

# Dell EMC Ready Solutions for Microsoft SQL: Dell EMC Unity 650F All Flash Storage

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## Deployment Guide

### Abstract

This deployment guide details how to deploy a virtualized Microsoft SQL Server 2017 solution using VMware virtualization on Dell EMC PowerEdge R740 servers and Dell EMC Unity 650F All Flash storage.

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# Chapter 1 Overview

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## About this guide

### Purpose and scope

This guide details how to deploy a virtualized Microsoft SQL Server 2017 solution using VMware virtualization on Dell EMC PowerEdge R740 servers and Dell EMC Unity 650 All Flash storage. For data protection, the solution integrates Dell EMC Data Domain Boost (DD Boost) software for SQL Server and the Dell EMC Data Domain DD6300 backup appliance.

This guide includes information about how to set up and configure the following hardware components and to test the infrastructure deployment for component failures:

- Dell EMC Networking S4048-ON switch
- Dell EMC PowerEdge R740 server
- Dell EMC Connectrix DS-6610B switch
- Dell EMC Unity 650F storage array
- Dell EMC Data Domain DD6300 appliance

This guide also provides information about the installation and configuration of VMware virtualization, Microsoft Windows Server 2016, SQL Server 2017, and DD Boost software.

### Audience

This guide is for IT professionals who want to deploy a virtualized SQL Server 2017 solution using VMware virtualization on PowerEdge R740 servers and Unity 650 All Flash storage. Deployment personnel must have some knowledge of PowerEdge servers, Unity storage, Connectrix switches, Dell EMC Networking switches, VMware virtualization, Windows Server 2016, and SQL Server 2017.

## Deployment overview

The complete deployment sequence for this solution is as follows:

1. Gather all the hardware components according to the solution requirements.
2. Set up the cabling.
3. Perform previrtualization configuration.
4. Configure virtualization.
5. Perform post-virtualization configuration.
6. Verify the deployment.
7. Install SQL Server 2017.
8. Configure the Data Domain backup appliance.
9. Install and configure the Microsoft application agent for DD Boost software.

## Additional resources

Dell EMC Services and Dell EMC certified channel partners provide consulting services to help you plan, deploy, and manage even the most advanced and complex virtualized configurations.

Additional resources include:

- [Dell EMC Support](#), which is dedicated to meeting customer requirements with proven services
- [Dell EMC Communities](#), where you can connect with Dell EMC customers and Dell EMC employees to share knowledge, best practices, and information about Dell EMC products and services

## We value your feedback

Dell EMC and the authors of this document welcome your feedback on the solution and the solution documentation. Contact the [Dell EMC Solutions team](#) with your comments.

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For links to additional documentation for this solution, see [Microsoft SQL Info Hub for Ready Solutions](#) on the Dell EMC Communities website.

# Chapter 2 Solution Architecture and Requirements

This chapter presents the following topics:

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## Solution architecture

This solution uses Server 2017 architectural design principles and guidelines to achieve balanced virtualization on PowerEdge R740 servers and the Unity 650 All Flash storage array. This solution employs VMware virtualization on PowerEdge 740 servers and Unity 650F storage to build an efficient infrastructure for SQL Server databases. The solution employs the Data Domain DD6300 backup appliance for data protection.

The following figure shows the architectural design of the solution. The quantities of the components that are listed in the image will vary based on the sizing needs of your solution.

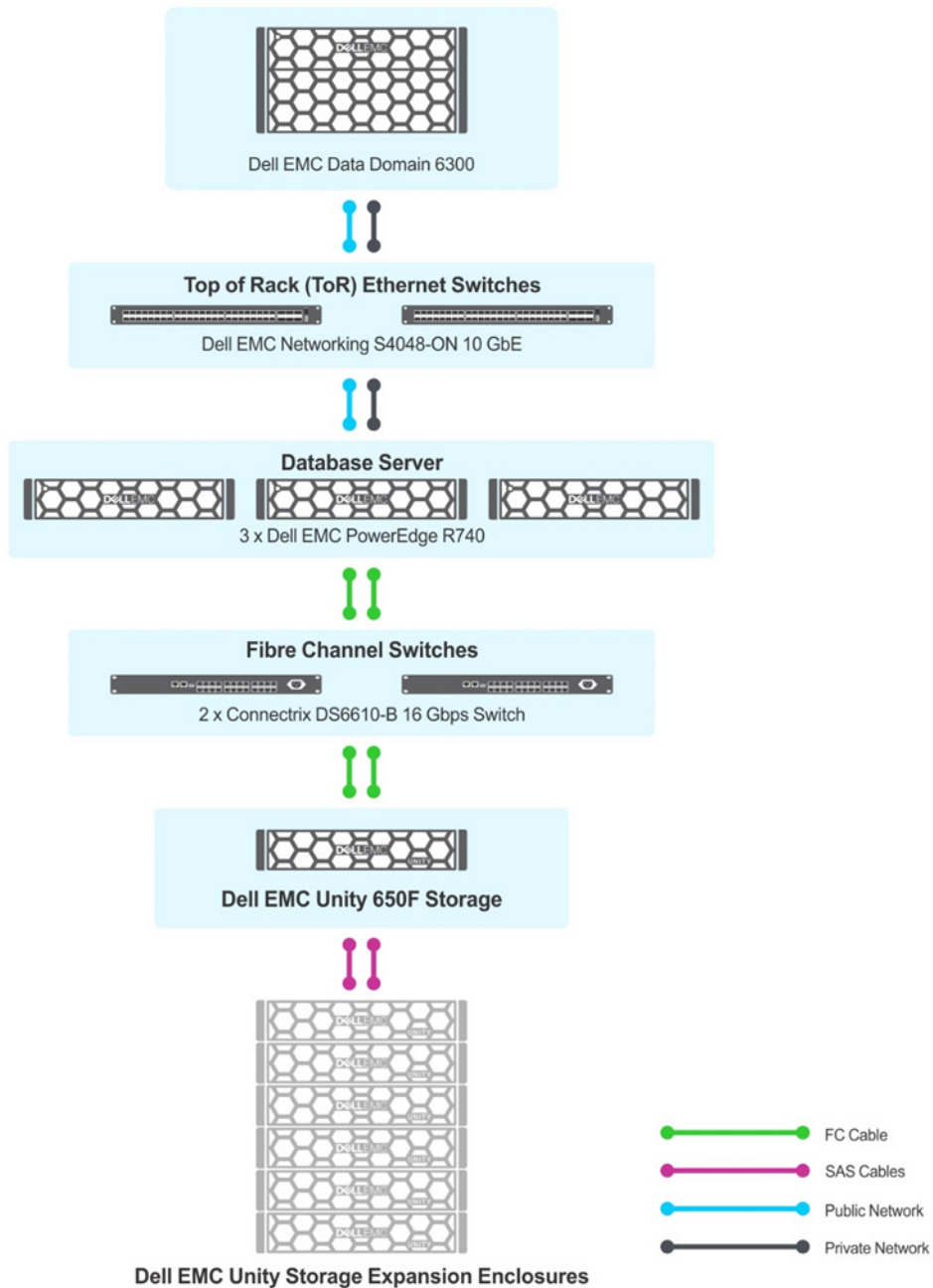


Figure 1. Architecture design

## Solution requirements

### Hardware requirements

The following table lists the solution hardware components.

**Table 1. Hardware components**

Component category	Component	Quantity
Servers	Dell EMC PowerEdge R740	3
Switches	Dell EMC Networking S4048-ON	2
	Dell EMC Connectrix DS-6610B	2
Storage	Dell EMC Unity 650F	1
	Dell EMC Data Domain DD6300	1

### Software requirements

The following table lists the solution software components.

**Table 2. Software components**

Component	Version
VMware vSphere	6.7
Microsoft Windows Server operating system	2016 Datacenter Edition
Microsoft SQL Server	2017 Enterprise Edition
Dell EMC Data Domain Boost for Enterprise Applications	9.2.1

### Firmware requirements

The following two tables list the firmware that you can use to deploy and validate the solution.

**Table 3. Firmware for PowerEdge R740 server**

Component	Version
BIOS	1.3.x or later
CPLD	1.x or later
iDRAC	9 Enterprise
Lifecycle Controller	3.21.21.21
PERC H330 Mini	FW 50.0.1-0537, driver 7.703.18.00
Network Controller Dell Quad Port Broadcom	20.6.18 or later
Emulex LightPulse LPe31002 2-port 16 Gb Fibre Channel	02.01.01 or later

**Table 4. Firmware for switches and Unity 650F storage**

Component	Version
Dell EMC Networking S4048-ON	3.21.5.3
Connectrix DS-6610B	Operating system 8.x
Dell EMC Unity 650F	4.2.1.9535982
Dell EMC Data Domain DD6300	Operating System 6.x

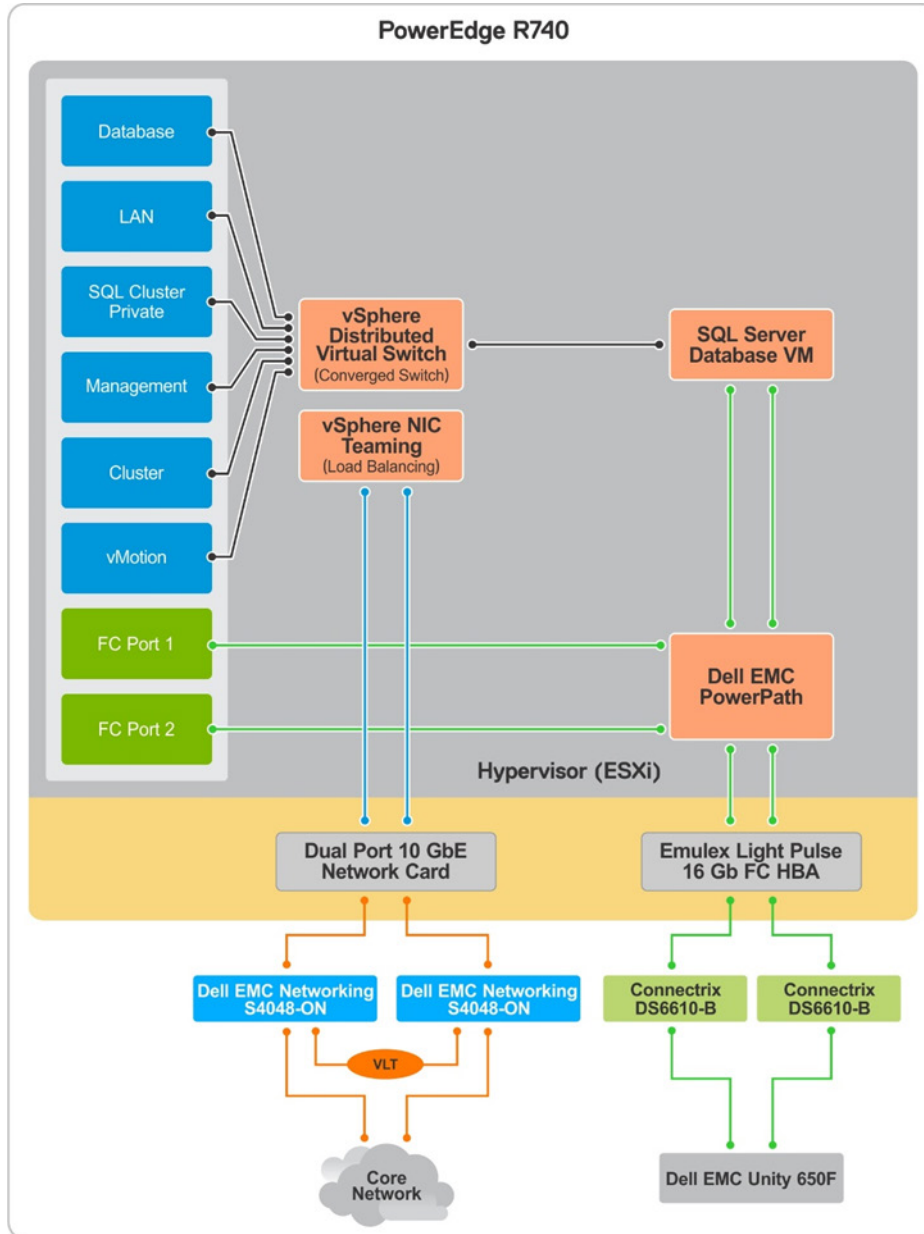
## Chapter 3 Network Connectivity

This chapter presents the following topics:

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## End-to-end I/O connectivity

The end-to-end I/O connectivity, as shown in the following figure, consists of multiple port channels and VLT configurations for LAN connectivity. Networking S4048T-ON switches provide 10 GbE network connectivity between the compute cluster and the rest of the data center.



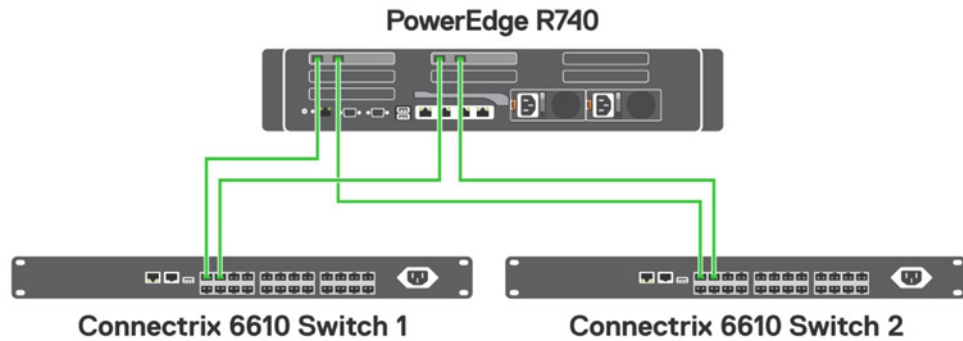
**Figure 2. End-to-end I/O connectivity**

According to SQL Server 2017 best practices and Dell EMC infrastructure design principles, each application network is deployed as a separate workload VLAN that is defined in the data center core network. All the workload VLANs are created as virtual network adapters on the converged virtual switch across all network connections. The Emulex LightPulse LPe31002 Fibre Channel (FC) adapters are used for FC connectivity in the host operating system, and virtual FC adapters are used for the virtual machines (VMs) that require in-guest FC connectivity.

## Cabling requirements

### Connectivity between server and Connectrix switches

The following figure shows the port assignments for FC connectivity. The ports that are marked are used to connect the PowerEdge R740 servers. Ports 4 and 5 on both switches are used to connect Dell EMC storage.



**Figure 3. Connectivity between PowerEdge R740 server and Connectrix switches**

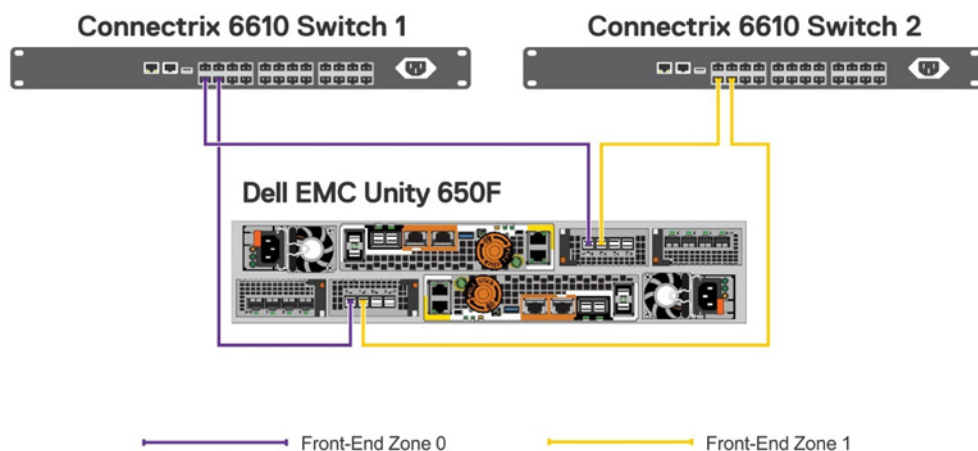
Connect the cables of the dual-port Emulex LightPulse LPe31002 cards on the PowerEdge R740 server as follows:

- From the first port of each Emulex card, connect to the first Connectrix DS-6610B switch on ports 0 and 1 respectively.
- From the second port of each Emulex card, connect to the second Connectrix DS-6610B switch on ports 0 and 1 respectively.

### Connectivity between Unity 650F storage and Connectrix switches

Unity 650F storage has two 16 Gb/s FC ports from each controller for the front-end connectivity. Connect one port from each controller to switch 1 and connect the remaining port from each controller to switch 2.

The following two figures illustrate the connections between the storage and the switches.



**Figure 4. Connectivity between Unity 650F storage and Connectrix switches**

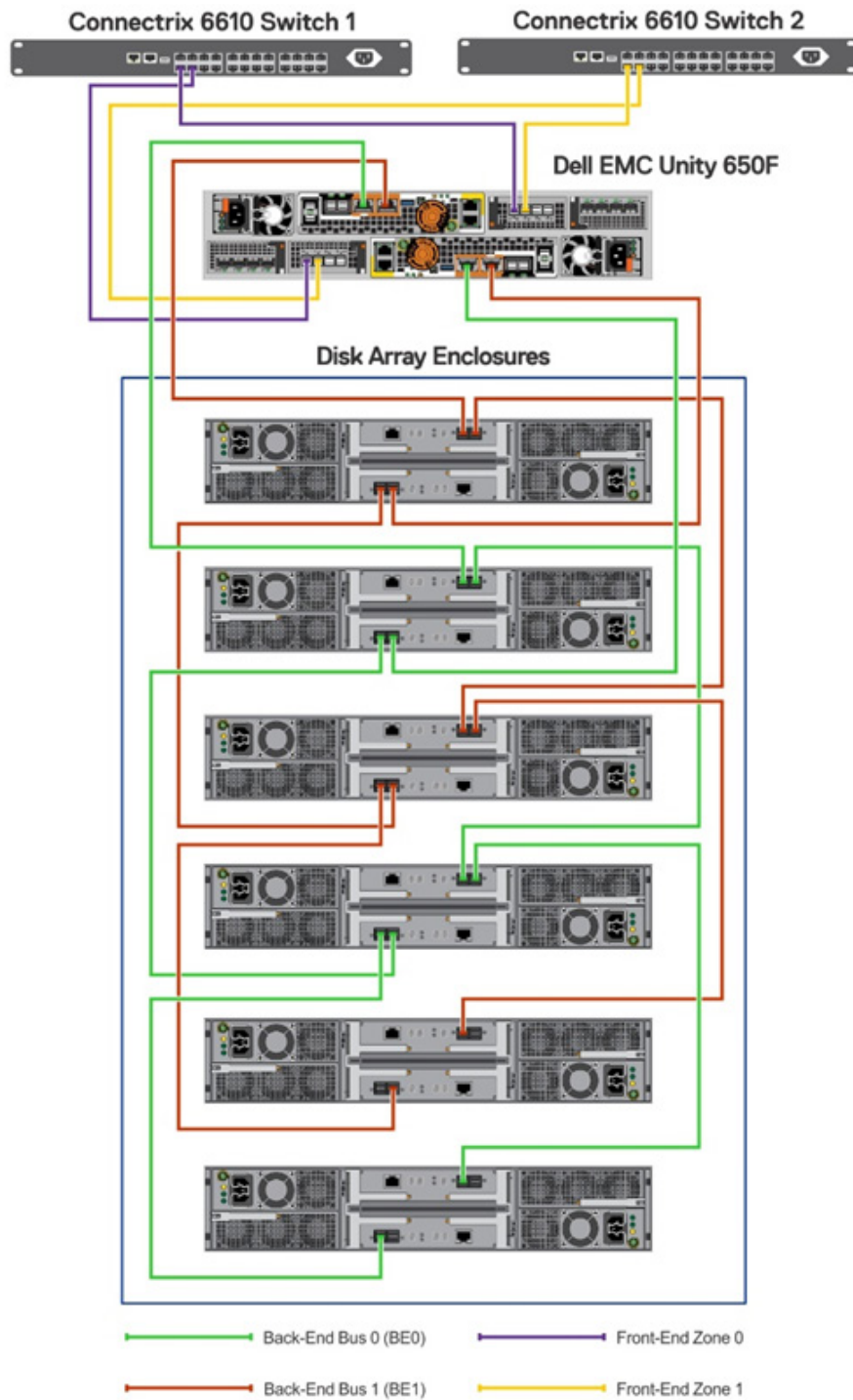
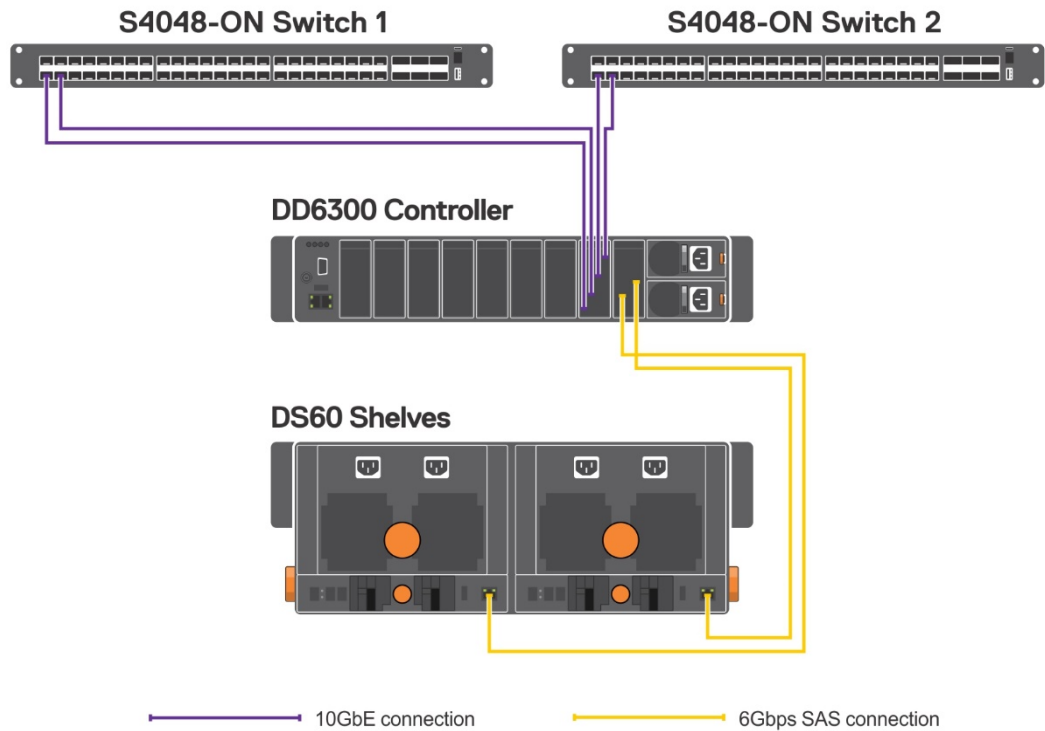


Figure 5. Connectivity between Unity 650F storage and Connectrix switches

## Connectivity between Data Domain DD6300 and Networking switches

The Dell EMC Data Domain DD6300 uses the 10 GbE cabling link to Networking switches, as illustrated in the following figure. You can find additional installation and racking details for the DD6300 in the [Dell EMC Data Domain DD6300 System Installation Guide](#).



**Figure 6.** DD6300 and Networking switches connectivity

# Chapter 4 Previrtualization Configuration

This chapter presents the following topics:

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## Introduction

Before you configure the ESXi 6.7 virtual infrastructure, configure the following components as described in this chapter:

- Networking S4048T-ON switches
- iDRAC IPv4 address
- BIOS
- Connectrix DS-6610B FC switches

## Configuring Dell EMC Networking S4048T-ON switches

### Configuring the switches

Configure the Networking S4048T-ON top and bottom switches, one at a time:

1. Connect to the serial console port on the switch through the CLI.  
To access the console, connect one end of the serial cable to the console port on the S4048T-ON switch and the other end to the terminal server (laptop).
2. Use HyperTerminal to open the switch console.
3. Configure the following parameters.

- a. Hostname:

```
configure hostname <name> exit
```

- b. System username and password to access the system remotely:

```
username <username> password <password> privilege
<privilege level>
```

For example:

```
configure username admin password <password> privilege
15 exit
```

- c. Management IP address for the switches:

```
configure interface ManagementEthernet 1/1 ip address
<xxx.xxx.xxx.xxx/xx> no shutdown exit
```

- d. Login credentials:

```
FTOS(conf) username admin privilege 15 password 0
<yourpassword> FTOS(conf) enable password level 15 0
<yourpassword>
```

4. Enable switch ports and MTU Settings frames as follows:

- a. Switch ports:

```
FTOS configure
FTOS(conf)interface range tengigabitethernet 1/1 - 1/48
FTOS(conf-if-range-te-1/1-1/48) switchport
```

```
FTOS(conf-if-range-te-1/1-1/48) no shutdown
FTOS(conf-if-range-te-1/1-1/48) exit FTOS(conf) exit
```

**b. MTU Settings frames:**

```
FTOS configure
FTOS(conf) interface range tengigabitethernet 1/1 - 1/48
FTOS(conf-if-range-te-1/1-1/48) mate 12000
```

**5. Configure spanning tree on edge ports:**

```
FTOS(conf-if-range-te-1/1-1/48) spanning-tree rstp edge-port
FTOS(conf-if-range-te-1/1-1/48) exit
```

**6. Configure the port channel for a link aggregation group (LAG) by typing the following commands to configure the switch interconnect as a LAG:**

```
FTOS (conf) interface Port-channel 1
FTOS (conf-if-po-1) mtu 12000
FTOS (conf-if-po-1) switchport
FTOS(conf-if-po-1) no shutdown
FTOS(conf-if-po-1) exit
```

**7. Configure the QSFP ports for the LAG by entering the following commands to assign the 40 Gb QSFP ports to the port channel:**

```
FTOS(conf) interface range fortyGigE 1/49-1/50
FTOS (conf-if-range-fo-1/49-1/50) no ip address
FTOS (conf-if-range-fo-1/49-1/50) mtu 12000
FTOS (conf-if-range-fo-1/49-1/50) no shutdown
FTOS (conf-if-range-fo-1/49-1/50) flowcontrol rx on tx off
FTOS (conf-if-range-fo-1/49-1/50) port-channel-protocol lacp
FTOS (conf-if-range-fo-1/49-1/50-lacp) port-channel 1 mode active
FTOS (conf-if-range-fo-1/49-1/50-lacp) exit
FTOS (conf-if-range-fo-1/49-1/50) exit
FTOS (conf) exit
```

**8. Configure VLANs as follows:**

**a. VLAN 10 for the host management network:**

```
configure interface vans 10 description "hostmanagement"
ip address <xxx.xxx.xxx.xxx/xx> tagged port- channel 1
tagged tengigabitethernet 1/1 - 1/4 no shutdown exit
```

**b. VLAN 20 for the cluster network:**

```
configure interface vlan 20 description "Cluster" ip
address <xxx.xxx.xxx.xxx/xx> tagged port- channel 1
tagged tengigabitethernet 1/5 - 1/8 no shutdown exit
```

**c. VLAN 30 for the live migration network:**

```
configure interface vlan 30 description "Live Migration"
ip address <xxx.xxx.xxx.xxx/xx> tagged port- channel 1
tagged tengigabitethernet 1/9 - 1/12 no shutdown exit
```

## d. VLAN 50 for the application network:

```
configure interface vlan 50 description "Application
Network" ip address <xxx.xxx.xxx.xxx/xx> tagged port-
channel 1 tagged tengigabitethernet 1/13 - 1/16 no
shutdown exit
```

## e. VLAN 60 for the front-end network:

```
configure interface vlan 60 description "Front End
Network" ip address <xxx.xxx.xxx.xxx/xx> tagged port-
channel 1 tagged tengigabitethernet 1/17 - 1/20 no
shutdown exit
```

## f. VLAN 70 for the SQL private network:

```
configure interface vlan 70 description "SQL Private
Network" ip address <xxx.xxx.xxx.xxx/xx> tagged port-
channel 1 tagged tengigabitethernet 1/21 - 1/24 no
shutdown exit
```

## 9. Save the configuration:

```
FTOS copy running-config startup-config
```

## Verifying the switch configuration

Verify the Networking S4048T-ON switch configuration:

## 1. Confirm that the VLT domain status is Up:

```
show vlt brief
```

## 2. Confirm that port-channel 100 status is Up:

```
show interfaces port-channel 100
```

## 3. Confirm that port-channel 100 is targeted on the VLAN interfaces (10,20,30):

```
show vlan
```

## 4. Confirm that the port-channel interfaces are Up, port-channel 100 consists of interfaces 1/2, 1/4, and 1/6, and the interface statuses are Up:

```
show interfaces port-channel 100 brief
```

## Configuring the iDRAC IPv4 address

Configure the iDRAC IPv4 address:

1. Turn on or restart the server.
2. At F2=System Setup, press F2.
3. In the **System Setup Main Menu**, click **iDRAC Settings**, and then click **Network**.

4. In **IPv4 Settings**, enter the following information:
  - **Starting IP Address**
  - **Starting Gateway**
  - **Starting Subnet Mask**
5. Click **Back**, and then, in **System Setup**, click **Finish**.
6. When the confirmation message appears, click **Yes**.

## Configuring the BIOS

Configure the BIOS:

1. Turn on or restart the server.
2. At **F2=System Setup**, press **F2**.
3. Ensure that logical processors and virtualization technology are enabled:
  - a. In **System Setup Main Menu**, click **System BIOS > Processor Settings**.
  - b. In **Processor Settings**, verify that **Logical Processors** is set to **Enabled** and that **Virtualization Technology** is set to **Enabled**.

## Configuring Connectrix DS-6610B Fibre Channel switches

### Overview

After racking and cabling the SAN switches, configure the switches by performing the following tasks, as described in this section:

1. Assign the management IP address to the switches.
2. Enable Dynamic Ports on Demand.

### Assigning the management IP address to the SAN switches

Assign the management IP address to the SAN switches:

1. Connect one end of the serial cable to the RJ-45 serial port on the switch, and the other end to the serial port on the server (workstation).
2. Use HyperTerminal to open the switch console.
3. In the console, configure the serial connection as follows:
  - **Bits per second**—9600
  - **Data bits**—8
  - **Parity**—None
  - **Stop bits**—1
  - **Flow control**—None
4. Log in to the switch by using the default username and password.

5. Assign the management IP address for the switch:

```
switch: admin> ipaddrset
Ethernet IP Address <IP address>
Ethernet Subnetmask <subnet mask>
Gateway IP Address <gateway>
DHCP [Off]: off
```

### Enabling Dynamic Ports on Demand

The Dynamic Ports on Demand (POD) feature automatically assigns POD licenses from a pool of available licenses that is based on the server blade or switch installation. Enable the Dynamic POD feature:

1. Connect to the switch and log in as an administrator.
2. Enter the following command to change the license assignment method to dynamic:

```
switch: admin> licenseport --method dynamic
```

3. Enter the following command to restart the switch:

```
switch: admin> reboot
```

## Setting Up Unity 650F storage and Data Domain DD6300

Dell EMC Professional Services or Certified Channel Partners perform the initial setup of Unity 650F storage and Data Domain DD6300.

# Chapter 5 Virtualization Configuration

This chapter presents the following topics:

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- Setting up a VM port group on the ESXi host..... 26**
- Setting up NIC teaming on the ESXi host ..... 26**
- Creating a cluster enabled for vSphere HA ..... 27**
- Adding the ESXi hosts to the cluster ..... 27**
- Creating a resource pool ..... 27**

## Introduction

To set up virtualization, perform the following tasks, as described in this chapter:

1. Configure a virtual disk for operating system deployment on the PowerEdge R740 server.
2. Configure prerequisites to install VMware ESXi 6.7.
3. Install ESXi 6.7 on the PowerEdge R740 server.
4. Install the Broadcom network driver files on the ESXi host.
5. Install VMware vCenter Server Appliance.
6. Set up a VM port group on the ESXi host.
7. Set up NIC teaming on the ESXi host.
8. Create a cluster that is enabled for VMware vSphere HA.
9. Add the ESXi host to the cluster.
10. Create a resource pool.
11. As required, repeat the preceding steps to configure additional hosts and servers.

## Configuring a virtual disk for operating system deployment on the PowerEdge R740 server

Configure a virtual disk for operating system deployment on the PowerEdge 740 server:

1. Log in to iDRAC and launch the virtual console.
2. If the system is powered off, go to the **Power** menu from the iDRAC virtual console and click **Power on the system**.
3. When the following message appears, click **Yes** to restart the system:
 

```
You are about to execute a server control action. Are you
sure you want to continue?
```
4. When the following message appears, press Ctrl-R to run the RAID configuration utility:
 

```
Press CTRL + R to Run configuration utility
```
5. In the configuration utility, select PERC H730 Mini, and then press F2 to enable operations.
6. From the list box, select **Create New VD**.
7. Create the virtual disk:
  - a. At **RAID Level**, select RAID-1.
  - b. Under **Physical Disks**, select the physical disks.
  - c. Under **Basic Settings**, use the default virtual disk size and virtual disk name, and click **OK**.

---

**Note:** The operating system partition is not I/O intensive. RAID 1 is recommended for operating system partitions so that they have hardware redundancy.

---

8. When the following message appears, click **OK**:

```
It is recommended that all newly created logical drives be
initialized unless you are attempting to recreate a previous
configuration and recover data as initialization is a
destructive process. Are you sure you want to skip
initialization?
```

The virtual disk is created.

9. Exit the utility and restart the server.
10. Repeat the preceding steps to configure the required number of virtual disks for your environment.

## Configuring prerequisites to install ESXi 6.7

Configure the prerequisites to install ESXi 6.7:

1. Map the virtual disk:
  - a. In the iDRAC virtual console, click **Connect Virtual Media**, and then click **Map CD/DVD**.
  - b. In the **Drive/Image File** dialog box, enter the drive location and click **Map Device**.

2. Set the boot device and load the operating system executable files:

- a. In the virtual console, select **Next Boot**, and then select **Virtual CD/DVD/ISO**.

- b. When the following message appears, click **OK**:

```
The selected device is set as the boot device for the
next boot until another user changes the selected boot
device. Therefore, it is recommended to reboot the
server immediately after saving this selection. Click OK
to save the selection.
```

Virtual CD/DVD/ISO is set as the boot device.

- c. Restart the server.

## Installing ESXi 6.7 on the PowerEdge R740 server

Install ESXi 6.7 on the PowerEdge R740 server:

1. Power on the server and press any key after you see the following message:

```
Booting from Virtual CD
Press any key to boot from CD or DVD.
```



2. When the welcome message appears, click **Continue**.
3. When the license agreement appears, click **Accept and Continue**.
4. When the **Select a Disk to Install or Upgrade** message appears, select the local disk for the operating system and click **Continue**.
5. When the **Please select a keyboard layout** message appears, select **US Default** and click **Continue**.
6. When prompted to provide a root password, set the password and click **Continue**.
7. When prompted to confirm the installation, click **Install**.
8. When the **Installation Complete** message appears, click **Reboot**.
9. After the server reboots, customize the system according to your requirements.

## Installing Broadcom network driver files on the ESXi host

Install the Broadcom network driver files on the ESXi host:

1. Log in to VMware ESXi 6.7 as the root user.
2. Upload the Broadcom 57412 network driver to the local datastore on the VMware ESXi server.
3. Run the following command to install the Broadcom network driver:
 

```
esxcli software vib install -d <FilePath>
reboot
```
4. Reboot the server.

## Installing vCenter Server Appliance

Before installing VMware vCenter Server Appliance, ensure that the vCenter Server Appliance installation media is ready to start the installation, and choose a specific ESXi host to run vCenter Server Appliance.

1. Run the installer as administrator under the folder `VMwareVCSA\vcasa-ui-installer\win32`.
2. At **Stage 1: Deploy appliance**, click **Install** to launch the installation wizard.
3. On the **Introduction** page, click **Next**.
4. On the **End user license agreement** page, select **I accept the terms of the license agreement**, and click **Next**.
5. At **Select deployment type**, select **Embedded Platform Services Controller**, and click **Next**.
6. On the **Appliance deployment target** page, enter the ESXi host and credentials, and click **Next**.
7. At the **Certificate Warning**, click **Yes**.

8. At **Set up appliance VM**, enter the VM name and credentials, and click **Next**.
9. At **Select deployment size**, select **Tiny** and click **Next**.
10. At **Select datastore**, select a datastore for the vCenter Server Appliance.
11. At **Configure networking settings**, enter the FQDN, IP, subnet mask, default gateway, and DNS server, and click **Next**.
12. At the **Ready to complete stage 1** page, review the settings and click **Finish**.
13. At **Install – Stage 1: Deploy vCenter Server with Embedded Platform Services Controller**, click **Continue**.
14. On the **Introduction** page, click **Next**.
15. On the **Appliance configuration** page, click **Next**.
16. At **SSO configuration**, select **Creating a new SSO domain**, enter `vSphere.local` and credentials, and click **Next**.
17. At **Ready to complete**, review the settings and click **Finish**.

## Setting up a VM port group on the ESXi host

Set up VM port group on the ESXi host:

1. In the vCenter Web Console, in the **Virtual switches** pane, click the **Add host networking** icon.
2. On the **Select connection type** page, click **Virtual Machine Port Group for a Standard Switch** and click **Next**.
3. On the **Select target device** page, click **New standard switch** and click **Next**.
4. On the **Create a Standard Switch** page, click the **Add Adapters** icon.
5. Select the vNIC and click **OK**.
6. Review the information for the new active adapter and click **Next**.
7. On the **Connection Setting** page, in the **Network label** text box, enter `SQLServer` and click **Next**.
8. On the **Ready to complete** page, verify that the information is accurate and click **Finish**.

## Setting up NIC teaming on the ESXi host

Set up NIC teaming on the ESXi host:

1. In the vSphere Web Client, under **vCenter Home**, click **Hosts and Clusters**.
2. Click the host, and then click **Manage > Networking > Virtual Switches**.
3. Click the vSwitch, and then click **Manage the physical network adapters**.
4. Select the appropriate (unclaimed) network adapter or adapters and use the arrow to move them to **Active Adapters**.
5. Click **Edit settings**.

6. Select the correct teaming policy under the **Load Balancing** option.
7. Click **OK**.

## Creating a cluster enabled for vSphere HA

Create a cluster that is enabled for vSphere HA:

1. Open a web browser, connect to the vCenter Server Appliance home page at `https://<vCenter_Server_Appliance_IP_address>/vsphere-client`, and log in.
2. On the vSphere Web Client Home page, click **Hosts and Clusters** and expand the view of the inventory.
3. Right-click the data center and select **New Cluster**.
4. Configure the new cluster and select **Turn on** for vSphere HA.
5. Leave the default settings for the remaining options and click **OK**.
6. In the **Recent Tasks** pane, monitor the progress as the cluster is created.

## Adding the ESXi hosts to the cluster

Add the ESXi hosts to the cluster:

1. On the vSphere Web Client Home page, click **Hosts and Clusters** and expand the view of the inventory.
2. Select the cluster that you created in the preceding procedure.
3. Drag ESXi hosts to the cluster.
4. Monitor the **Recent Tasks** pane and wait for the completion of the configuring vSphere HA task.

## Creating a resource pool

Create a resource pool:

1. In the vSphere Web Client, right-click the ESXi cluster in the inventory and select **New Resource Pool**.
2. Assign properties to the resource pool.
3. Click **OK**.

## Chapter 6 Post-Virtualization Configuration

This chapter presents the following topics:

<b>Mapping storage volumes to the ESXi cluster .....</b>	<b>29</b>
<b>Installing SQL Server 2017 .....</b>	<b>32</b>
<b>Deploying the Microsoft application agent for Data Domain Boost with SQL Server .....</b>	<b>34</b>

## Mapping storage volumes to the ESXi cluster

### Overview

To map storage volumes to the ESXi cluster, perform the following tasks, as described in this section:

1. Create a zone configuration.
2. Create a zone alias to easily manage the zone configuration.
3. Create zones.
4. Enable the zone configuration.
5. Create a storage pool.
6. Add the host to the Unity 650F storage.
7. Create a LUN and map it to the host.

### Creating a zone configuration

Create a zone configuration:

1. In Connectrix **Web Tools**, select the switch from the **Fabric** tree.
2. Click **Configure**, and then click **Zone Admin**.
3. In **Zone Administration**, from the **New** list, select **New Zone Config**.
4. In the **Create New Config** dialog box, enter a name for the new configuration and click **OK**.

### Creating a zone alias

Create a zone alias:

1. In Connectrix **Web Tools**, select the switch from the **Fabric** tree.
2. Click **Configure > Zone Admin**.
3. In the **Zone Administration** window, from the **New** list, click **New Alias**.
4. In the **Create New Alias** dialog box, enter a name for the new alias and click **OK**.

For example:

```
server ports, storage ports
```

5. Expand **Member Selection List** to view the nested elements.
6. Click the ports that are connected.
7. Click the World Wide Name (WWN) of the card, and then click the right arrow to add the WWN to alias members.
8. Repeat the preceding steps to create an alias for all the servers and storage physical ports and virtual ports.
9. Click **Action > Save Config** to save the configuration changes.

---

**Note:** You can also view the WWN of the servers from the iDRAC console.

---

## Creating zones

Create zones:

1. In Connectrix **Web Tools**, select the switch from the **Fabric** tree.
2. Click **Configure > Zone Admin**.
3. In the **Zone Administration** window, from the **New** list, click **New Zone**.
4. In the **Create New Zone** dialog box, enter a name for the new zone and click **OK**.
5. Expand **Member Selection List** to view the nested elements.
6. In **Member Selection List**, select the storage virtual ports and server ports alias that you want to include in the zone.
7. Click the right arrow to add the zone members to the zone alias.
8. Select **Zoning Actions > Save Config** to save the configuration changes.
9. Repeat the preceding steps to create zones for all the servers and storage virtual ports.

## Enabling the zone configuration

Enable the zone configuration:

1. In Connectrix **Web Tools**, select the switch from the **Fabric** tree.
2. Click **Configure > Zone Admin**.
3. In the **Zone Administration** window, click the **Zone Config** tab.
4. Expand **Member Selection List** to view the nested elements.
5. In **Member Selection List**, select the zones that you have created.
6. Click the right arrow to add the zones.
7. Select **Zoning Actions > Save Config** to save the configuration changes.
8. On the toolbar, click **Enable Config**.
9. In the **Choose Zone Config to be enabled** dialog box, select the configuration and click **OK**.
10. Click **Yes** to confirm that you want to enable the configuration.

The Connectrix switch for SAN connectivity is configured and enabled.

## Creating a storage pool

Create a storage pool:

1. Log in to the Unisphere for Unity 650F dashboard.
2. In the left panel, go to **Storage > Pools**, and click the plus sign (+).
3. In the **Create Pool** window, enter the name of the pool and click **Next**.
4. Select the type of tier from the available options—**Extreme Performance**, **Performance**, and **Capacity**.
5. Select **Use FAST Cache** if you want to enable FAST cache for this pool.
6. Select a RAID configuration for the drives.
7. Click **Next**.

8. In the **Summary** window, select the drives to be included in the pool.
9. Verify the total capacity of the pool.
10. Click **Finish**.

### Adding the host to the Unity 650F

Add the host to the Unity 650F:

1. Log in to the Unisphere for Unity 650F dashboard.
2. In the left panel, go to **Access > Hosts**, click the plus sign (+), and then select **Host**.
3. In the **Add a Host** window, enter the following details:
  - Hostname
  - Operating system
  - Network address (IP of the host)
4. Click **Next**.
5. In the **Initiators** window, select **Initiator WWN** and click **Next**.
6. In the **Summary** window, click **Finish**.

### Creating a LUN and mapping it to the host

Create a LUN and map it to the host:

1. Log in to the Unisphere for Unity 650F dashboard.
2. In the left panel, go to **Storage > Block**, and click the plus sign (+).  
The **Create LUN** window opens.
3. On the **Configure** tab, enter or select the following details:
  - Number of LUNs
  - Name of the LUN
  - Pool (select the pool that you created from the list of pools)
  - Tiering policy (choose one of the options—**Start High Then Auto-Tier**, **Highest Available Tier**, and **Lowest Available Tier**)
  - Size of the pool
  - Host I/O limit (select **No Limit**)
4. On the **Access** tab, click the plus sign (+).
5. In the **Select Host Access** window, select the hostname of the host that you previously configured.
6. Click **OK**.
7. Click **Next**.
8. In the **Summary** window, click **Finish**.

## Storage specifications

Typically, you can enhance SQL Server performance by placing the database and transaction log files on separate drives. Read I/O for database files is typically random, while the I/O for the transaction log is typically sequential. The following table lists the storage specifications for the ESXi cluster and the SQL Server databases.

**Table 5. Storage specifications**

Storage specification	Number of volumes	Size of each volume
<b>ESXi cluster</b>		
SQL Server data datastore	1	15 TB
SQL Server log datastore	1	3 TB
SQL Server tempdb datastore	1	4 TB
<b>SQL Server database servers</b>		
SQL Server data file	1	2 TB
SQL Server log file	1	300 GB
SQL Server tempdb	1	400 GB

## Installing SQL Server 2017

### Prerequisites for installing SQL Server 2017

Before you install SQL Server 2017, ensure that you have completed these steps:

1. Created a VM
2. Installed the operating system
3. Renamed and added a guest Windows server to Microsoft Active Directory

### Configuring database VMs

The following table lists the specifications for the database VMs.

**Table 6. Database VM specifications**

Component	Specification
vCPUs	12
Memory	192 GB
Memory for database	160 GB
Size of data LUN	1.5 TB
Size of transaction log LUN	300 GB
Size of tempdb LUN	400 GB



## Create a Virtual Machine

Create a VM on the ESXi host:

1. In the vSphere Web Client, right-click the previously created resource pool and select **New Virtual Machine**.
2. On the **Select a creation type** page, select **Create a new virtual machine** and click **Next**.
3. On the **Select a name and folder** page, enter a unique name for the VM and select a deployment location.
4. On the **Select a compute resource** page, select the resource pool where the VM will run and click **Next**.
5. On the **Select storage** page, choose the store type, the storage policy, and a datastore or datastore cluster where you want to store the VM files.
6. On the **Select compatibility** page, select the VM compatibility setting that is compatible with the ESXi host and click **Next**.
7. On the **Select a guest OS** page, select the guest operating system family and version, and click **Next**.
8. (Optional) **Enable Windows Virtualization Based Security**.
9. On the **Customize hardware** page, configure the VM hardware and options, and click **Next**.
10. On the **Ready to complete** page, review the details and click **Finish**.

## Install a guest operating system on a virtual machine

Install a guest operating system on a VM:

1. In the vSphere Web Client, verify that an ISO image file of the guest operating system is on a datastore on the ESXi host.
2. Verify that the CD/DVD drive in the VM points to the ISO image file of the guest operating system and that the CD/DVD drive is configured to connect at power on.
3. Right-click the VM, select **Power**, and select **Power On** to start the VM.
4. Right-click the VM, select **Console**, and follow the operating system vendor's installation instructions.

## Install SQL Server 2017

Before you install SQL Server 2017, ensure that the SQL Server installation media is ready to start the installation.

1. Run `setup.exe` as an administrator to start the setup wizard.
2. In the **SQL Server Installation Center** window, in the left panel, select **Installation** and then click **New SQL Server stand-alone** or **add features to an existing installation**.
3. On the **Product key** page, enter the product key and click **Next**.
4. On the **License Terms** page, select **I Accept the license terms**, and then click **Next**.

5. On the **Microsoft Update** page, select **Use Microsoft Update to check for updates (recommended)**, and then click **Next**.
6. On the **Feature Selection** page, select **Database Engine Services**, and then click **Next**.
7. On the **Instance Configuration** page, in both **Named instance** and **Instance ID**, enter the SQL Server instance network name, and then click **Next**.
8. On the **Server Configuration** page:
  - a. On the **Service Accounts** tab, specify the account name and password.
  - b. On the **Collation** tab, click **Customize**, and select:
    - i **SQL\_Latin1\_General\_CP1\_CI\_AS** for the SQL collation
    - ii **Grant Perform Volume Maintenance Task privilege to SQL Server Database Engine Service**
  - c. Click **Next**.
9. On the **Database Engine Configuration** page:
  - a. On the **Server Configuration** tab, select **Mixed Mode (SQL Server authentication and Windows authentication)** and specify the password for the SQL Server system administrator (sa) account.
  - b. On the **Data Directories and TempDB** tab, define the paths for disks or paths of the root for the system databases directory, user databases, log files, backup files, and tempdb, and then click **Next**.
10. On the **Ready to Install** page, review the details and click **Install**.
11. On the **Complete** page, verify that all the items have been installed successfully, and then click **Close**.

## Deploying the Microsoft application agent for Data Domain Boost with SQL Server

### Overview

The Microsoft application agent for Data Domain Boost (DD Boost) enables database and application administrators to efficiently back up and restore applications by using the applications' native tools.

Microsoft application agent backups are application-consistent, and the Microsoft application agent can completely restore the backups.

Deploy the Microsoft application agent for DD Boost as follows:

1. Configure the Data Domain system.
2. Install and configure the Microsoft application agent on the SQL Server host.

## Configuring the Data Domain system

Configure the Data Domain system as follows.

---

**Note:** For more information, see the [Dell EMC Microsoft Application Agent Installation and Administration Guide](#) on Dell EMC Online Support.

---

1. Log in to the Data Domain system as the sysadmin user:
 

```
ssh sysadmin@172.16.191.250
Enter password: *****
```
2. Create a Data Domain file system:
 

```
filesys create
```
3. Enable the file system:
 

```
filesys enable
```
4. Create a DD Boost user and password:
 

```
User add ms_agent_user password m*****
ddboost set user-name ms_agent_user
```
5. Enable the DD Boost software:
 

```
ddboost enable
```
6. Create a Data Domain storage unit:
 

```
ddboost storage-unit create MS _BACKUP user MS_AGENT_USER
```
7. Enable application-optimized compression:
 

```
mtree option set app-optimized-compression sqlserver1 mtree
/data/coll/ms_backup
```
8. Enable distributed segment processing:
 

```
ddboost option set distributed-segment-processing enabled
```

## Installing and configuring the Microsoft application agent on the SQL Server host

Install and configure the Microsoft application agent on the SQL Server host.

### Installing the Microsoft application agent

1. Download the Microsoft application agent 4.5.x software package from [Dell EMC Online Support](#), and copy or move the agent software to the database host.
2. Using WinZip, open and extract `msappagent45_win_x64.zip`.
3. Start the installation wizard by double-clicking the `emcmsappagent.exe` file.
4. On the **Welcome** page, select **I agree to the license term and agreements**, and then click **Next**.

5. On the **Change Install Location** page, perform one of the following tasks, and then click **Next**.
  - In the **Folder name** field, keep the default installation location, C:\Program Files\DPSAPPS\MSAPPAGENT.
  - To specify an installation location other than the default, click **Change**. In the dialog box that appears, specify the installation location, and then click **OK**.
6. On the **Configure Installation Options** page, select **SSMS Plug-in** to install the SQL server Management Studio plug-in, which you can use to perform SQL Server backup and restore operations.
7. Click **Install**.

### Configuring the application agent

Configure the Microsoft application agent for DD Boost with SQL Server.

---

**Note:** For more information, see the [Dell EMC Microsoft Application Agent Installation and Administration Guide](#) on Dell EMC Online Support.

---

1. Create the C:\ddconfig.cfg file with the following parameters:
 

```
DDBOOST_USER=ms_agent_user
DEVICE_HOST=1**.dellemc.com
DEVICE_PATH=/ms_backup
LOCKBOX_PATH="C:\Program Files\DPSAPPS\common\lockbox"
CLIENT=m****.appagentdev.com
DEBUG_LEVEL=0
```
2. Create a lockbox, which is an encrypted file that the Microsoft application agent uses to store confidential data, such as login credentials, and protect that data from unauthorized access:
 

```
msagentadmin administration --createLB --lockbox
C:\Lockboxes
```

where C:\Lockboxes is the location of the lockbox.

If you do not specify a folder, the lockbox is created in the following default directory: C:\Program Files\DPSAPPS\common\lockbox
3. Create a configuration file that contains the required credentials.
 

For example, enter the following command to edit config.cfg:

```
c:\Lockboxes\config.cfg
```
4. Add credentials to the configuration file.
 

For example, for a Data Domain user, add the following credentials:

```
LOCKBOX_PATH=C:\Lockboxes
DDBOOST_USER=ms_agent_user
DEVICE_HOST=1***.dellemc.com
DEVICE_PATH=/ddbdatest/mattp/ms_backup
```

5. Register the credentials with the lockbox:

```
msagentadmin administration --registerLB -config  
"<config_file_path>"
```

For example:

```
msagentadmin.exe administration --registerLB --config  
"C:\lockbox-config-details.cfg"
```

You are prompted for any required passwords for the configured user accounts.

## Next steps

After the deployment is complete, you can perform many post-deployment tasks such as adding and removing disks and adding and removing servers.

For information about adding and removing disks, see the following topics in the vSphere documentation:

- [Add a Hard Disk to a Virtual Machine in the vSphere Client](#)
- [Remove a Hard Disk from a Virtual Machine](#)

For information about adding and removing servers, see the following topics:

- [Add an Unmanaged Host to a Cluster in the vSphere Web Client](#)
- [Remove a Host from a Cluster](#)

# Chapter 7 Deployment Verification

This chapter presents the following topics:

**Verifying the deployment..... 39**

## Verifying the deployment

To verify the deployment:

1. Create VMs.
2. Migrate VMs across the cluster and check to see if the migration is progressing without any interruption.
3. Shut down one of the hosts and check to see if the VMs on that host are migrating within the cluster.
4. Power off one of the S4048-ON network switches and ensure that the VMs are running without any network loss.

# Chapter 8 References

This chapter presents the following topics:

<b>Dell EMC documentation</b> .....	<b>41</b>
<b>VMware documentation</b> .....	<b>41</b>



## Dell EMC documentation

For links to additional documentation for this solution, see [Microsoft SQL Info Hub for Ready Solutions](#).

The following documentation provides additional and relevant information. Access to these documents depends on your login credentials. If you do not have access to a document, contact your Dell EMC representative.

- [Dell EMC Microsoft Application Agent Installation and Administration Guide](#)
- [Dell EMC Data Domain DD6300 System Installation Guide](#)

## VMware documentation

The following VMware documentation provides additional and relevant information:

- [vSphere Virtual Machine Administration](#)
- [vSphere Web Access Administrator's Guide](#)
- [vSphere Resource Management](#)
- [vSphere Datacenter Administration Guide](#)