DELLEMC

Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020

Deployment guide with step-by-step instructions

Abstract

This paper provides step-by-step instructions for building a balanced configuration for a Microsoft® SQL Server® data warehouse workload and requirements for preparing the hardware platform and provisioning the OS to achieve a balanced, optimized 8TB configuration.

December 2017

Revisions

Date	Description
December 2017	Initial release

Acknowledgements

Author: Doug Bernhardt

Table of contents

DELLEMC

Overview

This guide provides step-by-step instructions to build a balanced configuration for a Microsoft® SQL Server® data warehouse workload, as specified in the companion reference architecture document, *8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020*. This guide also covers requirements for preparing the hardware platform and provisioning the OS to achieve a balanced, optimized 8TB configuration for a Microsoft SQL Server 2017 data warehouse by using Dell EMC™ PowerEdge™ R740 servers, Dell EMC SCv3020 storage arrays, and Microsoft Data Warehouse Fast Track (DWFT) principles.
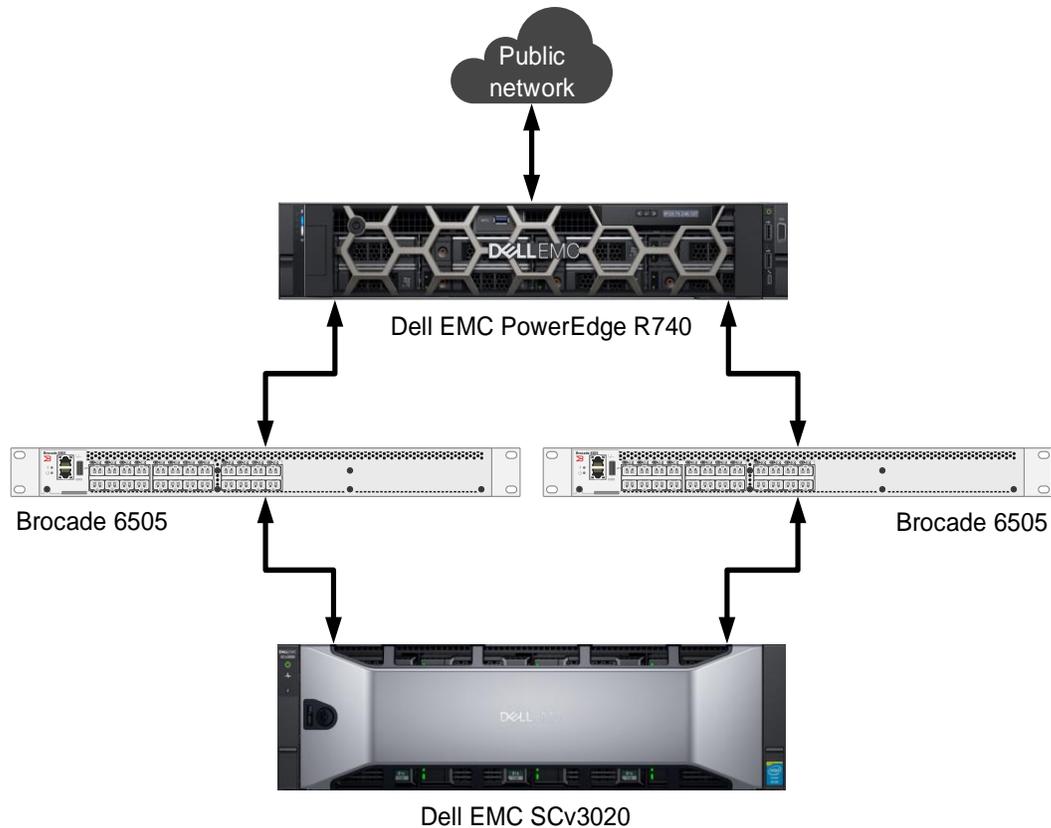
Figure 1   Single server reference architecture

Note: The 8TB solution includes both a single server configuration and a highly available (HA) configuration. For simplicity, this guide only covers the single server implementation.

DELLEMC

1 Solution requirements

This section lists the hardware and software components required to implement the single server reference architecture. The versions of firmware on the server used to validate the reference architecture are also listed.

Table 1   Hardware and software components

Component	Description	
Server	Dell EMC PowerEdge R740	
	Processors	One Intel® Xeon® Gold 6126 Processor (2.6GHz, 12 cores, 12 threads)
	Total cores	12
	Total logical processors	12 (Intel® Hyper-Threading Technology disabled)
	Total memory	128GB
	Network adapters	Minimum of one network adapter (1Gbps or 10Gbps based on requirements) Recommended to have more than one network adapter with load balancing configured
	Host bus adapters	One QLogic® QLE2662 dual port 16 Gbps FC HBA
Software	Operating system	Microsoft® Windows Server® 2016 Standard Edition
	Database software	SQL Server 2017 Standard Edition
Storage	Storage array	Dell EMC SCv3020 (SCOS v7.2.11)
	Disk drives	7 x 1.92TB read-intensive SSDs (2.5" SAS)
	SAN switches	Two Brocade® 6505 with 16 Gbps SFPs

Table 2   Server firmware versions

Hardware component	Firmware version
BIOS	1.0.7
Backplane 1	3.56
Dell™ 64 Bit uEFI Diagnostics	4301X09
Dell OS Driver Pack	17.05.21
Integrated Dell Remote Access Controller	3.00.00.00
Intel® Ethernet 10G 4P X520/l350 rNDC	18.0.16
Intel® Gigabit 4P X520/l350 rNDC	18.0.16
Lifecycle Controller	3.00.00.00
OS Collector	3.0
Power Supply	00.24.7D
QLogic QLE2662	09.00.06
System CPLD	1.0.1

DELLEMC

2 Deployment workflow

This section outlines the sequence of deploying the 8TB Data Warehouse Fast Track for SQL Server 2017 reference architecture using the Dell EMC PowerEdge R740 server and Dell EMC SCv3020 storage array.

To deploy the reference architecture, perform the following tasks:

1. Configure the Dell EMC SCv3020 storage array.
2. Configure the Dell EMC PowerEdge R740 server.
3. Install and configure the Microsoft Windows Server 2016 operating system.
4. Install and configure Microsoft SQL Server 2017 Standard Edition.

This guide assumes the reader has a general understanding of installing and configuring Microsoft Windows servers, Microsoft SQL Server, and Dell EMC SC Series arrays.

DELLEMC

3   Cabling requirements

Figure 2 shows how to cable the R740 server, the Fibre Channel (FC) switches, and the SCv3020 storage array.

Port 1 on each host bus adapter (HBA) in the server and ports 1 and 2 on each HBA in the SCv3020 should be connected to the same Brocade 6505 switch. Port 2 on each HBA in the server and ports 3 and 4 on each HBA in the SCv3020 should be connected to the other Brocade 6505 switch.

Dell EMC PowerEdge R740

Brocade 6505 (switch 1)

Brocade 6505 (switch 2)

Dell EMC SCv3020

■ FC front end (SW 1)   ■ FC front end (SW 2)
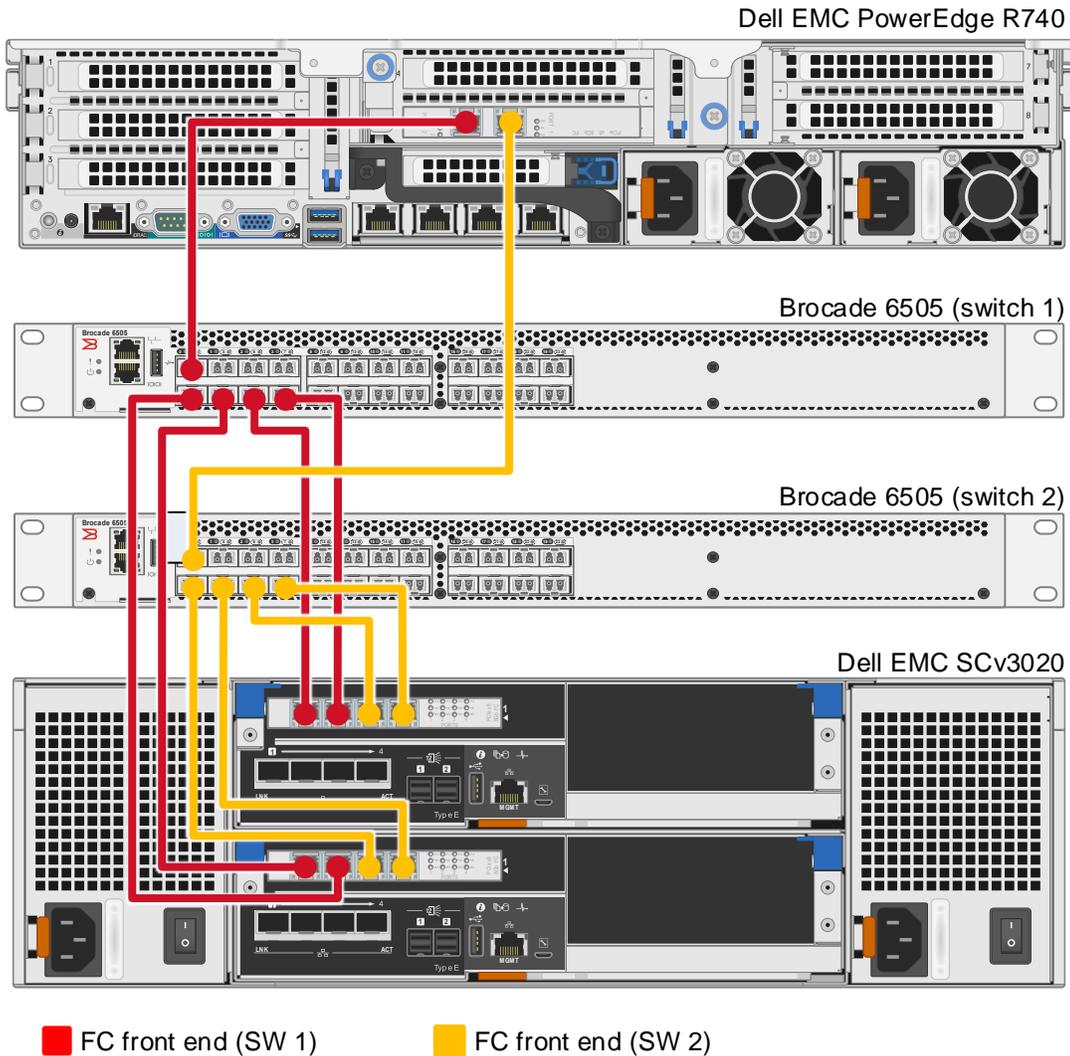
Figure 2   Single server configuration cabling diagram

4 Configure the SCv3020 storage array

This section describes the configuration of the SCv3020 storage array.

4.1 Configure local ports

The FC ports should be configured to use two fault domains in virtual port mode. Ports 1 and 2 from each controller should be put into fault domain 1 and ports 3 and 4 from each controller put into fault domain 2.

4.2 Configure disks

All 7 disks should be in the Assigned disk folder. One disk will automatically be defined as a hot spare, leaving 6 active disks.

4.3 Configure the storage type

The Assigned disk folder should be configured for single redundancy, using a 512KB page size.

4.4 Allow storage profile selection

In order to create a custom storage profile, you must allow the selection of storage profiles in your storage preferences.

To allow storage profile selection, perform the following steps:

1. Open the Dell Storage Manager (DSM) client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Right-click the SC Series array and select **Edit Settings**.
4. Click the **Preferences** tab.
5. Under Storage, below the Storage Profile drop-down list, select **Allow Storage Profile Selection**.
6. Click **OK**.

4.5 Turn off write cache

It is a best practice to disable write cache in all flash arrays.

To disable write cache, perform the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Right-click the SC Series array and select **Edit Settings**.
4. Click the **Storage** tab.
5. Under Cache, deselect **Write Cache Enabled**.
6. Click **OK**.

DELLEMC

4.6   Create the RAID 5 All Tiers storage profile

All SQL Server data volumes will use a custom storage profile to ensure that RAID 5 is always used.

To create the custom storage profile, perform the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Right-click **Storage Profiles** and select **Create Storage Profile**. The Create Storage Profile dialog box appears.
4. In the Name textbox, type **RAID 5 All Tiers**.
5. Under Data Writes, in the Write RAID Type drop-down list, select **Parity (RAID 5 / RAID 6).**
6. Under Snapshot Data, set the **Snapshot RAID Type** for Tier 1, Tier 2, and Tier 3 to **Parity (RAID 5 / RAID 6).**
7. Click **OK**.

4.7   Create the server object

A server object is used when presenting storage to a server. To create the server object, perform the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Right-click **Servers** and select **Create Server**. The **Create Server** dialog box appears.
4. In the Name textbox, enter the name of the server.
5. In the Operating System drop-down list, select **Windows Server 2016 Singlepath**. (The operating system definition will be changed after Windows has been installed.)
6. In the Host Bus Adapters list box, select all four FC ports for the server.
7. Click **OK**.

4.8   Remove the default snapshot profiles

Remove any default snapshot profiles by performing the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Right-click the SC Series array and select **Edit Settings**.
4. Click the **Preferences** tab.
5. Under Snapshot and to the right of Snapshot Profiles, click **Change**. The Select Snapshot Profiles dialog box appears.
6. At the top of the dialog box, uncheck all snapshot profiles in the list and click **OK**.
7. Click **OK**.

DELLEMC

4.9 Create the volumes

A total of eight SC Series volumes are used in the reference architecture and are listed in Table 3.

Table 3   SC Series volumes

Volume name	Storage profile	Volume size
Boot	Recommended (All Tiers)	200GB
MPHost	Recommended (All Tiers)	1GB
SQLSystem	Recommended (All Tiers)	20GB
SQLLog	Recommended (All Tiers)	Site Dependent
SQLData01	RAID 5 All Tiers	Site Dependent
SQLData02	RAID 5 All Tiers	Site Dependent
TempdbData01	Recommended (All Tiers)	Site Dependent
TempdbData02	Recommended (All Tiers)	Site Dependent

To create the SC Series volumes, perform the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. For each volume in Table 3, perform the following steps:

   a. Right-click **Volumes** and select **Create Volume.** The Create Volume dialog box appears.
   b. In the Name text box, enter the volume name.
   c. In the Size text box, enter the volume size.
   d. In the Volume Folder tree, select the desired volume folder.
   e. After Snapshot Profiles, verify that no snapshot profiles are listed.
   f. In the Storage Profile list box, select the appropriate storage profile.
   g. Click **OK**.

4.10 Map the boot volume to the server

Since the server is not using the MPIO version of the Windows Server 2016 operating system definition, only one path will be created for the boot volume. This is intentional because MPIO will need to be configured in the operating system before multiple paths can be used on a volume. The operating system definition will be changed to the MPIO version once Windows has been installed and configured.

To map the boot volume to the server, perform the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Expand the volume folder that contains the boot volume.
4. Right-click the boot volume and select **Map Volume to Server.** The Map Volume to Server dialog box appears.
5. Select the server and click **Next**.
6. Click **Advanced Options.**
7. Under Select LUN, select **Map volume using LUN 0**.
8. Click **Finish**.

10   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

5 Configure the PowerEdge R740 server

5.1 Update the firmware

The firmware update feature of the Lifecycle Controller can be used to update the firmware on the server. The Lifecycle Controller is accessible during the server boot cycle.

To update the firmware using the Lifecycle Controller, perform the following steps:

1. Reboot the server and press [F10] when prompted to enter the Lifecycle Controller.
2. On the left-hand side of the screen, click **Firmware Update**.
3. Click **Launch Firmware Update**.
4. On the Select Update Repository screen, leave **FTP Server** selected and click **Next**.
5. On the Enter Access Details screen, under Proxy Settings, uncheck **Enable Settings** and click **Next**.
6. On the Select Updates screen, available updates will have a check mark next to the component name. After verifying the list of selected updates, click **Apply**. This will apply the updates and reboot the server.
7. After rebooting, the server will enter the Lifecycle Controller. In some cases, it may be necessary to repeat this process until all updates have been applied.
8. To exit the Lifecycle Controller, click **Exit** in the upper right-hand corner of the screen.
9. In the Confirmation dialog box, click **Yes**. The server will reboot.

5.2 Configure the System BIOS

The BIOS can be configured using System Setup, which is accessible during the server boot cycle.

To configure the BIOS using System Setup, perform the following steps:

1. Reboot the server and press [F2] when prompted to enter System Setup.
2. On the System Setup main menu, click **System BIOS**.
3. Set the system profile to **Performance**:

   a. Click System Profile Settings.
   b. In the System Profile drop-down list, select **Performance**.
   c. Click **Back** to exit System Profile Settings.

4. Enable Hyper Threading:

   a. Click Processor Settings.
   b. For the Logical Processor option, select **Enabled**.
   c. Click **Back** to exit Processor Settings.

5. Click **Finish** to exit System BIOS.
6. Click **Finish** to exit System Setup.
7. On the **Confirm Exit** dialog box, click **Yes**. The server will reboot.

DELLEMC

5.3   Reset the HBAs to default settings

The HBAs can be reset using QLogic Fast!UTIL, which is accessible during the server boot cycle.

To reset the HBAs using QLogic Fast!UTIL, perform the following steps:

1. Reboot the server and press [Ctrl]+[Q] when prompted to enter QLogic Fast!UTIL.
2. In Select Host Adapter, select the first port in the list and press [Enter].
3. Reset the HBA port to factory defaults:

    a. In Fast!UTIL Options, select **Configuration Settings** and press [Enter].
    b. In Configuration Settings, select **Restore Default Settings** and press [Enter].
    c. After Adapter Defaults Restored is displayed, press any key to return to the Configuration Settings screen.
    d. Press [Esc] to exit Configuration Settings. When prompted, select **Save Changes** and press [Enter].

4. In Fast!UTIL Options, select **Select Host Adapter** and press [Enter].
5. In Select Host Adapter, select the next port in the list and press [Enter].
6. Using the instructions in step 3, reset the port to factory defaults. Repeat these steps until all four ports have been configured.

5.4   Configure the HBAs

The HBAs can be configured using QLogic Fast!UTIL, which is accessible during the server boot cycle. This section assumes that QLogic Fast!UTIL is still open on the server after completing the previous procedure.

To configure the HBAs using QLogic Fast!UTIL, perform the following steps:

1. In **Fast!UTIL Options,** select **Select Host Adapter** and press **[Enter].**
2. In **Select Host Adapter**, select the first port in the list and press [**Enter**].
3. Set the parameters on the HBA port according to best practices:

    a. In Configuration Settings, select **Adapter Settings** and press [Enter].
    b. In Adapter Settings:

        i.   Set Host Adapter BIOS to **Enabled**.
        ii. Set Connection Options to **1 (Point to point only).**
        iii. Press [Esc] to exit Adapter Settings.

    c. In Configuration Settings, select **Advanced Adapter Settings** and press [Enter].
    d. In Advanced Adapter Settings:

        i.   Set Enable LIP Reset to **Yes**.
        ii. Set Login Retry Count to **60**.
        iii. Set Port Down Retry Count to **60**.
        iv. Set Link Down Timeout to **30**.
        v.   Press [Esc] to exit Advanced Adapter Settings.

    e. Press [Esc] to exit Configuration Settings. When prompted, select **Save Changes** and press [Enter].

4. In Fast!UTIL Options, select **Select Host Adapter** and press [Enter].

5. In Select Host Adapter, select the next port in the list and press [Enter].
6. Using the instructions in step 3, set the parameters according to best practices. Repeat these steps until all four ports have been configured.

5.5   Configure the HBA port to boot from SAN

Only one path exists for the mapping between the server and the boot volume. The HBA port for that path needs to be configured to boot from SAN. Once the server is configured to use MPIO, the steps in this section will need to be repeated to configure each HBA port to boot from SAN. This section assumes that QLogic Fast!UTIL is still open on the server.

To configure the HBA port to boot from SAN using QLogic Fast!UTIL, perform the following steps:

1. In Fast!UTIL Options, select **Select Host Adapter** and press [Enter].
2. In Select Host Adapter, select the first port in the list and press [Enter].
3. In Fast!UTIL Options, select **Scan Fibre Devices** and press [Enter]. If a device is displayed, this is the port used for the boot volume. If a device is not displayed, go back and select the next port in the host adapter list and scan for devices. Keep repeating until the scan displays a device. Once the port for the boot volume is discovered, press [Esc] to exit Scan Fibre Devices.
4. In Fast!UTIL Options screen, select **Configuration Settings** and press [Enter].
5. In Configuration Settings screen, select **Selectable Boot Settings and** press [Enter].
6. In Selectable Boot Settings:

   a. Set Selectable Boot to **Enabled**.
   b. Select the first boot port entry and press [Enter].
   c. Select the boot device from the list and press [Enter].
   d. Press [Esc] to exit Selectable Boot Settings.

7. Press [Esc] to exit Configuration Settings. When prompted, select **Save changes** and press [Enter].
8. Press [Esc] to exit Fast!UTIL. When prompted, select **Reboot System** and press [Enter]. The server will reboot.

13   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell
EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

6 Install and configure Microsoft Windows Server 2016

6.1 Install Microsoft Windows Server 2016

The OS Deployment feature of the Lifecycle Controller can be used to install the operating system. One advantage of this approach is that Windows will be installed with the proper drivers for the R740 server.

To install Windows using the Lifecycle Controller, perform the following steps:

1. Reboot the server and press [F10] when prompted to enter Lifecycle Controller.
2. Click **OS Deployment** on the left-hand side of the screen.
3. Click **Deploy OS.**
4. Under Boot Mode, select **BIOS** if not already be selected.
5. Under Available Operating Systems, select **Microsoft Windows Server 2016** and click **Next.**
6. Under Select Installation Mode, select **Manual Install** and click **Next**.
7. Insert the Windows Server 2016 install media and click **Next**.
8. Review the options that were selected on the previous screens. If the information is correct, click **Finish**. The server will reboot. If prompted to boot from the Windows install disk, press any key. The Windows Setup screen will appear.
9. On the first screen, enter the following and click **Next**.

    – Language to install
    – Time and currency format
    – Keyboard or input method

10. On the next screen, click **Install Now**. The Windows Setup dialog box will appear.
11. On the Select the operating system you want to install screen, select **Windows Server 2016 Standard (Desktop Experience)** and click **Next**.
12. On the Applicable notices and License terms screen, accept the license terms by selecting **I accept the license terms** and click **Next**.
13. On the screen, Which type of installation do you want?, click **Custom: Install Windows only (advanced).**
14. On the screen, Where do you want to install Windows?, click **Drive 0** and click **Next.**
15. The Windows installation will start. After it is done, the server will reboot.
16. On the Customize Settings screen, enter the Administrator password and click **Finish**.

6.2 Configure Microsoft Windows Server 2016

Once Windows is installed, it needs to be configured for the Data Warehouse Fast Track workload.

To configure Windows, perform the following prerequisite steps:

1. Press [Ctrl]+[Alt]+[Delete] and log in as Administrator.
2. On the Networks pop-up window on the right-hand side of the screen, click **No**.

To complete the configuration, perform the steps in the following subsections in order.

14   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

6.2.1   Set the server name (optional)

1. In Server Manager, click **Local Server** on the left-hand side of the screen.
2. In the Properties pane, click the current server name next to the label, Computer name. The System **Properties** dialog box appears.
3. Click **Change**. The Computer Name/Domain Changes dialog box appears.
4. In the Computer name text box, enter the server name and click **OK**.
5. Click **OK** to acknowledge the computer restart.
6. Click **Close** to exit System Properties.
7. Click **Restart Now**. The server will reboot. When the server is back online, login as **Administrator**.

6.2.2   Set the IP address (optional)

1. In Server Manager, click **Local Server** on the left-hand side of the screen.
2. In the Properties pane, click **IPv4 address assigned by DHCP, IPv6 enabled** next to the label for the active Ethernet port. The Network Connections window will appear.
3. Right-click the icon for the active Ethernet port and select **Properties**.
4. Select **Internet Protocol Version 4 (TCP/IPv4)** in the list box and click **Properties**. The Internet Protocol Version 4 (TCP/IPv4) Properties dialog box appears.
5. Select **Use the following IP address** and enter the following:

   – IP address
   – Subnet
   – Gateway

6. Select **Use the following DNS** server addresses and enter the following:

   – Preferred DNS server
   – Alternate DNS server

7. Click **OK**.
8. Click **Close**.
9. On the Networks pop-up window on the right-hand side of the screen, click **No**.
10. Close the Network Connections window.

6.2.3   Enable Remote Desktop (RDP) (optional)

1. In Server Manager, click **Local Server** on the left-hand side of the screen.
2. In the Properties pane, click **Disabled** next to the label **Remote Desktop**. The System Properties dialog box appears.
3. In the Remote Desktop pane, select **Allow remote connections to this computer.**
4. A Remote Desktop Connection dialog box appears, stating that the Remote Desktop Firewall exception will be enabled. Click **OK**.
5. Click **OK**.

6.2.4   Install the Multipath I/O feature

1. In Server Manager, click **Local Server** on the left-hand side of the screen.
2. Scroll down until the Roles and Features pane is visible.
3. In the Tasks drop-down list at the top of the pane, select **Add Roles and Features**. The Add Roles and Features wizard will start.
4. On the Before you begin screen, click **Next**.

15   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell
EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

5. On the Select installation type screen, select **Role-based or feature-based installation**, and click Next.
6. On the Select destination server screen, select the server and click **Next**.
7. On the Select server roles screen, click **Next** without selecting any roles.
8. On the Select features screen, perform the following:

    a. Scroll down and select **Multipath I/O.**
    b. Click **Next**.

9. Click **Install**.
10. When the installation is complete, click **Close**.
11. Clear the installations completion message in Server Manager:

    a. Click the flag icon in the menu bar.
    b. Click the **X** to close the feature installation message.
    c. Click the flag icon in the menu bar.

6.2.5   Remove install disk

Eject the Windows installation disk from the server.

6.2.6   Set the time zone of the server (optional)

1. Place the cursor over the time in the lower left-hand corner of the screen.
2. Right-click and select **Adjust date/time**. The Settings window will appear.
3. Under Time zone, select the correct time zone in the drop-down list.
4. Close the Settings window.

6.2.7   Configure MPIO

1. Open the Control Panel.
2. In the View by drop-down list, select **Small icons.**
3. Click the **MPIO** icon. The MPIO Properties dialog box appears.
4. Click **Add**. The Add MPIO Support dialog box appears.
5. In the Device Hardware Id text box, enter **COMPELNTCompellent Vol** (there is a space between COMPELNTCompellent and Vol) and click **OK**.
6. The Reboot Required dialog box appears.
7. Click **Yes**. The server will reboot. When the server is back online, log in as Administrator.

6.2.8   Apply MPIO best practices

To apply best practices settings to the server, use the PowerShell script provided in the document, *Dell EMC SC Series Storage: Microsoft Multipath I/O Best Practices*. After running the PowerShell script, reboot the server. When the server is back online, log in as Administrator.

6.2.9   Set the Power Plan

Set the **Power Plan** to **High performance**:

1. Open the Control Panel.
2. Click the **Power Options** icon.
3. In the Power Options window, under Preferred plans, select **High performance.**
4. Close the Power Options window.

DELLEMC

6.2.10 Remove SMBv1 (optional)

1. Run the following PowerShell command:

```
Remove-WindowsFeature -Name "FS-SMB1"
```

2. Reboot the server. When the server is back online, log in as Administrator.

6.2.11 Configure Windows Updates (optional)

1. Click the start icon.
2. Click the settings icon.
3. Click **Update & security.**
4. Under **Update Status**, click **Check for updates.**
5. Apply all important updates.
6. Repeat until there are no results after clicking **Check for updates** and **Update Status** shows **Your device is up to date**.

6.2.12 Create a local SQL Server service account

Create a local SQL Server service account called **SQLService**:

1. Open **Computer Management.**
2. Expand **Local Users and Groups.**
3. Right-click **Users** and select **New User**. The New User dialog box appears.
4. In the User name text box, enter **SQLService**.
5. In the Description text box, enter **SQL Server service account**.
6. In the Password and Confirm password text boxes, enter the password.
7. Deselect **User must change password at next logon.**
8. Select **Password never expires**.
9. Click **Create**.
10. Click **Close**.
11. Close the Computer Management window.

6.2.13 Lock pages in memory

Grant the **Lock pages in memory** right to the SQL Server service account:

1. Right-click the **Start** icon and select **Run**.
2. In the **Open** text box, enter **secpol.msc.** The Local Security Policy window appears.
3. Expand **Local Policies.**
4. Select **User Rights Assignment.**
5. In the Policy list, double-click **Lock pages in memory.** The Lock pages in memory Properties dialog box appears.
6. Click **Add User or Group**. The Select Users or Groups dialog box appears.
7. Enter **SQLService** in the text box.
8. Click **Check Names** and click **OK**.
9. Click **OK**.
10. Close the Local Security Policy window.

17   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell
EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

6.2.14 Change the optical drive letter (optional)

Change the drive letter for the optical drive to **Z:**

1. Open **Disk Management.**
2. Right-click the optical drive in the list of disks in the lower pane of the center of the screen and select **Change Drive Letter and Paths**. The Change Drive Letter and Paths dialog box appears.
3. Click Change. The Change Drive Letter or Path dialog box appears.
4. Select **Z** from the drop-down list of drive letters and click **OK**.
5. A Disk Management dialog box will appear asking if you want to continue. Click **Yes**.
6. Close the Computer Management window.

6.2.15 Configure the Windows Firewall

Because security requirements can vary significantly from site to site, the configuration of the firewall is not included in this document. Using default settings, the Windows firewall may interfere with RDP connections and with connections to SQL Server. During validation of the solution, the Windows firewall was disabled.

6.3 Configure the Windows volumes

This section describes the steps required to configure the SC Series volumes for use by Windows.

6.3.1 Change the operating system definition in the SC Series array

The SC Series server object will need to be changed to use the MPIO version of the operating system definition. This will allow volume mappings to use all available paths.

To change the operating system definition of the server object, perform the following steps:

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Expand the server folder that contains the server object.
4. Right-click the server and select **Edit Settings**. The Edit Server Settings dialog box appears.
5. In the Operating System drop-down list, select **Windows Server 2016 MPIO** and click **OK**.

6.3.2 Change boot volume mappings

Modify the mappings for the boot volume to take advantage of MPIO.

1. Open the DSM client and connect to the SC Series array.
2. Click the **Storage** tab.
3. Select the boot volume.
4. On the right-hand side of the volume tree, click the **Mappings** tab.
5. Click **Edit Settings**. The Edit Volume Mapping Settings dialog box appears.
6. Click **Continue**.
7. Under Configure Multipathing, in the Maximum number of paths per Server list box, select **32**.
8. Click **OK**.

6.3.3   Configure each HBA port in the server to boot from SAN

To take advantage of all paths for the boot volume, each HBA port needs to be configured to boot from SAN. The HBAs can be configured using QLogic Fast!UTIL, which is accessible during the server boot cycle.

To configure each HBA port using QLogic Fast!UTIL, perform the following steps:

1. Reboot the server and press [Ctrl]+[Q] when prompted to enter QLogic Fast!UTIL.
2. In Select Host Adapter, select the first port in the list and press [Enter].
3. For each HBA port, perform the following:

   a. In Fast!UTIL Options, select **Configuration Settings** and press [Enter].
   b. In Configuration Settings, select **Selectable Boot Settings** and press [Enter].
   c. Set Selectable Boot to **Enabled**.
   d. Select the first boot port entry and press [Enter].
   e. Select the first device from the list and press [Enter].
   f. Select the second boot port entry and press [Enter].
   g. Select the second device from the list and press [Enter].
   h. Press [Esc] to exit Selectable Boot Settings.
   i. Press [Esc] to exit Configuration Settings. When prompted, select **Save changes** and press [Enter].
   j. In Fast!UTIL Options, select **Select Host Adapter** and press [Enter].
   k. In Select Host Adapter, select the next port in the list and press [Enter].
   l. Using the instructions in this step (step 3), configure each HBA port to boot from SAN. Repeat the instructions until all four ports have been configured.

4. Press [Esc] to exit Fast!UTIL. When prompted, select **Reboot System** and press [Enter]. The server will reboot.

6.3.4   Map and format the remaining volumes.

All volumes, except for the boot volume, will need to be mapped to the server and formatted in Windows. These volumes, along with required parameters, are listed in Table 4.

Table 4   Remaining volumes to map and format

Volume name	Drive letter/ mount point	Volume label	Allocation unit
MPHost	M:\	MPHost	Default
SQLSystem	M:\ft\SQLSystem	SQLSystem	64K
SQLLog	M:\ft\SQLLog	SQLLog	64K
SQLData01	M:\ft\SQLData01	SQLData01	64K
SQLData02	M:\ft\SQLData02	SQLData02	64K
TempdbData01	M:\ft\TempdbData01	TempdbData01	64K
TempdbData02	M:\ft\TempdbData02	TempdbData02	64K

19   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

Execute the following steps for each volume, one at time, in order as the volumes are listed in Table 4:

1. Open the DSM client and connect to the SC Series array
2. Click the **Storage** tab.
3. Map the volume in the DSM client:

   a. Expand the volume folder containing the volume.
   b. Right-click the volume and select **Map Volume to Server.** The Map Volume to Server dialog box appears.
   c. Expand the server folder containing the server object.
   d. Select the server object and click **Next.**
   e. Review the information and click **Finish.**

4. Format the volume on the Windows server:

   a. Open Disk Management.
   b. Click **Action** in the menu bar and select **Rescan Disks**. Continue to rescan disks until the new disk appears. It may take multiple rescans.
   c. Right-click the new disk and select **Online**.
   d. Right-click the new disk and select **Initialize** Disk. The Initialize Disk dialog box appears.
   e. Under Use the following partition style for the selected disks, select **GPT**.
   f. Click **OK.**
   g. Right-click the unallocated space of the new disk and select **New Simple Volume**.
   h. The New Simple Volume Wizard starts.
   i. Click **Next**.
   j. On the Specify Volume Size screen, keep the default size, and click **Next.**
   k. On the Assign Drive Letter or Path screen, use the drive letter or mount point listed in Table 4 for the volume and click **Next.**
   l. On the Format Partition screen:

      i. In the File system drop-down list, select **NTFS**.
      ii. In the Allocation unit size drop-down list, select the value from Table 4.
      iii. In the Volume label text box, enter the value from Table 4 and click **Next**.

   m. Review the settings and click **Finish.**

Once the volumes have been mapped and formatted, perform the following steps:

1. Verify that the odd-numbered SQL Server data volumes are on one controller and the even-numbered SQL Server data volumes are on the other controller. This can be corrected by remapping the volume and specifying the correct controller.
2. Verify that the tempdb data volumes are on different controllers. This can be corrected by remapping the volume and specifying the correct controller.
3. Create a folder named **Data** on each mount point under **M:\ft**, with the exception of **M:\ft\SQLSystem**, by doing the following:

   a. Open the File Explorer.
   b. Select the mount point (for example, M:\ft\SQLData01) in the directory tree.
   c. Right-click the mount point, select **New**, and select **Folder**.
   d. Name the folder **Data**.
   e. Repeat until all mount points (except for M:\ft\SQLSystem) have a Data folder.

20   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

7   Install and configure Microsoft SQL Server 2017 Standard Edition

7.1   Install Microsoft SQL Server 2017 Standard Edition

To install SQL Server 2017 Standard Edition, perform the following steps:

1. Insert the SQL Server 2017 Standard Edition install media.
2. Double-click **Setup.exe**. The SQL Server Installation Center window will appear.
3. Click **Installation** in the pane on the left-hand side.
4. Click **New SQL Server stand-alone installation or Add features to an existing installation**. The SQL Server 2017 Setup dialog box will appear.
5. On the Product Key screen, enter the product key and click **Next**.
6. On the License Terms screen, select **I accept the terms** and click **Next**.
7. On the Microsoft Update screen, leave Use **Microsoft Update to check for updates** unselected and click **Next**.
8. On the Feature Selection screen, select the following features and click **Next:**
   – Database Engine Services
   – SQL Server Replication (optional)
   – Full-Text and Semantic Extractions for Search (optional)
   – Client Tools Connectivity
   – Client Tools Backwards Compatibility
   – Documentation Components

9. On the Instance Configuration screen, leave **Default Instance** selected and **MSSQLSERVER** in the Instance ID textbox. Click **Next**.
10. On the Server Configuration screen, do the following:

    On the Service Accounts tab:
    a. Enter the SQL Server service account name (.\SQLService) and password for the SQL Server Agent.
    b. Change the startup type for the **SQL Server Agent** to **Automatic.**
    c. Enter the **SQL Server service** account name (.\SQLService) and the **SQL Server Database Engine.**
    d. Select the Grant Perform Volume Maintenance Task privilege to SQL Server Database Engine Service.

    On the Collation tab, leave the **Collation** at the default setting and click **Next.**

11. On the Database Engine Configuration screen, do the following:

    On the Server Configuration tab:
    a. Under Authentication Mode, select **Mixed Mode**.
    b. Enter and confirm the sa password.
    c. Click Add Current User.

    On the Data Directories tab:
    a. In the Data root directory text box, enter **M:\ft\SQLSystem**.
    b. Leave the remaining directory text boxes as-is.

DELLEMC

On the TempDB tab:
   a. In the Number of files list box, enter **8.**
   b. Remove existing directories in the Data directories list box. Select the directory and click **Remove.**
   c. Add the directory **M:\ft\TempdbData01\Data.** Click **Add.** The Browse for Folder dialog box appears. Select the folder and click **OK.**
   d. Add the directory **M:\ft\TempdbData02\Data.** Click **Add**. The Browse for Folder dialog box appears. Select the folder and click **OK**.
   e. In the Log directory list box, enter **M:\ft\SQLLog\Data**.
   f. On the FILESTREAM tab (optional), select **Enable FILESTREAM for Transaction-SQL access** and click **Next**.

12. On the Ready to Install screen, click **Install**.
13. On the Complete screen, click **Close**.
14. Close the SQL Server Installation Center window.
15. Remove the SQL Server install media.

7.2 Install SQL Server Management Studio (optional)

Starting with SQL Server 2016, SQL Server Management Studio (SSMS) is no longer installed as part of the SQL Server installation. SSMS is installed separately.

1. Download the latest SSMS installation package from Microsoft.
2. Double-click the SSMS setup executable file (for example, SSMS-Setup-ENU.exe).
3. On the Welcome screen, click **Install**.
4. On the Setup Completed screen, click **Close**.

7.3 Configure Microsoft SQL Server 2017 Standard Edition

After SQL Server is installed, a few configuration changes need to be made to optimize SQL Server for the Data Warehouse Fast Track workload.

To configure SQL Server, perform the steps in the following subsections.

7.3.1 Open SQL Server Management Studio

1. The Connect to Server dialog box appears.
2. In the Server name text box, enter the server name.
3. In the Authentication drop-down list, select **Windows Authentication**.
4. Click **Connect**.

7.3.2 Turn on advanced configuration options

1. Click **New Query** on the toolbar.
2. Enter the following T-SQL:

```
EXECUTE sp_configure 'show advanced options', 1
GO
RECONFIGURE
GO
```

3. Click **!Execute** on the toolbar.

DELLEMC

7.3.3 Set SQL Server maximum memory

Set the SQL Server maximum memory to 112 GB:

1. Click **New Query** on the toolbar.
2. Enter the following T-SQL:

```
EXECUTE sp_configure 'max server memory (MB)', '114688'
GO
RECONFIGURE
GO
```

3. Click **!Execute** on the toolbar.

7.3.4 Expand tempdb files

1. Click **New Query** on the toolbar.
2. Enter the following T-SQL to expand the existing tempdb files, replacing ***<log file size>*** and ***<data file size>*** with the appropriate file size:

```
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'templog',
      SIZE = <log file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'tempdev',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp2',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp3',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp4',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp5',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp6',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp7',
      SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
    ( NAME = N'temp8',
      SIZE = <data file size> )
```

3. Click **!Execute** on the toolbar.

23   Deploying the 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell
EMC PowerEdge R740 and SCv3020 | 3466-CD-SQL

DELLEMC

8 Verify the deployment

Use telnet from a client machine to verify that applications can successfully connect to the database server.

Note: The telnet client must already be installed on the client machine.

Perform the following steps on a client machine:

1. Open the command prompt.
2. Type **telnet *<ip address>* 1433**, replacing *<ip address>* with the IP address of the SQL Server machine, and press [Enter]. A blank screen will be displayed if the connection is successful.
3. Press [Ctrl] + []] to close the telnet connection.
4. Type **quit** to exit telnet.
5. Close the command prompt.

DELLEMC

A   Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

Dell TechCenter is an online technical community where IT professionals have access to numerous resources for Dell EMC software, hardware, and services.

Storage Solutions Technical Documents on Dell TechCenter provide expertise that helps to ensure customer success on Dell EMC storage platforms.

A.1   Related documentation

See the following referenced or recommended resources related to this document:

- Dell SQL Server Solutions
- Dell Data Warehouse Fast Track for SQL Server Advisor
- Dell Storage technical content on Dell TechCenter
- 8TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R740 and SCv3020