Connecting Microsoft SQL Server Reporting Services to Oracle Autonomous Databases and On-premises Databases

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This step-by-step tutorial guides how to configure Microsoft SQL Server Reporting Services (SSRS) connectivity to Oracle Autonomous Database (ADB) and on-premises databases.

These instructions use managed Oracle Data Provider for .NET (ODP.NET) for data access as required by SSRS. 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 SSRS:

- Provision Oracle database or ADB
- Download database credentials to Windows client
- Install Visual Studio and Microsoft Reporting Services extension on Windows client
- Install and configure ODP.NET on Windows client
- Validate SSRS 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 Visual Studio with an SSRS extension is installed on a Windows client. 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 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	Autonomou	s Databases in	PEDROTO	R Compartment		
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						

SSRS uses managed ODP.NET (Oracle.ManagedDataAccess.Client) for Oracle database connectivity. This tutorial uses Visual Studio 2022 to create a report server project.

Oracle Client 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 Visual Studio/SSRS installed. These credential files (*cwallet.sso, tnsnames.ora*, and *sqlnet.ora*) will be used to connect SSRS to ADB.

	Search for resources and services	
Autonomous Database » Autonomous	Database Details	
	Search for resources and services Deltabase < Autocomoust Database Deltabase Connection Deltabase Connection	
	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 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 Waltet Type ①		
	General Inform	Water Type () Instance Water
AVAILABLE	Database Name: ADWP Workload Type: Data Wa	Pounting Male
	Compartment: oraclepar OCID:zdbxmg_ <u>Show</u>	Wallet last rotated: -
	Created: Thu, Mar 12, 20 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 SSRS "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 database credentials on your Windows machine into a directory (e.g., C:\data\wallet). This machine is where SSRS 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.



✓ ↑ 📜 > This PC	System (C:) > DATA > WALLET		
Name	Date modi	fied Type	Size
cwallet.sso	2/3/2023 8	:25 AM SSO File	7 KB
🌍 ewallet.p12	2/3/2023 8	:25 AM Personal Info	rmati 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 I	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.

4. Managed ODP.NET can be downloaded for free. 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 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.

5. Download Oracle Client for Microsoft Tools.

Softw	are		
a C	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.



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	Х
Setup Type	
Select the setup type that best suits your need	ls.
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.

Oracle Client for Microsoft Tools			×
Choose Destination Location			
Select folder where setup will install files.			0
Setup will install Oracle Client for Microsoft T	ools in the follow	ving folder.	
To install to this folder, click Next. To install t select another folder.	o a different folo	ler, click Browse	and
Destination Folder			
C:\Program Files\Oracle Client for Microsof	t Tools		Browse
InstallShield			
	< Back	Next >	Cancel

6

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 — < 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				\times
Ready to Install the Program				0
Click Install to begin the installation.				
If you want to review or change any of your i exit the wizard.	nstallation sett	ings, click Back.	Click Cance	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 To	pols
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

If you are using the the service of the set with your Oracle database, open the *the the the the set of the*



7. Open Visual Studio (VS). This tutorial uses VS 2022 screen shots, but the usage experience will be similar for earlier VS versions.

Create a new "Report Server Project". Supply a name for the project.

In Solution Explorer, right-click "Shared Data Sources" and select "Add New Data Source".



	Solution	Explorer	
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	Search S	Solution Explorer (Ctrl+;)	
	🗖 So	olution 'Oracle Project' (1 of	1 project)
	4 6	Oracle Proiect	
		🛑 Shared Data Sources	
Add New Data Source		Shared Datasets	•
Add	- -	Reports	

In the Shared Data Source Properties window, enter a name for the data source, choose the "Oracle Database" as the type in the drop-down menu, and click the "Build" button to start entering the connection information.

eneral		
redentials	Change name, type, and connection options.	
	Name:	
	Oracle	
	Туре:	
	Microsoft SQL Server ~	
	Azure Analysis Services	
	Azure SQL Data Warehouse	
	Microsoft Analytics Platform System	Build
	Microsoft Azure SOL Database	
	Microsoft SOL Server	
	Microsoft SQL Server Analysis Services	
	Microsoft SharePoint List	
	ODBC	
	OLE DD	
	Oracle Database	
	Oracle Essbase	
	Report Server Model	
	SAP BW	
	TERADATA	
	XML	

On the Connection Properties window, verify the Data Source is "Oracle Database (ODP.NET)". Enter the Server Name (e.g., adwptr_high). Enter the database user name (e.g., ADMIN) and password.

Connection Properties			?	\times	
Data source:					
Oracle Database (ODP.NET)		Change			
Server name:					
adwptr_high					
Log on to the database					
User name:	admin				
Password:	•••••	••••			
Save my password					
				Advand	ed
Test Connect	ion	C)K	Can	cel

Click "Test Connection" to validate a working database connection.



Click "Ok" to go back to the Connection Properties window. Click "Ok" on this window as well to return to the Shared Data Source Properties window. Click "Ok"

8. In Solution Explorer, you should now see the Oracle connection (e.g., Oracle.rds) under the Shared Data Sources item. Let's now retrieve the Oracle database schema objects we need to use for our SSRS project.

Right click the Reports folder. Select "Add New Report".

			Solutio	n Explorer		
			6 9	û 🗛	0	• 😑 🗐 👘 🌽 🛋
			Search	Solution E	xplo	rer (Ctrl+;)
	Solution 'Oracle Project' (1 of 1 project)					Project' (1 of 1 project)
	🔺 📓 Oracle Project					ct
	🔺 🧲 Shared Data Sources					ata Sources
		🗑 Oracle.rds				
				💼 Share	ed Da	atasets
	Add New Report			📄 Repo	orts	
	Add		•			
	Import Reports		•			
×	Properties	Alt+Er	nter			

In the Report Wizard, select the data source (e.g., Oracle) you just created. Click "Next".

<u>-</u>	Report Wizard	—	\times
s	elect the Data Source Select a data source source.	Durce from which to obtain data for this report or create a new data	
\odot	Shared data source		
	Oracle	~	
0	New data source		

Enter the query to execute against the Oracle database. Click "Next".

🗟 Report Wizard		\times
Design the Query Specify a query to execute to get the data for the report.		
Use a query builder to design your query.		
Query Builder		
Query string:		
select * from table1	 	^

Select the report type, tabular or matrix. Click "Next". Then, design how to group the table data. Click "Finish". Supply a name for the report (e.g., Oracle Report). Click "Finish".

9. Congratulations! You have successfully imported Oracle database schema objects into your SSRS project.



Performance Tuning for Large Data Retrievals

Typically, BI applications retrieve large data amounts from a source database for further processing. To speed up Oracle data retrieval via SSRS, 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.

Managed ODP.NET Instructions

To increase the FetchSize, modify the .NET machine.config file. Modifying the machine.config requires Windows Administrator privileges. This file is generally located in one of two directories. Which one to modify depends on whether your running Visual Studio or SSRS process is 32-bit or 64-bit:

- For 32-bit C:\Windows\Microsoft.NET\Framework\v4.0.30319\Config
- For 64-bit C:\Windows\Microsoft.NET\Framework64\v4.0.30319\Config

Add an **<oracle.manageddataaccess.client>** section in the machine.config file for managed ODP.NET. This section should be placed within the **<configuration>** section and after the **<configSections> </configSections>**. Here's an example setting the FetchSize to 4 MB with new configuration additions highlighted in green and existing configuration sections highlighted in red:

```
<configuration>
<configSections>
...
</configSections>
<oracle.manageddataaccess.client>
<version number="4.122.19.1">
<settings>
<settings>
<setting name="FetchSize" value="4194304" />
</settings>
</version>
</oracle.manageddataaccess.client>
</configuration>
```

Restart Visual Studio or SSRS to run your queries with the new setting.