Connecting Microsoft Power BI Desktop to
Oracle Autonomous Databases and On-premises Databases

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This step-by-step tutorial guides how to configure Microsoft Power BI Desktop connectivity to Oracle Autonomous Database (ADB) and on-premises databases.

These instructions use unmanaged Oracle Data Provider for .NET (ODP.NET) for data access as required by Power BI Desktop. They work for on-premises database and both dedicated and shared infrastructure ADB. The instructions for on-premises databases setup also apply to Oracle Database Cloud Services and Oracle Exadata Cloud Service.

Overview

These are the general steps to setup Oracle database connectivity with Microsoft Power BI Desktop:
- Provision Oracle database or ADB
- Download database credentials to Windows client
- Install Power BI on Windows client
- Install and configure ODP.NET on Windows client
- Validate Power BI connects to Oracle database or ADB

Prerequisites

This document assumes that an on-premises Oracle database or ADB, such as Autonomous Data Warehouse (ADW) or Autonomous Transaction Processing (ATP), or Autonomous JSON Database (AJD) has been provisioned and Power BI Desktop is installed on a Windows machine. The Windows machine can be on-premises or in the cloud, such as Oracle Cloud Infrastructure or Azure.

Connecting to Oracle databases on-premises and ADB are similar. This tutorial will note the differences between them when setting up Power BI connectivity.

If using ADB, you will need access to the Oracle Cloud Console that has access to your ADB instance. Below is a screenshot from the cloud console to a database named ADWPTR.
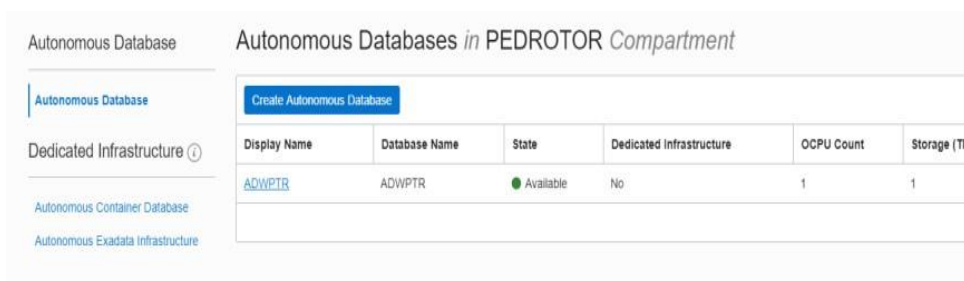
Power BI Desktop uses unmanaged ODP.NET (Oracle.DataAccess.Client) for Oracle database connectivity. This tutorial was tested with Power BI's June 2022 version using ODP.NET, Unmanaged Driver, 19.15.

## Installation and Setup Steps

1. For <u>ADB</u>, go to the cloud console screen for the ADB instance you will connect to. Start your ADB instance. Click on the "DB Connection" button. Download the corresponding ADB credentials zip file to the system that has Power BI Desktop installed. These credential files (*cwallet.sso*, *tnsnames.ora*, and *sqlnet.ora*) will be used to connect Power BI Desktop to ADB.
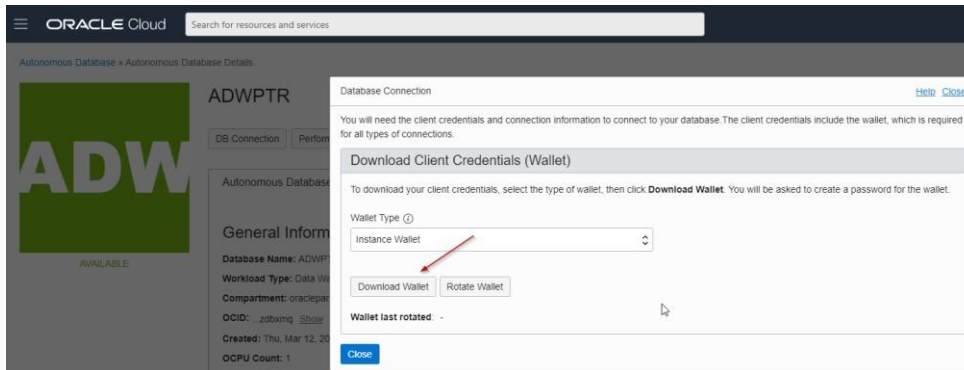
   For <u>on-premises databases</u>, the credential files required will depend on your database server setup. Typically, ODP.NET requires tnsnames.ora and sqlnet.ora to be accessible to connect to the database server. These files can be copied from another Oracle database client that connects to the target database server.

   Alternatively, an Easy Connect or Easy Connect Plus string can be used in lieu of credential files for on-premises databases. For example, the Power BI Desktop "Server" configuration setting can accept an Easy Connect string with the following format: "<DB hostname>:<Port>/<Service Name>". If you use Easy Connect (Plus), you can skip the credential file downloading and setup steps in this tutorial.

2. Place the Oracle ADB or DB credentials on your Windows machine into a directory (e.g. C:\data\wallet). This machine is where Power BI Desktop is or will be installed on. For ADB, the credentials have been downloaded into a zip file that you will unzip into this directory. Note the directory location for use in upcoming steps.
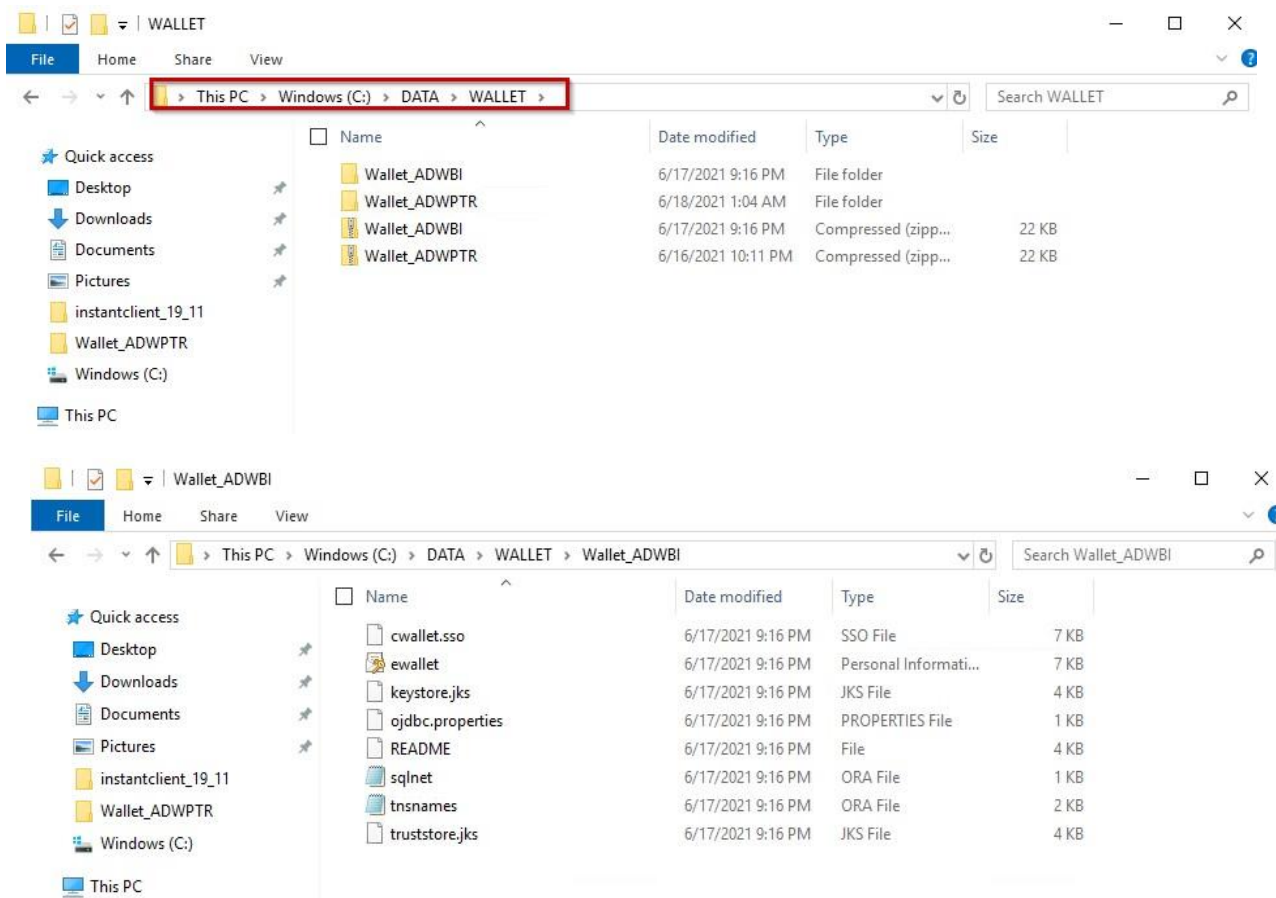
3. <u>ADB only</u>
   If you are connecting to **one ADB instance**, open the *sqlnet.ora* configuration file in the credentials directory in a text editor. You will see the following line:
   WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA = (DIRECTORY="?/network/admin")))

   Set the DIRECTORY value to the ADB wallet directory location, such as:

   WALLET_LOCATION = (SOURCE = (METHOD = file) (METHOD_DATA = (DIRECTORY=C:\DATA\WALLET\)))

   If you are connecting to **multiple ADBs** from the same machine with a different wallet for each, add the parameter MY_WALLET_DIRECTORY to each connect descriptor's specific wallet location in *tnsnames.ora*. For example:

   adwptr_high = (description=(retry_count=20)(retry_delay=3)(address=(protocol=tcps)(port=1522)
   (host=<host name>)) (connect_data=(service_name=<service name>))
   (security=(ssl_server_cert_dn="CN=adwc.uscom-east-1.oraclecloud.com, OU=Oracle BMCS US, O=Oracle
   Corporation, L=Redwood City, ST=California, C=US")(MY_WALLET_DIRECTORY=C:\DATA\WALLET\ADWPTR)))

   adwbi_high = (description=(retry_count=20)(retry_delay=3)(address=(protocol=tcps)(port=1522)

(host=<host name>))(connect_data=(service_name=<service name>))
(security=(ssl_server_cert_dn="CN=adwc.uscom-east-1.oraclecloud.com, OU=Oracle BMCS US, O=Oracle
Corporation,L=Redwood City, ST=California, C=US")(MY_WALLET_DIRECTORY=C:\DATA\WALLET\ADWBI)))

After making your changes, save the file.

4. Let's determine whether you are using 32-bit or 64-bit Power BI Desktop. The bitness of Power BI
Desktop and ODP.NET must match, meaning they both must be 32-bit or both 64-bit. In Windows, start
Power BI Desktop. On the menu, select Help > About to see a window similar to the following:
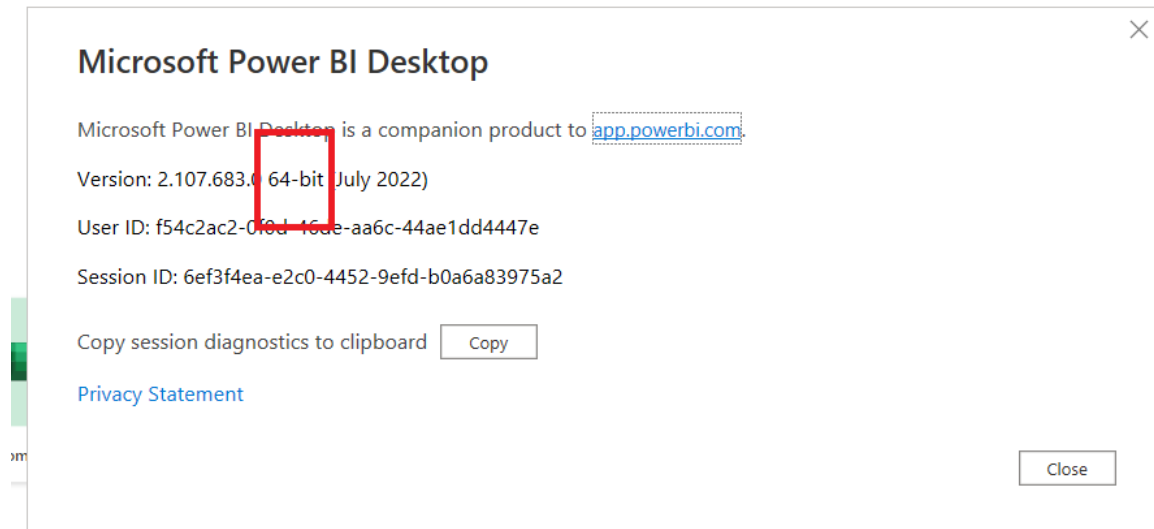
In the above screen shot, we see that it is 64-bit Power BI Desktop. That means 64-bit unmanaged
ODP.NET must be installed and configured for Power BI to connect to an Oracle Database. If 32-bit Power
BI Desktop was being used, then 32-bit unmanaged ODP.NET would be required.

Unmanaged ODP.NET download is part of the Oracle Data Access Components (ODAC), which can be
downloaded for free from the Oracle website.

5. From the **XCopy ODAC Packages** section on the bottom half of the ODAC Download page, click on the
"ODAC 19c (32-bit and 64-bit)" link. Do not use ODAC 21c versions currently.

Download the XCopy packages below. Unzip the package and read the included installation instructions and README.

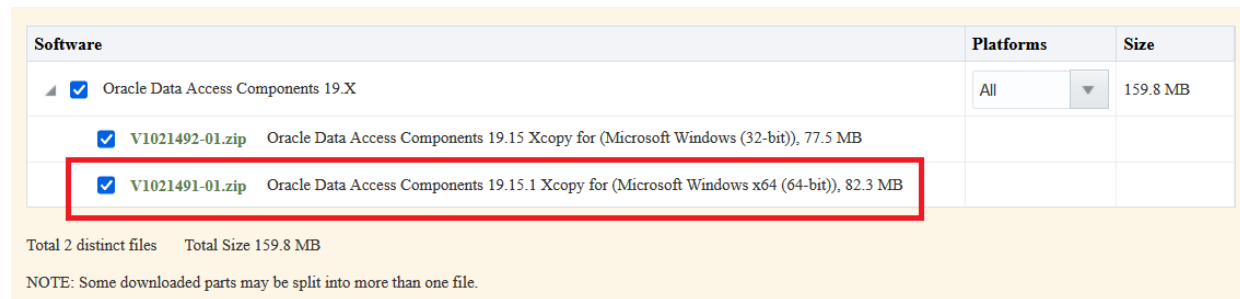Each of these downloads requires the Visual C++ Redistributable for Visual Studio 2015-2022 or later:

⬇ ODAC 21c (32-bit and 64-bit)

⬇ ODAC 19c (32-bit and 64-bit)

Additional Releases

Download older ODAC Oracle Universal Installer, ODP.NET, and Oracle Visual Studio tools versions.

Log on to the Oracle website. In the "Platforms" drop down, select 64-bit or 32-bit Windows. Download 64-bit ODAC 19.15.1 or higher if you are using 64-bit Power BI Desktop. Download 32-bit ODAC 19.15 or higher if you are using 32-bit Power BI Desktop. In the screen shot below, we will download 64-bit ODAC.

Software		Platforms	Size
◢ ☑ Oracle Data Access Components 19.X		All ▼	159.8 MB
☑ V1021492-01.zip	Oracle Data Access Components 19.15 Xcopy for (Microsoft Windows (32-bit)), 77.5 MB		
☑ V1021491-01.zip	Oracle Data Access Components 19.15.1 Xcopy for (Microsoft Windows x64 (64-bit)), 82.3 MB		

Total 2 distinct files   Total Size 159.8 MB

NOTE: Some downloaded parts may be split into more than one file.

6. Now, we will install ODP.NET. Installation instructions are the same for 32-bit and 64-bit ODP.NET. Unzip the download contents to a staging directory (e.g., C:\xcopy64-install or C:\xcopy32-install).
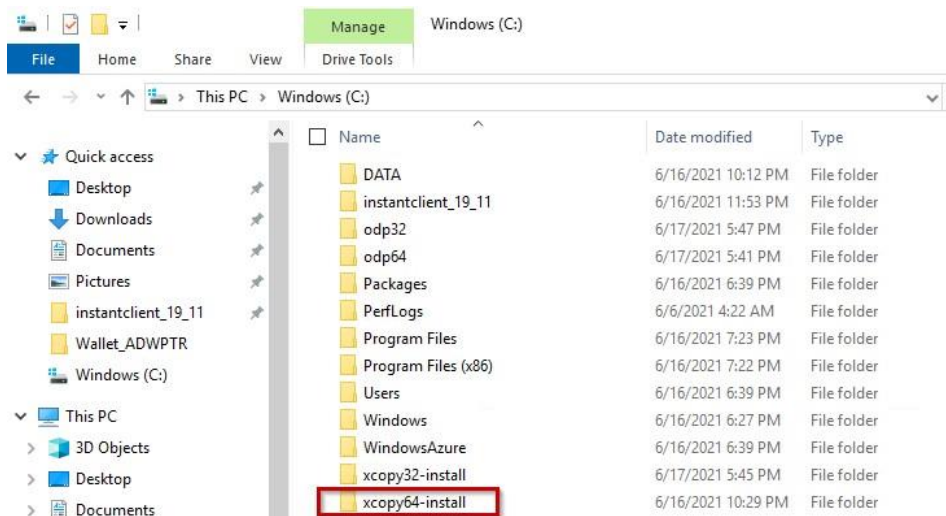
7. Open a Windows command prompt ***in administrator mode*.** Navigate to the ODAC staging directory, then execute the following command to install and configure ODP.NET:

install.bat \<component_name\> \<oracle_home_path\> \<oracle_home_name\> \<install_dependents\> \<machine_wide_configuration\> \<tns_admin_location\>

To configure ODP.NET for Power BI Desktop, use the following values:

- \<component_name\> = odp.net4
- \<oracle_home_name\> = ODAC install directory, such as C:\oracle
- \<oracle_home_name\> = unique name for the ORACLE HOME, such as myhome
- \<install_dependents\> = true
- \<machine_wide_configuration\> = true
- \<tns_admin_location\> = Oracle database credential files directory, such as C:\data\wallet

A sample execution of install.bat with these arguments looks like:

```
install.bat  odp.net4  c:\oracle  myhome  true true  c:\data\wallet
```

8. <u>32-bit Power BI Desktop only</u>
    Add the 32-bit Oracle Client directory (e.g. c:\oracle) and its bin directory (e.g. c:\oracle\bin) to the Windows Path. You can do this by editing the Windows environment variable, Path.
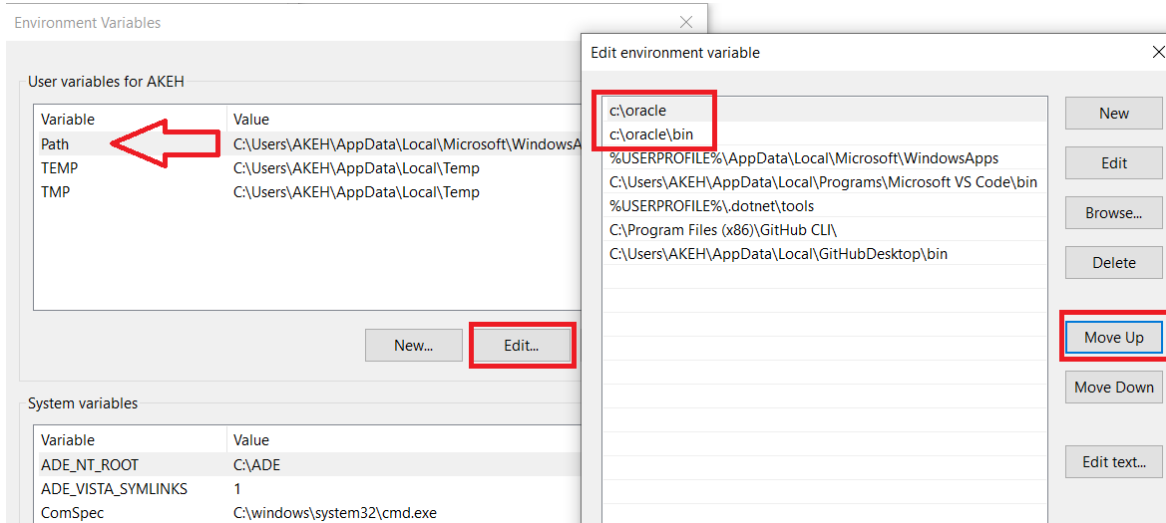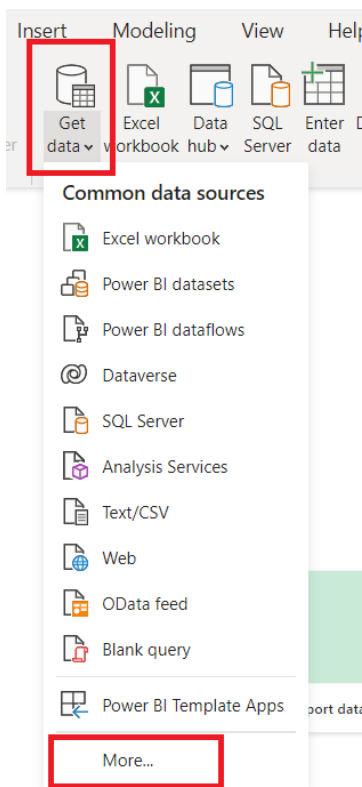

To ensure these directory path settings have precedence over existing Oracle Homes, move the settings up to the highest possible level in the directory order with the "Move Up" button.

9. If you are using tnsnames.ora file with your Oracle database, open the *tnsnames.ora* file to see which ADB or database net service names you can connect to. Below you see three different ones:
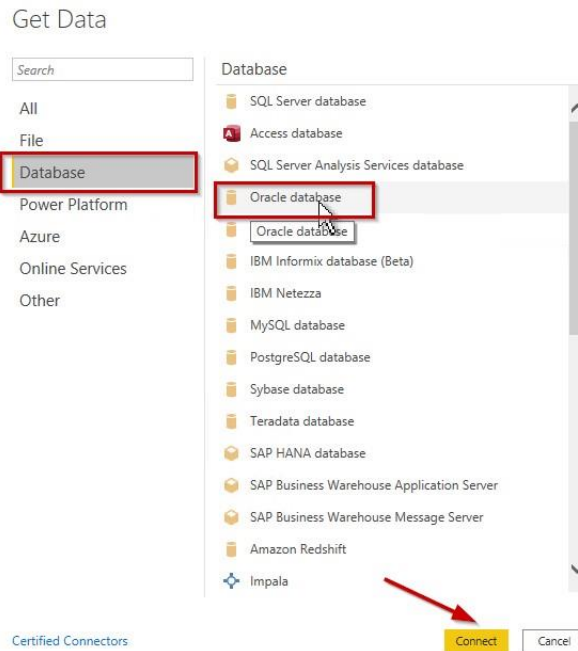
"adwptr_high", "adwptr_low", and "adwptr_medium". You will use one of these values for the Power BI Desktop "Server" name when configuring your Oracle connection.
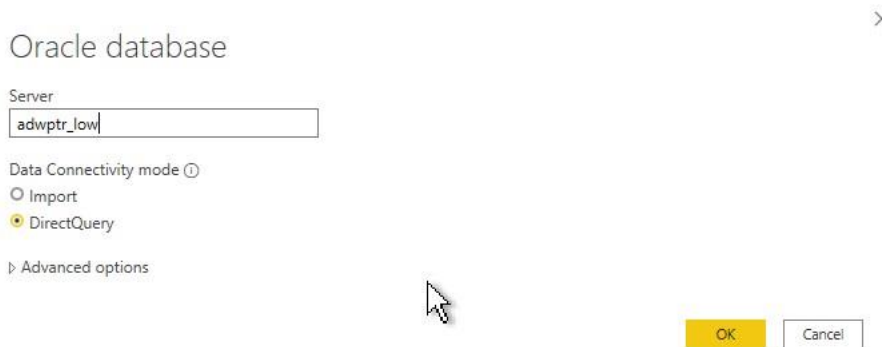

10. Open Power BI Desktop again. Click on "Get data" from the menu bar, then "More…" to begin connecting to Oracle database.

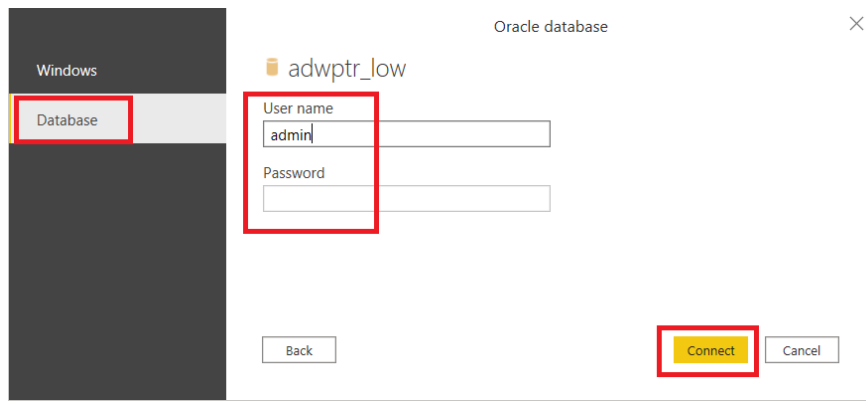Select "Database" > "Oracle database" > "Connect" to connect to your Oracle database.

Get Data

Search	Database
All	SQL Server database
File	Access database
Database	SQL Server Analysis Services database
Power Platform	Oracle database
Azure	Oracle database
Online Services	IBM Informix database (Beta)
Other	IBM Netezza
	MySQL database
	PostgreSQL database
	Sybase database
	Teradata database
	SAP HANA database
	SAP Business Warehouse Application Server
	SAP Business Warehouse Message Server
	Amazon Redshift
	Impala

Certified Connectors   Connect   Cancel

In the "Server" text box, enter your database net service name (e.g. adwptr_high) from Step 9 or an Easy Connect (Plus) string. Set any other Power BI settings needed on this screen. Then, click "OK" to connect.

Oracle database

×

Server

adwptr_low

Data Connectivity mode ⓘ
○ Import
◉ DirectQuery

▷ Advanced options

OK   Cancel

Power BI will request you enter in your database credentials. Select "Database" on the left side of the window so that you can use your database credentials. Then, enter your database user name (e.g. admin) and password. Click the "Connect" button when done.

11. Congratulations! Power BI Desktop should now connect to ADB or on-premises Oracle database. In the "Navigator" window, select the schema objects needed for your Microsoft Power BI Desktop file (.pbix) and load the data.
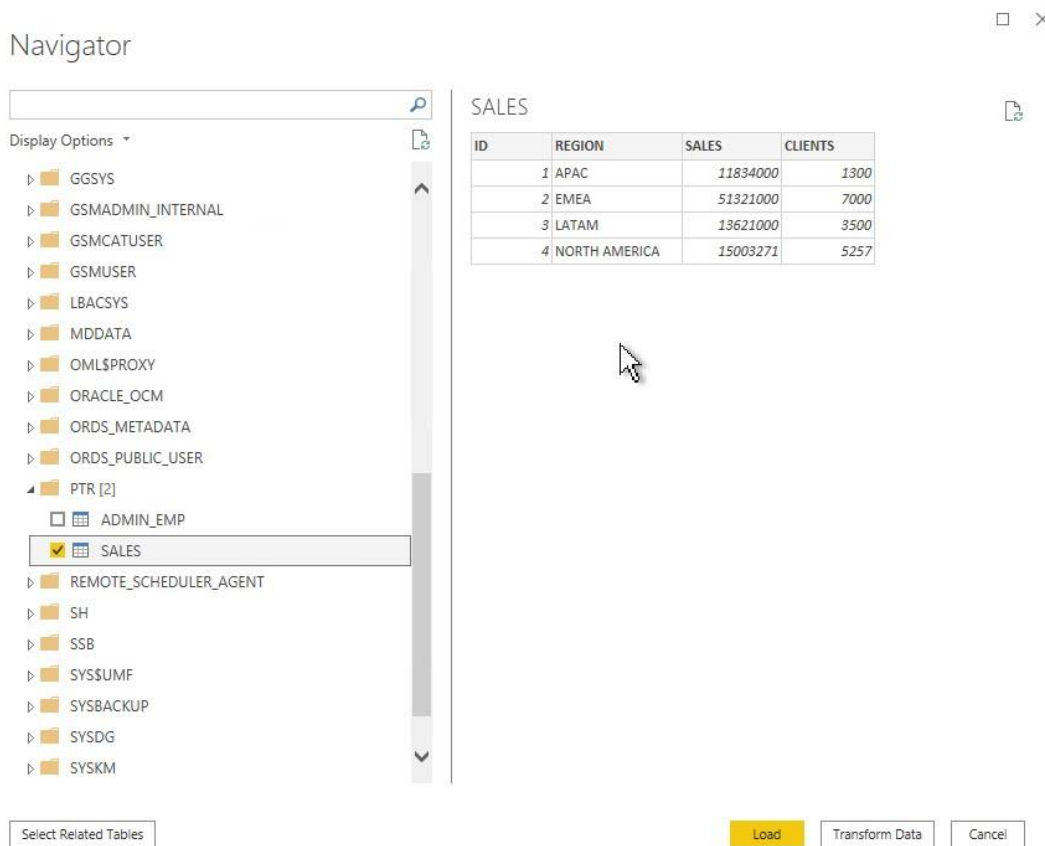
Performance Tuning for Large Data Retrievals

Typically, BI and ETL applications retrieve large data amounts from a source database for further processing. To speed up Oracle data retrieval via Power BI Desktop, the ODP.NET FetchSize can be increased from its default 128K value (131,072 bytes) to as large as int.MaxValue. The FetchSize determines the amount of data

ODP.NET fetches into its internal cache upon each database round trip. It's possible to improve performance by an order of magnitude by significantly increasing FetchSize when retrieving large result sets.

Unmanaged ODP.NET Instructions
To increase the 32-bit or 64-bit unmanaged ODP.NET's FetchSize, launch the Windows Registry editor (regedit.exe) and go to the following Registry key:
HKEY_LOCAL_MACHINE\SOFTWARE\Oracle\ODP.NET\4.122.19.1

Add the String Value "FetchSize" and set it to a value larger than the default (131072), such as 4194304 (4 MB).

Restart Power BI Desktop and run your queries with the new setting.