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.

ated Infrastructure OCPU Count	Storage (TB)
1	1
	ated Infrastructure OCPU Count

Power BI Desktop uses unmanaged ODP.NET (Oracle.DataAccess.Client) for Oracle database connectivity.

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.

	Search for resources and services	
Autonomous Database » Autonomous D	atabase Details	
	ADWPTR	Database Connection Help Close
	DB Connection Perform	You will need the client credentials and connection information to connect to your database. The client credentials include the wallet, which is required for all types of connections.
		Download Client Credentials (Wallet)
	Autonomous Database	To download your client credentials, select the type of wallet, then click Download Wallet . You will be asked to create a password for the wallet.
	General Inform	Instance Wallet
AVAILABLE	Workload Type: Data Wa Compartment: graclepar	Download Wallet Rotate Wallet
	OCID:zdbxmq Show	Wallet last rotated: -
	OCPU Count: 1	Close

For <u>on-premises databases</u>, the credential files required will depend on your database server setup. Typically, ODP.NET requires the the database 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 onpremises 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.

 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.



r ↑ 📜 > This PC System (C:)	> DATA > WALLET		
Name	Date modified	Туре	Size
cwallet.sso	2/3/2023 8:25 AM	SSO File	7 KB
莎 ewallet.p12	2/3/2023 8:25 AM	Personal Informati	7 KB
📄 ewallet.pem	2/3/2023 8:25 AM	PEM File	8 KB
keystore.jks	2/3/2023 8:25 AM	JKS File	4 KB
ojdbc.properties	2/3/2023 8:25 AM	PROPERTIES File	1 KB
README	2/3/2023 8:25 AM	File	3 KB
🤍 sqlnet.ora	2/3/2023 8:25 AM	ORA File	1 KB
 Insnames.ora 	2/3/2023 8:25 AM	ORA File	2 KB
truststore.jks	2/3/2023 8:25 AM	JKS File	4 KB
🔢 Wallet_ADWPTR.zip	2/3/2023 8:23 AM	Compressed (zipp	27 KB

3. ADB only

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.

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:

	Microsoft Power BI Desktop	\times
	Microsoft Power BI Desition is a companion product to app.powerbi.com. Version: 2.107.683.0 64-bit July 2022)	
	User ID: f54c2ac2-0 f0d=16u e-aa6c-44ae1dd4447e	
	Session ID: 6ef3f4ea-e2c0-4452-9efd-b0a6a83975a2	
	Copy session diagnostics to clipboard Copy	
	Privacy Statement	
m	Close]

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 <u>Oracle Client for Microsoft Tools</u> page, click on the download link, "64-bit Oracle Client for Microsoft Tools".

	Connect Microsoft Tools Tools to C Oracle Client for Microsoft Tools installs and configures Oracle Data Provider for .NET (O premises and cloud databases, including Oracle Autonomous Database. It supports com Analysis Services, SQL Server Data Tools, SQL Server Integration Services, SQL Server Re
Download	Get the Details 64-bit Oracle Client for Microsoft Tools
Tutorials	Power BI Desktop: Connect to Oracle Database (PDF)

Log on to the Oracle website. In the "Platforms" drop down, select 64-bit or 32-bit Windows.

6. <u>64-bit Power Desktop only</u>

64-bit Power BI Desktop requires 64-bit ODP.NET. If you are using 64-bit Power BI Desktop, download **Oracle Client for Microsoft Tools**.

Softw	are		
a [Ora	acle Data Access Co	mponents 19.X
		V1032766-01.zip	Oracle Data Access Components 19.17 Xcopy for (Microsoft Windows (32-bit)), 77.6 MB
		V1031049-01.zip	Oracle Data Access Components 19.16 Xcopy for (Microsoft Windows (32-bit)), 77.5 MB
		V1032890-01.exe	Oracle Client for Microsoft Tools 19.17 for (Microsoft Windows x64 (64-bit)), 97.0 MB
		V1032762-01.zip	Oracle Data Access Components 19.17 Xcopy for (Microsoft Windows x64 (64-bit)), 82.2 MB
		V1031050-01.zip	Oracle Data Access Components 19.16 Xcopy for (Microsoft Windows x64 (64-bit)), 82.2 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

Look for **Oracle Client for Microsoft Tools.exe**. Click the EXE link on the left side to begin the download process. Choose the local directory to download the executable to and click "Save". You should now see the download locally.

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Double click the icon to begin the install process. Next, click the "Yes" button in the User Account Control screen. You should now see the introductory install screen. Click the "Next" button.



Choose the "Default" Oracle Client setup type and click the "Next" button.

Oracle Client for Microsoft Tools	×
Setup Type	
Select the setup type that best suits your need	ds.
Click the type of setup you prefer.	
Custom	Description
Default	64-bit managed ODP.NET and unmanaged ODP.NET will be installed and configured for machine-wide use. Global changes will be made to the machine's .NET setup, including placing the provider assembly into the Global Assembly Cache (GAC) and updating the machine.config with ODP.NET configuration section handler and DbProviderFactories information.
InstallShield	
	< Back Next > Cancel

Enter the "Destination Location" where the Oracle Client will be installed on your machine. Use the "Browse" button to specify the directory location. Click "Next" when completed.

)racle Client for Microsoft Tools			
hace cheft for microsoft fools			\times
Choose Destination Location			
Select folder where setup will install files.			0
Setup will install Oracle Client for Microsoft	Tools in the following fol	der.	
To install to this folder, click Next. To install select another folder.	to a different folder, clic	k Browse and	
Destination Folder			
Destination Folder C:\Program Files\Oracle Client for Microso	ift Tools	Browse	
Destination Folder C:\Program Files\Oracle Client for Microso	ft Tools	Browse	•
Destination Folder C:\Program Files\Oracle Client for Microso	oft Tools	Browse	

Enter the directory where ODP.NET can find its Oracle Client configuration files, sqlnet.ora and tnsnames.ora, such as C:\data\wallet. Click "Next" when complete.

Oracle Client for Microsoft Tools	×
Oracle Configuration File Directory	0
Please specify the directory where Oracle Database Client will search for its configuration files, sqlnet.ora and tnsnames.ora.	
C:\data\wallet\	Browse
InstallShield	Cancel

The Oracle Client for Microsoft Tools is now ready to install. Click the "Install" button to proceed.

Oracle Client for Microsoft Tools	×
Ready to Install the Program	
The wizard is ready to begin installation.	
Click Install to begin the installation.	
If you want to review or change any of your installation settings, click Back. Click Cance exit the wizard.	el to
InstallShield -	
< Back Install Can	cel

The ODP.NET install is now complete and configured for use on this machine. On the "Wizard Complete" screen, you may review the client README. Click the "Finish" button to proceed.

Oracle Client for Microsoft Tools	
ORACLE	Wizard Complete
	The Wizard has successfully installed Oracle Client for Microsoft Tools. Click Finish to exit the wizard.
	I would like to view the README file.
	< Back Finish Cancel

7. <u>32-bit Power BI Desktop only</u>

32-bit Power BI Desktop requires 32-bit ODP.NET. If you are using 32-bit Power BI Desktop, download **32-bit ODAC 19.17 or higher**.

Softwa	Software		
4 C	Or	acle Data Access Co	mponents 19.X
		V1032766-01.zip	Oracle Data Access Components 19.17 Xcopy for (Microsoft Windows (32-bit)), 77.6 MB
		V1031049-01.zip	Oracle Data Access Components 19.16 Xcopy for (Microsoft Windows (32-bit)), 77.5 MB
		V1032890-01.exe	Oracle Client for Microsoft Tools 19.17 for (Microsoft Windows x64 (64-bit)), 97.0 MB
		V1032762-01.zip	Oracle Data Access Components 19.17 Xcopy for (Microsoft Windows x64 (64-bit)), 82.2 MB
		V1031050-01.zip	Oracle Data Access Components 19.16 Xcopy for (Microsoft Windows x64 (64-bit)), 82.2 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

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Click the zip link on the left side to begin the download process. Choose the local directory to download the executable to and click "Save". You should now see the download locally.

To install 32-bit ODP.NET, unzip the 32-bit ODAC download contents to a staging directory (e.g. C:\xcopy32-install).

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

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.

nvironment Variables		×	
		Edit environment variable	×
User variables for AKEH			
Variable	Value	c:\oracle	New
Path	C:\Users\AKEH\AppData\Local\Microsoft\WindowsA	c:\oracle\bin %USERPROFILE%\AppData\Local\Microsoft\WindowsApps	E alta
TEMP	C:\Users\AKEH\AppData\Local\Temp	C:\Users\AKEH\AppData\Local\Programs\Microsoft VS Code\bin	Edit
IMP	C:\Users\AKEH\AppData\Local\Temp	%USERPROFILE%\.dotnet\tools	Browse
		C:\Program Files (x86)\GitHub CLI\	browse
		C:\Users\AKEH\AppData\Local\GitHubDesktop\bin	Delete
	New Edit		Move Up
System variables			Move Down
Variable	Value		
ADE_NT_ROOT	C:\ADE		Edit text
ADE_VISTA_SYMLINKS	1		
ComSpec	C:\windows\system32\cmd.exe		

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.

If you are using the terminate of the set with your Oracle database, open the *the terminates.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.



9. 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.



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			×
Ofacic database			
Server			
adwptr_low			
Data Connectivity mode ①			
O Import			
DirectQuery			
Advanced options			
	2		
		OK Cance	el

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.

	Oracle database	\times
Windows	adwptr_low	
Database	User name admin Password	
	Back	Cancel

10. 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.

	Q	SALES				Da
isplay Options 🔹	[a	ID	REGION	SALES	CLIENTS	
D 🥌 GGSYS	•		I APAC	11834000	1300	
SSMADMIN_INTERNAL	53.	10	2 EMEA	51321000	7000	
D d GSMCATUSER				13621000	3500	
D d GSMUSER			NORTH AIVIERICA	15005271	5257	
D EBACSYS						
D MDDATA						
DISTRICT OMLSPROXY			12			
DI ORACLE_OCM			0			
DI ORDS_METADATA						
▷ 💼 ORDS_PUBLIC_USER						
4 🗾 PTR [2]						
ADMIN_EMP						
SALES						
REMOTE_SCHEDULER_AGENT						
þ 📁 SH						
Þ 📕 SSB						
⊳ 📕 SYS\$UMF						
D 📕 SYSBACKUP						
⊳ 📕 SYSDG						
D M SYSKM	~					

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.