



# Microsoft Cloud Workshop

Data platform upgrade and migration

Hands-on lab step-by-step

March 2018

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# Data platform upgrade and migration hands-on lab step-by-step

## Abstract and learning objectives

This hands-on lab is designed to help attendees better understand how to build a Proof-of-Concept (POC) and conduct a site analysis for a customer to compare cost, performance, and level of effort required to migrate from Oracle to SQL Server. You will evaluate the dependent applications and reports that will need to be updated, and come up with a migration plan. In addition, attendees will help the customer take advantage of new SQL Server features to improve performance and resiliency, as well as explore ways to migrate from an old version of SQL Server to the newest version and consider the impact of migrating from on-premises to the cloud.

### Learning Objectives:

- Migrate from Oracle to SQL Server using SQL Server Migration Assistant
- Migrate between different SQL Server editions using Data Migration Assistant
- Use advanced SQL Server features, such as JavaScript Object Notation (JSON) data store, table compression, Transparent Data Encryption, and clustered ColumnStore indexing
- Consider the steps required to update existing applications to use the new data platform
- Analyze and improve database performance
- Implement high availability using Stretch Database and AlwaysOn Availability Groups

## Overview

World Wide Importers (WWI) has experienced significant growth in the last few years. In addition to predictable growth, they've had a substantial amount of growth in the data they store in their data warehouse. Their data warehouse is starting to show its age; slowing down during extract, transform, and load (ETL) operations and during critical queries. It was built on SQL Server 2008 R2 Standard Edition.

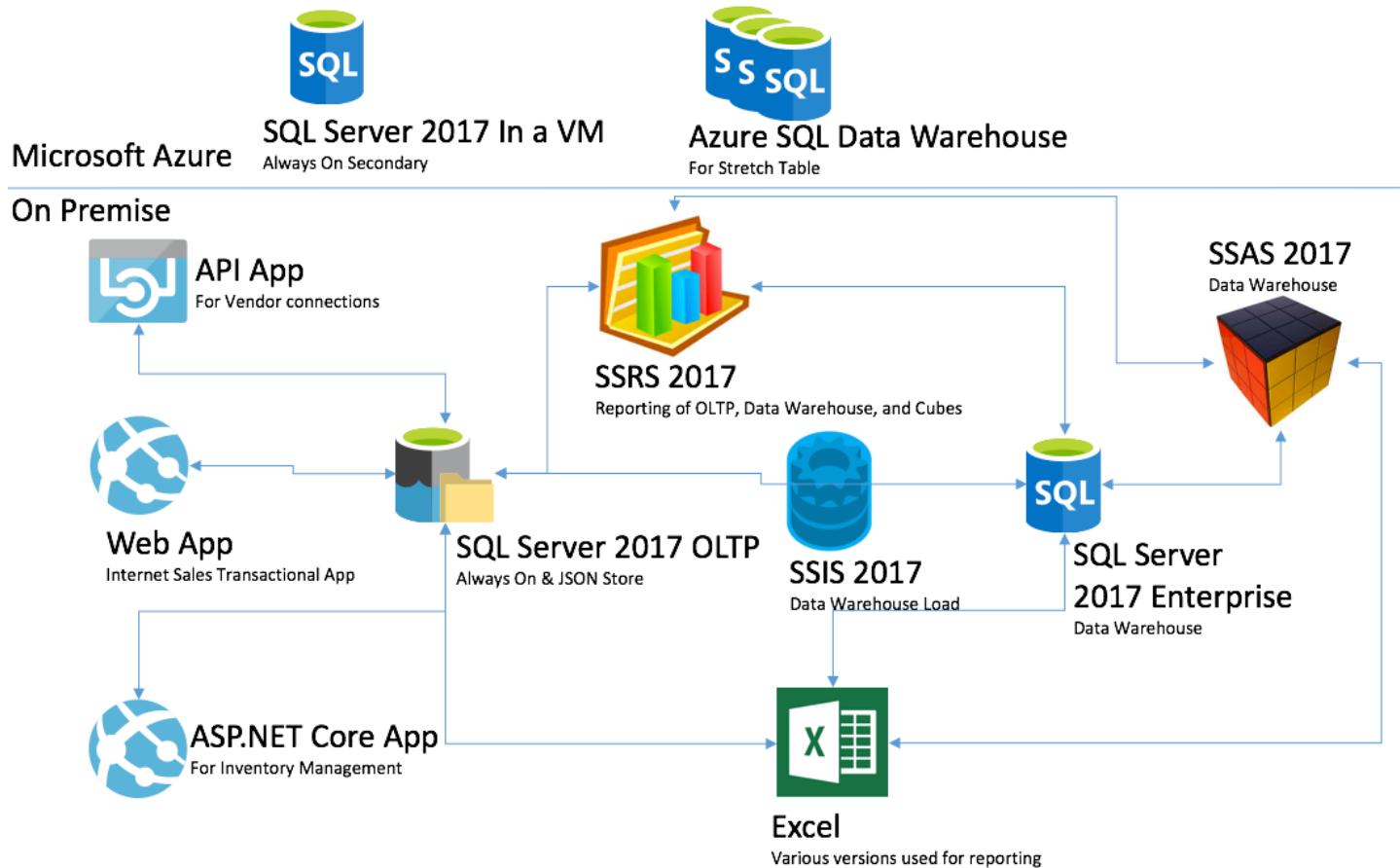
The WWI CIO has recently read about new performance enhancements of SQL Server 2017. She is excited about clustered ColumnStore indexes. In addition, she has chosen to upgrade to Enterprise Edition. She's hoping that table compression will improve performance, backup times, and lessen the load on the Storage Area Network (SAN).

WWI is concerned about upgrading their database to SQL Server 2017 or Azure SQL Database. The data warehouse has been successful for a long time. As it has grown, it has filled with data, stored procedures, views, and security. WWI wants assurance that if it moves its data store, it won't run into any incompatibilities with the storage engine of SQL Server 2017.

WWI's CIO would like a POC of a data warehouse move and proof that the new technology will help ETL and query performance.

## Solution Architecture

Below is a diagram of the solution architecture you will build in this lab. Please study this carefully, so you understand the whole of the solution as you are working on the various components.



The solution begins with using the Microsoft Data Migration Assistant to perform an assessment to see what potential issues need to be addressed in upgrading the database to SQL Server 2017 or Azure SQL Database. After correcting any issues, the SQL Server 2008 database is migrated to SQL Server 2017 Enterprise, using Data Migration Assistant. A shared folder is created for storing a backup of the database, which is used by Data Migration Assistant to move the database to SQL Server 2017. Two new features of SQL Server 2017, Table Compression and ColumnStore Index, will be applied to demonstrate value from the upgrade. For the ColumnStore Index, a new table based on the existing FactResellerSales table will be created, and a ColumnStore index applied. Next, the Oracle XE database supporting the application will be migrating to SQL Server 2017 Enterprise using SQL Server Migration Assistant (SSMA) 7.x for Oracle. Once the Oracle database has been migrated, the NorthwindMVC application is updated, so it targets SQL Server 2017 instead of Oracle. The entity models are updated against SQL Server, and code updates are made to use the new Entity Framework context based on SQL Server. Corrections to stored procedures are made due to differences in how stored procedures are accessed in Oracle versus SQL Server.

## Requirements

- Microsoft Azure subscription must be pay-as-you-go or MSDN.
  - Trial subscriptions will not work.
- A virtual machine configured with (see [Before the Hands-on Lab](#)):
  - Visual Studio Community 2017 or later
  - Azure SDK 2.9 or later (Included with Visual Studio 2017)

# Before the hands-on lab

Duration: 20 minutes

In this exercise, you will set up your environment for use in the rest of the hands-on lab. You should follow all the steps provided in the Before the hands-on lab section to prepare your environment before attending the hands-on lab.

## Task 1: Provision a lab virtual machine (VM)

In this task, you will provision a virtual machine (VM) in Azure. The VM image used will have Visual Studio Community 2017 installed.

1. Launch a web browser, and navigate to the [Azure Portal](#).
2. Select +Create a resource, then type "Visual Studio Community" into the search bar. Select Visual Studio Community 2017 (latest release) on Windows Server 2016 (x64) from the results.

NAME	PUBLISHER	CATEGORY
Visual Studio Community 2017 on Windows Server 2016 (x64)	Microsoft	Compute
Visual Studio Community 2017 on Windows 10 Enterprise N (x64)	Microsoft	Compute
Visual Studio Community 2017 (latest release) on Windows Server 2016 (x64)	Microsoft	Compute
Visual Studio Community 2017 (latest preview) on Windows Server 2016 (x64)	Microsoft	Compute

3. On the blade that comes up, ensure the deployment model is set to Resource Manager and select Create.

Select a deployment model (Optional)

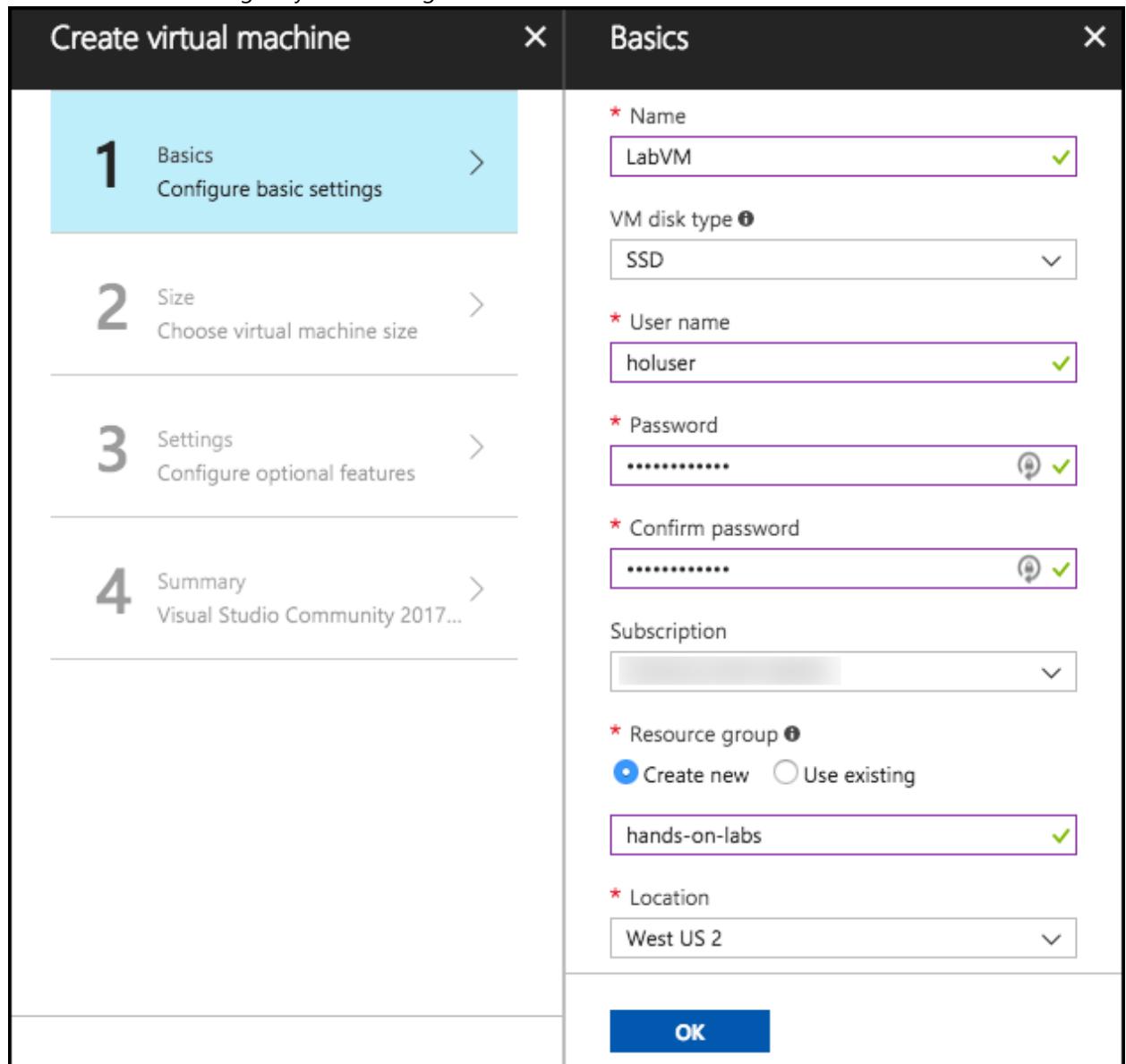
Resource Manager

Create

4. Set the following configuration on the Basics tab.

- Name: Enter LabVM.
- VM disk type: Select SSD.
- User name: Enter holuser
- Password: Enter Password.1!!
- Subscription: Select the subscription you are using for this lab.
- Resource Group: Select Create new, and enter hands-on-labs for the resource group name.

- g. Location: Select the region you are using for resources in this lab.



5. Select OK to move to the next step.

- On the Choose a size blade, ensure the Supported disk type is set to SSD, and select View all. This machine won't be doing much heavy lifting, so selecting D2S\_V3 Standard is a good baseline option.

Supported disk type	Minimum vCPUs	Minimum memory (GiB)
SSD	1	0
<span style="color: blue;">★ Recommended</span>   <span style="border: 2px solid red; padding: 2px;">View all</span>		
D2S_V3 Standard	D4S_V3 Standard	D8S_V3 Standard
2 vCPUs	4 vCPUs	8 vCPUs
8 GB	16 GB	32 GB
4 Data disks	8 Data disks	16 Data disks
4000 Max IOPS	8000 Max IOPS	16000 Max IOPS
16 GB Local SSD	32 GB Local SSD	64 GB Local SSD
Premium disk support	Premium disk support	Premium disk support
Load balancing	Load balancing	Load balancing
<b>142.85</b> USD/MONTH (ESTIMATED)	<b>285.70</b> USD/MONTH (ESTIMATED)	<b>571.39</b> USD/MONTH (ESTIMATED)
<span style="background-color: #0078d4; color: white; padding: 5px 20px; border-radius: 5px;">Select</span>		

- Select Select to move on to the Settings blade.
- Accept all the default values on the Settings blade, and select OK.

9. Select Create on the Create blade to provision the virtual machine.

The screenshot shows the 'Create' blade for provisioning a virtual machine. At the top, a blue bar indicates 'Validation passed'. Below it, the 'Offer details' section shows a 'Standard D2s v3' VM by Microsoft, priced at 0.1920 USD/hr, with a link to 'Pricing for other VM sizes'. There's also a link to 'Terms of use | privacy policy'. A note about Azure resources states that users can use monetary commitment funds or subscription credits for purchases. The 'Summary' section includes 'Basics' settings: Subscription (grayed out), Resource group '(new) hands-on-labs', and Location 'West US 2'. The 'Terms of use' section contains a checkbox agreement. At the bottom, there are 'Create' and 'Download template and parameters' buttons.

10. It may take 10+ minutes for the virtual machine to complete provisioning.

## Task 2: Connect to your lab VM

In this step, you will open an RDP connection to your Lab VM, and disable Internet Explorer Enhanced Security Configuration.

1. Connect to the Lab VM. (If you are already connected to your Lab VM, skip to Step 7.)

- From the left side menu in the Azure portal, select Resource groups, then enter your resource group name into the filter box, and select it from the list.

The screenshot shows the Azure Resource Groups blade. On the left sidebar, 'Resource groups' is selected and highlighted with a red box. In the main area, the 'Subscriptions' dropdown shows 'hands'. Below it, there is a table with one item: 'NAME' and 'hands-on-lab'. This row is also highlighted with a red box.

- Next, select your lab virtual machine, LabVM, from the list.

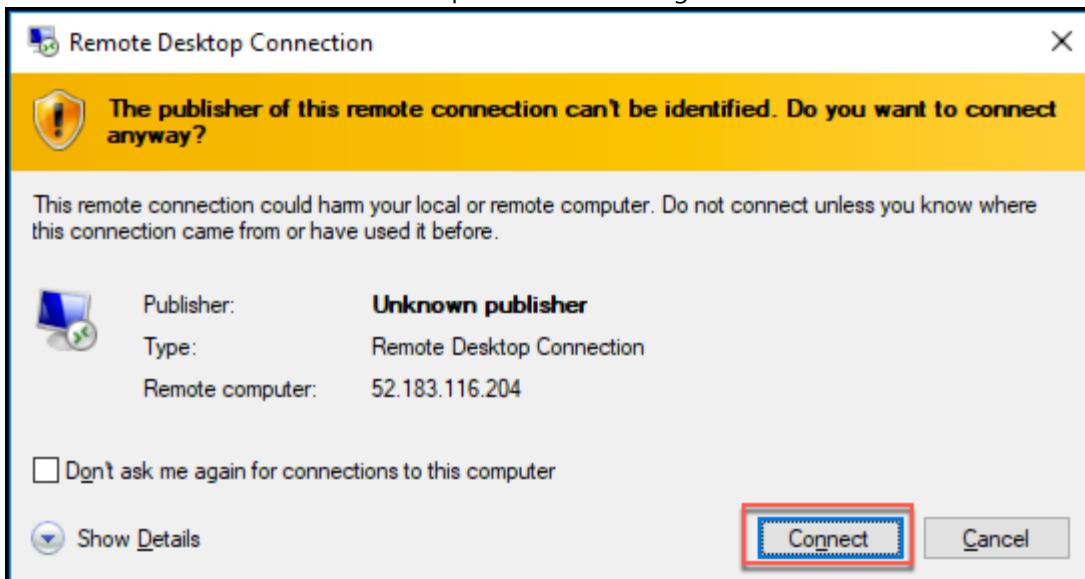
NAME	TYPE	LOCATION
handsonlabsdiag459	Storage account	West US 2
hands-on-labs-vnet	Virtual network	West US 2
<b>LabVM</b>	<b>Virtual machine</b>	<b>West US 2</b>
LabVM_OsDisk_1_c95974cae1fd410b85653d6505c22d9a	Disk	West US 2
labvm697	Network interface	West US 2

- On your Lab VM blade, select Connect from the top menu.

The screenshot shows the Lab VM blade. At the top, there is a toolbar with various icons: 'Connect' (highlighted with a red box), Start, Restart, Stop, Capture, Move, Delete, and Refresh. Below the toolbar, there is information about the resource group ('hands-on-labs') and the VM itself ('Computer name: LabVM, Operating system: Windows, Size: Standard D2s v3 (2 vcpus, 8 GB memory)').

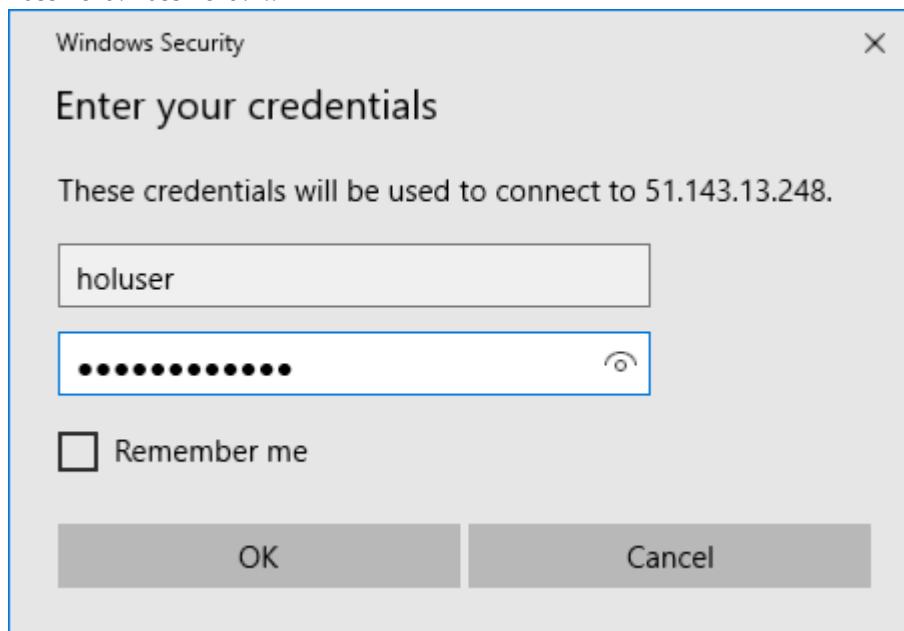
- Download and open the .RDP file.

6. Select Connect on the Remote Desktop Connection dialog.

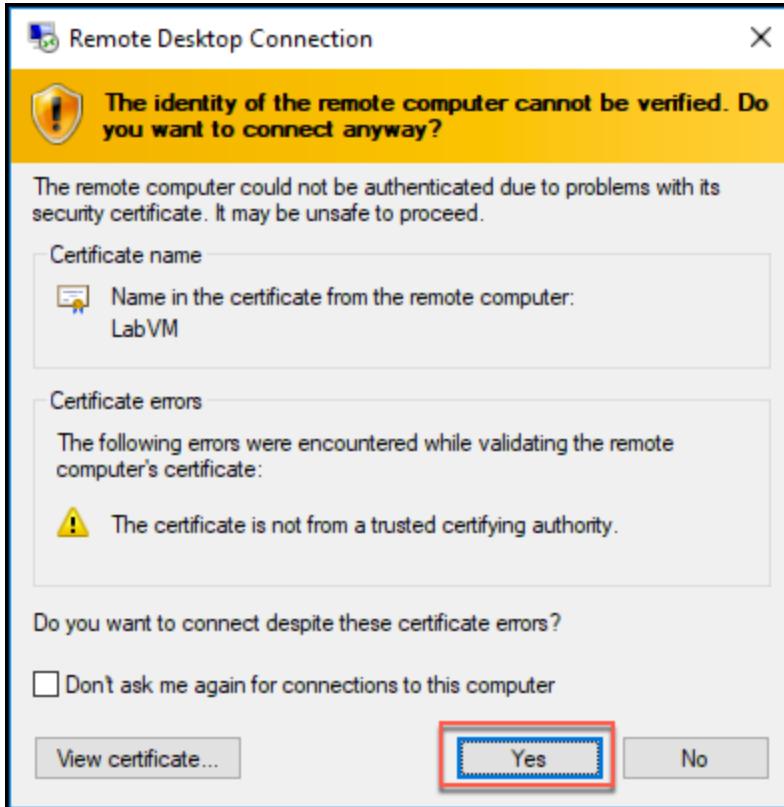


7. Enter the following credentials (or the non-default credentials if you changed them):

- User name: holuser
- Password: Password.1!!



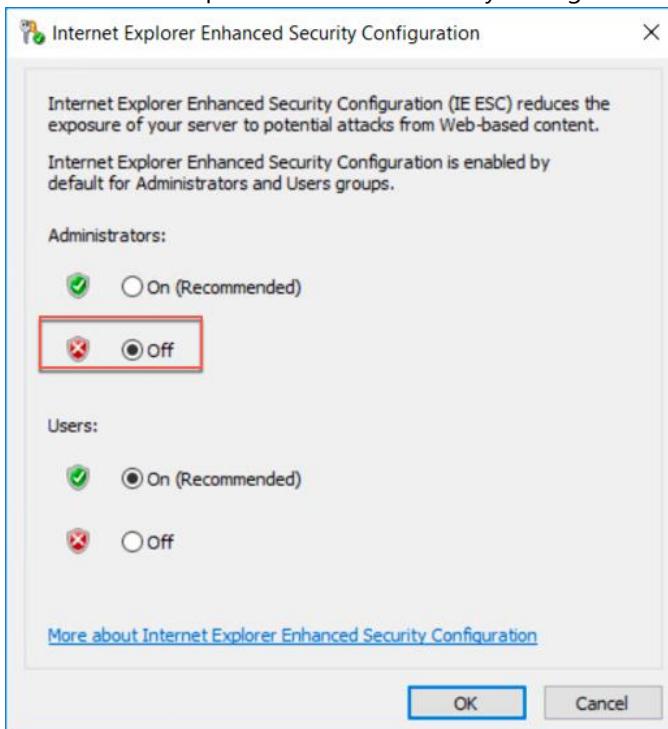
8. Select Yes to connect, if prompted that the identity of the remote computer cannot be verified.



9. Once logged in, launch the Server Manager. This should start automatically, but you can access it via the Start menu if it does not start.  
10. Select Local Server, the select On next to IE Enhanced Security Configuration.

The screenshot shows the 'PROPERTIES' window for the 'Local Server' under 'For LabVM'. The left sidebar shows 'Dashboard', 'Local Server' (selected), 'All Servers', and 'File and Storage Services'. The main pane displays various system details. In the 'Windows Defender' section, there is a row for 'IE Enhanced Security Configuration' with the value 'On'. A red arrow points to this row. Other visible details include 'Computer name: LabVM', 'Workgroup: WORKGROUP', 'Last installed updates: 10/11/2017 6:20 PM', 'Windows Update: Download updates only, using Windows Update', 'Last checked for updates: 10/11/2017 6:20 PM', 'Windows Firewall: Private: On', 'Remote management: Enabled', 'Remote Desktop: Enabled', 'NIC Teaming: Disabled', 'Ethernet: IPv4 address assigned by DHCP, IPv6 enabled', 'Windows Defender: Real-Time Protection: On', 'Feedback & Diagnostics: Settings', 'Time zone: (UTC) Coordinated Universal Time', and 'Product ID: 00376-40000-00000-AA947 (activated)'.

11. In the Internet Explorer Enhanced Security Configuration dialog, select Off under Administrators, then select OK.



12. Close the Server Manager.

You should follow all steps provided *before* attending the Hands-on lab.

# Exercise 1: Deploy SQL Server instances

Duration: 60 minutes

In this exercise, you will create an Azure VM that contains instances of both SQL Server 2008 and SQL Server 2017.

## Task 1: Provision an Azure VM

In this task, you will provision a virtual machine (VM) in Azure which can host instances of both SQL Server 2008 and SQL Server 2017. The VM will use the Windows Server 2012 R2 Datacenter image. Note, we are using an older version of Windows Server because SQL Server 2008 R2 is not supported on Windows Server 2016.

1. In a web browser, navigate to the Azure portal (<https://portal.azure.com>).
2. Select +Create a resource, and in the Search the marketplace box type "windows server 2012." Select the Windows Server 2012 R2 Datacenter VM image from the list.

NAME	PUBLISHER	CATEGORY
Windows Server 2012 R2 Datacenter	Microsoft	Compute
Windows Server 2012 Datacenter	Microsoft	Compute

3. In the blade that comes up, ensure the deployment model is set to Resource Manager, and select Create.

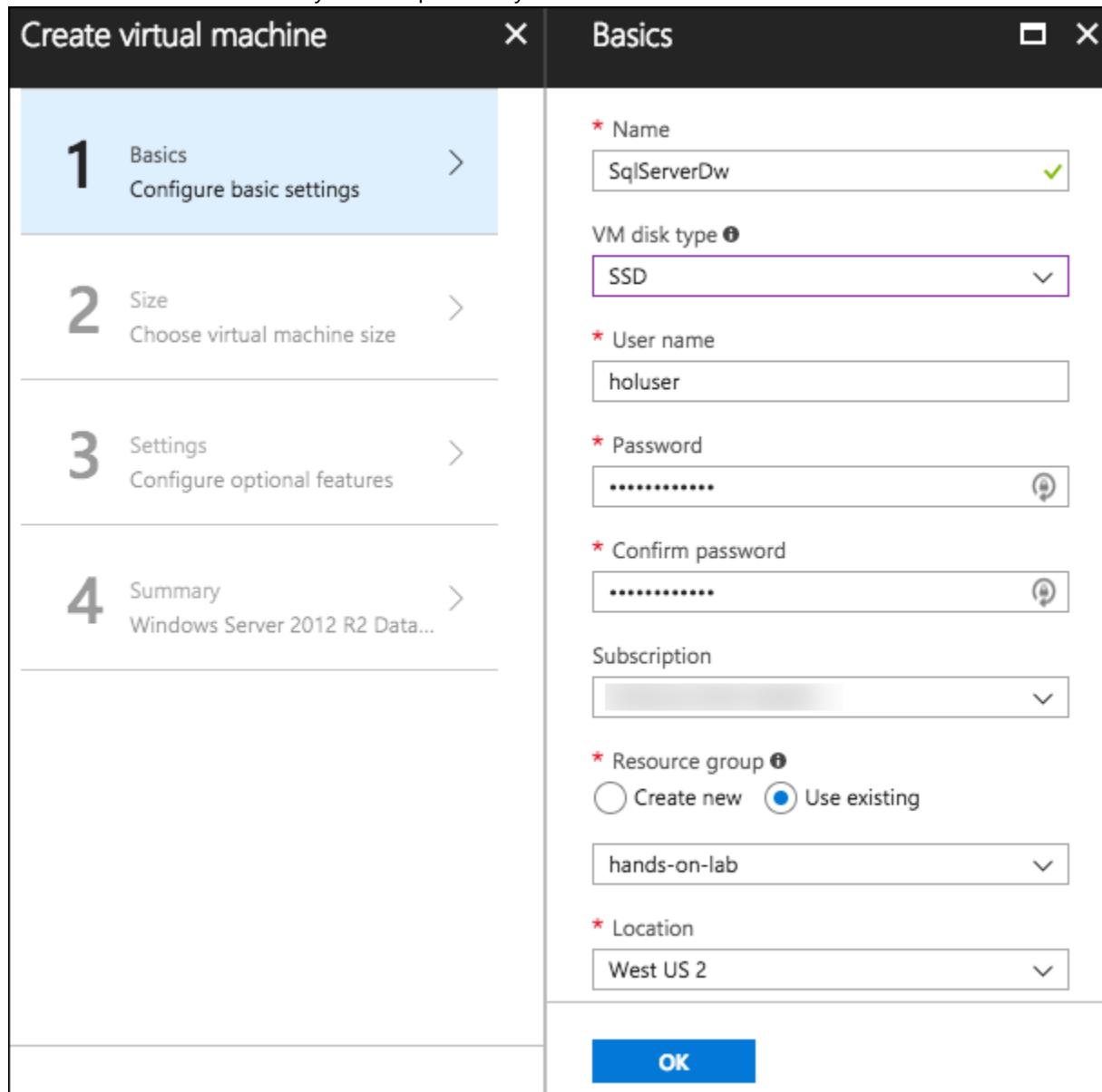
Select a deployment model ?

Resource Manager

Create

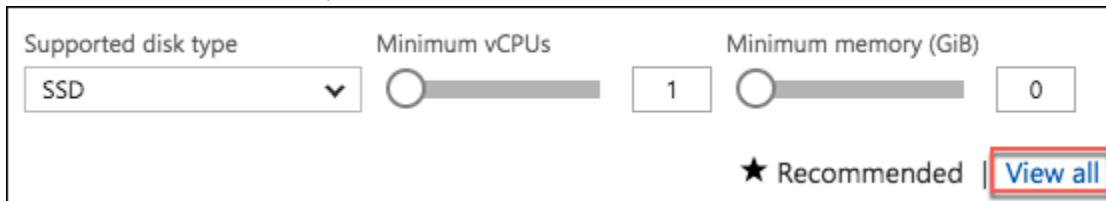
4. On the Create virtual machine blade, enter the following:
  - a. Name: Enter SqlServerDw
  - b. VM disk type: Select SSD
  - c. User name: Enter holuser
  - d. Password: Enter Password.1!!, then re-enter it in the confirm password text box
  - e. Subscription: Select the subscription you are using for this lab
  - f. Resource group: Select Use existing, then choose the hands-on-labs resource group

- g. Location: Select the location you used previously in this lab



h. Select OK to move on to the Size blade.

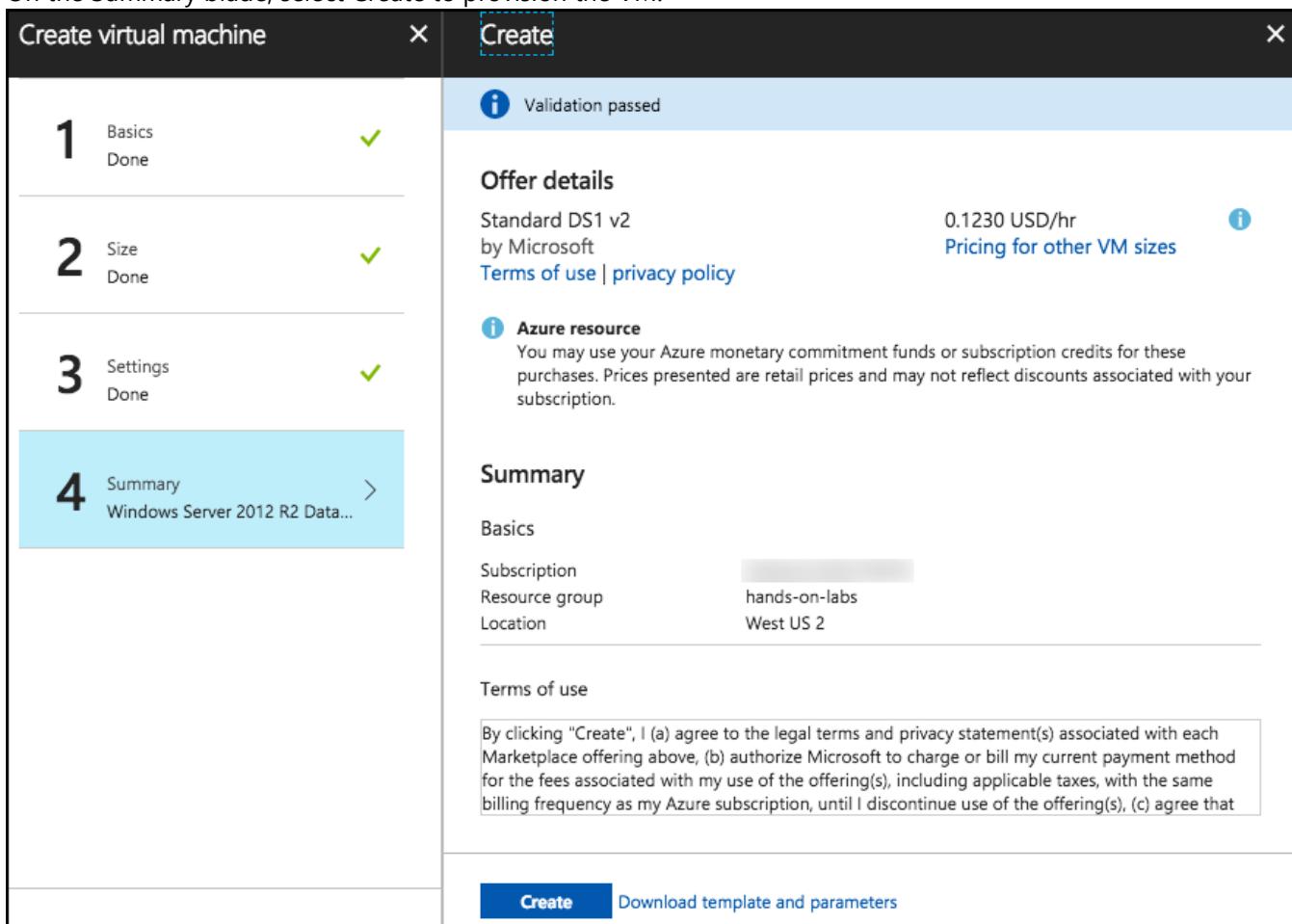
5. On the Choose a size blade, select View all.



6. Choose a VM size. For this lab, it does not need to be very large, so selecting DS1\_V2 Standard is a good option.

E64-16S_V3 Standard	DS1_V2 Standard	DS2_V2 Standard
16 vCPUs	1 vCPU	2 vCPUs
432 GB	3.5 GB	7 GB
32 Data disks	4 Data disks	8 Data disks
128000 Max IOPS	3200 Max IOPS	6400 Max IOPS
864 GB Local SSD	7 GB Local SSD	14 GB Local SSD
Premium disk support	Premium disk support	Premium disk support
Load balancing	Load balancing	Load balancing
<b>5,048.78</b> USD/MONTH (ESTIMATED)	<b>91.51</b> USD/MONTH (ESTIMATED)	<b>183.02</b> USD/MONTH (ESTIMATED)

7. Select Select on the Choose a size blade.  
 8. On the Settings blade, select OK to accept the defaults and move on to the Summary.  
 9. On the Summary blade, select Create to provision the VM.



The screenshot shows the 'Create virtual machine' wizard in the Azure portal. The left sidebar lists four steps: 1. Basics (Done), 2. Size (Done), 3. Settings (Done), and 4. Summary. Step 4 is currently selected. The main pane displays 'Offer details' for 'Standard DS1 v2 by Microsoft' at a price of 0.1230 USD/hr, with links to 'Pricing for other VM sizes' and 'Terms of use | privacy policy'. It also shows an 'Azure resource' note about monetary commitment funds. The 'Summary' section includes fields for 'Subscription' (hands-on-labs), 'Resource group' (hands-on-labs), 'Location' (West US 2), and a 'Terms of use' checkbox. At the bottom are 'Create' and 'Download template and parameters' buttons.

10. It can take 10+ minutes to provision the new VM.

## Task 2: Allow remote systems to connect with the SQL Server VM

In this task, you will create a network security rule for the SqlServerDw VM that allows remote systems to connect with SQL Server.

1. In the Azure portal, navigate to the newly provisioned SqlServerDw VM by selecting Resource groups from the left-hand menu, then selecting the hands-on-lab resource group from the list.

The screenshot shows the Azure Resource Groups blade. On the left sidebar, 'Resource groups' is selected and highlighted with a red box. The main area displays a list of resource groups under the heading 'Resource groups'. One resource group, 'hands-on-lab', is listed and highlighted with a red box. The list includes a column for 'NAME' and a checkbox column.

2. From the list of available resources, select the SqlServerDw virtual machine.

<input type="checkbox"/>	LabVM-ip	Public IP address	West US 2
<input type="checkbox"/>	LabVM-nsg	Network security group	West US 2
<input type="checkbox"/>	SqlServerDw	Virtual machine	West US 2
<input type="checkbox"/>	SqlServerDw_OsDisk_1_99142f56ffbf4ca8be32a12e0e0de00d	Disk	West US 2
<input type="checkbox"/>	sqlserverdw464	Network interface	West US 2

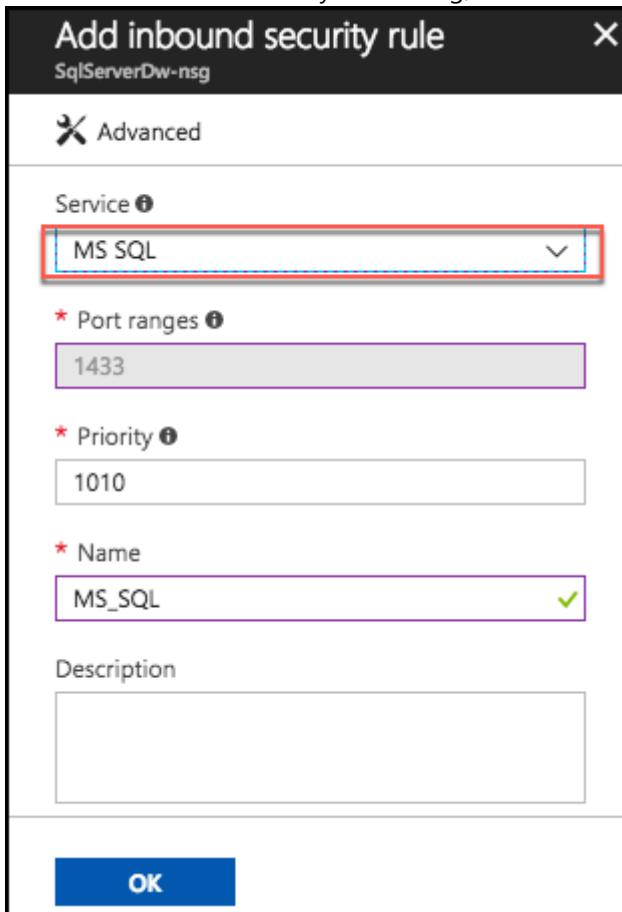
3. On the SqlServerDw blade, select Networking under Settings from the left-hand menu.

The screenshot shows the SqlServerDw blade under the 'SETTINGS' section. The 'Networking' option is highlighted with a red box. Other options in the list include 'Disks', 'Size', 'Extensions', and 'Availability set'.

4. On the Networking blade, select Add inbound port rule.

INBOUND PORT RULES <small>1</small>							<a href="#">Add inbound port rule</a>
PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION	...
1000	default-allow-rdp	3389	TCP	Any	Any	<span style="color: green;">Allow</span>	<a href="#">...</a>

5. In the Add inbound security rule dialog, select MS SQL for the Service, then select OK.



6. Once the new inbound port rule is created, you will see it appear in the Inbound port rules list.

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACTION
1000	default-allow-rdp	3389	TCP	Any	Any	<span style="color: green;">Allow</span>
1010	MS_SQL	1433	TCP	Any	Any	<span style="color: green;">Allow</span>
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	<span style="color: green;">Allow</span>

## Task 3: Install SQL Server 2017

In this task, you will create a remote desktop protocol (RDP) connection to the SqlServerDw VM, and install SQL Server 2017 and Microsoft SQL Server Management Studio (SSMS) on the SqlServerDw VM.

- From the overview blade of your SqlServerDw VM in the Azure portal, select Connect, and follow the prompts to login to the VM, following the same steps used to connect to your Lab VM and disable IE Enhanced Security

Configuration in [Before the hands-on lab, Task 2.](#)



- From a web browser on the SqlServerDw VM, download SQL Server 2017 Developer Edition by navigating to <https://www.microsoft.com/sql-server/sql-server-downloads>, and selecting the Download now link under Developer edition.

Download SQL Server 2017 for Windows

Free trial evaluation

Developer edition

Express edition

Get started with a 180-day free trial. SQL Server 2017 is a comprehensive, mission-critical database for demanding workloads.

SQL Server 2017 Developer is a full-featured free edition, licensed for use as a development and test database in a non-production environment.

SQL Server 2017 Express is a free edition of SQL Server, ideal for development and production for desktop, web, and small server applications.

[Download now >](#) [Download now ↓](#) [Download now ↓](#)

- Run the downloaded installer.
- In the install dialog, select Custom as the installation type on the first screen.

SQL Server 2017

Developer Edition

Select an installation type:

Basic

Select Basic installation type to install the SQL Server Database Engine feature with default configuration.

Custom

Select Custom installation type to step through the SQL Server installation wizard and choose what you want to install. This installation type is detailed and takes longer than running the Basic install.

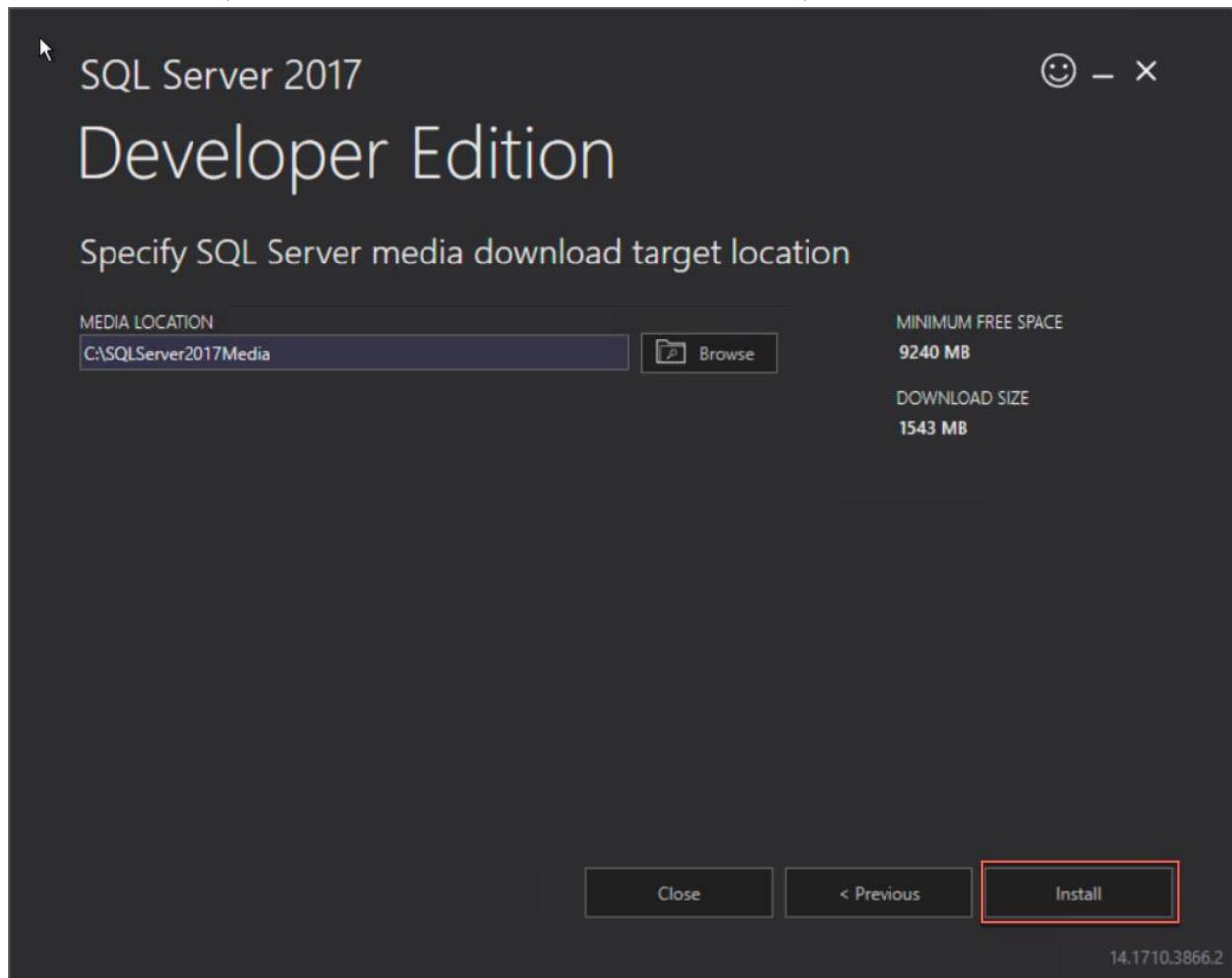
Download Media

Download SQL Server setup files now and install them later on a machine of your choice.

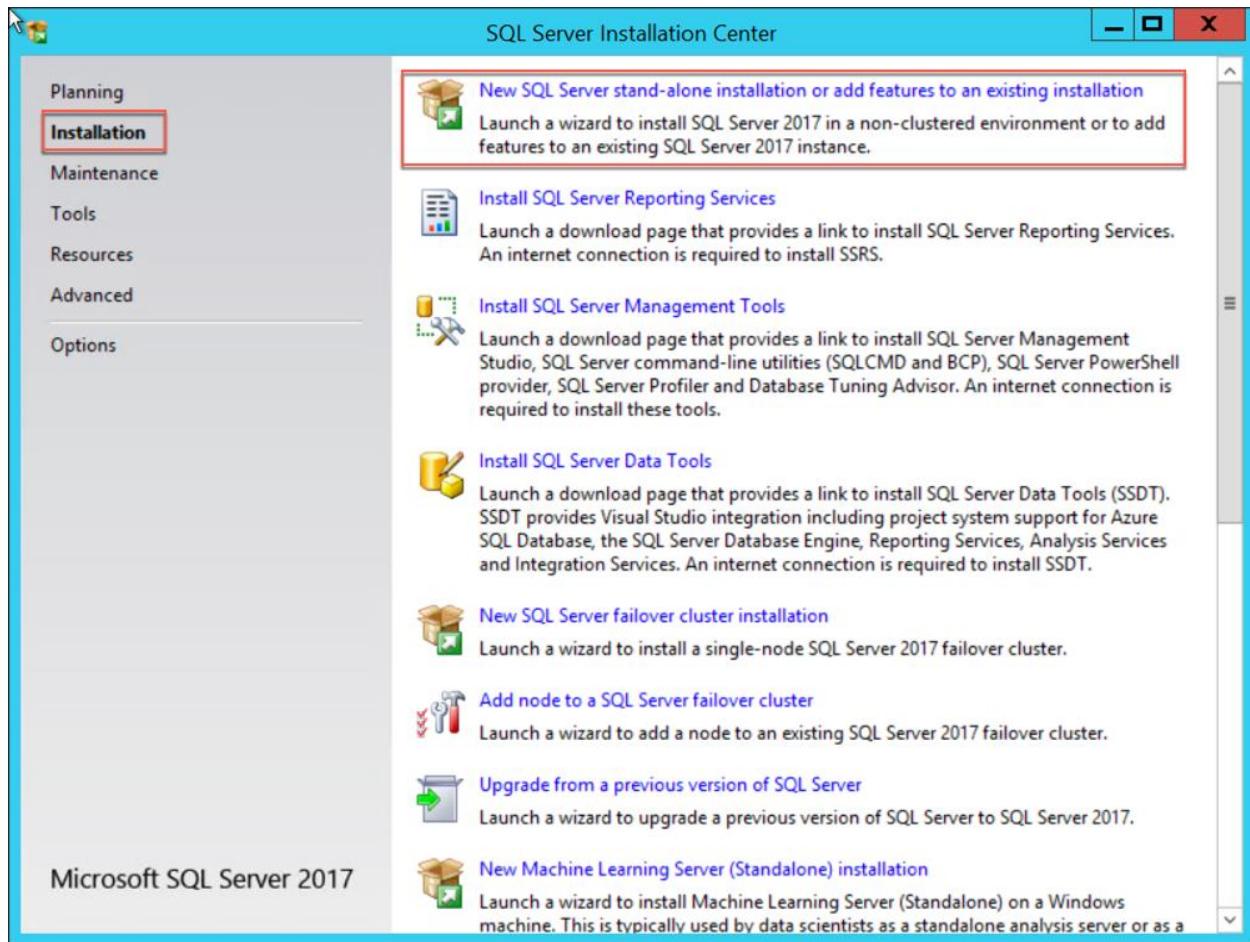
SQL Server 2017 transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about SQL Server 2017 data processing and privacy controls, please see the [Privacy Statement](#).

14.1710.3866.2

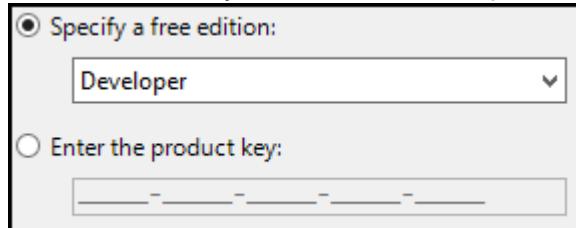
5. On the next screen, leave the Media Location set to the default value, and select Install.



- Once the necessary components are downloaded, the SQL Server Installation Center will open. Select Installation on the left-hand menu, then select New SQL Server stand-alone installation or add features to an existing installation.

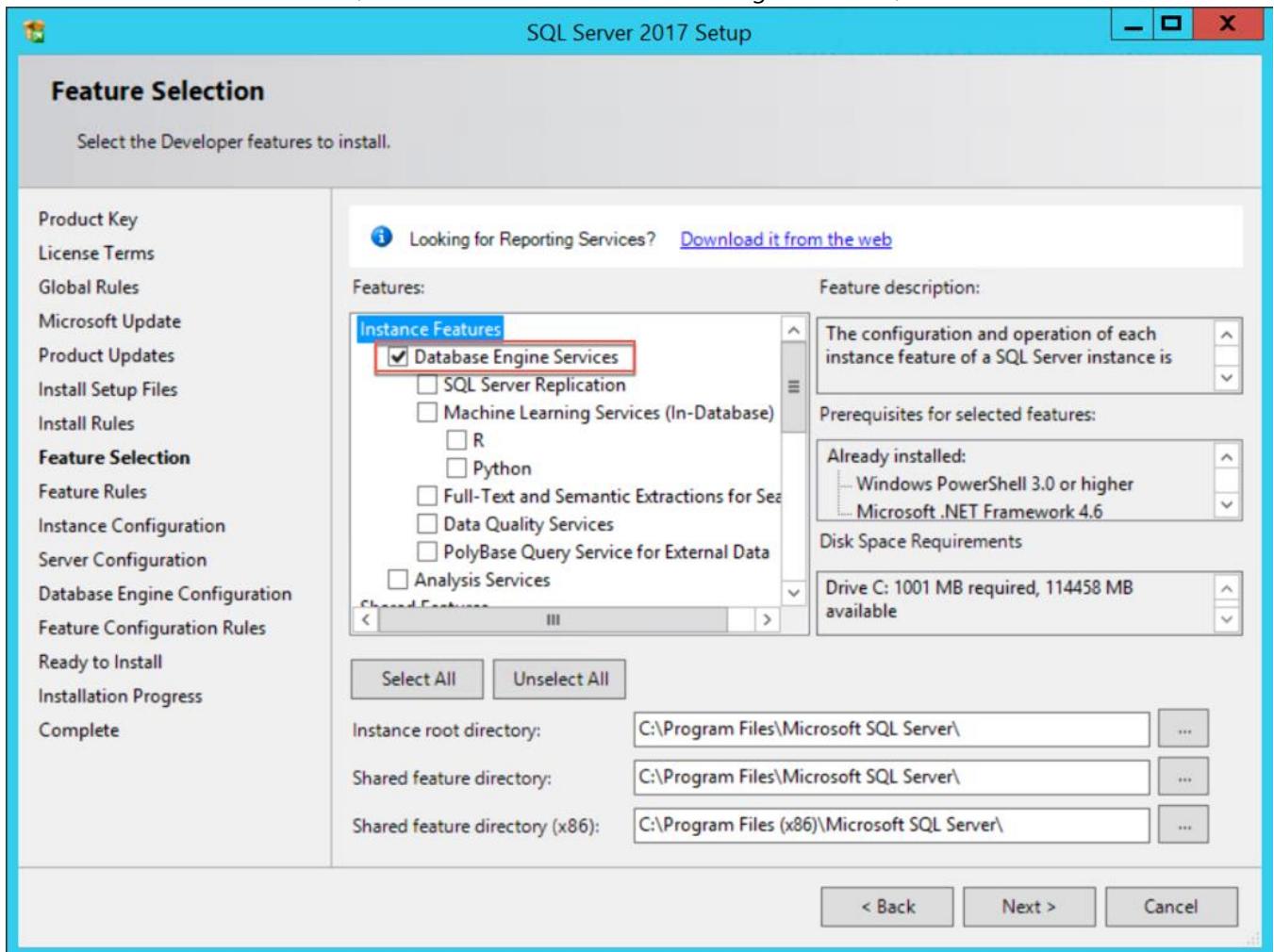


- On the Product Key screen, select Developer under Specify a free edition, and select Next.



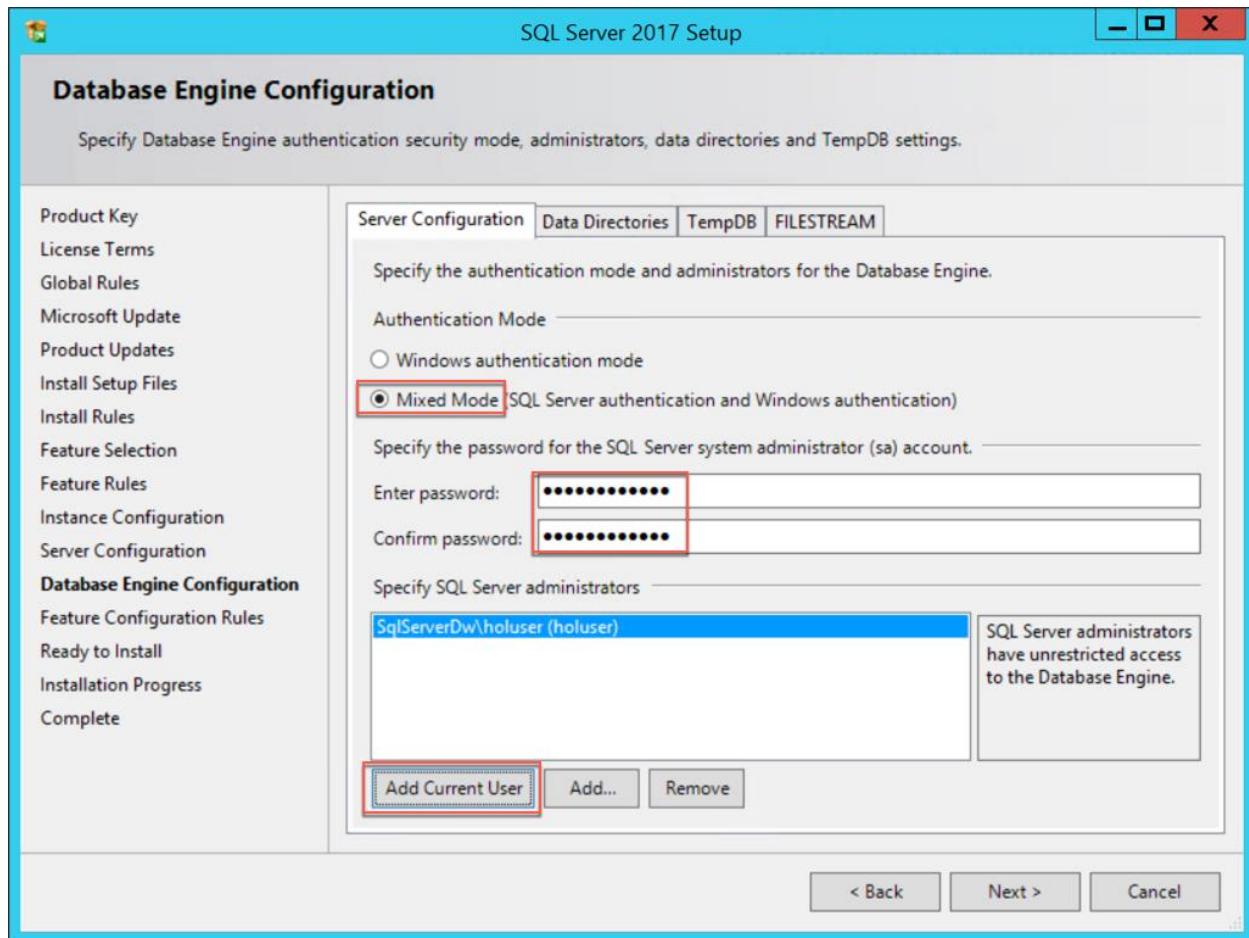
- On the License Terms screen, check the box to accept the license terms, and select Next.
- Select Next on each the following screens to accept the defaults, until you get to the Feature Selection screen.

10. On the Feature Selection screen, check the box next to Database Engine Services, and select Next.



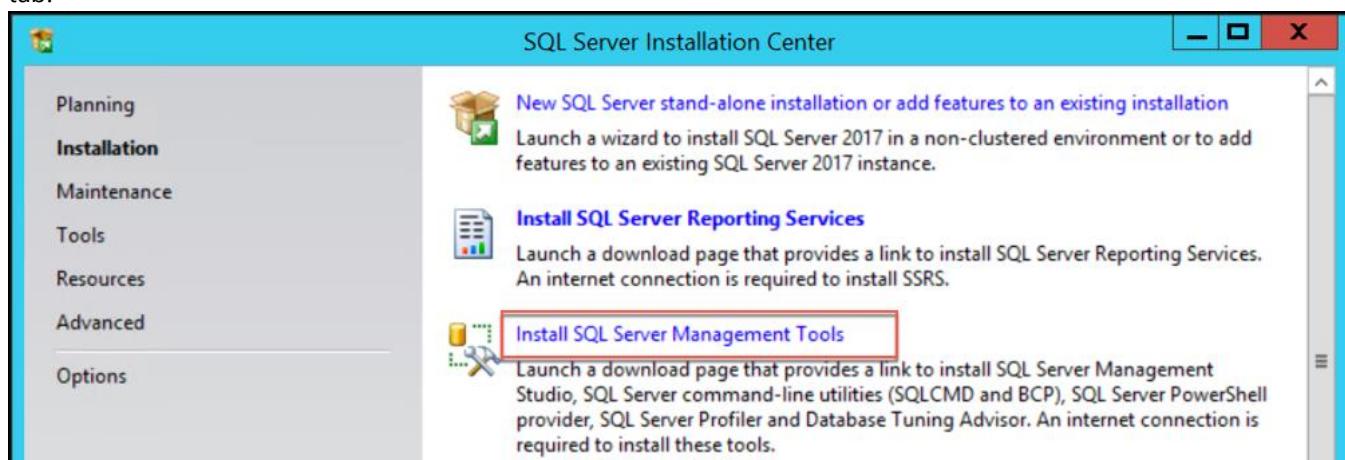
11. On the Instance Configuration screen, leave Default instance selected, and select Next.
12. Accept the default values on the Server Configuration screen, and select Next.
13. On the Database Engine Configuration screen:
  - a. Select Mixed Mode
  - b. Enter Password.1!! for the sa password.

- c. Click the Add Current User button to make the holuser windows account a SQL Server administrator.



- d. Select Next.

14. Select Install on the Ready to Install screen to start the installation.
15. Select Close when the installation is complete.
16. Back in the SQL Server Installation Center dialog, select Install SQL Server Management Tools on the Installation tab.



17. In the browser window that opens, scroll down and select the Download SQL Server Management Studio 17.x link, then run the installer.

**SSMS is free!**

SSMS 17.x is the latest generation of *SQL Server Management Studio* and provides support for SQL Server 2017.

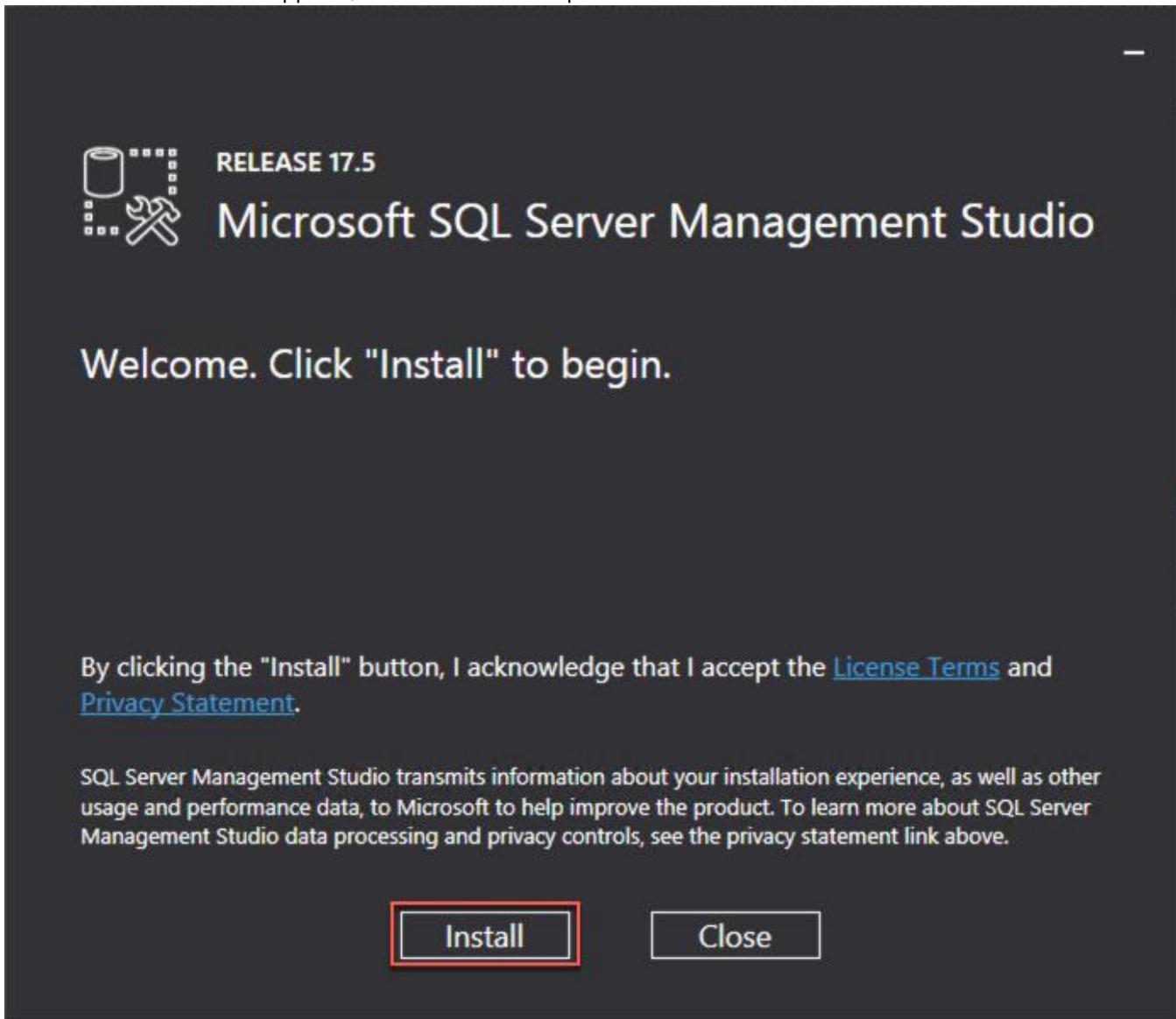


[Download SQL Server Management Studio 17.5](#)



[Download SQL Server Management Studio 17.5 Upgrade Package \(upgrades 17.x to 17.5\)](#)

18. In the install window that appears, select Install to complete the installation.



19. Close the SQL Server Management Studio (SSMS) installer once setup is completed.

20. Close the SQL Server Installation Center dialog.

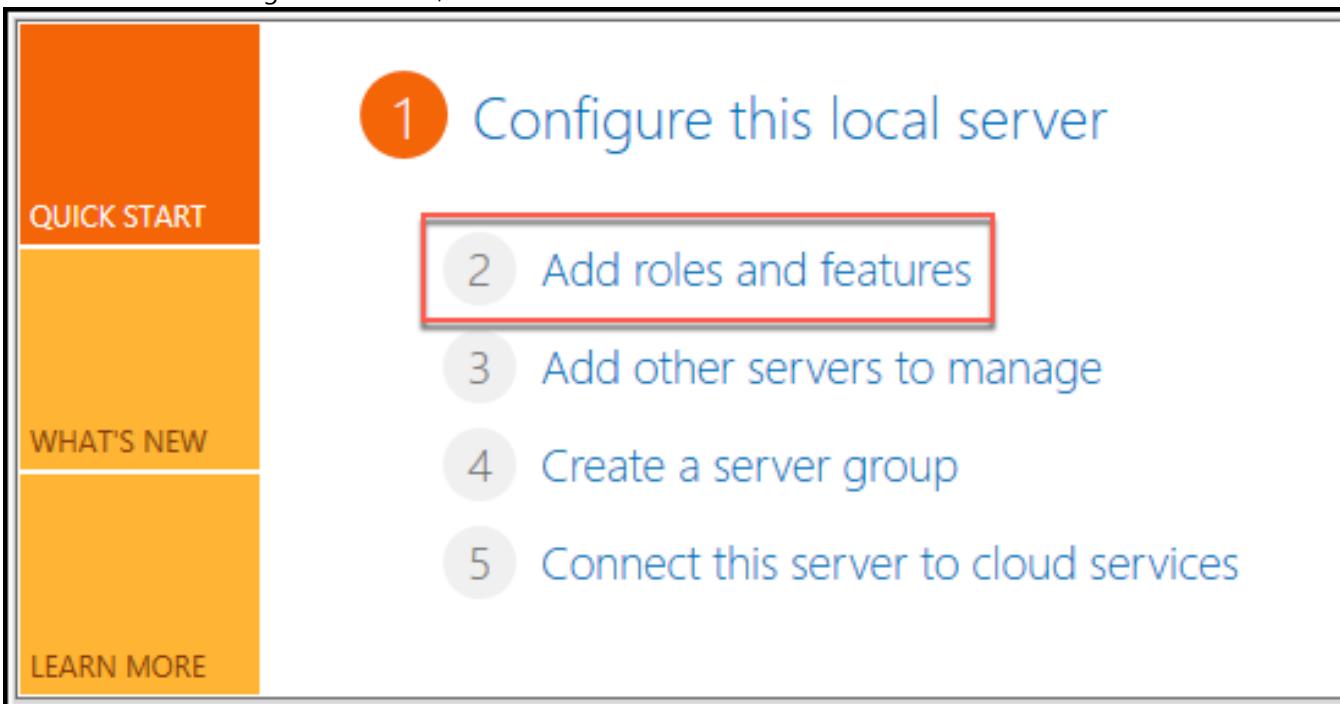
## Task 4: Configure the VM as an application server

In this task, you will configure the SqlServerDw VM to be an application server. This is necessary to install the required .NET components on the server prior to installing SQL Server 2008 R2.

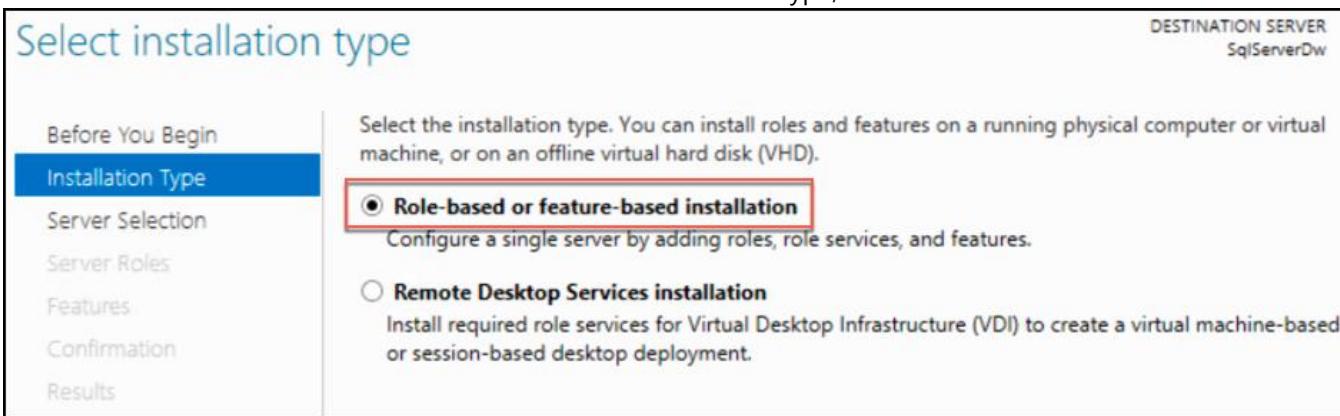
1. On your SqlServerDw VM, launch the Server Manager by selecting its icon on the Windows task bar.



2. From the Server Manager Dashboard, select Add roles and features.



3. Select Next on the Before You Begin screen.
4. Select Role-based or feature-based installation for the installation type, and select Next.



5. Accept the default selection on the Select destination server screen, and select Next.

**Select destination server**

DESTINATION SERVER  
SqlServerDw

Before You Begin  
Installation Type  
**Server Selection**  
Server Roles  
Features  
Confirmation  
Results

Select a server or a virtual hard disk on which to install roles and features.

Select a server from the server pool  
 Select a virtual hard disk

**Server Pool**

Filter:

Name	IP Address	Operating System
SqlServerDw	172.16.2.5	Microsoft Windows Server 2012 R2 Datacenter

6. On the Select server roles screen, select Application Server, and select Next.

**Select server roles**

DESTINATION SERVER  
SqlServerDw

Before You Begin  
Installation Type  
Server Selection  
**Server Roles**  
Features  
Application Server  
Role Services  
Confirmation  
Results

Select one or more roles to install on the selected server.

**Roles**

<input type="checkbox"/> Active Directory Certificate Services	Description
<input type="checkbox"/> Active Directory Domain Services	Application Server provides central management and hosting of high-performance distributed business applications such as those built with Enterprise Services and .NET Framework 4.5.
<input type="checkbox"/> Active Directory Federation Services	
<input type="checkbox"/> Active Directory Lightweight Directory Services	
<input type="checkbox"/> Active Directory Rights Management Services	
<input checked="" type="checkbox"/> Application Server	
<input type="checkbox"/> DHCP Server	
<input type="checkbox"/> DNS Server	

7. On the Select features screen, select .NET Framework 3.5 Features, then select Next.

**Select features**

DESTINATION SERVER  
SqlServerDw

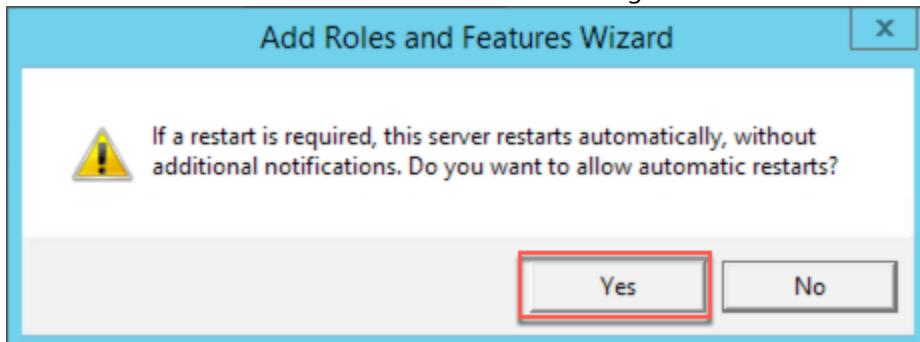
Before You Begin  
Installation Type  
Server Selection  
Server Roles  
**Features**  
Application Server  
Role Services  
Confirmation  
Results

Select one or more features to install on the selected server.

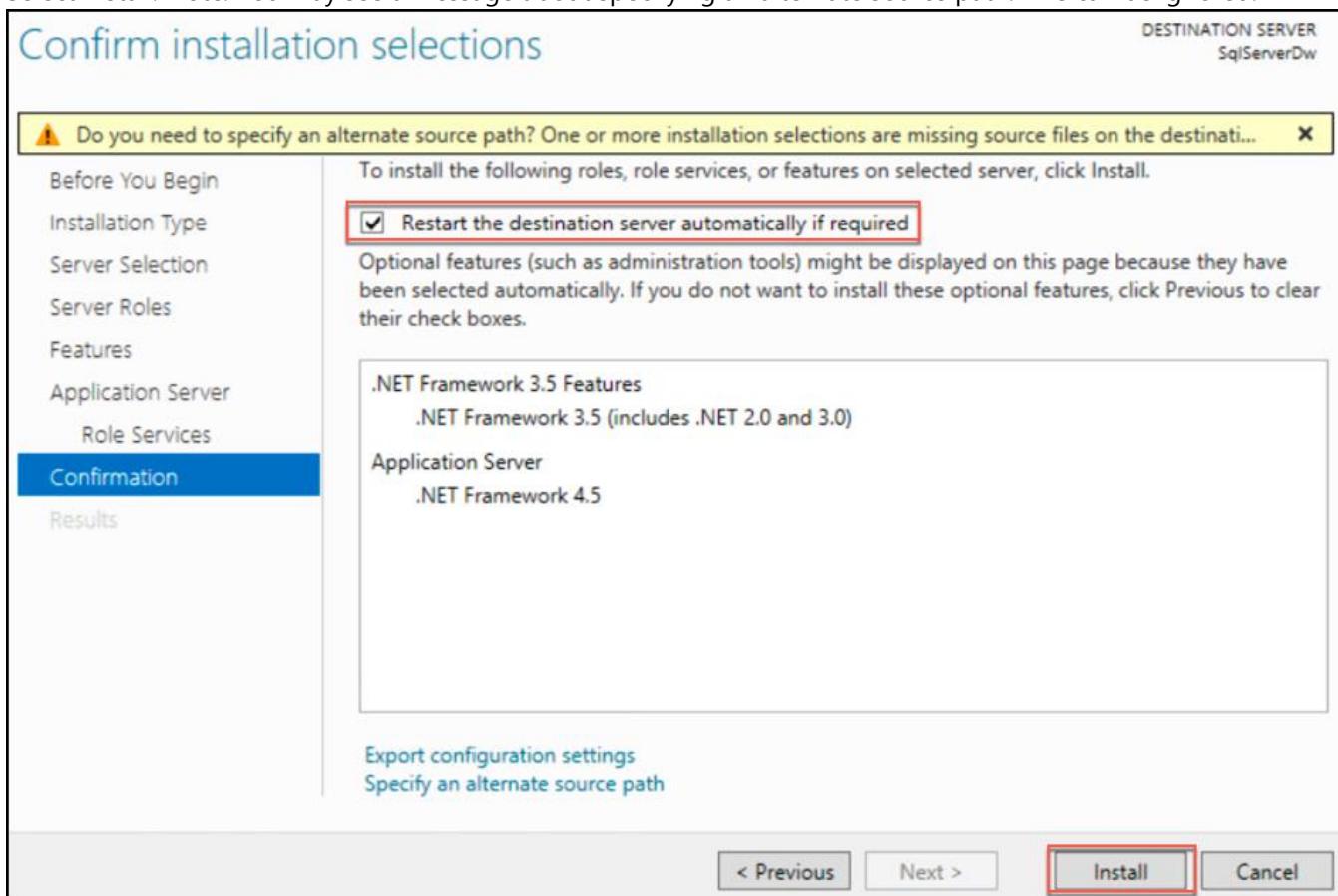
**Features**

<input checked="" type="checkbox"/> .NET Framework 3.5 Features	Description
<input type="checkbox"/> .NET Framework 4.5 Features (2 of 7 installed)	.NET Framework 3.5 combines the power of the .NET Framework 2.0 APIs with new technologies for building applications that offer appealing user interfaces, protect your customers' personal identity information, enable seamless and secure communication, and provide the ability to model a range of business processes.
<input type="checkbox"/> Background Intelligent Transfer Service (BITS)	
<input checked="" type="checkbox"/> BitLocker Drive Encryption (Installed)	
<input type="checkbox"/> BitLocker Network Unlock	
<input type="checkbox"/> BranchCache	
<input type="checkbox"/> Client for NFS	
<input type="checkbox"/> Data Center Bridging	

8. Select Next on the Application Server screen.
9. Accept the default values on the Select role services screen, and select Next.
10. On the Confirm installation selections screen, check the Restart the destination server automatically if required check box. Click Yes on the restart confirmation dialog.



11. Select Install. Note: You may see a message about specifying an alternate source path. This can be ignored.

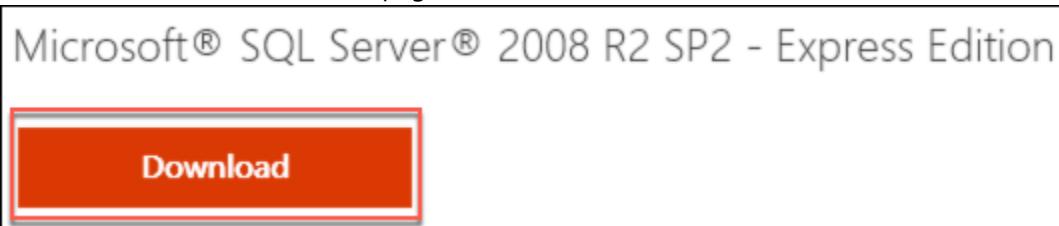


12. Close the Add Roles and Features Wizard, once the installation is completed.
13. Close the Server Manager.

## Task 5: Install SQL Server 2008 R2

1. On the SqlServerDw VM, open a web browser, and navigate to <https://www.microsoft.com/download/details.aspx?id=30438>.

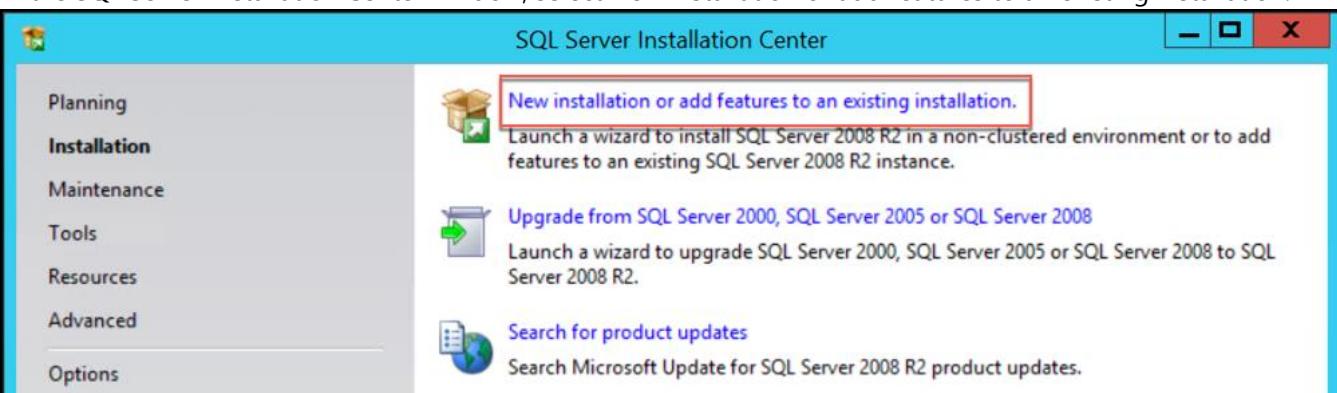
2. Select the Download link on the page.



3. Download SQL Server 2008 R2 Express with Advanced Services by selecting SQLEXPRAADV\_x64\_ENU.exe, then selecting Next.

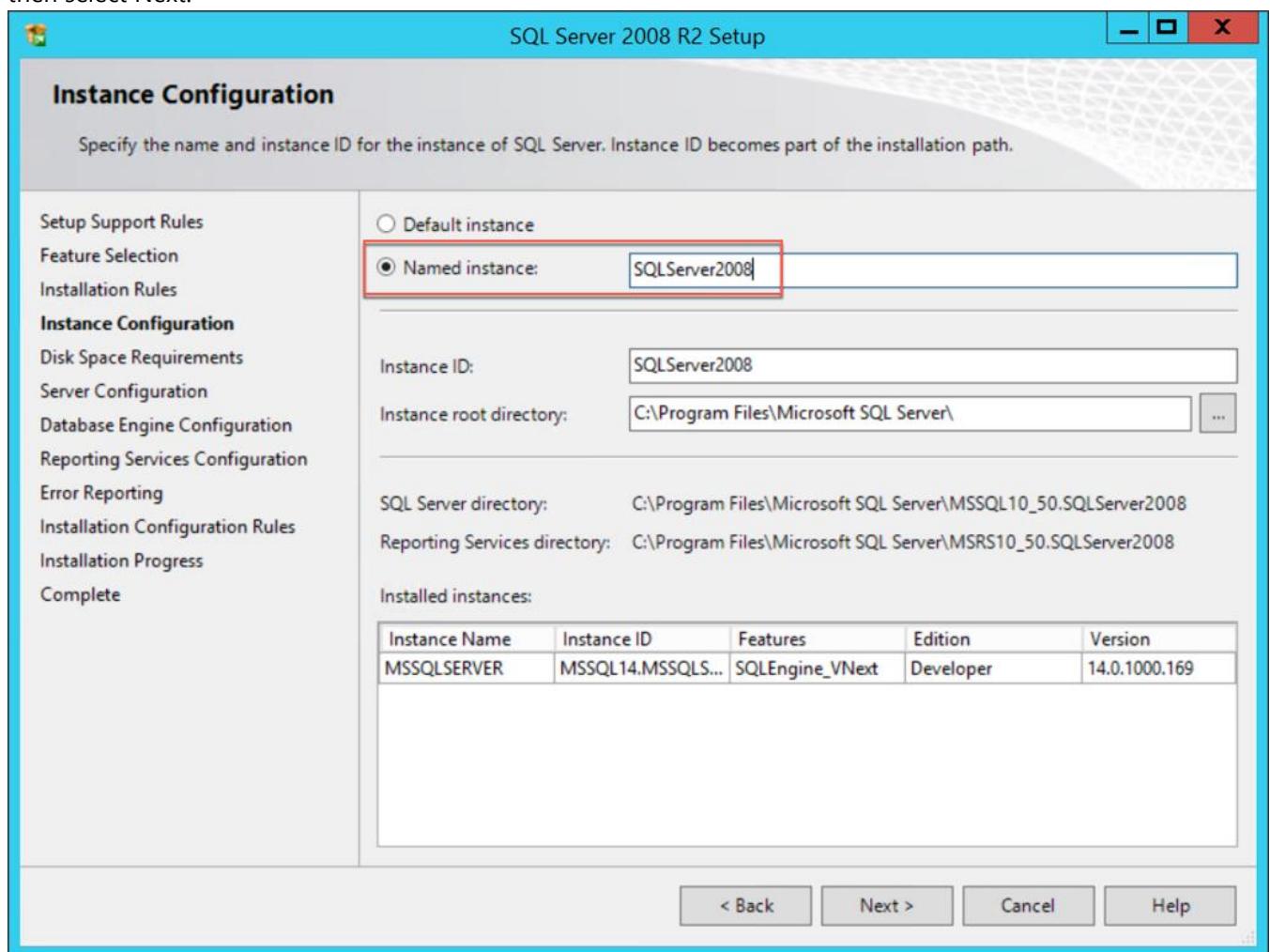


4. Run the installer.
5. In the SQL Server Installation Center window, select New installation or add features to an existing installation.

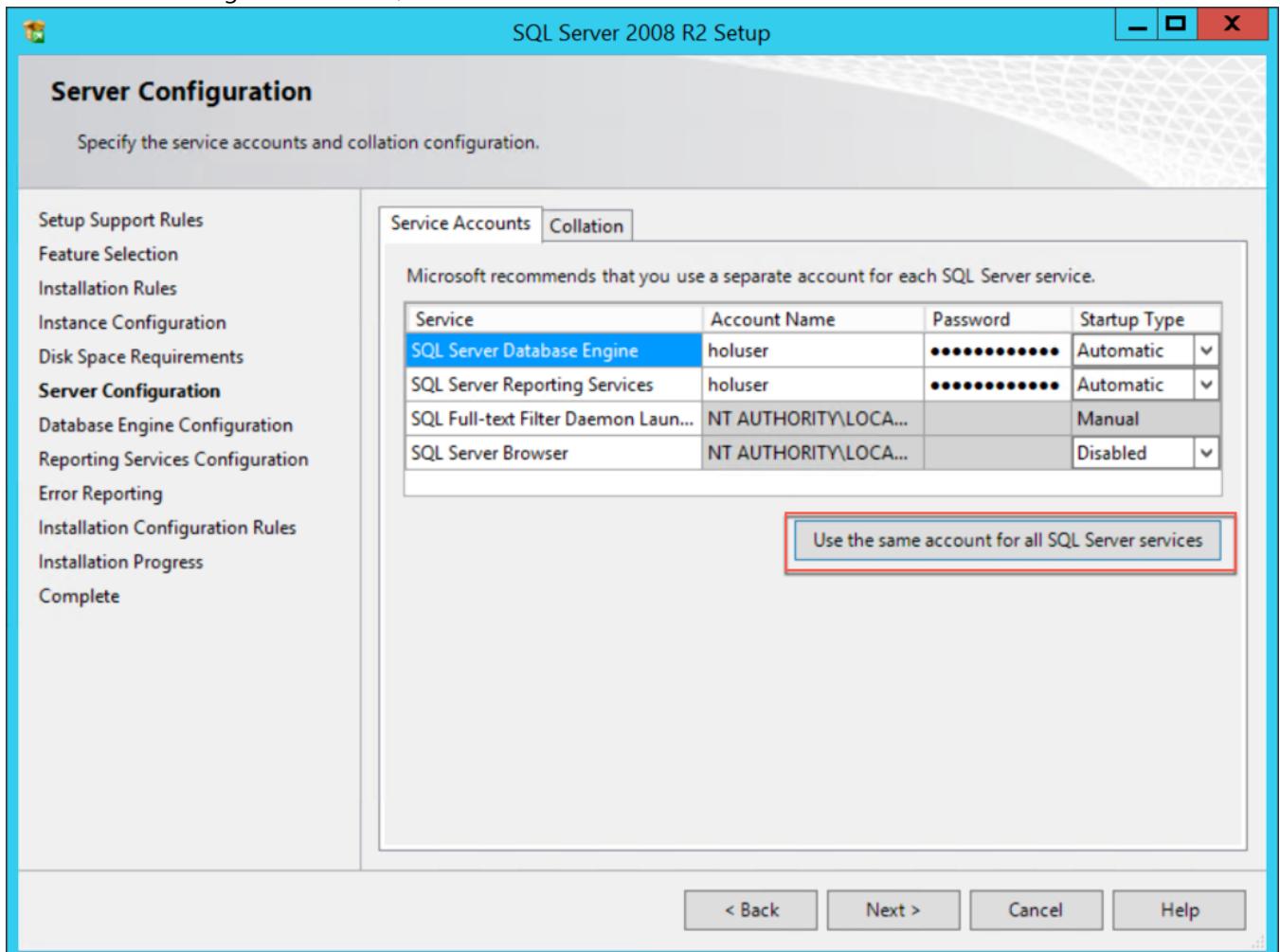


6. In the SQL Server 2008 R2 Setup dialog, accept the license terms on the License Terms screen, and select Next.
7. Accept the default values on each screen by selecting Next, until you get to the Instance Configuration screen.

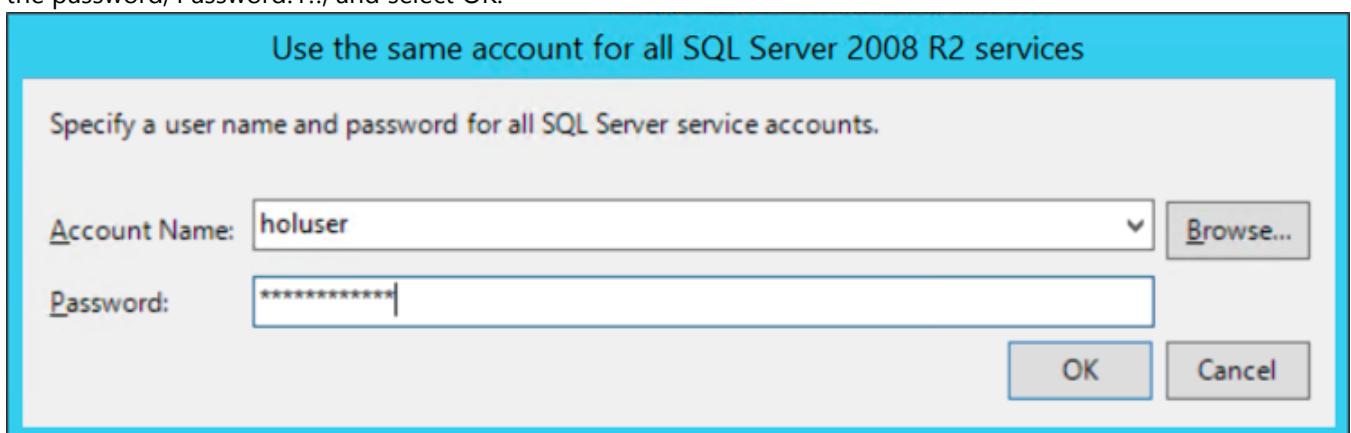
8. On the Installation Configuration screen, select Named Instance, and enter SQLServer2008 for the instance name, then select Next.



9. On the Server Configuration screen, select Use the same account for all SQL Server services.

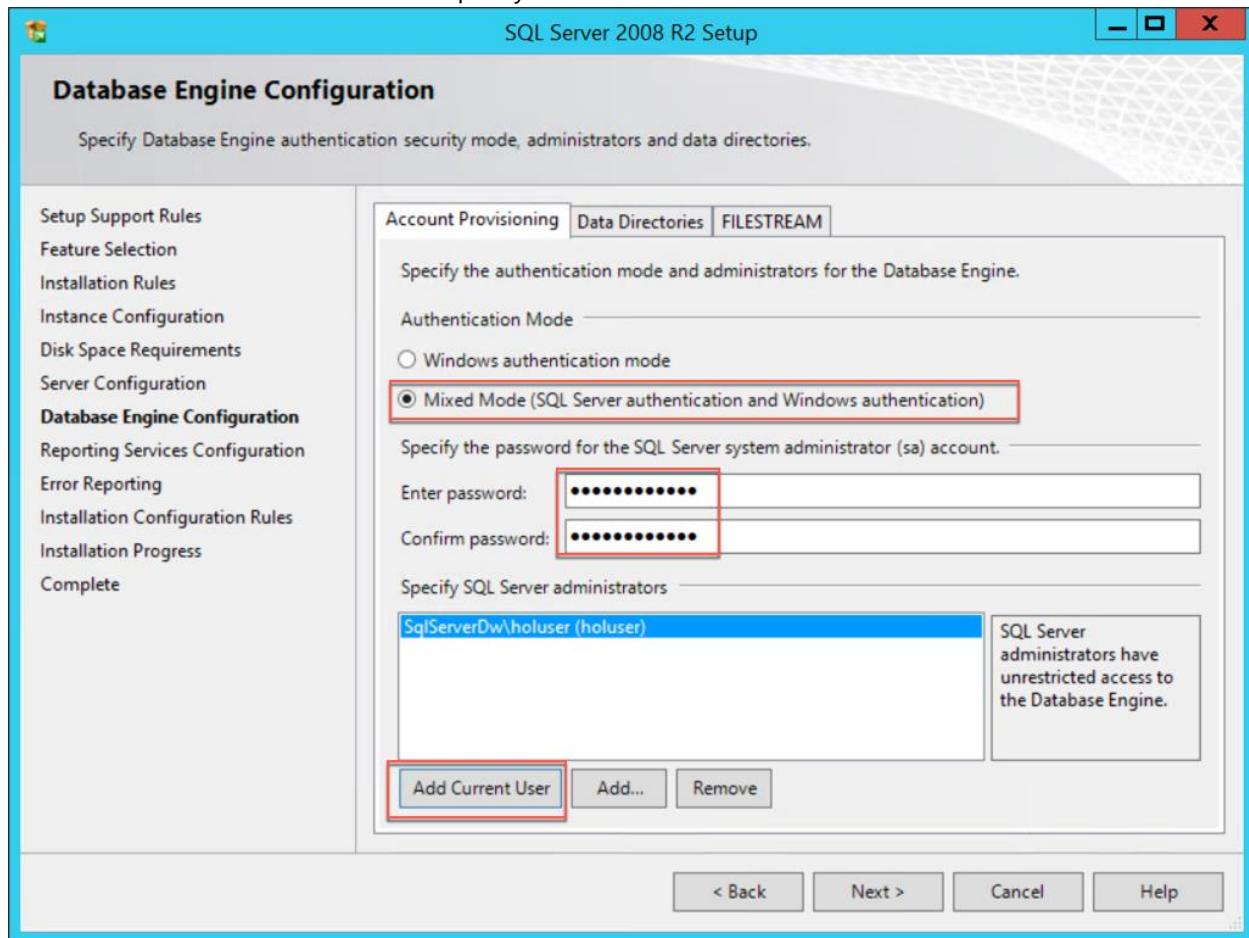


10. Click Browse, and enter holuser. Select the holuser account you created with you provisioned the VM, then enter the password, Password.1!!, and select OK.



11. Select Next on the Server Configuration screen.  
12. On the Database Engine Configuration screen:  
a. Select Mixed Mode.  
b. Enter Password.1!! for the sa password.

- c. Click the Add Current User button to specify the holuser Windows account as a SQL Server Administrator.



- d. Select Next.

13. Select Next to accept the default values on the remaining screens to complete the installation.

14. Select Close on the SQL Server 2008 R2 Setup dialog.

## Task 6: Open port 1433 on the Windows Firewall of the SqlServerDw VM

In this task, you will add rules to the SqlServerDw VM's Windows firewall to allow access to SQL Server via port 1433 by other machines.

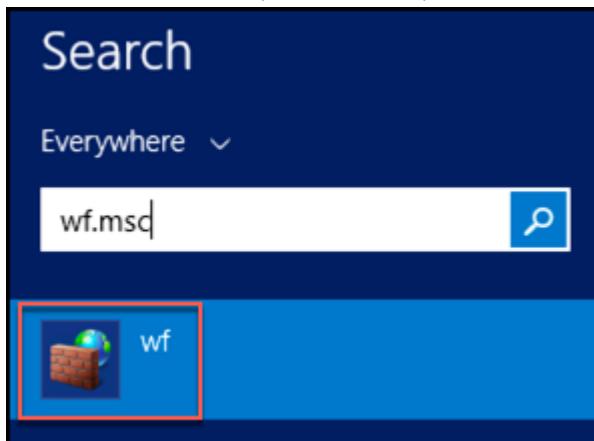
1. On the SqlServerDw VM, select Start.



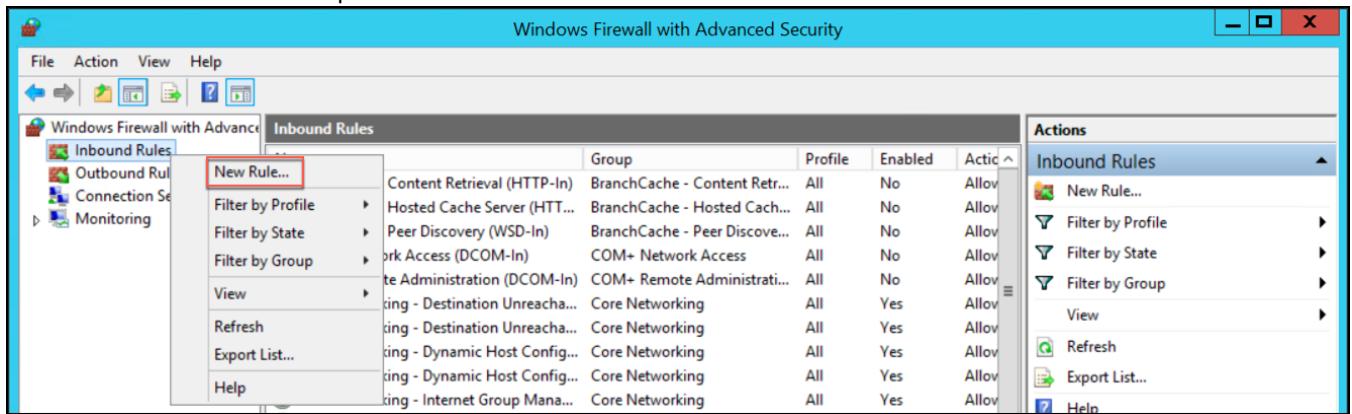
2. Then, select the Search icon in the top right-hand corner of the screen.



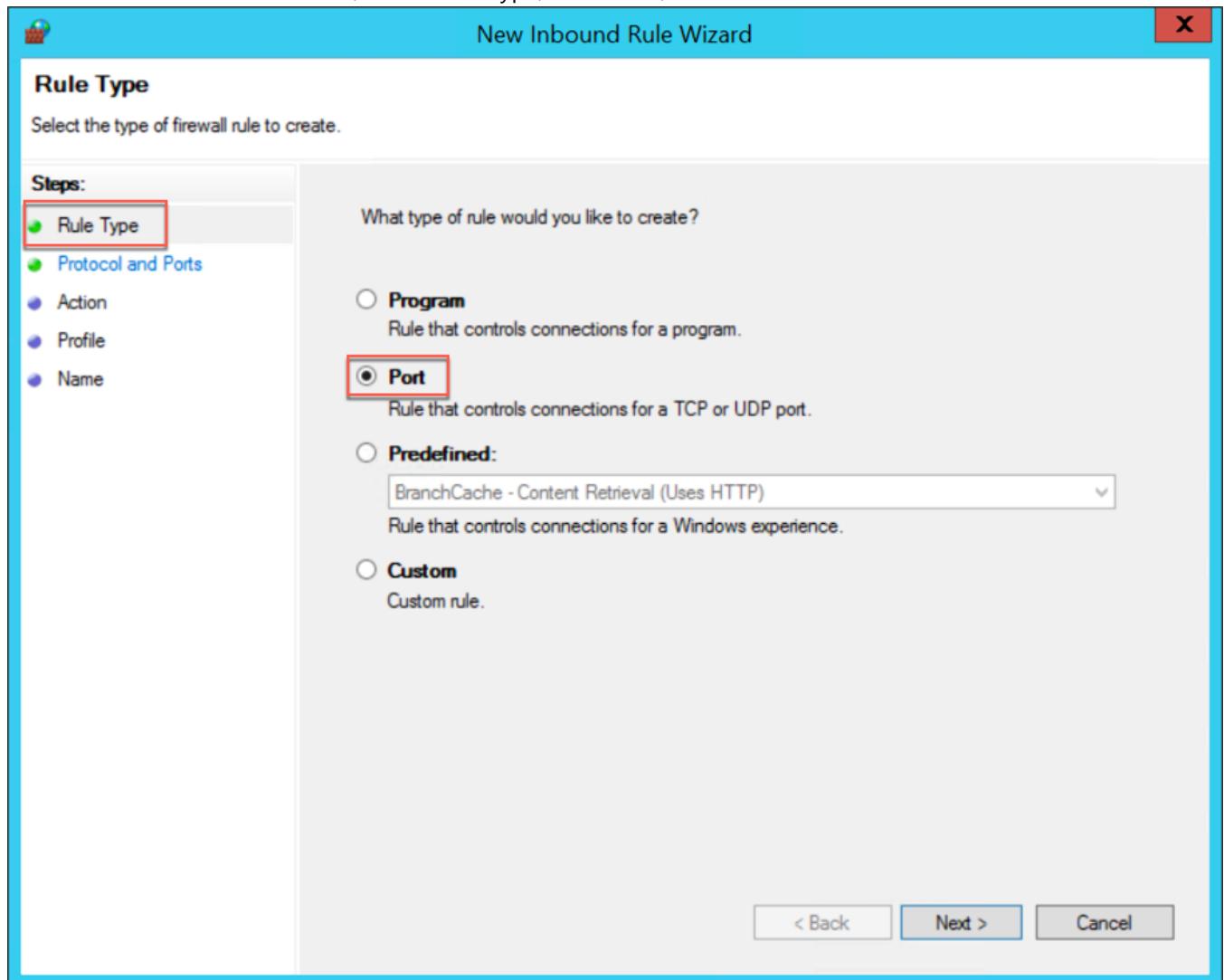
3. In the Search text box, enter wf.msc, then select wf from the list of results.



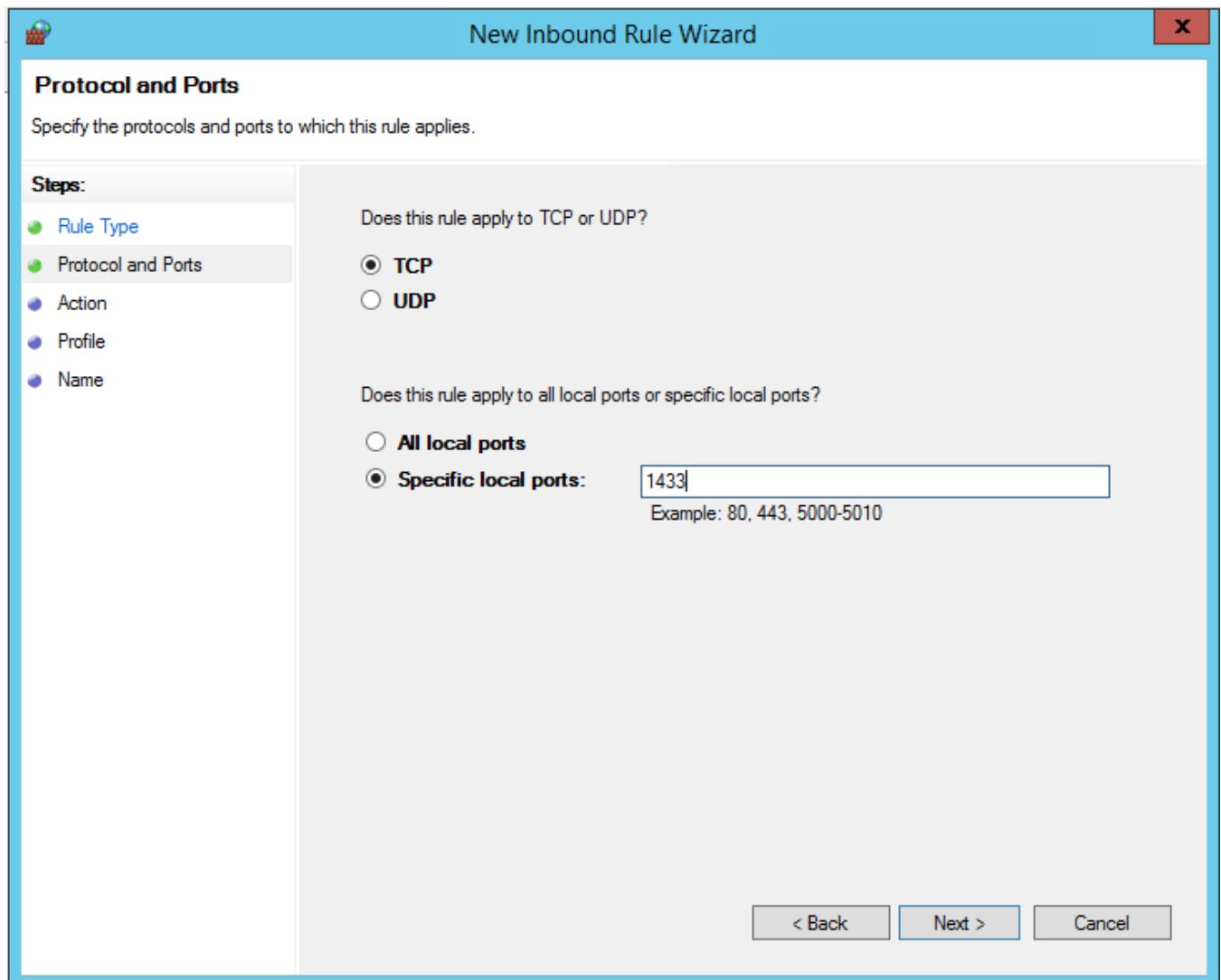
4. In the Windows Firewall with Advanced Security dialog, select, then right-click Inbound Rules in the left pane, then click New Rule in the action pane.



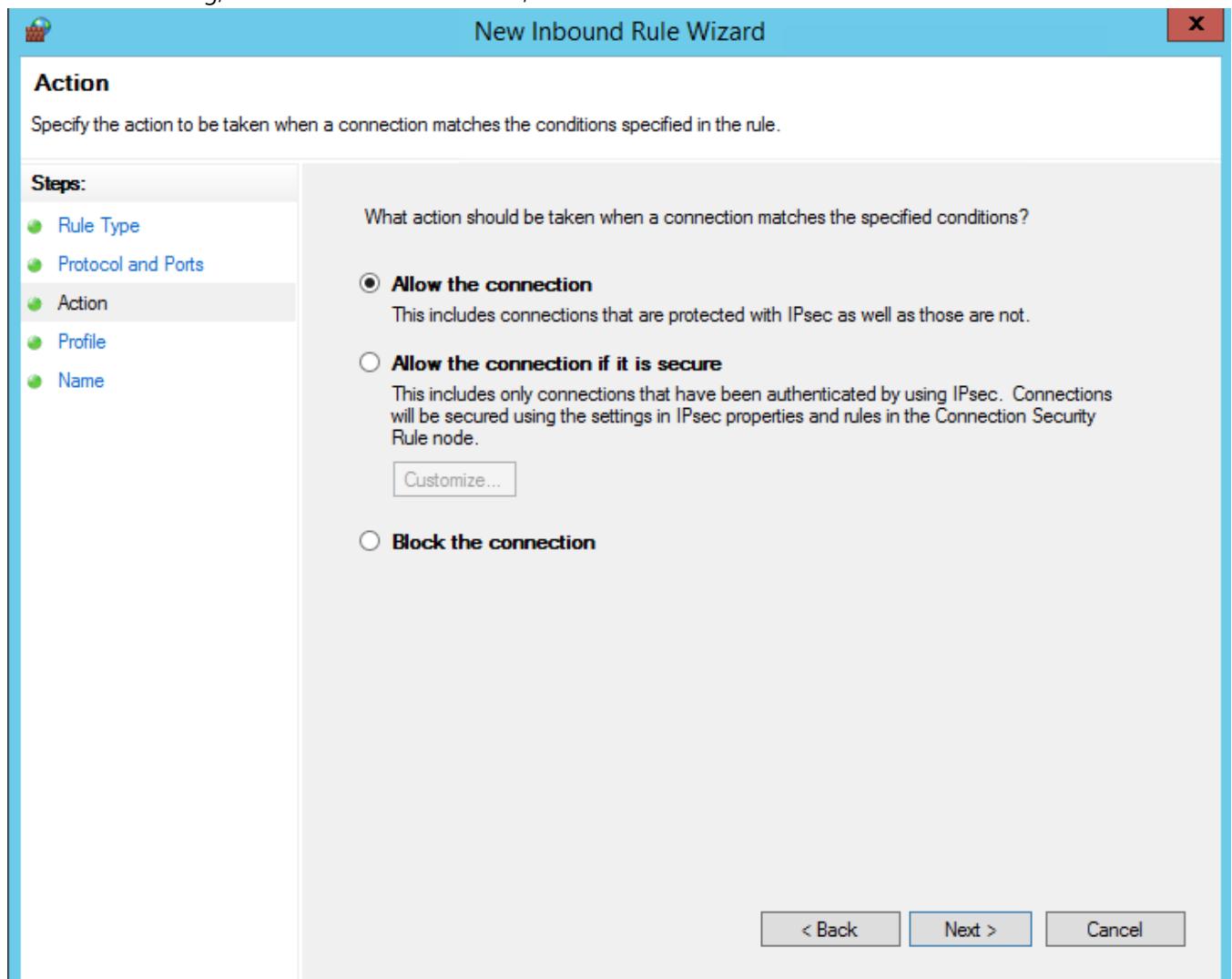
5. In the New Inbound Rule Wizard, under Rule Type, select Port, then select Next.



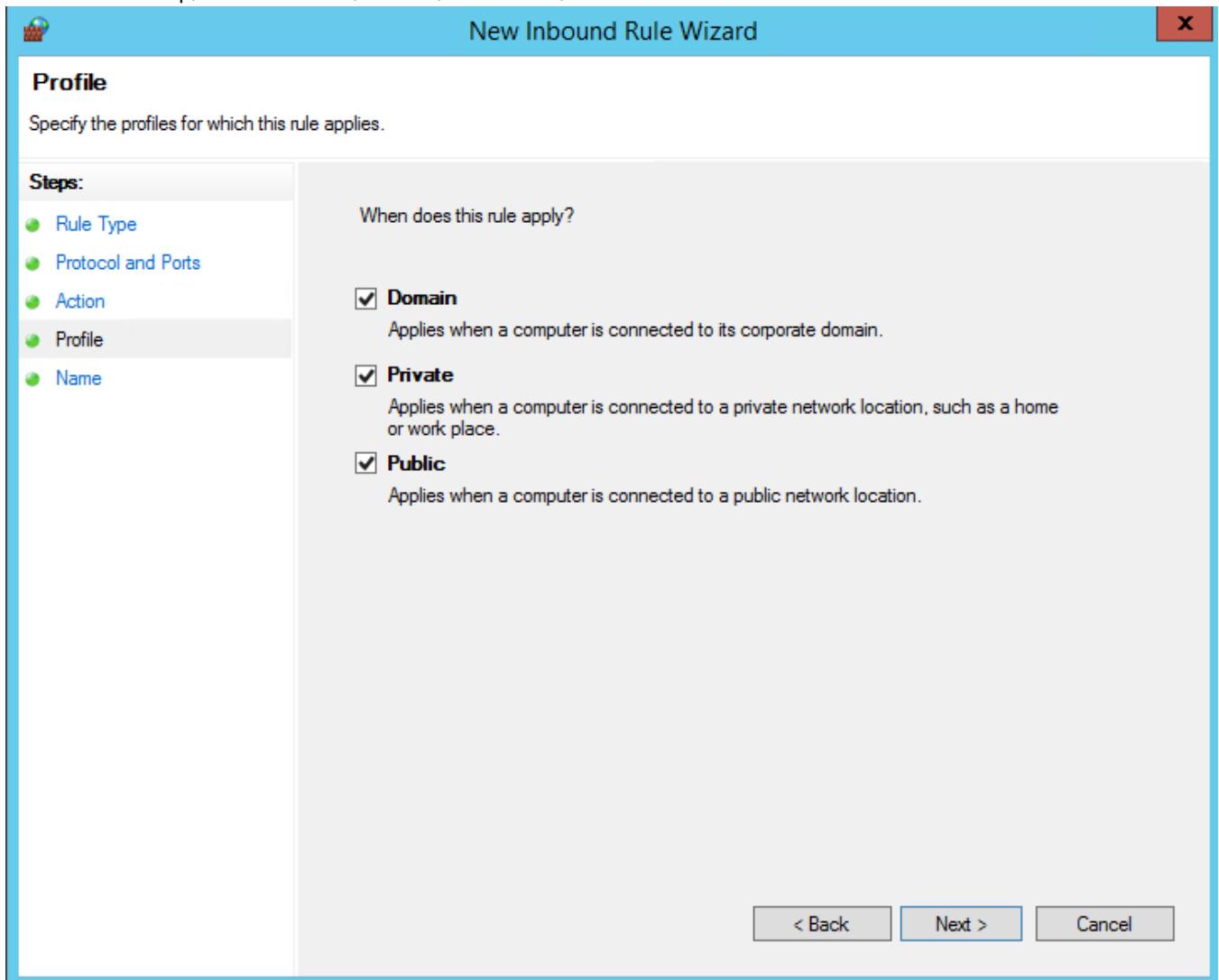
6. In the Protocol and Ports dialog, use the default TCP, and enter 1433 in the Specific local ports text box, then select Next.



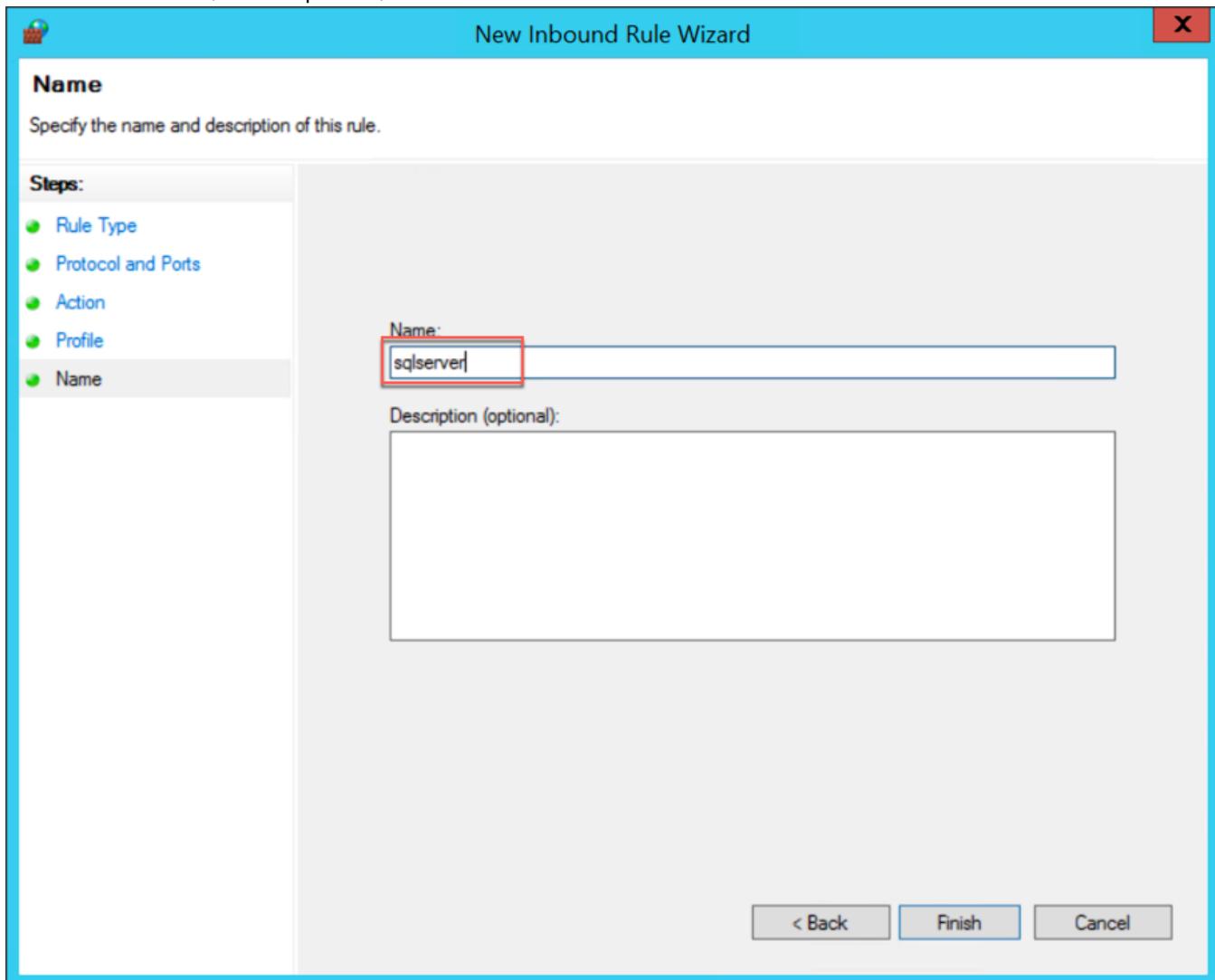
7. In the Action dialog, select Allow the connection, and select Next.



8. In the Profile step, check Domain, Private, and Public, then select Next.



9. In the Name screen, enter sqlserver, then select Finish.



10. Close the Windows Firewall with Advanced Security window.

## Task 7: Install the AdventureWorks sample database

In this task, you will install the AdventureWorks database in SQL 2008 R2, as the source database to migrate.

1. On the SqlServerDw VM, open a web browser, and navigate to the GitHub site containing the sample AdventureWorks database at <https://github.com/Microsoft/sql-server-samples/releases/tag/adventureworks2008r2>.

2. Scroll down under Assets, and select adventure-works-2008r2-dw.script.zip.

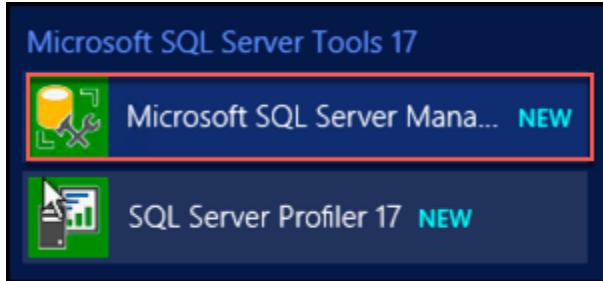
## AdventureWorks2008R2

 barbkess released this on Sep 22 2017 · 232 commits to master since this release

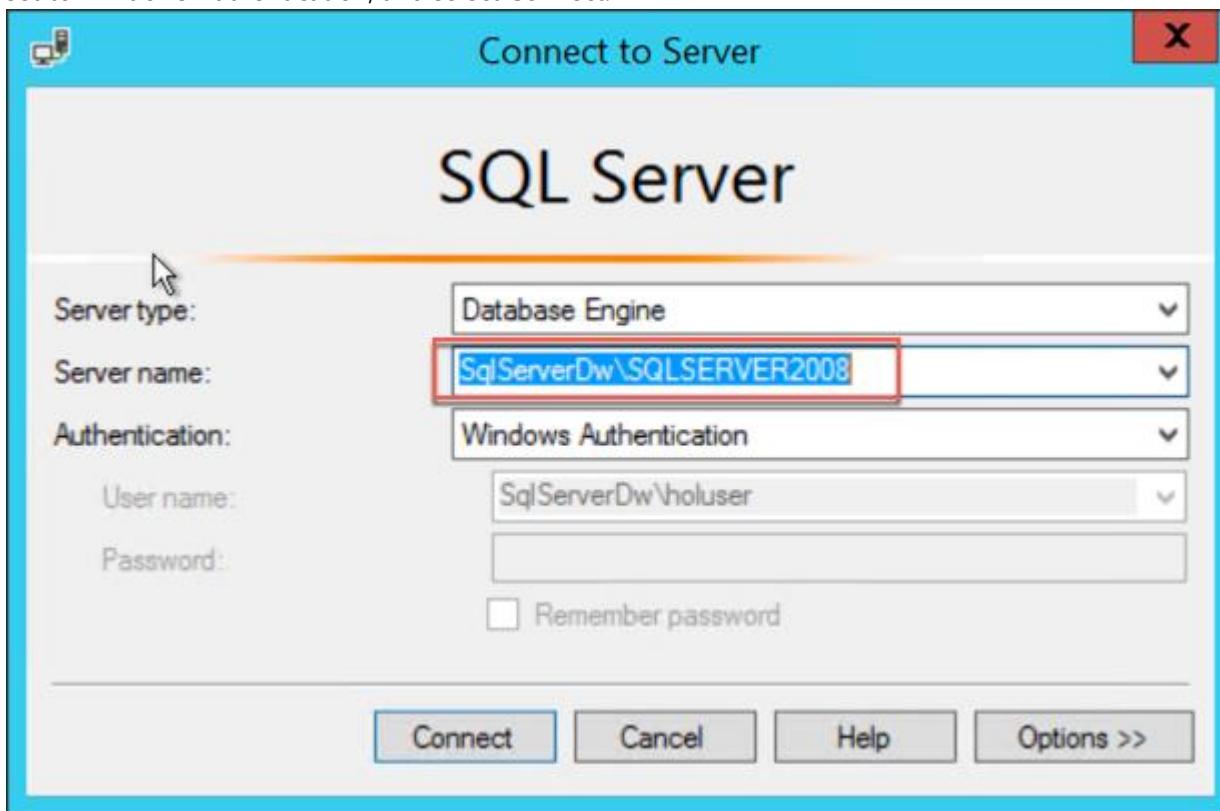
### Assets

 <a href="#">adventure-works-2008-lt-data-file.mdf</a>	5.19 MB
 <a href="#">adventure-works-2008r2-dw-data-file.mdf</a>	73.2 MB
 <a href="#">adventure-works-2008r2-dw-full-database-backup.zip</a>	35.2 MB
 <a href="#">adventure-works-2008r2-dw-script.zip</a>	8.81 MB
 <a href="#">adventure-works-2008r2-lt-script.zip</a>	915 KB
 <a href="#">adventure-works-2008r2-oltp-data-file.mdf</a>	196 MB
 <a href="#">adventure-works-2008r2-oltp-script.zip</a>	19.6 MB

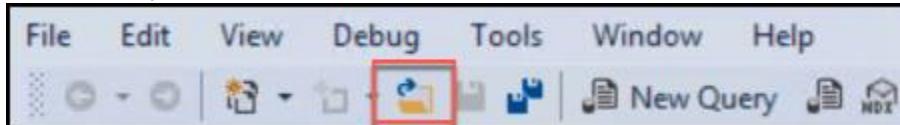
3. Unzip the downloaded file to a folder you create, called C:\AdventureWorksSample.
4. Launch SQL Server Management Studio 17 (SSMS), found under Start->Apps->Microsoft SQL Server Tools 17.



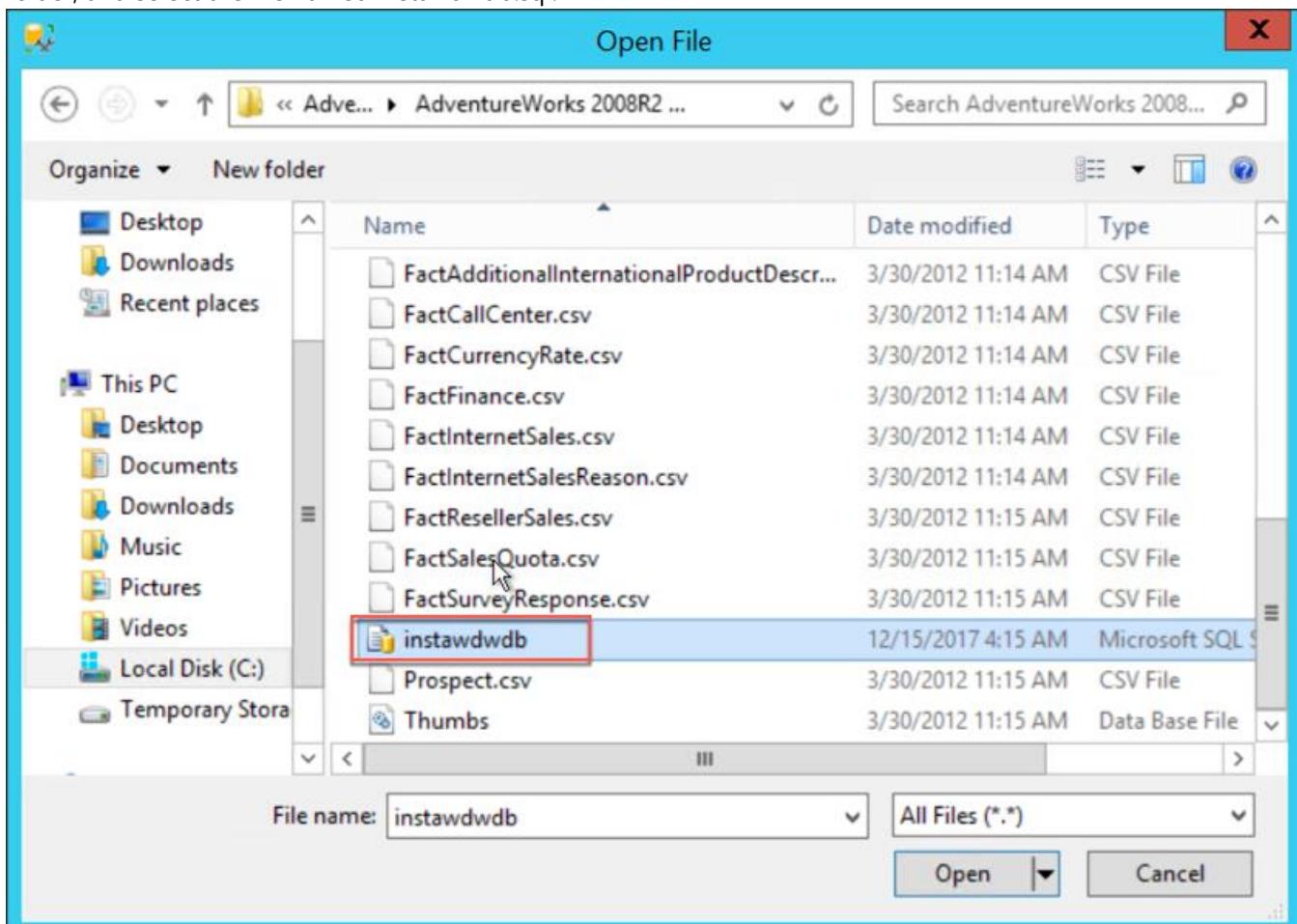
5. In the Connect to Server dialog, enter SqlServerDw\SQLSERVER2008 in the Server name box, leave Authentication set to Windows Authentication, and select Connect.



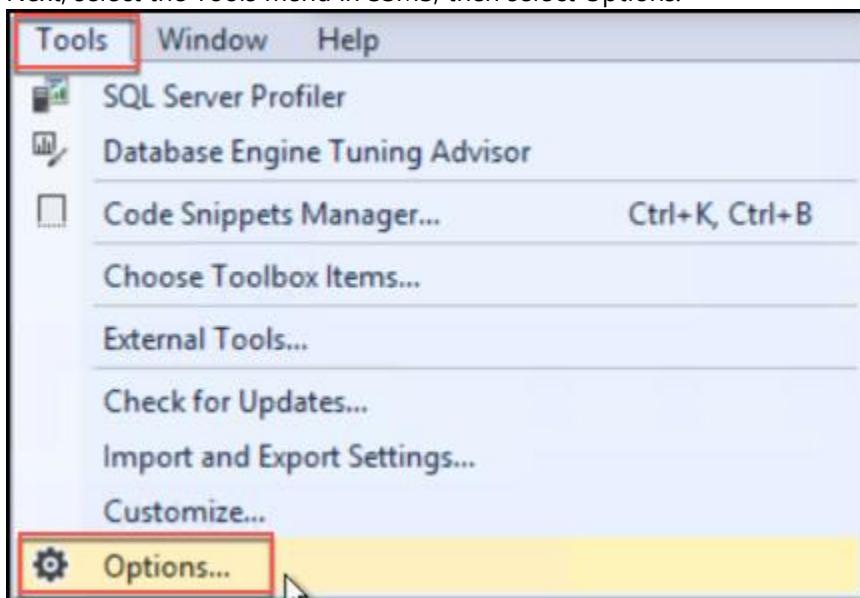
6. Select the Open File icon in SSMS menu bar.



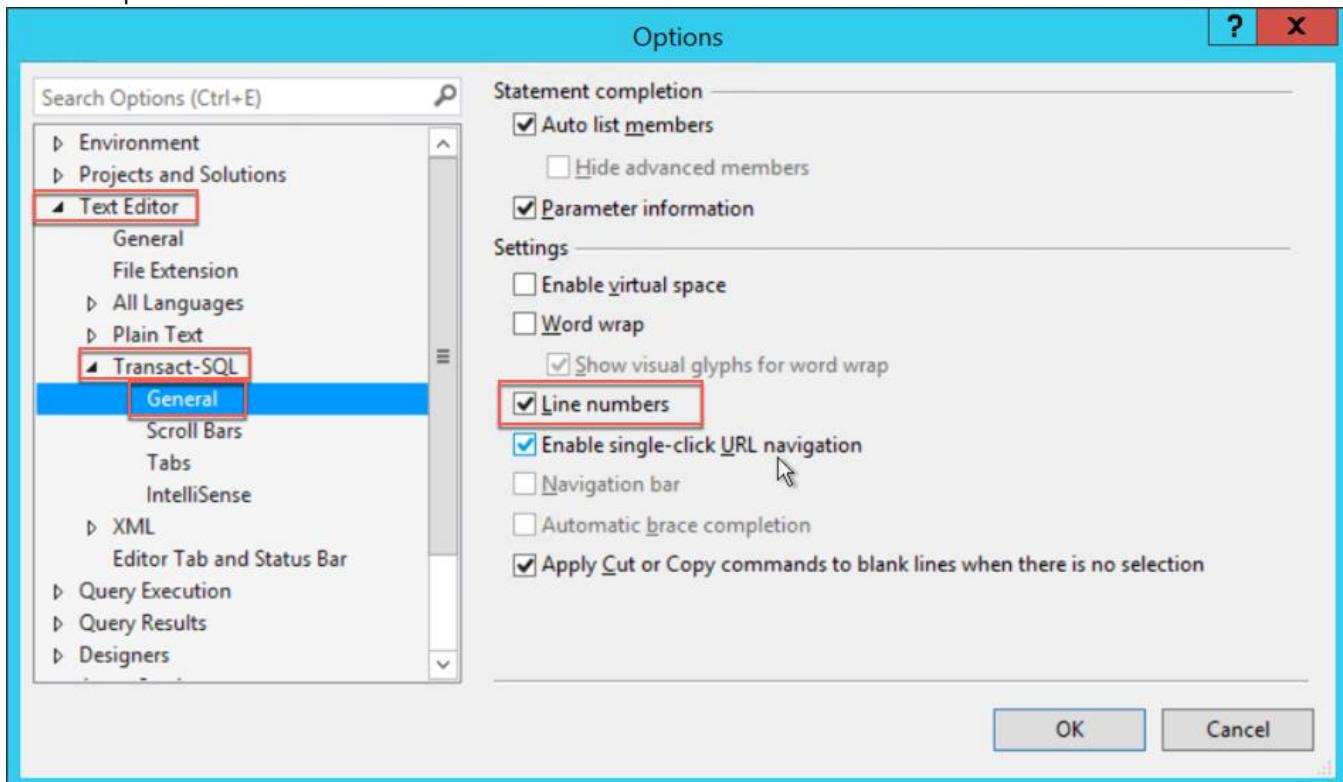
7. In the Open File dialog, browse to the C:\AdventureWorksSample\AdventureWorks 2008R2 Data Warehouse\ folder, and select the file named instawdwdb.sql.



8. Select Open.  
9. Next, select the Tools menu in SSMS, then select Options.



10. In the Options dialog, expand Text Editor in the tree view on the left, then expand Transact-SQL, select General, then check the box next to Line numbers. This will display line numbers in the query editor window, to make finding the lines specified below easier.



11. Select OK to close the Options dialog.  
 12. In the SSMS query editor for instawdwdb.sql, uncomment the SETVAR lines (lines 36 and 37) by removing the double hyphen "--" from the beginning of each line.  
 13. Next, edit the file path for each variable so they point to the following (remember to include a trailing backslash "\\" on each path):

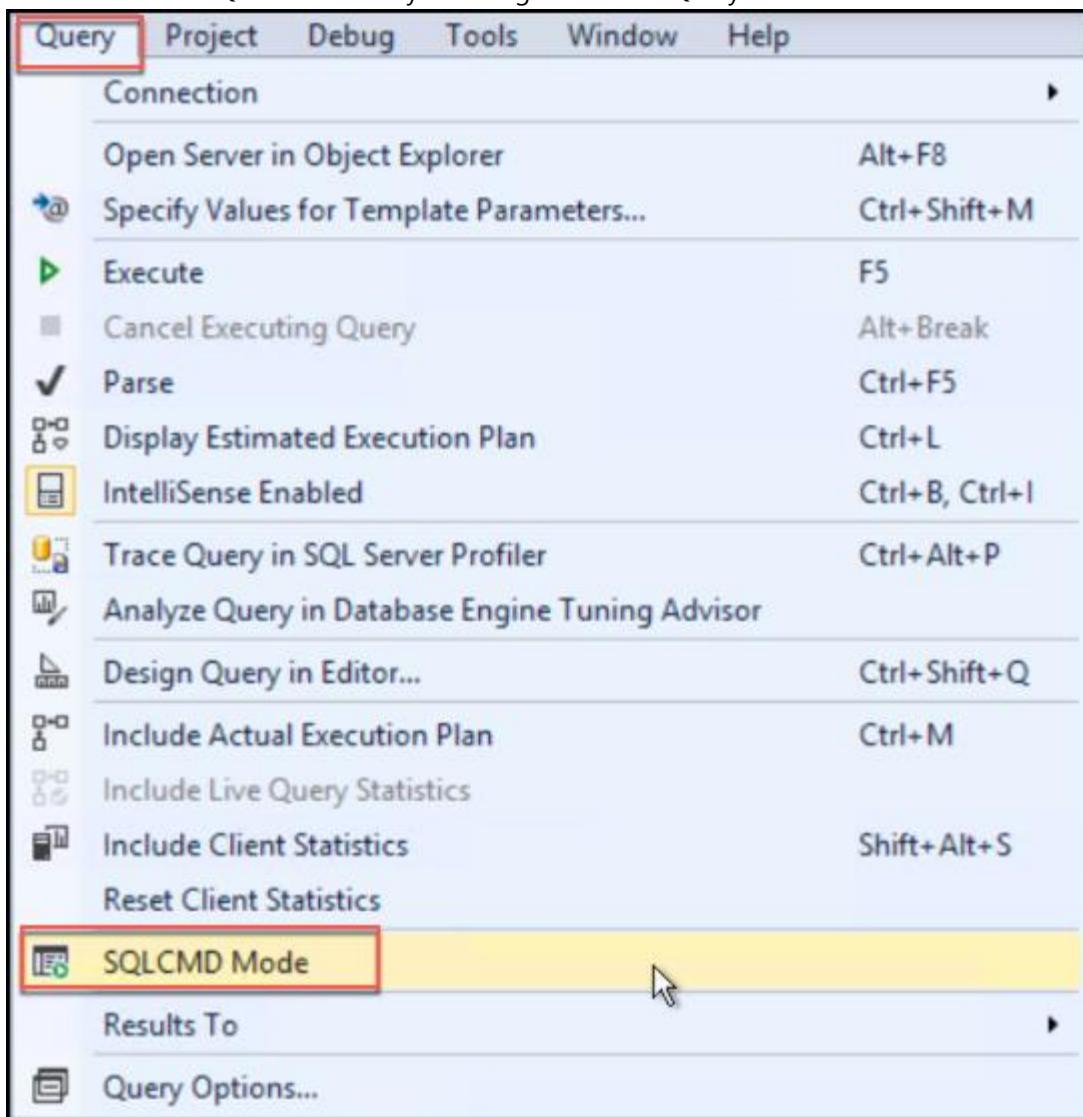
- a. SqlSamplesDatabasePath: C:\AdventureWorksSample\
- b. SqlSamplesSourceDataPath: C:\AdventureWorksSample\AdventureWorks 2008R2 Data Warehouse\

```

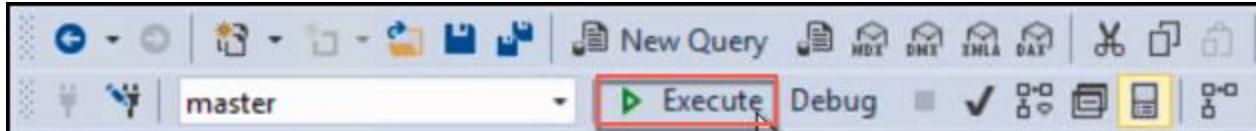
29  /* 
30   * In order to run this script manually, either set the environment variables,
31   * or uncomment the setvar statements and provide the necessary values if
32   * the defaults are not correct for your installation.
33   */
34
35
36  :setvar SqlSamplesDatabasePath "C:\AdventureWorksSample\
37  :setvar SqlSamplesSourceDataPath "C:\AdventureWorksSample\AdventureWorks 2008R2 Data Warehouse\
38

```

14. Place SSMS into SQLCMD mode by selecting it from the Query menu.



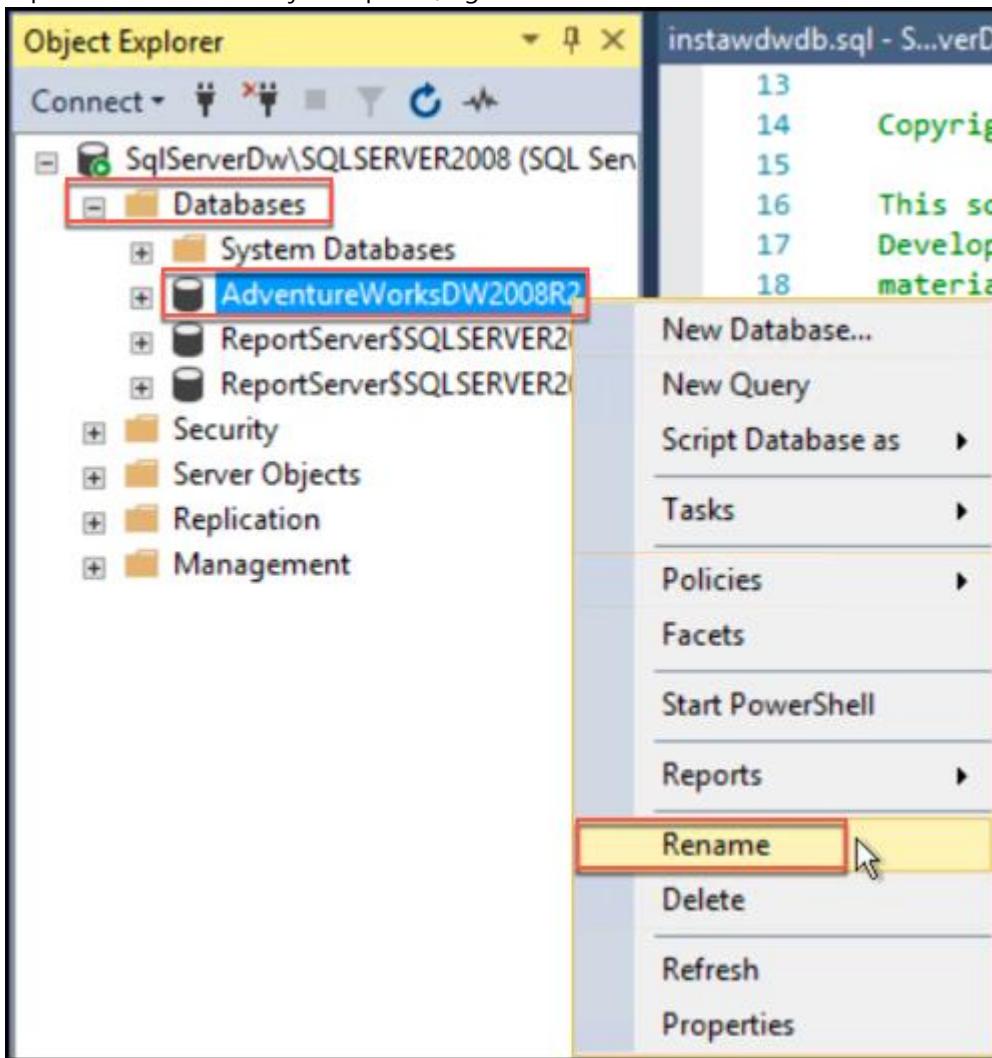
15. Execute the script by selecting the Execute button on the toolbar in SSMS.



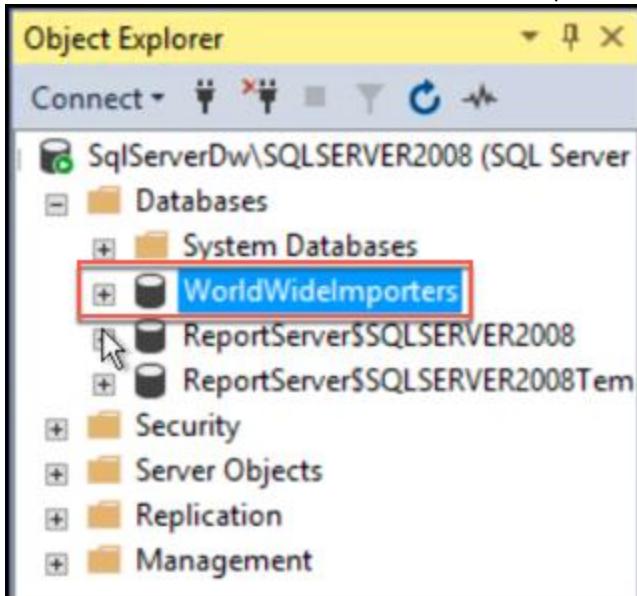
16. This will create the AdventureWorksDW2008R2 database. When the script is done running, you will see output similar to the following in the results pane.

Results		Messages				
DbId	FileId	CurrentSize	MinimumSize	UsedPages	EstimatedPages	
1	7	1	9256	9248	9248	
2	7	2	256	256	256	

17. Expand Databases in Object Explorer, right-click the AdventureWorksDW2008R2 database, and select Rename.

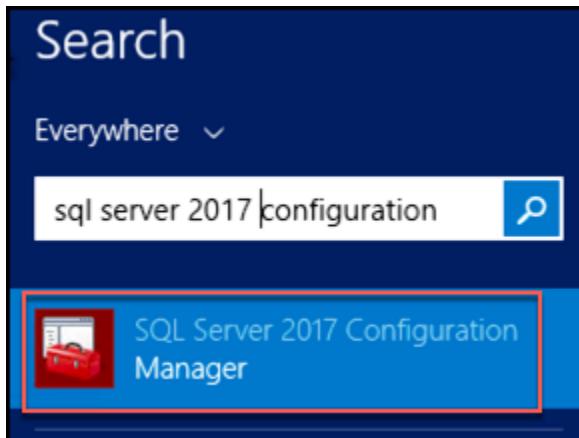


18. Set the name of the database to WorldWideImporters.



## Task 8: Update SQL Server service accounts using Configuration Manager

- From the Start Menu on your SqlServerDw VM, search for SQL Server 2017 Configuration Manager, then select it from the search results.



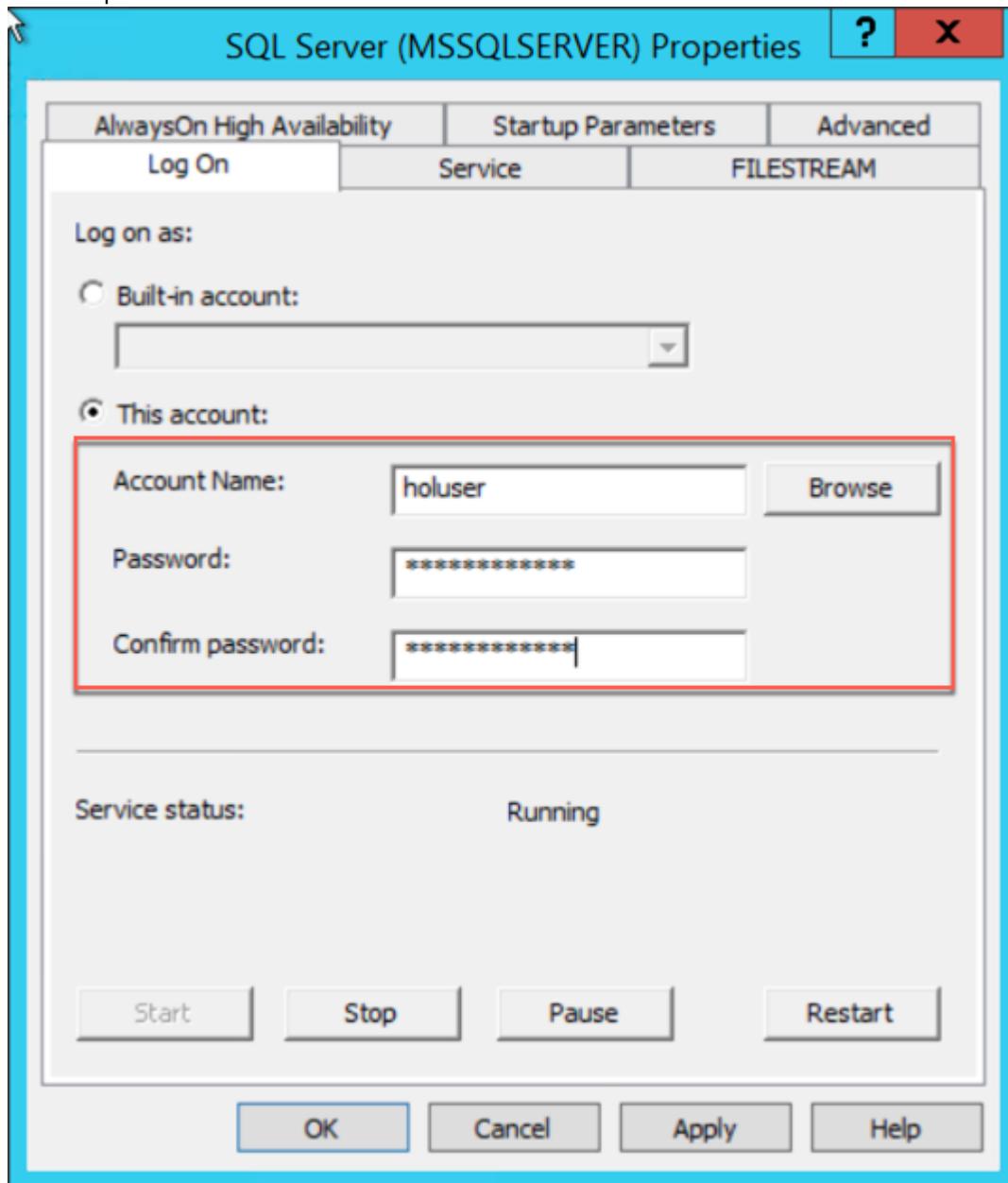
- From the tree on the left, select SQL Server Services.

Name	State	Start Mode	Log On As	Process ID	Service Type
SQL Server Browser	Stopped	Other (Boot, Syste...)	NT AUTHORITY\LO...	0	
SQL Server (MSSQLSERV...)	Running	Automatic	NT Service\MSSQL...	3876	SQL Server
SQL Server Agent (MSSQLSERV...)	Stopped	Manual	NT Service\SQLSERV...	0	SQL Agent
SQL Server (SQLSERV...)	Running	Automatic	\holuser	3612	SQL Server
SQL Server Agent (SQLSERV...)	Stopped	Other (Boot, Syste...)	NT AUTHORITY\NE...	0	SQL Agent
SQL Full-text Filter Da... (SQLSERV...)	Running	Manual	NT AUTHORITY\LO...	3404	
SQL Server Repor... (SQLSERV...)	Running	Automatic	\holuser	2692	Report Server

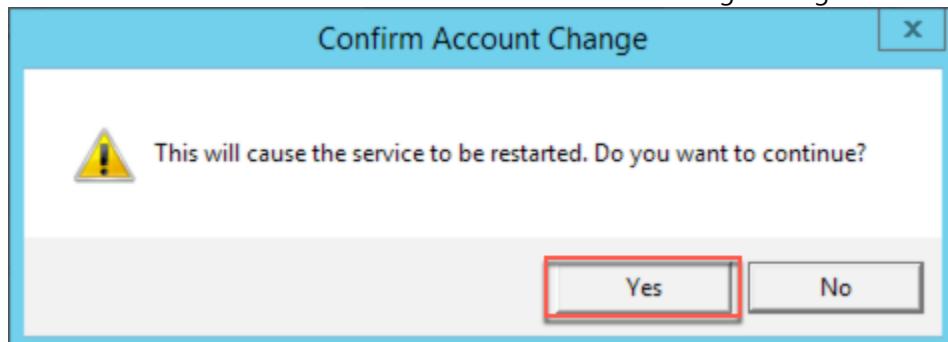
- In the list of services, double-click SQL Server (MSSQLSERVER) to open its properties dialog.

Name	State	Start Mode	Log On As	Process ID	Service Type
SQL Server Browser	Stopped	Other (Bo...	NT AUTHORITY\LO...	0	
SQL Server (MSSQLSERV...)	Running	Automatic	NT Service\MSSQL...	3876	SQL Server
SQL Server Agent (MSSQLSERV...)	Stopped	Manual	NT Service\SQLSERV...	0	SQL Agent
SQL Server (SQLSERV...)	Running	Automatic	\holuser	3612	SQL Server
SQL Server Agent (SQLSERV...)	Stopped	Other (Bo...	NT AUTHORITY\NE...	0	SQL Agent
SQL Full-text Filter Daemon Launcher (SQLSERV...)	Running	Manual	NT AUTHORITY\LO...	3404	
SQL Server Reporting Services (SQLSERV...)	Running	Automatic	\holuser	2692	Report Server

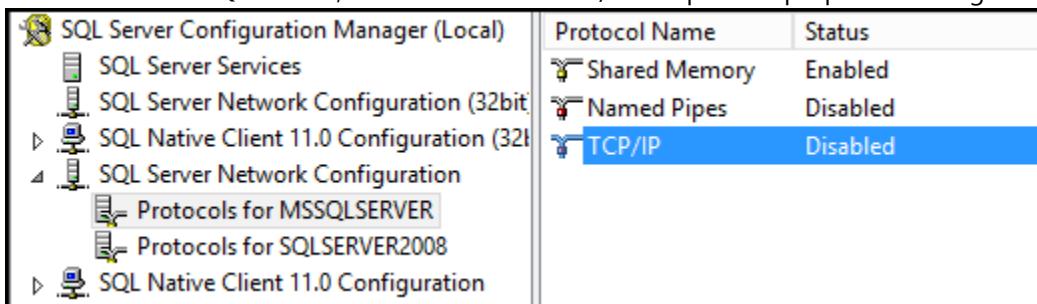
- In the SQL Server (MSSQLSERVER) Properties dialog, change the Log On user to use the holuser account, by entering holuser into the Account Name box, then entering the password, Password.1!! into the Password and Confirm password boxes.



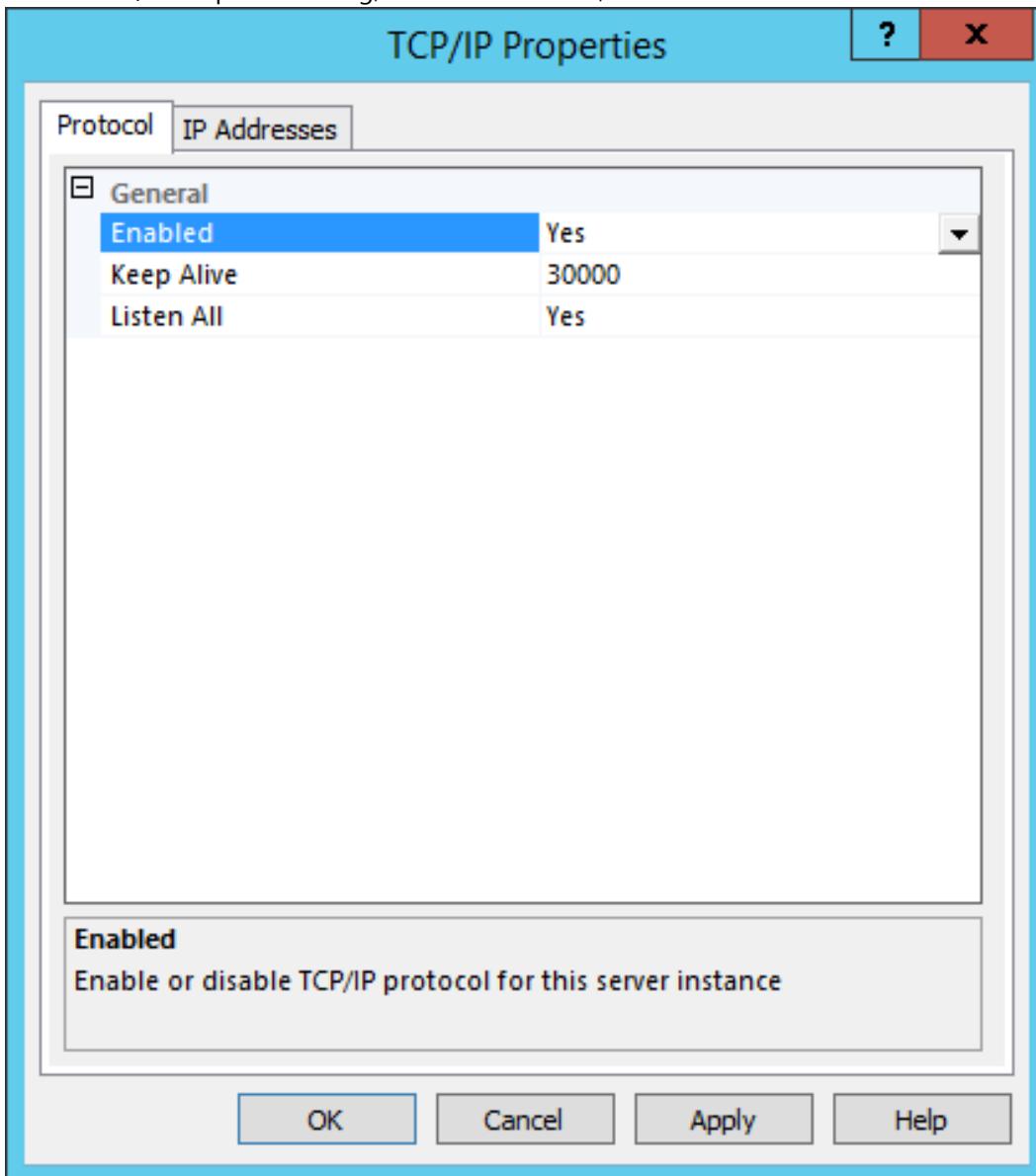
- Select OK.
- Select Yes to restart the service in the Confirm Account Change dialog.



7. Repeat steps 3 – 6 above to set the server account to holuser for the SQL Server (SQLSERVER2008) instance as well, if it is not already using the holuser account.
8. While still in the SQL Server 2017 Configuration Manager, expand SQL Server Network Configuration, select Protocols for MSSQLSERVER, and double-click TCP/IP to open the properties dialog.

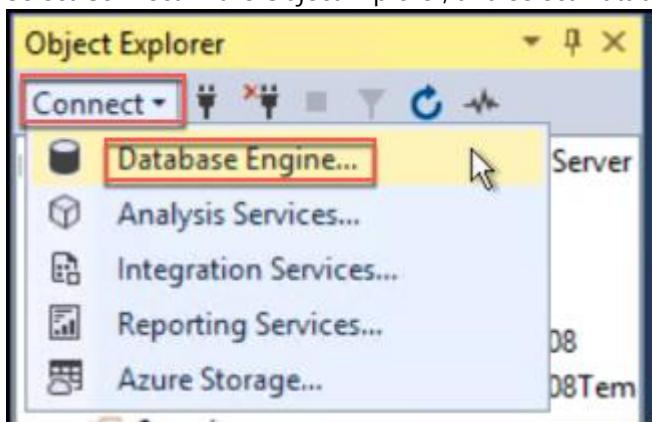


9. On the TCP/IP Properties dialog, set Enabled to Yes, and select OK.

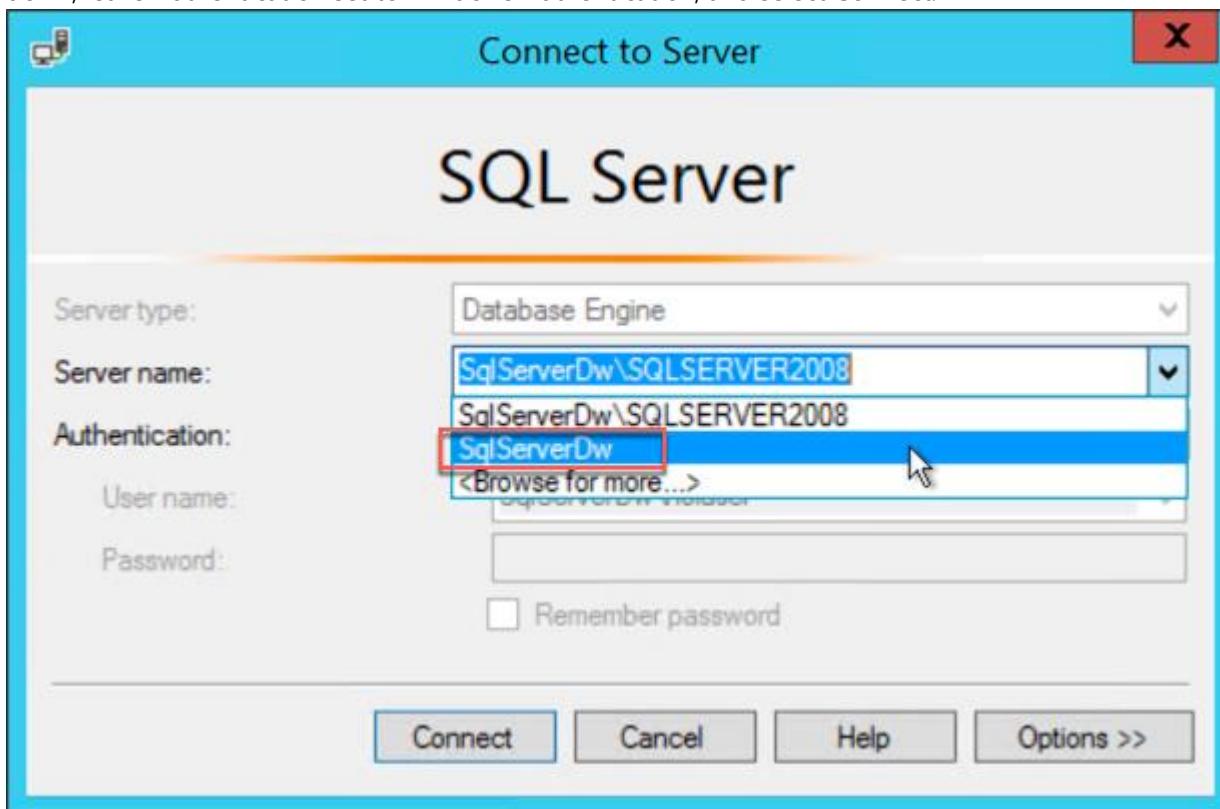


10. When prompted that the changes will not take effect until the service is restarted, select OK. You will restart the service later.

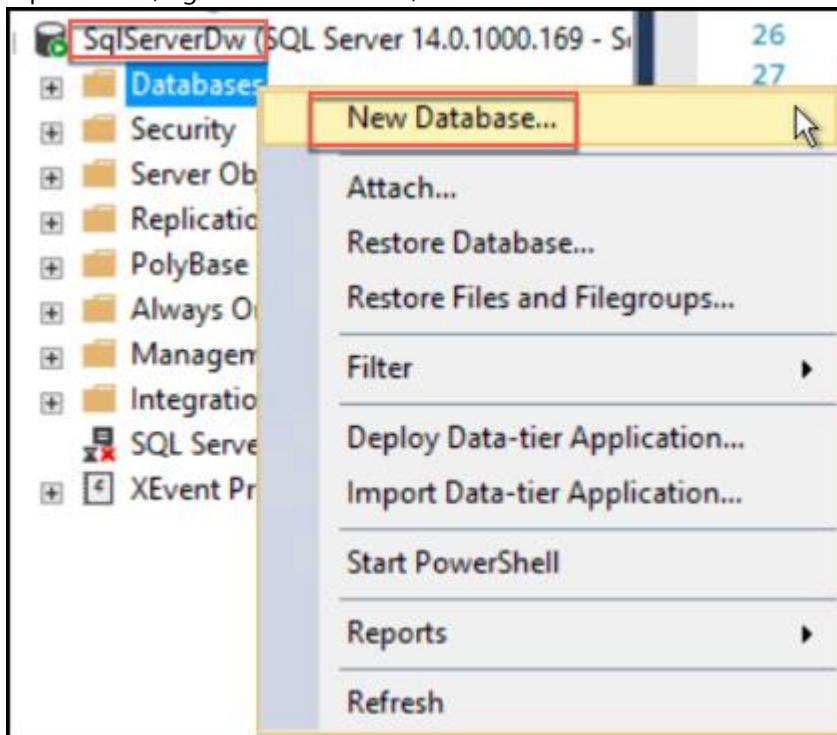
11. Return to the SSMS window.
12. Select Connect in the Object Explorer, and select Database Engine...



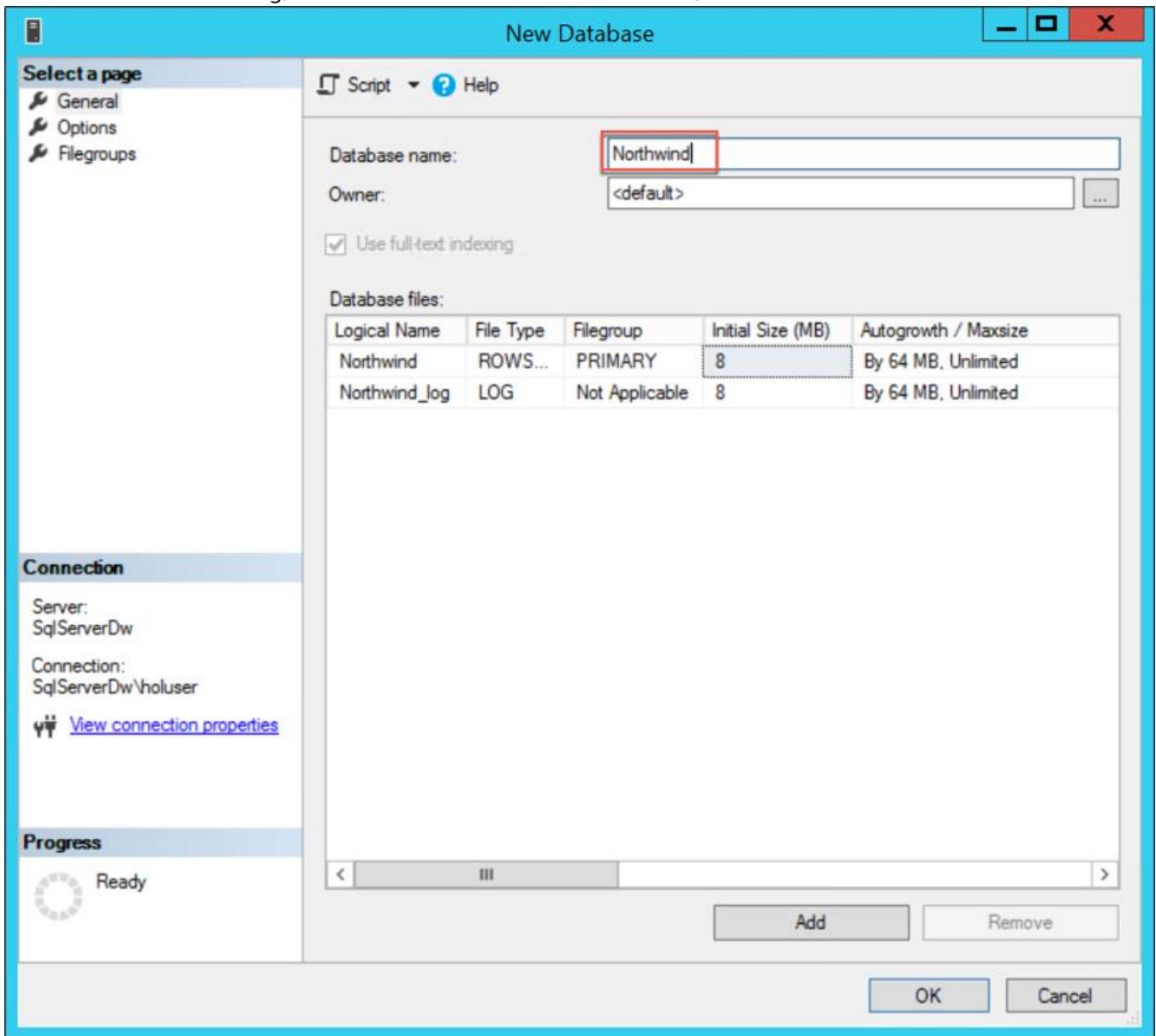
13. In the Connect to Server dialog, select the SQL Server 2017 instance, SqlServerDw, from the Server name drop down, leave Authentication set to Windows Authentication, and select Connect.



14. In the Object Explorer, you will now see both the 2008R2 and 2017 instances. Under the 2017 instance, SqlServerDw, right-click Databases, and select New Database...

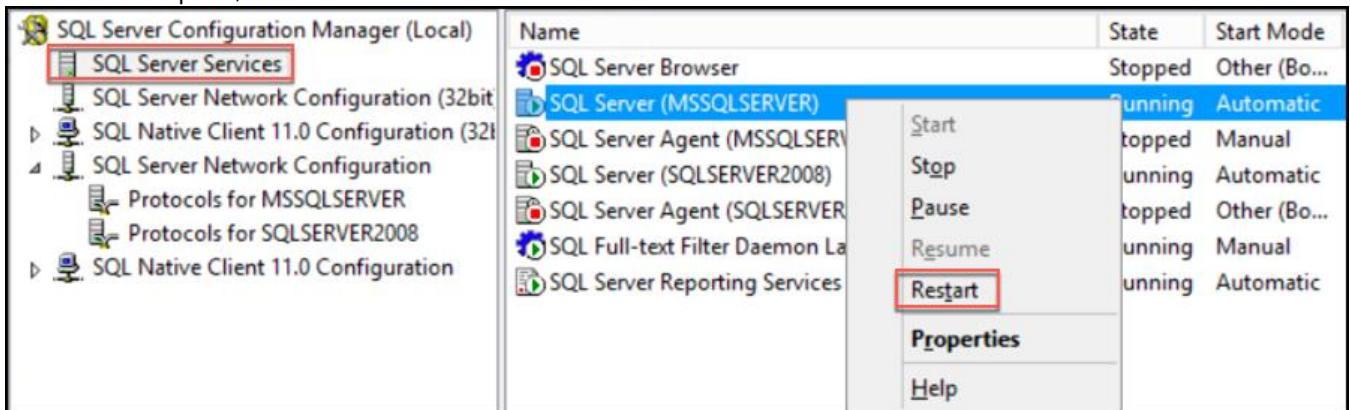


15. In the New Database dialog, enter Northwind for the Database name, and select OK.

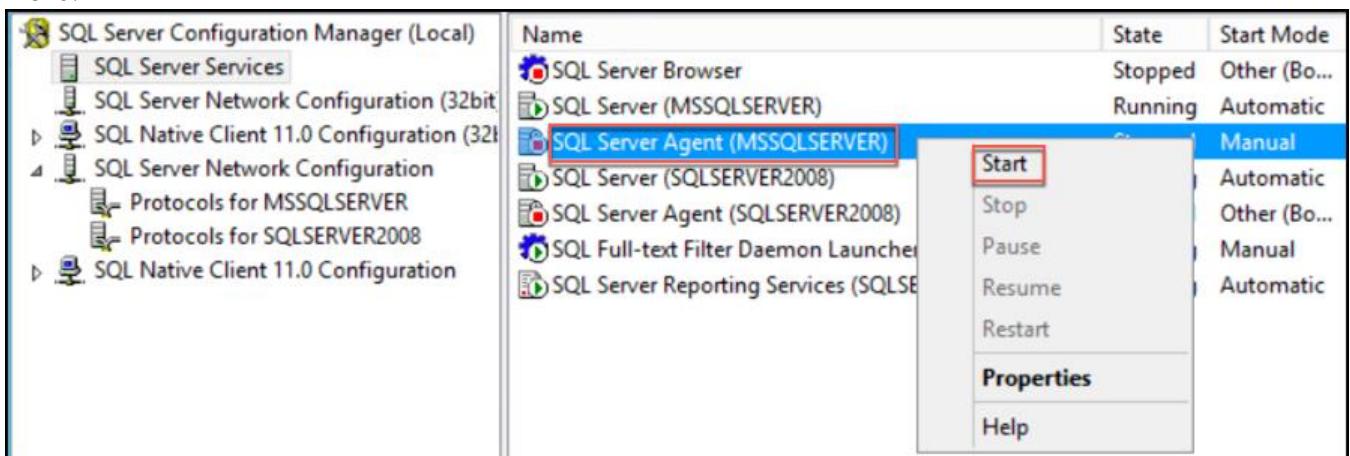


16. Now, return to the SQL Server 2017 Configuration Manager window.

17. As done previously, select SQL Server Services in the tree on the left, then right-click SQL Server (MSSQLSERVER) in the services pane, and select Restart.



18. Repeat the previous step for the SQL Server Agent (MSSQLSERVER) service, this time selecting Start from the menu.



19. Close the SQL Server 2017 Configuration Manager.

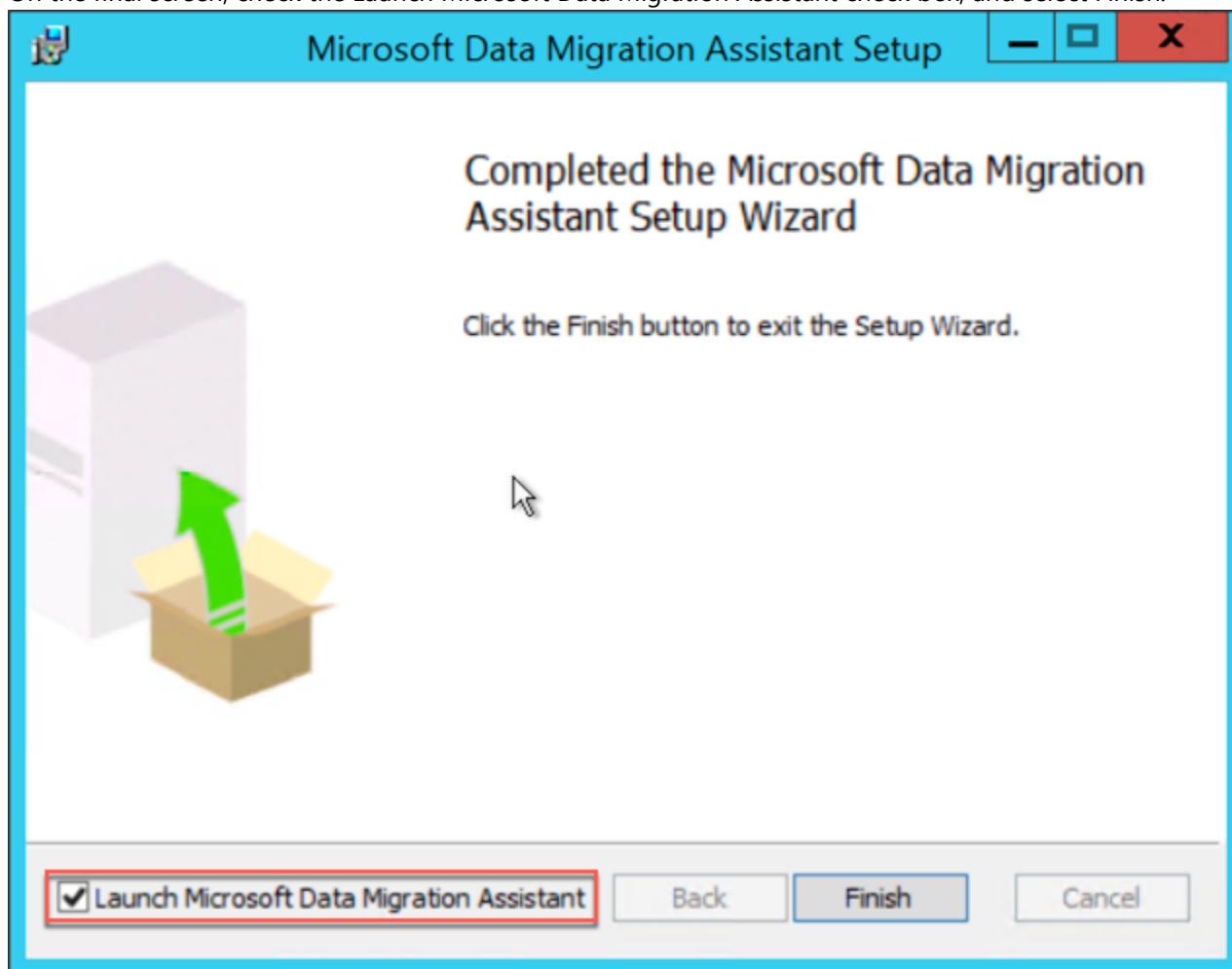
## Exercise 2: Perform an assessment for a move to Azure SQL Database

Duration: 15 minutes

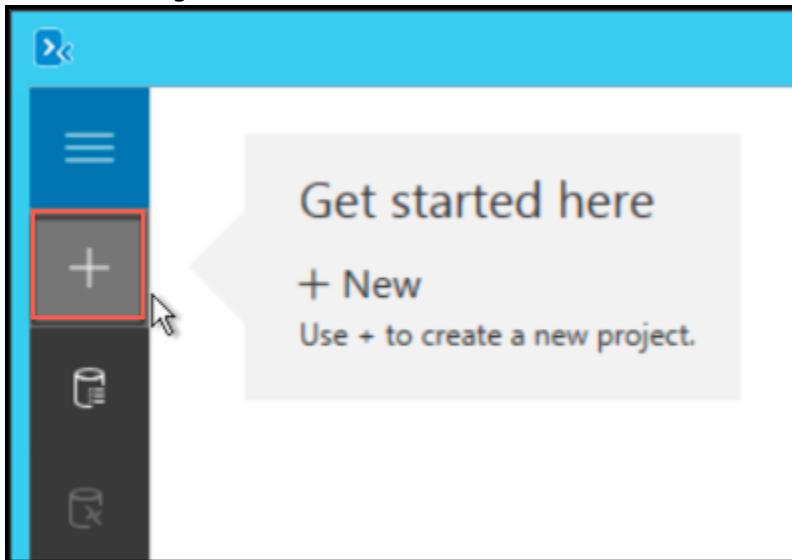
World Wide Importers would like an assessment to see what potential issues they would have to address in moving their database to Azure SQL Database.

### Task 1: Perform an assessment

1. On your SqlServerDw VM, open a web browser, and download the Data Migration Assistant v3.x from <https://www.microsoft.com/download/details.aspx?id=53595> by clicking the Download button on the page.
2. Run the installer.
3. Select Next on each of the screens, accepting to the license terms and privacy policy in the process.
4. Select Install on the Privacy Policy screen to begin the installation.
5. On the final screen, check the Launch Microsoft Data Migration Assistant check box, and select Finish.



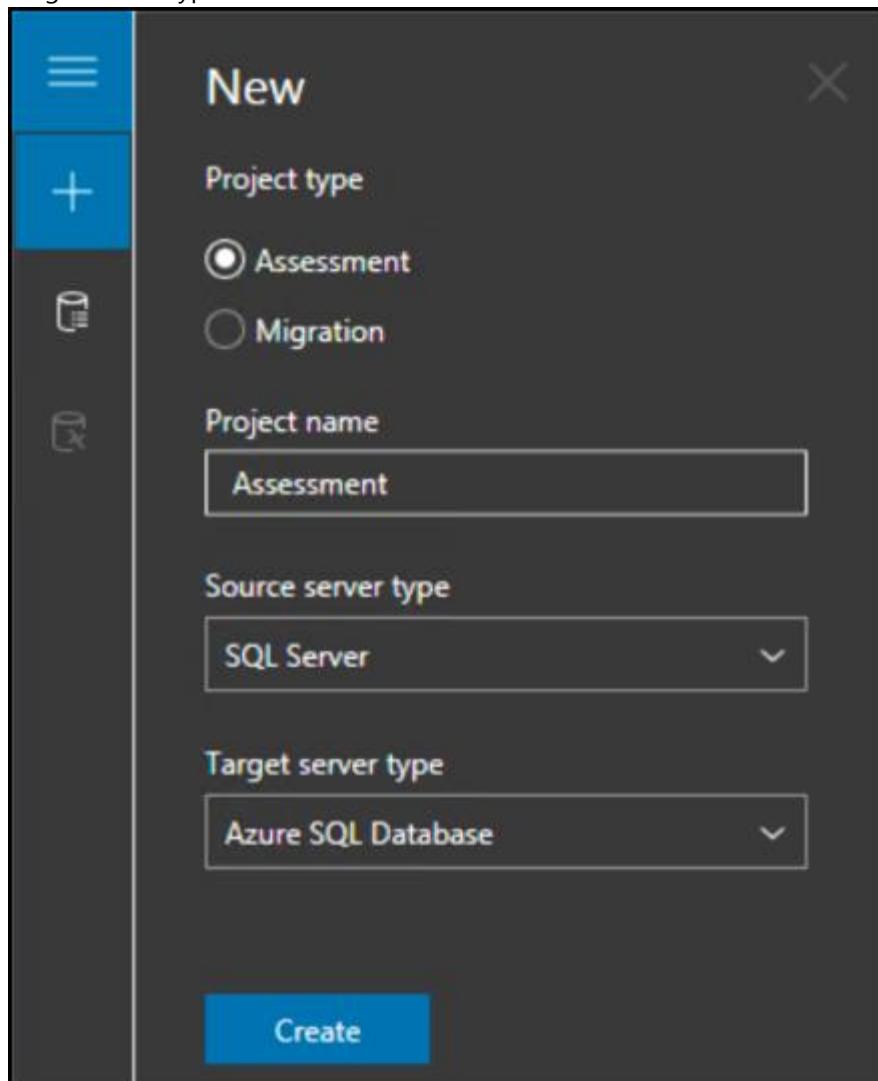
6. In the Data Migration Assistant window, select +New.



7. In the New project dialog, enter the following:

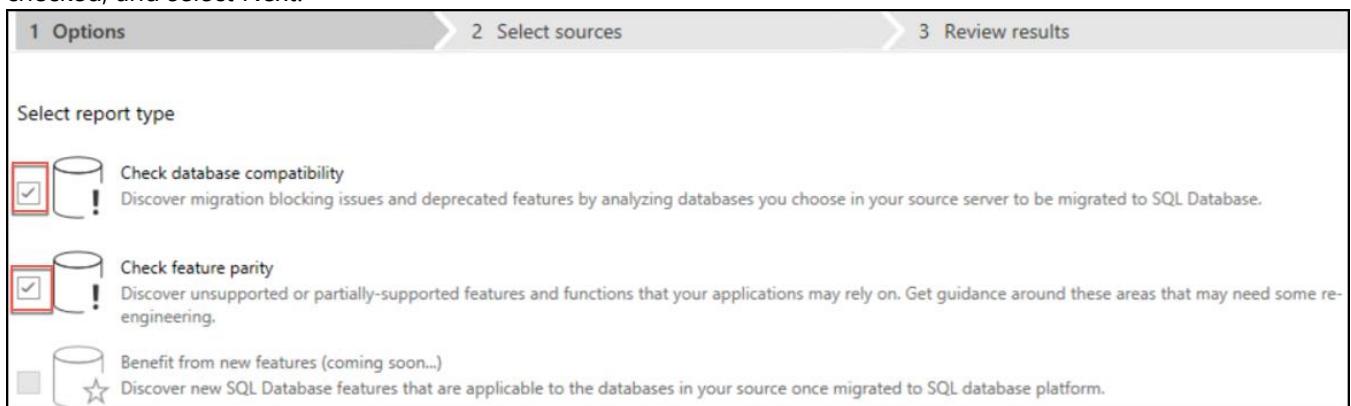
- a. Project type: Select Assessment
- b. Project name: Enter Assessment
- c. Source server type: SQL Server

- d. Target server type: Azure SQL Database

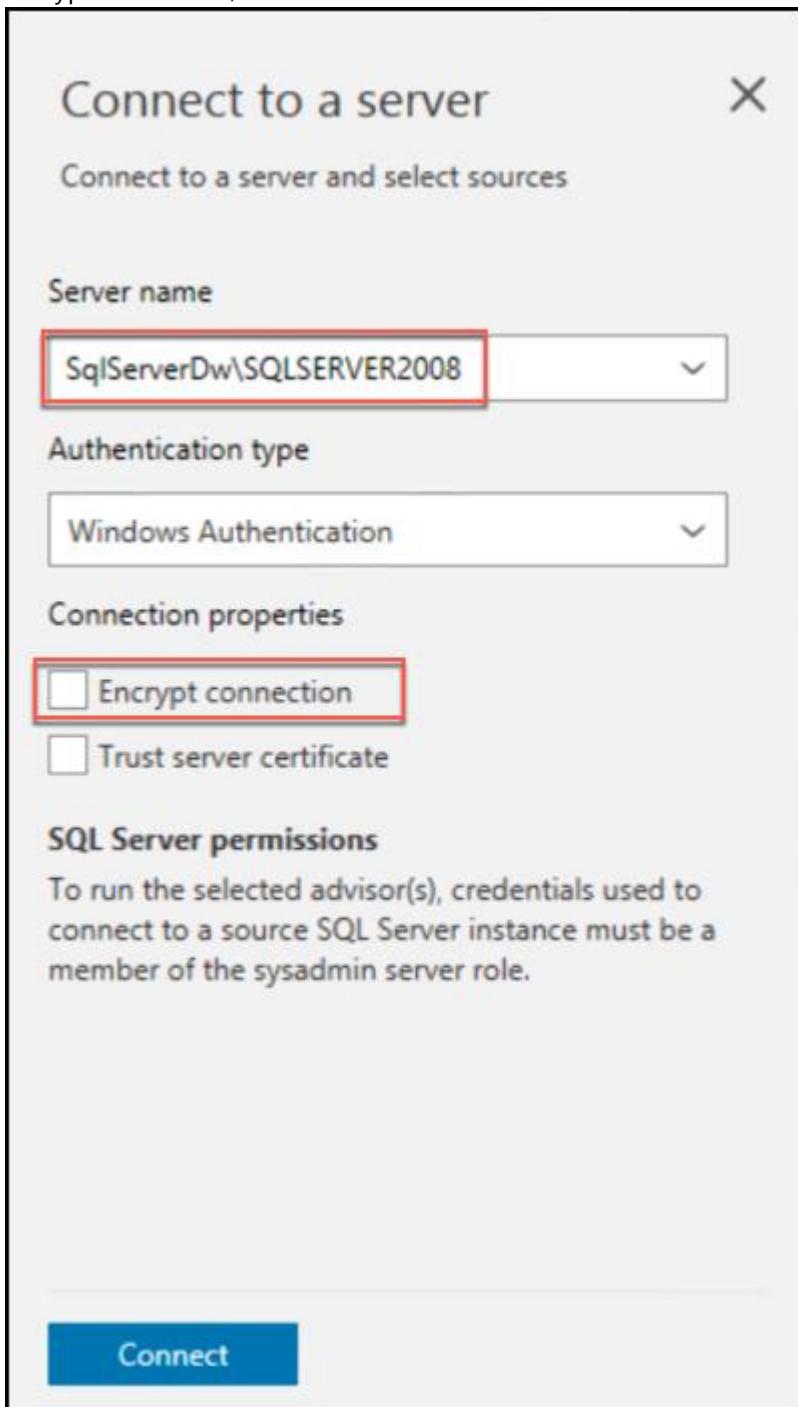


- e. Select Create

8. On the Options screen, ensure the Check database compatibility and Check feature parity report types are checked, and select Next.



9. In the Connect to a server dialog, enter SqlServerDw\SQLSERVER2008 into the Server name box, and uncheck Encrypt connection, then select Connect.



10. In the Add sources dialog that appears, check the box next to WorldWideImporters, and select Add.



11. Select Start Assessment.  
12. Review the Assessment results.

Recommendation	Databases
Service Broker feature is not supported...	1
SQL Server Reporting Services is not s...	N/A
Azure SQL Database does not suppor...	N/A

Details

Impact: SQL Server Service Broker provides native support for messaging and queuing applications in the SQL Server Database Engine.

Recommendation: Service Broker feature is not supported in Azure SQL Database. You need to use native support for messaging and queuing applications in the SQL Server Database Engine.

Database details: Type: Database, Name: WorldWideImporters, This database has ...

Export report

13. You now have a list of the issues WWI will need to consider in upgrading their database to Azure SQL Database. Notice the assessment includes recommendations on the potential resolutions to issues. You can select Export report to save the report as a JSON file, if desired.

## Exercise 3: Upgrade the SQL Server 2008 database to SQL Server 2017

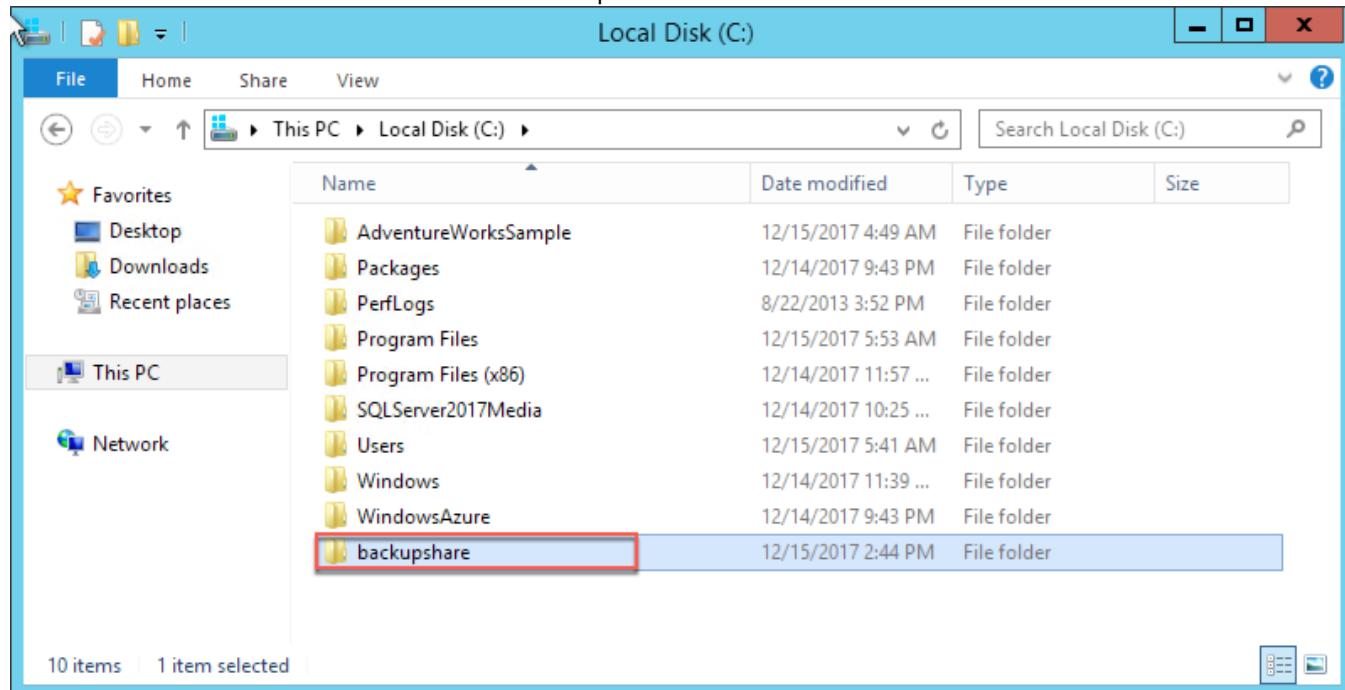
Duration: 30 minutes

World Wide Importers would like a Proof of Concept (POC) that moves their database to SQL Server 2017 Enterprise. They would like to know about any incompatible features that will block their eventual production move.

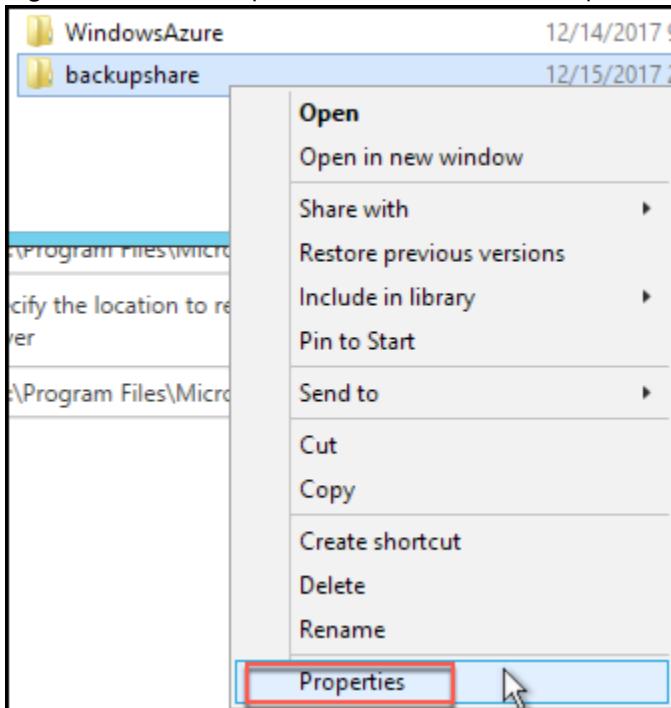
### Task 1: Create a shared folder for the database migration

In this task, you are going to create a shared folder that is accessible by both the source and target databases for the migration. This folder will store a backup of the database used for the migration process.

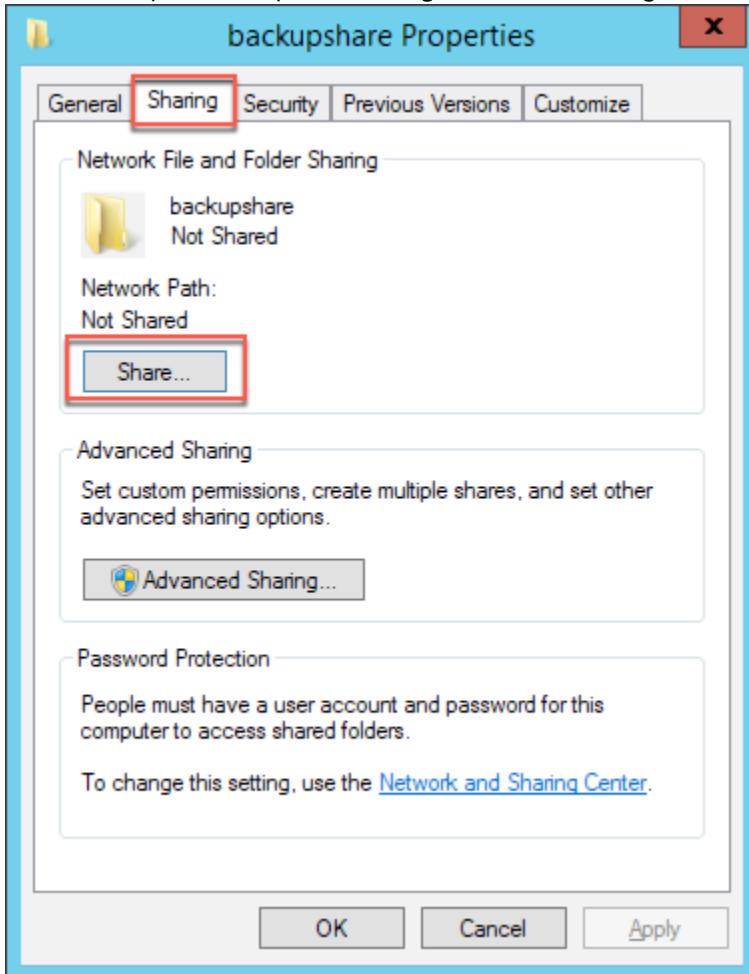
1. Open Windows Explorer.
2. Create a new folder in the root of C: named backupshare.



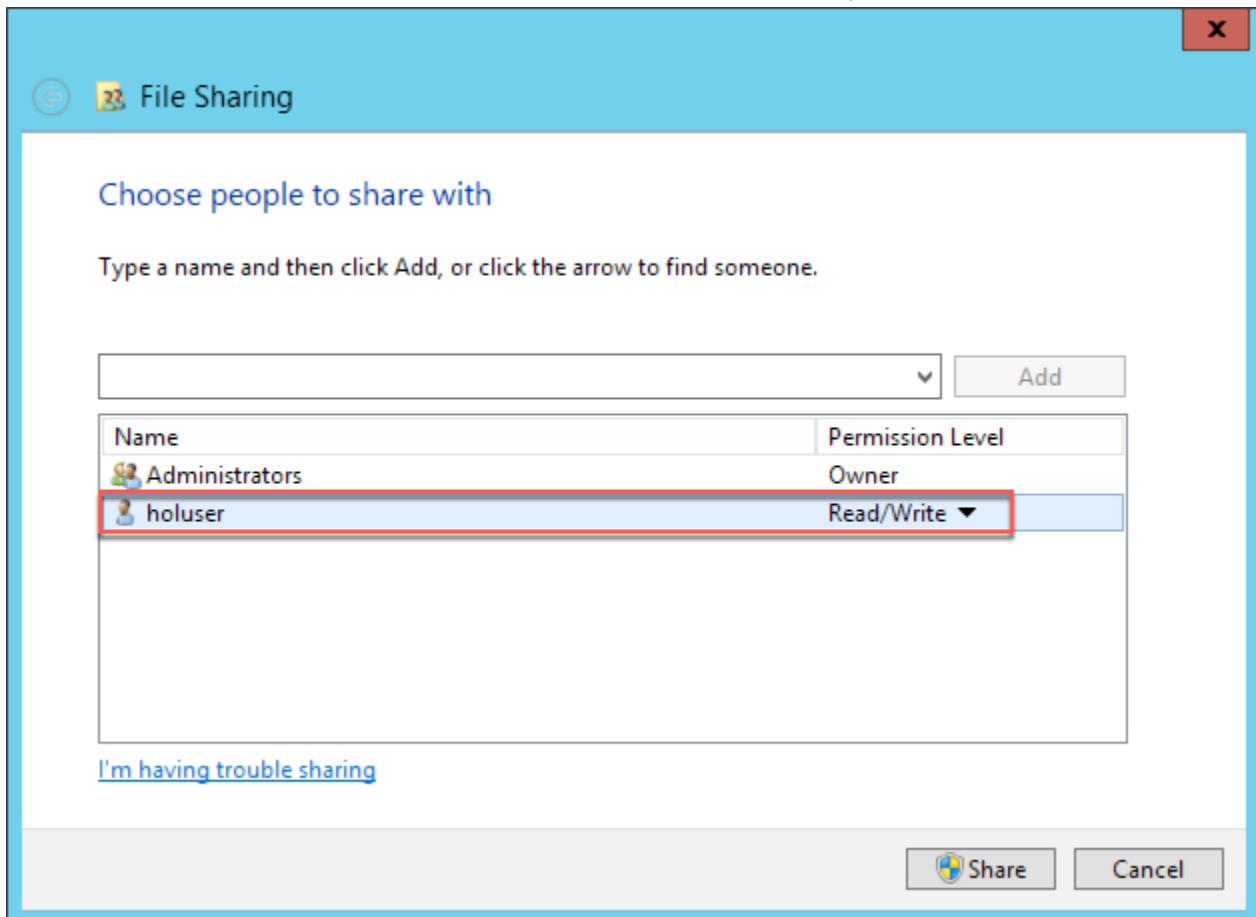
3. Right-click the backupshare folder, and select Properties.



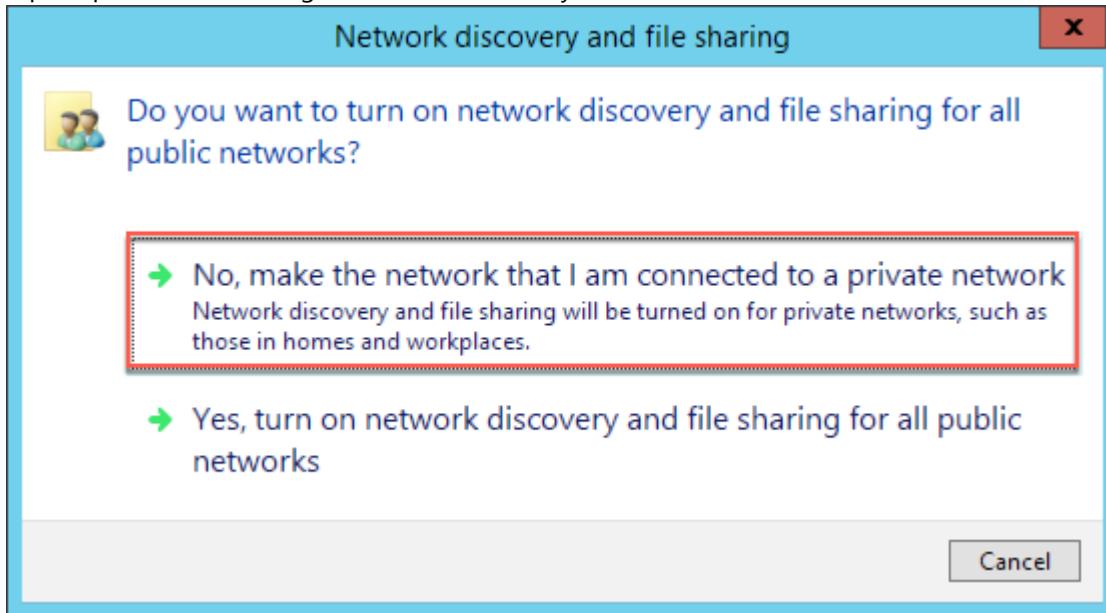
4. In the backupshare Properties dialog, select the Sharing tab, and select Share...



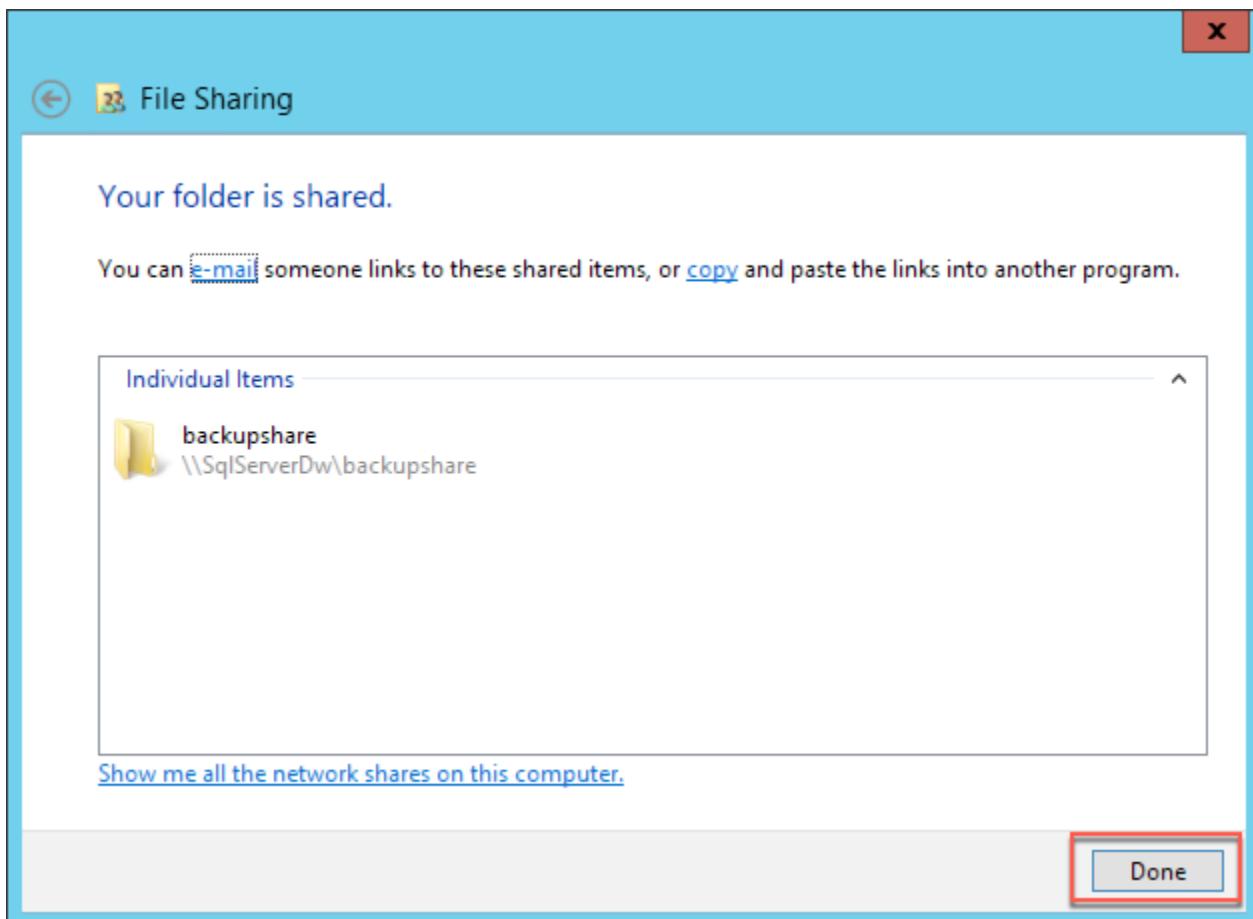
5. Ensure the Permission Level for the holuser account is set to Read/Write, and select Share.



6. If prompted about turning on network discovery, select No.



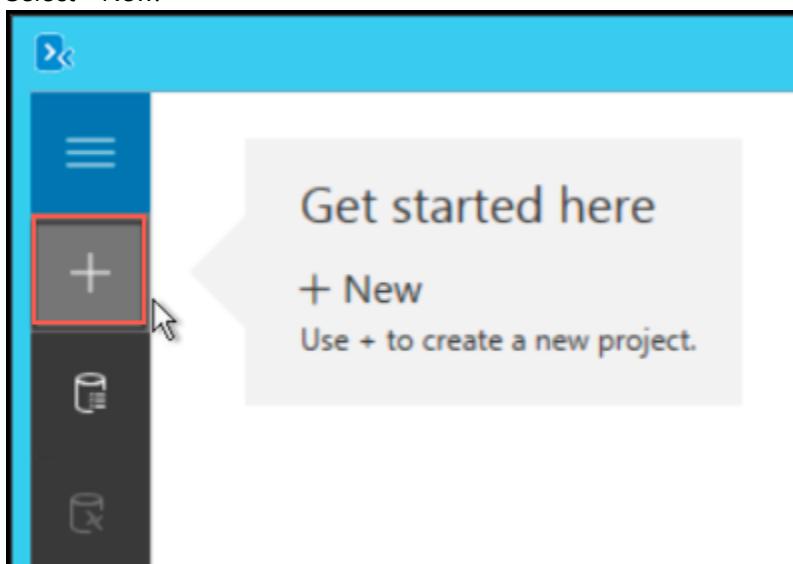
7. Select Done.



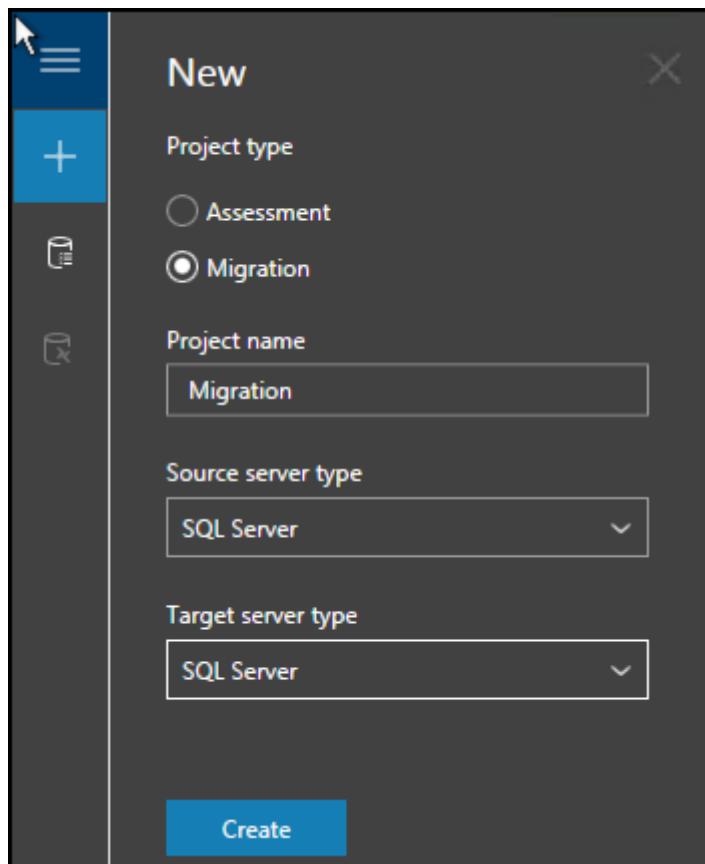
8. Select Close on the backupshare Properties dialog.

## Task 2: Migrate using Data Migration Assistant

1. On your SqlServerDw VM, open the Data Migration Assistant.
2. Select +New.



3. On the New project pane, set the following:
  - a. Project type: Select Migration
  - b. Project name: Enter Migration
  - c. Source server type: Select SQL Server
  - d. Target server type: Select SQL Server, as you will target the “on-premises” SQL Server 2017 instance you installed previously.
  - e. Select Create.



4. On the Specify source & target tab, enter the following:
  - a. Source server name: SqlServerDw\SQLSERVER2008
  - b. Target server name: SqlServerDw
  - c. Authentication type: Set to Windows Authentication for both the Source and Target servers.

- d. Connection properties: Ensure the Encrypt connection and Trust server certification check boxes are unchecked for both the Source and Target servers.

The screenshot shows the 'Migration' wizard interface. The title bar says 'Migration'. Below it, a progress bar indicates '1 Specify source & target' is selected, with '2 Add databases' as the next step. The left side is labeled 'Source server details' and the right side is labeled 'Target server details'. Both sides have dropdown menus for 'Server name' (set to 'SqlServerDw\SQLSERVER2008' and 'SqlServerDw' respectively) and 'Authentication type' (set to 'Windows Authentication' for both). Under 'Connection properties' on both sides, there are two checkboxes: 'Encrypt connection' and 'Trust server certificate', both of which are unchecked. Below these, sections for 'Source SQL Server permissions' and 'Target SQL Server permissions' are shown, each containing a note about the required permissions for the source and target servers respectively.

Source server details

Target server details

Server name

SqlServerDw\SQLSERVER2008

Server name

SqlServerDw

Authentication type

Windows Authentication

Authentication type

Windows Authentication

Connection properties

Encrypt connection

Trust server certificate

Encrypt connection

Trust server certificate

Source SQL Server permissions

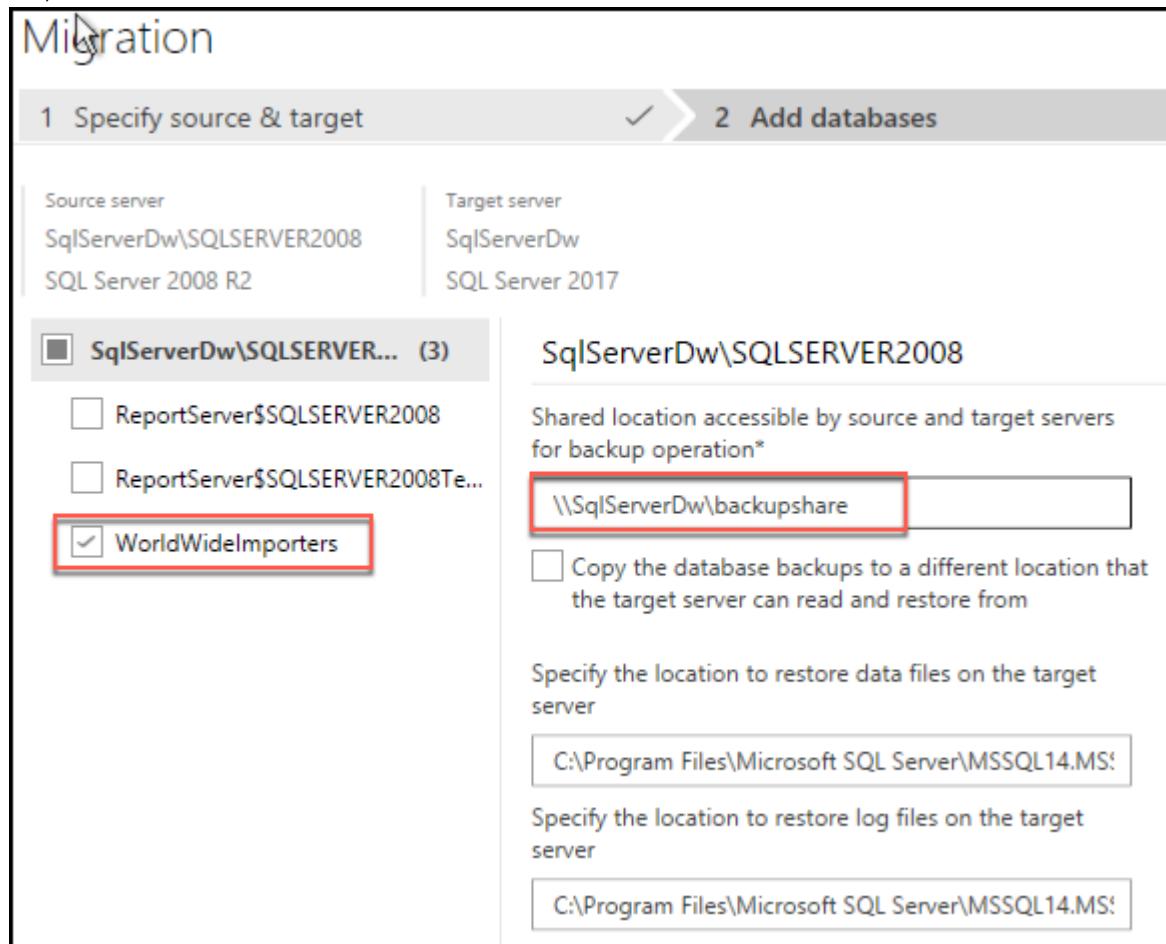
Credentials used to connect to source SQL Server instance must have CONTROL SERVER permission.

Target SQL Server permissions

Credentials used to connect to target SQL Server instance must be a member of the sysadmin server role.

5. Select Next.
6. On the Add database screen:
  - a. Make sure the ONLY database selected is WorldWideImporters. All other databases should be unchecked.

- b. Enter \\SqlServerDw\\backupshare into the Shared location text box, and leave the remaining fields as they are, then select Next.



7. On the Select logins screen, ensure SqlServerDw\holuser is selected, then select Start Migration.

	Login name	Login type	Default database	Source status	Ready to move
<input checked="" type="checkbox"/>	SqlServerDw\holuser	Windows	master	Enabled	Login already exists, only securab
<input type="checkbox"/>	##MS_PolicyEventProcessingLogin##	SQL	master	Disabled	No: Created by a SQL component
<input type="checkbox"/>	##MS_PolicyTsqlExecutionLogin##	SQL	master	Disabled	No: Created by a SQL component

8. Review the results. You may also wish to select Export report to save the report as a CSV file for later review.

**Migration**

1 Specify source & target    2 Add databases    3 Select logins    4 View results

Server objects: 2    In-progress: 0    Successful: 1    Warnings: 1    Failed: 0

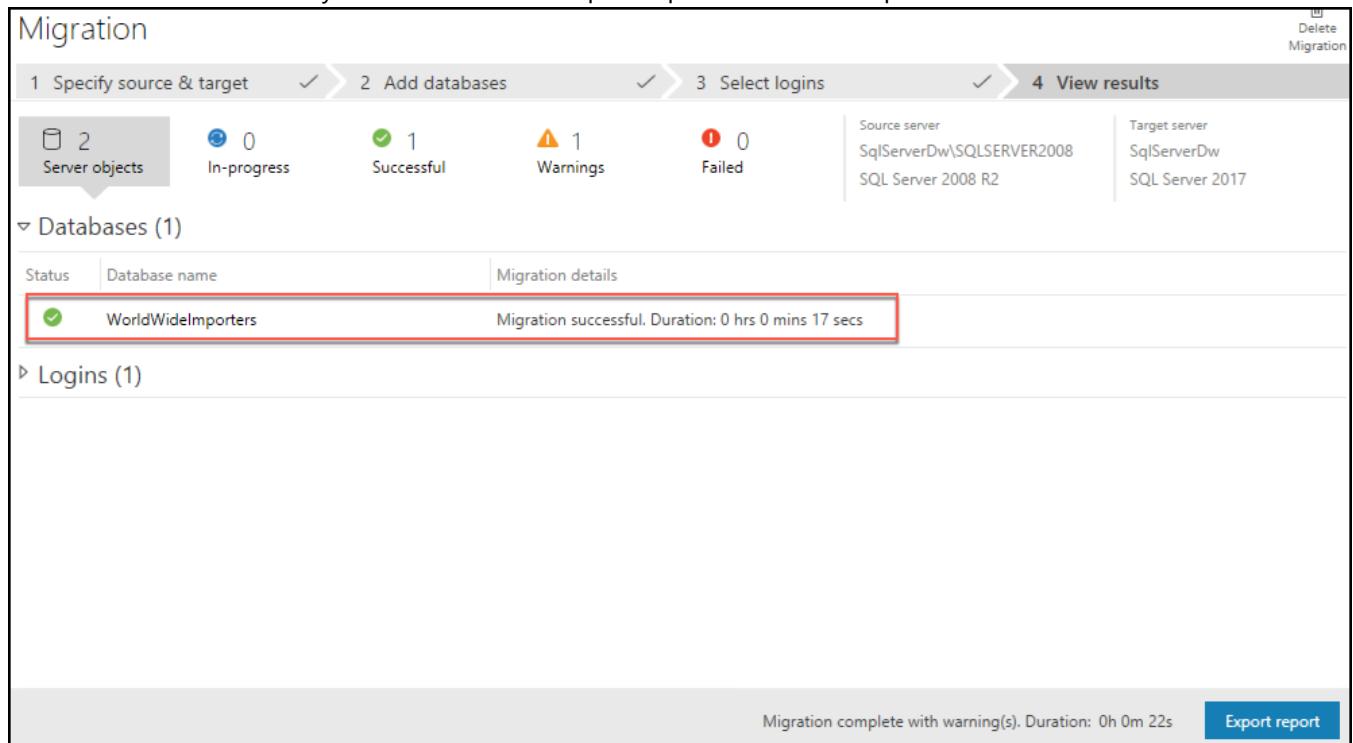
Source server: SqlServerDw\SQLSERVER2008  
Target server: SqlServerDw  
SQL Server 2008 R2    SQL Server 2017

Databases (1)

Status	Database name	Migration details
✓	WorldWideImporters	Migration successful. Duration: 0 hrs 0 mins 17 secs

Logins (1)

Migration complete with warning(s). Duration: 0h 0m 22s    **Export report**



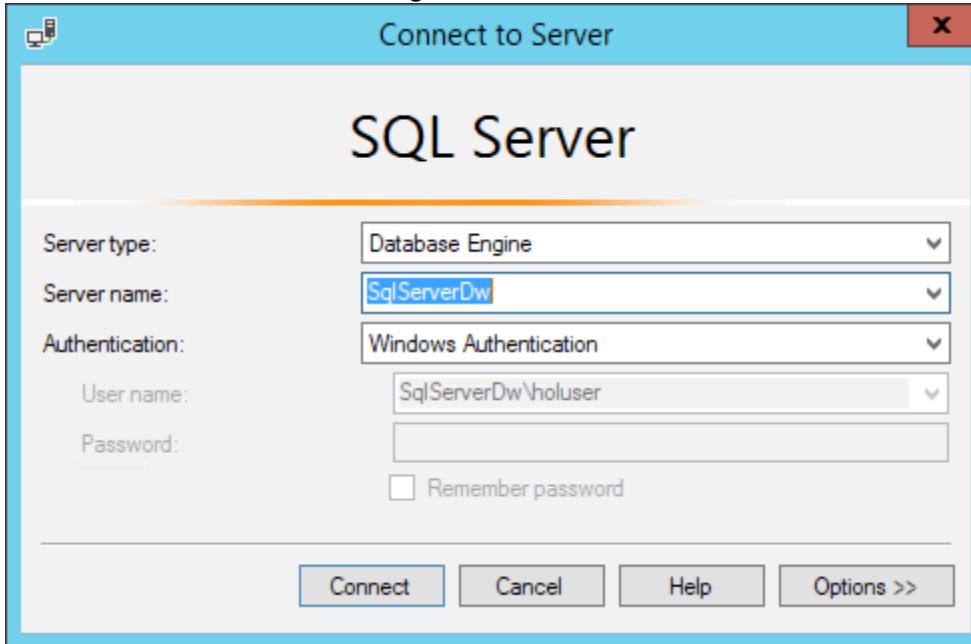
## Exercise 4: Post upgrade enhancement

Duration: 20 minutes

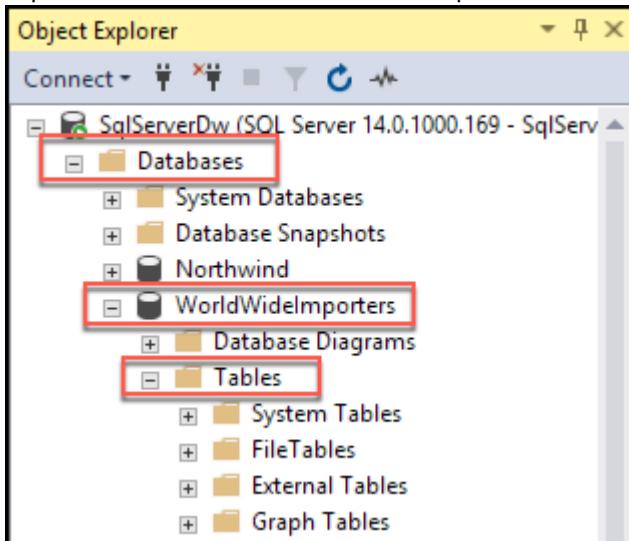
In this exercise, you will confirm that the POC was successful. To demonstrate value from the upgrade, the new features of SQL Server 2017 (Table Compression and ColumnStore Index) will be enabled to immediately show benefit.

### Task 1: Table compression

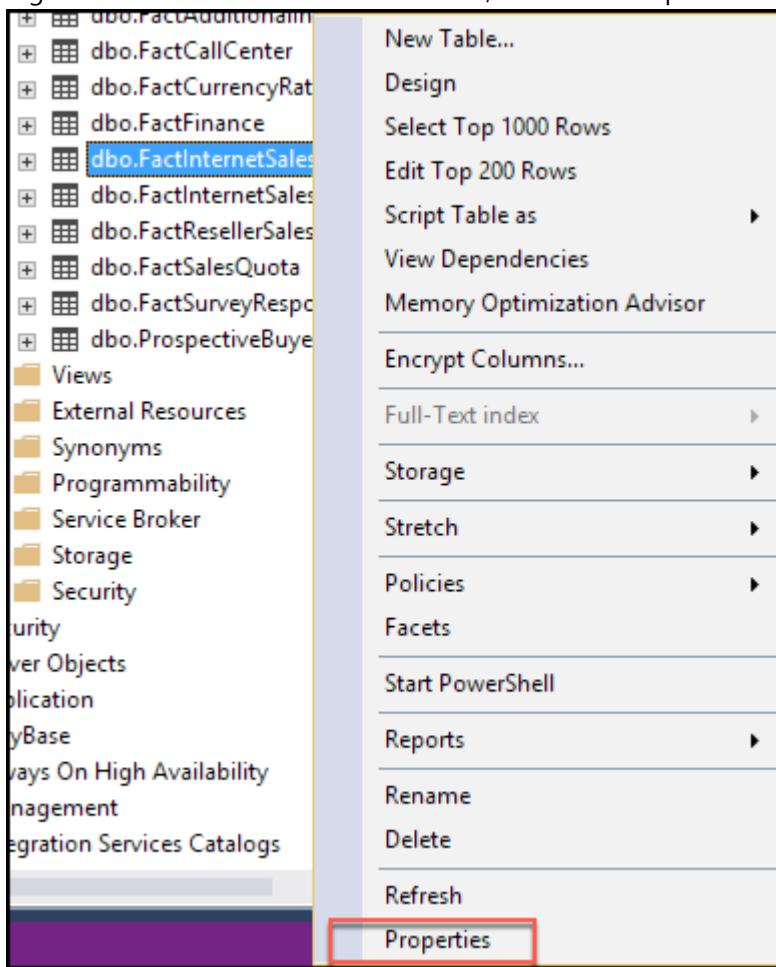
1. On the SqlServerDw VM, open SSMS 17. Note: There are two version of SSMS installed, so be sure to choose the correct one.
2. Connect to your SQL Server 2017 instance by selecting Connect in the Object Explorer, entering SqlServerDw into the Server name box, then selecting Connect.



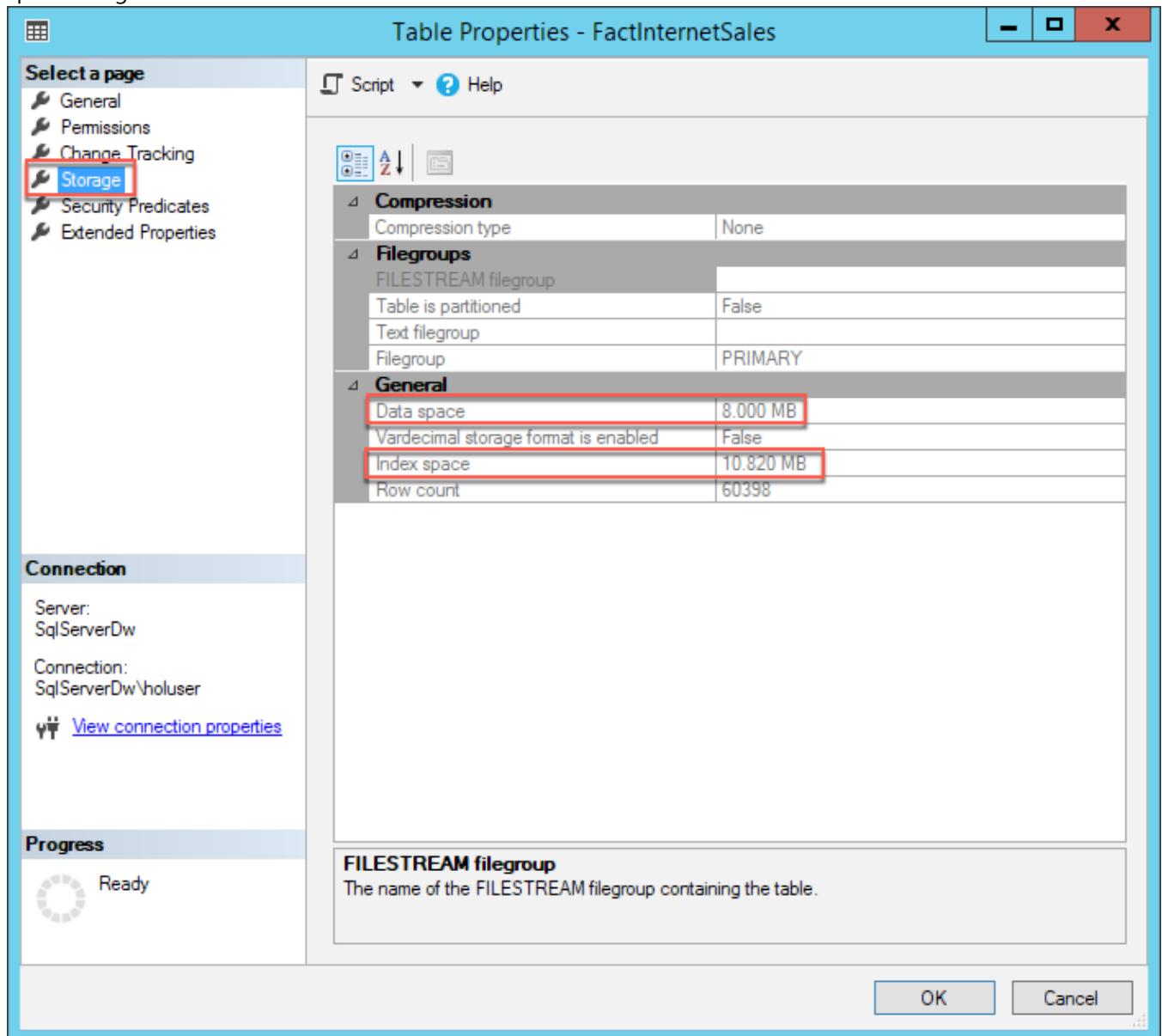
3. Expand Databases, then WorldWideImporters, and then Tables.



4. Right-click on the FactInternetSales table, and select Properties.

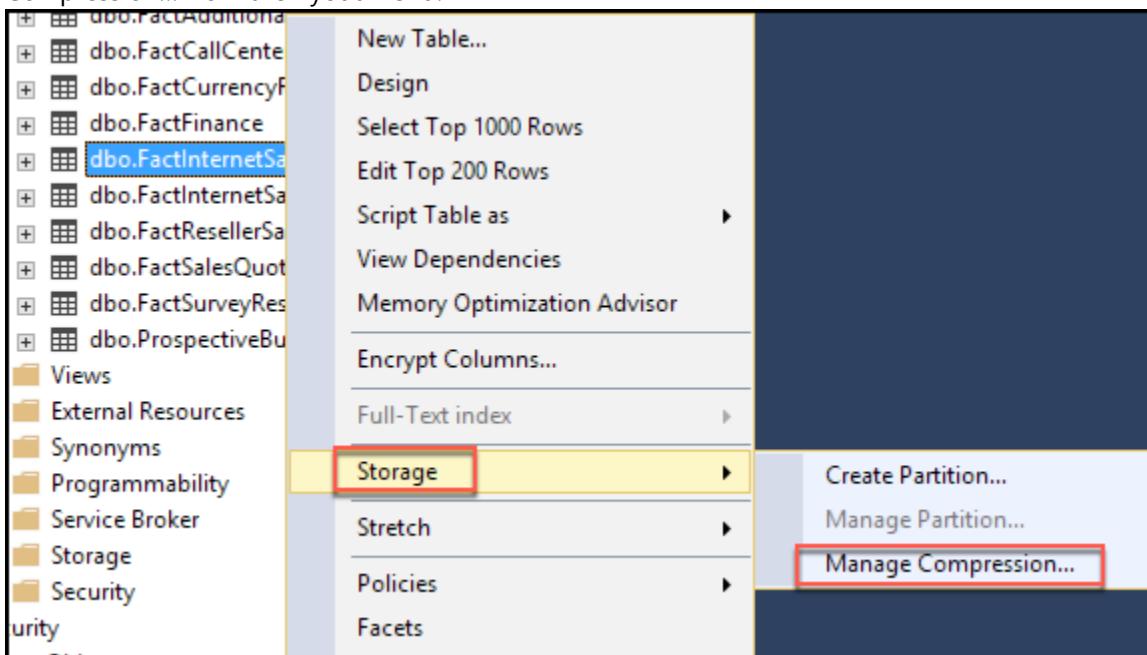


5. In the Table Properties – FactInternetSales dialog, select the Storage page, and record the data space and index space being used.



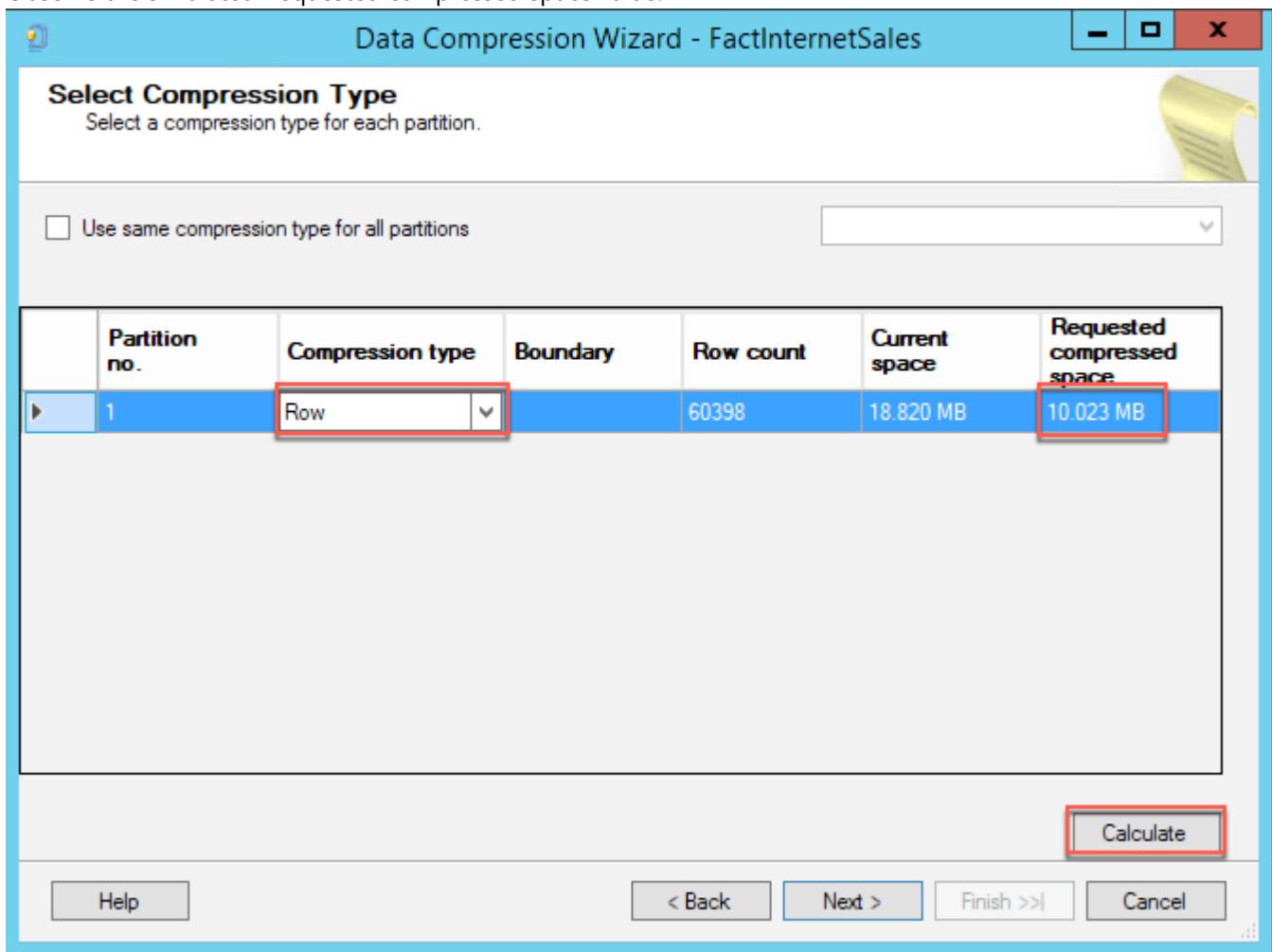
6. Select Cancel to close the properties dialog.

7. Right-click the FactInternetSales table again, and this time select the Storage context menu, then select Manage Compression... from the flyout menu.

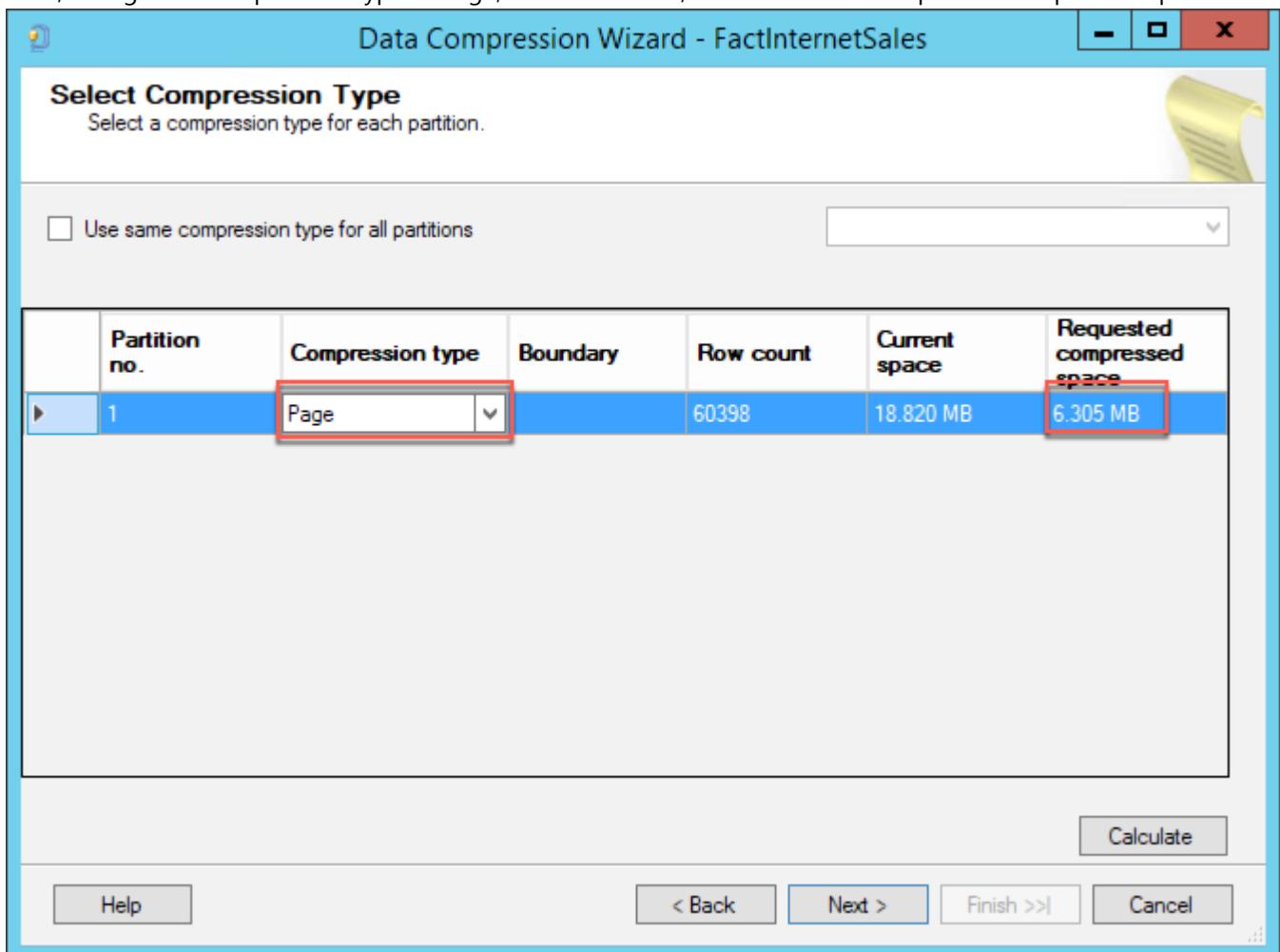


8. On the Welcome page of the Data Compression Wizard, select Next.

9. On the Select Compression Type pages, select Row from the Compression Type drop down, then select Calculate. Observe the simulated Requested compressed space value.

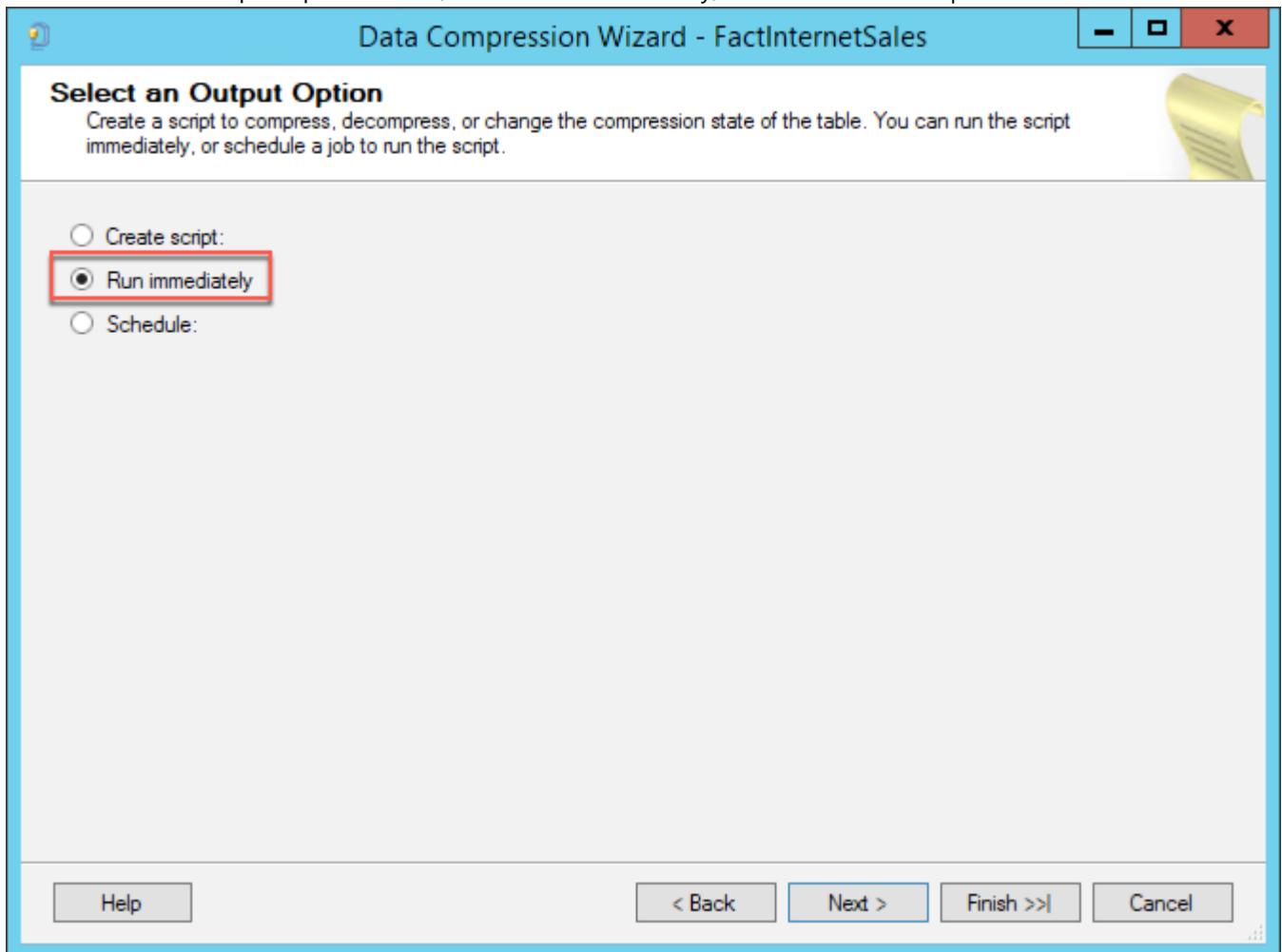


10. Now, change the Compression type to Page, select Calculate, and observe the Requested compressed space.

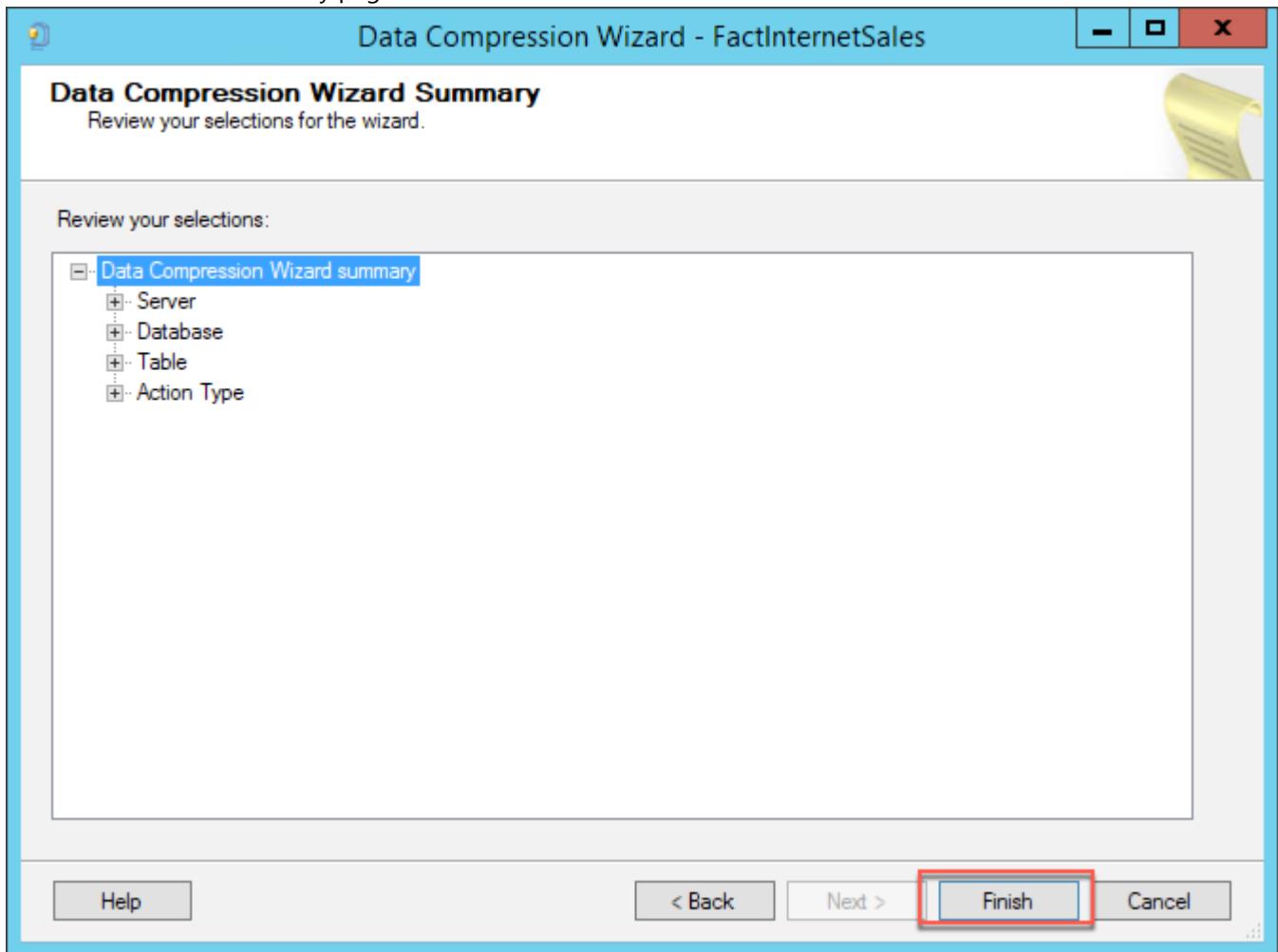


11. Leave the Compression type set to Page, and select Next.

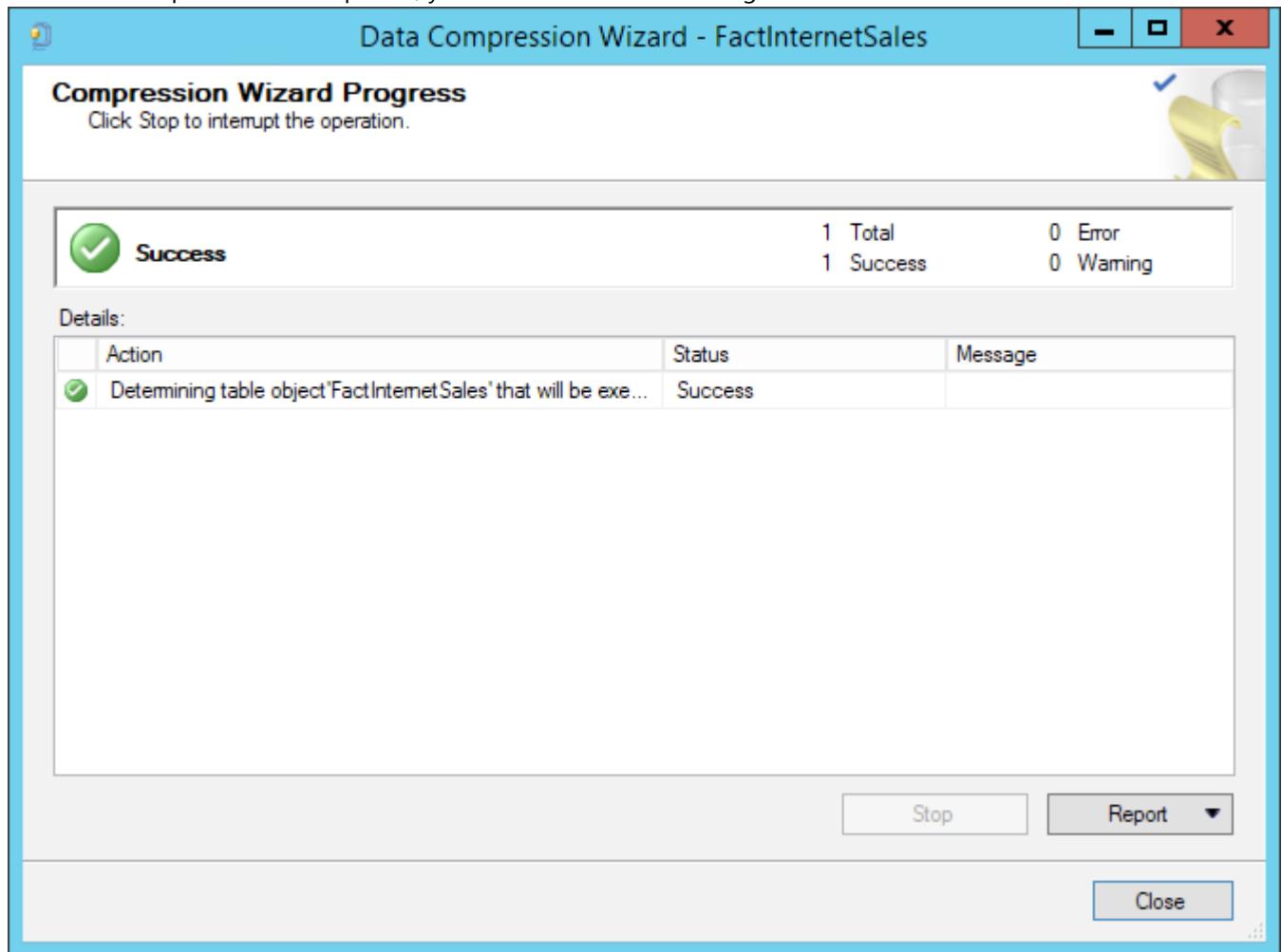
12. On the Select an Output Option screen, select Run Immediately, and select Finish >>|.



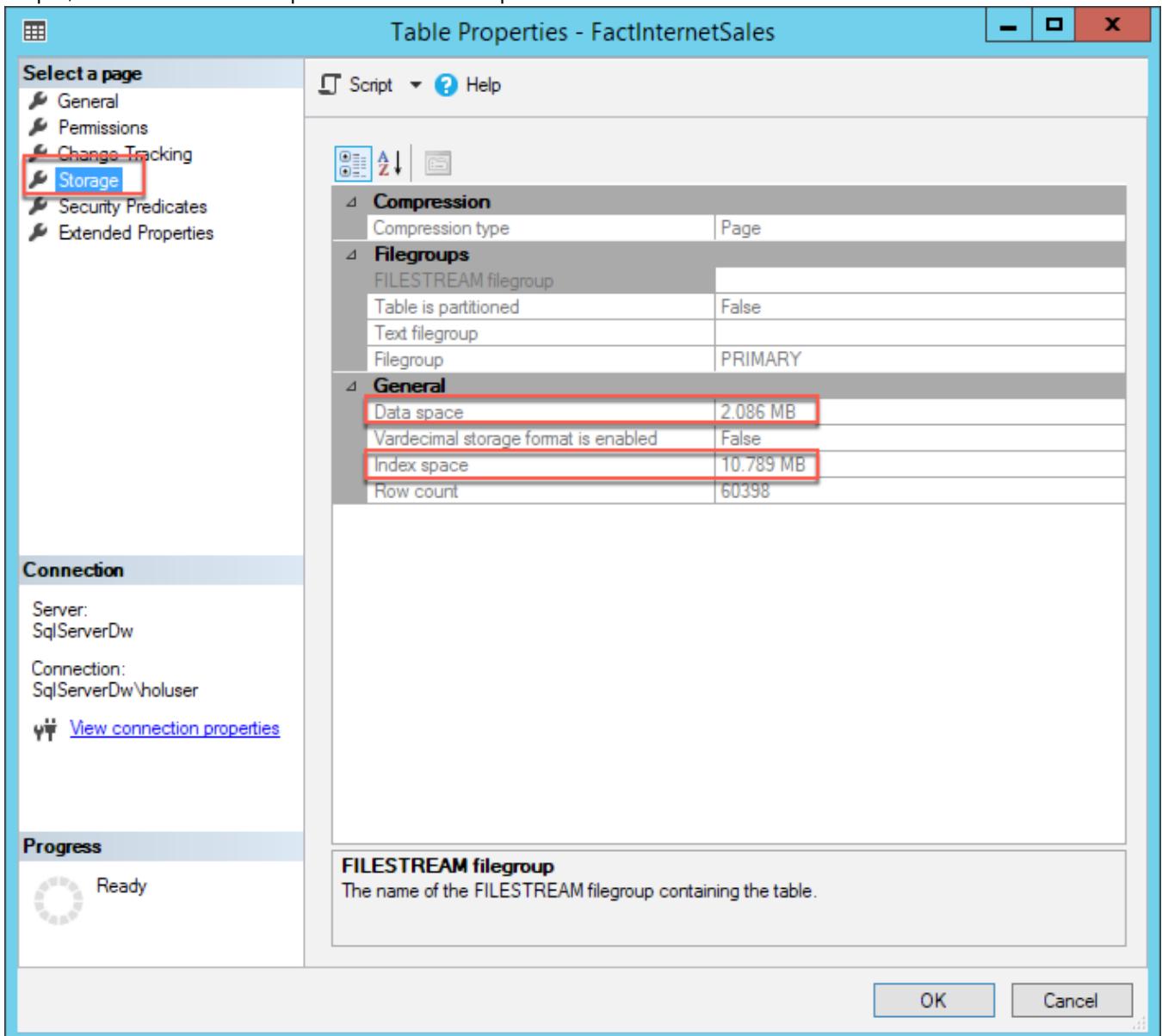
13. Select Finish on the summary page.



14. When the compression is completed, you will see a success message. Select Close.



15. Return to the FactInternetSales Properties dialog (right-click the table and select Properties), and select the Storage page. Once again, note the Data space and Index space, and compare those to the values recorded in Step 5, above. Notice the improvement with compression.



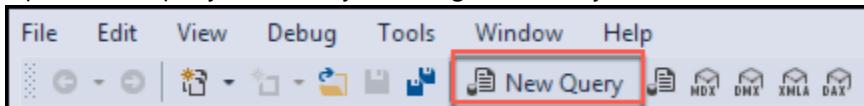
16. Compression decreases the load on the Disk I/O subsystem, while increasing the load on the CPU. Since most data warehouse workloads are heavily disk bound, and often have low CPU usage, compression can be a great way to improve performance.  
17. Select Cancel to close the table properties window.

## Task 2: Clustered ColumnStore index

In this task, you will create a new table based on the existing FactResellerSales table and apply a ColumnStore index.

1. In SSMS 17, ensure you are connected to the SQL Server 2017 instance (SqlServerDw).

2. Open a new query window by selecting New Query from the toolbar.



3. Copy the script below, and paste it into the query window.

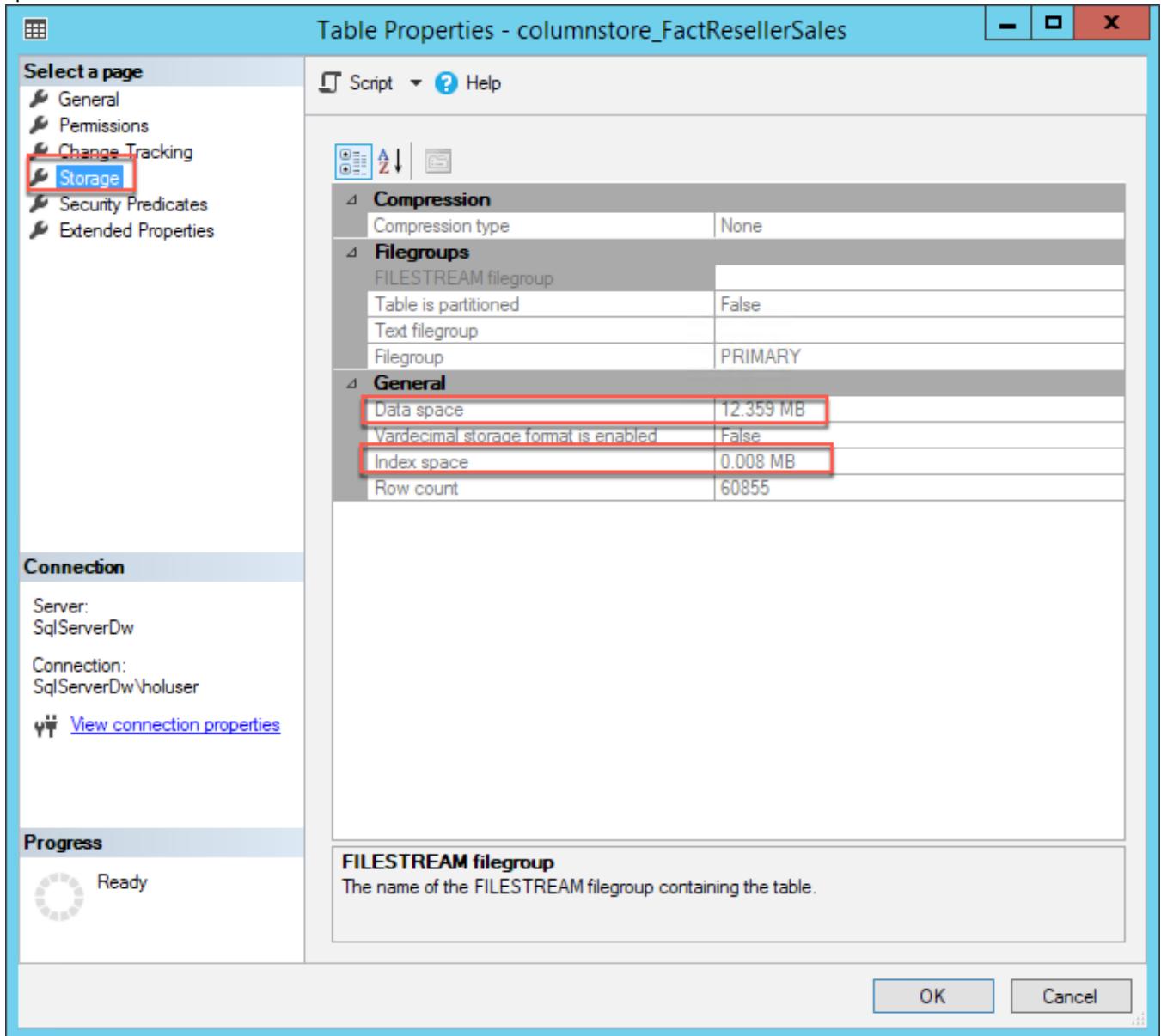
```
use WorldWideImporters  
select *  
into ColumnStore_FactResellerSales  
from FactResellerSales  
go
```

4. Select Execute on the toolbar to run the query.



5. In the Object Explorer, expand Tables under the WorldWideImporters database, right-click the new ColumnStore\_FactResellerSales table, and select Properties. You may need to select the Refresh button in the Object Explorer, if you don't see the new table.

- In the ColumnStore\_FactResellerSales properties dialog, select the Storage page and note the Data and Index space.

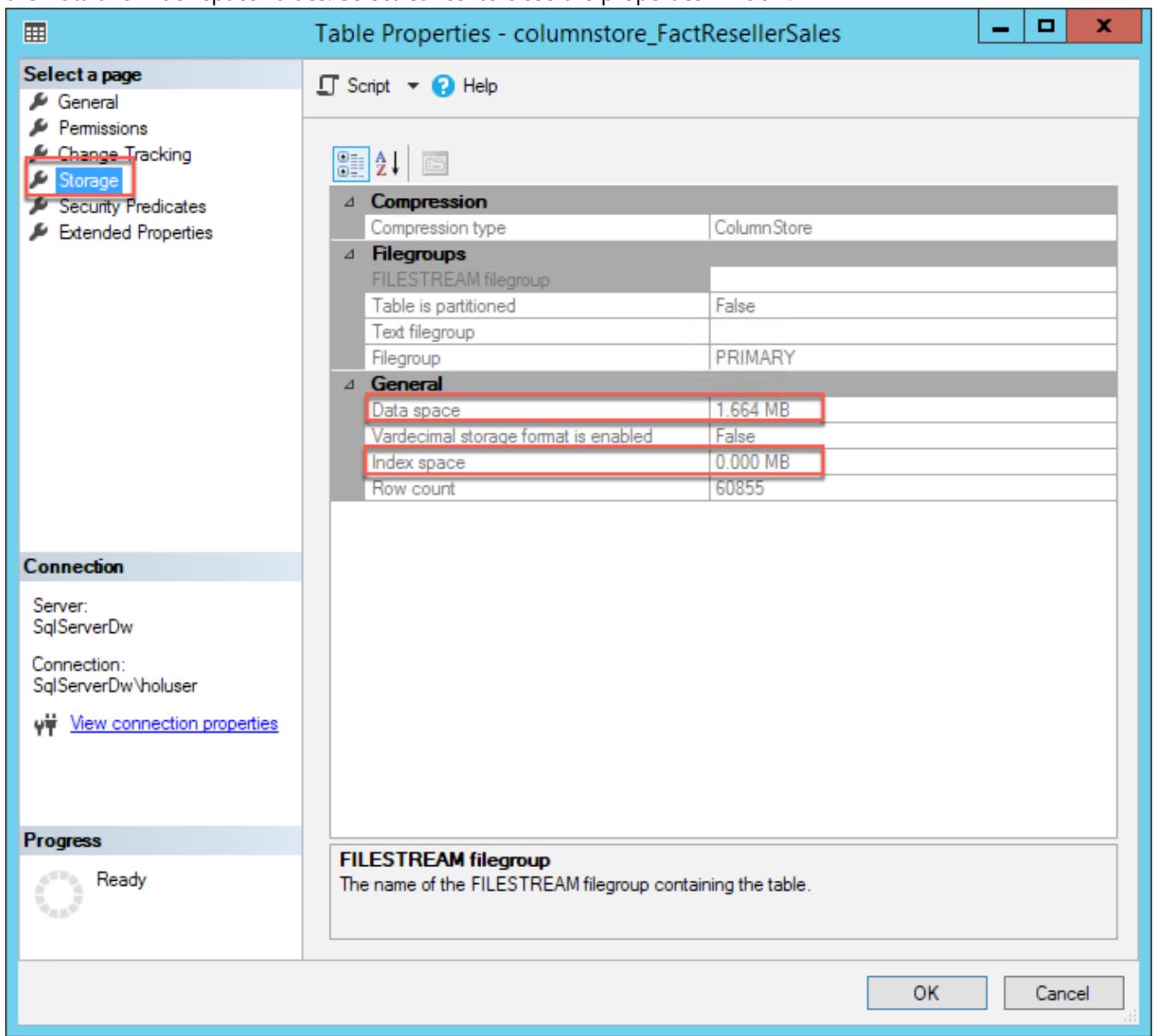


- Select Cancel to close the properties dialog.
- Select New Query again from the toolbar, and copy and paste the below query into the new query window.

```
USE [WorldWideImporters]
GO
CREATE CLUSTERED COLUMNSTORE INDEX [cci_FactResllerSales]
ON [dbo].[ColumnStore_FactResellerSales]
```

- This query will create a clustered ColumnStore index on the ColumnStore\_FactResellerSales table. Run the query by selecting Execute on the toolbar.

10. Return to the properties window of the ColumnStore\_FactResellerSales table, select the Storage page, and observe the Data and Index space values. Select Cancel to close the properties window.



11. Create a new query window by selecting New Query from the toolbar, and select the Include Actual Execution Plan by selecting its button in the toolbar.

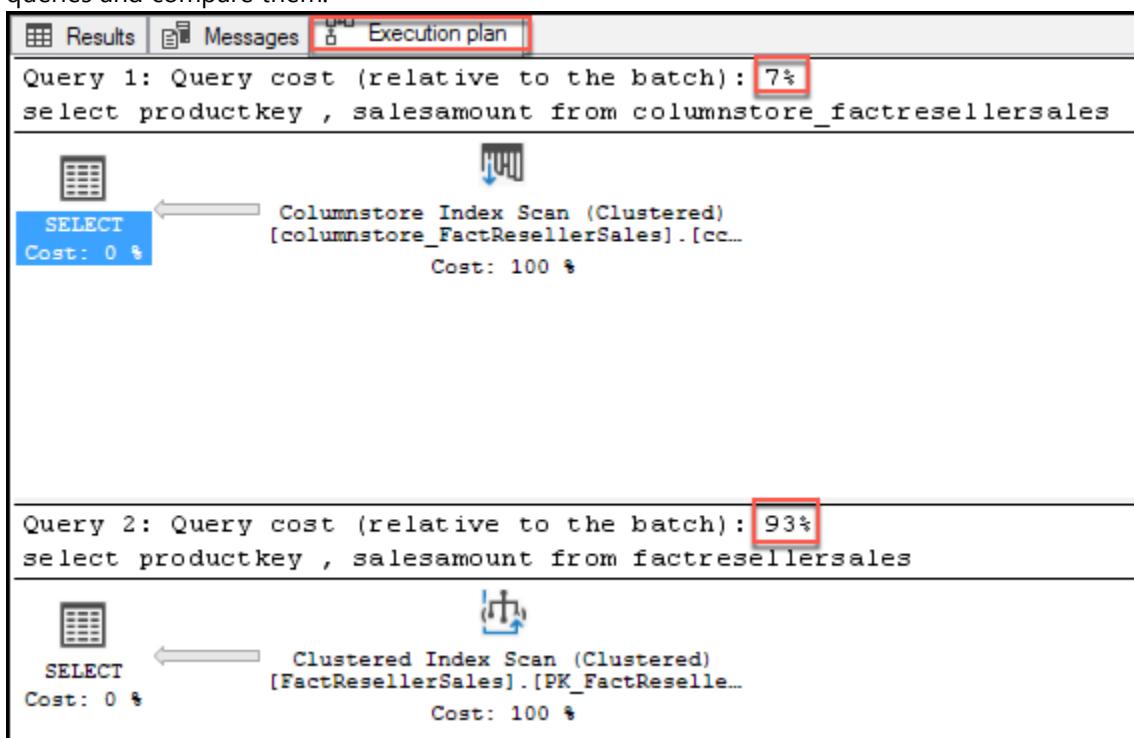


12. Paste the queries below into the new query window, and select Execute on the toolbar.

```
select productkey,  
salesamount  
from ColumnStore_FactResellerSales
```

```
select productkey,  
salesamount  
from FactResellerSales
```

13. In the Results pane, select the Execution Plan tab. Check the (relative to the batch) percentage value of the two queries and compare them.



14. Run the same queries again, but this time set statistics IO on in the query by adding the following to the top of the query window.

```
set statistics io on  
GO
```

15. Your query should look like:

```
SQLQuery1.sql - Sq...verDw\holuser (53)*  ↳ X
1 set statistics io on
2 GO
3
4 select productkey
5     , salesamount
6 from columnstore_factresellersales
7
8 select productkey
9     , salesamount
10 from factresellersales
```

16. Select Execute from the toolbar to run the query.

17. Statistics IO reports on the amount of logical pages that are read in order to return the query results. Select the Messages tab of the Results pane, and compare two numbers, logical reads and lob logical reads. You should see a significant drop in total number of logical reads on the columns store table.

```
(60855 rows affected)
Table 'columnstore_FactResellerSales'. Scan count 1, logical reads 0, physical reads 0, read-ahead reads 0, lob logical reads 27,
Table 'columnstore_FactResellerSales'. Segment reads 1, segment skipped 0.

(1 row affected)

(60855 rows affected)
Table 'FactResellerSales'. Scan count 1, logical reads 1491, physical reads 0, read-ahead reads 0, lob logical reads 0, lob physi
(1 row affected)
```

## Exercise 5: Setup Oracle 11g Express Edition

Duration: 45 minutes

In this exercise, you will install Oracle XE on your Lab VM, load a sample database supporting an application, and then migrate the database to SQL Server 2017.

### Task 1: Install Oracle XE

1. Connect to your Lab VM using RDP, as you did in [Before the Hands-on Lab, Task 2](#).
  - a. User name: holuser
  - b. Password: Password.1!!
2. Using a web browser, navigate to <http://www.oracle.com/technetwork/database/database-technologies/express-edition/downloads/index.html>
3. Accept the license agreement, and select Oracle Database 11g Express Edition Release 2 for Windows x64.

**Oracle Database Express Edition 11g Release 2**

**June 4, 2014**

You must accept the [OTN License Agreement for Oracle Database Express Edition 11g Release 2](#) to download this software.

Accept License Agreement  Decline License Agreement

**Oracle Database Express Edition 11g Release 2 for Windows x64**

- Unzip the download and run the DISK1/setup.exe
- Oracle Database Express Edition 11g Release 2 for Windows x32**
- Unzip the download and run the DISK1/setup.exe
- Oracle Database Express Edition 11g Release 2 for Linux x64**
- Unzip the download and the RPM file can be installed as normal

4. Sign in with your Oracle account to complete the download. If you don't already have a free Oracle account, you will need to create one.

**Sign in**

Username (i)

Password (i)

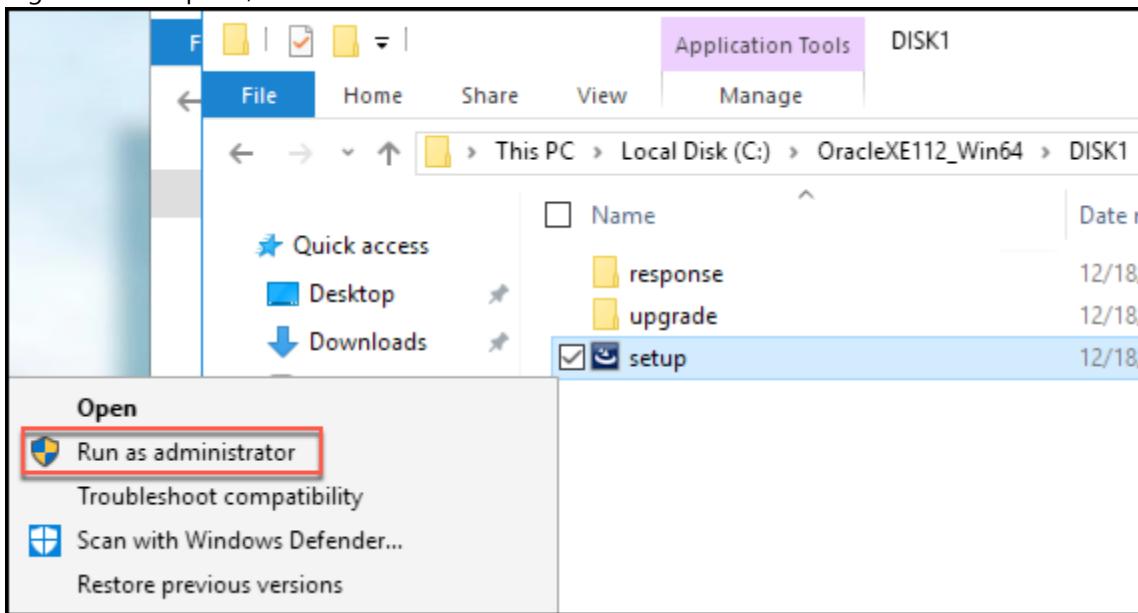
**Sign in**

Don't have an Oracle Account?

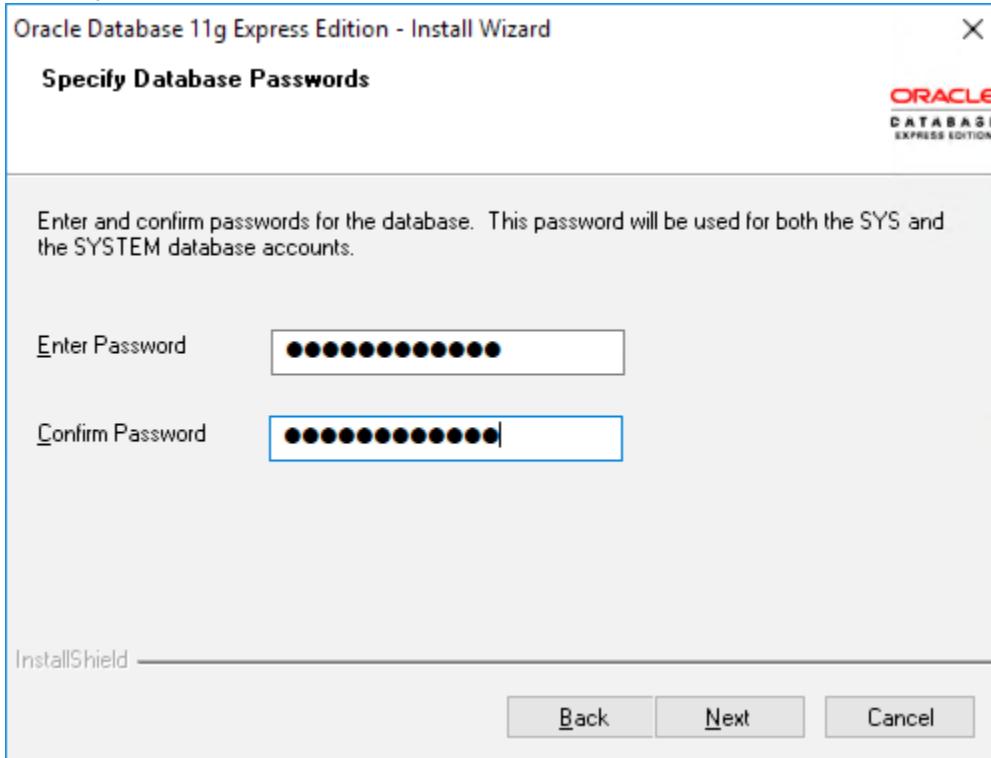
**Create Account**

© Oracle | Legal Notices | Terms of Use | Privacy Policy

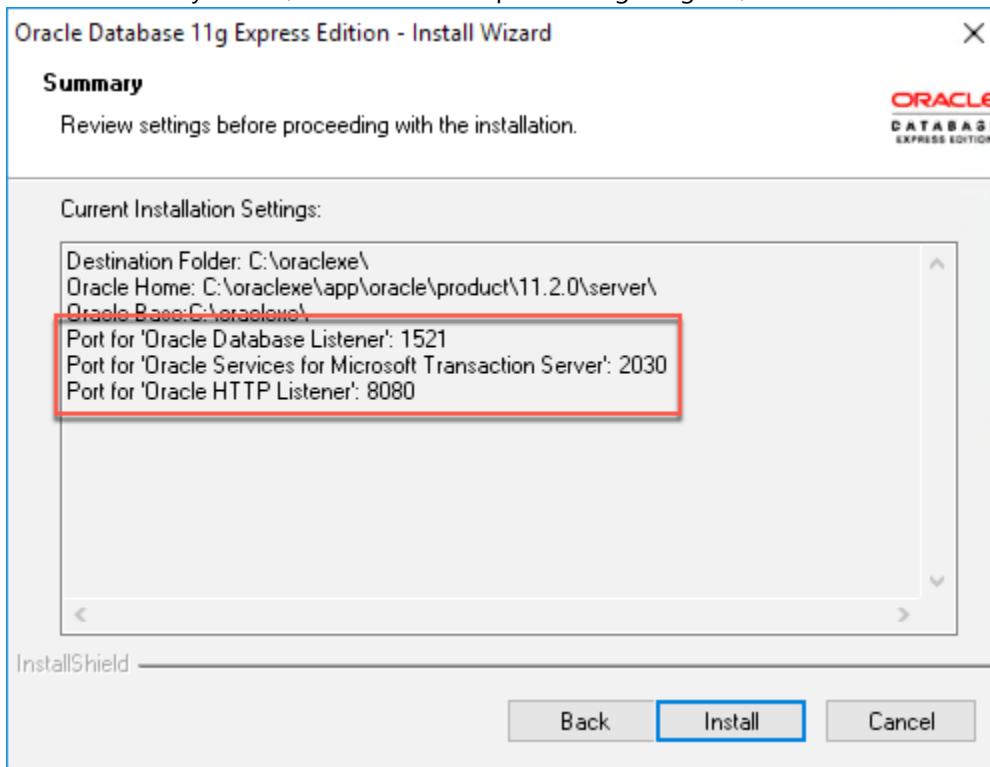
5. After signing in, the file will download.
6. Unzip the file, and navigate to the DISK1 folder.
7. Right-click setup.exe, and select Run as administrator.



8. Select Next to step through each screen of the installer, accepting the license agreement and default values, until you get to the Specify Database Passwords screen.
9. Set the password to Password.1!! , and select Next.



10. On the Summary screen, take note of the ports being assigned, and select Install.



11. Select Finish on the final dialog to complete the installation.

## Task 2: Install Oracle Data Access components

1. On your Lab VM, open a browser and navigate to <http://www.oracle.com/technetwork/database/windows/downloads/index-090165.html>

2. Accept the license agreement, and select the ODAC122010\_x64.zip download link under 64-bit ODAC 12.2c Release 1 (12.2.0.1.0) for Windows x64.

## 64-bit Oracle Data Access Components (ODAC) Downloads

**Important:** The [32-bit Oracle Developer Tools for Visual Studio download](#) is required for Entity Framework design-time features. The downloads that support Entity Framework deployment below do not contain design-time tools, only run-time support.

You must accept the [OTN License Agreement](#) to download this software.

Accept License Agreement  Decline License Agreement

### 64-bit ODAC 12.2c Release 1 (12.2.0.1.0) Xcopy for Windows x64

[Released May 31, 2017]

-  [ODP.NET\\_Managed\\_ODAC122cR1.zip](#) - 2.98 MB (3,125,659 bytes)  
This download contains ODP.NET, Managed Driver xcopy only. Installation Instructions are included within the zip file.
-  [ODAC122010Xcopy\\_x64.zip](#) - 77.0 MB (80,834,288 bytes)  
Installation Instructions are included within the zip file.

#### Download Includes

- 64-bit Oracle Data Provider for .NET 4 12.2.0.1.0
- 64-bit Oracle Data Provider for .NET 2.0 12.2.0.1.0
- 64-bit Oracle Providers for ASP.NET 4 12.2.0.1.0
- 64-bit Oracle Providers for ASP.NET 2.0 12.2.0.1.0
- 64-bit Oracle Provider for OLE DB 12.2.0.1.0
- 64-bit Oracle Services for Microsoft Transaction Server 12.2.0.1.0
- 64-bit Oracle Instant Client 12.2.0.1.0

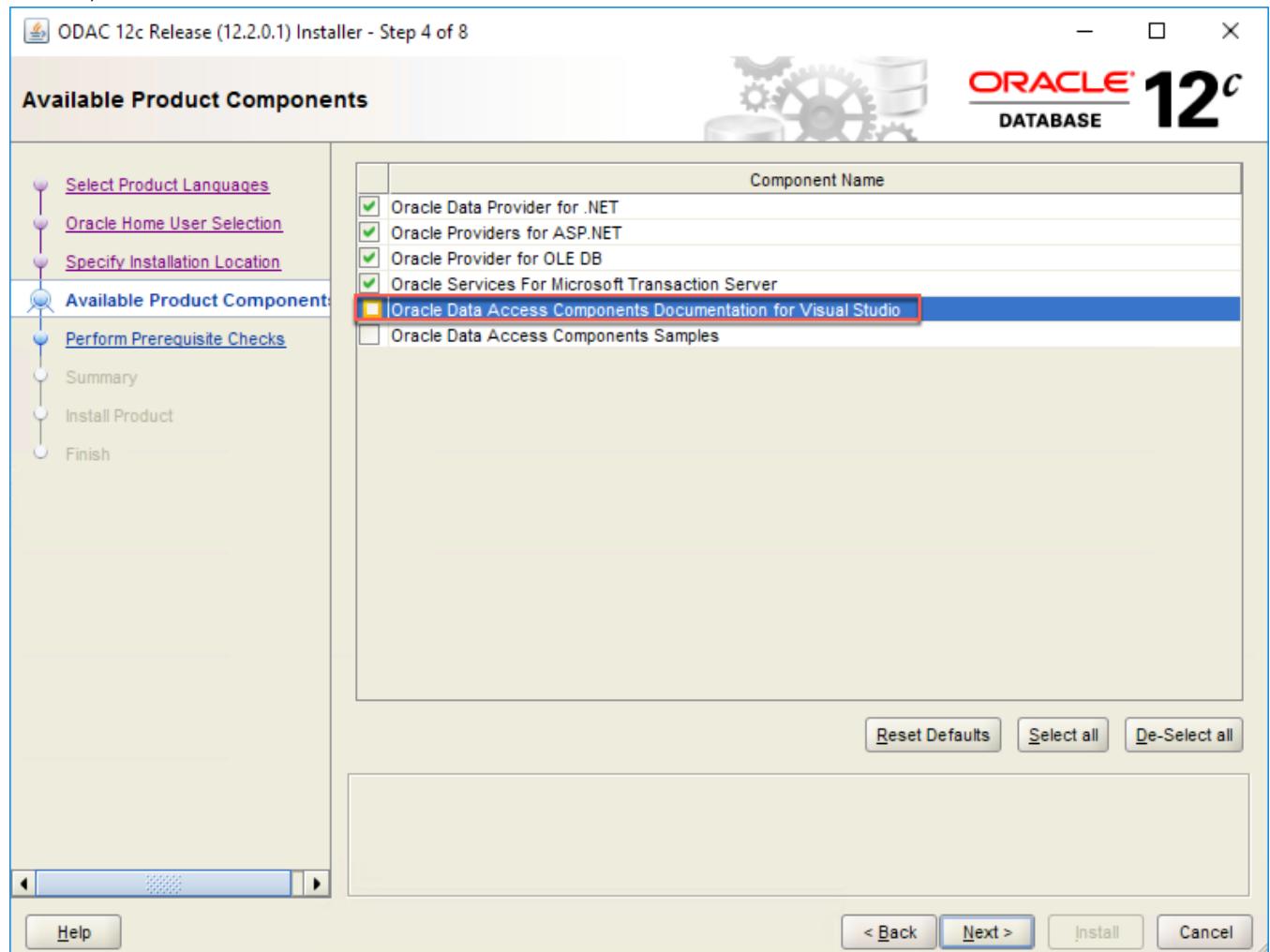
### 64-bit ODAC 12.2c Release 1 (12.2.0.1.0) for Windows x64

[Released June 1, 2017]

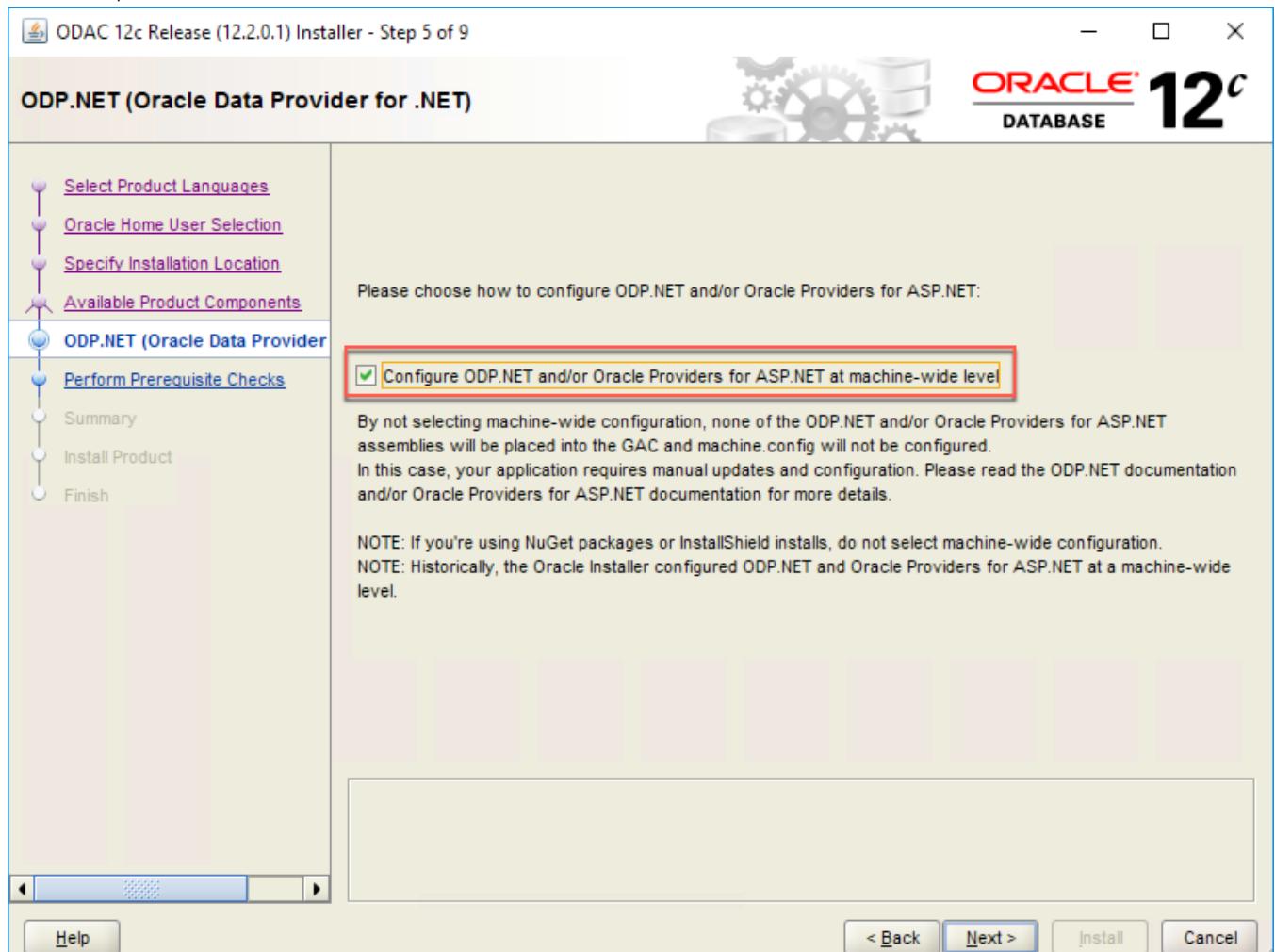
-  [ODAC122010\\_x64.zip](#) - 415 MB (435,541,788 bytes)

3. When the download completes, extract the contents of the ZIP file to a local drive.
4. Navigate to the folder containing the extracted ZIP file, and right-click setup.exe, then select Run as administrator to begin the installation.
5. Select Next to accept the default language, English, on the first screen.
6. On the Specify Oracle Home User screen, accept the default, Use Windows Built-in Account, and select Next.
7. Accept the default installation locations, and select Next.

8. On the Available Product Components, uncheck "Oracle Data Access Components Documentation for Visual Studio", and select Next.



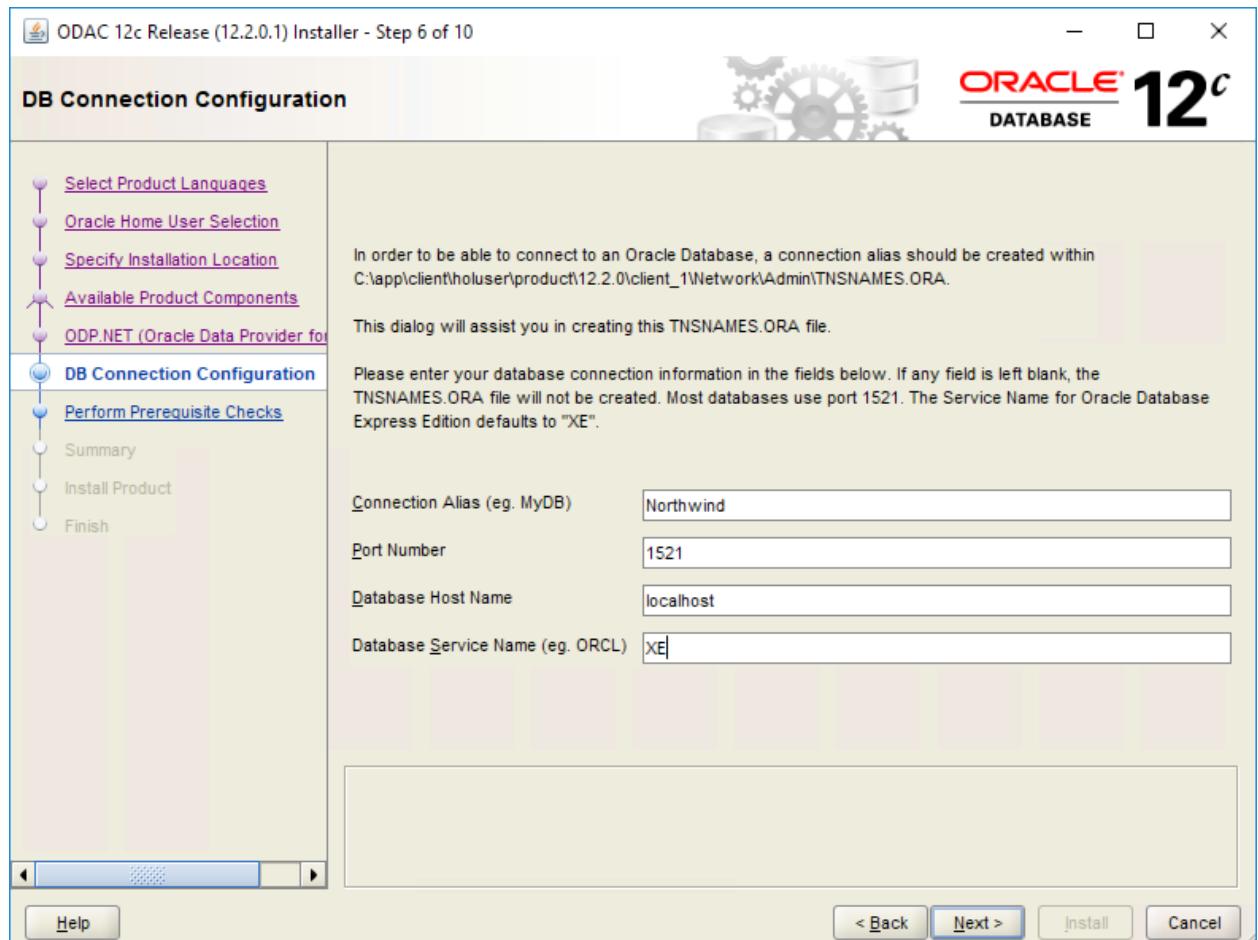
9. On the ODP.NET screen, check the box for Configure ODP.NET and/or Oracle Providers for ASP.NET at machine-wide level, and select Next.



10. On the DB Connection Configuration screen, enter the following:

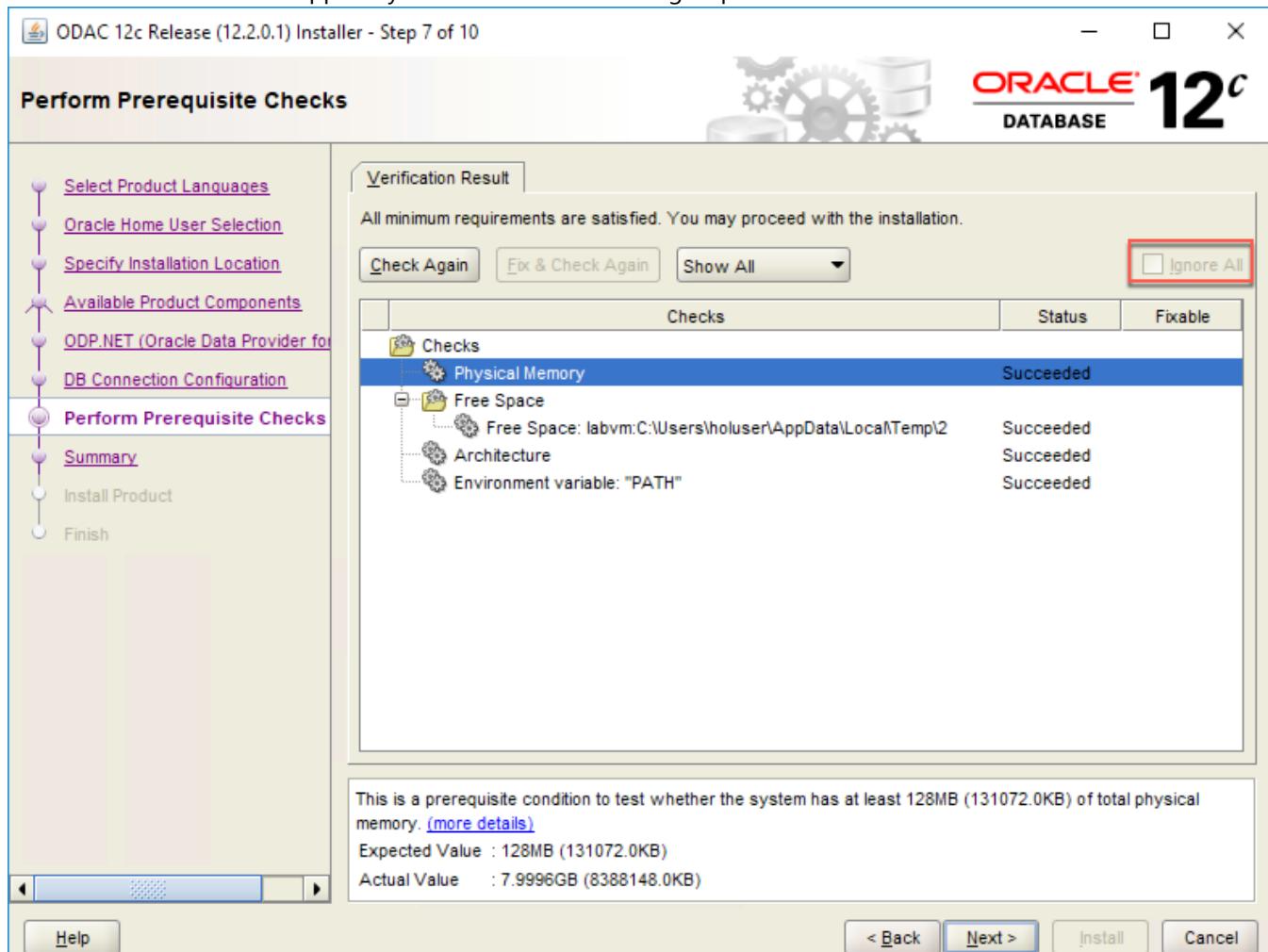
- Connection Alias: Northwind
- Port Number: 1521
- Database Host Name: localhost

## d. Database Service Name: XE



## e. Select Next.

11. If the Next button is disabled on the Perform Prerequisite Checks screen, check the Ignore All box, and then select Next. This screen will be skipped by the installer if no missing requisites are found.



12. On the Summary screen, select Install.

13. On the Finish screen, select Close.

### Task 3: Install SQL Server Migration Assistant (SSMA) 7.x for Oracle

1. In a web browser on your Lab VM, navigate to <https://www.microsoft.com/en-us/download/details.aspx?id=54258>
2. Select the Download button to download SSMA.



3. Check the box next to SSMA for Oracle.7.7.0.msi, and select Next to begin the download.

### Choose the download you want

File Name	Size
<input checked="" type="checkbox"/> SSMAforOracle_7.7.0.msi	8.9 MB
<input type="checkbox"/> SSMAforOracle_7.7.0_x86.msi	8.9 MB
<input type="checkbox"/> SSMAforOracleExtensionPack_7.7.0.msi	2.9 MB

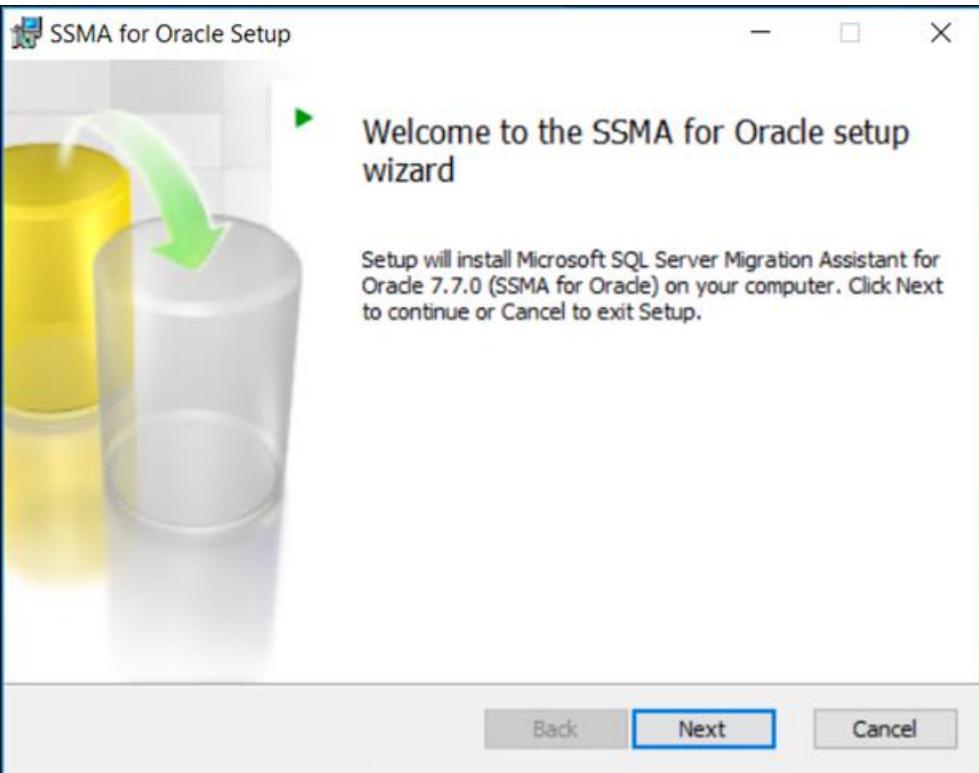
Download Summary:  
KBMBGB

1. SSMAforOracle\_7.7.0.msi

Total Size: 8.9 MB

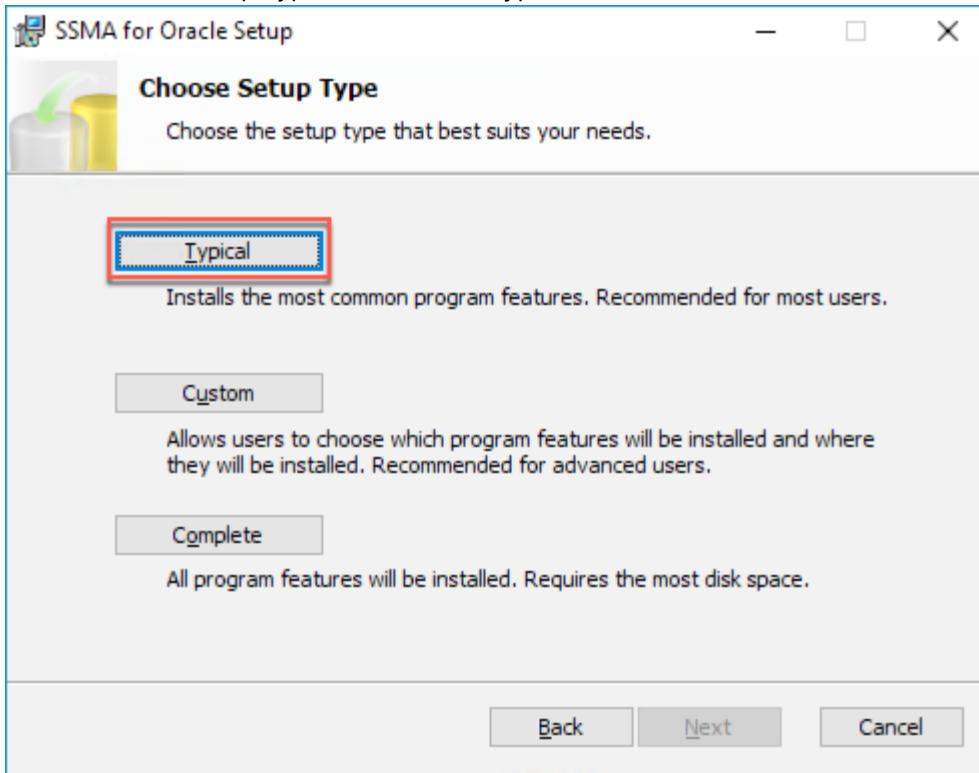
**Next**

4. Run SSMA for Oracle.7.7.0.msi to start the installation of SSMA. Select Next on the Welcome screen.

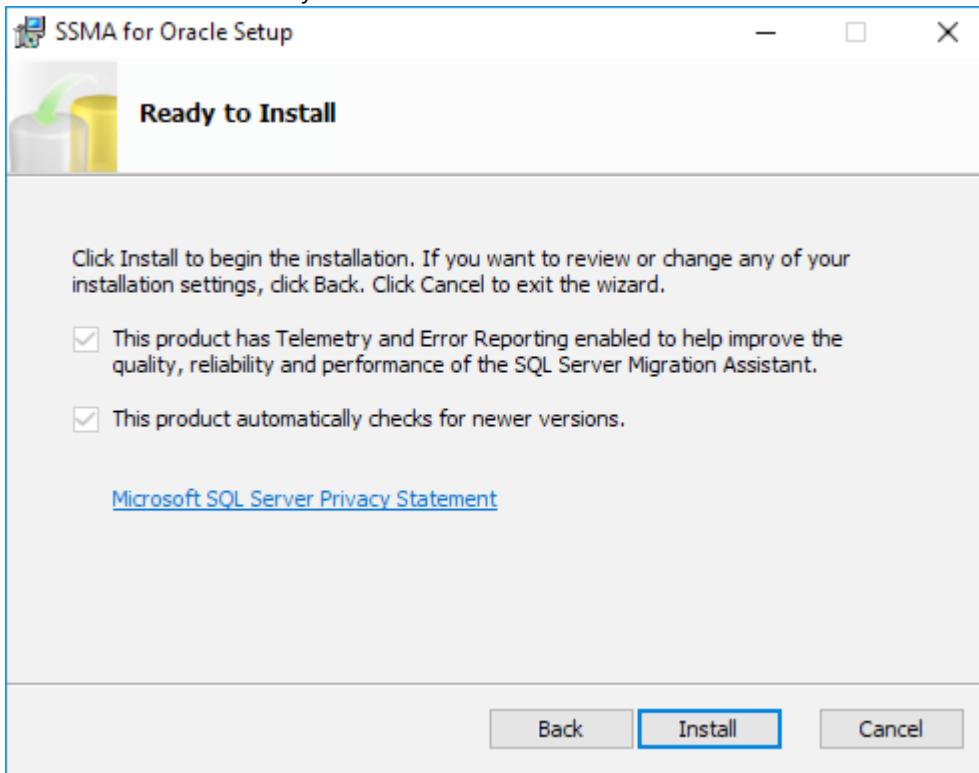


5. Accept the License Agreement, and select Next.

6. On the Choose Setup Type screen, select Typical, and select Next.



7. Select Install on the Ready to Install screen.



8. Select Finish when the installation is complete.

## Task 4: Install dbForge Fusion tool (trial version)

In this task, you will install a third-party extension to Visual Studio to enable interaction with, and script execution for, the Oracle database in Visual Studio 2017 Community Edition. This step is necessary because the Oracle Developer Tools extension does not currently work with Visual Studio 2017 Community Edition.

1. On your Lab VM, open a web browser and navigate to  
<https://www.devart.com/dbforge/oracle/fusion/download.html>
2. Scroll down on the page, and download a Trial of the current version by selecting the green download link.

### dbForge Fusion, Current Version

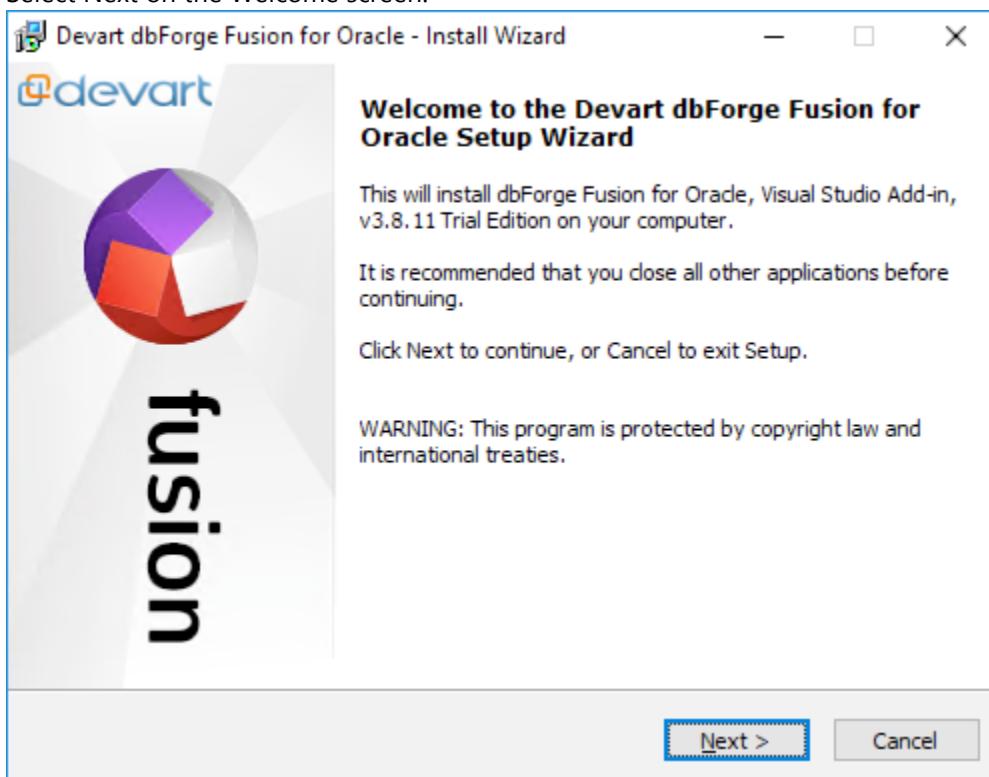
#### dbForge Fusion for Oracle, v3.8 Professional Trial

47.88 Mb

DOWNLOAD

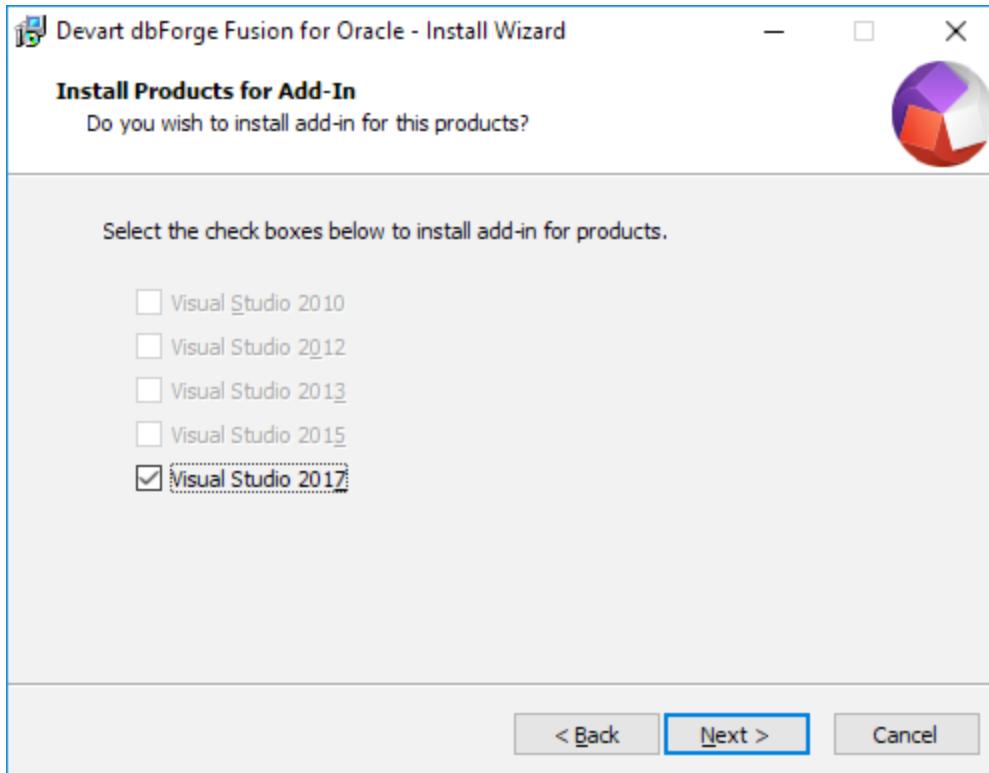
Note: Supports Visual Studio 2010, 2012, 2013, 2015, 2017

3. Run the installer. If Visual Studio is open, you will need to exit the application prior to running the installer.
4. Select Next on the Welcome screen.

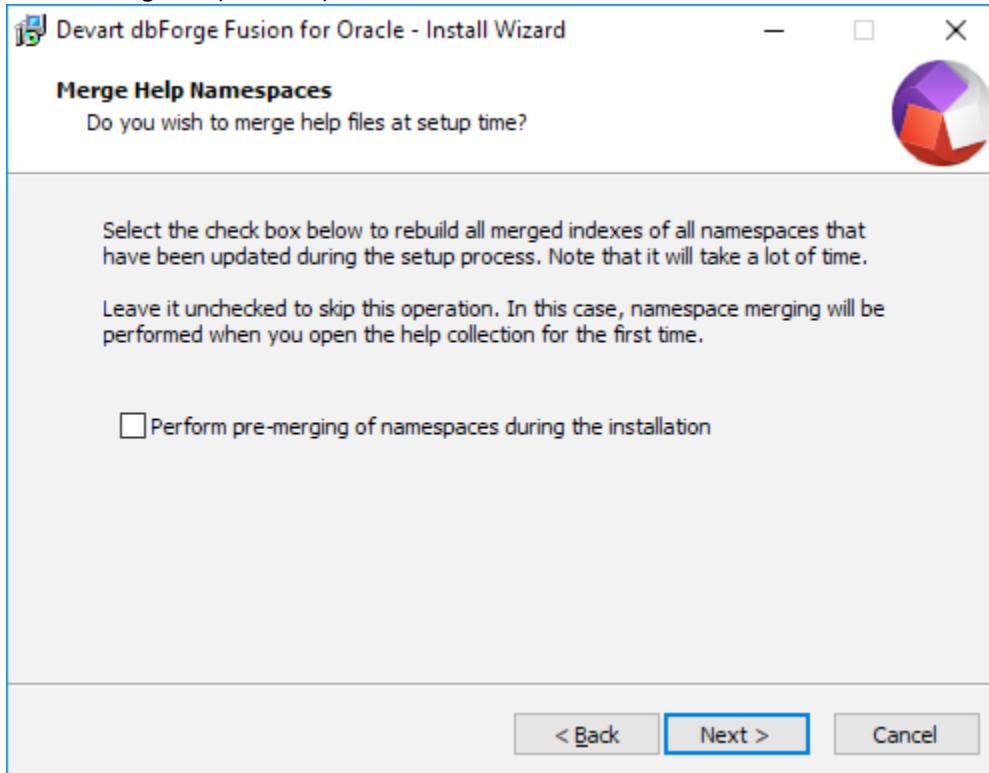


5. Accept the license agreement, and select Next.
6. Accept the default installation location, and select Next.
7. On the Select Start Menu Folder, select Next, accepting the default value.

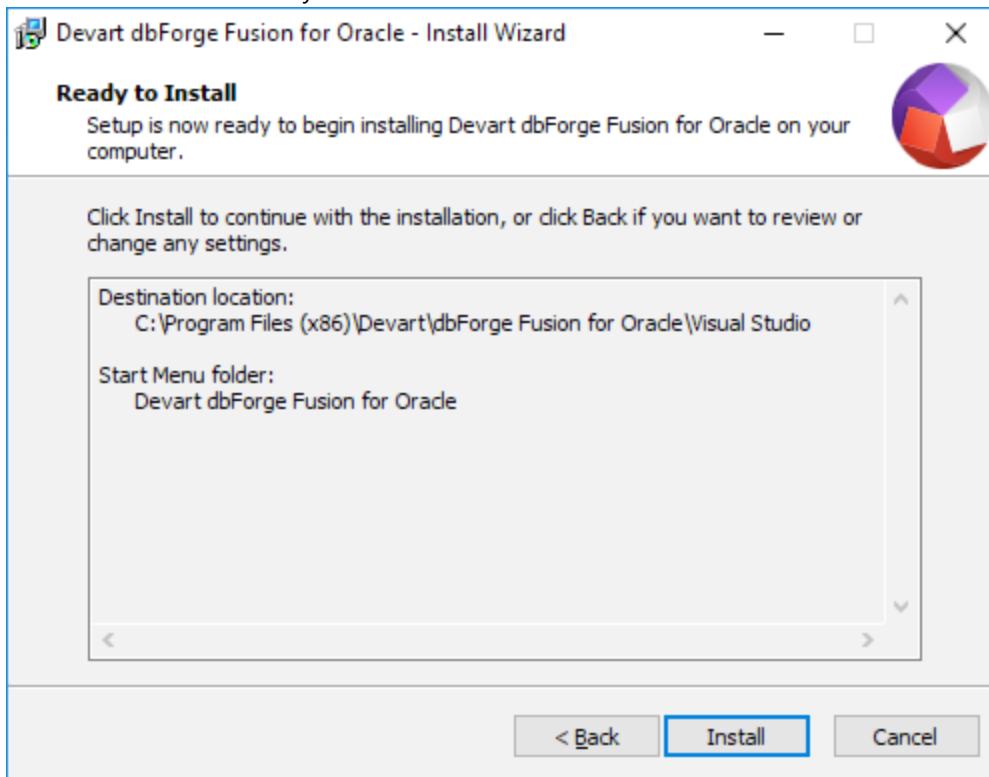
8. On the Install Products for Add-in screen, ensure Visual Studio 2017 is checked, and select Next.



9. On the Merge Help Namespaces screen, leave the check box unchecked, and select Next.



10. Select Install on the Ready to Install screen.

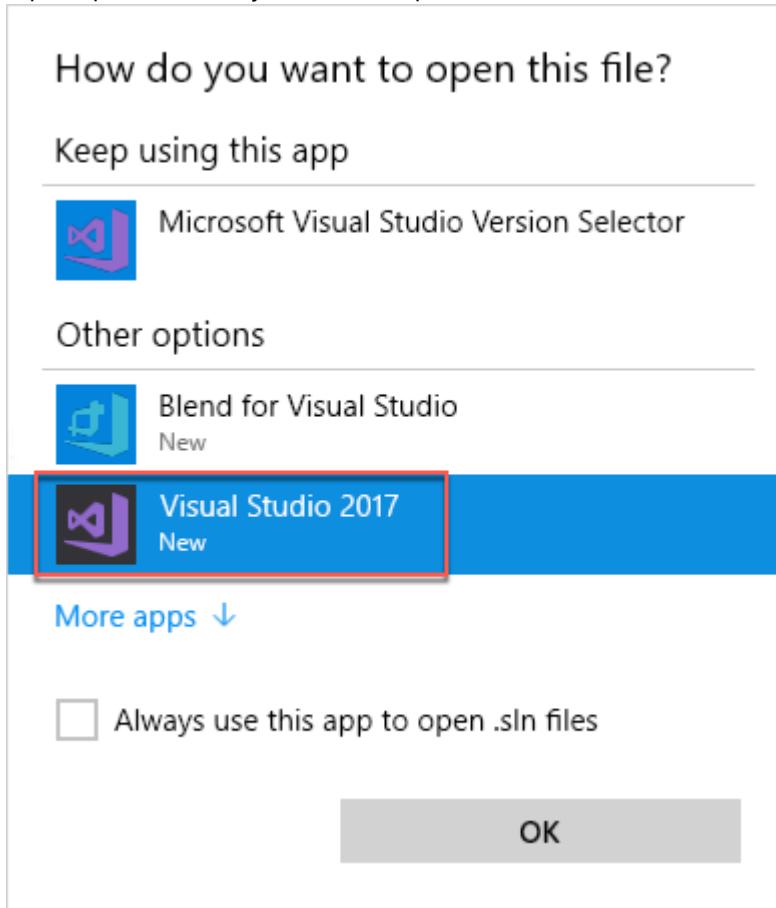


11. Select Finish when the installation is complete.

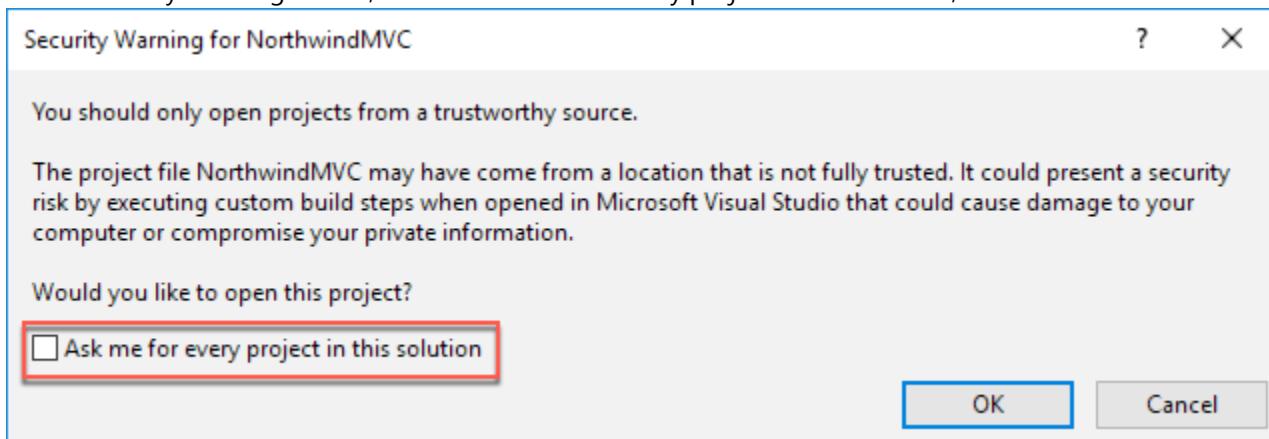
## Task 5: Create the Northwind database in Oracle 11g XE

In this task, you will create a connection to the Oracle database on your Lab VM, and create a database called Northwind.

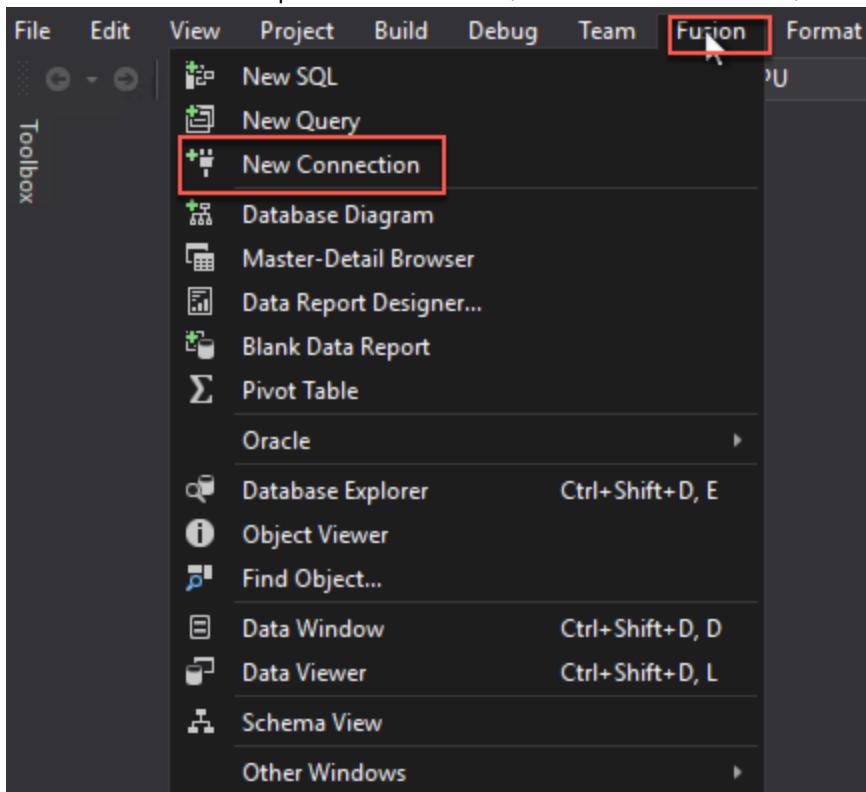
1. On your Lab VM, download the starter files from <http://bit.ly/2rwxnwW>. (Note the URL is case sensitive, so you may need copy and paste it into your browser.)
2. When the download completes, unzip the contents to C:\handsonlab.
3. Within the handsonlab folder, open the NorthwindMVC folder, and double-click NorthwindMVC.sln to open the project in Visual Studio 2017.
4. If prompted for how you want to open the file, select Visual Studio 2017, and select OK.



5. Sign into Visual Studio (or create an account if you don't have one), when prompted.
6. At the Security Warning screen, uncheck Ask me for every project in this solution, and select OK.

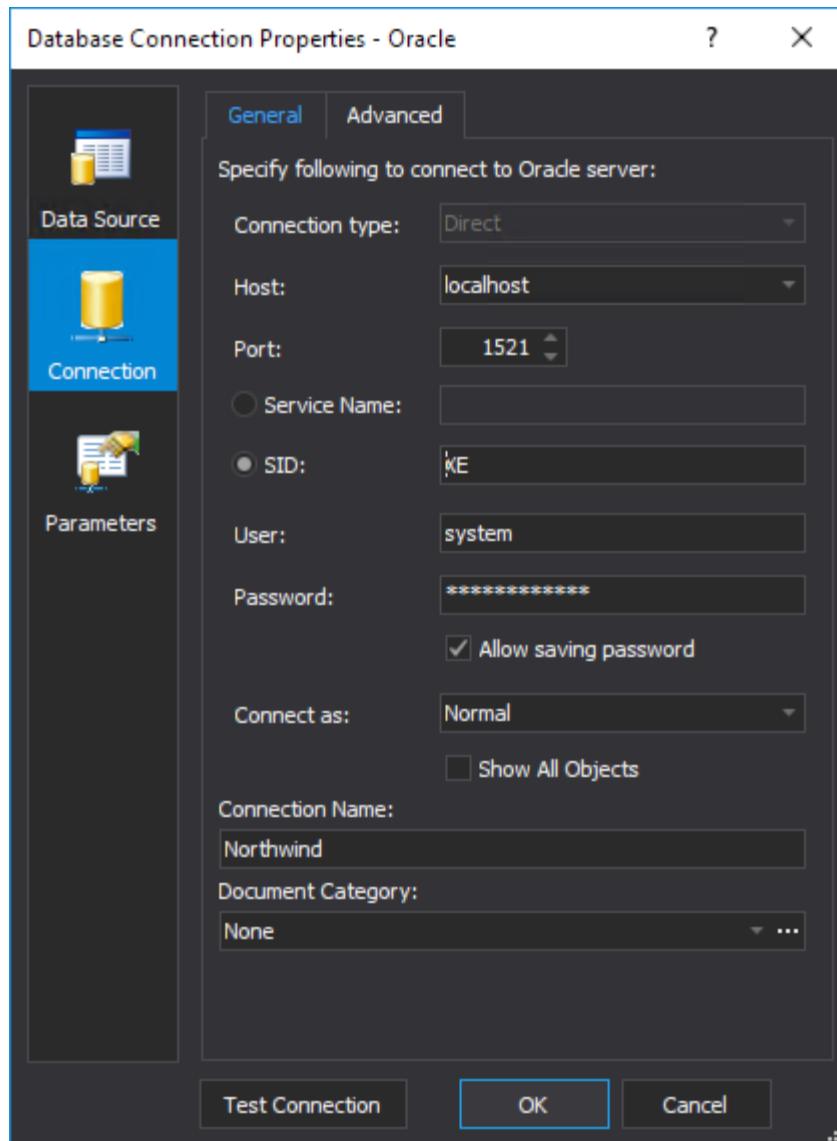


7. Once then solution is open in Visual Studio, select the Fusion menu, and select New Connection.



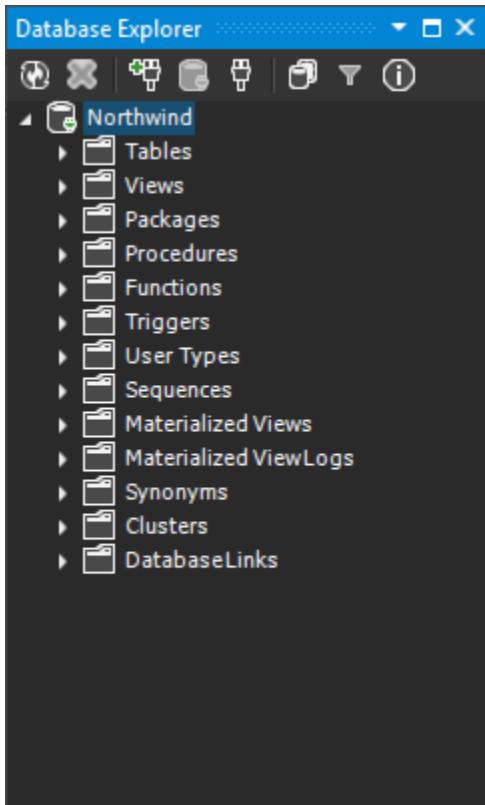
8. In the Database Connection properties dialog, set the following values:
- Host: localhost
  - Port: Leave 1521 selected
  - Select SID, and enter XE
  - User: system
  - Password: Password.1!!
  - Check Allow saving password
  - Connect as: Normal

## h. Connection Name: Northwind

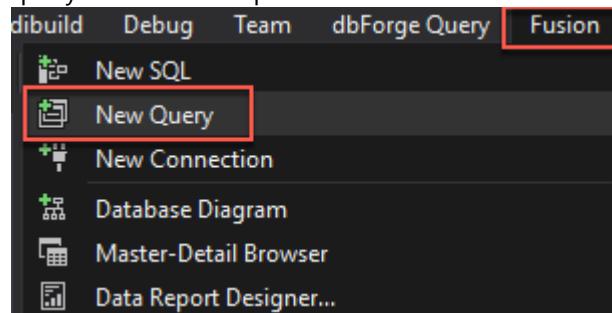


9. Select Test Connection to verify the settings are correct, and select OK to close the popup.
10. Select OK to create the Database Connection.

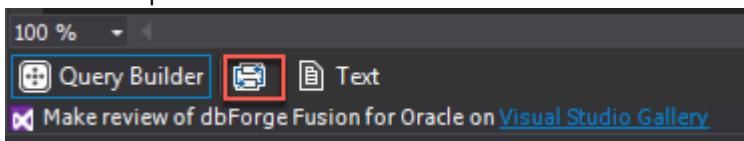
11. You will now see the Northwind connection in the Database Explorer window.



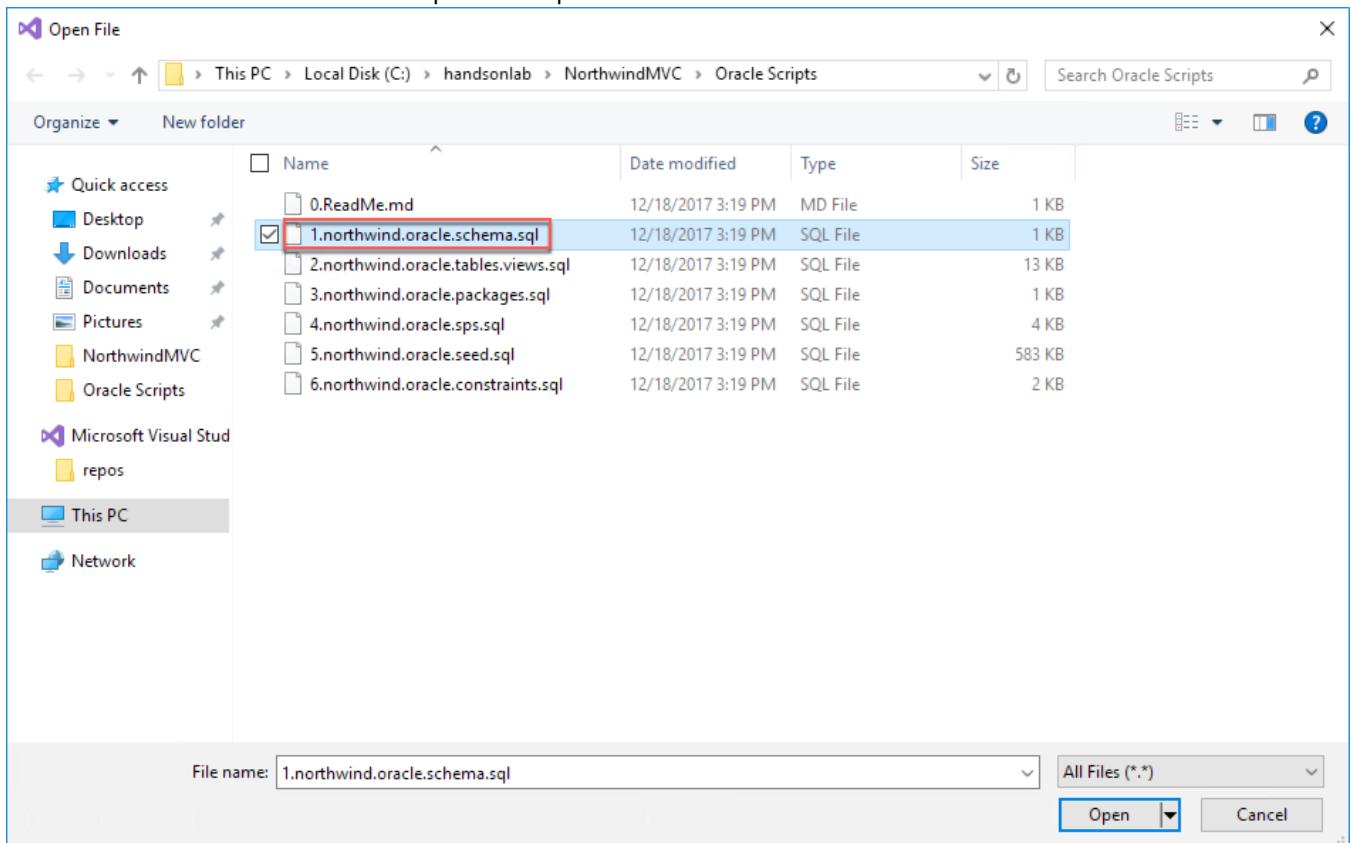
12. Select Fusion from the Visual Studio menu, and select New Query. You may receive a notification that your trial has expired when you do this. This can be ignored for this hands-on lab. Close that dialog, and continue to the query window that opens in Visual Studio.



13. You will be working in the Text area of the query window, so at the bottom of the query window, select the Swap views icon to move the Text area to the top of the window, and the Query Builder down. You can then use the mouse to expand the Text area.

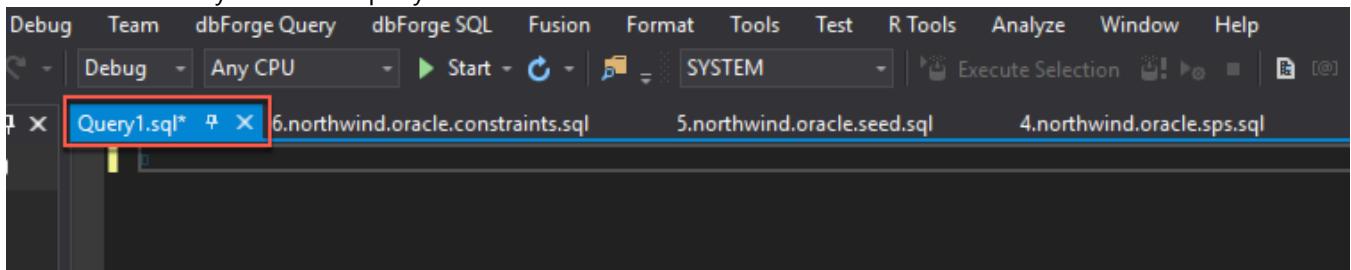


14. In Visual Studio, select File, Open File, and navigate to C:\handsonlab\NorthwindMVC\Oracle Scripts, and select the file 1.northwind.oracle.schema.sql. Select Open.



15. Select and copy all the file contents (use CTRL+A, CTRL+C).

16. Select the tab for your Fusion query.

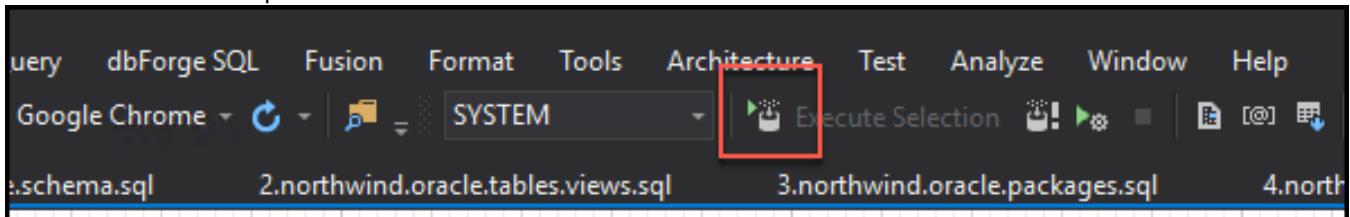


17. Paste (CTRL+V) the text copied in the previous step into the Text area at the bottom of the query window.

The screenshot shows a Visual Studio code editor window titled "Query1.sql". The code in the editor is a SQL script for creating a user named NW. It includes comments for steps 1, 2, and 3, and grants CONNECT, DBA, and RESOURCE permissions. The last line of the script is a commented-out command to select session information.

```
-- 1. Run to drop schema  
--drop user NW cascade;  
  
-- 2. Run to create user and schema:  
CREATE USER NW IDENTIFIED BY Password  
  DEFAULT TABLESPACE users  
  TEMPORARY TABLESPACE temp  
  QUOTA UNLIMITED ON users  
;  
-- 3. Run to grant permissions  
GRANT "CONNECT" TO NW;  
GRANT DBA TO NW;  
GRANT "RESOURCE" TO NW;  
ALTER USER NW DEFAULT ROLE "CONNECT",  
  DBA,  
  "RESOURCE";  
  
ALTER USER NW IDENTIFIED BY oracledemo123;  
  
--select s.sid, s.serial#, s.status, p.spid
```

18. Select the Execute script button on the Visual Studio toolbar.



19. The results of execution can be viewed in the Output window, found at the bottom left of the Visual Studio window.

The screenshot shows the Visual Studio Output window. The title bar says "Output". The window displays a list of successful execute operations, each followed by a timestamp. At the bottom, it shows "Done: Query1.sql".

Query Builder | Text | [Make review of dbForge Fusion for Oracle on Visual Studio Gallery](#)

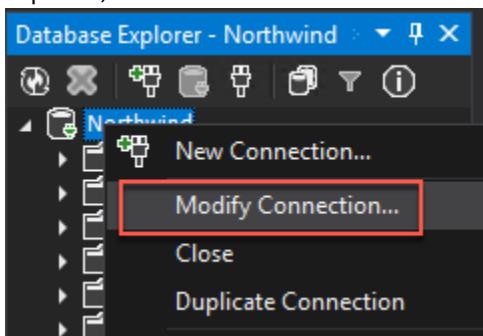
Output

Show output from: Devart - General

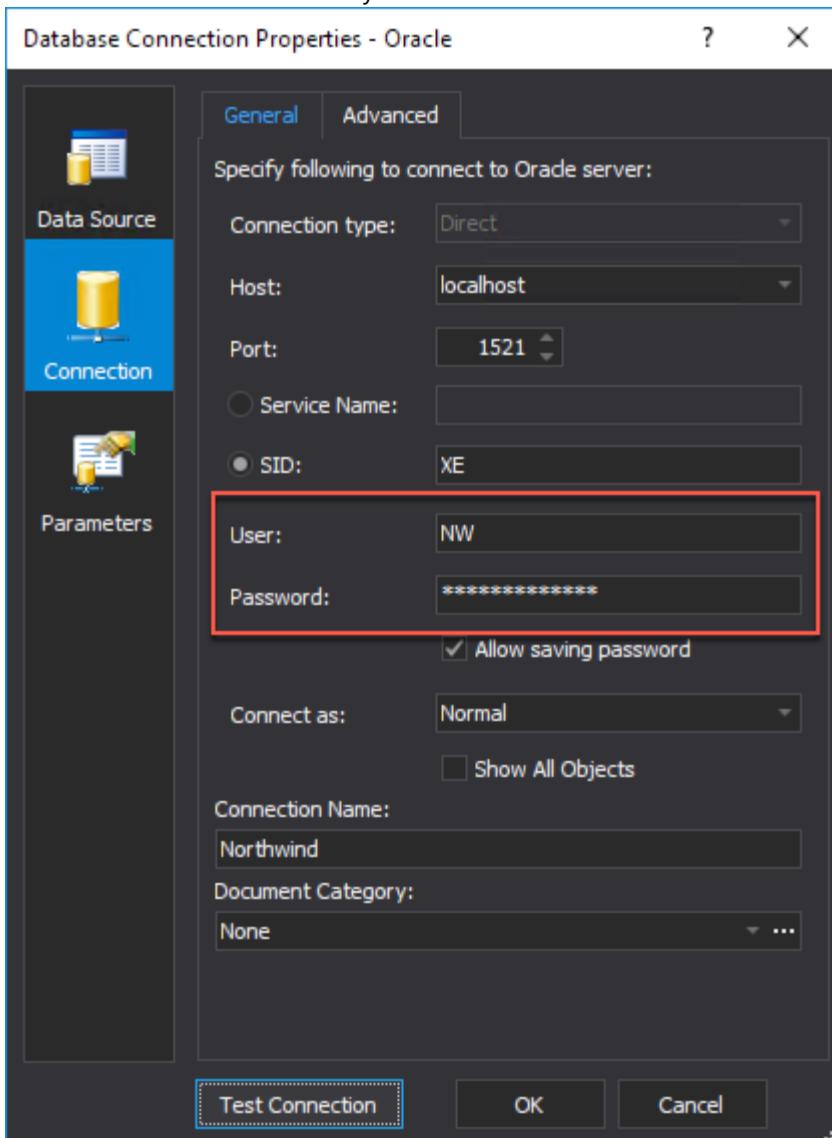
Execute succeeded [0.106s]  
Execute succeeded [0.013s]  
Execute succeeded [0.005s]  
Execute succeeded [0.050s]  
Execute succeeded [0.016s]  
Execute succeeded [0.028s]

----- Done: Query1.sql -----

20. In the Database Explorer window, right-click on the Northwind connection, and select Modify Connection... (If the Database Explorer is not already open, you can open it by selecting Fusion in the menu, then selecting Database Explorer).

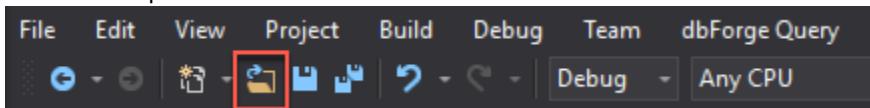


21. In the Modify Connection dialog, change the username and password as follows:
- User name: NW
  - Password: oracledemo123
22. Select Test Connection to verify the new credentials work.

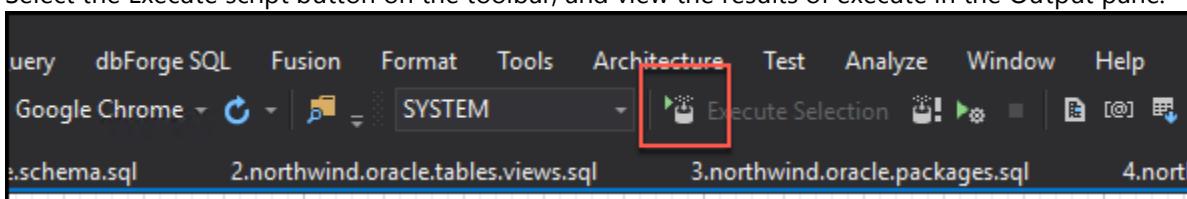


23. Select OK to close the Database Connection properties dialog.

24. Return to your Fusion query window in Visual Studio.
25. Delete all the query text pasted into the Text area previously. (Click in the Text area, press CTRL+A, then press Delete).
26. Select the Open File icon on the Visual Studio toolbar.



27. In the Open File dialog, navigate to C:\handsonlab\NorthwindMVC\Oracle Scripts. Select the file 2.northwind.oracle.tables.views.sql, and select Open.
28. As you did previously, copy all the text from the query, and paste it into the Text area in the Fusion query window.
29. Select the Execute script button on the toolbar, and view the results of execute in the Output pane.



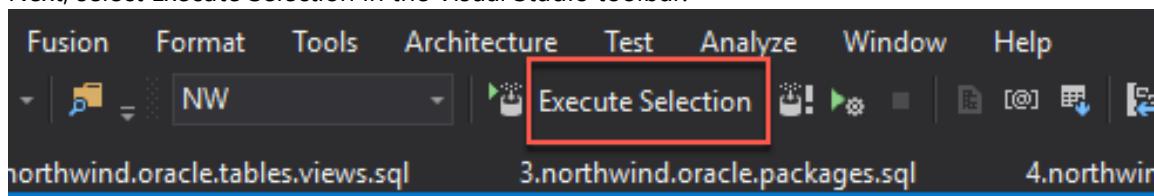
30. Repeat steps 26 – 29, replacing the file name in step 27 with each of the following:
  - a. 3.northwind.oracle.packages.sql
  - b. 4.northwind.oracle.sps.sql
    - i. During the Execute script step for this file, you will need to execute each CREATE OR REPLACE statement independently.
    - ii. Using your mouse, select the first statement, starting with CREATE and going to END;

```

CREATE OR REPLACE
PROCEDURE GetCustomersTest(
  + p_customer_id IN varchar2,
  + p_param_test IN varchar2,
  - cur_OUT OUT PKGENTLIB_ARCHITECTURE.CURRENTLIB_ARCHITECTURE)
AS
BEGIN
  - OPEN cur_OUT FOR SELECT * FROM Customers WHERE CustomerID = p_customer_id;
END;

CREATE OR REPLACE
PROCEDURE CustOrdersOrders(
  + p_customer_id IN varchar2,
  - cur_OUT OUT PKGENTLIB_ARCHITECTURE.CURRENTLIB_ARCHITECTURE)
AS
BEGIN
  - OPEN cur_OUT FOR
  - + SELECT + OrderID,
  - +     + OrderDate,
  - +     + RequiredDate,
  - +     + ShippedDate
  - +     FROM Orders
  - +     WHERE CustomerID = p_customer_id
  - +     ORDER BY OrderID;
END;
  
```

- iii. Next, select Execute Selection in the Visual Studio toolbar.



- iv. Repeat this for each of the remaining CREATE OR REPLACE... END; blocks in the script file (there are 7 more to execute, for 8 total)
- c. 5.northwind.oracle.seed.sql

- i. This query can take a few minutes to run, so make sure you wait until you see Execute succeeded in the output window before executing the next file, like the following.

```
1 row inserted [0.001s]
Execute succeeded [0.003s]

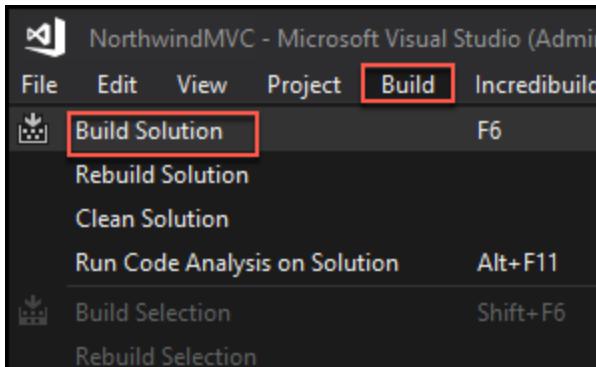
----- Done: Query1.sql -----
```

- d. 6.northwind.oracle.constraints.sql

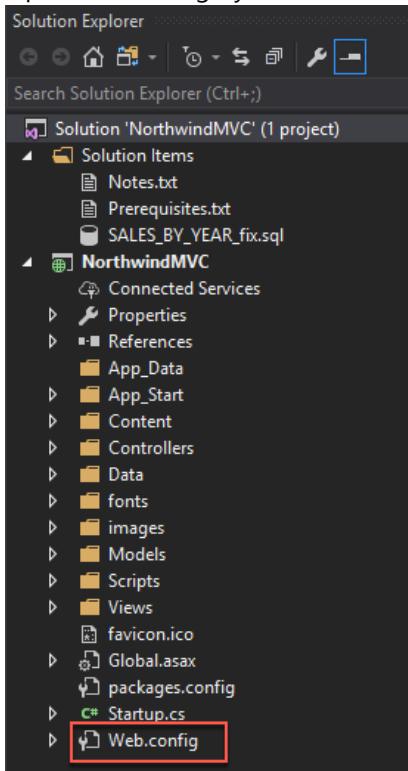
## Task 6: Configure the Starter Application to use Oracle

In this task, you will add the necessary configuration to the NorthwindMVC solution to connect to the Oracle database you created in the previous task.

1. In Visual Studio, select Build from the menu, then select Build Solution.



2. Open Web.config by double-clicking the file in the Solution Explorer, on the right-hand side in Visual Studio.

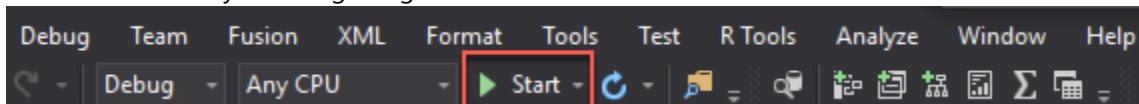


3. In the Web.config file, locate the connectionString section, and verify the connection string named "OracleConnectionString" matches the values you have used in this hands-on lab:

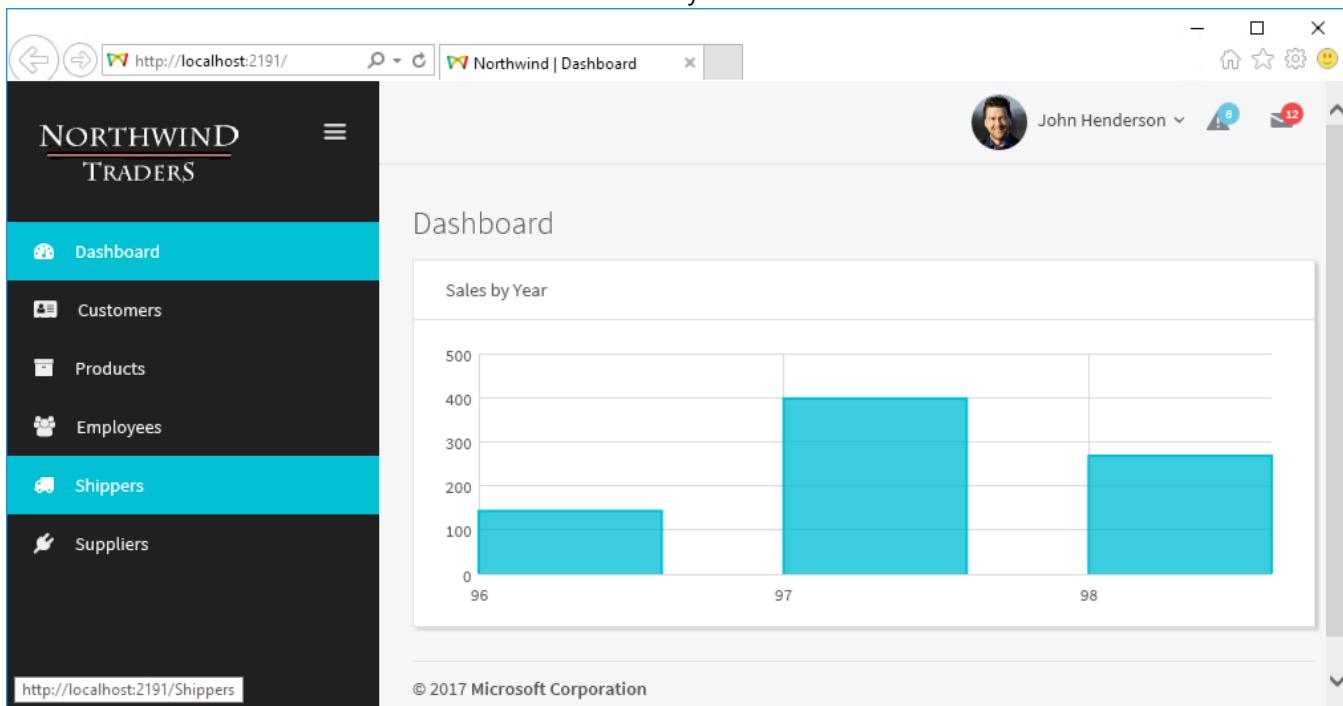
```
DATA SOURCE=localhost:1521/XE;PASSWORD=oracledemo123;USER ID=NW
```

```
</configSections>
<connectionStrings>
  <add name="OracleConnectionString" connectionString="DATA SOURCE=localhost:1521/XE;PASSWORD=oracledemo123;USER ID=NW" providerName="Oracle.ManagedDataAccess.Client" />
  <add name="SqlServerConnectionString" connectionString="data source=13.64.74.120;initial catalog=Northwind;user id=sapassword=M$password11;MultipleActiveResultSets=True" providerName="System.Data.SqlClient" />
</connectionStrings>
<DatabaseFactoryConfiguration Name="NorthwindMVC.Data.Oracle.OracleRepositories, NorthwindMVC.Data, Version=1.0.0.0, Culture=neutral, PublicKeyToken=null" ConnectionString="OracleConnectionString" />
```

4. Run the solution by selecting the green Start button on the toolbar.



5. You should see the Northwind Traders Dashboard load in your browser.



6. Close the browser to stop debugging the application, and return to Visual Studio.

## Exercise 6: Migrate the Oracle database to SQL Server 2017

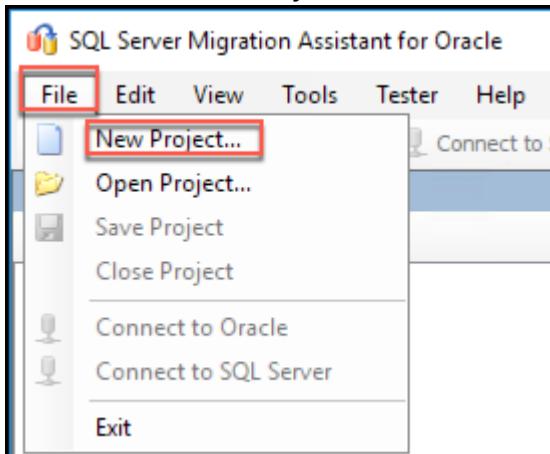
Duration: 30 minutes

In this exercise, you will migrate the Oracle database into SQL Server 2017 using SSMA.

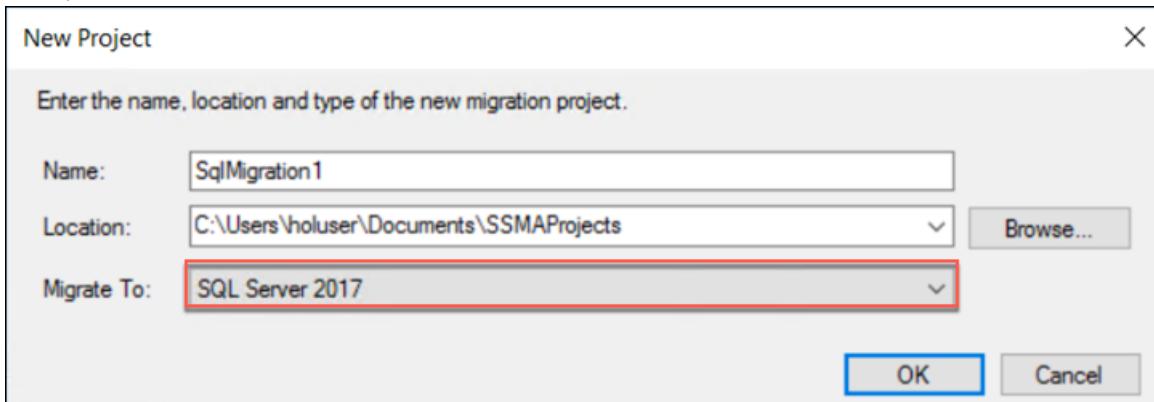
### Task 1: Migrate the Oracle database to SQL Server 2017 using SSMA

1. Launch Microsoft SQL Server Migration Assistant for Oracle (32-bit) from the Start Menu.

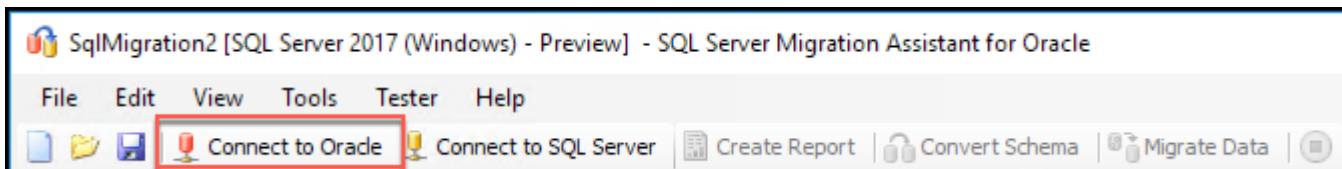
2. Select File, then New Project...



3. In the New Project dialog, accept the default name and location, select SQL Server 2017 for the Migration To value, and select OK.



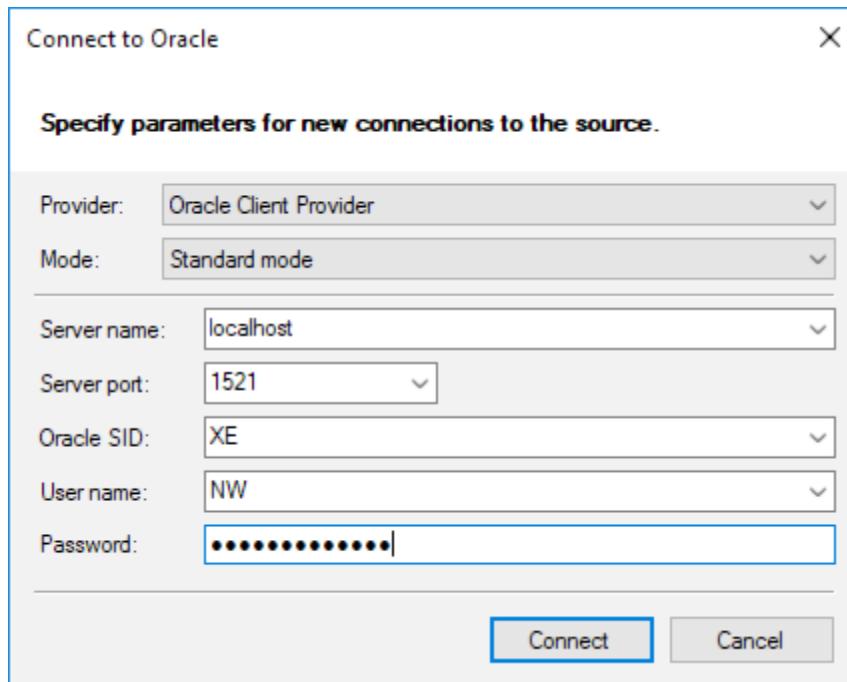
4. Select Connect to Oracle in the SSMA toolbar.



5. In the Connect to Oracle dialog, enter the following:

- Provider: Leave set to the default value, Oracle Client Provider
- Mode: Leave set to Standard mode
- Server name: Enter localhost
- Server port: Set to 1521
- Oracle SID: Enter XE
- User name: Enter NW

- g. Password: Enter oracledemo123

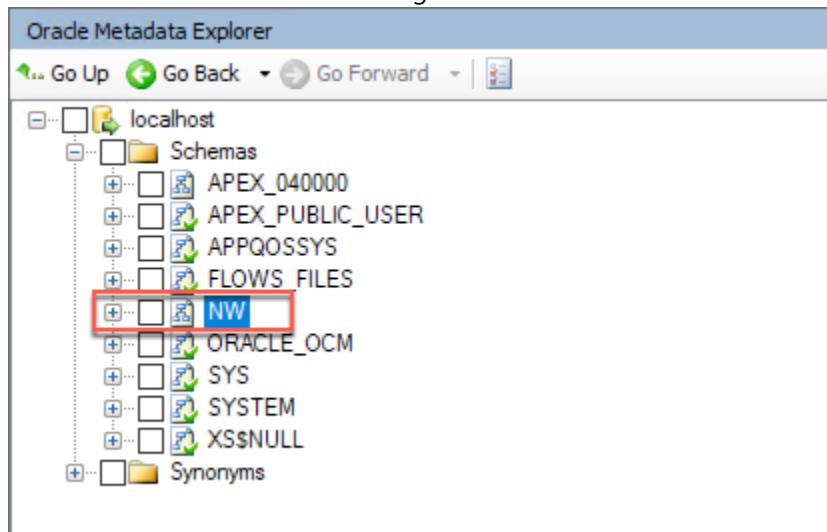


6. Select Connect.
7. In the Output window, you will see a message that the connection was established successfully, like the following:

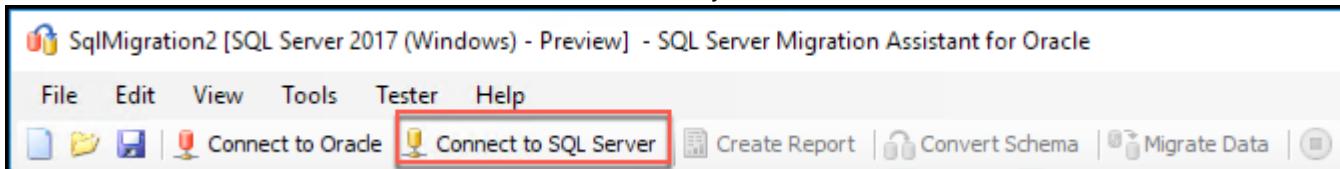
```
Connection to Oracle established successfully.  
Connection string: Data Source=(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=localhost) (PORT=1521)) (CONNECT_DATA=(SID=XE)));Unicode=True;User ID=NW;
```

The screenshot shows the 'Output' window with a message indicating a successful connection: 'Connection to Oracle established successfully.' Below it, the connection string is displayed: 'Connection string: Data Source=(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=localhost) (PORT=1521)) (CONNECT\_DATA=(SID=XE)));Unicode=True;User ID=NW;'.

8. Under Oracle Metadata Explorer, expand the localhost node, Schemas, and confirm you can see the NW schema, which will be the source for the migration.



9. Next, select Connect to SQL Server from the toolbar, to add your SQL 2017 connection.



10. In the connect to SQL Server dialog, provide the following:

- Server name: Enter the IP address of your SqlServerDw VM. You can get this from the Azure portal by navigating to your VM's blade, and looking at the Essentials area.

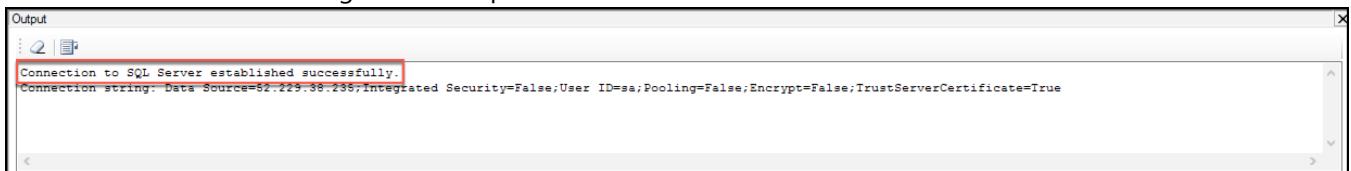
A screenshot of the Azure portal showing the 'hands-on-labs' VM details. It lists the resource group ('hands-on-labs'), status ('Running'), location ('West US 2'), and subscription information. On the right side, it shows the 'Computer name' as 'SqlServerDw', 'Operating system' as 'Windows', 'Size' as 'Standard DS1 v2 (1 vcpu, 3.5 GB memory)', and the 'Public IP address' as '52.229.38.235' (which is highlighted with a red box). It also shows the 'Virtual network/subnet' as 'hands-on-labs-vnet/default' and the 'DNS name' as 'Configure'.

- Server port: Leave set to [default]
- Database: Enter Northwind
- Authentication: Set to SQL Server Authentication
- User name: Enter sa
- Password: Enter Password.1!!

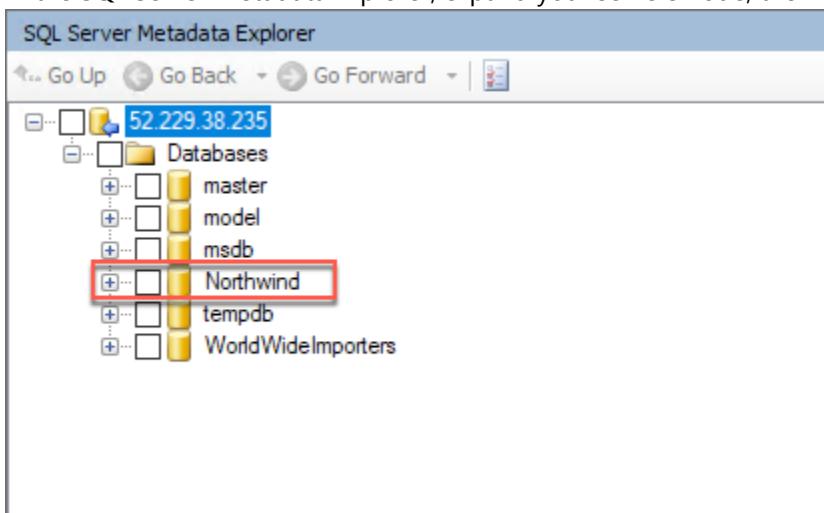
A screenshot of the 'Connect to SQL Server' dialog box. It contains fields for 'Server name' (52.229.38.235), 'Server port' ([default]), 'Database' (Northwind), 'Authentication' (SQL Server Authentication), 'User name' (sa), and 'Password' (represented by a series of dots). Below these fields are two checked checkboxes: 'Encrypt Connection' and 'Trust Server Certificate'. At the bottom are 'Connect' and 'Cancel' buttons.

11. Select Connect.

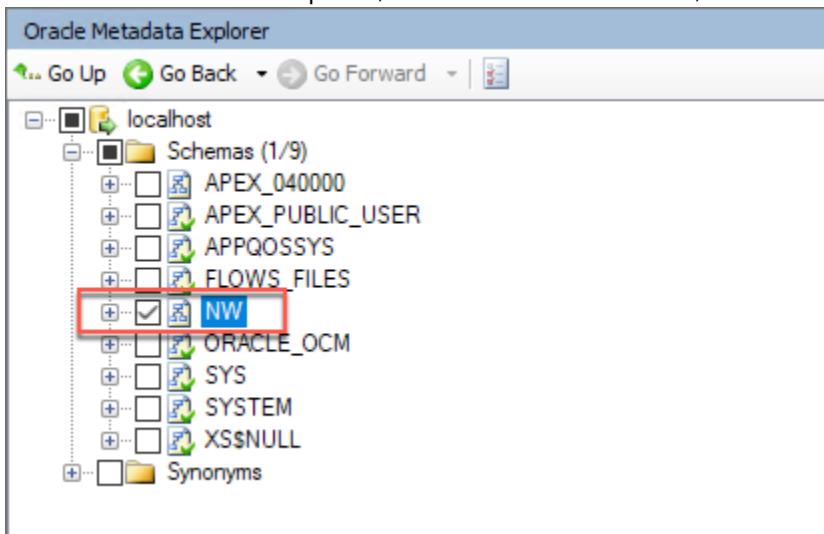
12. You will see a success message in the output window.



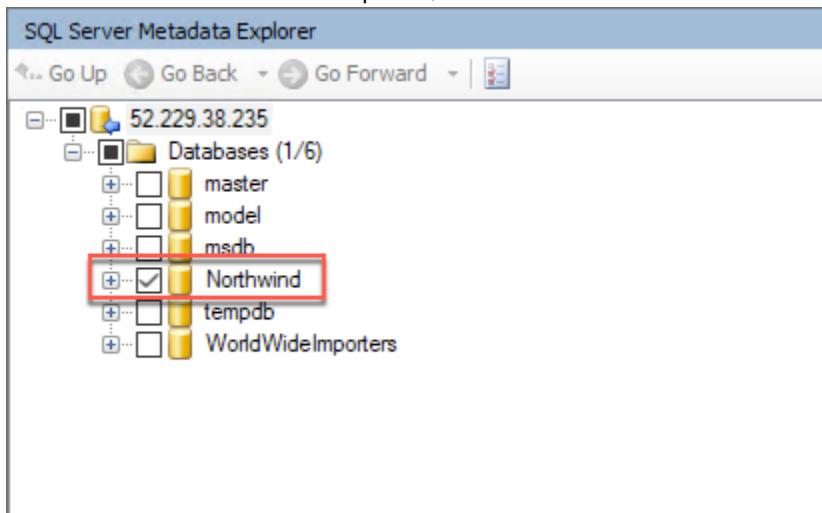
13. In the SQL Server Metadata Explorer, expand your servers node, then Databases. You should see Northwind listed.



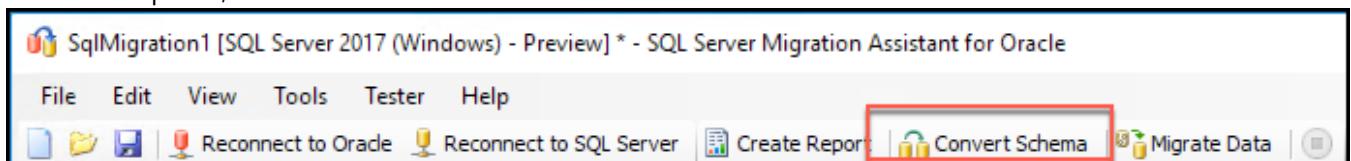
14. In the Oracle Metadata Explorer, check the box next to NW, and make sure it is selected in the tree.



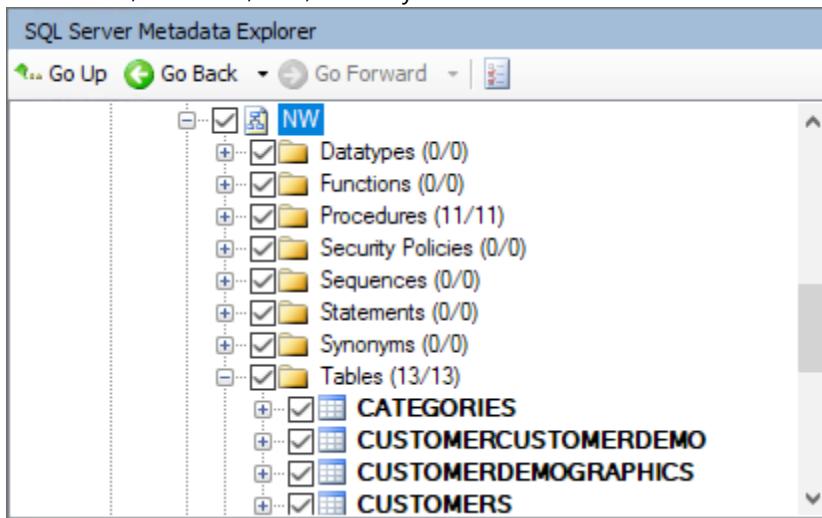
15. In the SQL Server Metadata explorer, check the box next to Northwind.



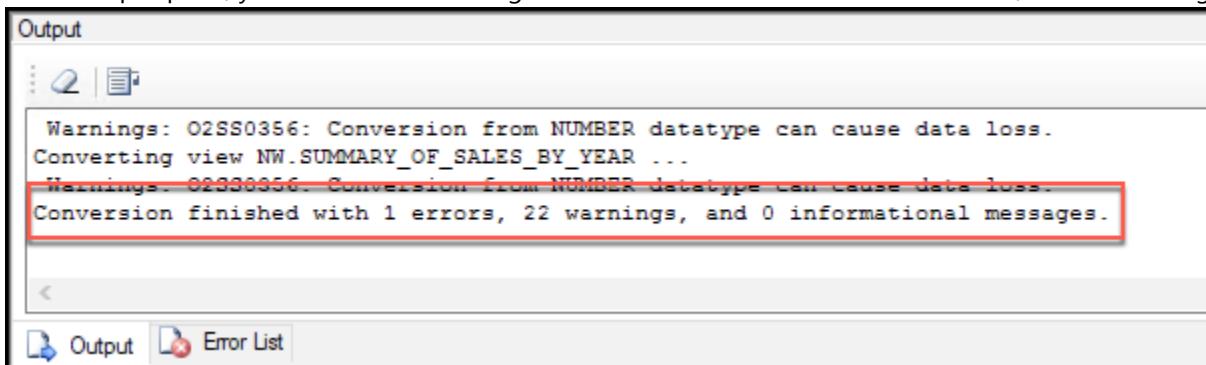
16. In the SSMA toolbar, select Convert Schema. There is a bug in SSMA which prevents this button to being properly enabled, so if the button is disabled, you can expand the NW node in the Oracle Metadata Explorer, which should cause the Convert Schema button to become enabled. You can also right-click on the NW database in the Oracle Metadata Explorer, and select Convert Schema if that does not work.



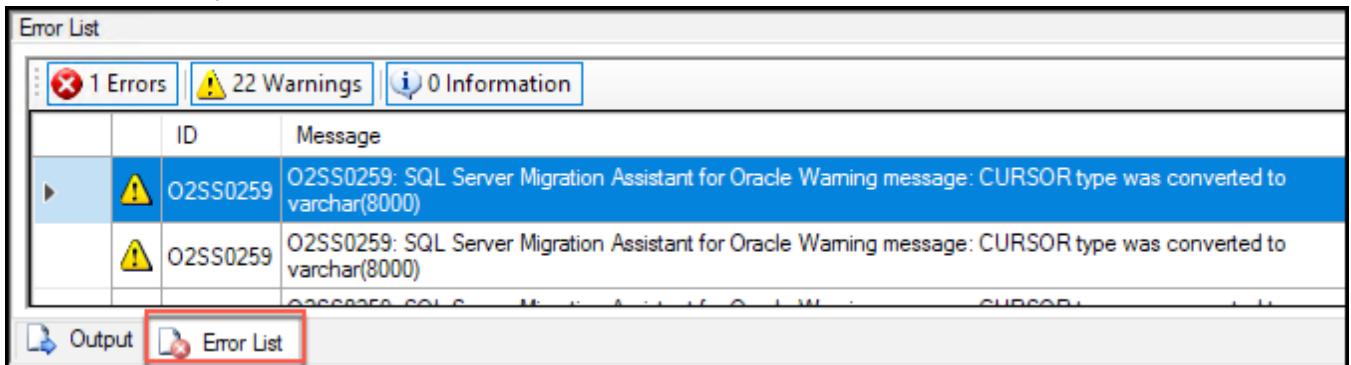
17. After about a minute the conversion should have completed.  
18. In the SQL Server Metadata Explorer, observe that new schema objects have been added. For example, under Northwind, Schemas, NW, Tables you should see the tables from the Oracle database.



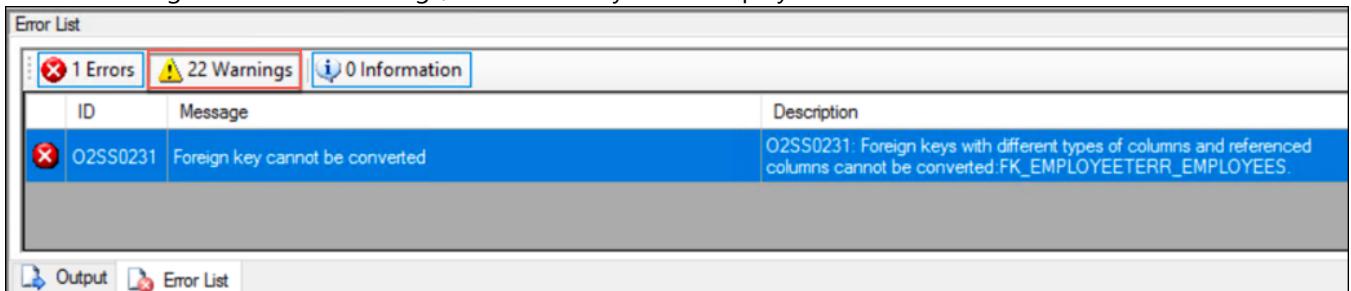
19. In the output pane, you will notice a message that the conversion finished with 1 error, and 22 warnings.



20. To view the errors, select the Errors List at the bottom of the SSMA screen.



21. Select Warnings to hide the warnings, and leave only Errors displayed.



22. Double-click on the error listed. This will display the Table in both Oracle and SQL Server that is causing the error, EMPLOYEEETERRITORIES. Notice the Oracle table lists EMPLOYEEID with a data type of NUMBER, while SQL Server is expecting a data type of float(53).

	Column Name	Data Type	Precision	Scale	Default	Nullable
	EMPLOYEEID	NUMBER				<input type="checkbox"/>
	TERRITORYID	VARCHAR2(20)				<input type="checkbox"/>

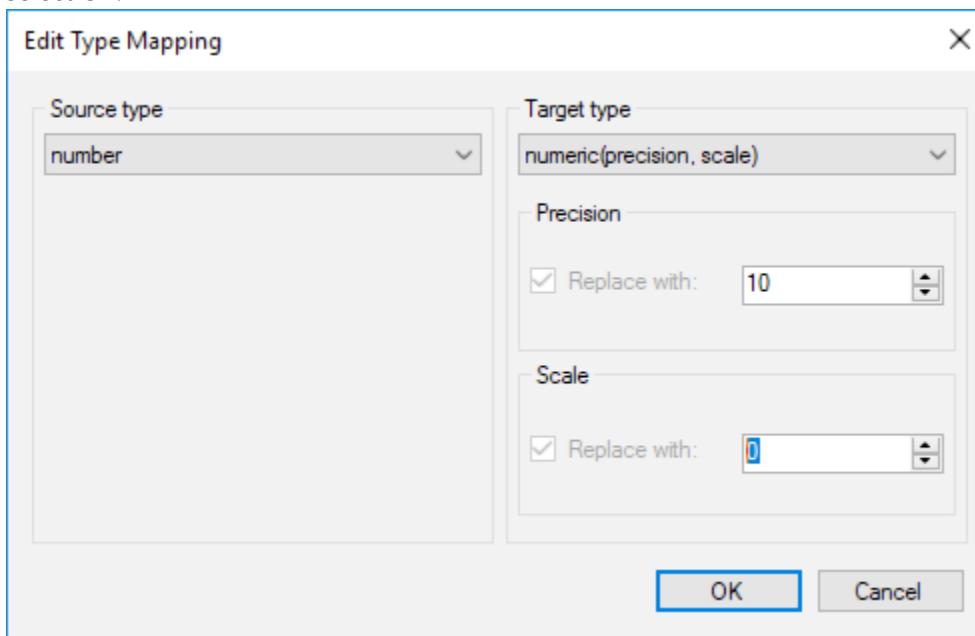
  

	Column Name	Data Type	Precision	Scale	Default	Nullable	Description
	EMPLOYEEID	float(53)	53			<input type="checkbox"/>	
	TERRITORYID	varchar(20)				<input type="checkbox"/>	

23. Look at the table definition for the table on the Oracle side.  
 24. To change the data type, select the Type Mapping tab, select the row with source type of number, and select Edit.

SourceType	TargetType
nclob	nvarchar(max)
number	float[53]
number[".."]	numeric[""]
number[".."]  ".."	numeric[""]  "
decimal	decimal

25. In the Edit Type Mapping dialog, set the Target type to numeric(precision, scale), set the Precision to 10, and select OK.



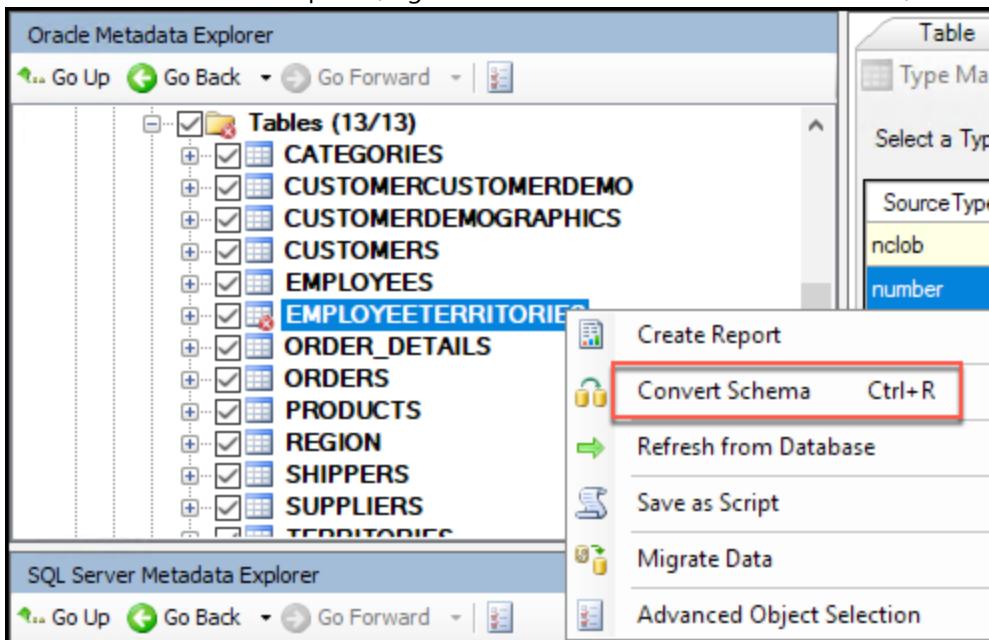
26. Select Apply on the Type mapping tab.

The screenshot shows the 'Type Mapping' tab selected in the top navigation bar. A message bar at the top says 'table : EMPLOYEE TERRITORIES'. Below it, a dropdown menu says 'Select a Type Mapping option: Columns type mapping'. A table lists type mappings:

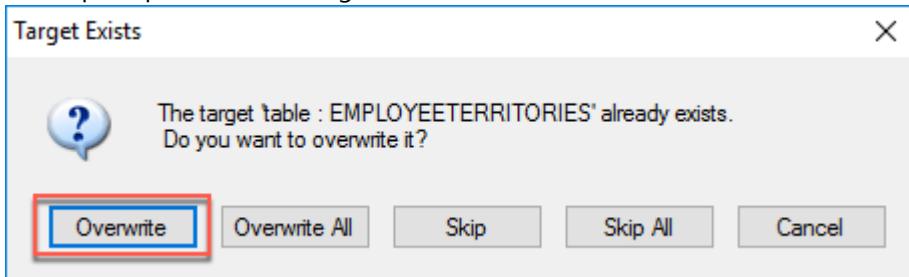
SourceType	TargetType
nclob	nvarchar(max)
number	numeric[10][0]
number[*..*]	numeric[*]
number[*..*][*..*]	numeric[*][*]
enumada	enumada

At the bottom, a warning message says '⚠ There is unsaved data on this page.' and there are 'Apply' and 'Cancel' buttons. The 'Apply' button is highlighted with a red box.

27. In the Oracle Metadata Explorer, right-click the EMPLOYEE TERRITORIES table, and select Convert Schema.



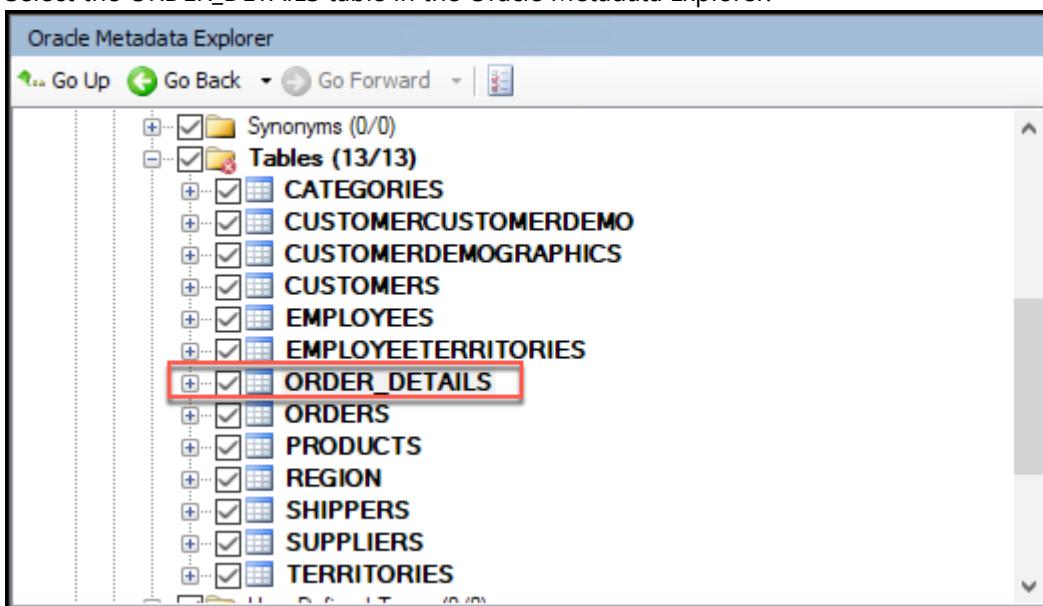
28. When prompted that the target exists, select Overwrite.



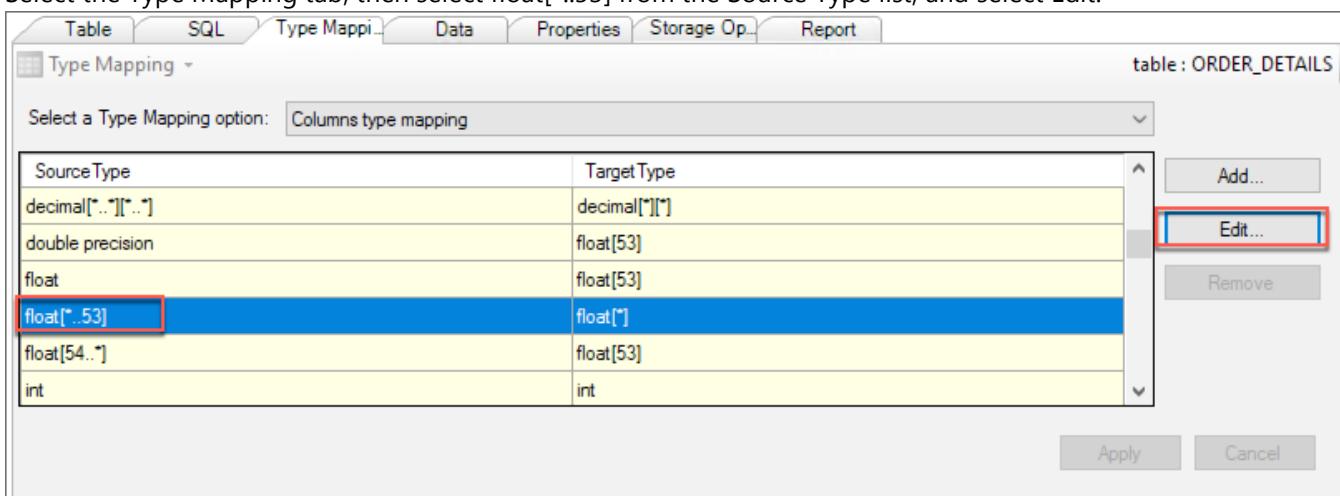
29. Notice the error is now gone from the Error List.

30. We are going to fix another data type conversion issue now, which will otherwise appear when we attempt to migrate the data.

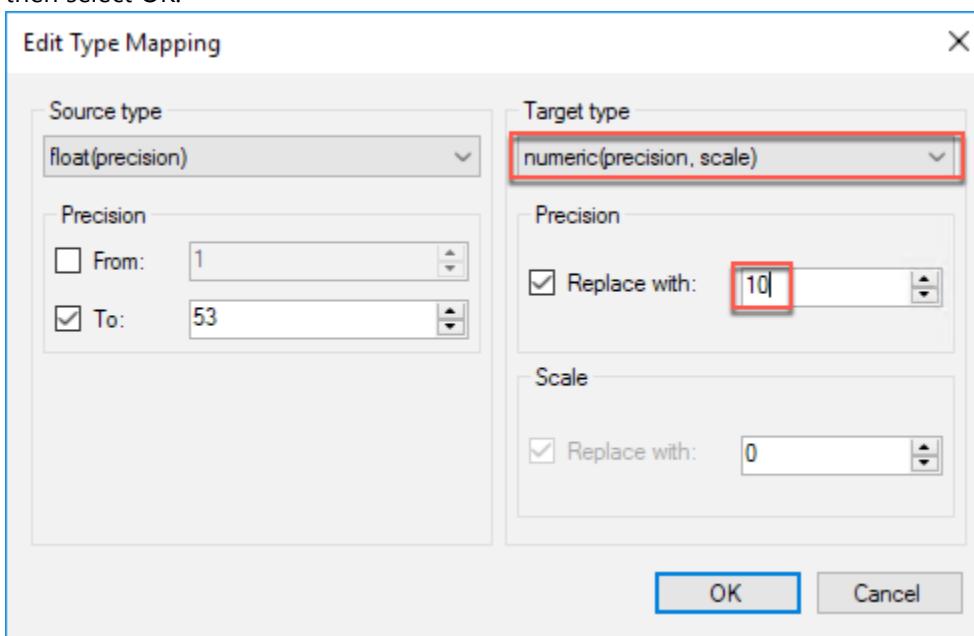
31. Select the ORDER DETAILS table in the Oracle Metadata Explorer.



32. Next, you are going to convert the type associated with the DISCOUNT column, FLOAT(23) to a numeric(10, 0), similar to what you did for the EMPLOYEE\_TERRITORIES table.
33. Select the Type Mapping tab, then select float[\*..53] from the Source Type list, and select Edit.



34. In the Edit Type Mapping dialog, change the Target type to numeric(precision, scale), and set the Precision to 10, then select OK.



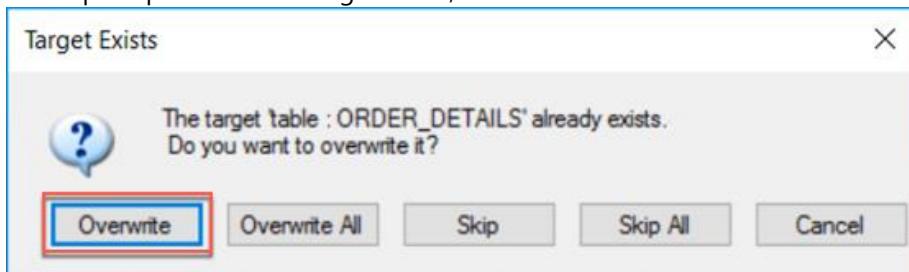
35. Select Apply to save the changes to the ORDER\_DETAILS table.

SourceType	TargetType
decimal[*..*][*..*]	decimal[*][*]
double precision	float[53]
float	float[53]
float[*..53]	numeric[10][0]
float[54..*]	float[53]
int	int

**Apply**

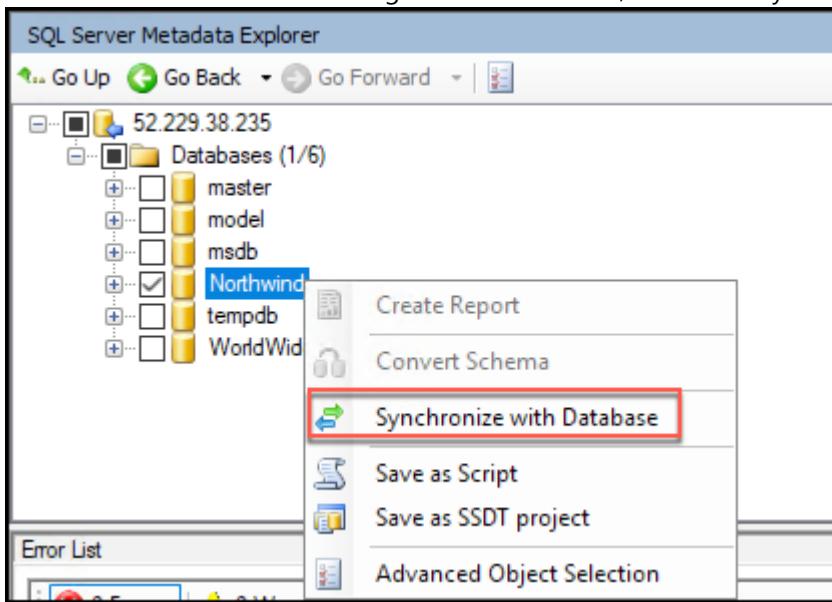
36. Now, right-click on the ORDER\_DETAILS table in the Oracle Metadata Explorer, and select Convert Schema.

37. When prompted that the target exists, select Overwrite.

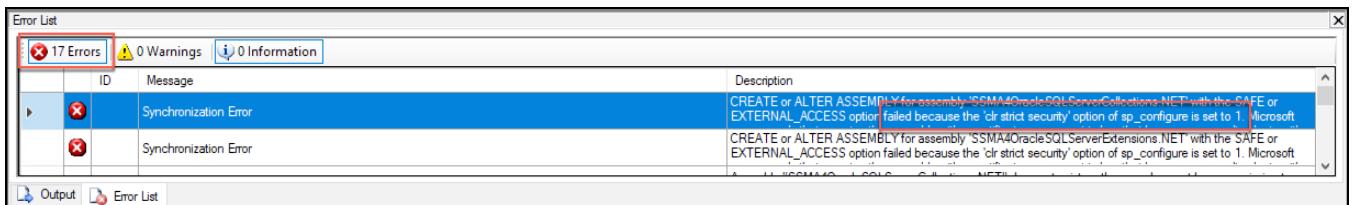


38. [Optional] Save the project. This can take a while, and is not necessary to complete the hands-on lab.

39. To apply the resultant schema to the Northwind database in SQL Server, use the SQL Server Metadata Explorer to view the Northwind database. Right-click Northwind, and select Synchronize with Database.

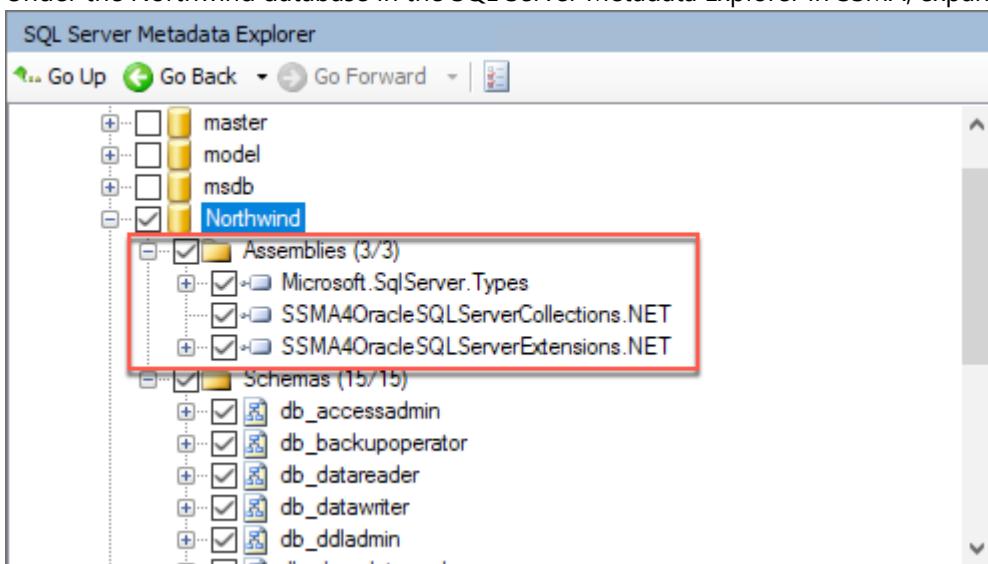


40. Select OK in the Synchronize with the Database dialog.  
 41. The Synchronize action will result in multiple errors in the Error List, resulting from attempting to add the SSMA assemblies to the Northwind database.

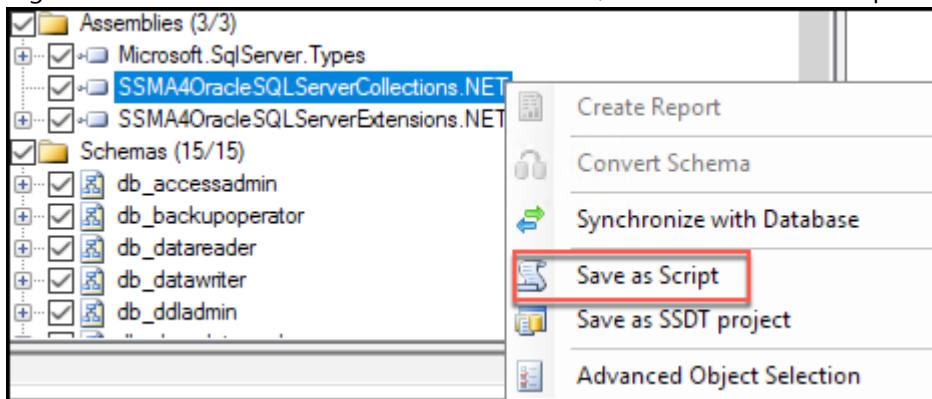


42. These errors are the result of improvements implemented in SQL Server 2017 SQLCLR security model. Specifically, in SQL Server 2017, Microsoft now by default requires that all type of assemblies (SAFE, EXTERNAL\_ACCESS, UNSAFE) are authorized for UNSAFE access.  
 43. For this hands-on lab, you will be adding the assemblies causing the errors to the trusted assembly list, which is synonymous with whitelisting the assemblies. To fix these errors, complete the following:

- Under the Northwind database in the SQL Server Metadata Explorer in SSMA, expand Assemblies.



- b. Right-click SSMA4OracleSQLServerCollections.NET, and select Save as Script.



- c. Save the script to the local machine.

- d. Now, you will need to use SSMS on your SqlServerDw VM.

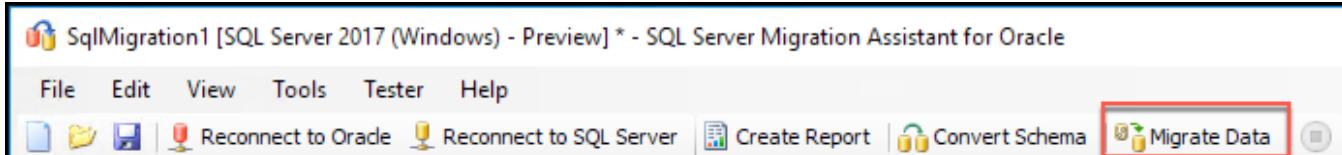
- Open an RDP connection to your SqlServerDw VM, if one is not already open.
- Open SSMS 17.
- Connect to the SQL Server 2017 instance (SqlServerDw), by selecting Connect, and entering SqlServerDw into the Server name field.
- Expand Databases.
- Right-click on Northwind, and select New Query.
- Paste the following query into the new query window.

```
USE master;
GO
DECLARE @clrName nvarchar(4000) = 'SSMA4OracleSQLServerCollections.NET'
DECLARE @asmBin varbinary(max) = [INSERT BINARY];
DECLARE @hash varbinary(64);
SELECT @hash = HASHBYTES('SHA2_512', @asmBin);
EXEC sys.sp_add_trusted_assembly @hash = @hash, @description = @clrName;
```

- Now, return to your Lab VM, and open the saved SSMA4OracleSQLServerCollections.NET.sql file from the desktop with Notepad.exe.
- Within the SQL file, locate the line that begins with CREATE ASSEMBLY, then locate the word FROM. Copy the binary string that appears after FROM. This value will span all the way down to the line containing the text "WITH PERMISSION\_SET = SAFE". Be sure not to include any whitespace at the end of the binary value.
- Now, return to SSMS on your SqlServerDw VM, and replace [INSERT BINARY] with the copied binary value. The line should end with ";" and there should be no whitespace before the ";".
- Execute the query in SSMS.

44. Repeat step 34, this time for the assembly SSMA4OracleSQLServerExtensions.NET. Make sure to replace the @clrName variable in the script with the value "SSMA4OracleSQLServerExtensions.NET".
45. The SSMA assemblies have now been whitelisted in SQL Server 2017.

46. Return to SSMA on your Lab VM, and rerun the Synchronize with Database action on the Northwind database. This will create all the schema objects in the SQL Server Northwind database. There should now be no errors, and the Output pane should show Synchronization operation is complete.
47. Now you need to migrate the data.
48. In the Oracle Metadata Explorer, select NW and from the command bar, select Migrate Data.



49. You will be prompted to re-enter your Oracle credentials for use by the migration connection.
- Recall the Oracle credentials are:
    - Server name: localhost
    - Server port: 1521
    - Oracle SID: XE
    - User name: NW
    - Password: oracledemo123
  - The SQL Server credentials are:
    - Server name: IP address of your SqlServerDw VM (obtained in the essentials area of your VM's blade in Azure portal)
    - Server port: [default]
    - Authentication: SQL Server Authentication
    - User name: sa
    - Password: Password.1!!
50. Select Connect.
51. After the migration completes, you will be presented with a Data Migration Report, similar to the following:

Data Migration Report						
Status	From	To	Total Rows	Migrated Rows	Success Rate	Duration (DD:HH:MM:SS:MS)
Info	"NW"."EMPLOYEEINFO"	[Northwind].[NW].[EMPLC]	49	49	100.00 %	00:00:00:02:430
Info	"NW"."TERRITORIES"	[Northwind].[NW].[TERRI]	53	53	100.00 %	00:00:00:00:680
Info	"NW"."REGION"	[Northwind].[NW].[REGIO]	4	4	100.00 %	00:00:00:02:270
Info	"NW"."CUSTOMERDEM	[Northwind].[NW].[CUSTO]	0	0	100.00 %	00:00:00:02:130
Info	"NW"."CUSTOMERCUST	[Northwind].[NW].[CUSTO]	0	0	100.00 %	00:00:00:02:164
Info	"NW"."ORDER_DETAIL"	[Northwind].[NW].[ORDERS]	2155	2155	100.00 %	00:00:00:02:433
Info	"NW"."PRODUCTS"	[Northwind].[NW].[PRODU]	77	77	100.00 %	00:00:00:02:365
Info	"NW"."ORDERS"	[Northwind].[NW].[ORDERS]	830	830	100.00 %	00:00:00:02:388
Info	"NW"."SUPPLIERS"	[Northwind].[NW].[SUPPLI]	29	29	100.00 %	00:00:00:00:759
Info	"NW"."SHIPPERS"	[Northwind].[NW].[SHIPPE]	3	3	100.00 %	00:00:00:00:765
Info	"NW"."CUSTOMERS"	[Northwind].[NW].[CUSTO]	91	91	100.00 %	00:00:00:02:307
Info	"NW"."CATEGORIES"	[Northwind].[NW].[CATEG]	8	8	100.00 %	00:00:00:02:504
Info	"NW"."EMPLOYEES"	[Northwind].[NW].[EMPLC]	9	9	100.00 %	00:00:00:02:448

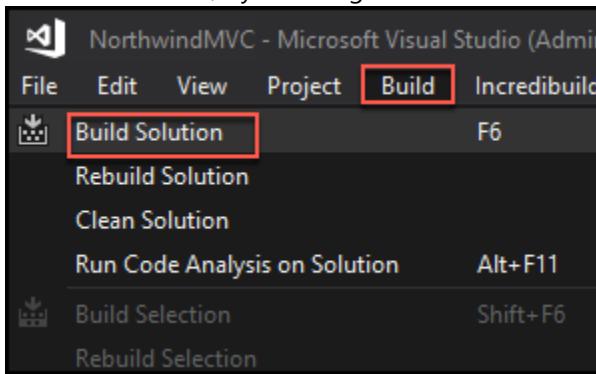
## Exercise 7: Migrate the Application

Duration: 15 minutes

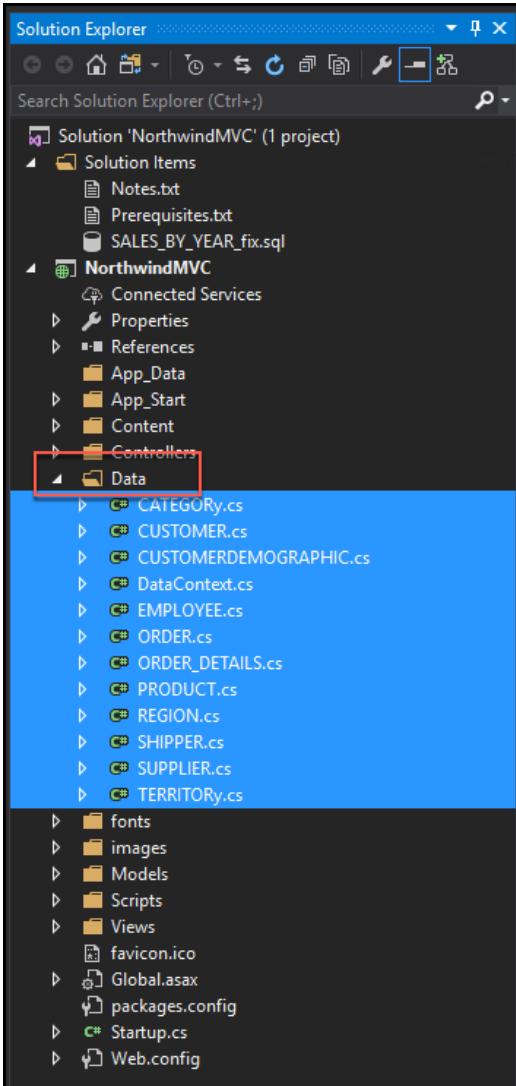
In this exercise, you will modify the NorthwindMVC application, so it targets SQL Server 2017 instead of Oracle.

### Task 1: Create a new Entity Model against SQL Server

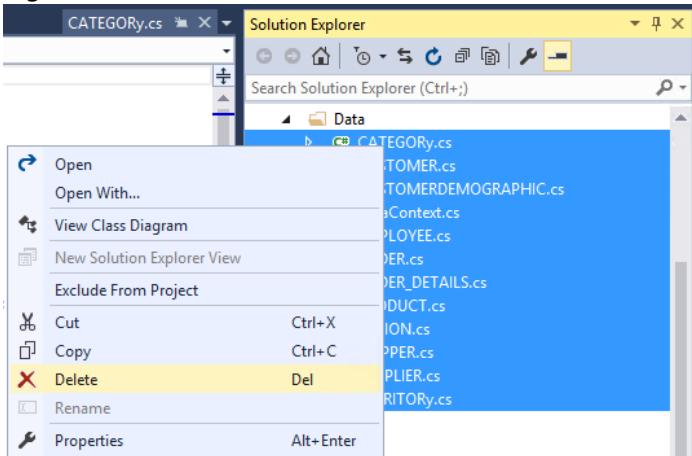
1. On your Lab VM, return to Visual Studio, and open Web.config from the Solution Explorer.
2. Modify the connection string named SqlServerConnectionString to match your remote SQL Server credentials.
  - a. Replace the value of "data source" with your SqlServerDw VM's public IP address.
  - b. Replace the value of "password" with Password.1!!.
3. Build the solution, by selecting Build in the Visual Studio menu, then selecting Build Solution.



4. In the Solution Explorer, expand the Data folder, and select all the files within the folder.

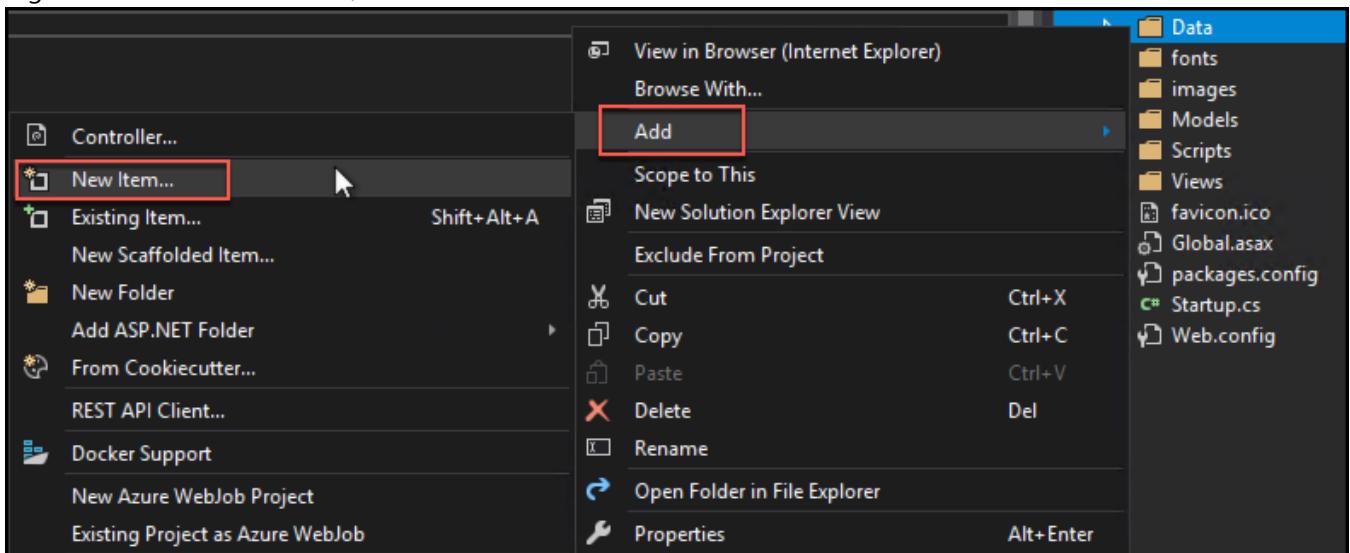


5. Right-click, and choose Delete.

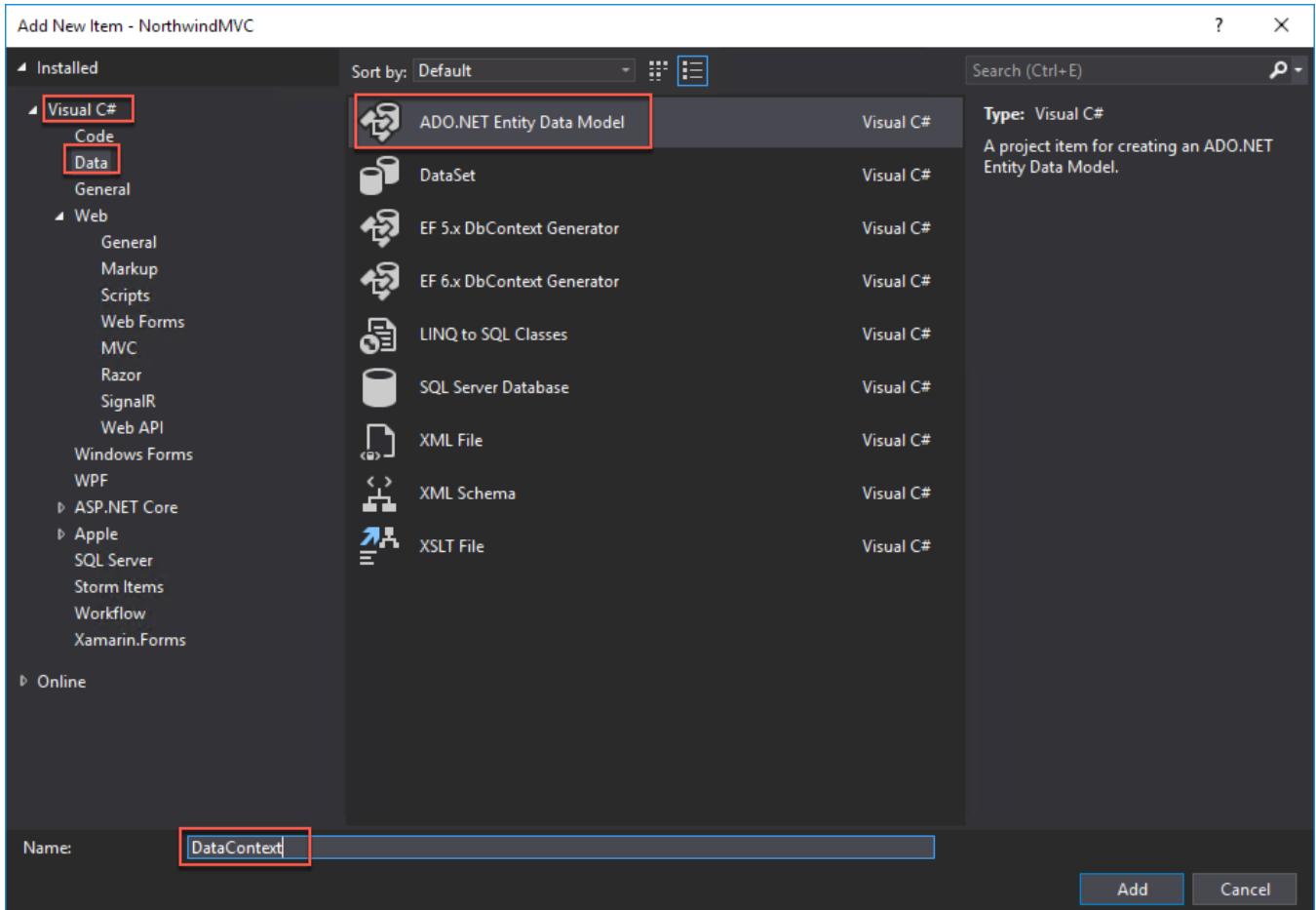


6. Select OK at the confirmation prompt.

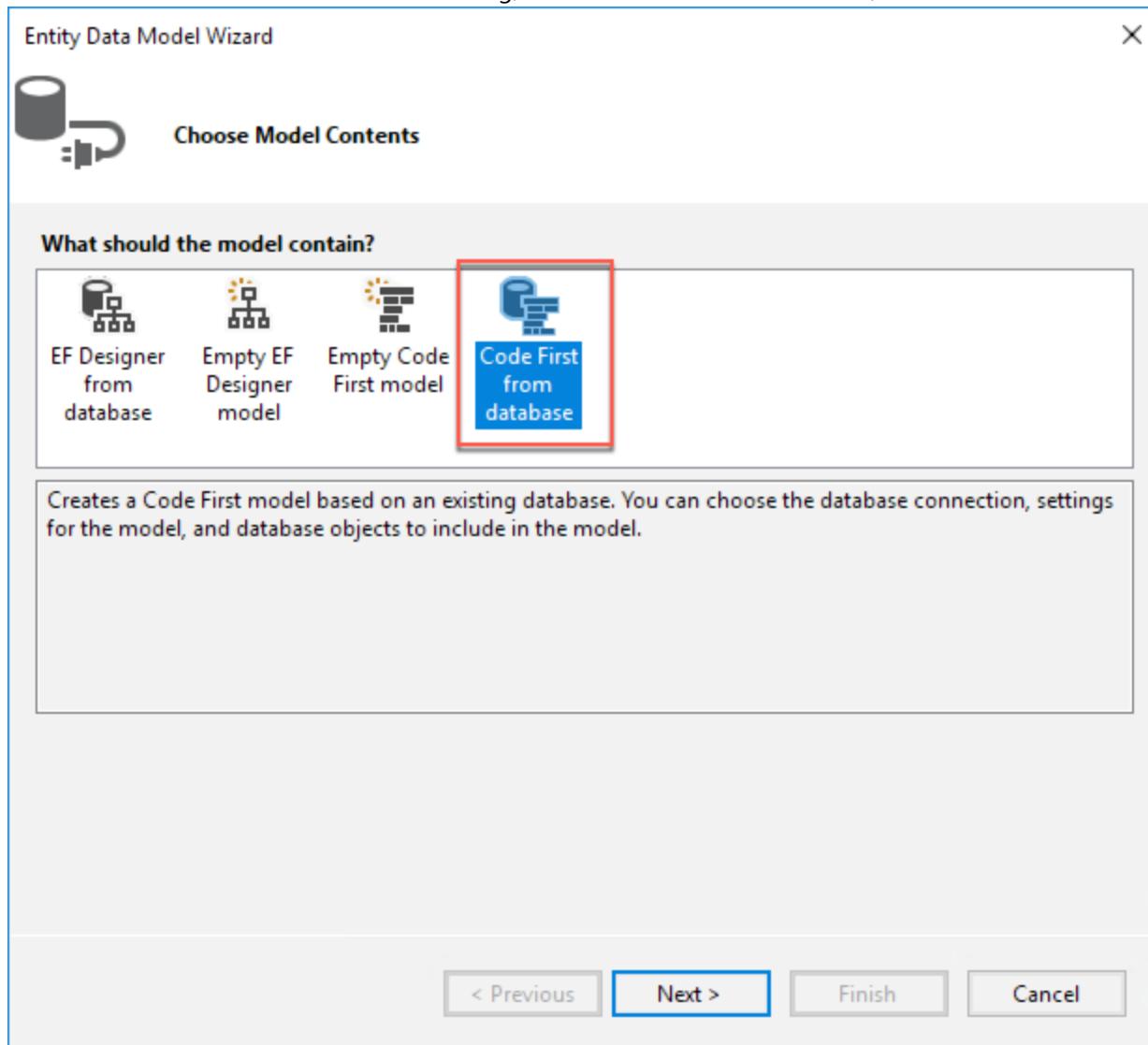
7. Right-click on the Data folder, and select Add > New Item...



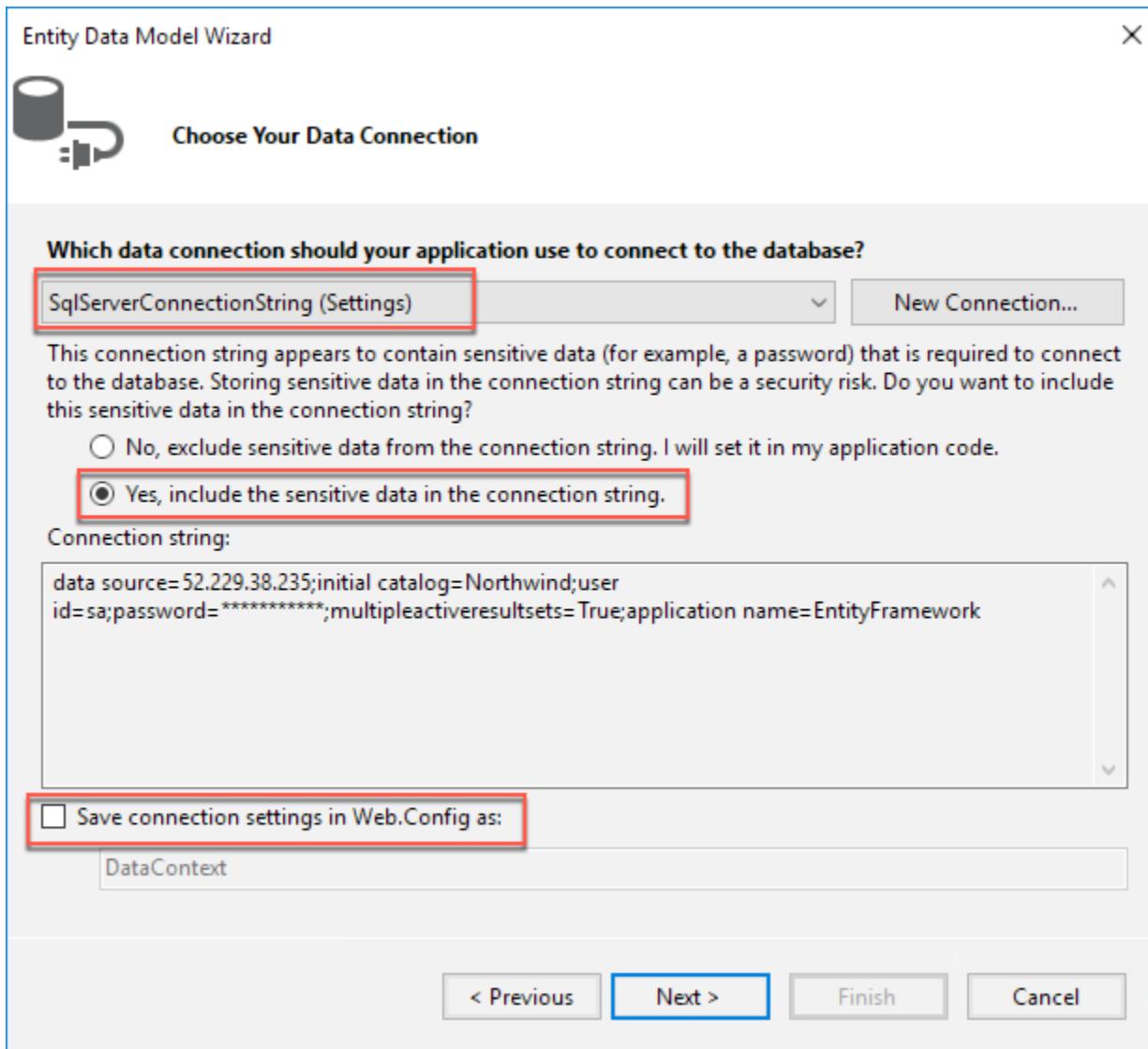
8. In the Add New Item dialog, expand Visual C#, select Data, and select ADO.NET Entity Data Model. Enter DataContext for the name, and select Add.



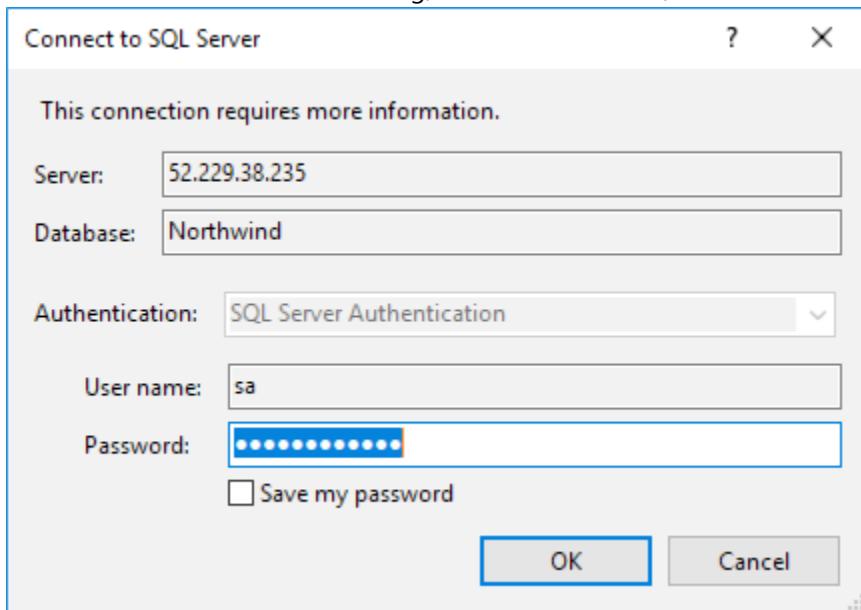
9. In the wizard's Choose Model Contents dialog, select Code First from database, and select Next.



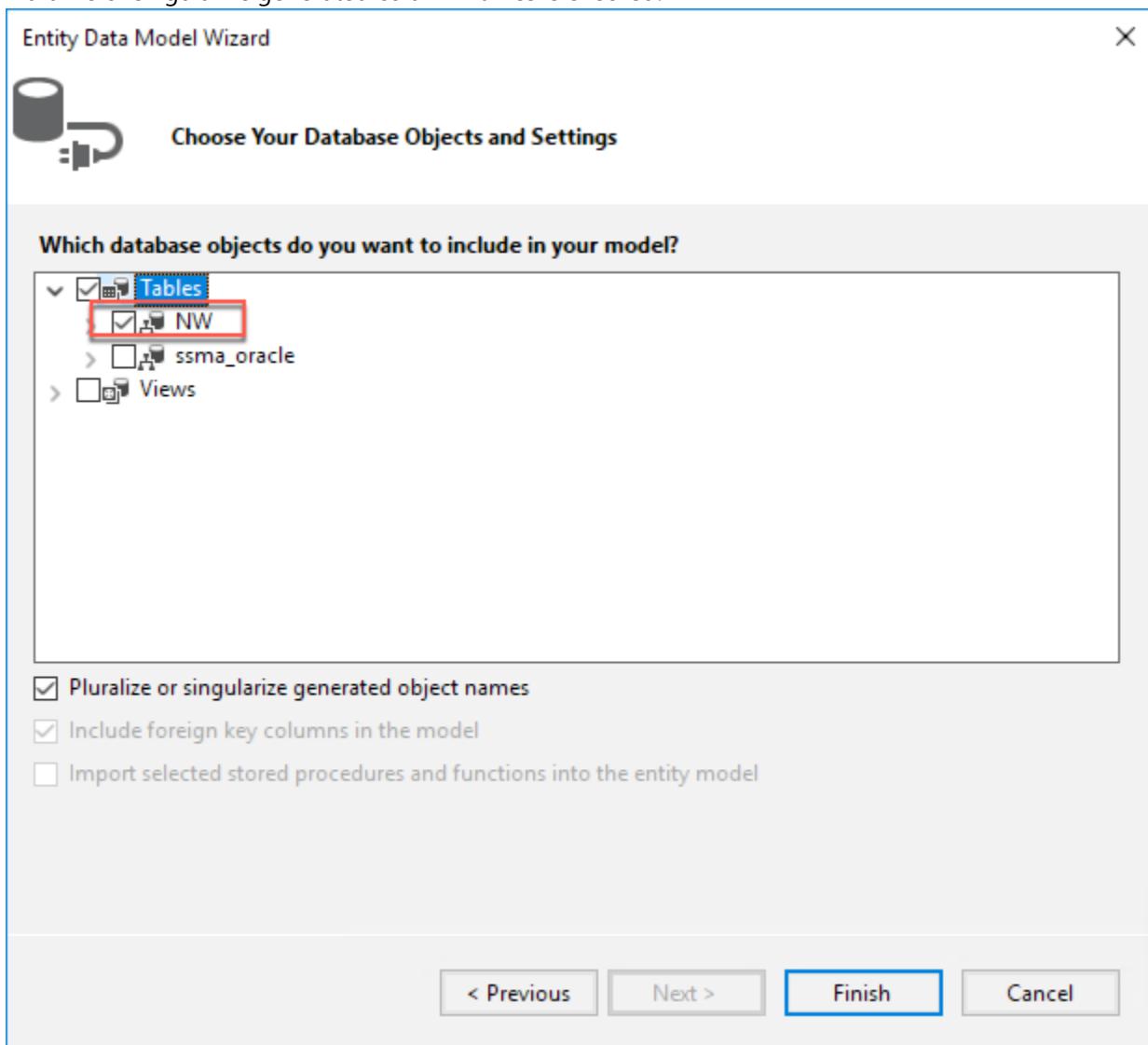
10. In the Choose Your Data Connection dialog, select SqlServerConnectionString (Settings) from the drop down, and select Yes, include the sensitive data in the connection string. Uncheck Save connection settings in Web.Config, and select Next.



11. In the Connect to SQL Server dialog, enter the Password, Password.1!!.



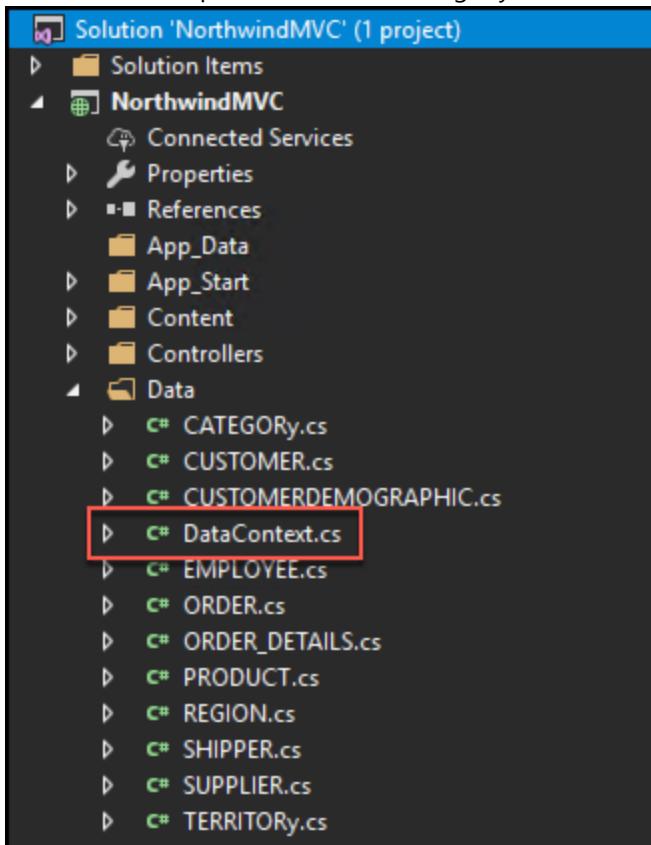
12. On the Choose Your Database Objects and Settings screen, expand the Tables node, and check NW only. Ensure Pluralize or singularize generated column names is checked.



13. Select Finish, and the model will be generated. This may take a few minutes.

## Task 2: Modify Application Code

1. In Visual Studio, open the file `DataContext.cs` from the Solution Explorer. You may need to collapse the Data folder, and re-expand it after refreshing if you don't see the file listed.



2. The call to base in the `DataContext` constructor, at the top of the file, needs to be updated to reflect the correct connection string.

```
8     public partial class DataContext : DbContext
9     {
10         public DataContext()
11         {
12             : base("name=DataContext")
13         }
14     }
```

3. Change the line from:

```
: base ("name=DataContext")
```

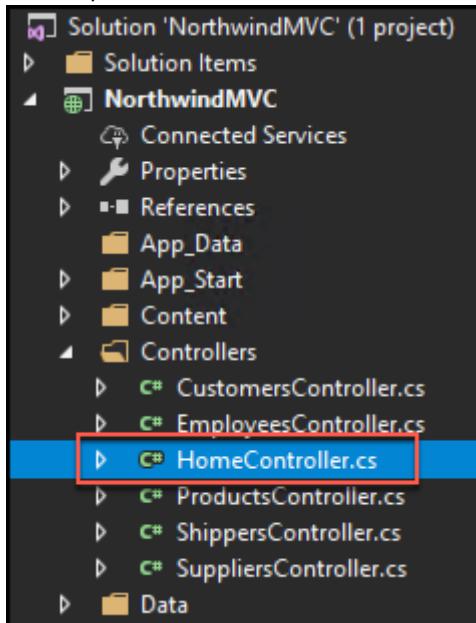
4. To:

```
: base ("name=SqlServerConnectionString")
```

5. Save the file.

```
10    public DataContext()
11        : base("name=SqlServerConnectionString")
12    {
13    }
```

6. Next, open the file HomeController.cs, in the Controllers folder in the Solution Explorer.



7. Comment out the code under the Oracle comment. First, select the lines for the Oracle code, then select the Comment button in the toolbar.

```
1  using System.Data;
2  using System.Data.SqlClient;
3  using System.Linq;
4  using System.Web.Mvc;
5  using NorthwindMVC.Data;
6  using NorthwindMVC.Models;
7  using Oracle.ManagedDataAccess.Client;
8  using Oracle.ManagedDataAccess.Types;
9
10 namespace NorthwindMVC.Controllers
11 {
12     public class HomeController : Controller
13     {
14         private DataContext db = new DataContext();
15
16         public ActionResult Index()
17         {
18                  /// Oracle
19                  //var salesByYear = this.db.Database.SqlQuery<SALESBYYEAR>(
20                  //     "BEGIN NW.SALESBYYEAR(:P_BEGIN_DATE, :P_END_DATE, :CUR_OUT); END;",
21                  //     new OracleParameter("P_BEGIN_DATE", OracleDbType.TimeStamp, new OracleTimeStamp(1996, 1, 1), ParameterDirection.Input),
22                  //     new OracleParameter("P_END_DATE", OracleDbType.TimeStamp, new OracleTimeStamp(1999, 12, 31), ParameterDirection.Input),
23                  //     new OracleParameter("CUR_OUT", OracleDbType.RefCursor, ParameterDirection.Output)).ToList();
24
25                  // SQL Server
26                  //var salesByYear = this.db.Database.SqlQuery<SALESBYYEAR>(
27                  //     "exec [NW].[SALESBYYEAR] @p_begin_date, @p_end_date",
28                  //     new SqlParameter("p_begin_date", "1996-1-1"),
29                  //     new SqlParameter("p_end_date", "1999-1-1")).ToList();
30         }
31     }
32 }
```

8. Next, uncomment the code under the SQL Server comment. Select the commented out code, then select the Uncomment button on the toolbar. You may need to click the Uncomment button twice to uncomment the code.

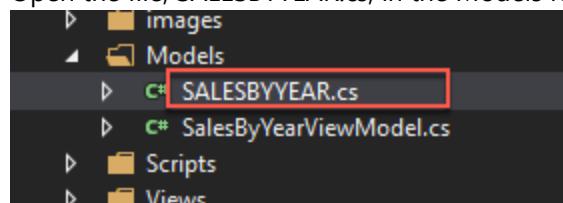
The lines will change from green to colored text when the comment characters have been removed from the front of each line. This code change is done because of differences in how stored procedures are accessed in Oracle versus Sql Server.

```

1  using System.Data;
2  using System.Data.SqlClient;
3  using System.Linq;
4  using System.Web.Mvc;
5  using NorthwindMVC.Data;
6  using NorthwindMVC.Models;
7  using Oracle.ManagedDataAccess.Client;
8  using Oracle.ManagedDataAccess.Types;
9
10 namespace NorthwindMVC.Controllers
11 {
12     public class HomeController : Controller
13     {
14         private DataContext db = new DataContext();
15
16         public ActionResult Index()
17         {
18             // Oracle
19             //var salesByYear = this.db.Database.SqlQuery<SALESBYYEAR>(
20             //    "BEGIN NW.SALESBYYEAR(:P_BEGIN_DATE, :P_END_DATE, :CUR_OUT); END;",
21             //    new OracleParameter("P_BEGIN_DATE", OracleDbType.TimeStamp, ParameterDirection.Input),
22             //    new OracleParameter("P_END_DATE", OracleDbType.TimeStamp, ParameterDirection.Input),
23             //    new OracleParameter("CUR_OUT", OracleDbType.RefCursor, ParameterDirection.Output)).ToList();
24
25             // SQL Server
26             var salesByYear = this.db.Database.SqlQuery<SALESBYYEAR>(
27                 "exec [NW].[SALESBYYEAR] @p_begin_date, @p_end_date",
28                 new SqlParameter("p_begin_date", "1996-1-1"),
29                 new SqlParameter("p_end_date", "1999-1-1")).ToList();
30
31             var model = from r in salesByYear

```

9. Save the changes to HomeController.cs.
10. Open the file, SALESBYYEAR.cs, in the Models folder in the Solution Explorer.



11. Change the types of the following properties:
  - a. Change the SUBTOTAL property from double to decimal.
  - b. Change the YEAR property from string to int.

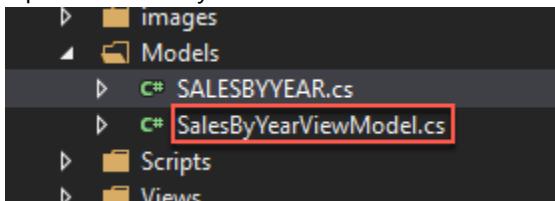
```

5  public class SALESBYYEAR
6  {
7      public DateTime ShippedDate { get; set; }
8
9      public decimal ORDERID { get; set; }
10
11     public decimal SUBTOTAL { get; set; }
12
13     public int YEAR { get; set; }
14

```

12. Save the file.

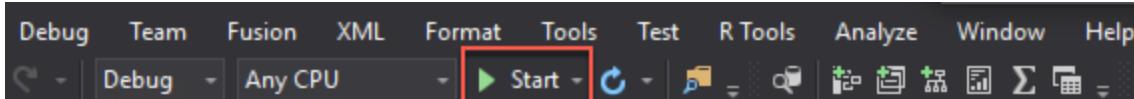
13. Open the SalesByYearViewModel.cs file from the Models folder in the Solution Explorer.



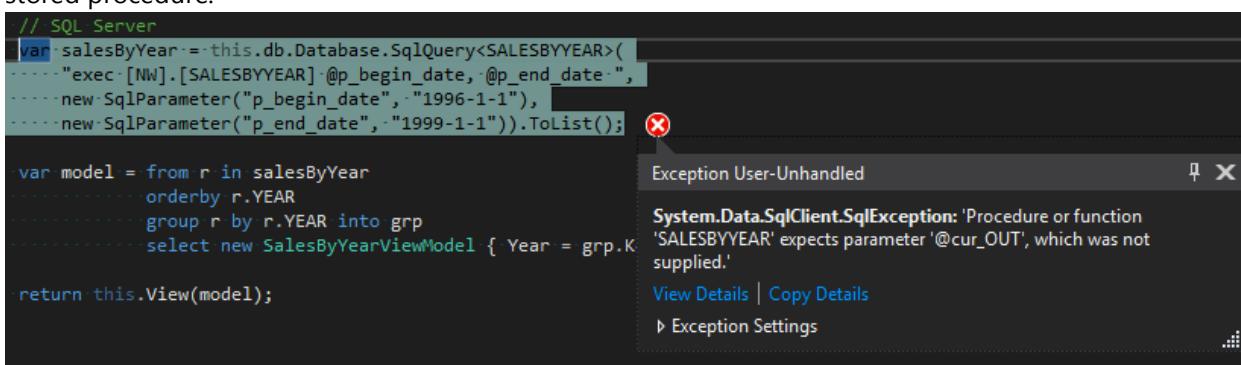
14. Change the type of the YEAR property from string to int, then save the file.

```
5 | public int Year { get; set; }
```

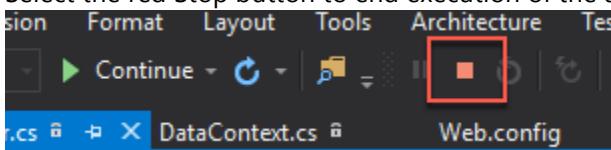
15. Run the solution by selecting the green Start button on the toolbar.



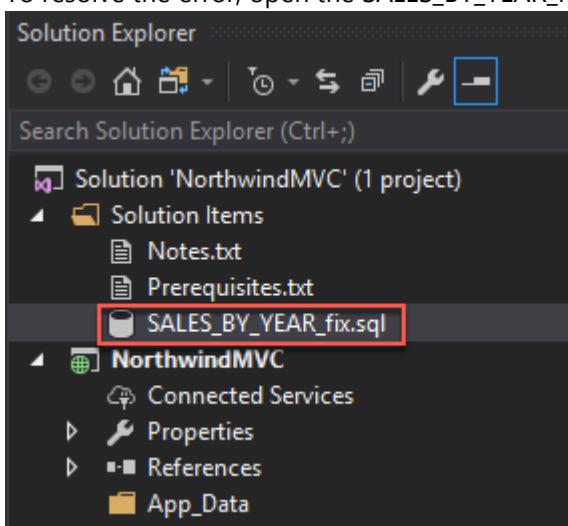
16. You will get an exception that the stored procedure call has failed. This is because of an error in migrating the stored procedure.



17. Select the red Stop button to end execution of the application.



18. To resolve the error, open the SALES\_BY\_YEAR\_fix.sql file, located under Solution Items in the Solution Explorer.



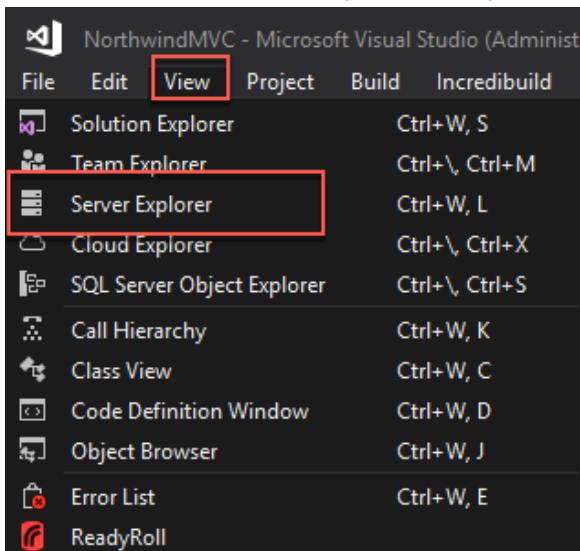
19. Note the database name at the top of the file (within the brackets after the USE keyword).

```
USE [NorthwindMigration]
GO
```

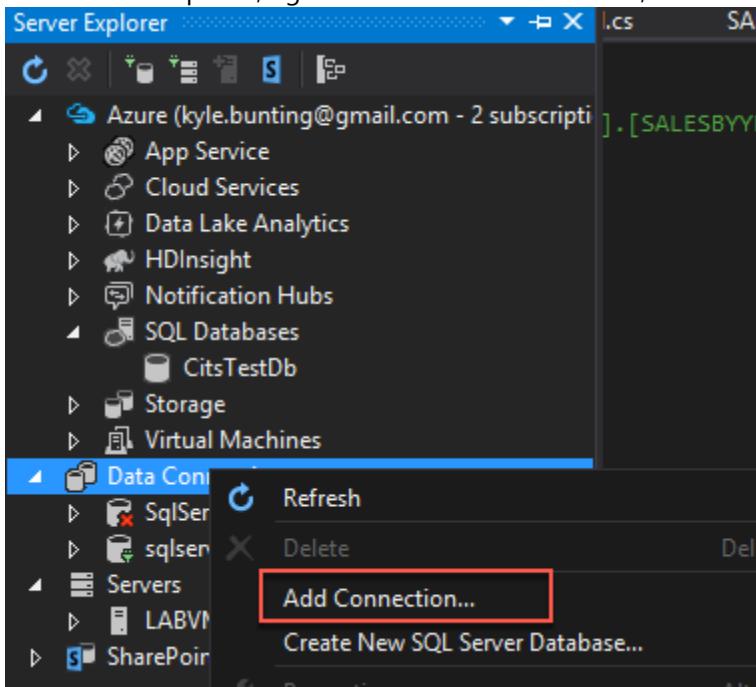
20. Enter the correct database name, Northwind, at the top of the file, and save the file.

```
USE [Northwind]  
GO
```

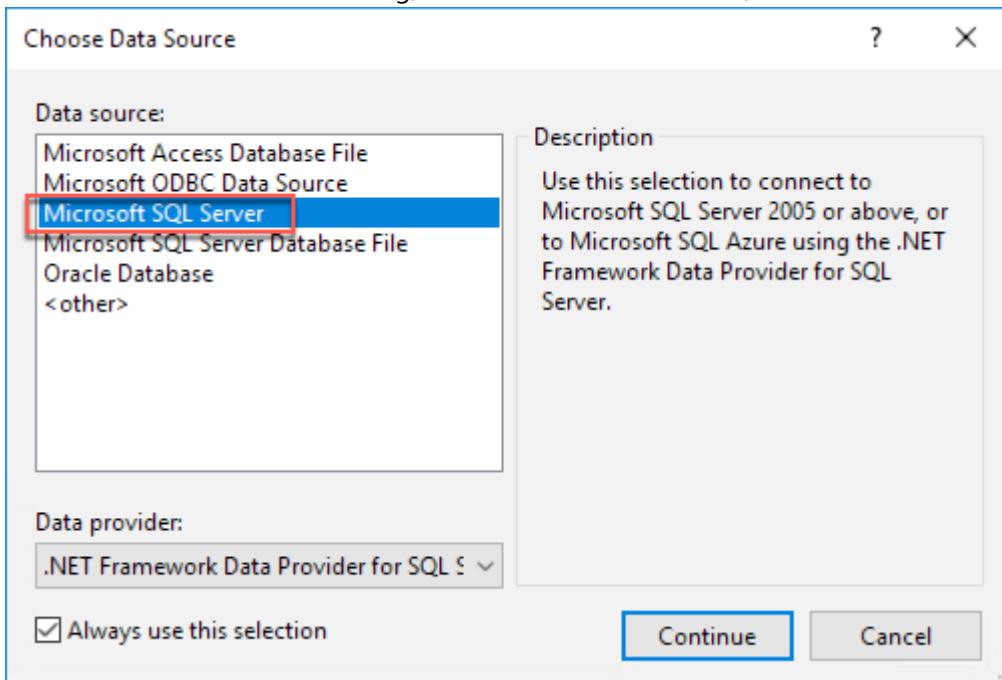
21. From the Visual Studio menu, select View, and then Server Explorer.



22. In the Server Explorer, right-click on Data Connections, and select Add Connections...

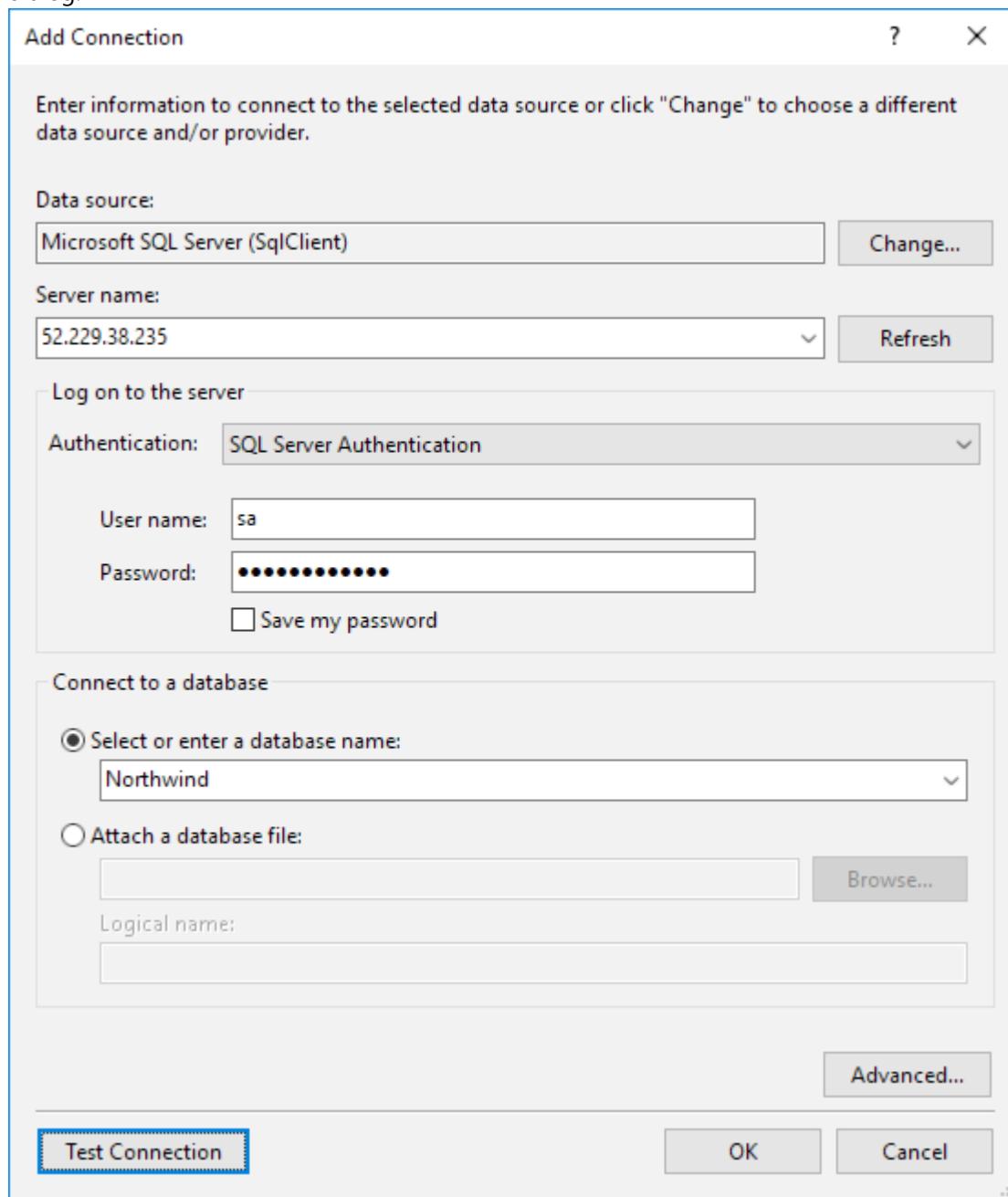


23. On the Choose Data Source dialog, select Microsoft SQL Server, and select Next.



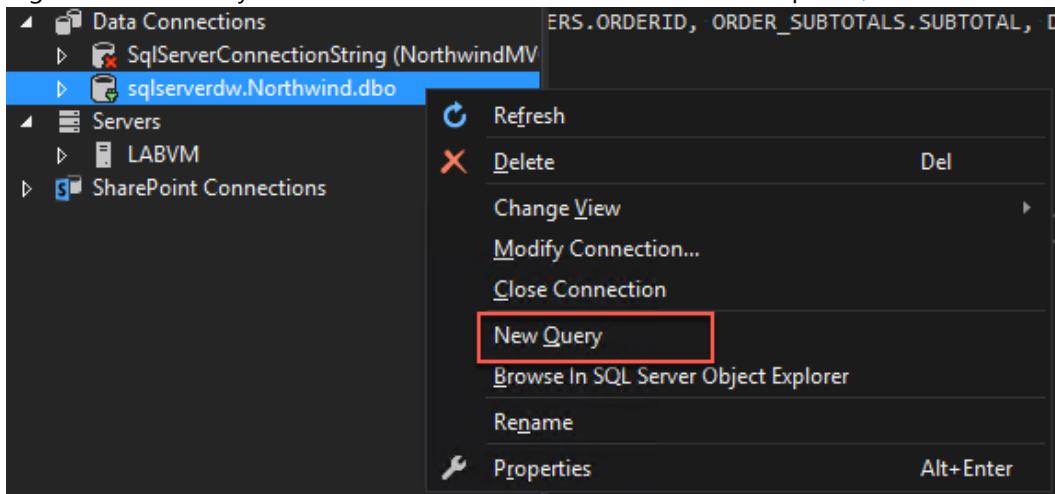
24. On the Add Connection dialog, enter the following:
- Data source: Leave Microsoft SQL Server (SqlClient)
  - Server name: Enter the IP address of your SqlServerDw VM.
  - Authentication: Select SQL Server Authentication
  - User name: Enter sa
  - Password: Enter Password.1!!
  - Connect to a database: Choose Select or enter database name, and enter Northwind

- g. Select Test Connection to verify your settings are correct, and select OK to close the successful connection dialog.



25. Select OK.

26. Right-click the newly added SQL Server connection in the Server Explorer, and select New Query.



27. Select and copy all of the text from the SALES\_BY\_YEAR\_fix.sql file (click CTRL+A, CTRL+C in the SALES\_BY\_YEAR\_fix.sql file).
28. Paste (CTRL+V) the copied text into the new Query window.
29. Verify the Use [Northwind] statement is the first line of the file, and that it matches the database listed in the query bar. Select the green Execute button.

```

1 USE [Northwind]
2 GO
3 /****** Object: .. StoredProcedure [NW].[SALESBYYEAR] ---- Script Date: 1/
4 SET ANSI_NULLS ON
5 GO
6 SET QUOTED_IDENTIFIER ON
7 GO
8 ALTER PROCEDURE [NW].[SALESBYYEAR]
9   @p_begin_date datetime2,
10   @p_end_date datetime2
11 AS
12 BEGIN
13
14   SELECT ORDERS.SHIPPEDDATE, ORDERS.ORDERID, ORDER_SUBTOTALS.SUBTO
15   FROM NW.ORDERS
16     INNER JOIN NW.ORDER_SUBTOTALS
17       ON ORDERS.ORDERID = ORDER_SUBTOTALS.ORDERID
18       WHERE ORDERS.SHIPPEDDATE BETWEEN @p_begin_date AND @p_end_date
19
20
21 END

```

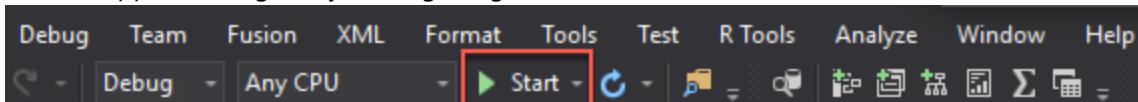
30. You should see a message that the command completed successfully.

```

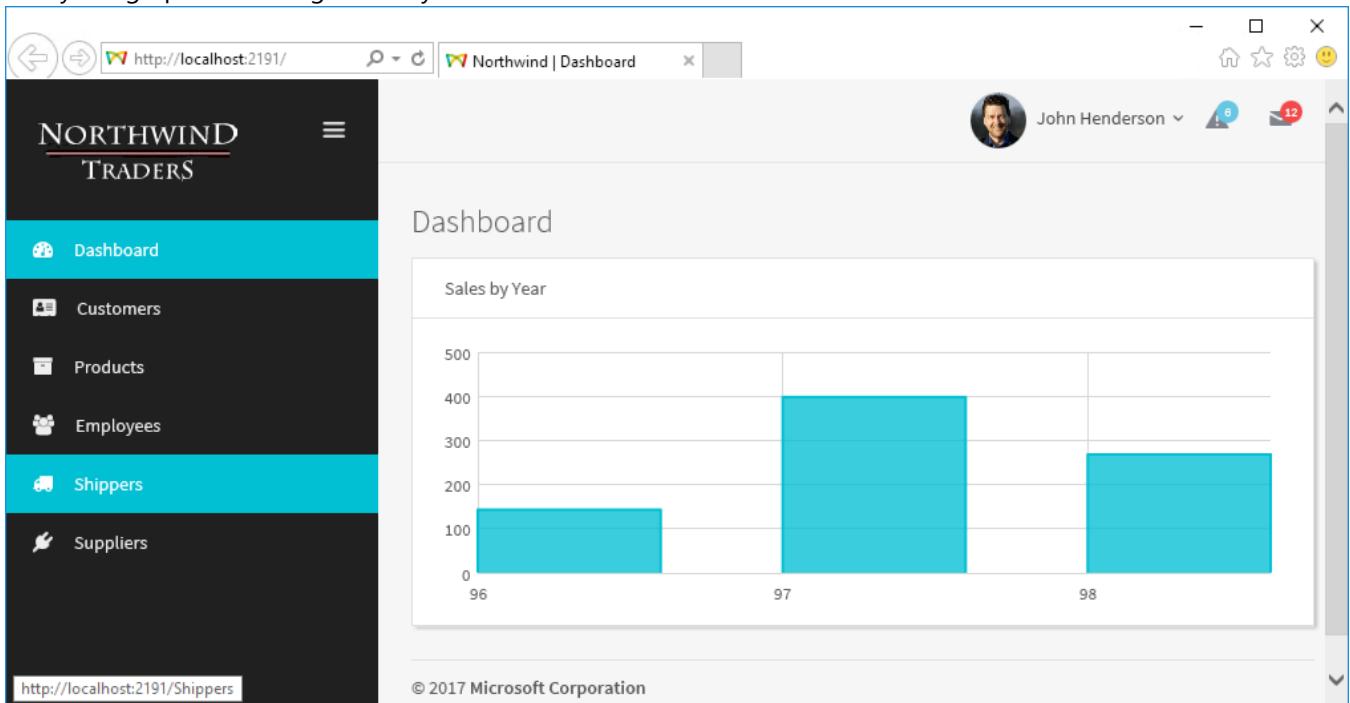
100 %
T-SQL ↑ Message
Command(s) completed successfully.

```

31. Run the application again by clicking the green Start button in the Visual Studio toolbar.



32. Verify the graph is showing correctly on the Northwind traders dashboard.



33. Congratulations! You have successfully migrated the data and application from Oracle to SQL Server.

## After the hands-on lab

Duration: 10 mins

In this exercise, attendees will deprovision any Azure resources that were created in support of the lab. You should follow all steps provided after attending the Hands-on lab.

### Task 1: Delete the resource group

1. Using the Azure portal, navigate to the Resource group you used throughout this hands-on lab by selecting Resource groups in the left menu.
2. Search for the name of your research group, and select it from the list.
3. Select Delete in the command bar, and confirm the deletion by re-typing the Resource group name, and selecting Delete.

You should follow all steps provided *after* attending the Hands-on lab.