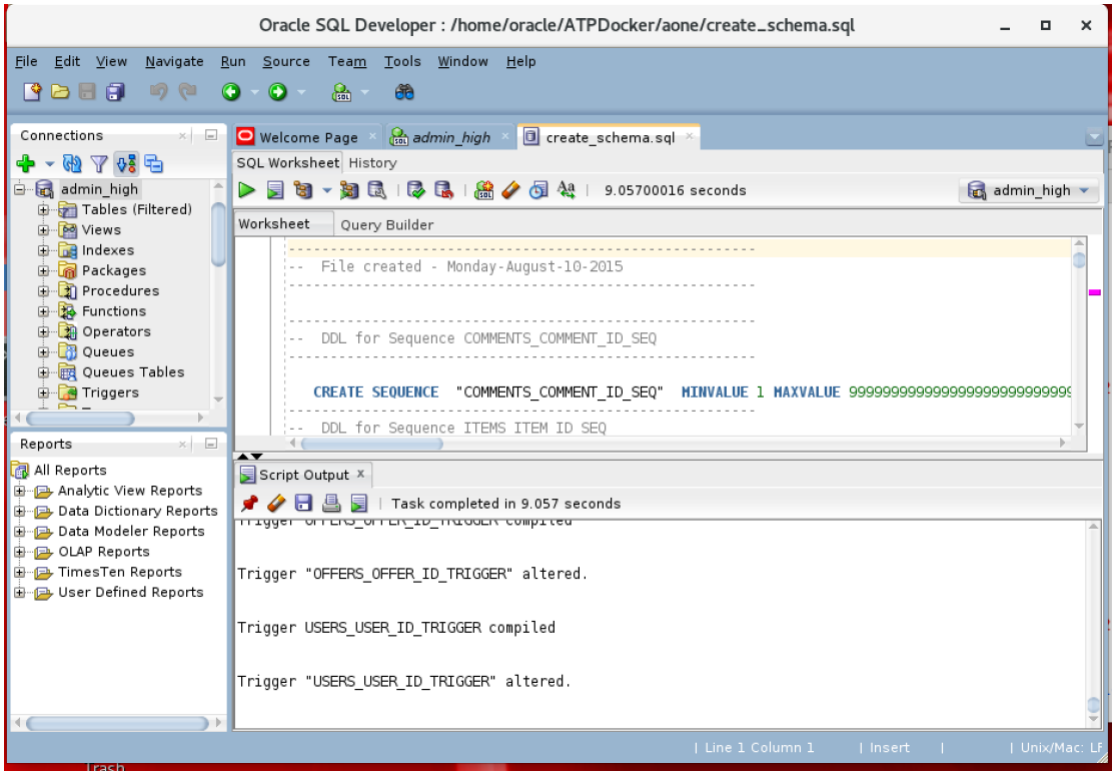




This will load the script into a SQL Worksheet.
Run the script, a pop-up window will ask you select a connection. Select the **admin_high** connection used in previous labs.



After asking you for the admin password the script will run and create the schema required for the Node.js application.



Your database is now prepared for the application.

Alternatively, you can copy the entire contents of **create_schema.sql** file, and paste it in the SQL Developer Query Builder box and run it. (Like in previous SQL Developer labs).

Creating your Docker image

There is a large repository of pre-created registered Docker images that can be searched and selected for use. Docker images can either be pulled from this repository or created from configuration files. For this lab we will be using configuration files that will create our image that contains all the components needed to run the node.js application being deployed.

Before creating our image explore what images for “Oracle” already exist in the repository. In a terminal window navigate to **/home/oracle/ATPDocker** and run the Docker command to search the repository:

```
cd /home/oracle/ATPDocker
sudo docker search "oracle"
```

You will see a list of images available

```
[oracle@demo-long ATPDocker]$ sudo docker search "oracle"
INDEX             NAME                                      DESCRIPTION                                     STARS     OFFICIAL   AUTOMATED
docker.io         oraclelinux                               Official Docker builds of Oracle Linux.         545       [OK]
docker.io         sath89/oracle-12c                         Oracle Standard Edition 12c Release 1 with d…   443                  [OK]
docker.io         frolvlad/alpine-oraclejdk8                The smallest Docker image with OracleJDK 8 (…   358                  [OK]
docker.io         alexeiled/docker-oracle-xe-11g            This is a working (hopefully) Oracle XE 11.2…   280                  [OK]
docker.io         sath89/oracle-xe-11g                      Oracle xe 11g with database files mount supp…   237                  [OK]
docker.io         wnameless/oracle-xe-11g                   Dockerfile of Oracle Database Express Editio…   155                  [OK]
docker.io         jaspeen/oracle-11g                        Docker image for Oracle 11g database            82                   [OK]
docker.io         isuper/java-oracle                        This repository contains all java releases f…   56                   [OK]
docker.io         oracle/openjdk                            Docker images containing OpenJDK Oracle Linux   53                   [OK]
docker.io         airdock/oracle-jdk                        Docker Image for Oracle Java SDK (8 and 7) b…   43                   [OK]
docker.io         sath89/oracle-ee-11g                      Dockerfile of Oracle Database Enterprise Edi…   43                   [OK]
docker.io         cogniteev/oracle-java                     Oracle JDK 6, 7, 8, and 9 based on Ubuntu 16…   24                   [OK]
docker.io         ingensi/oracle-jdk                        Official Oracle JDK installed on centos.        21                   [OK]
docker.io         oracle/nosql                              Oracle NoSQL on a Docker Image with Oracle L…   17                   [OK]
docker.io         sgrio/java-oracle                         Docker images of Java 7/8/9/10 provided by O…   17                   [OK]
docker.io         n3ziniuka5/ubuntu-oracle-jdk              Ubuntu with Oracle JDK. Check tags for versi…   16                   [OK]
docker.io         andreptb/oracle-java                      Debian Jessie based image with Oracle JDK in…   7                    [OK]
docker.io         frolvlad/alpine-oraclejre8                The smallest Docker image with OracleJRE 8 (…   7                    [OK]
docker.io         davidcaste/debian-oracle-java             Oracle Java 8 (and 7) over Debian Jessie        4                    [OK]
docker.io         martinseeler/oracle-server-jre            Oracle's Java 8 as 61 MB Docker container.      4                    [OK]
docker.io         teradatalabs/centos6-java8-oracle         Docker image of CentOS 6 with Oracle JDK 8 i…   4
docker.io         publicisworldwide/oracle-core             This is the core image based on Oracle Linux…   1                    [OK]
docker.io         bitnami/oraclelinux-extras                Oracle Linux base images                        0                    [OK]
docker.io         pivotaldata/oracle7-test                  Oracle Enterprise Linux (OEL) image for GPDB…   0
docker.io         softwareplant/oracle                      oracle db                                       0                    [OK]
[oracle@demo-long ATPDocker]$
```

If you wanted to use any of these images you would use the **'docker pull'** command, for example **'docker pull oraclelinux'** would pull the oraclelinux image from the repository and install it on your Docker containers.

In this lab we will not pull an image but build our own from configuration files.

Edit the Docker configuration file to set the github repository location.

```
cd /home/oracle/ATPDocker
vi Dockerfile
```

Change line 34 from

```
RUN git clone https://github.com/cloudsolutionhubs/ATPDocker.git
```

to

```
RUN git clone https://github.com/melanieosc/ATPDocker.git
```

And save the file.

You are ready to create your Docker image that will contain the Node.js application. Ensure that you are in the **/home/oracle/ATPDocker** directory and run the Docker build command. We will build an image called "**aone**" based on the steps and configurations defined in the default "**Dockerfile**" in this directory (alternate configuration files could be selected with the –f parameter if required):

```
cd /home/oracle/ATPDocker
sudo docker build -t aone .
```

Note the "dot" at the end of the Docker build command.

```
[oracle@demo-long ~]$ cd /home/oracle/ATPDocker
[oracle@demo-long ATPDocker]$ sudo docker build -t aone .
Sending build context to Docker daemon   76.1MB
Step 1/18 : FROM frolvlad/alpine-glibc:alpine-3.8
 ---> 29238b990a07
Step 2/18 : RUN apk update && apk add libaio libnsl &&     ln -s /usr/lib/libnsl.so.2 /usr/lib/libnsl.so.1
 ---> Using cache
 ---> 0eed448b0bc1
Step 3/18 : RUN apk add --update     nodejs     nodejs-npm     git     python    && rm -rf /var/cache/apk/*
 ---> Using cache
 ---> f06ba8fc30bb
Step 4/18 : ENV CLIENT_FILENAME instantclient-basic-linux.x64-12.1.0.2.0.zip
 ---> Using cache
 ---> 6e9c58614803
Step 5/18 : WORKDIR /opt/oracle/lib
```

This will build the Docker image (for this lab ignore any errors during the build process!). You can verify the image was built by running the following command to list all your Docker images installed on your computer and looking for **aone** on the list.

```
sudo docker images -a
```

```
[oracle@demo-long-v4 ]$ sudo docker images -a
REPOSITORY              TAG                 IMAGE ID            CREATED              SIZE
aone                    latest              c481031662b9        20 seconds ago       576MB
<none>                  <none>              7c5c6d7a0d8d        21 seconds ago       576MB
<none>                  <none>              9ed8b976b421        22 seconds ago       576MB
<none>                  <none>              e92098b80b42        29 seconds ago       562MB
<none>                  <none>              f60eca0e103d        30 seconds ago       562MB
<none>                  <none>              0f8127e5b055        31 seconds ago       562MB
<none>                  <none>              d60b2e54d996        32 seconds ago       562MB
<none>                  <none>              0407206b1f80        33 seconds ago       562MB
<none>                  <none>              9fe34b133d86        34 seconds ago       562MB
<none>                  <none>              8dc938d36a30        34 seconds ago       562MB
<none>                  <none>              43310280c6da        39 seconds ago       562MB
<none>                  <none>              e99352ef63fa        44 seconds ago       562MB
<none>                  <none>              80fd2e5cb1c2        48 seconds ago       550MB
<none>                  <none>              d6e80b6738ce        56 seconds ago       173MB
<none>                  <none>              5b8257b45bfb        58 seconds ago       110MB
<none>                  <none>              8231975ed6bb        59 seconds ago       110MB
<none>                  <none>              8890c4d4d2a9        About a minute ago   110MB
<none>                  <none>              27d0f3d8e278        About a minute ago   14.9MB
frolvlad/alpine-glibc   alpine-3.8          29238b990a07        5 weeks ago          11.3MB
```

Display the hostname of your Lab VM. It will not match the value in the screenshot.

```
uname -n
```

```
$ uname -n
demo-long-v4
```

Now run the image. The image is started in interactive mode (**-i**), using port 3050 (**-p**) and image aone (**-t**) with bash prompt (**sh**) as the interface:

```
sudo docker run -i -p 3050:3050 -t aone sh
```

The image will start, and you will be at the Unix command prompt of the container. You have created a container service running Linux on your VM. Note that the prompt has changed and if you check the hostname you will see that this has a different value to your VM. The hostname is generated, and so will not match the value in the screenshots.

```
[oracle@demo-long-v4 ]$ uname -n
demo-long-v4
[oracle@demo-long-v4 ]$ sudo docker run -i -p 3050:3050 -t aone sh
Docker Container # uname -n
359c1fe7341d
Docker Container #
Docker Container #
```

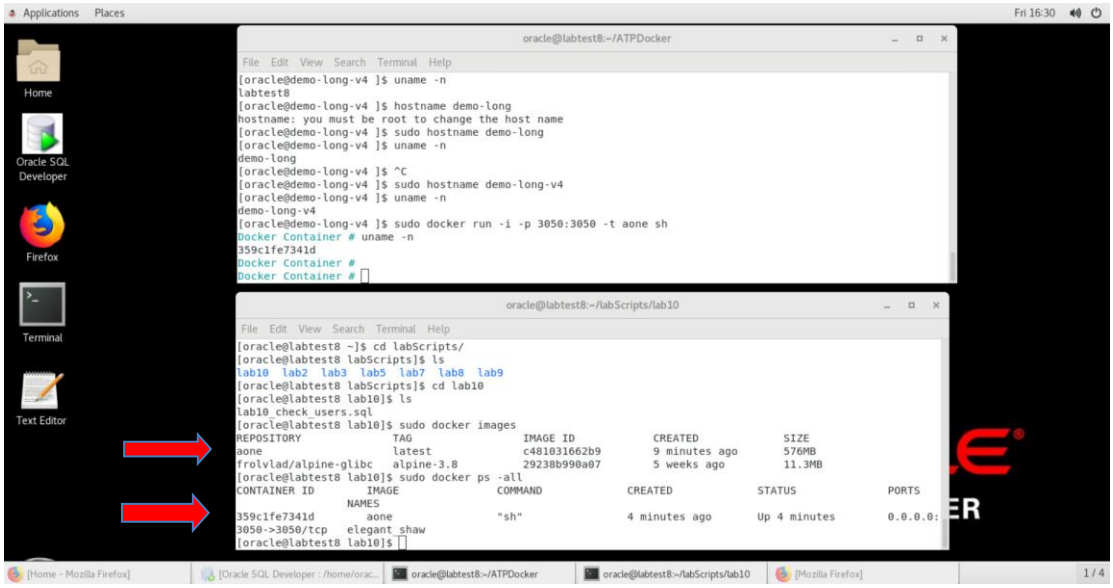
Different hostname

Different prompt

Open a new terminal **window leaving the Docker image aone running** in the original terminal. In the new terminal window run the following commands to view your image information, and what Docker images are running.

You will see your **aone** image listed.

```
sudo docker images
sudo docker ps -all
```



Running the Node.js application in your Docker image

If you completed the previous Node.js lab the next set of steps should be familiar. At this point we have a running Docker image with all the components we manually installed and configured for the Node.js lab above. The next step is to configure the ATP database connection file (dbconfig.js) to contain your ATP connection information.

In the window with your running container (which is running the Bourne shell, command prompt including '#'), navigate to the directory that has the config file. You will need to know vi or another form of editing in Linux to update the file.

```
cd /opt/oracle/lib/ATPDocker/aone/scripts
vi dbconfig.js
```

```
/opt/oracle/lib # cd /opt/oracle/lib/ATPDocker/aone/scripts
/opt/oracle/lib/ATPDocker/aone/scripts # vi dbconfig.js
```

The file should contain your database information, below is the information for this demo database (replace items in black with your information):

```
module.exports= {
user:"admin",
password:"ATPwelcome-1234",
connectString:"atpmeltrain01_high"
}
```

Once you configure this file you are ready to run the sample application provided. The node application creates a simple 'storefront' web page that pulls information from an ATP Database, and displays it on port 3050 of your web browser. To run the application, go to the directory where the application resides and run it with node:

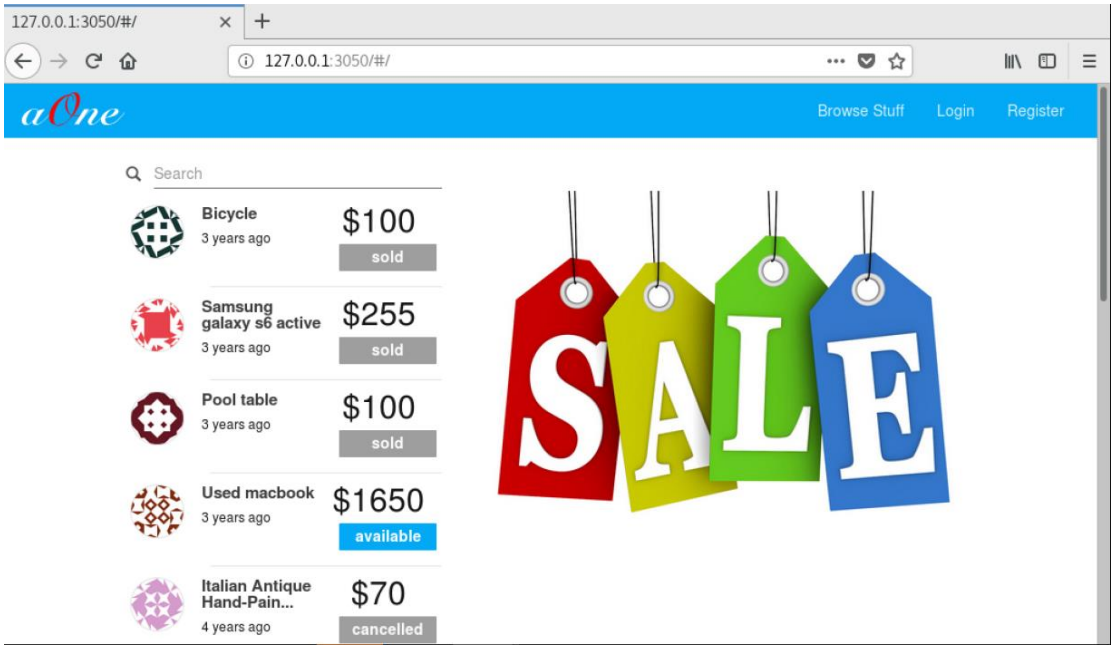
```
cd /opt/oracle/lib/ATPDocker/aone/
node server.js
```

```
[oracle@demo-long-v4 ]$ sudo docker run -i -p 3050:3050 -t aone sh
Docker Container # cd /opt/oracle/lib/ATPDocker/aone/scripts
Docker Container # vi dbconfig.js
Docker Container # cat dbconfig.js
module.exports= {
user:"admin",
password:"ATPwelcome-1234",
connectString :"melatptrain01_high"
}
Docker Container # cd /opt/oracle/lib/ATPDocker/aone
Docker Container # node server.js
aOne listening on port 3050
```

When the application is running you will notice an initial message indicating output on port 3050. Open a new browser window or tab and connect to:

http://localhost:3050/

You will see a website with information pulled from your ATP Database. Press any buttons and explore the app.



As you navigate the page you will see different information being pulled from the database displayed on your terminal window where you started the app. This is only informational output to show that database operations are occurring.

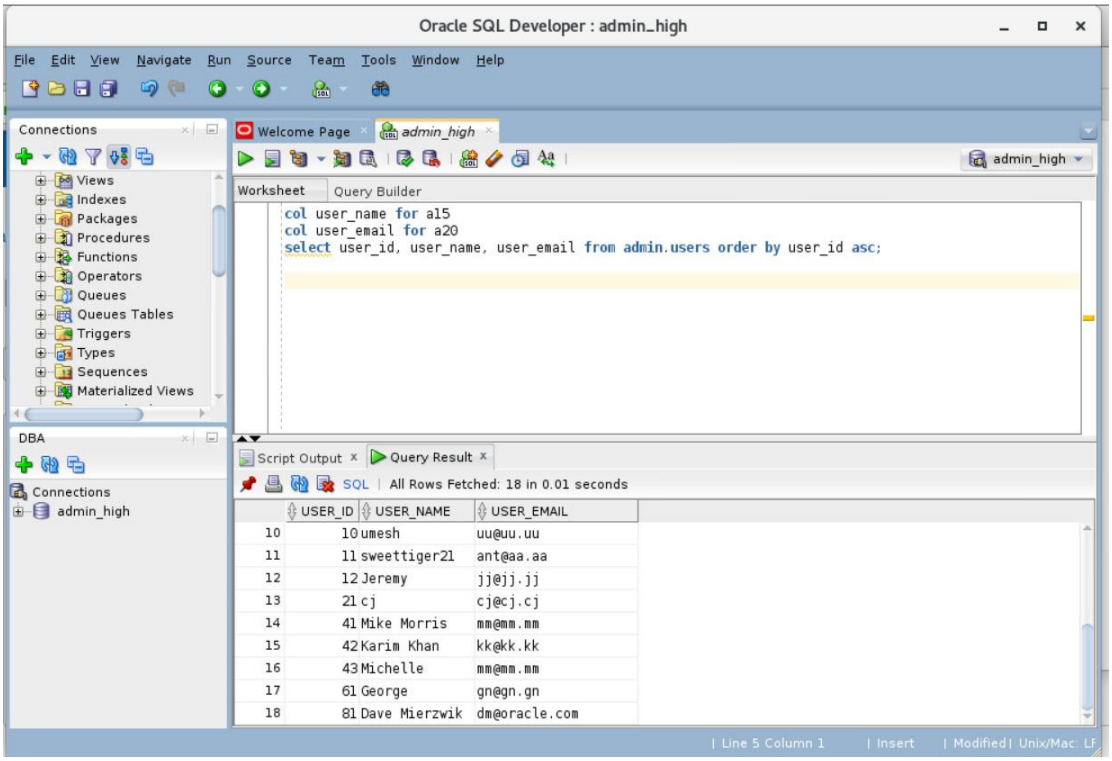
```
/opt/oracle/lib/ATPDocker/aone # node server.js
aOne listening on port 3050
[ { USER_NAME: 'Ashish',
    USER_GRAVATAR: 'https://www.gravatar.com/avatar/1cb1c39857f5eef49897f849251861a9.jpg?d=identicon',
    COMMENT_ID: 50,
    COMMENT_BY: 4,
    COMMENT_TEXT: 'HI, I am making an offer for this item. Hope it is in good condition. Offer subject to
    COMMENT_CREATE_DATE: 2015-07-13T00:00:00.000Z },
  { USER_NAME: 'Ashish',
    USER_GRAVATAR: 'https://www.gravatar.com/avatar/1cb1c39857f5eef49897f849251861a9.jpg?d=identicon',
    COMMENT_ID: 61,
    COMMENT_BY: 4,
    COMMENT_TEXT: 'Hey Im putting an offer for this. let me know',
    COMMENT_CREATE_DATE: 2015-07-20T00:00:00.000Z } ]
```

Optional – Prove that the application is using the ATP database for data storage

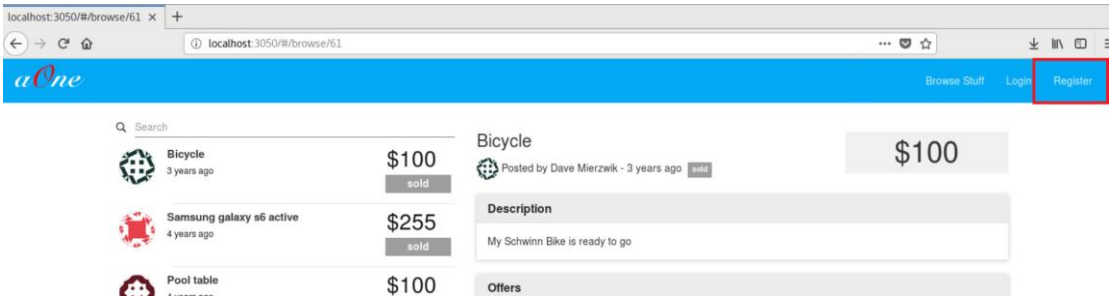
We are going to register a new user in the application and show the user in the database.

Check the current status of the registered users by starting SQL Developer, and connecting to your **admin_high** connection. Execute the SQL to list the registered application users. This sql can be found in the file **/home/oracle/labScripts/lab10/lab10_check_users.sql**

```
col user_name for a15
col user_email for a20
select user_id, user_name, user_email from admin.users order by
user_id asc;
```

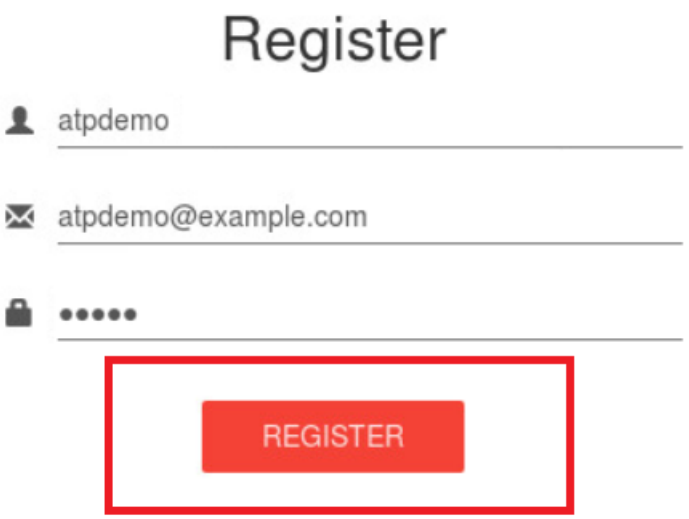


Note the number of rows returned and the highest value for USER_ID.
Select 'Register' in the top right-hand side of the application web page

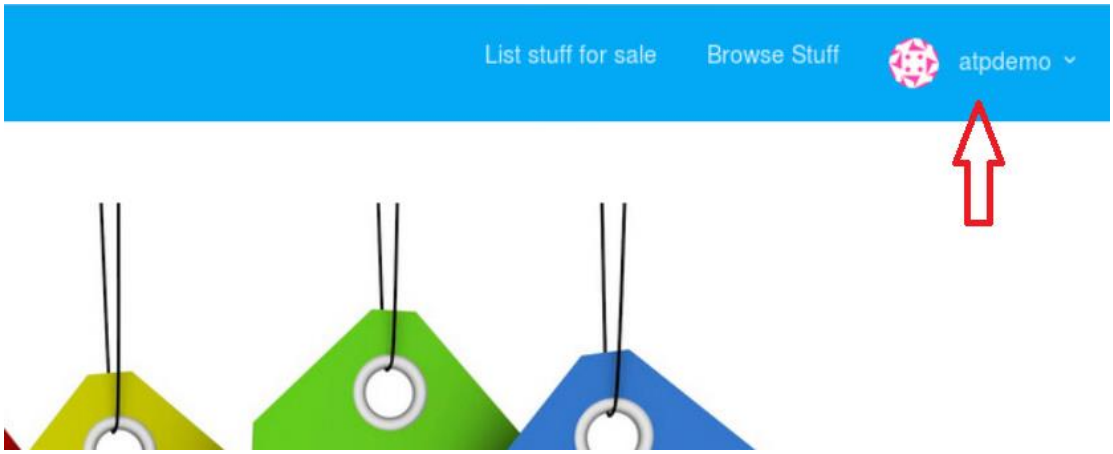


Complete the form and select 'Register'. As this application only does very basic data validation use the following sample data

Username: atpdemo
Email: atpdemo@example.com
Password: hello

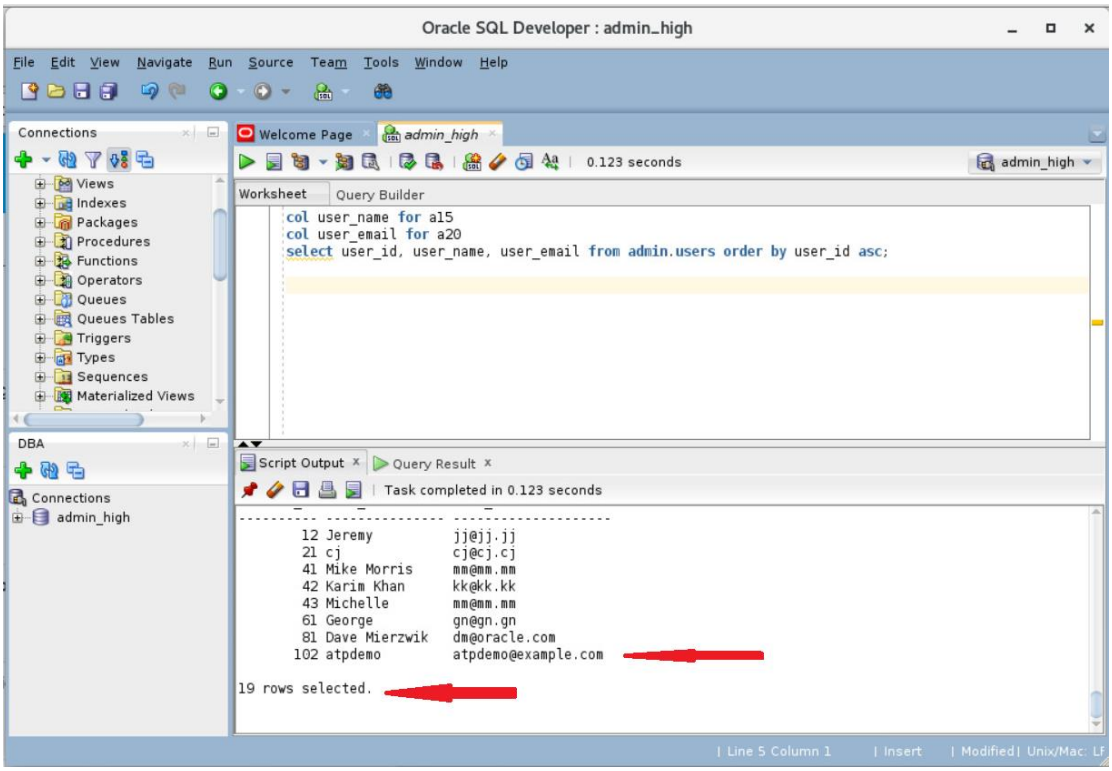


When you are returned to the store front page you will note that you are now logged in as the registered user **atpdemo**



Return to SQL Developer and execute the user query again using your **admin_high** connection.

```
col user_name for a15
col user_email for a20
select user_id, user_name, user_email from admin.users order by
user_id asc;
```



You should see that an additional row has been added to the USERS table for the user 'atpdemo'.

Creating and running your own customized Docker Container Image

Now that you have customized the Docker image, you can create your own container image based on the customizations you made. You can then take that image and publish it to run it on a Docker service without having to make any further customizations (for example, changing database parameters).

Open a new terminal and issue the command to list running docker containers, so you can find the CONTAINER_ID.

```
sudo docker ps -all
```

```
[oracle@demo-long ~]$ sudo docker ps -all
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS              PORTS                    NAMES
be69eb9cf89d        aone                "sh"                About an hour ago
Up About an hour    0.0.0.0:3050->3050/tcp   friendly_borg
[oracle@demo-long ~]$
```

To create an image of your running Docker container use the docker commit command. In this case we are going to commit changes from our running container

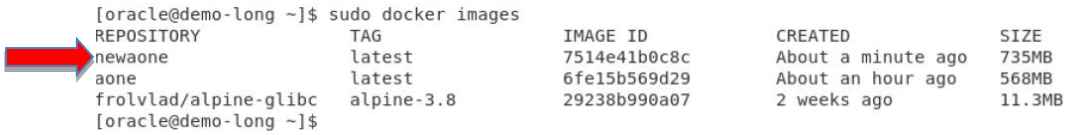
and create a new container with those changes. The Docker commit statement needs the CONTAINER ID (highlighted above), that is associated with the "aone" container we are currently running. Call the new container newaone, running the following command (replace the black id below with your CONTAINER_ID from the docker –ps all command).

```
sudo docker commit be69eb9cf89d newaone
```

```
[oracle@demo-long ~]$ sudo docker commit be69eb9cf89d newaone
sha256:7514e41b0c8ccb692db3e660a9983214e2b2eda34e3644e2c5cd75c7a62a570d
[oracle@demo-long ~]$
```

To verify the image created, run the command to list the docker images.

```
sudo docker images
```



Your "newaone" will be listed along with the original aone image. You have just created a Docker image.

Now run your new Docker image. As this image is configured to use the same ports as our original image, we need to stop the original image before we can successfully run this one.

Go back to the original window where you are running aone and hit <CTRL>C to stop the original image and completely exit the original Docker container by entering `exit`. Close the browser page you were using to display the application http://localhost:3050/.

```
Docker Container # node server.js
aOne listening on port 3050
^C
Docker Container # exit
[oracle@demo-long-v4 ]$
```

In the terminal where you ran the Docker commit statement start your new Docker image.

```
sudo docker run -i -p 3050:3050 -t newaone sh
```

Once in the image go to the scripts directory. Notice that in the new image the directories are still the same structure, but you no longer have to edit the dbconfig.js file, as that change was committed to our new image.

Go to scripts directory

```
cd /opt/oracle/lib/ATPDocker/aone/scripts
```

Verify changes made to dbconfig.js in aone image were saved
```
cat dbconfig.js
```

Go to aone directory where the node application resides
```
cd /opt/oracle/lib/ATPDocker/aone/
```

Run node application

```
node server.js
```

```
[oracle@labtest8 lab10]$ sudo docker run -i -p 3050:3050 -t newaone sh
Docker Container # cd /opt/oracle/lib/ATPDocker/aone/scripts
Docker Container # cat dbconfig.js
module.exports= {
user:"admin",
password:"ATPwelcome-1234",
connectString :"melatptrain01_high"
}
Docker Container # cd /opt/oracle/lib/ATPDocker/aone/
Docker Container # node server.js
aOne listening on port 3050
```

Open a new web browser window or tab and go to: `http://localhost:3050/`

You will see the application in the window, executing from your new container.

When you have finished with the Lab, hit Ctrl-C on your terminal window to end the application.

Optional – Clean your Docker environment.

Once you have completed with this lab, you can clean up your docker environment. The following commands can be run from the terminal window. This will maintain your Docker installation, but remove any images created. You can always recreate the images above by starting at the docker build command.

```
sudo docker image prune
sudo docker container prune
sudo docker volume prune
sudo docker network prune
```

Congratulations, you have completed the Docker lab. You created a Docker container image and implemented a Node.js application within that container which accessed an ATP database. You have created a container from a generic image downloaded from a library and customized it to use your own ATP database credentials. You created a new Docker image using this customised container. This image could be deployed on any Docker container service and access the ATP cloud database from any internet connected location.

Want to Learn More?

Recommended Reading

- Autonomous Transaction Processing Made Easy (eBook)

Additional Resources

- Additional Resources: https://cloud.oracle.com/en_US/atp/additional-resources
- Demos and Videos: **https://cloud.oracle.com/en_US/atp/videos**
- **Oracle Autonomous Transaction Processing Documentation**
- Join the Autonomous Transaction Processing forum.
- Getting Started with Oracle Cloud

https://docs.oracle.com/en/cloud/paas/atp-cloud/atpug/load-data.html

Appendix

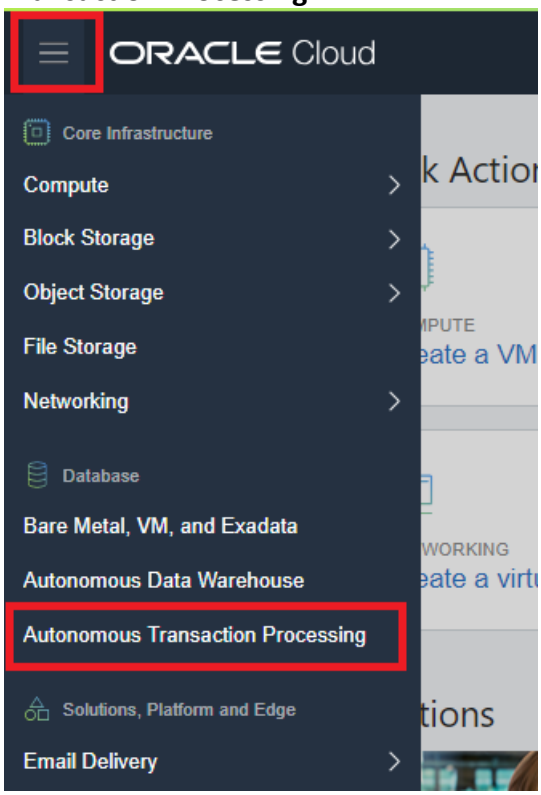
Appendix A – Provisioning Process Walkthrough

This is a walkthrough of the process used to create an ATP instance. This was demonstrated live during your lab session.

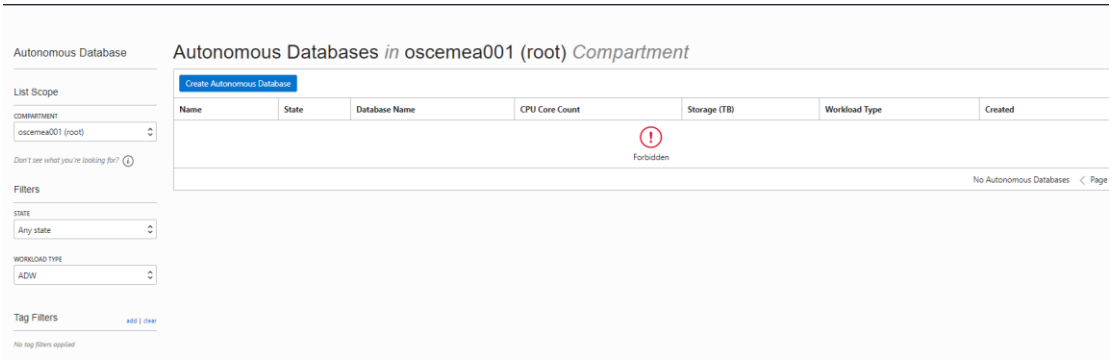
Creating your Autonomous Transaction Processing Database

Click on the **MENU** link at the top left of the page.

This will produce a drop-down menu, where you should select "**Autonomous Transaction Processing"**

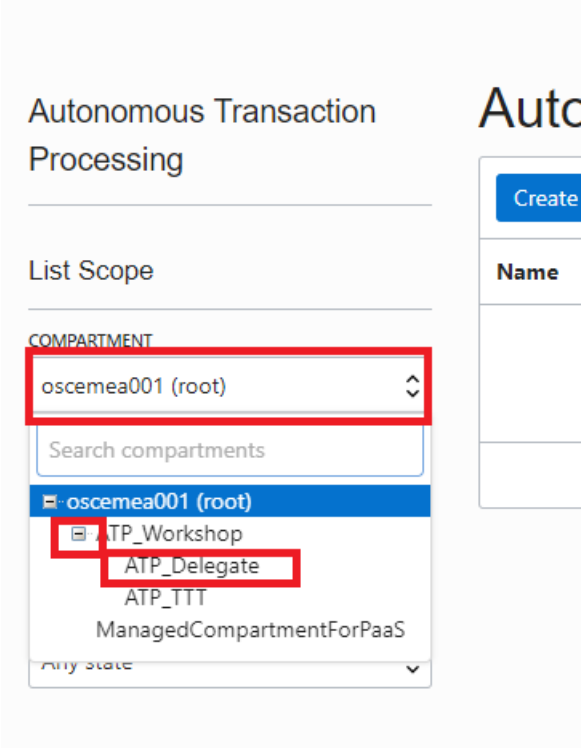


This will take you to the management console page for ATP in the root compartment of the tenancy. The red warning icon "**Forbidden**" indicates that the Policies within the tenancy does not allow your user to create ATP Instances in the root compartment.



To begin the process of creating your ATP instance in this tenancy you need to select a compartment.

Click on the pulldown menu marked **Compartment**. Expand the menu under ATP_Workshop by clicking the **'+'.** Select the "**ATP_Delegate**" compartment.

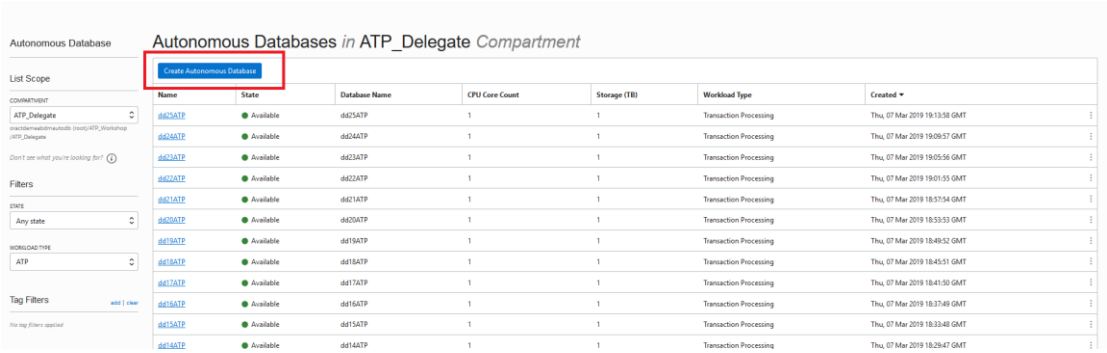


Note – Your list of compartments may be different to the one shown above. In these lab notes we will use the compartment called ATP_Delegate in all the screenshots

The main page will now change to show the list of ATP instances within your compartment, as shown below:

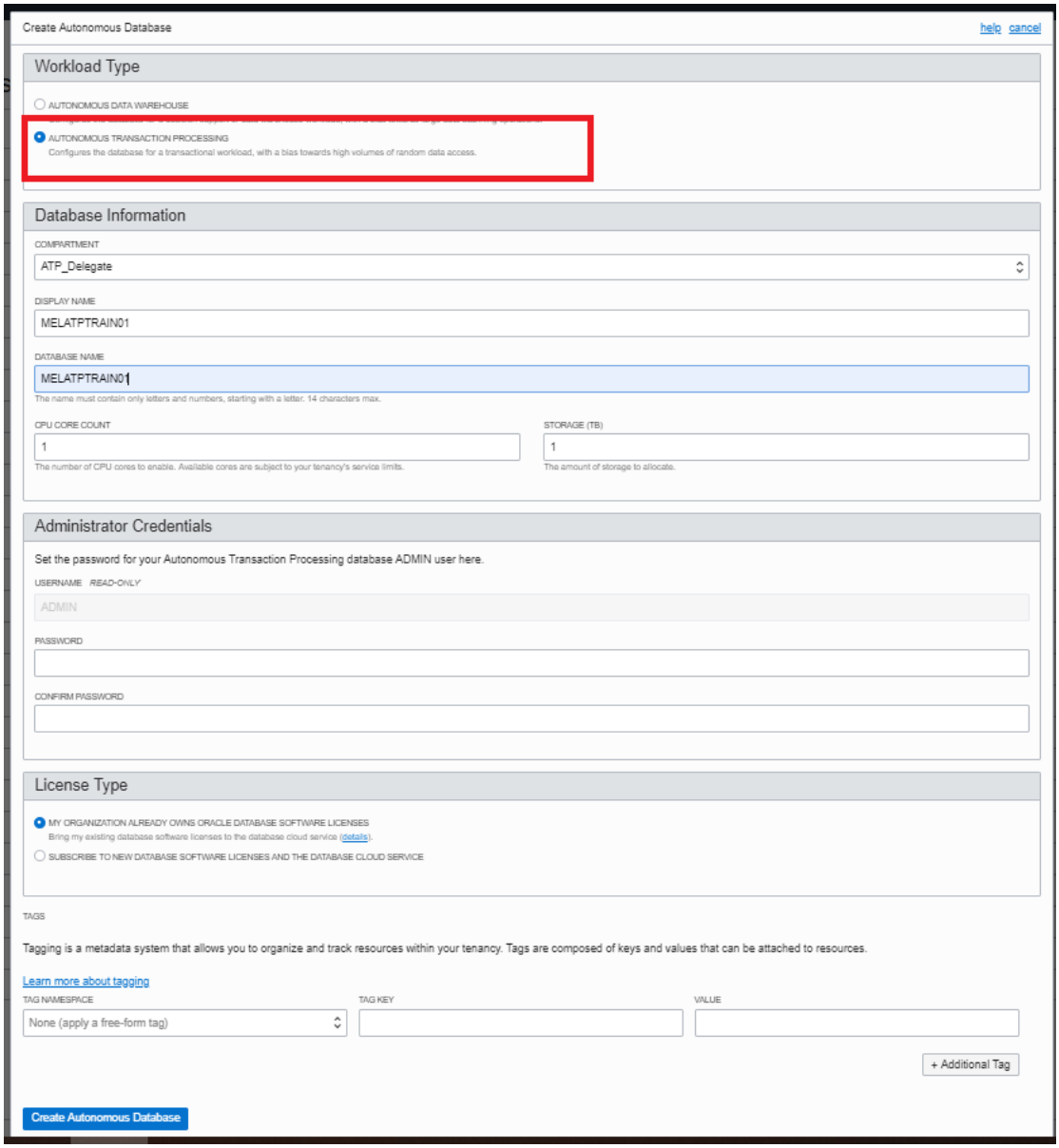
Note: this lab uses the same tenancy and compartment for all lab attendees, therefore, it is possible that you may see ATP instances listed on this page which have already been created by other users attending this lab.

To create a new instance, click the blue "**Create Autonomous Database**" button.

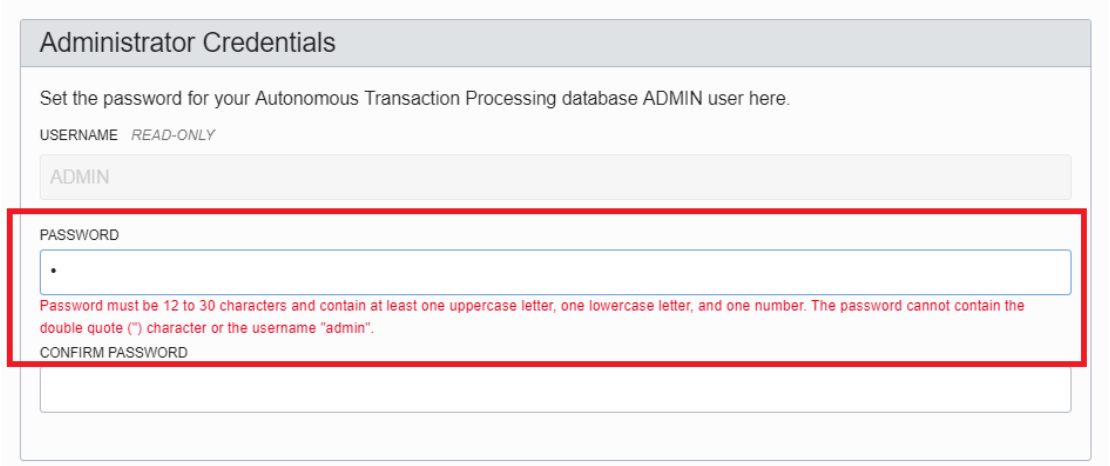


Enter the required information and click the **"Create Autonomous Transaction Processing Database**" button at the bottom of the form. For the purposes of this lab, use the information below:

Workload Type: Autonomous Transaction Processing
Compartment: Verify that the **ATP_Delegate** compartment is selected. You will not be able to create instances outside this compartment due to Identity Management policies.
Display Name: Enter the display name for your ATP Instance. (Hint- use your username so you can identify your instance more easily)
Database Name: Enter any database name you choose that fits the requirements for ATP. The database name must consist of letters and numbers only, starting with a letter. The maximum length is 14 characters. (Hint- use your username so you can identify your instance more easily)
CPU Count: 1
Storage Capacity (TB): 1
Administrator Password: Enter any password you wish to use noting the specific requirements imposed by ATP. A suggested password for this lab is ATPwelcome-1234

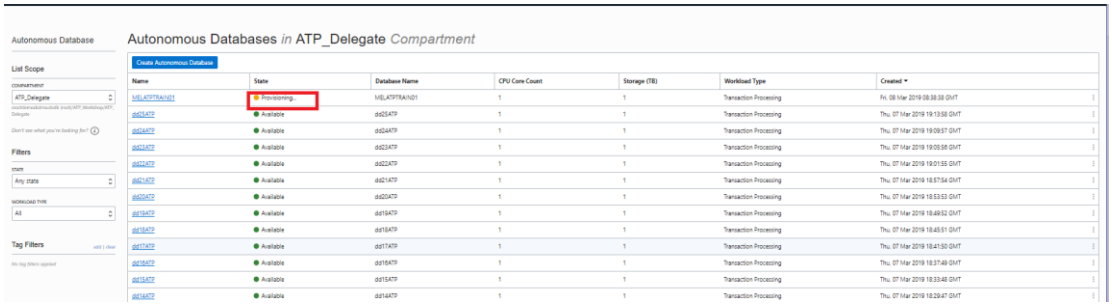


When you enter the administrator password, note the specific requirements imposed by ATP:

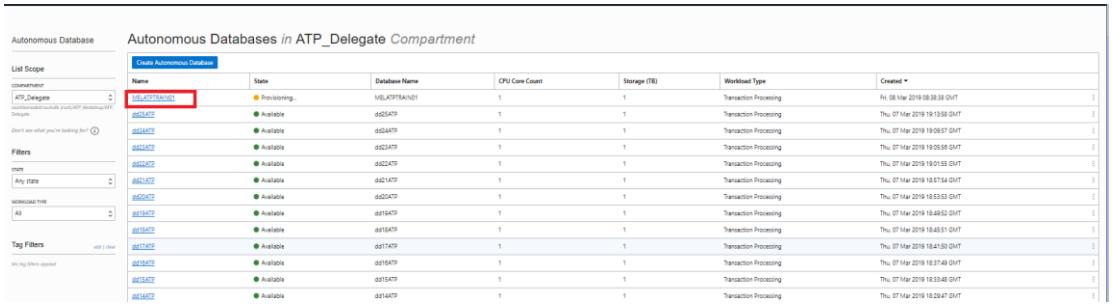


When you have completed the required fields, scroll down and click on the blue **Create Autonomous Database** button at the bottom of the form:

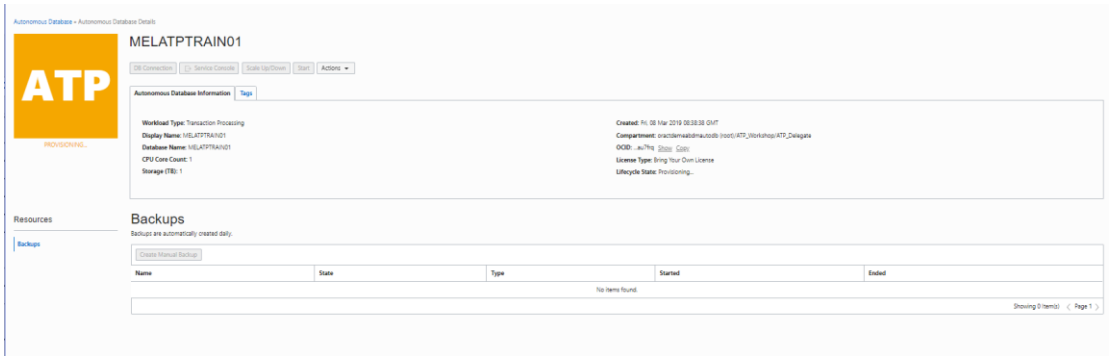
The console page will display the message "**Provisioning**" under the "State" column.



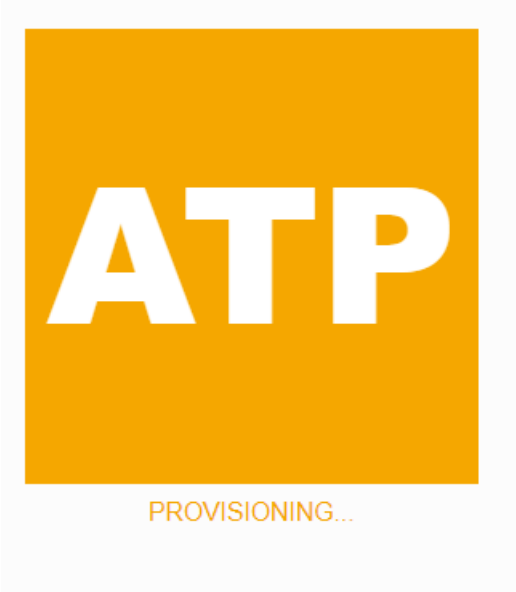
Click on the name of your ATP instance, as shown below



This will display more information about your instance and you should notice the various menu buttons that help you manage your new instance – because the instance is currently being provisioned all the management buttons are grayed out.

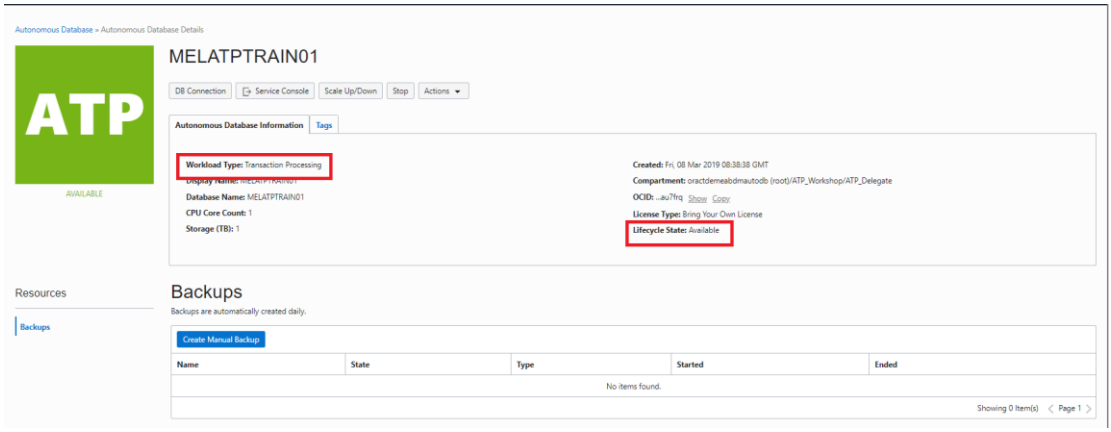


A summary of your instance status is shown in the large box on the left. In this example, the color is amber and the status is **Provisioning**



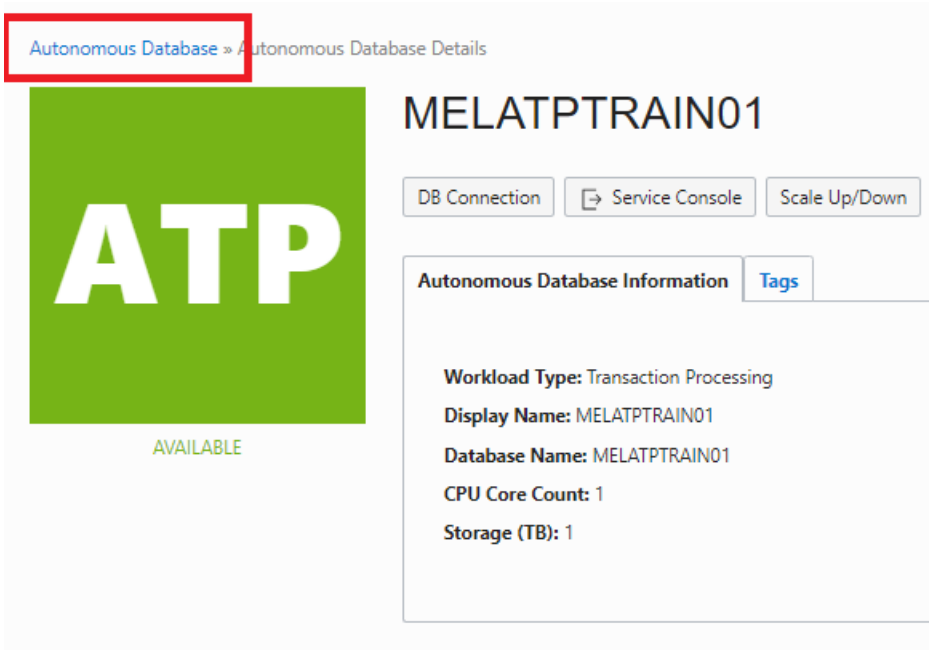
After a short while the status will change to **Available** and the "ATP" box will change color to green:

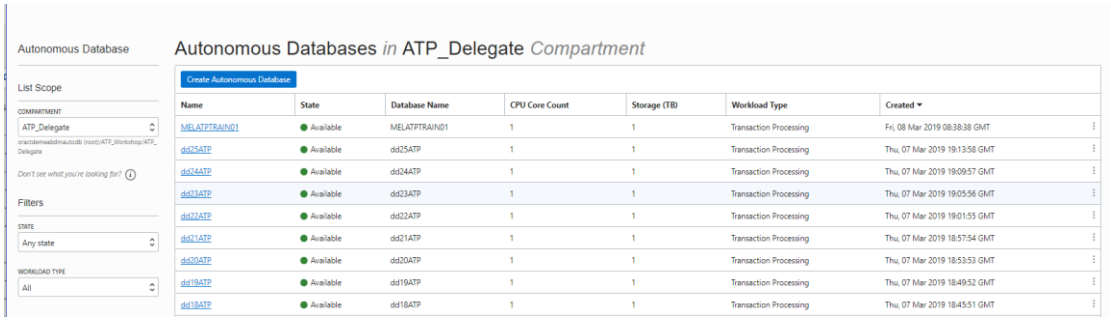
Once the Lifecycle Status is **Available**, additional summary information about your instance is populated, including the workload type. You can also see the Lifecycle Status reported in this region.



Congratulations you have created your first ATP instance!

Return to the main page which list all your ATP instances by clicking on the Autonomous Database link at the top of the page:





You are now ready to start Lab 2.

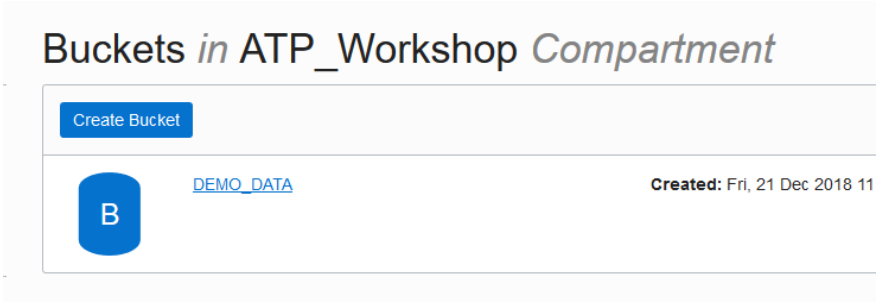
Appendix B – Creating and preparing a user to access Object Storage

Information about how the environment was prepared

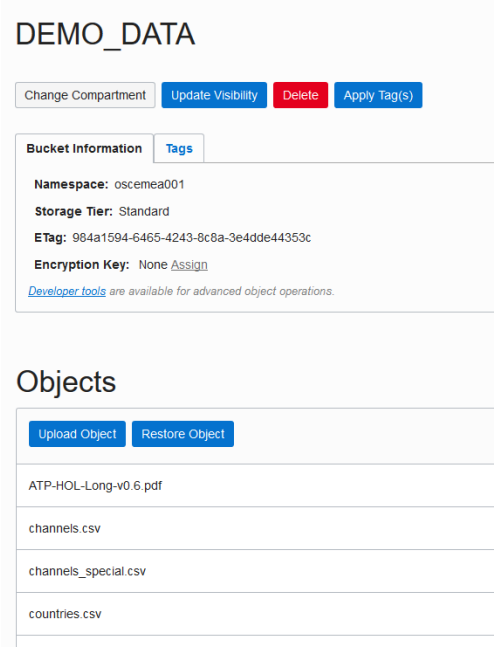
To load data from the Oracle Cloud Infrastructure Object Storage you will need a Cloud user with the appropriate privileges to read data from the Object Store. The communication between the database and the object store relies on the Swift protocol and a username/password authentication token.

This is an outline of the steps that your instructor carried out – your lab user does not have permission to do these operations, or to see all of the referenced objects.

Select/Create your object storage bucket.

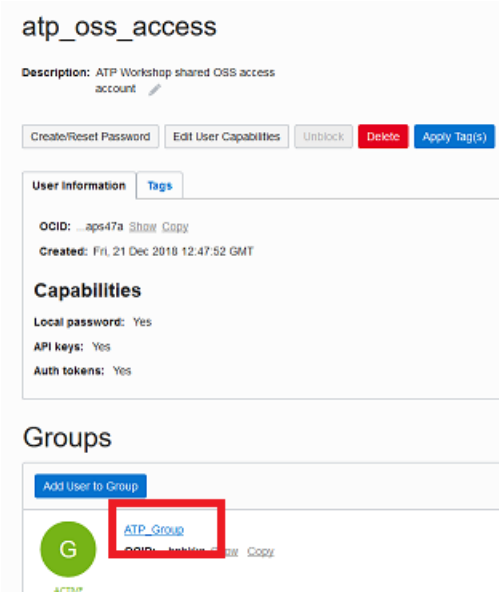


Upload the files to the object storage bucket.

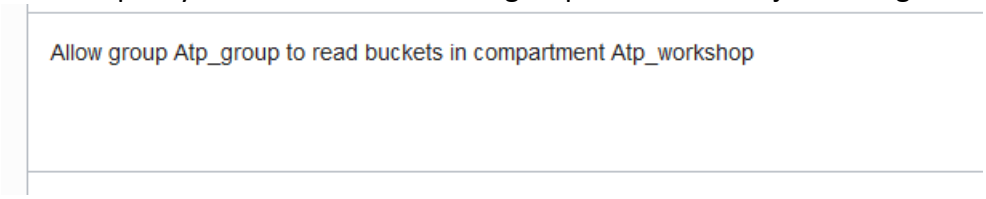


Construct the URL that points to the location of the file staged in the OCI Object Storage. The URL is structured as follows
https://swiftobjectstorage.<region_name>.oraclecloud.com/v1/<tenant_name>/<bucket_name>/<file_name>

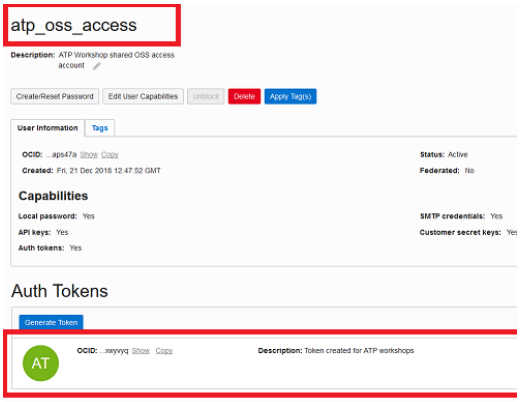
Create a user, in this example, 'atp_oss_access' and associate the user with a group.



Create a policy statement to allow the group to read the object storage bucket.



Create an Authentication Token (Auth Token) for this user. Make a note of it as you are only told this information once.



To access data in the Object Store you must enable your database user to authenticate itself with the Object Store using your object store account and Auth Token.

You do this by creating a private CREDENTIAL object for your user that stores this information encrypted in your ATP instance using the DBMS_CLOUD package. This encrypted connection information is only usable by your user schema.

```
set define off
begin
  DBMS_CLOUD.create_credential(
    credential_name => 'OBJ_STORE_CRED',
    username => 'atp_oss_access',
    password => '2Qn8uD}D-5fyAw6cZ9QO'
  );
end;
/
```

Appendix C – Connecting to the database using Oracle Machine Learning Notebook

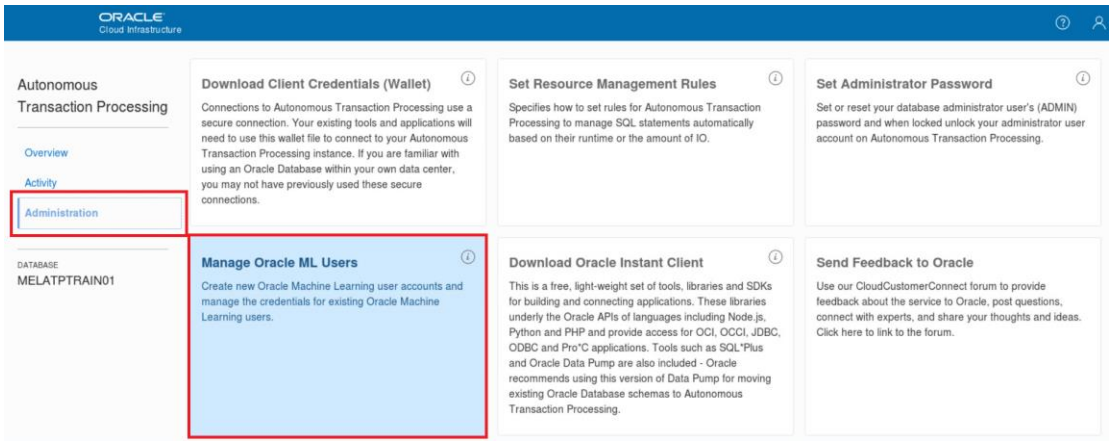
You can use the included Oracle Machine Learning OML Notebook based environment to connect to your ATP environment. OML is a browser-based environment, and so provides an easy to connect and fast environment to work with ATP. It can be used to run SQL queries and scripts, which can then be grouped together within a notebook. Notebooks can be used to build single reports, collections of reports and dashboards, and notebooks can be shared with other users.

Creating an OML user

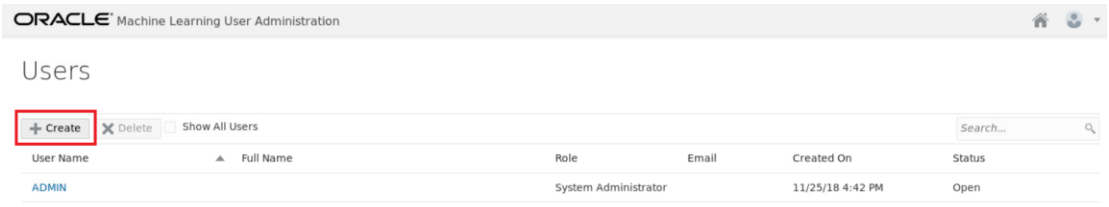
The OML Notebook requires you to create a user, as the ATP instance admin user is prohibited from creating notebooks and jobs.

Return to your Firefox window and open your ATP instance service console.

Select **Administration** and **Manage Oracle ML Users**

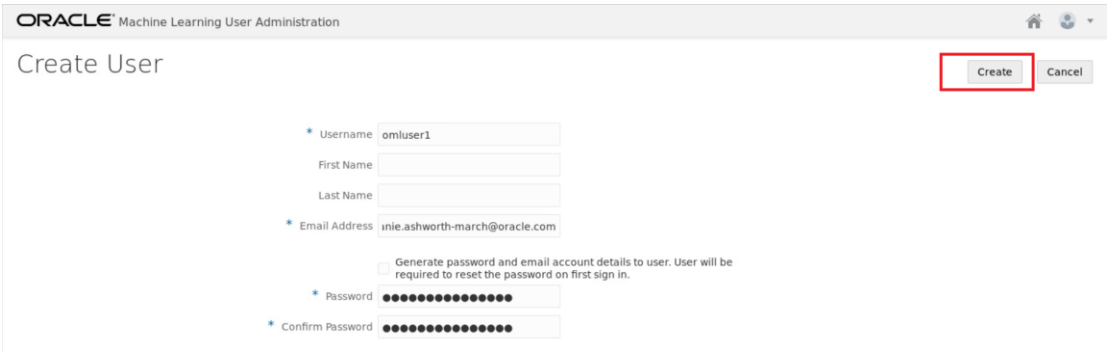


You will now see the User management page. Select **Create** to create your new user.

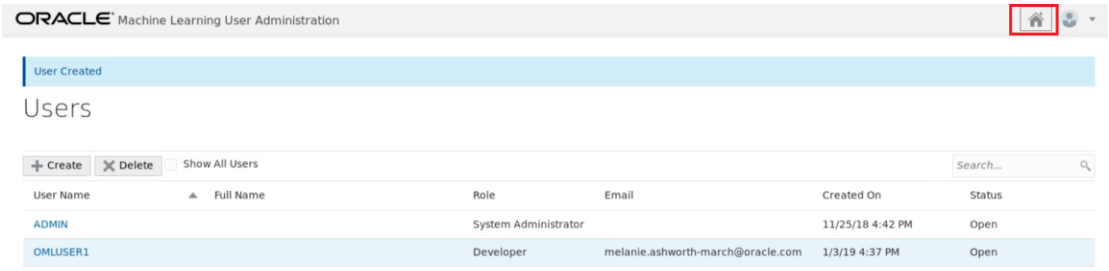


Enter the required information and click **Create.** For the purposes of this lab, use the information below:

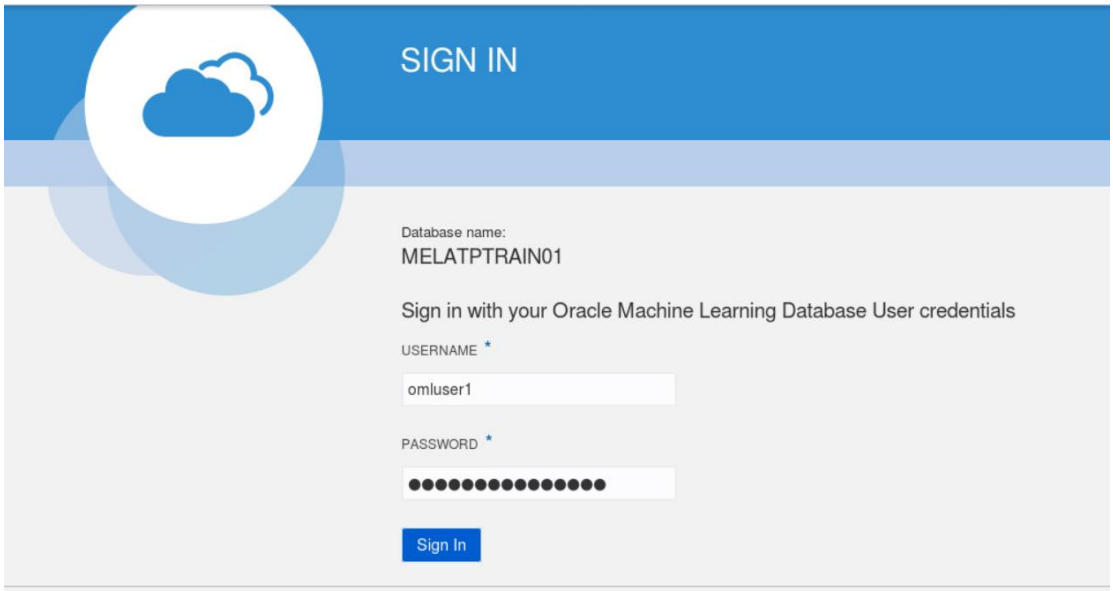
Username: *omluser1*
Email Address: Enter a valid email address
Uncheck the generate password button. You can optionally have a secure password emailed to the email address and then reset it on first login. As access to your email is not guaranteed, to speed up this lab we are going to manually enter a password.
Password: Enter any password you wish to use noting the specific requirements imposed by ATP. A suggested password for this lab is ATPwelcome-1234



Connect as your new OML user by selecting the Home Icon (shaped like a house) on the Users screen



This will open a new browser tab. Sign in as **omluser1**



You are now connected as an OML Notebook user.

Now we will use the OML SQL Scripts function to run the same simple query we ran in SQL Developer.

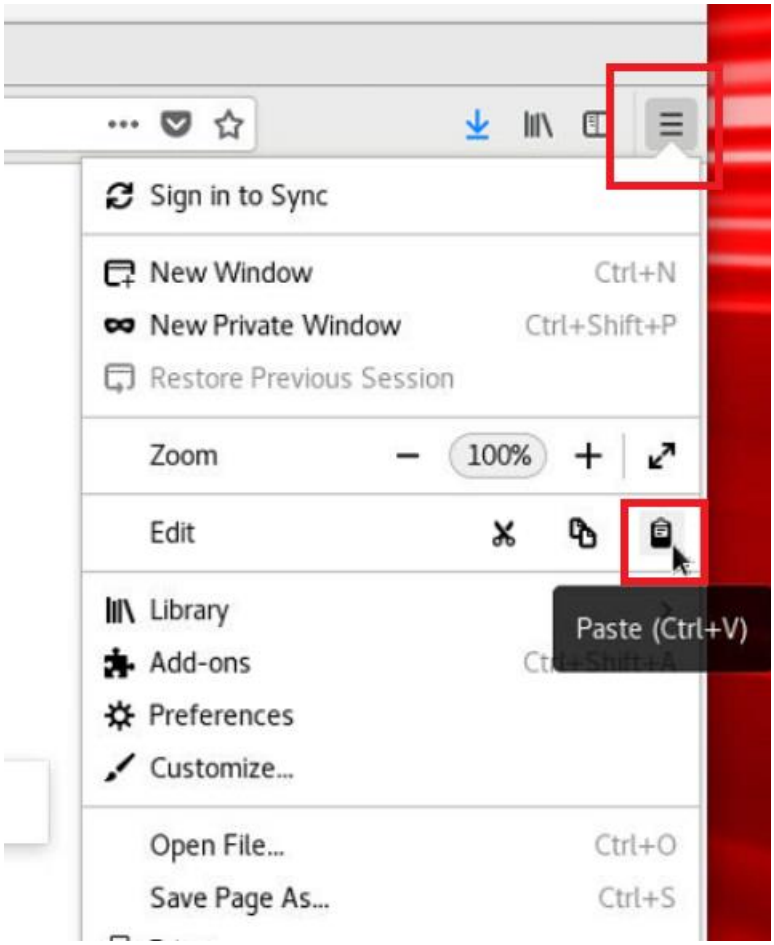
Select **Run SQL Scripts** to open the SQL Script Scratchpad.

Note: As this is the first time the Notebook Server has been started in this ATP instance, sometimes it will fail to start first time with the message 'Notebook server not available, please try again at a later time' Just try the Run SQL Scripts button again and it should start successfully.

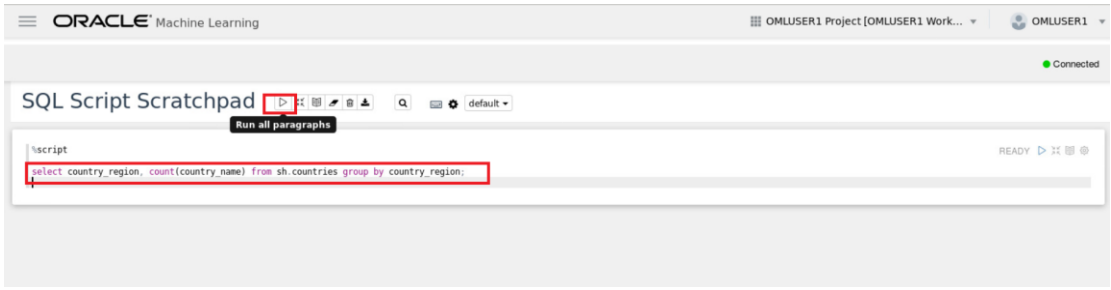
Copy this SQL statement and paste it in the gray SQL script box.

```
select country_region, count(country_name) from sh.countries group by
country_region;
```

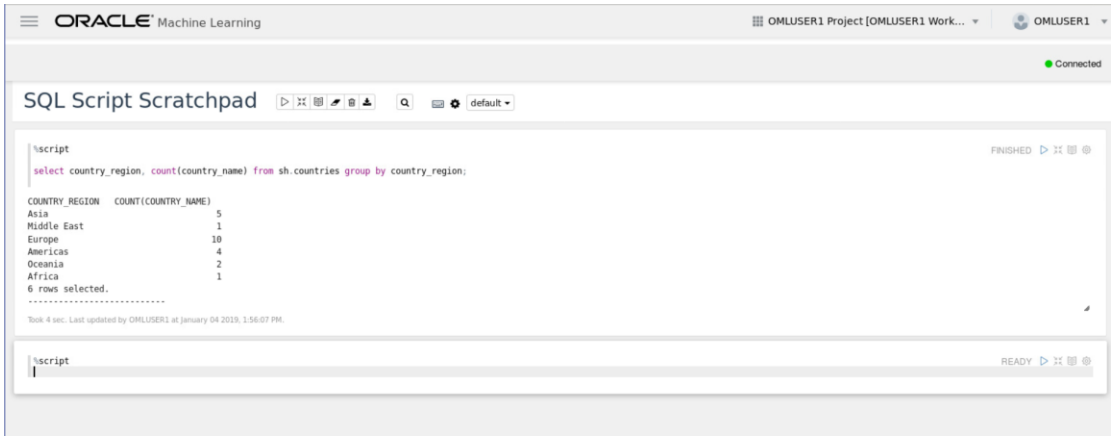
If you are having a problem pasting data into Firefox there is a 'Paste' menu item in the Firefox Menu.



Select the **Run all Paragraphs** icon to execute the script.



Select **ok** on the **Run all paragraphs** confirmation screen. The results of the query will be displayed.



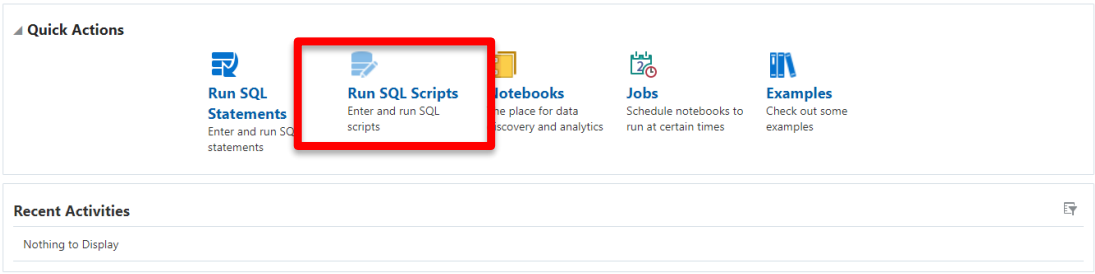
You have successfully connected and run an operation against ATP with Oracle OML.

Selecting the Service in OML

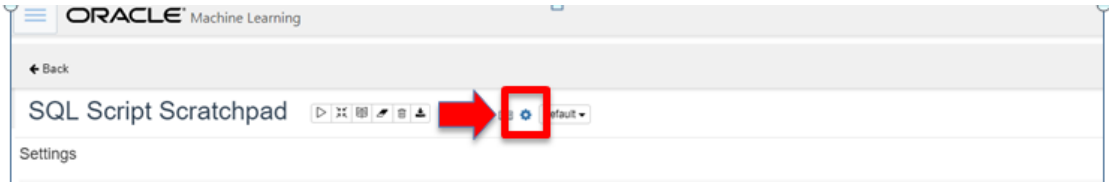
OML makes it easier to do this because Notebooks automatically "see" all services available in the instance. Notebooks also allow re-running the same query multiple times without having to make any changes or re-posting the query.

Your OML session should still be open from the previous section, if not connect to OML as your omluser1 session.

If not already in **Run SQL Scripts,** select it from Quick Actions:



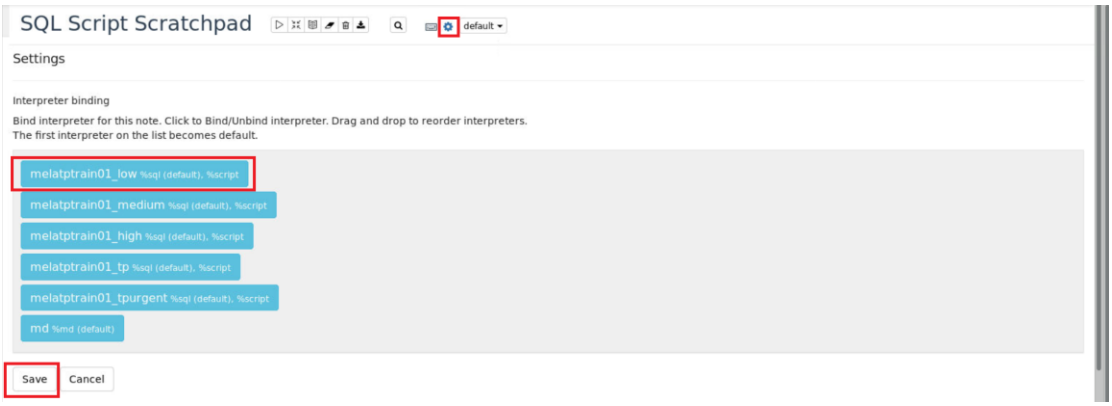
Before running a query, explore the different services that can be used to run the query by selecting the **Interpreter binding** button (next to the **default** drop down button) which as shown below:



A new pane opens listing all the services available to run queries. You will see the five services already discussed previously and a new one specific to OML (md). The services are selected in list order, with the service at the top of the list being tried first. OML will try to connect to each selected service in order, and will then execute the SQL against the first successfully connected service.

The first time you run a query against a service, OML will establish a database connection. This will be reflected in the total execution time, which could include several additional seconds for the new connection. With a short query this will substantially add to the total execution time.

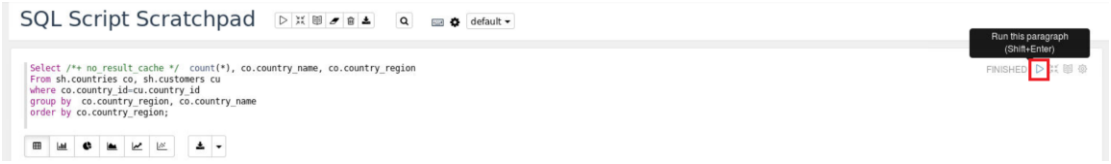
A blue color indicates the service is selected and will be tried, if you click on any of the services it will turn white, which de-selects it. You can drag and drop any service up or down the list to specify the order in which they will be attempted.
For the first test we will use the **_LOW** service. If it is not at the top of the list, drag and drop it to the top of the list. Select **Save** when done.



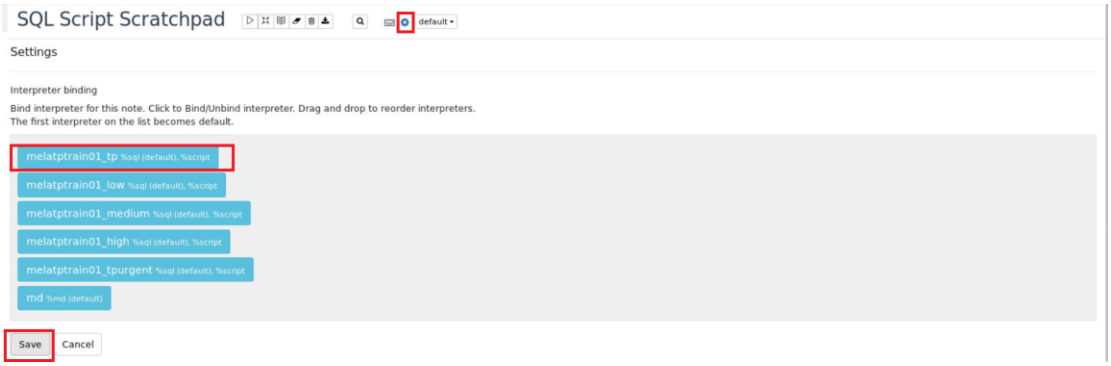
Paste this query into OML. The sql can be found in the file
/home/oracle/labScripts/lab2/lab2_oml_countries.sql

```
Select /*+ no_result_cache */  count(*), co.country_name,
co.country_region
From sh.countries co, sh.customers cu
where co.country_id=cu.country_id
group by  co.country_region, co.country_name
order by co.country_region;
```

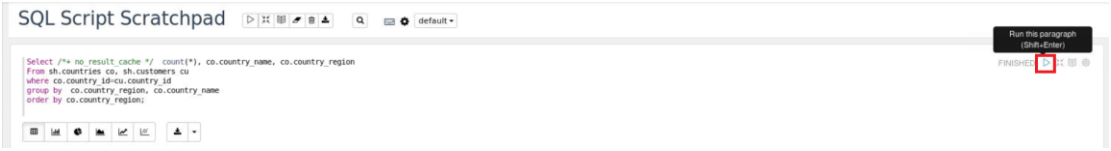
Now run the query by selecting the **Run This Paragraph** button



Now run the query in the **_tp** service. Follow the steps above for changing the service by selecting the **Interpreter binding** button and when the list of services appears drag the **_tp** service to the top and **Save:**



Now run the exact same query as before by selecting the **Run This Paragraph** button. As this is the first connection to the _tp service the elapsed run time for this SQL will be slower, and it will include the time taken to make the initial connection.



The number of CPUs assigned to your instance, the other workloads running and the amount of parallelization that your query requires will affect how much impact selecting the different built in services has on your query run time.

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