DELL EMC POWEREDGE PROFESSIONAL EXAM STUDY GUIDE

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Introduction

This Study Guide provides an overview of each topic on the Dell EMC PowerEdge Professional certification exam and a list of technical resources for detailed information about each topic. Candidates should use the resources for further study and exam preparation.

Information about Dell EMC PowerEdge Professional certifications, exams, and classes is available on the Dell EMC Certification Page and at http://www.Dell.com/certification.

Dell EMC PowerEdge Professional Certification Preparation

Recommended training courses are listed in the Exam Description available on the Dell EMC Certification Page. Links to online practice tests are also provided on this page.

Class dates and additional course details are available at www.LearnDell.com

Who should take the exam

Candidates for the PowerEdge Professional Exam should have knowledge and skills learned from the PowerEdge Associates course and exam. The PowerEdge Professional Exam covers installation and configuration of M1000e, FX, and VRTX hardware, including chassis-based storage and networking on each platform. IT professionals and system administrators are required to pass the exam to become certified.

Exam description

A detailed exam description is available on the Dell EMC Certification Page.

Purpose of this study guide

This Study Guide provides an overview of each topic on the Dell EMC PowerEdge Professional Exam and a list of resources for detailed information about each topic. Candidates should use the resources for further study and exam preparation.

The intent of this Study Guide is to assist candidates with preparing for the exam by providing information and resources about topics as they relate to a Dell EMC PowerEdge server deployment. This Study Guide is not intended to give candidates all the information needed to pass the exam, as their experience in the field is expected to complement the Study Guide and product-related resources.

Finding the resources referenced in this guide

Resources and references for each topic are available from the following:

- Dell EMC Support website at http://www.dell.com/support/home/US/en/04/Products/ser_stor_net/poweredge
- Dell EMC community support forum at http://en.community.dell.com/support-forums/servers/, where Dell EMC users and employees share knowledge, best practices, and information about Dell EMC products
- Dell EMC Knowledge Center at http://en.community.dell.com/techcenter/

Exam sections and topics

Install hardware components in new or existing environments

Fabric within M1000e Chassis

There are three supported high-speed fabrics per M1000e half-height server module. Two flexible fabrics use optional plug-in mezzanine cards on the server, and one is connected to the LAN on Motherboards (LOMs) on the server. The ports on the server module connect via the midplane to the associated I/O Modules (IOMs) in the rear of the enclosure, which then connect to the user's LAN/SAN/IPC networks.

Use the resources below to help yourself understand all the fabric connectivity options. Run the slideshow and follow the instructions.

Resources

- M1000e Blade Fabric Connectivity Tool
- PowerEdgeM1000e blade enclosure

PowerEdge VRTX – install and configure add-in PCIe card

The PowerEdge VRTX provides eight PCI Express (PCIe) expansion slots and two dedicated storage slots as follows:

PCIe Slot Information

Slot #	Location	Fabric B/C	Width	Physical Size	Card Size Supported	Power Allocated	Power with AUX Power Cables
1	Riser (top)	C	x8	x16	Full-height, Full-length	75 W	150 W/225 W
2	Riser	C	x8	x16	Full-height, Full-length	75 W	150 W
3	Riser	B	x8	x16	Full-height, Full-length	75 W	150 W
4	System Board	C	x8	x8	Low-profile	25 W	N/A
5	System Board	C	x8	x8	Low-profile	25 W	N/A
6	System Board	B	x8	x8	Low-profile	25 W	N/A
7	System Board	B	x8	x8	Low-profile	25 W	N/A
8	System Board	B	x8	x8	Low-profile	25 W	N/A
PERC 1	System Board	B	x8	Custom	PERC-mini (monolithic)	25 W	N/A
PERC 2	System Board	C	x8	Custom	PERC-mini (monolithic)	25 W	N/A

Resources

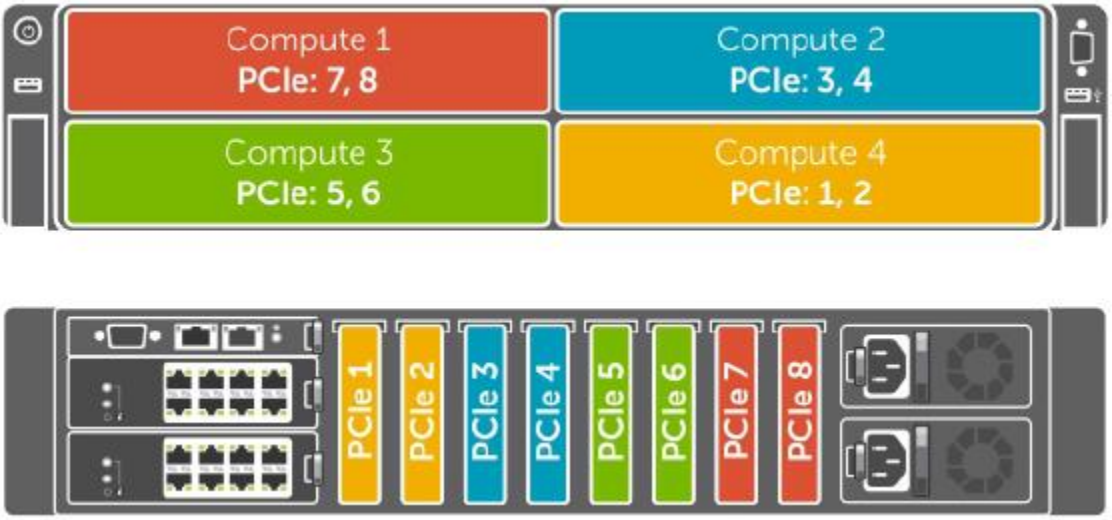
- Expansion Card Installation Guidelines

PCIe card mapping to a specific FX node

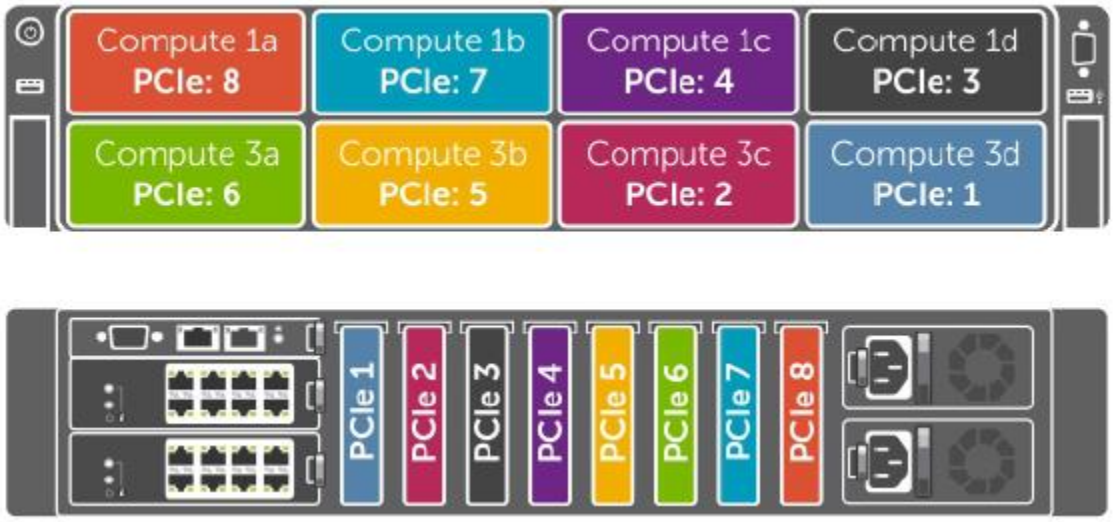
The PCIe switches on the PCIe switch board partition and guide transactions between server sleds and PCIe slots. Each of the eight rear PCIe card slots map to a front quarter-width slot. A PCIe card module is owned by the server sled occupying the quarter-width slot corresponding to the PCIe card slot.

In PowerEdge FX2s enclosure configurations that support only compute sleds, the PCIe slots are mapped to the compute sleds in the following manner:

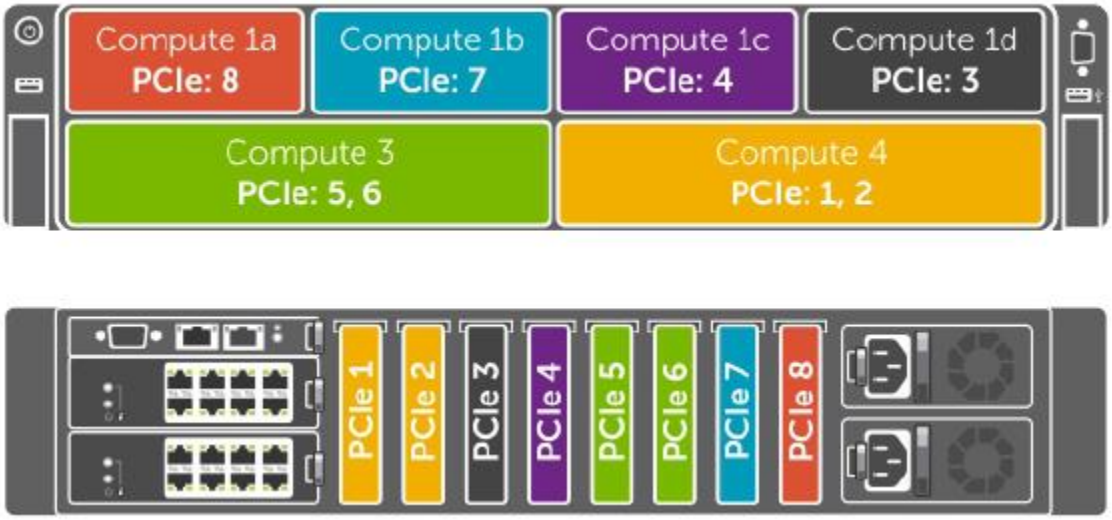
1. Four-bay chassis: Each half-width compute sled is mapped to two PCIe slots.



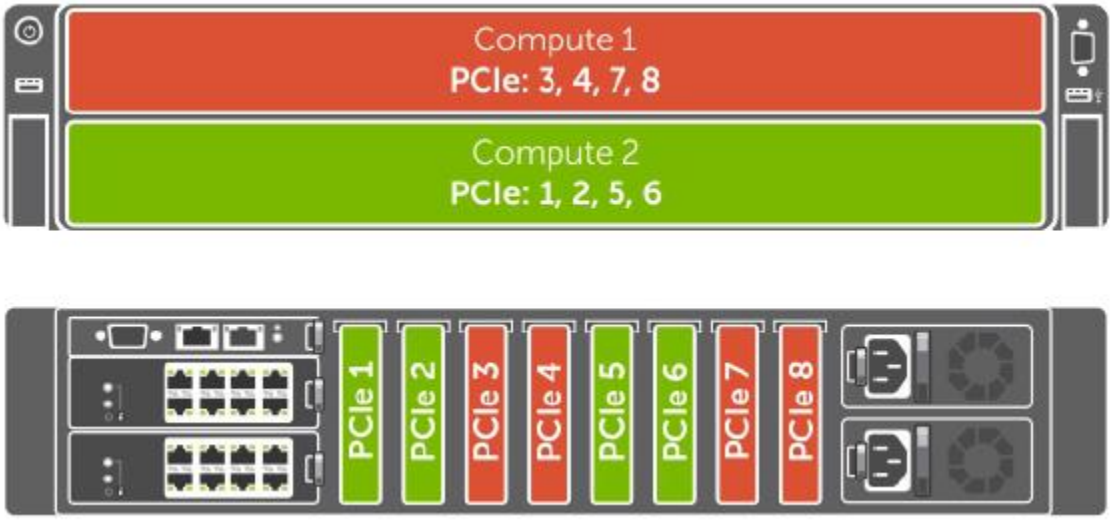
2. Eight-bay chassis: Each quarter-width compute sled is mapped to one PCIe slot.



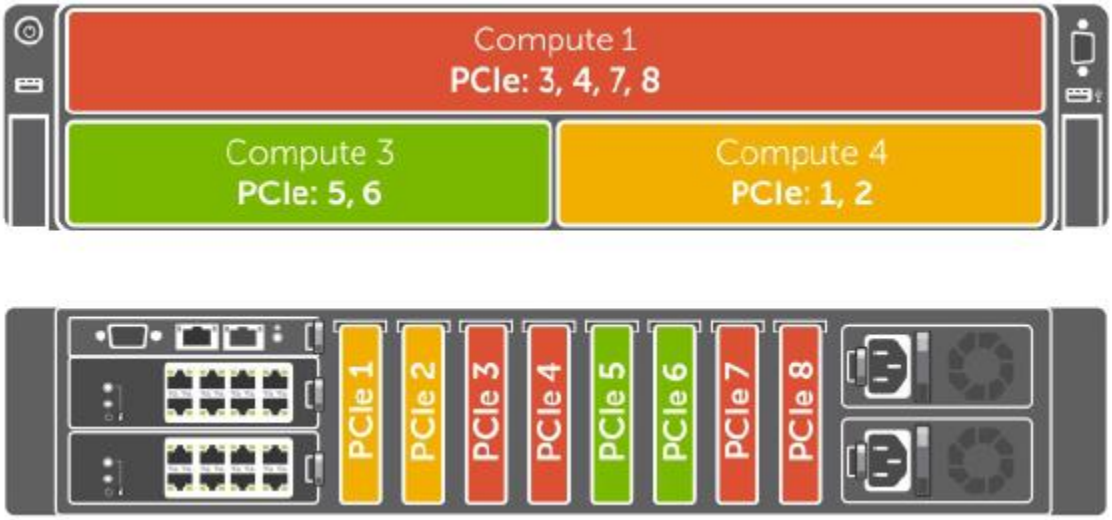
3. Six-bay chassis: Each quarter-width compute sled is mapped to one PCIe slot. Each half-width compute sled is mapped to two PCIe slots.



4. Two-bay chassis: Each full-width compute sled is mapped to four PCIe slots.



5. Three-bay chassis: The full-width compute sled is mapped to four PCIe slots. Each half-width compute sled is mapped to two PCIe slots.



Configure cabling (rack and stack)

PowerEdge M1000e – Power Redundancy policy

The redundancy policy is a configurable set of properties that determine how the Chassis Management Controller (CMC) manages power to the chassis.

The following redundancy policies are configurable with or without dynamic power supply unit (PSU) engagement:

- Grid redundancy
  - Enables a modular enclosure system to operate in a mode in which it can tolerate power failures. These failures may originate in the input power grid, the cabling and delivery, or a PSU itself.
- Power supply redundancy
  - This is useful when redundant power grids are not available, but you want to protect against a single PSU failure bringing down your servers in a modular enclosure.
- No redundancy
  - This is a factory default setting for a three-PSU configuration and indicates that the chassis does not have any power redundancy configured. In this configuration, the overall redundancy status of the chassis always indicates no redundancy.

Power Tables for Redundancy Options

Grid Redundancy Power Table

	Max Power Available									
	3000W		2700W DC-DC		2700W		1350W		2360W	
Configuration	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts
1+1	2880	3370	2534	2977	2534	2977	1230	1448	2222	3497
2+2	5760	6739	5068	5949	5068	5949	2460	2890	4444	6983
3+3	8640	10109	7602	8921	7602	8921	3690	4333	6666	7799

Power Supply Redundancy Power Table

	Max Power Available									
	3000W		2700W DC-DC		2700W		1350W		2360W	
Configuration	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts
1+1	2880	3370	2534	2977	2534	2977	1230	1448	2222	2611
2+1	5760	6739	5068	5949	5068	5949	2460	2890	4444	5217
3+1	8640	10109	7602	8921	7602	8921	3690	4333	6666	7823
4+1	11520	13478	10136	11898	10136	11898	4920	5776	8888	10430
5+1	14400	16848	12670	14875	12670	14875	6150	7218	11110	13055

No Redundancy Power Table

	Max Power Available									
	3000W		2700W DC+DC		2700W		1350W		2360W	
Configuration	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts	DC Watts	AC Watts
1+0	2880	3370	2534	2977	2534	2977	1230	1448	2222	2611
2+0	5760	6739	5068	5949	5068	5949	2460	2890	4444	5217
3+0	8640	10109	7602	8921	7602	8921	3690	4333	6666	7823
4+0	11520	13478	10136	11898	10136	11898	5068	5781	8888	10430
5+0	14400	16848	12670	14875	12670	14875	6298	7229	11110	13055
6+0	17280	20218	15204	17852	15204	17852	7528	8677	13332	15666

Resources

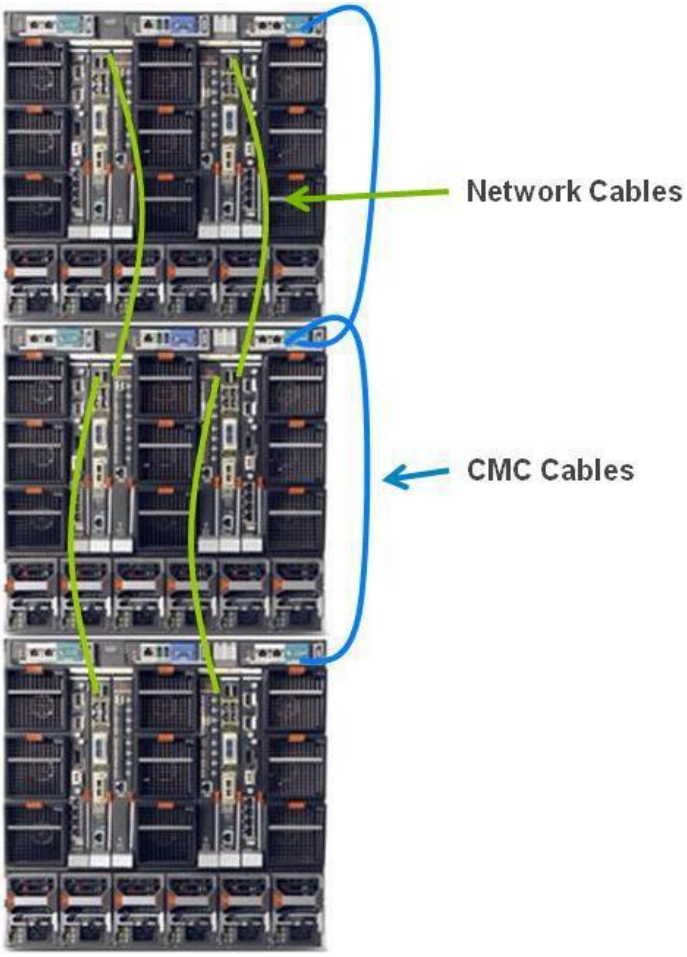
- M1000e CMC Firmware 5.1 User Guide - Redundancy Policies

CMCs and Ethernet switching cabling

Two types of external cabling simplification features are offered:

- Stacked CMCs
  - CMC has a second Ethernet port for connection to other CMCs in the rack.
  - CMC connects to the management network to manage all blade servers.
  - This saves port consumption on external switches.
- Stacked Ethernet Switching
  - Internal switches have optional 10GbE uplinks and/or stacking connectors.
  - Manage/configure multiple switches as one with stacking.
  - Consolidate uplinks from multiple chassis into 2–4 x 10GbE ports.

The following illustration shows the simplified cabling on the M1000e.



Resources

- M1000e CMC Firmware 5.1 User Guide - Daisy Chain CMC Network Connection

External Shared PERC Cabling

Resources

- Shared PERC 8 Cards For PowerEdge VRTX Systems User's Guide - Single or Dual Shared PERC 8 External Non-Fault Tolerance
- Shared PERC 8 Cards For PowerEdge VRTX Systems User's Guide - Dual Shared PERC 8 External Fault Tolerance

Troubleshoot components installed in new and existing chassis

Troubleshooting a power supply issue

The PSUs are hot-swappable. Remove and replace only one PSU at a time in a system that is turned on. Leave a failed PSU installed in the enclosure until you are ready to replace it. Operating the system with a PSU removed for extended periods of time can cause the system to overheat.

Resources

- PowerEdge VRTX Owner's Manual - Troubleshooting power supply units

Troubleshooting a CMC for the M1000e

If you cannot log in to the CMC using any of the interfaces (the web interface, Telnet, SSH, remote RACADM, or serial), you can verify the CMC functionality by observing the LEDs on the CMC, obtaining recovery information using the DB-9 serial port, or recovering the CMC firmware image.

Resources

- M1000e CMC Firmware Version 5.1 User's Guide – Troubleshooting Non-responsive CMC
- CMC for M1000e Troubleshooting

Firmware compatibility

Before performing the firmware update, review the latest firmware release notes to verify the compatibility of installed components (CMC, iDRAC, CPLD, IOM, and system board).

Resources

- PowerEdge M1000e – Manuals > Software Documents > Chassis Management Controller Version Release Notes

Configure and manage shared controller storage (VRTX)

Shared PERC on VRTX

The Shared PowerEdge RAID Controller (PERC) 8 card controller allows four server modules to access a local storage. Each server module's operating system loads a Virtual Function (VF) driver that allows the server module to communicate with the Shared PERC 8 firmware. Virtual disks located on the shared storage can then be mapped to a server module. From a single server module, you can only access the virtual disks that are mapped to that server module.

Resources

- Shared PERC 8 User's Guide > Deploying the Shared PERC 8 Card
- Configuring PowerEdge VRTX shared storage for VMware vSphere Environment

Storage Domain

Storage domains are independent on Shared PERC 8 Internal and External cards. That is, the internal card cannot access disks connected to an external card and vice versa.

Resources

- Shared PERC 8 User's Guide > About the Shared PERC 8 card > Configurations of the Shared PERC 8 Card

Configure and manage chassis-based storage (FX, M1000e)

PS-M4110 Storage Array

The PS-M4110 is a double-wide, half-height blade storage array with 1 or 2 hot-swappable Type 13 control modules and up to 14 drives. To access control modules in the PS-M4110 array, open the array drawer. The figure that follows shows an example of control modules in an open array drawer.

Resources

- EqualLogic PS-M4110

FD332 Controller Configuration

The FD332 supports the following configuration modes:

- Single or dual PERC mode
- Split mode
- Joined mode

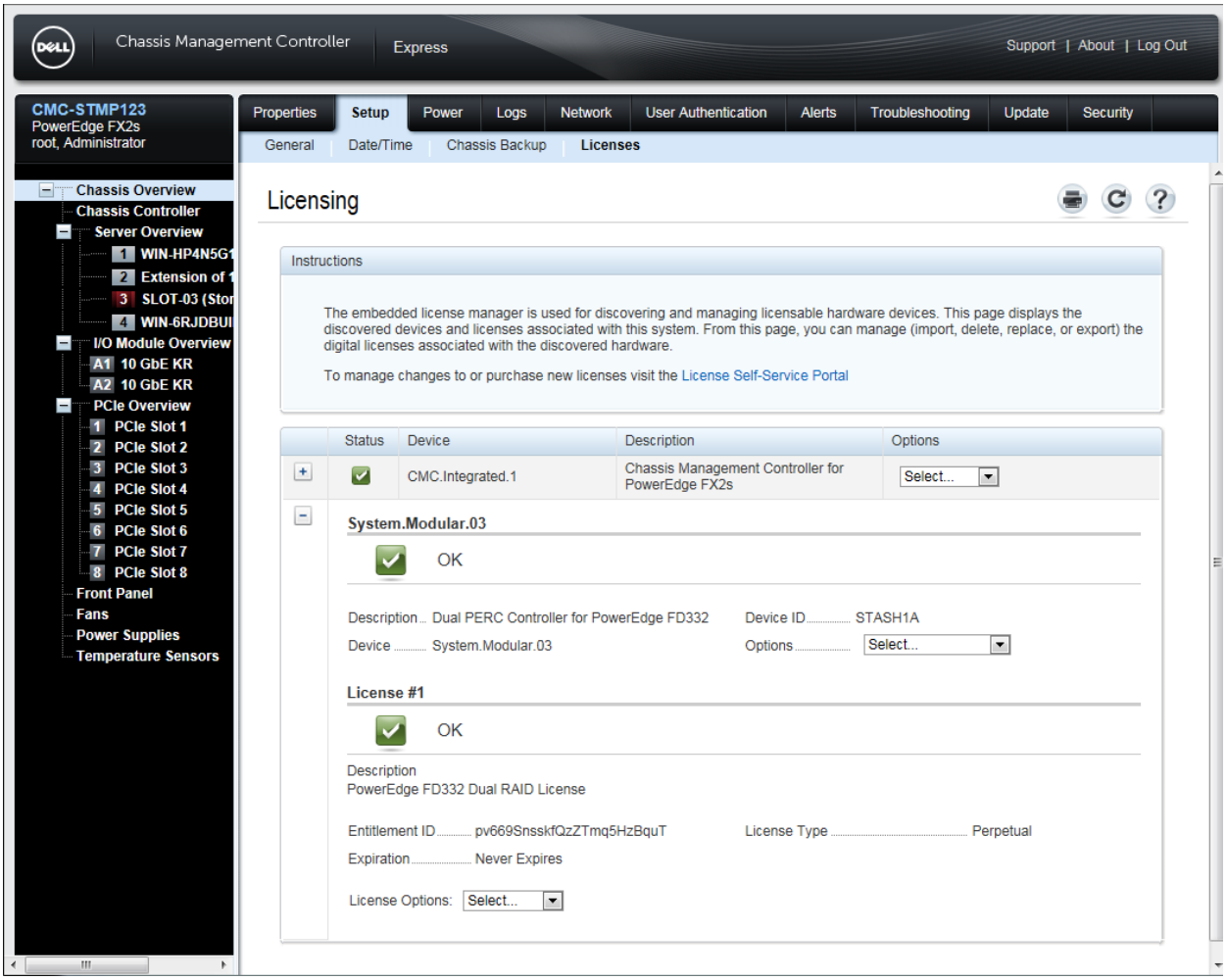
Resources

- FD332 Owner's Manual - Storage Sled Mapping Configurations

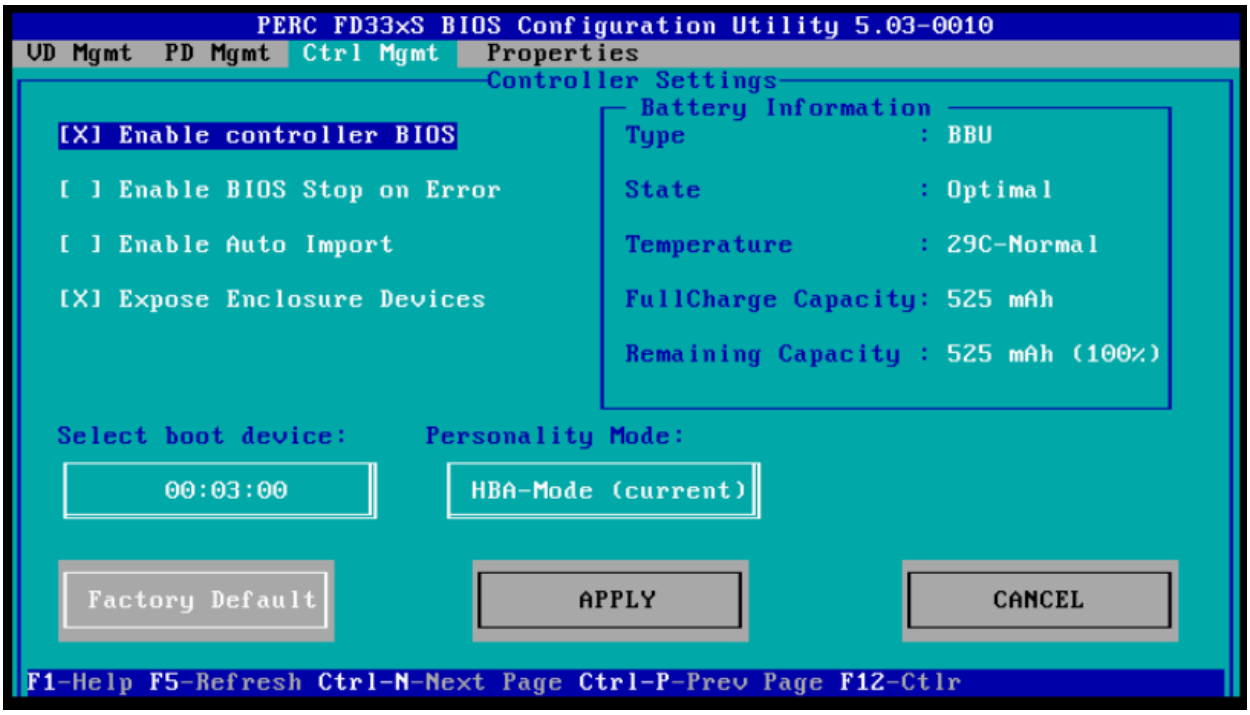
Disk Configuration

All hardware components are identical between a host bus adapter (HBA)-enabled and RAID-enabled PERC controller. As a result, the PERC may be upgraded to RAID-enabled in the field, as well as at the factory, by importing the digital license.

The following image shows the tab where the RAID license may be imported.



The BIOS RAID utility may be entered during POST using the Ctrl-R command. The following BIOS screenshot is an example of the configuration utility for a single PERC in HBA mode. In this example, Driver 0 of the FD332 installed in Bay 3 of FX2 has been selected as a boot device.



Troubleshoot chassis-based storage (VRTX)

Shared PERC 8 Troubleshooting

The PowerEdge VRTX includes two dedicated expansion card slots on the system board. These slots allow for two integrated controller cards that provide the integrated storage subsystem for your system's internal hard drives.

Resources

- Shared PERC 8 User's Guide > Troubleshooting

Configure input/output adapters on all platforms

Install expansion modules on an M1000e

Dell EMC offers several networking blade and rack-mounted switches that allow users to upgrade the hardware by installing expansion modules. These modules can be used to increase access ports, augment upstream bandwidth, extend media forms (that is 10GBase-T, SFP+, CX4, or XFP), or add stacking capabilities.

Resources

- Expansion Modules for PowerConnect™ and Force10 Switches

IOA Modes

IOA supports the following operational modes:

- Standalone mode
- VLT mode
- Programmable MUX
- Stacking mode

Resources

- Editing the Active IOA Mode
- PowerEdge FN I/O Aggregator Configuration Guide

Assigning VLAN

Resources

- VLAN Assignment

Apply and Configure Network Settings

Resources

- Switching Layer-2

Configure IOM switches

Configuring Advanced Layer 2 Networking

Resources

- Networking Configuration Guide for the MXL - Layer 2
- PowerEdge VRTX Networking > PowerEdge VRTX Configuration

Configuring Stacking of Switches

Resources

- Networking Configuration Guide for the MXL - Stacking

Identify Internal to External Mapping (Pass-through Module)

Resources

- 10Gb Ethernet Pass Through -k for M1000e

Configure host

Configuring Network Settings for IOMs

Resources

- M1000e CMC Firmware Version 5.1 User's Guide – Configuring Network Settings for IOM(s)

Troubleshoot server connectivity

Validate Hardware Compatibility and Firmware Versions on M1000e

Refer to CMC for M1000e and Minimum CMC Version for hardware compatibility and supported firmware versions.

Analyze Running Config

Each blade server has its onboard LOMs mapped to internal ports on fabric A, which corresponds to internal ports on IOMs A1 and A2 to provide I/O redundancy. The mezzanine cards for fabric B and C work in the same way, except that they can be 1GbE, 10GbE, Fibre Channel (FC), or InfiniBand.

For example, suppose there is a fully loaded M1000e chassis with eight full-height M710 blade servers, each with four onboard NICs. The four ports on each server are divided between IOMs A1 and A2. Eight servers provides 16 ports for each IOM, which is the same number of internal ports on pass-through modules and Ethernet switches. The same is true for fabric B and C. Match the mezzanine card with a corresponding pair of IOMs for the same type of communication (Ethernet, FC, or InfiniBand).

Verify differences in CMC features and capabilities

PowerEdge VRTX CMC License Types

Dell EMC offers the Express and Enterprise license types for the PowerEdge VRTX. The Express license provides embedded tools, console integration, and simplified remote access. The Enterprise license provides administrators a management experience that makes them feel they are in the physical vicinity of a chassis.

Resources

- CMC for PowerEdge VRTX User's Guide > Managing Licenses

Impact of hardware differences on CMC features

Refer to CMC for M1000e for information about the differences between CMC firmware versions.

Configure chassis using the CMC

Backup CMC configuration

Resources

- M1000e CMC Firmware Version 5.1 User's Guide - Saving or Restoring Chassis Configuration
- How to Backup and Restore the VRTX CMC

Use CMC to deploy iDRAC in FX2

It is easier to use the CMC web interface to complete the rest of the initial FX2 setup, which includes configuring and deploying iDRAC, configuring the servers, and creating server profiles.

Resources

- CMC Version 1.3 for FX2/FX2s User's Guide - Configuring iDRAC network settings

Enable FlexAddress/Extended Storage

FlexAddress is a feature on PowerEdge M1000e systems which substitutes chassis-assigned addresses for factory-programmed protocol-specific addresses on Ethernet and FC devices. Both factory- and chassis-assigned addresses are 48-bit IEEE Standard 802.1A Universal LAN MAC Addresses (ULA) for Ethernet devices and World Wide Names (WWN) for FC devices.

To enable FlexAddress/extended storage, follow these four steps.

Resources

- Using FlexAddress and FlexAddress Plus Cards

Configure email alerts

Resources

- Configuring CMC To Send Alerts

Configure users using local and Active Directory

Resources

- Configuring Local Users
- Configuring Active Directory Users

Configure the CMC network

Resources

- Configuring CMC Network and Login Security Settings

Evaluate power usage and policies at the chassis level

Recommended number of servers on M1000e and PSUs

Resources

- PowerEdge M1000e Enclosure Owner's Manual

Assigning server slots power priority

Resources

- Server Slot Power Priority Settings

Set up an enclosure-level power cap

The power cap is set at the chassis level for blade servers and not at the blade server level. As a result, components like the processer and memory can throttle down when necessary on lower-priority blade servers. An allocation is taken out for the infrastructure (fans and IOMs), then the remainder is applied to the blades, and finally throttling is applied if required to get under the cap.

Resources

- CMC Version 1.3 for FX2/FX2s User's Guide - Power Troubleshooting

Verify/compare differences in PCI slot assignments

Configuring PCIe mapping on a VRTX

Resources

- PowerEdge VRTX - Mapping PCIe Expansion Slots

Configuring PCIe-to-node mapping on an FX2

Resources

- CMC Version 1.3 for FX2/FX2s User's Guide – Configuring PCIe slots
- FX2/FX2s Enclosure Owner's Manual > PowerEdge FX2/FX2s mapping configurations > Expansion bus > PCIe expansion slot mapping

Configure multi-chassis management

Create a chassis group

The CMC enables you to monitor multiple chassis from a single lead chassis. When a Chassis Group is enabled, the CMC in the lead chassis generates a graphical display of the status of the lead chassis and all member chassis within the Chassis Group.

Resources

- M1000e CMC Firmware Version 5.1 User's Guide – Setting Up Chassis Group

Configuring chassis properties propagation

Resources

- CMC Version 1.3 for FX2/FX2s User's Guide - Propagating Leader Chassis Properties to Member Chassis

Capture and deploy server profiles (power, system setup)

Accessing the Server Profile page

Resources

- M1000e CMC Firmware Version 5.1 User's Guide - Accessing Server Profiles Page

Adding or saving a profile

Resources

- M1000e CMC Firmware Version 5.1 User's Guide - Adding or Saving Profile

Applying a profile

Resources

- M1000e CMC Firmware Version 5.1 User's Guide – Applying Profile

Install and configure System Management tools (OME, OMPC, DRM, OMNM)

Installing and configuring OpenManage Essentials

OpenManage Essentials (OME) is a hardware management application that provides a comprehensive view of Dell EMC systems, devices, and components in an enterprise network.

Resources

- Installing OpenManage Essentials

Installing and configuring OpenManage Power Center

OpenManage Power Center (OMPC) is a power management solution for the data center. It enables you to monitor and manage power consumption and temperature in your data center through the management console.

Resources

- OpenManage Power Center 3.2 User's Guide - Using OpenManage Power Center

Installing and configuring Repository Manager

Dell EMC Repository Manager (DRM) is an application that allows you to create customized bundles and repositories on systems running the Windows operating system. Using DRM ensures that your PowerEdge system is equipped with the latest BIOS, driver, firmware, and software updates.

Resources

- Repository Manager Data Center Version 2.2 User's Guide - Using the Repository Manager

Installing and configuring OpenManage Network Manager (OMNM)

Dell EMC Networking OpenManage Network Manager (OMNM) allows you to quickly and efficiently deploy and manage all your network switches. OMNM's centralized management solution for Dell EMC networking environments provides discovery, configuration management, monitoring, and reporting for the entire networking family of products, right out of the box.

Resources

- OpenManage Network Manager version 5.1
  - Installing and System Startup
  - Configuring OpenManage Network Manager Users
  - Configuration Management

Install and configure support tools (SupportAssist)

Downloading and Installing SupportAssist for OME

Installing and using SupportAssist results in improved support, products, and services to meet user needs. SupportAssist is optional.

Resources

- SupportAssist Version 1.3 for Servers User's Guide - Downloading the SupportAssist installation package
- SupportAssist Version 1.3 for Servers User's Guide - Installing SupportAssist

Configuring Default Credentials for Managed Devices in SupportAssist

SupportAssist utilizes the credentials (user name and password) that you provided for adding the device—to log in to the device, collect system information, and send it securely to Dell EMC.

Resources

- Configuring Credential Types in SupportAssist with OpenManage Essentials

Configuring SNMP Alerting on Managed Devices

Resources

- SupportAssist Version 1.3 for Servers User's Guide – Configuring the Alert (SNMP trap) Destination

Update firmware (using CMC, OME)

Confirming System Update Compliance in OpenManage Essentials

Resources

- OpenManage Essentials Version 2.2 User's Guide - System Update

Updating firmware via OME System Update with out-of-band method

Resources

- OpenManage Essentials Version 2.2 User's Guide - Applying System Updates Using the System Update Task Wizard

Updating firmware via CMC

Resources

- M1000e CMC Firmware Version 5.1 User's Guide – Updating Firmware

Creating customized offline repository with Repository Manager

A customized repository will be created in the DRM local database first. A customized repository cannot be used by a Dell EMC-supported system management console until it is exported into a user-specified location.

Resources

- Managing a Local Repository

Use System Management tools to discover and monitor devices out-of-band

Reviewing health status of managed devices in OpenManage Essentials

Resources

- OpenManage Essentials Version 2.2 User's Guide – Health and Connection Status

Discovering iDRACs and CMC via WS-MAN protocol in OpenManage Essentials

Resources

- OpenManage Essentials Version 2.2 User's Guide – WS-MAN Configuration

Configuring SNMP alerting on devices managed via OpenManage Essentials

Resources

- OpenManage Essentials Version 2.2 User's Guide – SNMP Configuration

Configuring OpenManage alerting

Resources

- OpenManage Essentials Version 2.2 User's Guide - Configuring Alert Actions

Perform one-to-many deployment

Configuring multiple CMCs through RACADM using chassis configuration profiles

Resources

- M1000e CMC Firmware Version 5.1 User's Guide - Configuring Multiple CMCs through RACADM Using Chassis Configuration Profiles

Chassis configuration profiles via CMC

Resources

- M1000e CMC Firmware Version 5.1 User's Guide - Chassis Configuration Profiles

Configure File Share and Server Template via OME

Resources

- OpenManage Essentials Version 2.2 User's Guide – Configuring the Deployment File Share
- OpenManage Essentials Version 2.2 User's Guide – Creating a Device Configuration Template

Modify and deploy a Server Template to server nodes using OME

Resources

- OpenManage Essentials Version 2.2 User's Guide - Editing a Device Configuration Template

Confirm device configuration compliance using OME

Resources

- OpenManage Essentials Version 2.2 User's Guide - Getting Started for Device Configuration Compliance

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