Deploying the 65TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R640 and Dell EMC PowerVault ME4024

Deployment guide with step-by-step instructions

Abstract
Step-by-step instructions for building a Microsoft® SQL Server® data warehouse workload, and requirements for preparing the hardware platform and provisioning the OS to achieve a balanced, optimized 65TB configuration.

September 2018
## Revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 2018</td>
<td>Initial release</td>
</tr>
</tbody>
</table>

## Acknowledgements

Author: Doug Bernhardt
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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, *65TB Data Warehouse Fast Track Reference Architecture for Microsoft SQL Server 2017 using Dell EMC PowerEdge R640 and Dell EMC PowerVault ME4024* (available on Dell.com/support). This guide also covers requirements for preparing the hardware platform and provisioning the OS to achieve a balanced, optimized 65TB configuration for a Microsoft SQL Server 2017 data warehouse by using Dell EMC™ PowerEdge™ R640 servers, Dell EMC PowerVault™ ME4024 storage arrays, and Microsoft Data Warehouse Fast Track (DWFT) principles.

![Diagram of single-server reference architecture](image)

**Figure 1** Single-server reference architecture

**Note:** The 65TB solution includes both a single-server configuration and a highly available (HA) configuration. For simplicity, this guide only covers the single-server implementation.
Solution requirements

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>PowerEdge R640</td>
</tr>
<tr>
<td>Processors</td>
<td>Dual Intel® Xeon® Gold 6126 Processor (2.6 GHz, 12 cores, 24 threads)</td>
</tr>
<tr>
<td>Total cores</td>
<td>24</td>
</tr>
<tr>
<td>Total logical processors</td>
<td>48 (Hyper-Threading Technology enabled)</td>
</tr>
<tr>
<td>Total memory</td>
<td>896 GB</td>
</tr>
<tr>
<td>Network adapters</td>
<td>Minimum of one network adapter (1 Gbps or 10 Gbps based on requirements)</td>
</tr>
<tr>
<td></td>
<td>Recommended to have more than one network adapter with load balancing configured</td>
</tr>
<tr>
<td>Host bus adapters</td>
<td>Two QLogic® QLE2662 dual-port 16 Gbps FC HBA</td>
</tr>
<tr>
<td>Software</td>
<td>Operating system</td>
</tr>
<tr>
<td></td>
<td>Microsoft Windows Server® 2016 Standard Edition</td>
</tr>
<tr>
<td></td>
<td>Database software</td>
</tr>
<tr>
<td></td>
<td>SQL Server 2017 Enterprise Edition</td>
</tr>
<tr>
<td>Storage</td>
<td>Array</td>
</tr>
<tr>
<td></td>
<td>PowerVault ME4024 (firmware: GT275R0003-01)</td>
</tr>
<tr>
<td></td>
<td>Front-end I/O ports</td>
</tr>
<tr>
<td></td>
<td>8 x 16 Gbps FC ports (four per controller)</td>
</tr>
<tr>
<td></td>
<td>Disk drives 24 x 1.92 TB SSDs (2.5&quot; SAS)</td>
</tr>
</tbody>
</table>

Table 2 Server firmware versions

<table>
<thead>
<tr>
<th>Hardware component</th>
<th>Firmware version</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS</td>
<td>1.4.9</td>
</tr>
<tr>
<td>Backplane 1</td>
<td>4.26</td>
</tr>
<tr>
<td>Dell™ 64 Bit uEFI Diagnostics</td>
<td>4301X09</td>
</tr>
<tr>
<td>Dell OS Driver Pack</td>
<td>18.04.07</td>
</tr>
<tr>
<td>Integrated Dell Remote Access Controller</td>
<td>3.21.21.21</td>
</tr>
<tr>
<td>Intel® Ethernet 10G 4P X520/I350 rNDC</td>
<td>18.5.17</td>
</tr>
</tbody>
</table>
## Solution requirements

<table>
<thead>
<tr>
<th>Hardware component</th>
<th>Firmware version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel® Gigabit 4P X710/l350 rNDC</td>
<td>18.5.7</td>
</tr>
<tr>
<td>Lifecycle Controller</td>
<td>3.21.21.21</td>
</tr>
<tr>
<td>OS Collector</td>
<td>3.0</td>
</tr>
<tr>
<td>Power supply</td>
<td>00.24.7D</td>
</tr>
<tr>
<td>QLogic QLE2662</td>
<td>14.04.09</td>
</tr>
<tr>
<td>System CPLD</td>
<td>1.0.1</td>
</tr>
</tbody>
</table>
2 Deployment workflow

This section outlines the sequence of deploying the 65TB Data Warehouse Fast Track for SQL Server 2017 reference architecture using the PowerEdge R640 server and PowerVault ME4024 storage array.

To deploy the reference architecture, perform the following tasks:

1. Configure the PowerVault ME4024 storage array.
2. Configure the PowerEdge R640 server.
3. Install and configure the Windows Server 2016 operating system.

This guide assumes the reader has a general understanding of installing and configuring Windows servers, SQL Server, and Dell EMC PowerVault ME4 Series arrays.
3 Cabling requirements

Figure 2 shows how to cable the PowerEdge R640 server and the PowerVault ME4024 storage array. The hardware components were connected using Dell EMC best practices.

In a direct-connect configuration, each HBA should have one port connected to the top storage controller and the other port connected to the bottom storage controller (see Figure 2).

Figure 2 Single-server configuration cabling diagram
Configure the PowerVault ME4024 storage array

This section describes the configuration of the PowerVault ME4024 storage array. ME4 Series arrays can be configured using the ME Storage Manager interface or ME4 Series command-line interface (CLI). This guide covers the configuration steps using ME Storage Manager.

4.1 Configure local ports
On the Ports tab > System Settings, the Host Port Mode should be either FC or FC-and-iSCSI. When using FC-and-iSCSI, set Ports A0, A1, B0, and B1 to Speed: auto, Connection Mode: point-to-point.

4.2 Configure disks
Under Pools > Add Disk Group, add two disk groups. For each disk group, perform the following steps:

1. Specify a name (optional).
2. Select Virtual as the type (default).
3. Select A as the pool for the first disk group, and B as the pool for the second disk group (default)
4. For Data Protection, select RAID-5.
5. Select disks 0-11 for the first disk group, and disks 12-23 for the second disk group.
6. Click Add.

4.3 Create the host and volumes
A host object is used when presenting storage to a server. To create the host object, perform the following steps:

1. Open ME Storage Manager.
2. Click the Hosts tab.
3. Click Action and select Host Setup. The Host Setup wizard appears.
4. In the Name box, enter the name of the server.
5. Select all four initiators listed. Verify that the initiator IDs match the FC ports on the host.
6. In the Host Bus Adapters list box, select all four FC ports for the server and click Next.
7. Select Do not group this host and click Next.
8. Using the **Add Row** button, create the volumes listed in Table 3. The volume sizes will depend upon your database configuration.

<table>
<thead>
<tr>
<th>Volume name</th>
<th>Volume size</th>
<th>Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPHost</td>
<td>1GB</td>
<td>A</td>
</tr>
<tr>
<td>SQLSystem</td>
<td>20GB</td>
<td>B</td>
</tr>
<tr>
<td>SQLLog</td>
<td>Site Dependent</td>
<td>A</td>
</tr>
<tr>
<td>SQLData01</td>
<td>Site Dependent</td>
<td>A</td>
</tr>
<tr>
<td>SQLData02</td>
<td>Site Dependent</td>
<td>B</td>
</tr>
<tr>
<td>SQLData03</td>
<td>Site Dependent</td>
<td>A</td>
</tr>
<tr>
<td>SQLData04</td>
<td>Site Dependent</td>
<td>B</td>
</tr>
<tr>
<td>SQLData05</td>
<td>Site Dependent</td>
<td>A</td>
</tr>
<tr>
<td>SQLData06</td>
<td>Site Dependent</td>
<td>B</td>
</tr>
<tr>
<td>SQLData07</td>
<td>Site Dependent</td>
<td>A</td>
</tr>
<tr>
<td>SQLData08</td>
<td>Site Dependent</td>
<td>B</td>
</tr>
<tr>
<td>SQLTempdb01</td>
<td>Site Dependent</td>
<td>A</td>
</tr>
<tr>
<td>SQLTempdb02</td>
<td>Site Dependent</td>
<td>B</td>
</tr>
</tbody>
</table>

9. Click **Next**.
10. Click **Configure Host**.
11. When prompted to configure another host, click **No**.
Configure the PowerEdge R640 server

5 Configure the PowerEdge R640 server

5.1 Update the firmware

The firmware update feature of the Dell 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

To configure the BIOS using System Setup, which is accessible during the server boot cycle, 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.
5.3 **Reset the HBAs to default settings**

To reset the HBAs using QLogic Fast!UTIL, which is accessible during the server boot cycle, 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]`.
   c. After **Adapter Defaults Restored** is displayed, press any key to return to the **Configuration Settings** screen.

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**, complete the following:
      i. Set **Connection Options** to 1 (Point to point only).
      ii. Press `[Esc]` to exit Adapter Settings.
   d. In **Advanced Adapter Settings**, complete the following:
      i. Set **Login Retry Count** to 60.
      ii. Set **Port Down Retry Count** to 60.
      iii. Set **Link Down Timeout** to 30.
   e. Press `[Esc]` to exit Configuration Settings. When prompted, select **Save Changes** 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.
6 Install and configure Windows Server 2016

6.1 Install 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 PowerEdge R640 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, select **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 has completed, the server will reboot.
16. On the **Customize Settings screen**, enter the administrator password and click **Finish**.

6.2 Configure Windows Server 2016
Once Windows Server is installed, it needs to be configured for the Data Warehouse Fast Track workload.

To configure Windows Server, 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.
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.
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.
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 Discover Multi-Paths tab.
5. Your storage system model should be listed. Select the device and click Add.
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 Remove SMBv1 (optional)
1. Run the following PowerShell command:
   ```powershell
   Remove-WindowsFeature -Name "FS-SMB1"
   ```
2. Reboot the server. When the server is back online, log in as Administrator.

6.2.10 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.

6.2.11 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.
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.

6.2.12 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.
6.2.13 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.

6.2.14 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 ME4 Series volumes for use by Windows.

6.3.1 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. Format all volumes as NTFS. These volumes, along with required parameters, are listed in Table 4.

<table>
<thead>
<tr>
<th>Volume name</th>
<th>Drive letter/ mount point</th>
<th>Volume label</th>
<th>Allocation unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPHost</td>
<td>M:\</td>
<td>MPHost</td>
<td>Default</td>
</tr>
<tr>
<td>SQLSystem</td>
<td>M:\SQLSystem</td>
<td>SQLSystem</td>
<td>64K</td>
</tr>
<tr>
<td>SQLLog</td>
<td>M:\SQLLog</td>
<td>SQLLog</td>
<td>64K</td>
</tr>
<tr>
<td>SQLData01</td>
<td>M:\SQLData01</td>
<td>SQLData01</td>
<td>64K</td>
</tr>
<tr>
<td>SQLData02</td>
<td>M:\SQLData02</td>
<td>SQLData02</td>
<td>64K</td>
</tr>
<tr>
<td>SQLData03</td>
<td>M:\SQLData03</td>
<td>SQLData03</td>
<td>64K</td>
</tr>
<tr>
<td>SQLData04</td>
<td>M:\SQLData04</td>
<td>SQLData04</td>
<td>64K</td>
</tr>
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<td>SQLData05</td>
<td>M:\SQLData05</td>
<td>SQLData05</td>
<td>64K</td>
</tr>
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<td>SQLData06</td>
<td>M:\SQLData06</td>
<td>SQLData06</td>
<td>64K</td>
</tr>
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<td>SQLData07</td>
<td>M:\SQLData07</td>
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<td>64K</td>
</tr>
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<td>SQLData08</td>
<td>M:\SQLData08</td>
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<tr>
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<td>64K</td>
</tr>
<tr>
<td>SQLTempdb02</td>
<td>M:\SQLTempdb02</td>
<td>SQLTempdb02</td>
<td>64K</td>
</tr>
</tbody>
</table>
Install and configure Windows Server 2016

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

1. Open **ME Storage Manager** and connect to the ME4 Series array.
2. Click the **Storage** tab.
3. Map the volume in the ME Storage Manager:
   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, complete the following:
      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 performing 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.
Install and configure SQL Server 2017 Enterprise Edition

7.1 Install SQL Server 2017 Enterprise Edition

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

1. Insert the SQL Server 2017 Enterprise Edition install media.
2. Double-click Setup.exe. The SQL Server Installation Center window appears.
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
10. On the Server Configuration screen, do the following:
    a. Under Authentication Mode, select Mixed Mode.
    b. Enter and confirm the sa password.
    c. Click Add Current User.
    d. Select the Grant Perform Volume Maintenance Task privilege to SQL Server Database Engine Service.
    e. On the Collation tab, leave the Collation at the default setting and click Next.
11. On the Database Engine Configuration screen, complete the following:
    a. In the Data root directory text box, enter M:\ft\SQLSystem.
    b. Leave the remaining directory text boxes as-is.
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\SQLTempdb01\Data`. Click **Add**. The **Browse for Folder** dialog box appears. Select the folder and click **OK**.
d. Add the directory `M:\ft\SQLTempdb02\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 and 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 SQL Server 2017 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.

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 commands:

   ```
   EXECUTE sp_configure 'show advanced options', 1
   GO
   RECONFIGURE
   GO
   
   ```
3. Click **!Execute** on the toolbar.
7.3.3 Set SQL Server maximum memory
Set the SQL Server maximum memory to 864GB:

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

   ```sql
   EXECUTE sp_configure 'max server memory (MB)', '884736'
   GO
   RECONFIGURE
   GO
   ```

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

7.3.4 Configure the resource governor

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

   ```sql
   ALTER WORKLOAD GROUP [default]
   WITH( request_max_memory_grant_percent = 12 )
   GO
   ALTER RESOURCE GOVERNOR RECONFIGURE;
   GO
   ```

3. Click **Execute** on the toolbar.
7.3.5 Expand tempdb files

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

   ```sql
   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.
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.
Technical support and resources

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

Storage Solutions Technical Documents 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 EMC PowerVault ME4
- Dell EMC PowerEdge R640

The following ME4 Series publications and additional resources are available at Dell.com/support.

- Administrator's Guide
- Deployment Guide
- CLI Guide
- Owner's Manual
- Support Matrix