# **Connecting Microsoft Power BI Service to**

## **Oracle Autonomous Database and On-premises Database**

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This step-by-step tutorial guides configuring Microsoft Power BI service connectivity to Oracle Autonomous Database (ADB) and on-premises databases. Microsoft Power BI service runs in the Microsoft 365 cloud.

Power BI service uses on-premises data gateway, also known as Power BI gateway, to connect the Power BI service to Oracle databases. The gateway is hosted on Windows that can either be on-premises or in a cloud virtual machine, such as in Oracle Cloud Infrastructure or Azure.

These instructions use 64-bit unmanaged Oracle Data Provider for .NET (ODP.NET) for data access, as required by Power BI service and on-premises gateway. 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 service:

- Provision Oracle database or ADB
- Download database credentials to Windows client
- Create Power BI service in Microsoft 365 cloud
- Install and configure Power BI gateway on Windows client
- Install and configure ODP.NET on Windows client
- Validate Power BI service 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 service has also been provisioned on a Windows machine.

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

Autonomous Database	Create Autonomous	Database				
Dedicated Infrastructure ()	Display Name	Database Name	State	Dedicated Infrastructure	OCPU Count	Storage (TB
	ADWPTR	ADWPTR	Available	No	1	1
Autonomous Container Database						
Autonomous Exadata Infrastructure						

Power BI service and on-premises gateway uses 64-bit 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. Move the credential files to the Windows machine that hosts the gateway. These credential files (*cwallet.sso, tnsnames.ora*, and *sqlnet.ora*) will be used to connect the gateway and Power BI Desktop to ADB.

	Constant and the second s	
	Search for resources and services	
Autonomous Database » Autonomous I	Database 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.
ADW	Autonomous Database	Download Client Credentials (Wallet) 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 Database Name: ADWP*	Wallet Type () Instance Wallet
	Workload Type: Data Wa Compartment: oraclepar OCID:zdbxmq Show	Download Wallet Rotate Wallet Wallet -
	OCPU Count: 1	Close

For <u>on-premises databases</u>, the credential files required 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 onpremises databases. For example, the Power BI gateway "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 the Windows machine into a directory (e.g. C:\data\wallet). This
machine is where Power BI gateway is or will be installed on. It can be located on-premises or in the cloud,
such as on an Oracle Cloud Infrastructure virtual machine, as long as it has network access to Power BI
cloud service.

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.

	::) > DATA > WALLET		
Name ^	Date modified	Туре	Size
Wallet_ADWPTR.zip	2/3/2023 8:23 AM	Compressed (zipp	) 27 KE
↑ → 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
jdbc.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
<ul> <li>Insnames.ora</li> </ul>	2/3/2023 8:25 AM	ORA File	2 KB
truststore.jks	2/3/2023 8:25 AM	JKS File	4 KB
Wallet ADWPTR zin	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.

4. Since Power BI Gateway is a 64-bit application, we use 64-bit unmanaged ODP.NET to perform database access. 64-bit unmanaged ODP.NET download is part of the Oracle Data Access Components (ODAC), which can be downloaded for free from the Oracle website.

From the Oracle Client for Microsoft Tools page, click on the download link, "64-bit Oracle Client for Microsoft Tools".

	Connect Microsoft Tools to C
<b>∃</b> ⊢	Oracle Client for Microsoft Tools installs and configures Oracle Data Provider for .NET (O premises and cloud databases, including Oracle Autonomous Database. It supports conr 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 Windows, then download **Oracle Client for Microsoft Tools**.

Ci - 64		
Softw	are	
<b>A</b> [	Oracle Data Access Co	omponents 19.X
	V1032766-01.zip	Oracle Data Access Components 19.17 Xcopy for (Microsoft Windows (32-bit)), 77.6 MB
	U1031049-01.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.



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 r	needs.
Click the type of setup you prefer.	Description
Custom 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.

Oracle Client for Microsoft Tools	×
Choose Destination Location	
Select folder where setup will install files.	
Setup will install Oracle Client for Microsoft Tools in the following folder.	
To install to this folder, click Next. To install to a different folder, click Browse and select another folder.	
Destination Folder	
C:\Program Files\Oracle Client for Microsoft Tools Browse.	
InstallShield-	
< Back Next > Ca	ncel

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 Da configuration files, sqlnet.ora and tnsnames.o	tabase Client wi ora.	ll search for its	
C:\data\wallet\			
			Browse
InstallShield			
	< Back	Next >	Cancel

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

Oracle Client for Microsoft Tools			×
<b>Ready to Install the Program</b> The wizard is ready to begin installation.			0
Click Install to begin the installation.			
If you want to review or change any of your i exit the wizard.	nstallation settings,	click Back. Click	: Cancel to
InstallShield	< Back	Install	Cancel

The ODP.NET install is now complete and configured for use on this machine. On the "Wizard Complete" screen, you can choose to review the Oracle Client for Microsoft Tools README. Click the "Finish" button to proceed.



5. 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 gateway "Server" name when configuring your Oracle connection.



6. Sign on to the <u>Power BI website</u> with your Microsoft 365 account.



7. We now download the Power BI gateway to the Windows machine and install it. You can skip steps 9 and 10 if you already have created and configured the Power BI gateway.

From the Power BI web console, click the "…" drop down menu in the upper right > "Download" > "Data Gateway".



A web page will open. Click "Download standard mode" to download the gateway install.



Run "GatewayInstall.exe" file after it downloads. Enter the install directory location and accept the terms.

🗘 On-premises data gateway installation	?
Setting ready to install the on-premises data gateway.	
Please review <u>minimum requirements</u> for installing the On-premises data gateway. Not meeting these requirements may result in performance bottlenecks.	
nstall to	
C:\Program Files\On-premises data gateway	

I accept the terms of use and privacy statement.

8. We will now complete registration of the Power BI gateway. Start by entering the email address of your Power BI service account. You will be asked to sign in to register the gateway with your Power BI account.

🗘 On-premises data gateway	?
Almost done.	
Installation was successful!	
Email address to use with this gateway:	
pedro.p.torres@oracle.com	
pedro.p.torres@oracle.com	
Next, you need to sign in to register your gateway.	



Choose to register a new gateway on the computer. Click "Next".



Next	Cancel

Name the gateway (e.g. Gateway), provide the recovery key, and confirm the key. Click "Configure". We will use the gateway name later when we create a Power BI Data Source.

ou are signed in as pedro.p.torres@oracie.com and are ready to register the ateway.	
New on-premises data gateway name	
gateway	
Add to an existing gateway cluster Learn more	
Recovery key (8 character minimum)	
•••••	
$\widehat{ m D}$ This key is needed to restore the gateway and can't be changed. Record it in a safe place	ce.
Confirm recovery key	
•••••	
We'll use this region to connect the gateway to cloud services: West US Change Region	
Provide relay details By default. Azure Relays are automatically provisioned	

Configure

Cancel

The gateway should now be online and ready to use.

← On-premises data gateway				
Status	⊘ The gateway gateway is online and ready to be used.			
Service Settings	Gateway version number: 3000.130.5 (June 2022)			
Diagnostics	✓ Help us improve the on-premises data gateway by	y sending usage information		
Network	to Microsoft. <u>Read the privacy statement online</u>			
Connectors	Logic Apps, Azure Analysis Services	Create a gateway in Azure		
Recovery Keys	West US 2			
	Power Apps, Power Automate West US 2	🐼 Ready		
	Power BI Default environment	🐼 Ready		
		Close		

Go back to the Power BI website. Switch to a Power BI Premium or Power BI Pro workspace. Click "New" >
 "Dataflow" > "Add new tables"





10. Select "Oracle database".

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- 11. Provide the entries to connect to your data source:
  - Server = Enter the database net service name (e.g. "adwptr\_high", "adwptr\_low") or Easy Connect (Plus) configuration
  - Data gateway = Power BI gateway name (e.g. gateway)
  - Authentication kind = Basic
  - Username and Password = Your ADB or on-premises database user credentials

Click the "Next" button.

r Query	
onnect to data sour	ce
Oracle database	Connection settings
Database	Server *
Learn more	adwptr_high
	<ul> <li>Advanced options</li> <li>Connection credentials</li> </ul>
	connection credentials
	Data gateway *
	Data gateway * [On-premises] gateway
	Data gateway * [On-premises] gateway  Authentication kind
	Data gateway * [On-premises] gateway ∨ ひ Authentication kind Basic ∨
	Data gateway * [On-premises] gateway  V  Authentication kind Basic V Username
	Data gateway *       Image: Constraint of the second
	Data gateway * [On-premises] gateway V Authentication kind Basic V Username admin Password

12. Congratulations! Your Power BI service instance is now connected to Oracle database. You should now be able to view the schema objects available to the Oracle user. In the tree control, select the schema objects needed for your Microsoft Power BI application and load the data.

	Power BI ADWPTR	Triak 59 days ket	Search	Q (©	<b>⊻</b> ?	٥	8
=		Power Query - Choose data					×
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R	GRAPHSPRCKY_USER      GSMADMIN_INTERNAL      Select related tables      Back			Cance	Tra	nsform 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 service, 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 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 gateway and run your queries with the new setting.