



Cortex Innovation - SQL Server 2016 Installation Guide

Cortex can be deployed with two engines: the original engine and the Innovation engine. This document is intended specifically for deployments using only the Innovation engine (Cortex v2022).

Cortex Limited
Kings Park House,
22 Kings Park Road,
Southampton,
SO15 2AT
T +44 23 8254 8990
E info@cortex-ia.com

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Preface

About this Manual

Cortex can be deployed with two engines: the original engine and the Innovation engine. This document is intended specifically for deployments using only the Innovation engine (Cortex v2022).

This document provides detailed information regarding the installation of SQL Server 2016 for Cortex Innovation solutions.

This manual is organised into the following main sections:

- **Pre-requisites** - This section details necessary system configuration and third-party components for this software installation.
- **Attended Installation** - This section provides information on the installation of SQL Server via the user interface.
- **Service Pack Installation** - This section provides information on the installation of the latest SQL Server Service Pack.

Audience

The intended audience is anyone required to install a SQL Server 2016 instance for use with Cortex Innovation solutions.

Related Material

Other documents related to this installation guide are as follows:

- **Cortex Innovation v2022 Documentation**

For further information, please also consult the following document:

- **Install SQL Server 2016 from the Installation Wizard (Setup)**

Abbreviations used in this Document

SQL - Structured Query Language
TLS - Transport Layer Security

Revisions to this Document

The following revisions have been made to this document

Date	Author	Revision	Notes
9/07/2022	D. Smith	1.0.0	Final

1 Pre-requisites

1.1 System requirements

Component	Supported versions
Operating System	Windows Server 2016 (x64) Standard
	Windows Server 2016 (x64) Datacentre
SQL Server	2016 (x64) Product Version 13.0.x

1.2 Required service user account (within Database server setup)

A Local User or Active Directory Domain User (an example user account name is Cortex_SqlAdmin) should be used to run the SQL Server services. To create a new Active Directory user account, follow the following Steps in 1.2.1 or to create a new Local User account follow the Steps in 1.2.2.

Note: The user to be used cannot be the built in Administrator account.

The user account to be used should be added to the administrators group as follows:

1. Navigate to **Start -> Administrative Tools -> Computer Management**.
 2. In the left-hand panel, expand the **Local Users and Groups** node then select **Groups**.
 3. In the right-hand panel, double-click on the **Administrators** group.
 4. In the **Administrators Properties** dialog, click on the **Add** button.
- 💡 For step 5 it is possible to use the **Advanced...** button to look up names rather than entering them manually. Various filters can be set to find the correct user more easily. **OK** adds the selected user to the **Enter the object names to select** text box.
5. Type the name of the SQL Admin user into the **Enter the object names to select** text box. Click the **Check Names** button to confirm that the user exists.
 6. Click **OK** on the **Select Users** dialog, and then confirm that the user is correct by clicking **OK** on the **Properties** dialog.

1.2.1 Creating Active Directory accounts

Follow the following steps to create Active Directory accounts if required:

1. Log on to a machine that has Active Directory Users and Computers (Navigable via **Start -> Administrative Tools -> Active Directory Users and Computers**).
2. In the left-hand panel expand the node labelled with the desired domain.
3. Locate the required OU (organisational unit) and right-click on it.
4. Select **New -> User**.
5. Enter details into the **First name**, **Last name** and **User logon name** text boxes and then click **Next >**.

6. Enter details into the **Password** and **Confirm password** fields. Ensure that the password conforms to any company password policy requirements.
7. Untick **User must change password at next logon**. Tick **User cannot change password** and tick **Password never expires**. Click **Next >**.
8. Click **Finish** to create the user.

1.2.2 Creating Local User accounts

Follow the following steps to create Local User accounts if required:

1. Navigate to **Start -> Administrative Tools -> Computer Management**.
2. In the right-hand panel expand the **Local Users and Groups** node.
3. Right-click on **Users** and select **New User**.
4. Enter details in the **User name**, **Full name**, **Password** and **Confirm password** fields. Ensure that the password conforms to any company password policy requirements.
5. Untick **User must change password at next logon**. Tick **User cannot change password** and tick **Password never expires**. Click **Next >**.
6. Click **Create** to create the new user.

1.3 Additional pre-requisites

- 📖 The install must be executed from the machine that the software will be installed on.
- 📖 The user that executes the install must have local admin rights on the machine and must be a domain user if the machine is on a domain.
- 📖 The SQL Server install media must be available and visible to the local machine.

2 Attended Installation

2.1 Installation of SQL Server

1. Run the SQL Server installer. When the installer loads you will be presented with the SQL Server Installation Center as shown in Figure 1 - SQL Server Installation Center.

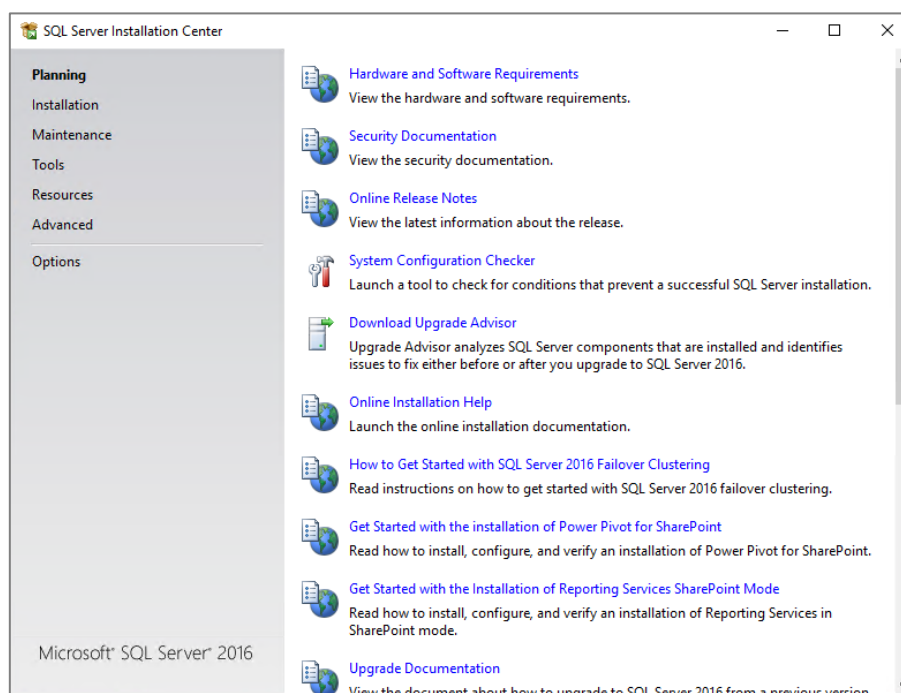


Figure 1 - SQL Server Installation Center

2. Click Installation from the list of options on the left of the screen.
3. Click New SQL Server stand-alone installation or add features to an existing installation as shown in Figure 2 - SQL Server Installation Center - Installation Menu.

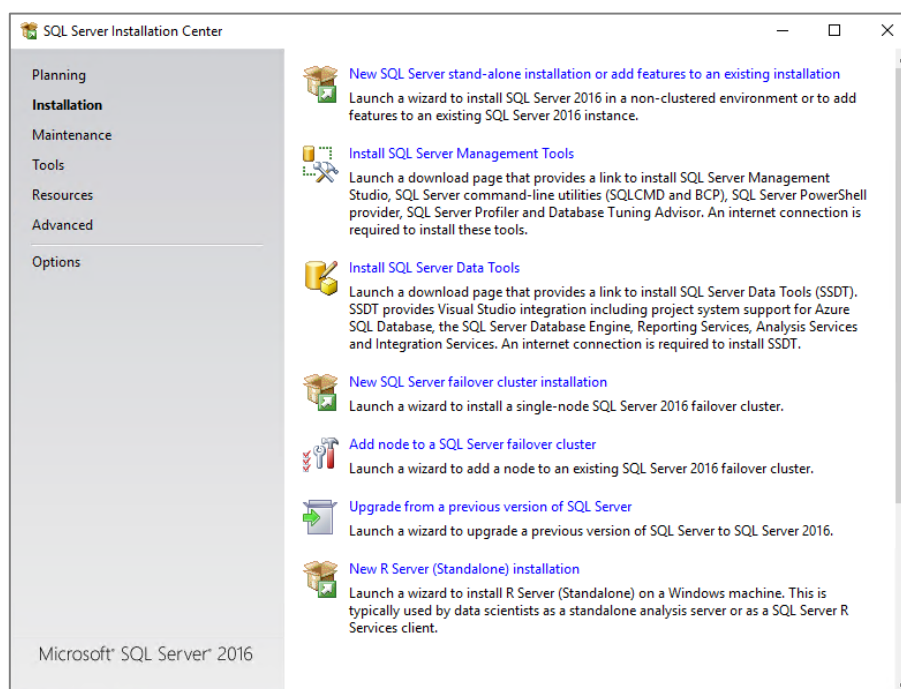


Figure 2 - SQL Server Installation Center - Installation Menu

4. The installer will then show a Product Key screen. The product key may be prepopulated for you, if so, click next. If the product key is empty as shown in Figure 3 - Product Key you will need to enter a Product Key. Click Next to continue.

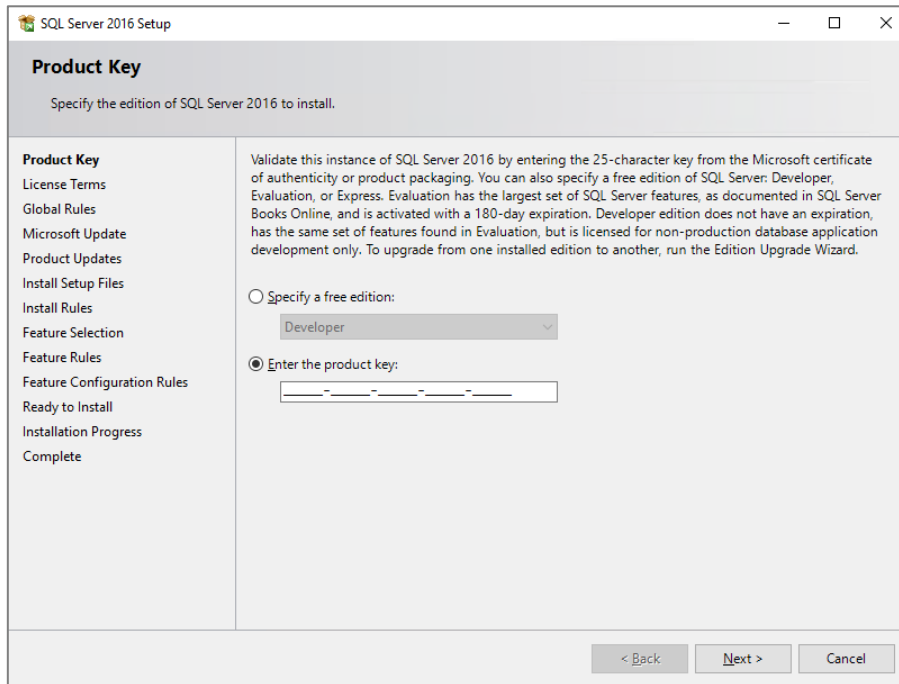


Figure 3 - Product Key

5. The installer will then show a License Terms screen as shown in Figure 4 - License Terms. Click to agree to the terms and conditions and click Next to continue.

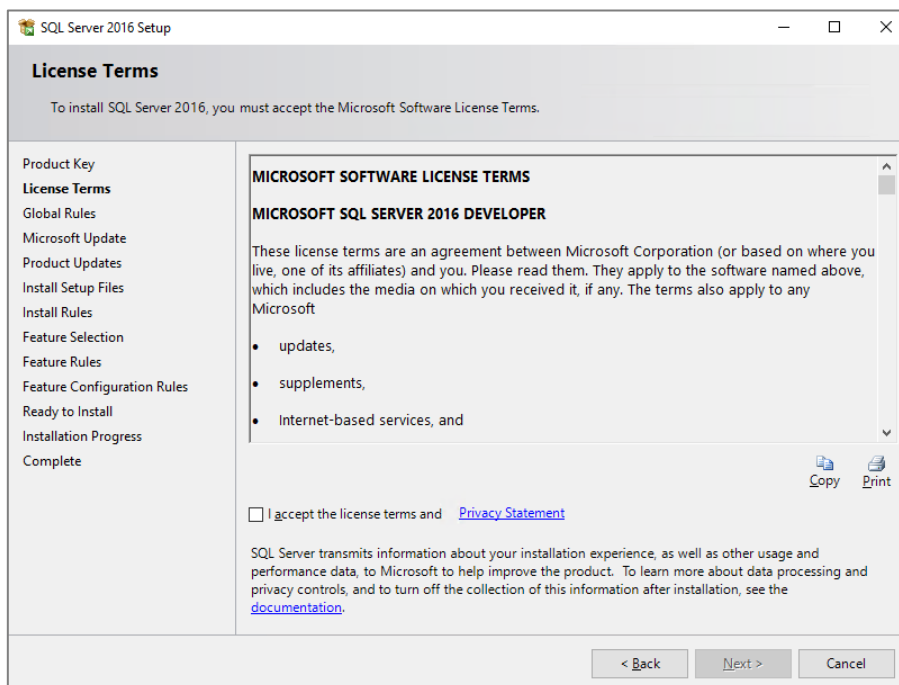


Figure 4 - License Terms

- The installer will then check for any potential issues when installing the setup support files as shown in Figure 5 - Global Rules. Any issues highlighted should be addressed appropriately. This screen will only show if any problems arise. Once issues are resolved click Re-run and then click Next.

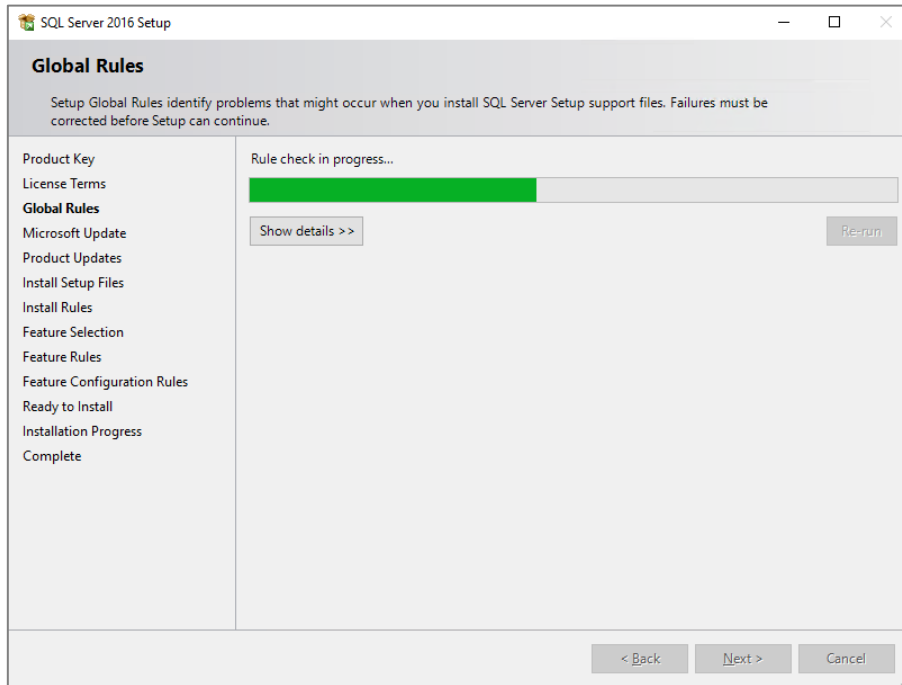


Figure 5 - Global Rules

- The Installer will then ask whether you want to use Microsoft Update to check for updates as shown in Figure 6 - Microsoft Update. Confirm and click Next to continue.

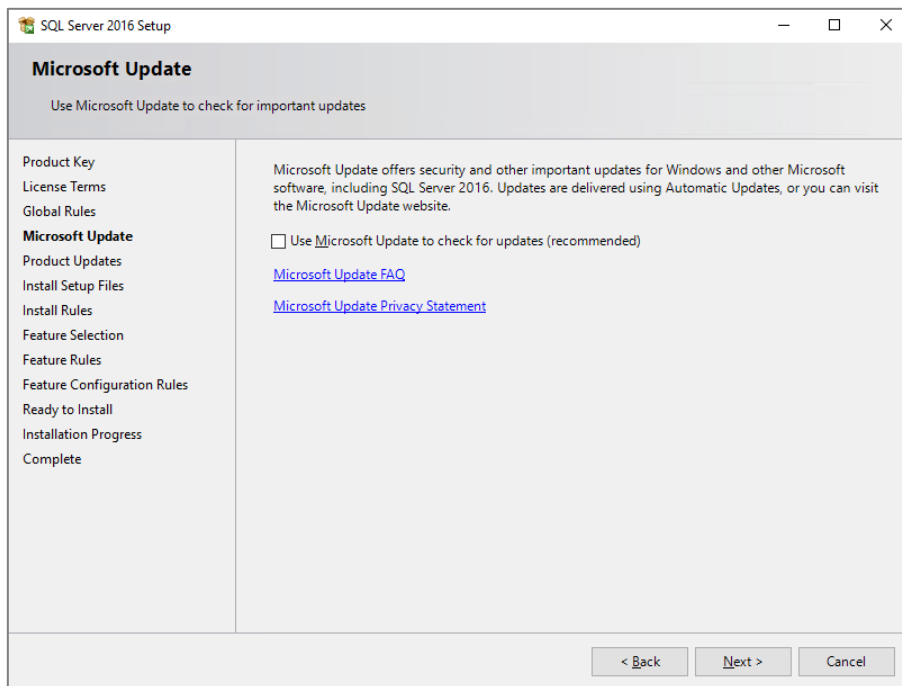


Figure 6 - Microsoft Update

8. At this stage, the Product Updates screen will be displayed if there are updates available as shown in Figure 7 - Product Updates. If any updates are listed, they will be installed when you click Next.

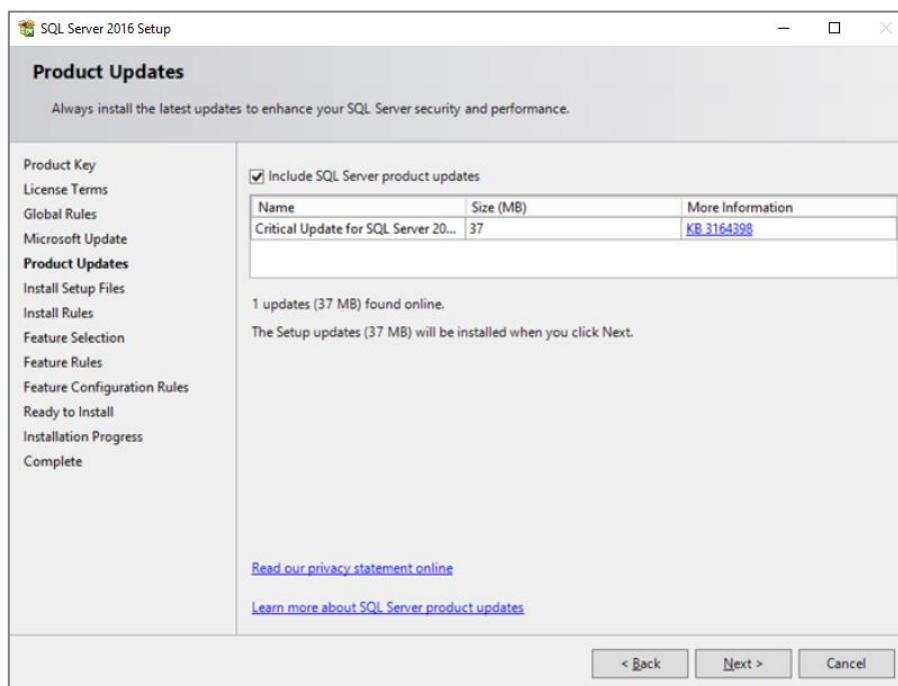


Figure 7 - Product Updates

9. The next step is installing setup files as shown in Figure 8 - Install Setup Files. Once complete, click Install.

◆ This screen is usually only displayed if there are any warnings or failures

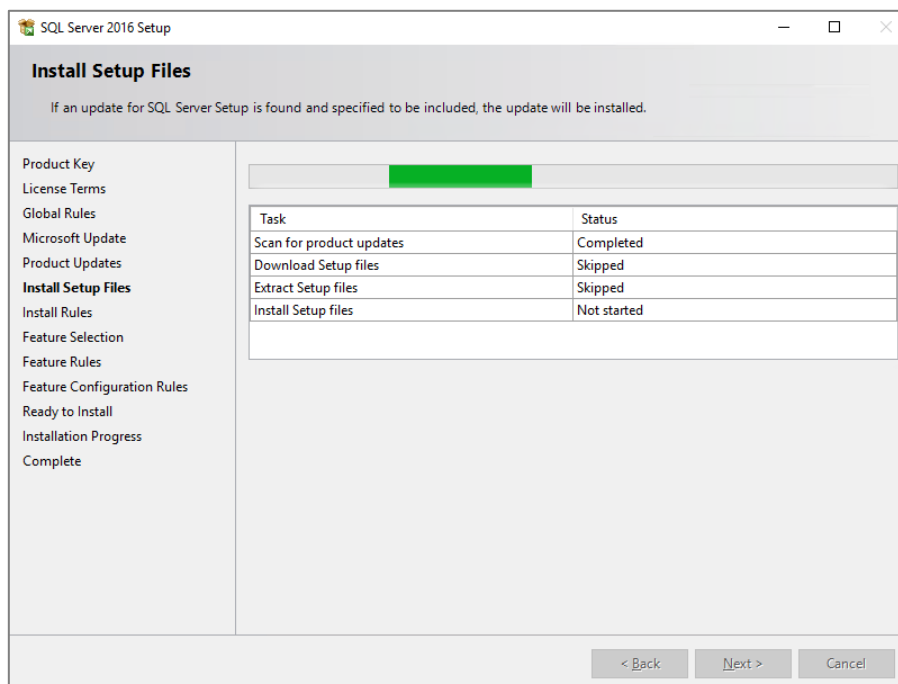


Figure 8 - Install Setup Files

10. Some install rules will then be verified as shown in Figure 9 - Install Rules. Click Next.

◆ This screen is usually only displayed if there are any warnings or failures

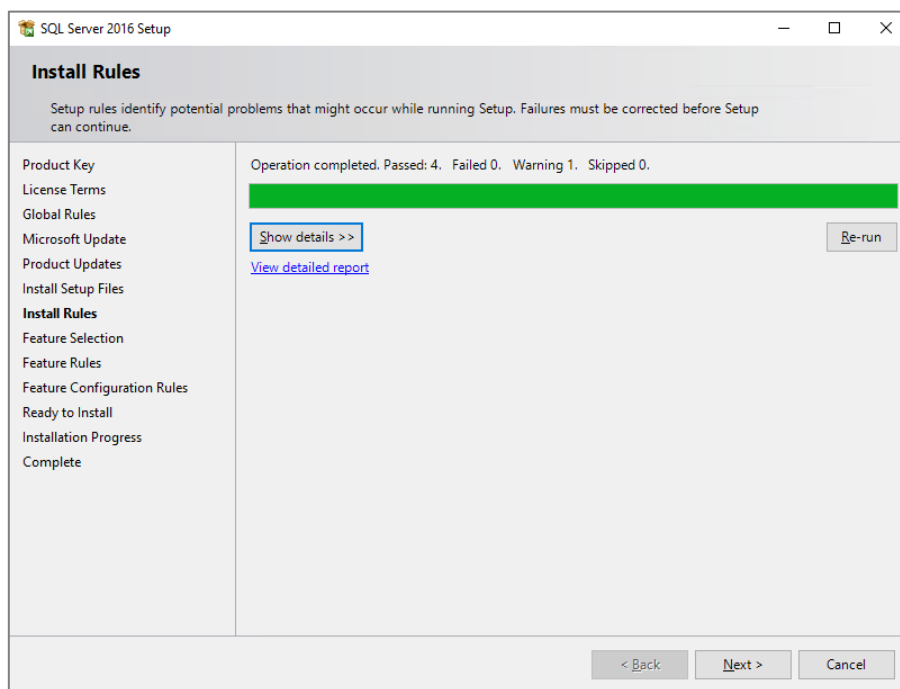


Figure 9 - Install Rules

11. If you currently have SQL Server components installed, you the Installation Type screen will be displayed as shown in Figure 10 - Installation Type. For a new installation of SQL Server 2016 select the **Perform a new installation of SQL Server 2016** option. Click Next.

If you do not have any SQL Server components installed, you will not see this screen and can go straight to step 12.

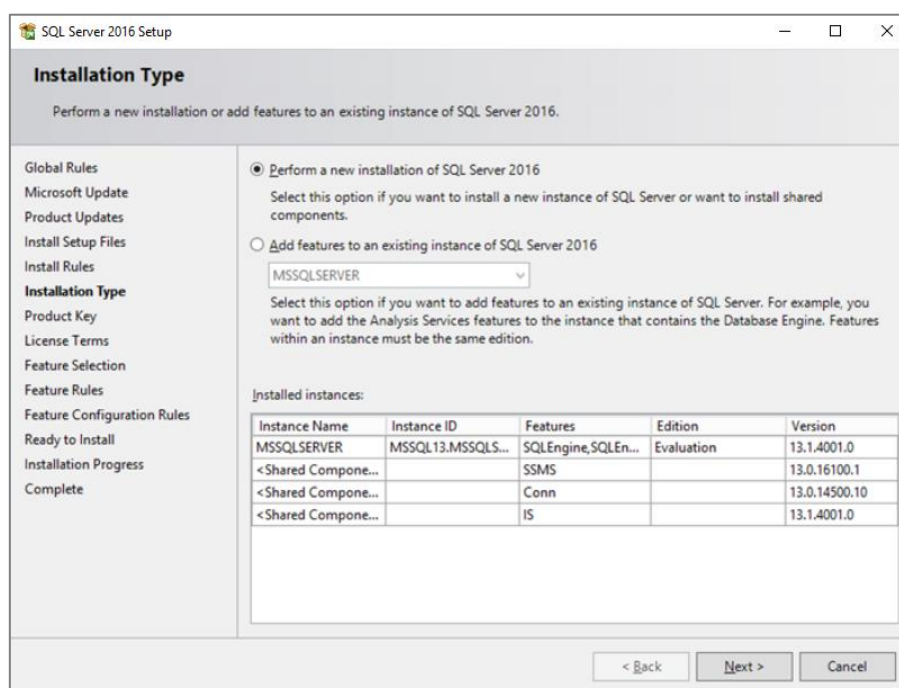


Figure 10 - Installation Type

12. On the Feature Selection screen, as shown in Figure 11 - Feature Selection you will need to select options based on the components required for Cortex Innovation. Table 1 - Feature Selection Matrix shows which options should be selected for a Cortex Innovation installation. Any components not specified in Table 1 should not be installed.

Component	Cortex Innovation
Database Engine Services	Yes
Client Tools Connectivity	Yes

Table 1 - Feature Selection Matrix

Once the options required have been selected, click Next.

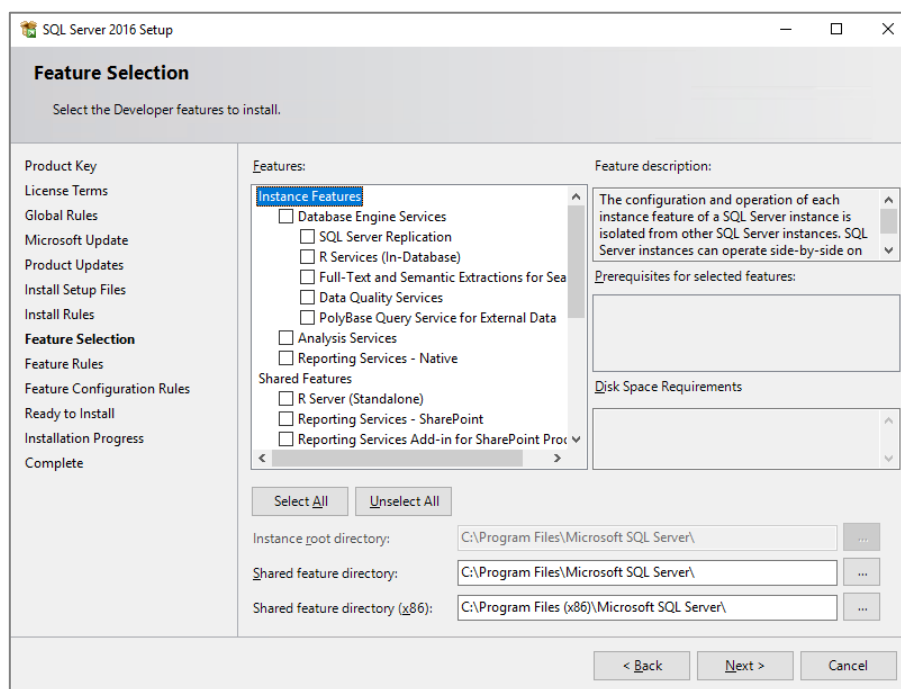


Figure 11 - Feature Selection

13. Some feature rules will then be verified as shown in Figure 12 - Feature Rules. Click Next.

◆ This screen is usually only displayed if there are any warnings or failures

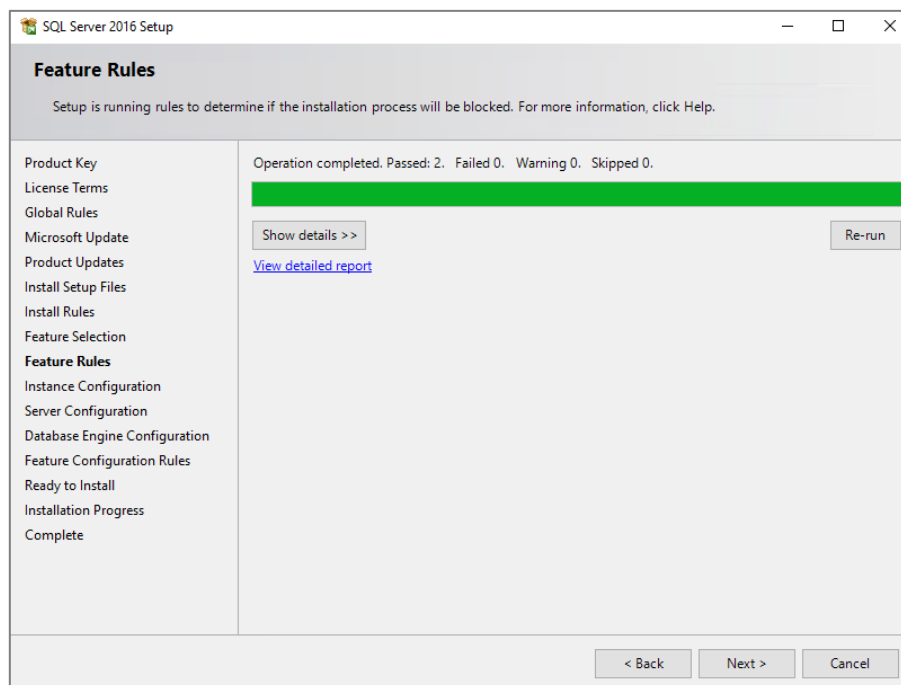


Figure 12 - Feature Rules

14. The Instance Configuration screen, as shown in Figure 13 - Instance Configuration allows you to install either the default instance or a named instance. You can install either, albeit that you can only have one default instance on any given machine. Typically, you should install the default instance unless told otherwise. You do not need to change any other default values, and once options have been selected, click Next.

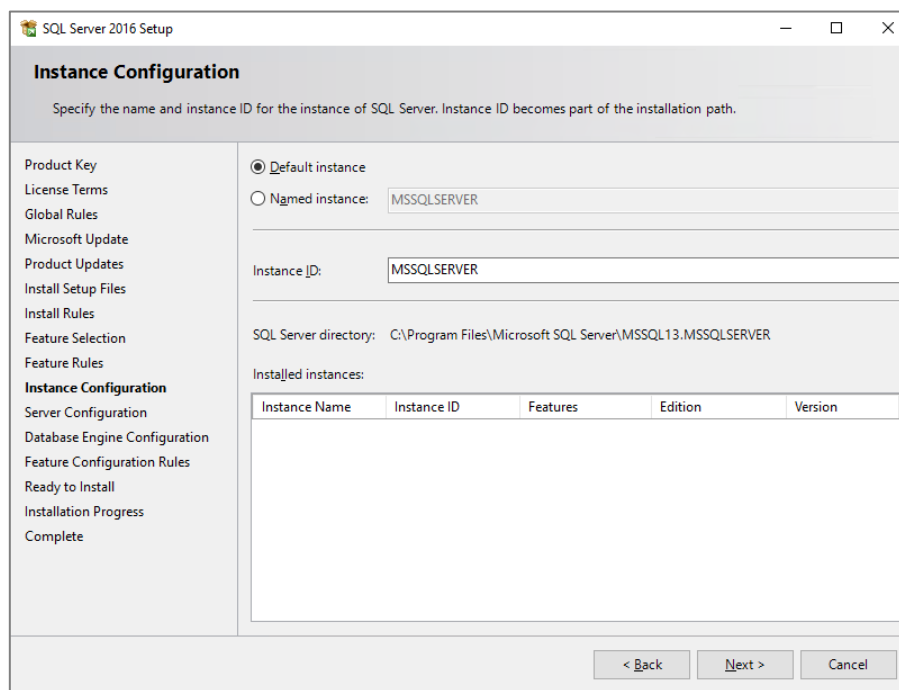



Figure 13 - Instance Configuration

15. The Server Configuration screen as shown in Figure 14 - Server Configuration - Service Accounts allows you to specify which account the SQL Server Services will run as. This would normally be a dedicated user account e.g. Domain\Cortex_SQL_Admin. You should also change the SQL Server Agent startup type from Manual to Automatic. Once you have configured service accounts and their associated passwords navigate to the Collation tab.
-  If you have selected to install a named instance in step 14, the SQL Server Browser service should be set to automatic start up too though the service account cannot be changed.

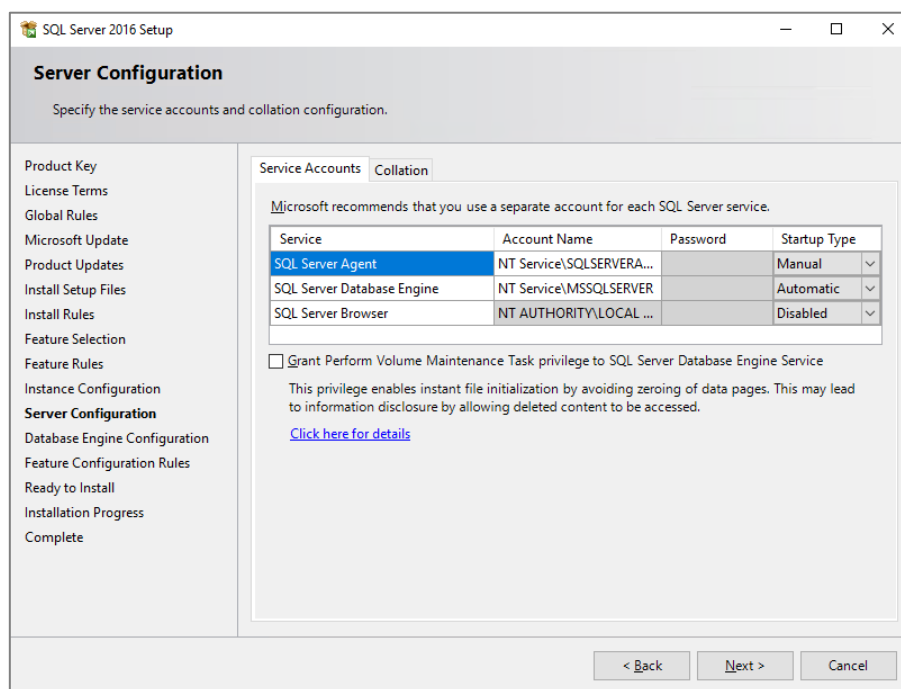


Figure 14 - Server Configuration - Service Accounts

16. On the Collation tab as shown in Figure 15 - Server Configuration - Collation you need to ensure that the collation for any items in the list is set to **Latin1_General_CI_AS**. If this is not the case, click the Customize... button and go to step 17. If the collation is set to **Latin1_General_CI_AS** click Next and go to step 18.

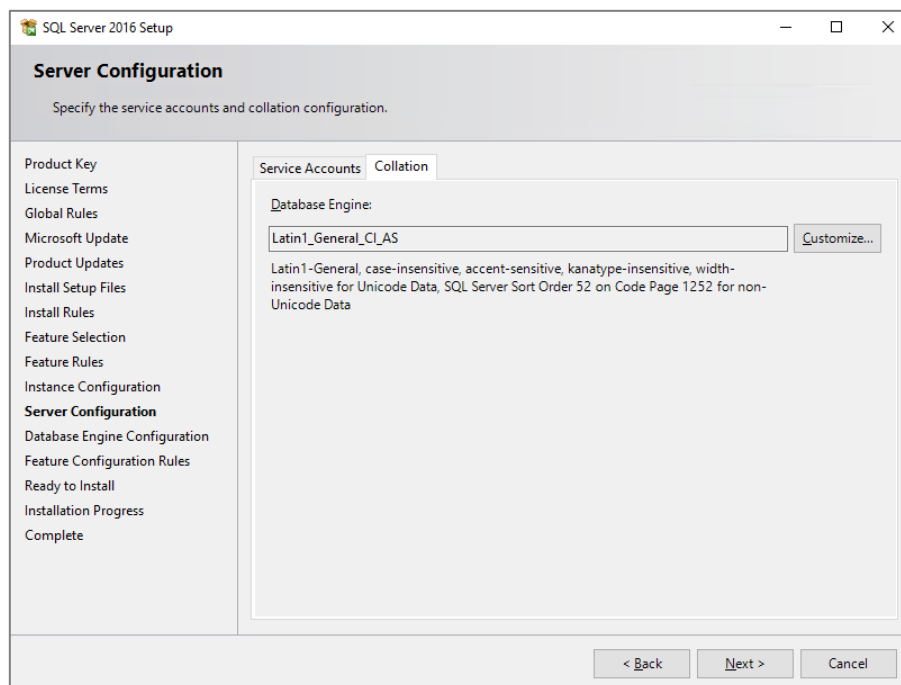


Figure 15 - Server Configuration - Collation

17. On the customization screen ensure that the values are specified as shown in Figure 16 - Server Configuration - Collation Customization and click OK.

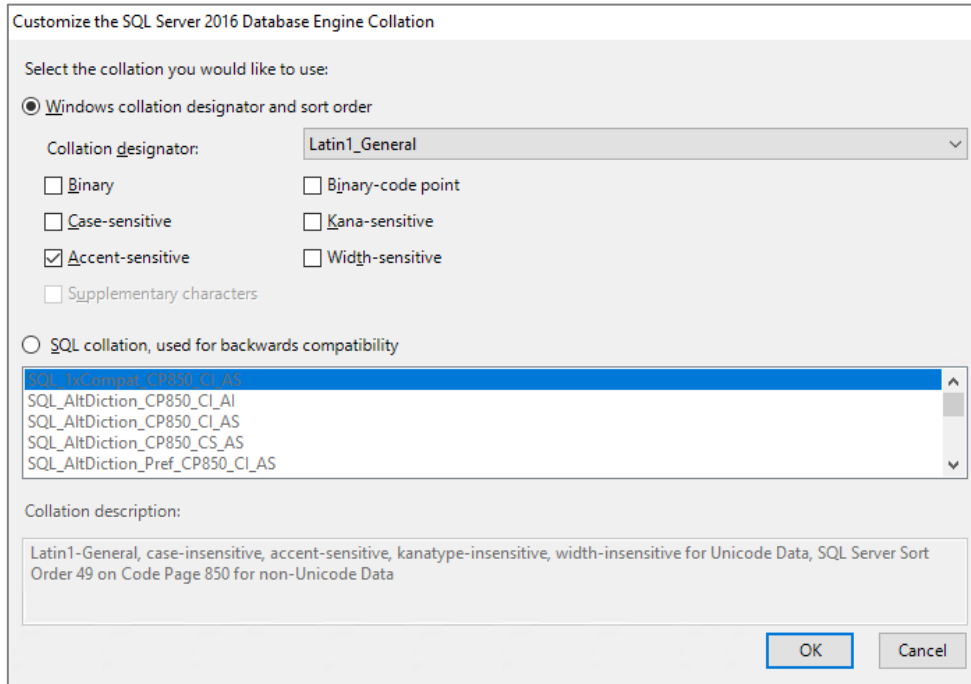


Figure 16 - Server Configuration - Collation Customization

Back on the collation tab, ensure that the collation for any items in the list is now set to **Latin1_General_CI_AS** and click Next.

18. On the Database Engine Configuration screen as shown in Figure 17 - Database Engine Configuration you can specify whether to install in Windows authentication mode or Mixed mode. Mixed mode allows you to access the system using SQL Server authentication.

If you are installing in mixed mode, you will need to supply a password for the sa account.

You also need to specify SQL Server administrators for the system. You must specify at least one, and you have the option to select the current user and any other available Windows users and groups.

-  The MSSQLSERVER service user(s) should be configured as a system administrator.

Once authentication mode and administrators have been specified click Next.

-  There is no need to change any configuration in the Data Directories, TempDB or FILESTREAM tabs.

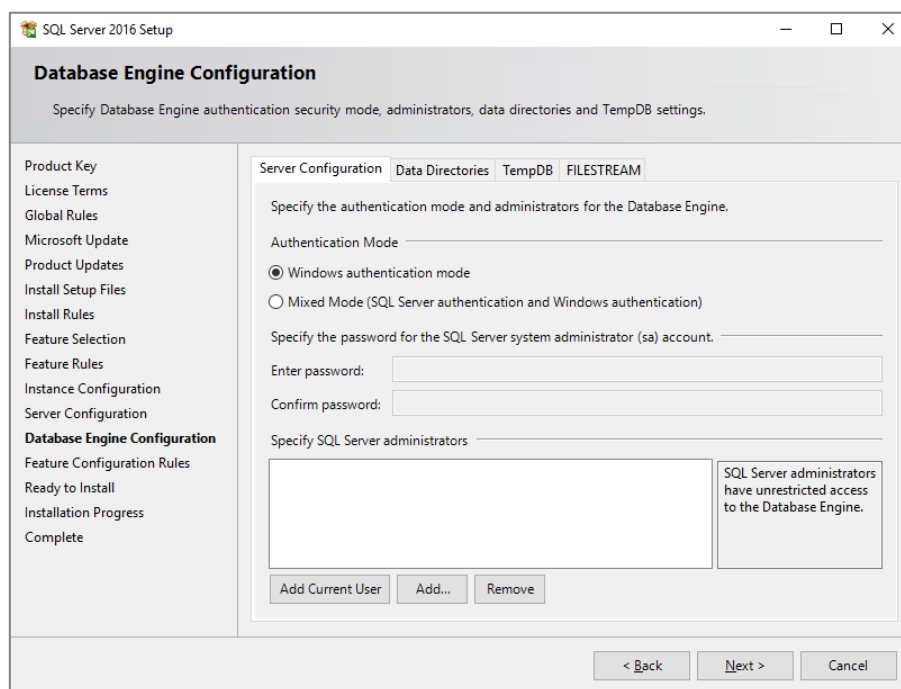


Figure 17 - Database Engine Configuration

19. On the Feature Configuration Rules screen as shown in Figure 18 - Feature Configuration Rules click Next.

❖ This screen is usually only displayed if there are any warnings or failures

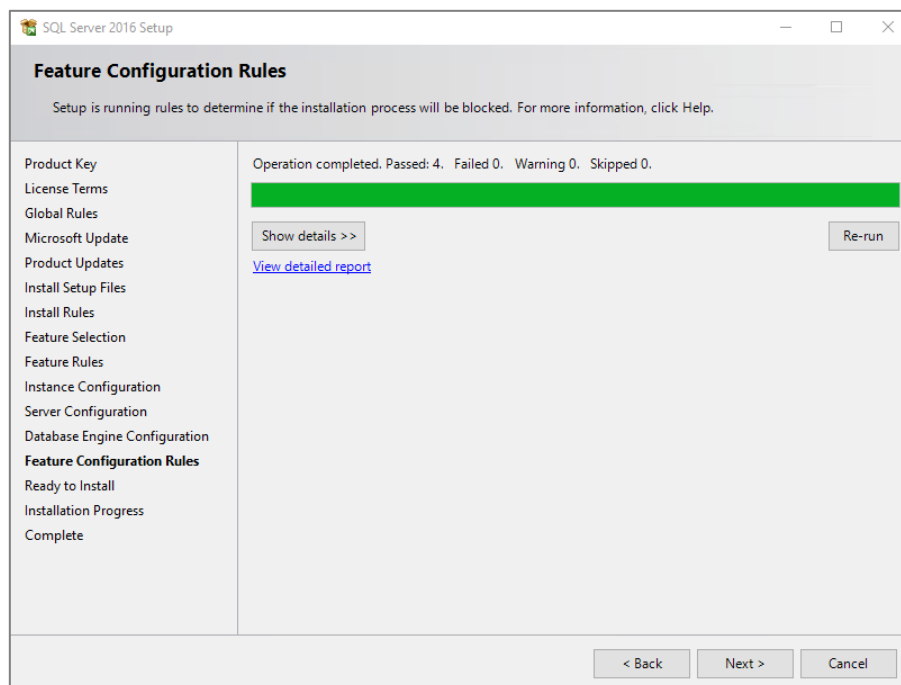


Figure 18 - Feature Configuration Rules

20. On the Ready to Install screen as shown in Figure 19 - Ready to Install click Install.

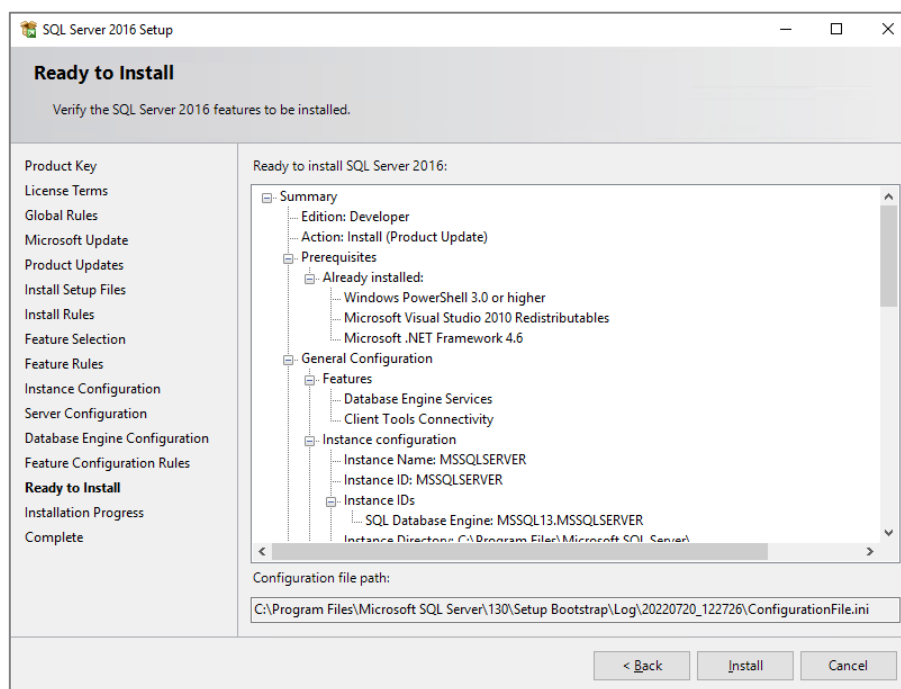


Figure 19 - Ready to Install

21. The Installation Progress screen as shown in Figure 20 - Installation Progress will then be displayed.

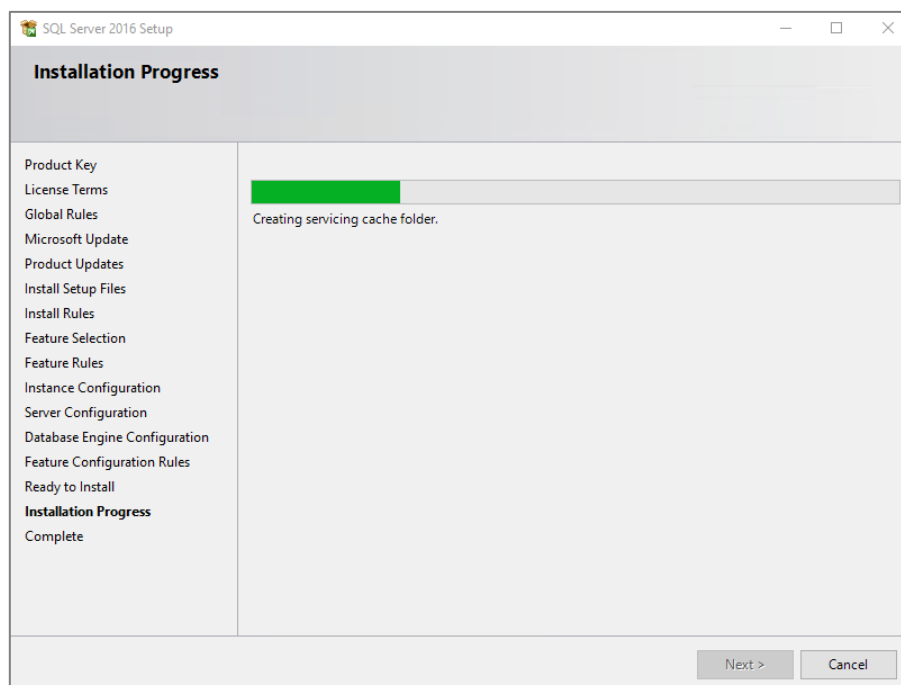


Figure 20 - Installation Progress

22. You may be advised that a computer restart is required to complete the setup process. Click OK.

23. The Installation Complete screen as shown in Figure 21 - Installation Complete confirms that the installation is complete. Click Close, and your SQL Server installation is complete.

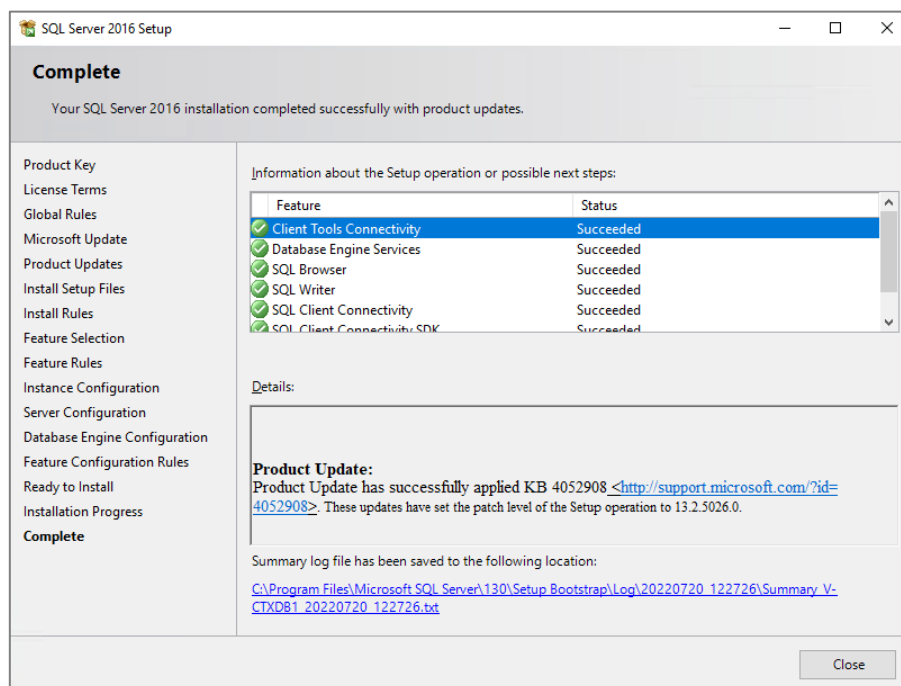


Figure 21 - Installation Complete

24. If you were prompted to restart your computer at step 22 you should restart it now.

2.2 Installation of SQL Server Management Tools

1. In the SQL Server Installation Center, ensure that you are on the Installation section on the list of options on the left of the screen.
2. Click Install SQL Server Management Tools as shown in Figure 22 - SQL Server Installation Center - Installation Menu.

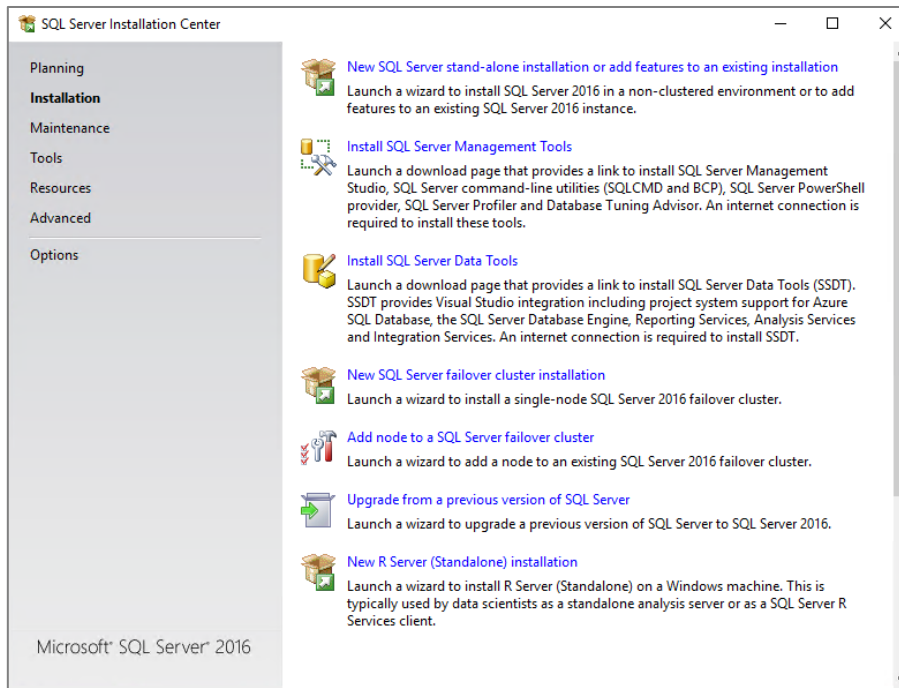


Figure 22 - SQL Server Installation Center - Installation Menu

3. You will be redirected to Microsoft's download website to download the file needed to install the SQL Server Management Tools as shown in Figure 23 - Microsoft Download Page.

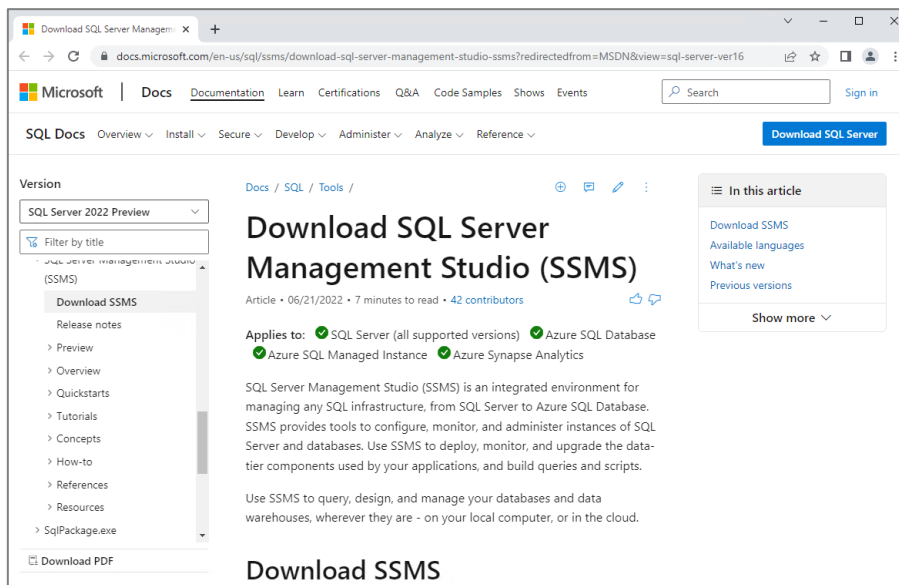


Figure 23 - Microsoft Download Page

4. Download the latest version (release for production use) of the Management Tools by clicking on the link and select Save As when prompted and save it to a known location. Wait for the download to complete.

5. Open the location that the installer was saved to in step 4 and start the installation by double clicking on the SSMS-Setup-ENU.exe file.
6. When the Microsoft SQL Server Management Studio welcome screen is displayed as shown in Figure 24 - SQL Server Management Studio Welcome Screen click Install.

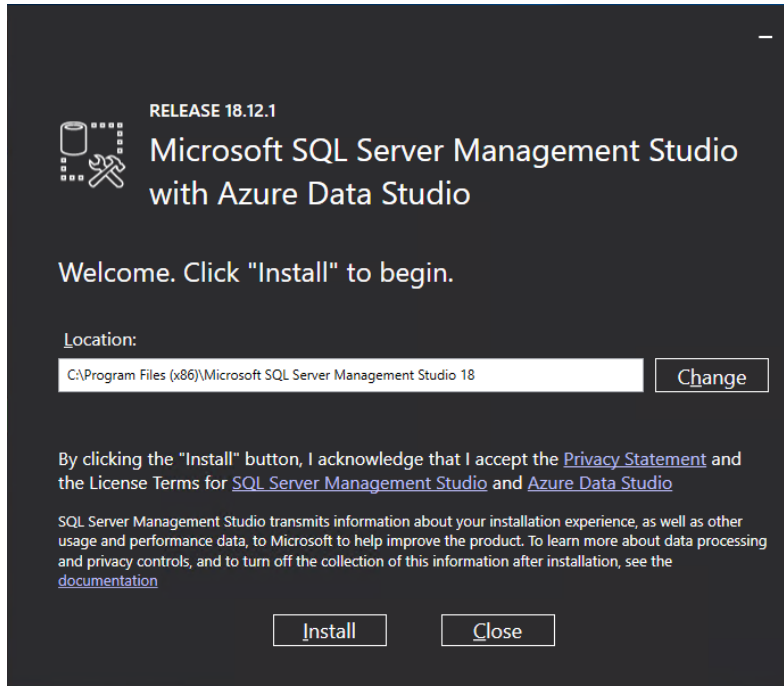


Figure 24 - SQL Server Management Studio Welcome Screen

- You may be prompted with a Restart Required screen. Close any open applications and click Restart. If a restart is not required, go to step 8.
7. Once the machine has restarted, open the location that the installer was saved to in step 4 and restart the installation by double clicking on the SSMS-Setup-ENU.exe file.
 8. You will then see a progress screen as shown in Figure 25 - Loading Packages Progress while the installation packages are loaded

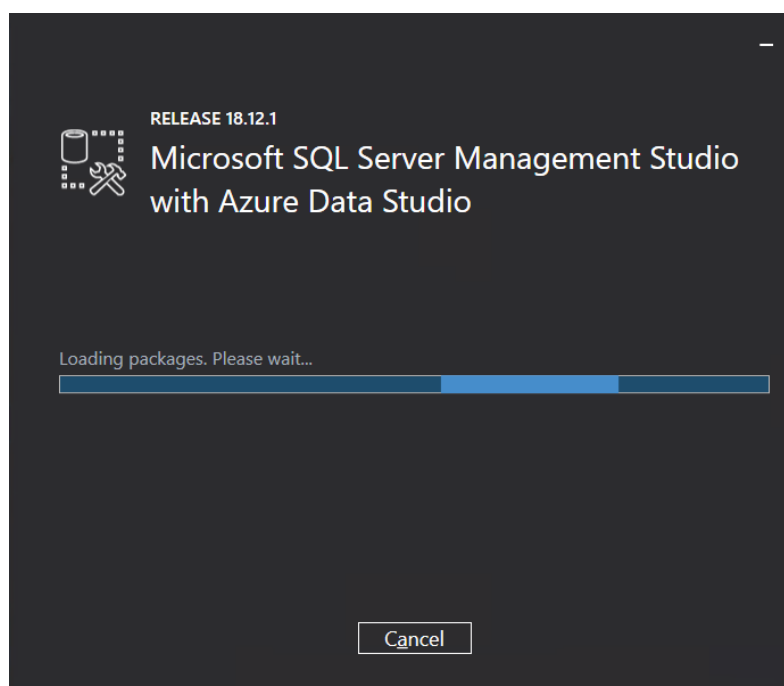


Figure 25 - Loading Packages Progress

9. A progress screen will then display the progress of the installation as shown in Figure 26 - Installation Progress.

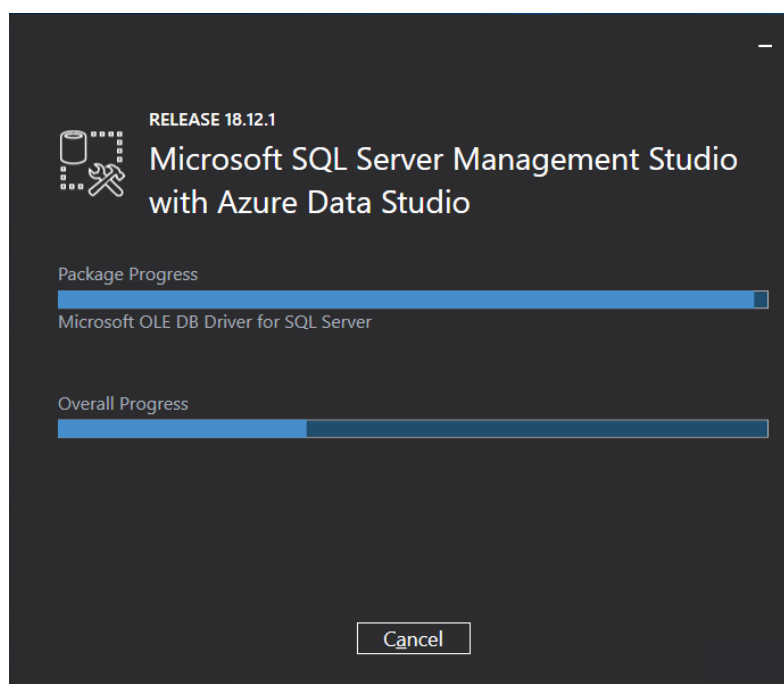


Figure 26 - Installation Progress

10. Once installation has completed a confirmation screen will be displayed and may request a machine restart as shown in Figure 27 - Installation Complete. Click Restart if prompted, else click Close.

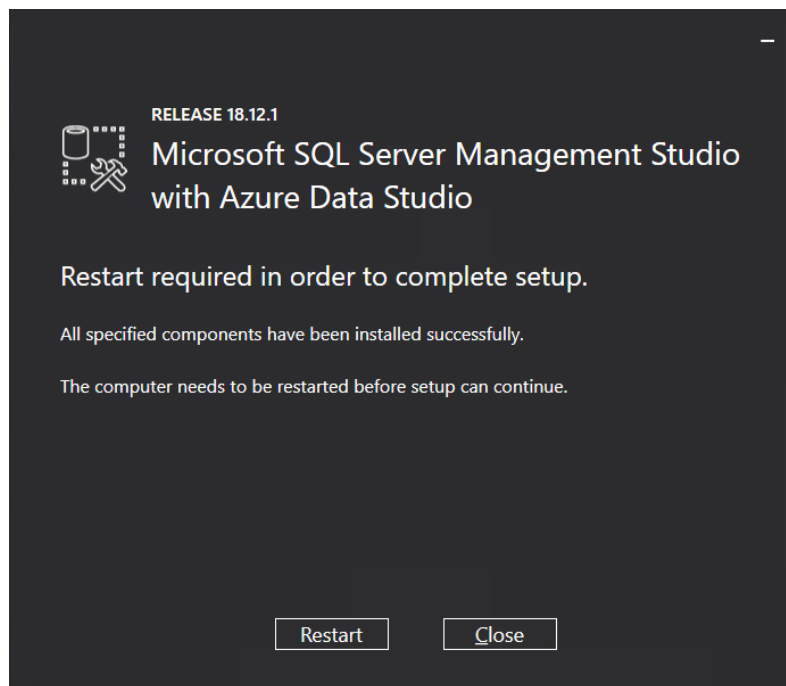


Figure 27 - Installation Complete

2.3 Enable Named Pipes

Once SQL Server has been installed, we need to configure the instance so that it can be connected to via name rather than just IP Address.

1. Open the **SQL Server 2016 Configuration Manager**

- a. Click the **Start** button
- b. Search for **SQLServerManager13.msc**
- c. Click the search result

The dialog should be like the one shown in Figure 28 - SQL Server 2016 Configuration Manager.

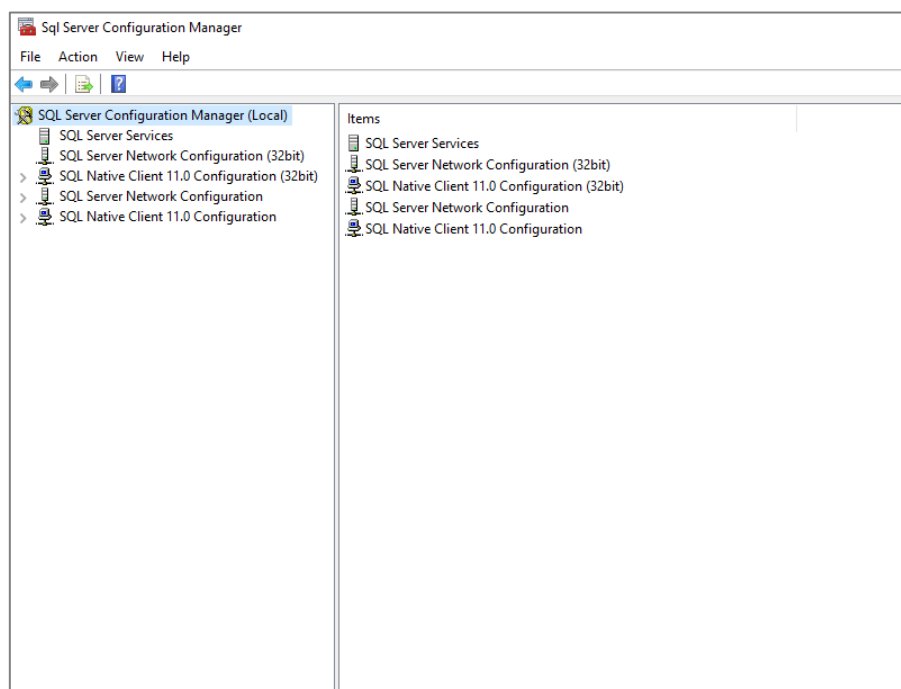


Figure 28 - SQL Server 2016 Configuration Manager

2. In the left-hand side of the Window, expand the “SQL Server Network Configuration” tree and select “Protocols for <instance name>” where instance name is the instance that you have installed in 2.1 step 14 as shown in Figure 29 - SQL Server Network Configuration.

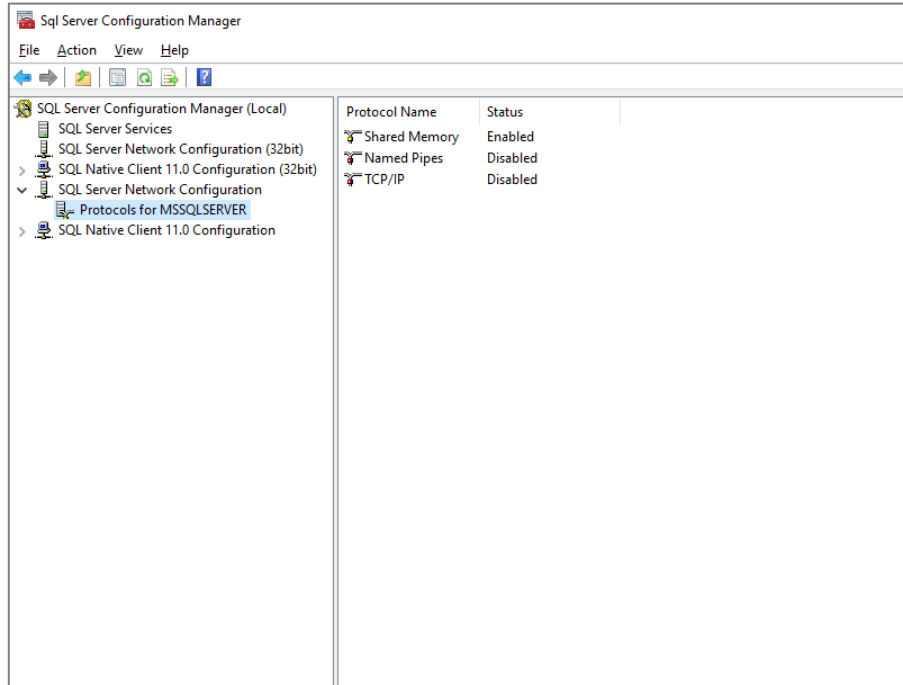


Figure 29 - SQL Server Network Configuration

3. In the Right-hand side of the Window, locate the protocol “Named Pipes” and check whether it is enabled, if it is not right click on the protocol name and select enable.
4. You will be displayed a message as shown in Figure 30 - Confirmation Message that confirms that the SQL Server Service needs to be restarted for the changes to take effect.



Figure 30 - Confirmation Message

5. Click OK
6. Now check the protocol “TCP/IP” and ensure that this is enabled, if not right click on the protocol name and select enable.
7. You will be displayed a message as shown in Figure 30 - Confirmation Message that confirms that the SQL Server Service needs to be restarted for the changes to take effect.
8. Click OK
9. Repeat steps 3 to 8 for the following options in the left-hand side of the screen:
 - a. SQL Native Client 11.0 Configuration
 - b. SQL Native Client 11.0 Configuration (32bit)
10. In the left-hand side of the window select “SQL Server Services”.

11. In the right-hand side of the window as shown in Figure 31 - SQL Server Services, locate the “SQL Server (<instance name>)” Service where instance name is the instance that you have installed in 2.1 step 14.

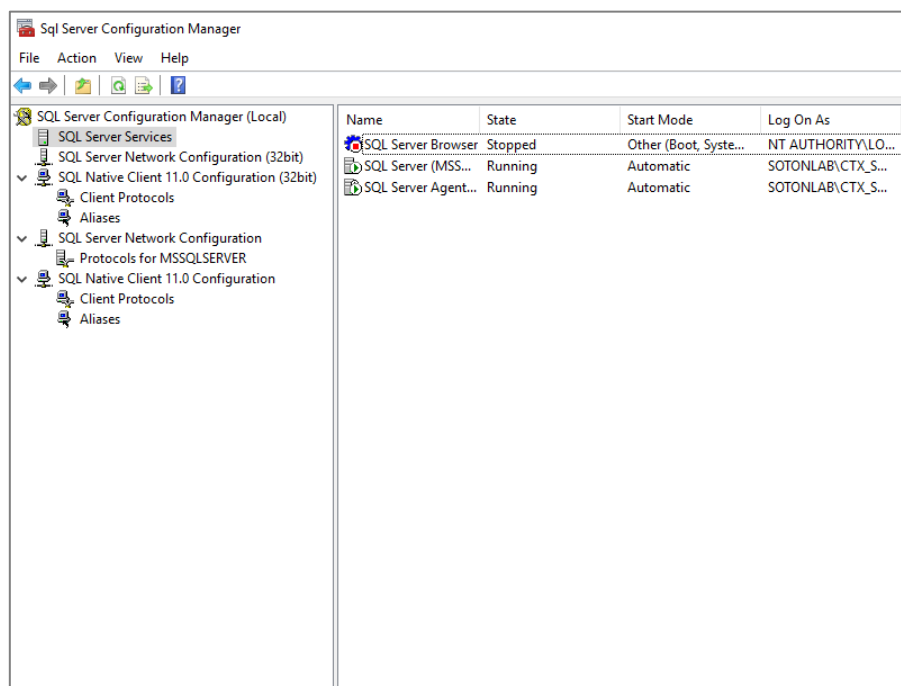


Figure 31 - SQL Server Services

12. Right click on the Name and select restart.
13. Once the necessary services have restarted and the restart dialogs have disappeared close the SQL Server Configuration Manager.
14. Once the configuration is finished the system is ready to install the latest SQL Server Service Pack following the instructions in section 3 Service Pack Installation.

3 Service Pack Installation

Once the install of SQL Server 2016 is complete you should install the latest available service pack. At the time of writing this document the latest version available is Service Pack 3.

3.1 Service Pack Installation

1. Once you have sourced the service pack installer, run it on the machine that is going to be updated.
2. When the installer runs the first thing you will see is the SQL Server 2016 update screen as shown in Figure 32 - SQL Server 2016 update. Click Next.

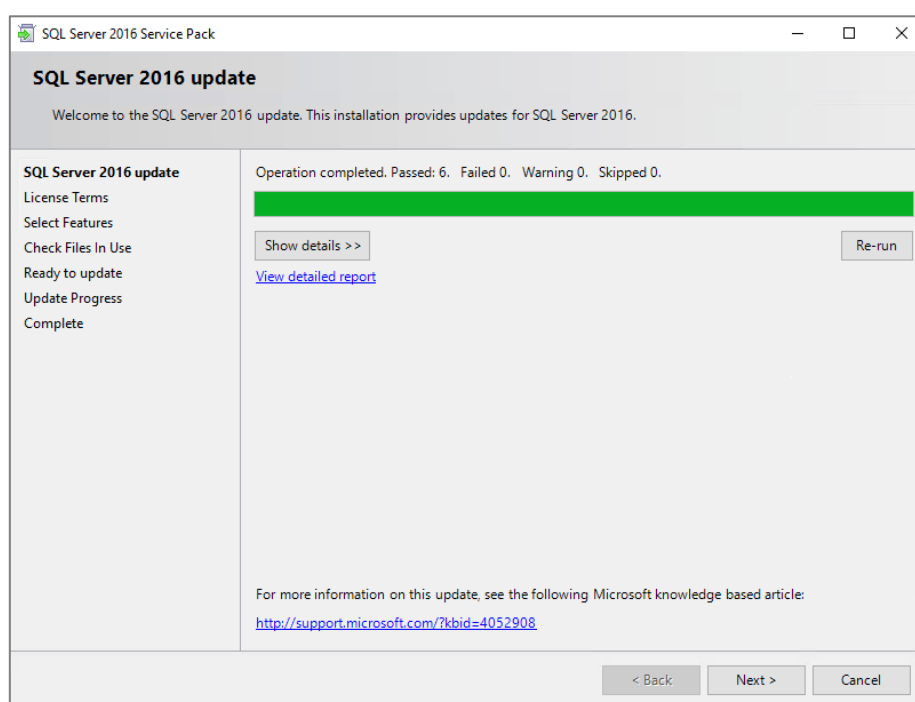


Figure 32 - SQL Server 2016 update

- On the License Terms screen as shown in Figure 33 - License Terms, accept the terms of the licence and click Next.

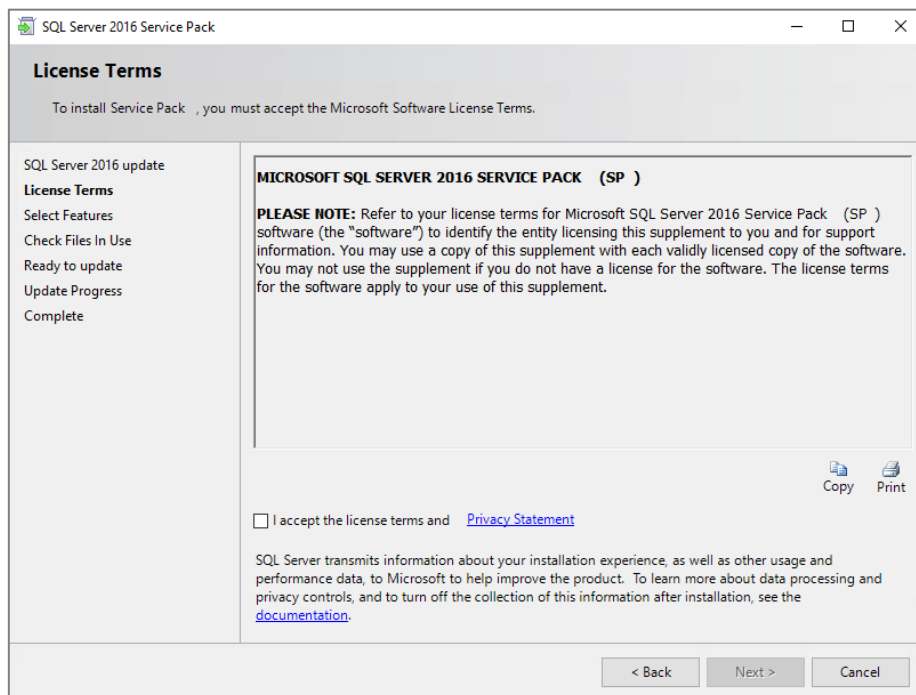


Figure 33 - License Terms

- On the Select Features screen as shown in Figure 34 - Select Features, leave all defaults selected and click Next.

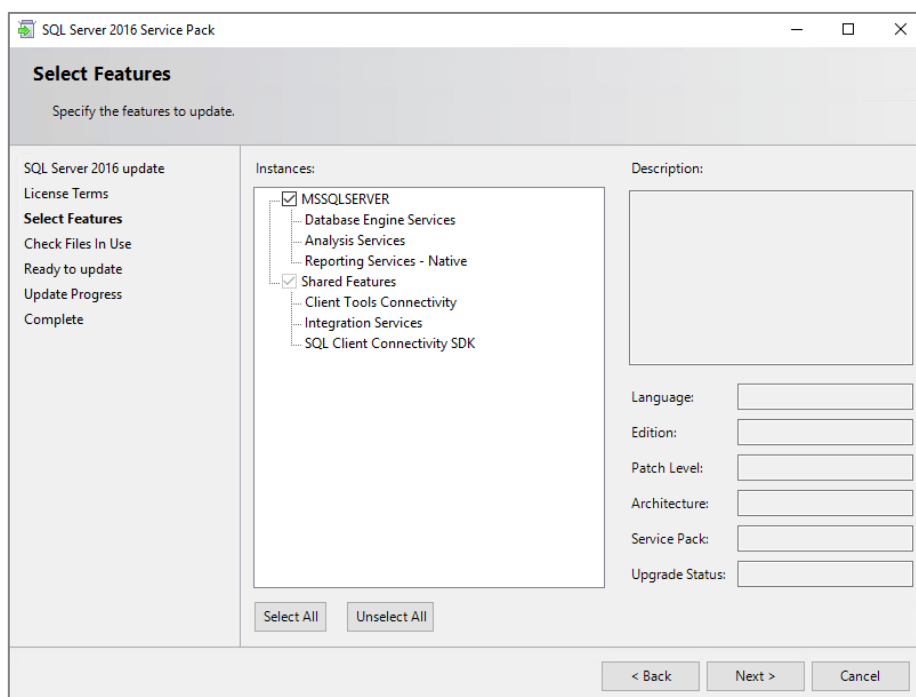


Figure 34 - Select Features

5. The installer then checks files in use as shown in Figure 35 - Check Files In Use. Close any applications highlighted and Click Refresh Check once done. Once there are no files in use warnings, click Next.

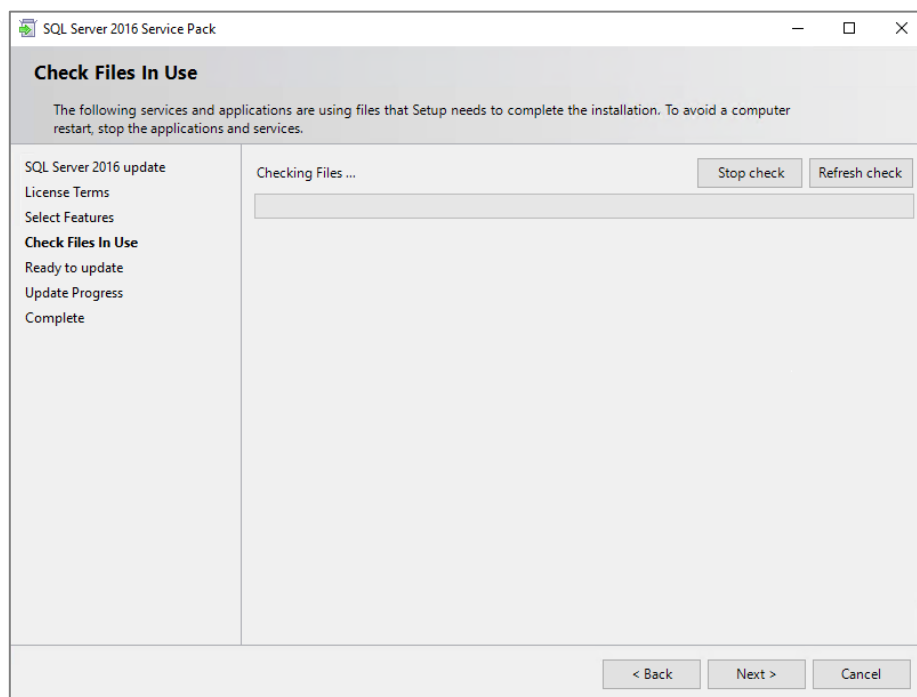


Figure 35 - Check Files In Use

6. On the Ready to update screen as shown in Figure 36 - Ready to update, click Update for the service pack to be applied.

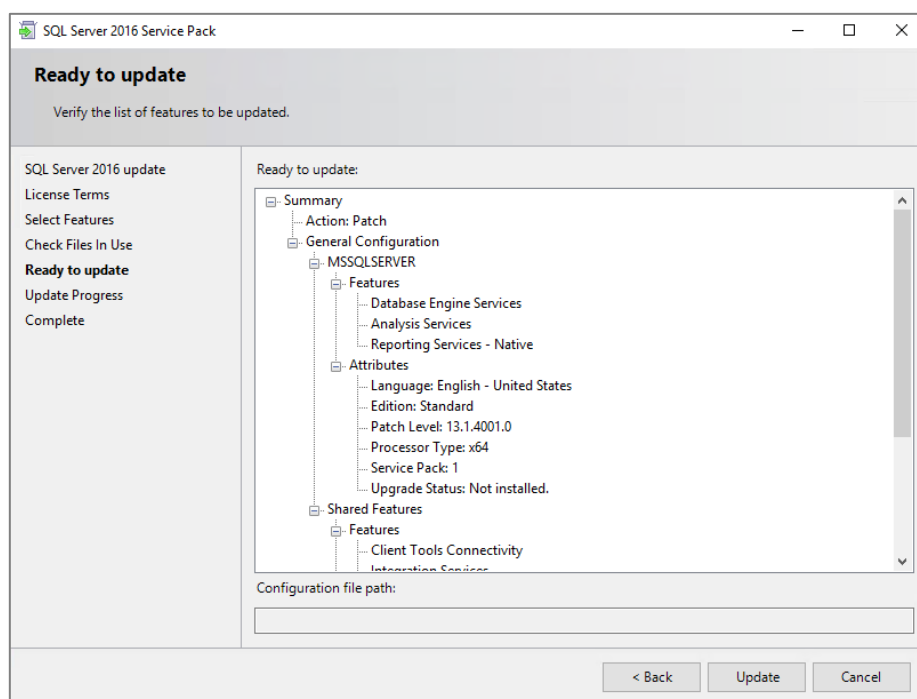


Figure 36 - Ready to update

7. The Update Progress screen as shown in Figure 37 - Update Progress then shows the update progress.

◇ No user interaction is required here.

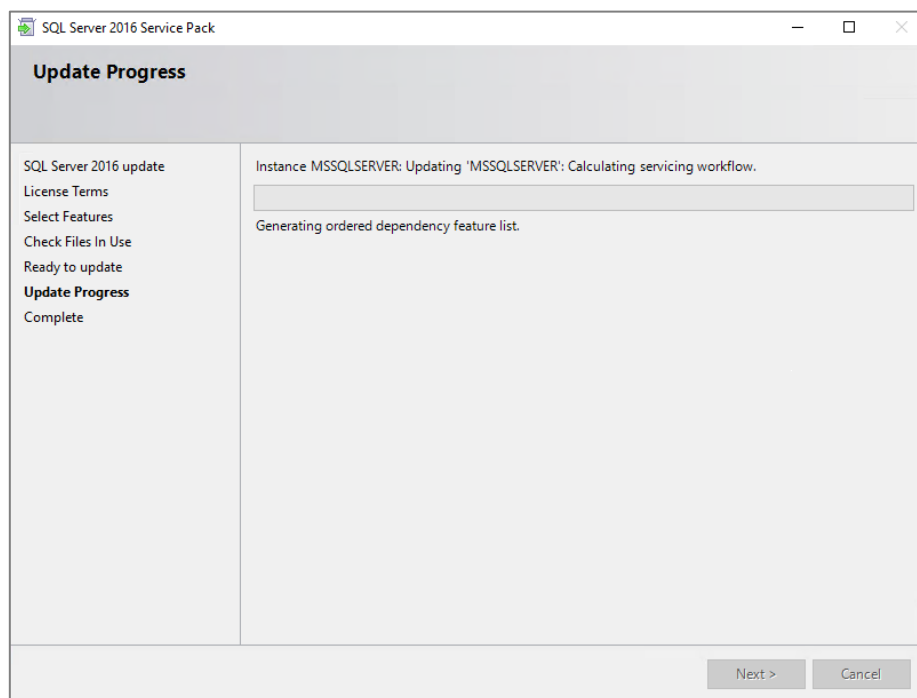


Figure 37 - Update Progress

8. Once the update is complete the Complete screen will be displayed as shown in Figure 38 - Update Complete. Click Close.

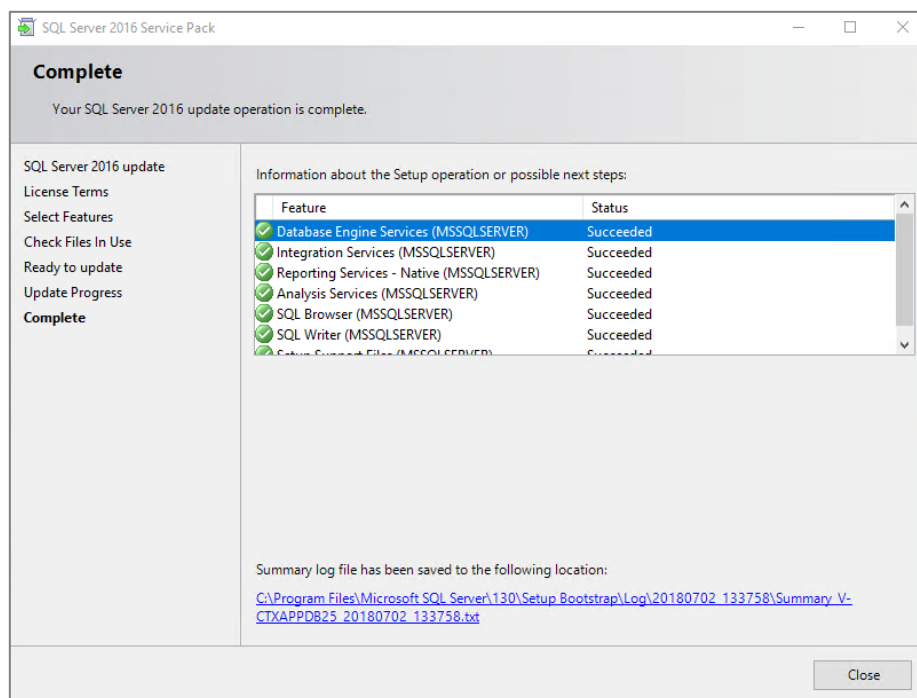


Figure 38 - Update Complete

4 Configure SQL Server to use TLS

It is recommended that SQL Server is configured to use TLS to ensure that all connections to the database are encrypted.

For full instructions on how to configure this see the following Microsoft website, however the instructions below can be followed:

<https://docs.microsoft.com/en-us/sql/database-engine/configure-windows/enable-encrypted-connections-to-the-database-engine?view=sql-server-2016>

4.1 Obtain and Install a Valid Certificate

To configure SQL Server to use TLS, a certificate needs to be available however there are strict requirements for the certificate to adhere to if it is not a domain wildcard certificate:

- The certificate must be signed by a valid Certificate Authority.
- The certificate must be issued for Server Authentication. This requires the Enhanced Key Usage property of the certificate to specify Server Authentication (1.3.6.1.5.5.7.3.1).
- The certificate must be created using the keyspec option of AT_KEYEXCHANGE.
- The SQL Server Service accounts must have the necessary permission to access the TLS certificate.
- The current system time must be after the valid from property and before the valid to property of the certificate.
- The certificate's common name must be the FQDN or hostname of the machine that SQL Server is installed on. If the hostname is used, the DNS suffix must be specified in the certificate.
- The certificate must be in either the local computer or current user certificate store.
- The certificate will need to be installed on both the SQL Server machine as well as any client machines (all application servers that communicate with the instance of SQL Server that will force encryption).

4.2 Configure SQL Server to use the Certificate

Once the certificate has been installed you will need to configure SQL Server to use this certificate and force the encryption.

4.2.1 Domain Wild Card Certificate

If the certificate to be used is a domain wild card certificate, then the configuration to use the certificate is required to be done making a registry change:

1. Open a command prompt with elevated permissions
2. Execute the following command to get a list of the certificates that are installed to the local computer

```
certutil -store "my"
```

If the certificate is installed for the local user, then execute the following command:

```
certutil -user -store "my"
```

3. Locate the certificate you wish to use and copy the Cert Hash value for this certificate.
4. If the value copied in the previous step contains spaces these need to be removed using a text editor.

5. Open the **Registry Editor**
 - a. Click the **Start** button
 - b. Search for **Regedit.exe**
 - c. Click the search result
6. Locate the SQL Server instance hive which is typically in the following location where <InstanceName> should be replaced with your installed instance name or MSSQLSERVER if you have installed the default instance:

```
Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Microsoft SQL Server\MSSQL13.<InstanceName>\MSSQLServer\SuperSocketNetLib
```
7. If there is a string value with the name **Certificate** skip to step 9.
8. If there is no string value with the name **Certificate** create one:
 - a. Right click on the right-hand panel of the registry editor.
 - b. Select New → String Value.
 - c. Enter the Name **Certificate**.
9. Right Click on the Certificate string value and select **Modify...**
10. In the Value data field enter the certificate hash copied in step 3 (or step 4 if spaces have had to be removed).
11. Open the SQL Server 2016 Configuration Manager
 - a. Click the **Start** button.
 - b. Search for **SQLServerManager13.msc**.
 - c. Click the search result.
12. In the left-hand side of the window, expand the **SQL Server Network Configuration** tree and right click the **Protocols for <instance name>** where instance name is the instance that you wish to configure to use TLS.
13. Select **Properties**.
14. In the Properties dialog that opens, on the Flags tab, set **Force Encryption** to be **Yes**.
15. Click **OK**.
16. A dialog will pop up confirming that changes will not take effect until the service is stopped and restarted.
17. Click **OK**.
18. In the left-hand side of the window, right click the **SQL Native Client 11.0 Configuration (32 bit)** node and select **Properties**.
19. In the Properties Dialog set **Force Protocol Encryption** to **Yes**.
20. Click **OK**.
21. A dialog will pop up confirming that changes will not take effect until the service is stopped and restarted.
22. Click **OK**.
23. In the left-hand side of the window, right click the **SQL Native Client 11.0 Configuration** node and select **Properties**.
24. In the Properties Dialog set **Force Protocol Encryption** to **Yes**.
25. Click **OK**

26. A dialog will pop up confirming that changes will not take effect until the service is stopped and restarted.
27. Click **OK**.
28. In the left-hand side of the window select the **SQL Server Services** node, restart all SQL Server Services by right clicking on each service and selecting **restart**.

4.2.2 All Other Certificates

This is done using SQL Server Configuration Manager:

1. Open the **SQL Server 2016 Configuration Manager**
 - a. Click the **Start** button.
 - b. Search for **SQLServerManager13.msc**.
 - c. Click the search result.
2. In the left-hand side of the window, expand the **SQL Server Network Configuration** tree and select **Protocols for <instance name>** where instance name is the instance that you wish to configure to use TLS.
3. Select **Properties**.
4. In the Properties dialog that opens, on the **Flags** tab, Set Force Encryption to be **Yes**.
5. In the Certificate drop down select the certificate that has been installed for this purpose. If the certificate is not visible it does not meet the requirements for SQL Server to use and the certificate should be regenerated adhering to the requirements specified in **4.1 Obtain and Install a Valid Certificate**.
6. Click **OK**.
7. A dialog will pop up confirming that changes will not take effect until the service is stopped and restarted.
8. Click **OK**.
9. In the left-hand side of the window, right click the **SQL Native Client 11.0 Configuration (32 bit)** node and select **Properties**.
10. In the Properties Dialog set **Force Protocol Encryption** to **Yes**.
11. Click **OK**.
12. A dialog will pop up confirming that changes will not take effect until the service is stopped and restarted.
13. Click **OK**.
14. In the left-hand side of the window, right click the **SQL Native Client 11.0 Configuration** node and select **Properties**.
15. In the Properties Dialog set **Force Protocol Encryption** to **Yes**.
16. Click **OK**.
17. A dialog will pop up confirming that changes will not take effect until the service is stopped and restarted.
18. Click **OK**.
19. In the left-hand side of the window select the **SQL Server Services** node, restart all SQL Server Services by right clicking on each service and selecting **restart**.