



# Deploying the 55TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2014 using PowerEdge R730 and Dell Storage SC4020

Dell Storage Engineering  
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## 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, [55TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2014 using PowerEdge R730 and Dell Storage SC4020](#). This guide also covers requirements for preparing the hardware platform and provisioning the OS to achieve a balanced, optimized 55TB configuration for a Microsoft SQL Server 2014 data warehouse by using Dell™ PowerEdge™ R730 servers, Dell Storage SC4020 storage arrays, and Microsoft Data Warehouse Fast Track (DWFT) principles.

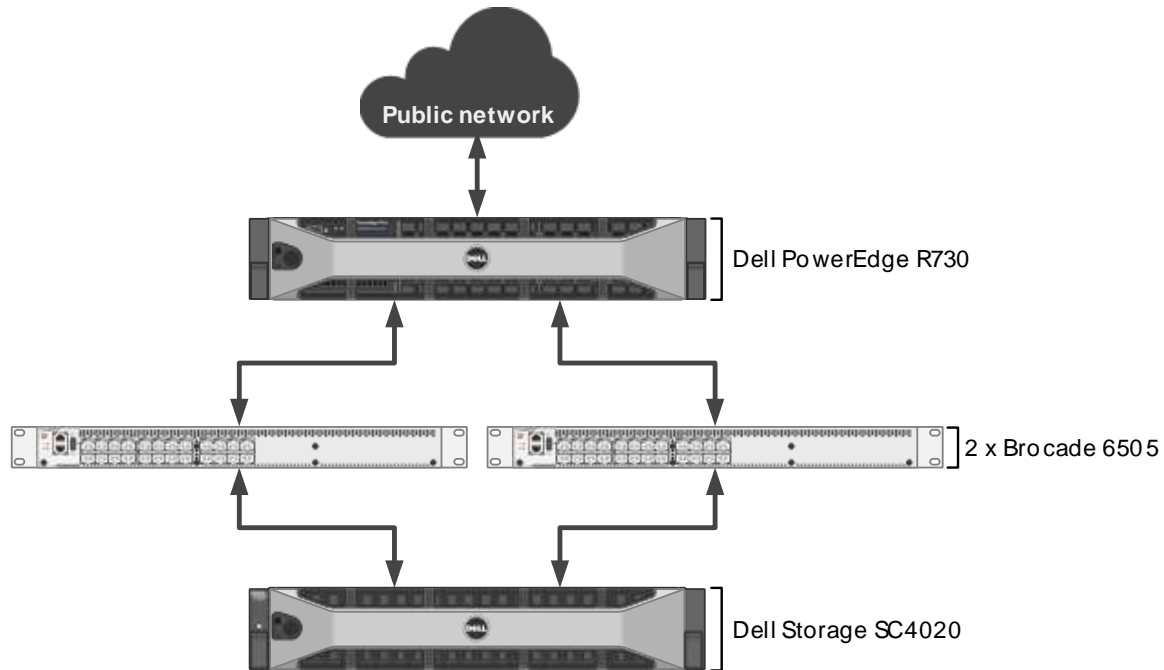


Figure 1 Single server reference architecture

**Note:** The 55TB solution includes both a single server configuration and a highly available (HA) configuration. For simplicity, this guide only covers the single server implementation.

# 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	PowerEdge R730	
	Processors	2 x Intel® Xeon® Processor E5-2697 v3 (2.6Ghz, 14 cores, 28 threads)
	Total cores	28
	Total logical processors	56 (Intel Hyper-Threading Technology enabled)
	Total memory	768 GB
	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	4 x QLogic® QLE2562 dual port 8 Gbps FC HBA
Software	Operating system	Microsoft® Windows Server® 2012 R2 Standard Edition
	Database software	SQL Server 2014 Enterprise Edition
Storage	Storage array	1 x Dell Storage SC4020 (SCOS v6.5.20)
	Disk drives	18 x 1.6 TB read intensive SSDs (2.5" SAS)
	SAN switches	2 x Brocade® 6505 with 8 Gbps SFPs

**Table 2** Server firmware versions

Hardware component	Firmware version
BIOS	1.1.4
Dell 64 Bit uEFI Diagnostics	4239A14
Dell OS Single Driverpack for 13G	14.10.00, A00
Integrated Dell Remote Access Controller	2.02.01.01
Intel Ethernet 10G 4P X520/I350 rNDC	16.0.24
Intel Gigabit 4P X520/I350 rNDC	16.0.24
Lifecycle Controller	2.02.01.01



Hardware component	Firmware version
OS Collector	OSC_1.0
Power Supply	00.24.35
System CPLD	1.0.1



## 2 Deployment workflow

This section outlines the sequence of deploying the 55TB Data Warehouse Fast Track for SQL Server 2014 reference architecture using the Dell PowerEdge R730 server and Dell Storage SC4020 storage array.

To deploy the reference architecture, perform the following tasks:

1. Configure the Dell Storage SC4020 storage array.
2. Configure the Dell PowerEdge R730 server.
3. Install and configure Microsoft Windows Server 2012 R2 operating system.
4. Install and configure Microsoft SQL Server 2014 Enterprise Edition.

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





### 3 Cabling requirements

The diagram in Figure 2 shows how to cable the R730 server, the Fibre Channel (FC) switches, and the SC4020 storage array.

Port 1 on each host bus adapter (HBA) in the server and ports 1 and 2 on each module in the SC4020 should be connected to the same Brocade 6505 switch. Port 2 on each HBA in the server and ports 3 and 4 on each module in the SC4020 should be connected to the other Brocade 6505 switch.

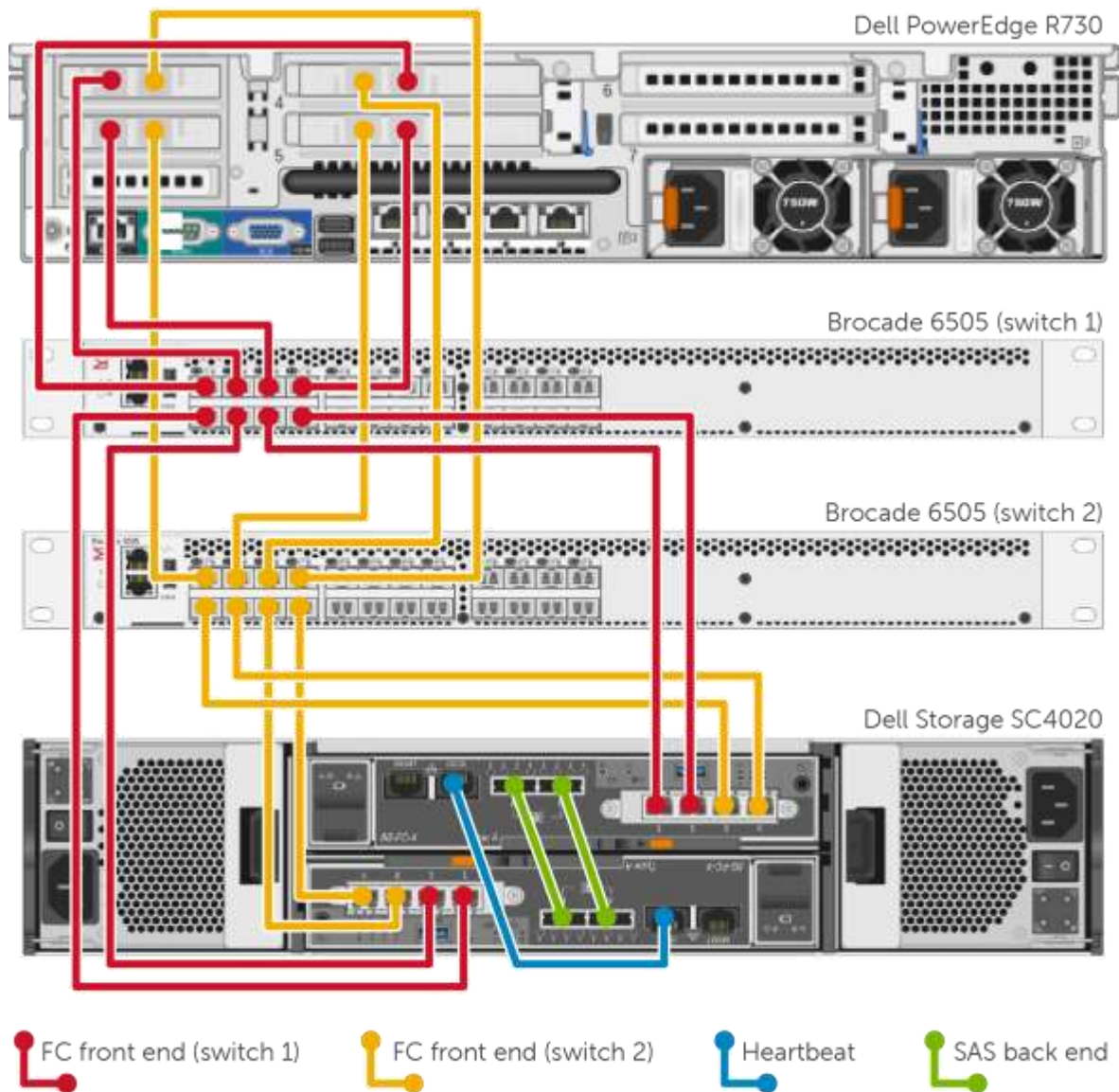


Figure 2 Single server configuration cabling diagram

## 4 Configure the Dell Storage SC4020 storage array

This section describes the configuration of the SC4020 storage array.

### 4.1 Configure local ports

The front-end Fibre Channel (FC) ports and back-end SAS ports can be configured using the **Configure Local Ports** wizard.

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 0 and ports 3 and 4 from each controller put into fault domain 1. In addition, all eight ports should be configured as front-end ports by selecting **Front End** for the purpose.

All four SAS ports should be configured as back-end ports by selecting **Back End** for the purpose.

### 4.2 Configure disks

All 18 disks should be added to the **Assigned** disk folder. One disk should be defined as a hot spare, leaving 17 active disks.

### 4.3 Configure the disk folder

The **Assigned** disk folder should be configured for single redundancy, using a 2MB page size.

### 4.4 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 Storage Center GUI.
2. Expand **Storage**.
3. Right-click **Storage Profiles** and select **Create Storage Profile**. The **Create Storage Profile** dialog box appears.
4. In the **RAID Type Used** frame, select **RAID 5/RAID 6 only**.
5. In the **Storage Tiers Used** frame, select all tiers and click **Continue**.
6. In the **Name** textbox, type **RAID 5 All Tiers**.
7. Click **Create Now**.



## 4.5 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 Storage Center GUI.
2. Right-click **Servers** and select **Create Server**. The **Create Server** dialog box appears.
3. Select all eight FC ports for the server and click **Continue**.
4. In the server folder list, select the desired server folder.
5. In the **Name** textbox, enter the name of the server.
6. In the **Operating System** drop-down list, select **Windows 2012** and click **Continue**. (The operating system definition will be changed after Windows has been installed.)
7. Click **Create Now**.

## 4.6 Create the volumes

A total of 14 Storage Center volumes are used in the reference architecture and are listed in Table 3.

**Table 3** Storage Center volumes

Volume name	Storage profile	Volume size
Boot	Recommended (All Tiers)	200 GB
MPHost	Recommended (All Tiers)	1 GB
SQLSystem	Recommended (All Tiers)	20 GB
SQLLog	Recommended (All Tiers)	Site Dependent
SQLData01	RAID 5 All Tiers	Site Dependent
SQLData02	RAID 5 All Tiers	Site Dependent
SQLData03	RAID 5 All Tiers	Site Dependent
SQLData04	RAID 5 All Tiers	Site Dependent
SQLData05	RAID 5 All Tiers	Site Dependent
SQLData06	RAID 5 All Tiers	Site Dependent



Volume name	Storage profile	Volume size
SQLData07	RAID 5 All Tiers	Site Dependent
SQLData08	RAID 5 All Tiers	Site Dependent
TempdbData01	Recommended (All Tiers)	Site Dependent
TempdbData02	Recommended (All Tiers)	Site Dependent

To create the Storage Center volumes, perform the following steps:

1. Open the Storage Center GUI.
2. Configure volume defaults to allow a Storage Profile to be selected:
  - a. Right-click the Storage Center name in the upper left-hand side of the screen and select **Configure My Volume Defaults**.
  - b. Click the **Advanced** tab. (The **Advanced** tab looks like a button.)
  - c. Select **Allow Storage Profile selection** and click **OK**.
5. Expand **Storage** in the pane on the left-hand side of the screen.
6. For each volume in Table 3, perform the following steps:
  - a. Right-click **Volumes** and select **Create Volume**. The **Create Volume** dialog box appears.
  - a. In the **Size** text box, enter the volume size.
  - b. Click **Advanced**.
  - c. Select the appropriate storage profile and click **Continue**.
  - d. Deselect any selected Replay Profiles and click **Continue**.
  - e. Select the desired volume folder.
  - f. In the **Name** text box, enter the volume name.
  - g. Click **Continue** and click **OK**.



## 4.7 Map the boot volume to the server

Since the server is not using the MPIO version of the Windows Server 2012 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 operation 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 Storage Center GUI.
2. Expand the volume folder that contains the boot volume.
3. Right-click the boot volume and select **Map Volume to Server**.
4. Select the server and click **Continue**.
5. Click **Advanced**.
6. Select **Map volume using LUN 0** and click **Continue**.
7. Click **Create Now**.



## 5 Configure the Dell PowerEdge R730 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. On **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:
  - h. Click **System Profile Settings**.
  - i. In the **System Profile** drop-down list, select **Performance**.
  - j. Click **Back** to exit **System Profile Settings**.
7. Enable hyper-threading:
  - a. Click **Processor Settings**.
  - b. For the **Logical Processor** option, select **Enabled**.
  - c. Click **Back** to exit Processor Settings.
8. Click **Finish** to exit System BIOS.
9. Click **Finish** to exit System Setup.
10. On the **Confirm Exit** dialog box, click **Yes**. The server will reboot.



## 5.3 Configure the HBAs

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

To configure 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.
11. In **Select Host Adapter**, select the first port in the list and press **Enter**.
12. 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.
13. 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. Set **Execution Throttle** to **256**.
    - vi. Press **Esc** to exit Advanced Adapter Settings.
  - e. Press **Esc** to exit Configuration Settings. When prompted, select **Save Changes** and press **Enter**.
14. In **Fast!UTIL Options**, select **Select Host Adapter** and press **Enter**.
15. In **Select Host Adapter**, select the next port in the list and press **Enter**.
16. Using the instructions in steps 3 and 4, reset the port to factory defaults and set the parameters according to best practices. Repeat these steps until all 8 ports have been configured.



## 5.4 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 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**.
17. In **Select Host Adapter**, select the first port in the list and press **Enter**.
18. 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.
19. In **Fast!UTIL Options** screen, select **Configuration Settings** and press **Enter**.
20. In **Configuration Settings** screen, select **Selectable Boot Settings** and press **Enter**.
21. 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.
22. Press **Esc** to exit Configuration Settings. When prompted, select **Save changes** and press **Enter**.
23. Press **Esc** to exit Fast!UTIL. When prompted, select **Reboot System** and press **Enter**. The server will reboot.





## 6 Install and configure Microsoft Windows Server 2012 R2

### 6.1 Install Microsoft Windows Server 2012 R2

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 R730.

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**. (BIOS should already be selected.)
5. Under **Available Operating Systems**, select **Microsoft Windows Server 2012 R2** and click **Next**.
6. Under **Select Installation Mode**, select **Manual Install** and click **Next**.
7. Insert the Windows Server 2012 R2 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 2012 R2 Standard (Server with a GUI)** and click **Next**.
12. On the **License terms** screen, accept the license terms by clicking on **I accept the license terms** and click **Next**.
13. On the **Which type of installation do you want?** screen, click **Custom: Install Windows only (advanced)**.
14. On the **Where do you want to install Windows?** screen, click **Drive 0** and click **Next**.
15. The Windows installation will start. After it is done, the server will reboot.
16. On the **Settings** screen, enter the Administrator password and click **Finish**.



## 6.2 Configure Microsoft Windows Server 2012 R2

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

To configure Windows, begin with these steps:

1. Press **Ctrl-Alt-Delete** and login 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.

### 6.2.1 Set the server name (optional)

1. In **Server Manager**, click **Local Server** on the left-hand side of the screen.
24. In the **Properties** pane, click the current server name next to the label **Computer name**. The **System Properties** dialog box appears.
25. Click **Change**. The **Computer Name/Domain Changes** dialog box appears.
26. In the **Computer name** text box, enter the server name and click **OK**.
27. Click **OK** to acknowledge the computer restart.
28. Click **Close** to exit System Properties.
29. Click **Restart Now**. The server will reboot. When the server is back online, log in 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.
30. 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.
31. Right-click the icon for the active Ethernet port and select **Properties**.
32. Select **Internet Protocol Version 4 (TCP/IPv4)** in the list box and click **Properties**. The **Internet Protocol Version 4 (TCP/IPv4) Properties** box appears.
33. Select **Use the following IP address** and enter the following:
  - IP address
  - Subnet
  - Gateway
34. Select **Use the following DNS server addresses** and enter the following:
  - Preferred DNS server
  - Alternate DNS server
35. Click **OK**.
36. Click **Close**.
37. On the **Networks** pop-up window on the right-hand side of the screen, click **No**.
38. 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.
39. In the **Properties** pane, click **Disabled** next to the label **Remote Desktop**. The **System Properties** box appears.
40. In the **Remote Desktop** pane, select **Allow Remote connections to this computer**.
41. A **Remote Desktop Connection** dialog box appears, stating that the Remote Desktop Firewall exception will be enabled. Click **OK**.
42. Click **OK**.

### 6.2.4 Install the .NET Framework 3.5 and Multipath I/O features

1. In **Server Manager**, click **Local Server** on the left-hand side of the screen.
43. Scroll down until the **Roles and Features** pane is visible.
44. 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.
45. On the **Before you begin** screen, click **Next**.
46. On the **Select installation type** screen, select **Role-based or feature-based installation**, and click **Next**.
47. On the **Select destination server** screen, select the server and click **Next**.
48. On the **Select server roles** screen, click **Next** without selecting any roles.
49. On the **Select features** screen, do the following:
  - a. Expand **.Net Framework 3.5 Features** and select **.Net Framework 3.5 (includes .NET 2.0 and 3.0)**.
  - b. Scroll down and select **Multipath I/O**.
  - c. Click **Next**.
9. On the **Confirm installation selections** screen, click **Specify an alternate source path**. A box appears.
10. In the **Path** text box, enter **E:\Sources\Sxs\** and click **OK**. If the Windows install disk is mounted using a different drive letter, use that drive letter instead of **E:\**.
11. Click **Install**.
12. When the installation is complete, click **Close**.
13. 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 **Date and Time** dialog box will appear.
3. Click **Change time zone**. The **Time Zone Settings** box will appear.
4. In the **Time zone** drop-down list, select the correct time zone and click **OK**.
5. Click **OK**.

### 6.2.7 Configure MPIO

1. Open **Control Panel**.
2. In the **View by** drop-down list, select **Small icons**.
3. Click the **MPIO** icon. The **MPIO Properties** box appears.
4. Click **Add**. The **Add MPIO Support** 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 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.

### 6.2.9 Configure Windows Updates (optional)

1. Open **Control Panel**.
2. Click the **Windows Update** icon.
3. In the **Windows Update** window, click **Change settings**.
4. In the **Change settings** window, under **Important Updates**, select **Download updates but let me choose whether to install them**.
5. Click **OK**. Windows Update will check for updates.
6. After the update check is complete, click **XX important updates are available**, where **XX** is the number of important updates.
7. On the **Select the updates you want to install** screen, leave all of the important updates selected and click **Install**.
8. After installation has completed, you will need to reboot the server. Click **Restart now**. When the server comes back online, log in as **Administrator**.
9. Repeat the process to check for Windows updates and install any important updates, until no more important updates are available.



### 6.2.10 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 **Computer Management**.

### 6.2.11 Lock pages in memory

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

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

### 6.2.12 Change the optical drive letter (optional)

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

1. Open **Computer Management**.
2. Click **Disk Management**.
3. 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.
4. Click **Change**. The **Change Drive Letter or Path** box appears.
5. Select **Z** from the drop-down list of drive letters and click **OK**.
6. A **Disk Management** dialog box will appear asking if you want to continue. Click **Yes**.
7. Close **Computer Management**.



### 6.2.13 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 Storage Center volumes for use by Windows.

### 6.3.1 Change the operating system definition in the Storage Center

The Storage Center 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 Storage Center GUI.
2. Expand the server folder that contains the server object.
3. Right-click the server and select **Properties**. The **Server Properties – FastTrack4S** box appears.
4. In the **Operating System** drop-down list, select **Windows 2012 MPIO** and click **OK**.

### 6.3.2 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.
50. In **Select Host Adapter**, select the first port in the list and press **Enter**.
51. For each HBA port, do 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 51), configure each HBA port to boot from SAN. Repeat the instructions until all 8 ports have been configured.
52. Press **Esc** to exit **Fast!UTIL**. When prompted, select **Reboot System** and press **Enter**. The server will reboot.



### 6.3.3 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
SQLData03	M:\ft\SQLData03	SQLData03	64K
SQLData04	M:\ft\SQLData04	SQLData04	64K
SQLData05	M:\ft\SQLData05	SQLData05	64K
SQLData06	M:\ft\SQLData06	SQLData06	64K
SQLData07	M:\ft\SQLData07	SQLData07	64K
SQLData08	M:\ft\SQLData08	SQLData08	64K
TempdbData01	M:\ft\TempdbData01	TempdbData01	64K
TempdbData02	M:\ft\TempdbData02	TempdbData02	64K

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

1. Map the volume on the Storage Center:
  - a) Open the Storage Center GUI.



- b) Expand the volume folder containing the volume.
  - c) Right-click the volume and select **Map Volume to Server**. The **Map Volume to Server** box appears.
  - d) Expand the server folder containing the server object.
  - e) Select the server object and click **Continue**.
  - f) Review the information and click **Create Now**.
2. Format the volume on the Windows server:
- a) Open **Computer Management**.
  - b) Expand **Storage**.
  - c) Right-click **Disk Management** and select **Rescan Disks**. Continue to rescan disks until the new disk appears. It may take multiple rescans.
  - d) Right-click the new disk and select **Online**.
  - e) Right-click the new disk and select **Initialize Disk**. The **Initialize Disk** dialog box appears.
  - f) Under **Use the following partition style for the selected disks**, select **MBR** for volumes that are less than 2TB. Select **GPT** for volumes that are 2TB or larger.
  - g) Click **OK**.
  - h) Right-click the unallocated space of the new disk and select **New Simple Volume...**
  - i) The **New Simple Volume Wizard** starts.
  - j) Click **Next**.
  - k) On the **Specify Volume Size** screen, keep the default size, and click **Next**.
  - l) 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**.
  - m) On the **Format Partition** screen:
    - i. In the **File system** drop down list, select **NTFS**.
    - ii. In the **Allocation unit size**, select the value from Table 4.
    - iii. In the **Volume label** text box, enter the value from Table 4 and click **Next**.
  - n) 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 File Explorer.
  - b) Select the mount point (for example, **M:\ft\SQLData01**) in the directory tree.
  - c) Right-click the mount point and select **New** and then **Folder**.
  - d) Name the folder **Data**.
  - e) Repeat until all mount points (except for **M:\ft\SQLSystem**) have a **Data** folder.

### 6.3.4 Configure MPIO for the SQL Server data volumes

Each SQL Server data volume needs to be configured with an MPIO policy of failover-only, with a unique active path. Each volume will have 16 paths to choose from. When choosing the active path, first sort by Path Id, and then select the path number listed in Table 5. The path number is the position of the path within the list that is sorted by Path Id. For example, if the path number is 4, choose the 4th path in the sorted list of paths.

**Table 5** Active path for each volume

Volume	Active path number
SQLData01	1
SQLData02	3
SQLData03	6
SQLData04	8
SQLData05	11
SQLData06	9
SQLData07	16
SQLData08	14



For each volume listed in Table 5, perform the following steps on the Windows server:

1. Open **Computer Management**.
2. Expand **Storage**.
3. Click **Disk Management**.
4. Right-click the Windows disk for the volume and select **Properties**. The disk properties box will appear.
5. Click the **MPIO** tab.
6. In the **Select the MPIO policy** drop-down list, select **Fail Over Only**.
7. In the path list, select all paths and click **Edit...** The **MPIO Path Details** box will appear.
8. In the **Path State** drop-down list, select **Standby** and click **OK**.
9. In the path list, select the path that should be active and click **Edit...** (Note: Clicking **Path Id** may not sort the path list properly.) The **MPIO Path Details** box will appear.
10. In the **Path State** drop-down list, select **Active/Optimized** and click **OK**.
11. Click **OK**.



## 7 Install and Configure Microsoft SQL Server 2014 Enterprise Edition

### 7.1 Install Microsoft SQL Server 2014 Enterprise Edition

To install SQL Server 2014 Enterprise Edition, perform the following steps:

1. Insert the SQL Server 2014 Enterprise 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 on **New SQL Server stand-alone installation or add features to an existing installation**. The **SQL Server 2014 Setup** 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 **Install Rules** screen, verify all tests passed and click **Next**.
9. On the **Setup Role** screen, select **SQL Server Feature Installation** and click **Next**.
10. 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
  - > Management Tools – Basic
  - > Management Tools – Complete
11. On the **Instance Configuration** screen, leave **Default Instance** selected and **MSSQLSERVER** in the **Instance ID** textbox. Click **Next**.
12. 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.
  - > On the **Collation** tab, leave the **Collation** at the default setting and click **Next**.



13. On the **Database Engine Configuration** screen, do the following:
  - > On the **Server Configuration** tab:
    - a. Select **Mixed Mode**.
    - d. Enter and confirm the sa password.
    - e. Click **Add Current User**.
  - > On the **Data Directories** tab:
    - a. In the **Data root directory** text box, enter **M:\ft\SQLSystem**.
    - f. Leave the remaining directory text boxes as-is.
  - > On the **FILESTREAM** tab (optional), select **Enable FILESTREAM for Transaction-SQL access** and click **Next**.
14. On the **Ready to Install** screen, click **Install**.
15. On the **Complete** screen, click **Close**.
16. Close the **SQL Server Installation Center** window.
17. Remove the SQL Server install media.

## 7.2 Configure Microsoft SQL Server 2014 Enterprise 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 in order.

### 7.2.1 Add startup parameters

Add the **-E** and **-T1117** startup parameters:

1. Open **SQL Server Configuration Manager**.
2. In the left-hand pane, click **SQL Server Services**.
3. Right-click the **SQL Server (MSSQLSERVER)** service and select **Properties**. The **SQL Server (MSSQLSERVER) Properties** box appears.
4. Click the **Startup Parameters** tab.
5. In the **Specify a startup parameter** text box, enter **-E** and click **Add**.
6. In the **Specify a startup parameter** text box, enter **-T1117** and click **Add**.
7. Click **OK**. A **Warning** dialog box appears, saying that the service needs to be stopped and restarted in order for the changes to take effect. Click **OK**.
8. Right-click **SQL Server (MSSQLSERVER)** and select **Restart**.
9. Close SQL Server Configuration Manager.

### 7.2.2 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**.

### 7.2.3 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
```
53. Click **!Execute** on the toolbar.

## 7.2.4 Set SQL Server maximum memory

Set the SQL Server maximum memory to 706 GB:

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

```
EXECUTE sp_configure 'max server memory (MB)', '722944'
GO
RECONFIGURE
GO
```
54. Click **!Execute** on the toolbar.

## 7.2.5 Set the max degree of parallelism (MAXDOP)

1. Click **New Query** on the toolbar.
2. Enter the following T-SQL to set the max degree of parallelism:  

```
EXECUTE sp_configure max degree of parallelism', '28'
GO
RECONFIGURE
GO
```
55. Click **!Execute** on the toolbar.

## 7.2.6 Configure the resource governor

1. Click **New Query** on the toolbar.
2. Enter the following T-SQL to configure the resource governor to limit memory grants to 12 percent:  

```
ALTER WORKLOAD GROUP [default]
WITH( request_max_memory_grant_percent = 12 )
GO
ALTER RESOURCE GOVERNOR RECONFIGURE;
GO
```
56. Click! **Execute** on the toolbar.



## 7.2.7 Configure tempdb

1. Move the existing tempdb files:
  - a. Click **New Query** on the toolbar.
  - b. Enter the following T-SQL to move the existing tempdb files:

```
ALTER DATABASE tempdb MODIFY FILE
( NAME      = N'templog',
  FILENAME  = N'M:\ft\SQLLog\Data\templog.ldf' )
ALTER DATABASE tempdb MODIFY FILE
( NAME      = N'tempdev',
  FILENAME  = N'M:\ft\TempdbData01\Data\tempdb.mdf' )
```
  - c. Click **!Execute** on the toolbar.
  - d. Restart the SQL Server service.
  - e. Right-click the instance name on the left-hand side of the screen and select **Restart**.
  - f. A popup box asks if you want to continue. Click **Yes**.
  - g. A second popup box asks if you want to continue. Click **Yes**.
57. Expand the existing tempdb files:
  - a. Click **New Query** on the toolbar.
  - b. Enter the following T-SQL to expand the existing tempdb files, replacing *<data file size>* and *<log file size>* with the appropriate file size:

```
ALTER DATABASE tempdb MODIFY FILE
( NAME = N'templog',
  SIZE = <data file size> )
ALTER DATABASE tempdb MODIFY FILE
( NAME = N'tempdev',
  SIZE = <log file size> )
```
  - c. Click **!Execute** on the toolbar.
58. Add 7 more data files for tempdb. All tempdb data files should be the same size.
  - a. Click **New Query** on the toolbar.
  - b. Enter the following T-SQL to add 7 tempdb data files, replacing *<data file size>* with the appropriate file size:

```
ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev2',
  FILENAME  = N'M:\ft\TempdbData01\Data\tempdev2.ndf',
  SIZE      = <data file size> )
ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev3',
  FILENAME  = N'M:\ft\TempdbData01\Data\tempdev3.ndf',
  SIZE      = <data file size> )
ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev4',
  FILENAME  = N'M:\ft\TempdbData01\Data\tempdev4.ndf',
  SIZE      = <data file size> )
ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev5',
  FILENAME  = N'M:\ft\TempdbData02\Data\tempdev5.ndf',
  SIZE      = <data file size> )
```



```

ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev6',
  FILENAME  = N'M:\ft\TempdbData02\Data\tempdev6.ndf',
  SIZE      = <data file size> )
ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev7',
  FILENAME  = N'M:\ft\TempdbData02\Data\tempdev7.ndf',
  SIZE      = <data file size> )
ALTER DATABASE tempdb ADD FILE
( NAME      = N'tempdev8',
  FILENAME  = N'M:\ft\TempdbData02\Data\tempdev8.ndf',
  SIZE      = <data file size> )

```

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



## 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 **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 **Command Prompt**.





## A Additional resources

### A.1 Technical support and resources

For Copilot support of Dell SC Series products:

- [Global online support](#)
- Email: [support@compellent.com](mailto:support@compellent.com) (non-emergency business hours)
- Phone: 866-EZ-STORE (866-397-8673) (United States only)

The Dell SC Series [Portal](#) is an online portal for existing customers. A valid portal account is required to access the Knowledge Center. Once logged in to the portal, click **Knowledge Center**.

[Dell TechCenter](#) is an online technical community for IT professionals and is a great resource to discover and learn about a wide range of technologies such as storage, servers, networking, software, and cloud management.

### A.2 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](#)

