

Dell EMC Ready Bundle for Red Hat OpenStack

Hardware Deployment Guide

Version 6.0.1



Dell EMC Converged Platforms and Solutions

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Notes, Cautions, and Warnings

-  A **Note** indicates important information that helps you make better use of your system.
-  A **Caution** indicates potential damage to hardware or loss of data if instructions are not followed.
-  A **Warning** indicates a potential for property damage, personal injury, or death.

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Chapter 1

Overview

Topics:

- [Deployment Methodology](#)
- [Intended Audience](#)
- [Dependencies](#)

This guide provides information necessary to deploy the Dell EMC Ready Bundle for Red Hat OpenStack, on Dell EMC PowerEdge R630 and Dell EMC PowerEdge R730xd servers with the Dell EMC PowerEdge H730 disk controller; and the network with Dell Networking S3048-ON and S4048-ON switches.

Deployment Methodology

To perform a deployment of the Dell EMC Ready Bundle for Red Hat OpenStack:

1. Use the [Dell EMC Ready Bundle for Red Hat OpenStack Hardware Deployment Guide](#).
2. Then, depending on the methodology that you prefer, use either the:
 - a. [Dell EMC Ready Bundle for Red Hat OpenStack Software Manual Deployment Guide](#), or
 - b. [Dell EMC Ready Bundle for Red Hat OpenStack Software Automated Deployment Guide](#) in order to perform an automated deployment using scripts and methods developed and validated by Dell EMC

Intended Audience

This guide assumes the reader is familiar with:

- OpenStack
- Dell EMC PowerEdge R630 and Dell EMC PowerEdge R730xd RAID and BIOS configuration
- Red Hat Enterprise Linux (RHEL)
- Red Hat OpenStack Platform (RHOSP) documentation
- Network Configuration
- The concepts and procedures in [Red Hat's Red Hat OpenStack Platform update/upgrade documentation](#)

Dependencies

For customers performing a self-installation, these files are available on request from Dell EMC. Please contact your account representative, or email openstack@dell.com for instructions.

[Dell EMC Ready Bundle for Red Hat OpenStack Hardware Deployment Guide](#) dependencies and prerequisites include:

- IPMI Utilities - used for validating server IPMI configuration
 - For Linux® - <http://sourceforge.net/projects/ipmitool/>
 - For Windows® - <http://ipmiutil.sourceforge.net/>
- The Dell EMC Toolkit (DTK)
 - A copy of the archive: DELL-DTK-Switch_configs-6.0.1.tgz, which contains:
 - The DTK ISO
 - Sample switch configs
 - Solution Workbook
 - Creating the DTK Configurator ISO requires a Linux® environment that has the following programs installed:
 - `cpio`
 - `rpm`
 - `rpm2cpio`

Chapter

2

Configuring R630 and R730xd Hardware

Topics:

- [IPMI Configuration](#)
- [Configuring Server User Information](#)
- [Configuring Server Network Settings](#)
- [Validating Server IPMI Configuration](#)
- [Infrastructure and Virtualization Node Settings](#)
- [DTK Configurator](#)

This section describes manually configuring PowerEdge R630 and R730xd server hardware for the Dell EMC Ready Bundle for Red Hat OpenStack with Red Hat OpenStack Platform:

- IPMI Configuration
- BIOS Configuration
- RAID Configuration



Note: The hardware configuration for the optional PowerEdge R430 and R730 servers is the same as for Compute nodes.

IPMI Configuration

You must perform configuration of the iDRAC on supported systems. Dell EMC recommends that you configure these settings from the iDRAC web interface, or directly on the node console.

Configuring Server User Information

1. Set credentials for the root user, including changing the password based upon good password standards.
2. Set privileges for the user to the Admin level, including over LAN.
3. Enable the user, if disabled.

Configuring Server Network Settings

1. Set the iDRAC IP address source to *static* IP addressing.
2. Set the iDRAC IP address, subnet mask, default gateway IP, and default VLAN (ID = 110).
3. Set the iDRAC NIC mode to *Dedicated*.
4. Configure the IPMI over LAN Setting to *Enabled*.

Validating Server IPMI Configuration

Validating that remote commands can be executed is an essential part of the IPMI setup.

1. Install the IPMI Utilities to your workstation from SourceForge:
 - a. For Linux® - <http://sourceforge.net/projects/ipmitool/>
 - b. For Windows® - <http://ipmiutil.sourceforge.net/>
 - c. Validate that you have all the requirements, and that it will run.
2. Plug your Ethernet port into a switch port that is on the same VLAN as your iDRACs.
3. Configure your NIC to use an IP address in the iDRAC network range.
4. Execute the following IPMI command, replacing "username" and "password" with the credentials for the iDRACs:

```
for i in $(seq 162 170); do ipmitool -P "password" -U "username" -I
lanplus -H 192.168.200.$i power status; done
```

This will perform a simple, non-destructive poll of the power status of the iDRAC from 192.168.200.162 to 192.168.200.170.



Note: You will need to replace the IP address range and subnet with correct information for the deployed iDRAC subnet.

- a. You can replace the keyword status with *reset*, *off*, or *on*.



Note: These may change the power state of the nodes.

5. Ensure that all machines return responses to the command.

Infrastructure and Virtualization Node Settings

The following settings should be preset from the factory on the R630; be sure to double-check them:

- [OpenStack Default BIOS Specification](#)

This section describes the settings for nodes that will be used on the Solution Admin Host (SAH), OpenStack controllers, and Compute nodes:

- [OpenStack Controller and Storage Specification](#)
- [OpenStack Compute and SAH Specification](#)

DTK Configurator

This topic contains Dell EMC Toolkit (DTK) Configurator usage instructions. The DTK Configurator enables you to create a USB key from which you can boot a Dell PowerEdge R630 or R730xd, and apply the BIOS and RAID settings.

Tested BIOS and Firmware

[Table 1: Tested BIOS and Firmware Versions](#) on page 11 lists the BIOS and firmware versions that were tested for the Dell EMC Ready Bundle for Red Hat OpenStack, version 6.0.1.


 **Caution:** You must ensure that the firmware on all servers is up to date. Otherwise, unexpected results may occur.

Table 1: Tested BIOS and Firmware Versions

Product	Version
BIOS	2.1.7
iDRAC Firmware	2.30.30.30
Lifecycle Controller	2.30.30.30
Intel® 10G NIC	17.5.10
PERC H730 RAID Controller	25.4.0.0017
BP13G+0:1	2.23 (R630) - 3.31 (R730xd)
Power Supply Firmware	00.11.3F (R630) - 00.24.7A (R730xd)

Creating the DTK Configurator ISO

To create the DTK Configurator ISO:

1. Ensure you are running in a Linux® environment that has the following programs installed:
 - `cpio`
 - `rpm`
 - `rpm2cpio`
2. Ensure the user you are logged in as has passwordless `sudo` rights.
3. Copy the `bootimage.iso` included in the DTK configuration `tgz` file to your home directory.

- Run the following command to ensure that the loop module is loaded, so that the script has access to loopback devices:

```
$ sudo modprobe loop
```

- Copy the ISO onto a USB key using the following command:

```
$ sudo dd if=~/.bootimg.iso of=/dev/sdx bs=2048
```

Where: `/dev/sdx` is the device that was created when the USB key was inserted into the system. The USB key must be at least 512MB in size.

Customizing the ISO

This utility creates a CentOS 6.6 Live CD ISO that has the Dell EMC DTK Configurator installed. It uses `syscfg`, `raidcfg` and `racadm` to configure the system. The main customization point is `bootimg/node-config.sh`, which automatically runs when the ISO finishes booting.

iDRAC Default Settings

[Table 2: OpenStack Infrastructure and Storage Node Specification](#) on page 12 lists and describes iDRAC default `racadm` settings that will be set by the DTK Configurator:

Table 2: OpenStack Infrastructure and Storage Node Specification

Menu Choice	iDRAC Setting
iDRAC.IPMILan.Enable	Enabled
iDRAC.IPMILan.PrivLimit	4
iDRAC.IPv4.Enable	Enabled
iDRAC.Users.2.Enable	Enabled
iDRAC.Users.2.IpmiLanPrivilege	4
iDRAC.Users.2.Privilege	0x1ff
iDRAC.WebServer.Enable	Enabled

OpenStack Default BIOS Specification

[Table 3: OpenStack Default BIOS Specification](#) on page 12 lists and describes the default BIOS settings for the OpenStack servers that will be set by the DTK Configurator.

Table 3: OpenStack Default BIOS Specification

Display Name	Attribute	Settings
Boot Mode	BootMode	BIOS
Boot Sequence Retry	BootSeqRetry	Enabled
DCU IP Prefetcher	DculpPrefetcher	Enabled
DCU Streamer Prefetcher	DcuStreamerPrefetcher	Enable
Logical Processor Idling	DynamicCoreAllocation	Disabled
Integrated RAID Controller	IntegratedRaid	Enabled
Internal SD Card	InternalSdCard	Off

Display Name	Attribute	Settings
I/OAT DMA Engine	IoatEngine	Enabled
Logical Processor	LogicalProc	Enabled
Memory Operating Mode	MemOpMode	OptimizerMode
System Memory Testing	MemTest	Disabled
Node Interleaving	NodeInterleave	Disabled
OS Watchdog Timer	OsWatchdogTimer	Disabled
Adjacent Cache Line Prefetch	ProcAdjCacheLine	Enabled
Number of Cores per Processor	ProcCores	all
Execute Disable	ProcExecuteDisable	Enabled
Hardware Prefetcher	ProcHwPrefetcher	Enabled
CPU Power Management	ProcPwrPerf	MaxPerf
Turbo Mode	ProcTurboMode	Enabled
Virtualization Technology	ProcVirtualization	Disabled
QPI Speed	QpiSpeed	MaxDataRate
Alternate RTID (Requestor Transaction ID) Setting	RtidSetting	Disabled
SR-IOV Global Enable	SriovGlobalEnable	Enabled
System Profile	SysProfile	PerfOptimized

OpenStack Controller and Storage Specification

Table 4: OpenStack Controller and Storage Node Specification on page 13 lists and describes OpenStack Controller and Storage Node parameters that differ from *OpenStack Default BIOS Specification* on page 12. Controller nodes are sometimes referred to as Infrastructure nodes.

Table 4: OpenStack Controller and Storage Node Specification

Display Name	Attribute	Settings
SR-IOV Global Enable	SriovGlobalEnable	Disabled

OpenStack Compute and SAH Specification

Table 5: OpenStack Compute and SAH Specification on page 13 lists and describes OpenStack Compute and SAH parameters that differ from *OpenStack Default BIOS Specification* on page 12.

Table 5: OpenStack Compute and SAH Specification

Display Name	Attributes	Settings
Virtualization Technology	ProcVirtualization	Enabled

Setting RAID Profiles

Table 6: RAID Setting Profiles on page 14 lists and describes RAID setting profiles that will be created by the DTK Configurator.

Table 6: RAID Setting Profiles

Profile	Settings
RAID10	<ol style="list-style-type: none"> 1. Configure all the disks on the first controller as a single large RAID 10. 2. Mark it as the boot volume. <p>All the disks must use the same media type (SSD or HDD), and the same interface type (SAS or SATA). If they do not, array creation will fail.</p>
RAID1 and JBOD	<ol style="list-style-type: none"> 1. Configure the last two disks on the storage node as a RAID 1. 2. Mark it as bootable. 3. Configure the rest of the disks as JBOD volumes. <p>All the disks in the RAID 1 must use the same media type, and have the same interface type. On the R730xd, this should result in the boot volume being on the rear drives (assuming that the rear backplane is attached properly).</p>

Dell EMC PowerEdge R730xd Storage nodes are available in chassis options that support different drive configurations:

- **3.5" Drive Configuration** — Three (3) SSD journal drives, twelve (12) 3.5" OSD drives, and two (2) flex bay drives
- **2.5" Drive Configuration** — Twenty four (24) external 2.5" drives and two (2) flex bay drives

Mapping Menu Choices BIOS and RAID Settings

[Table 7: RAID and BIOS Menu Choices Mappings](#) on page 14 lists and describes the mappings of menu choices to RAID and BIOS settings.

Table 7: RAID and BIOS Menu Choices Mappings

Menu Choice	BIOS/RAID Setting
OpenStack Infrastructure (Controller)	OpenStack Controller, RAID10
OpenStack Compute	OpenStack Compute, RAID10
OpenStack Storage	OpenStack Storage, RAID1 and JBOD
OpenStack SAH	OpenStack SAH, RAID10

Running the DTK Configurator ISO

To run the DTK Configurator ISO:

1. Boot the system to be configured from the USB key.
2. Once the system finishes booting, it displays the detected RAID controllers along with their current configuration; and offers you a choice of system configurations.
 - a. Select a system configuration based upon the role that the node will play:
 - OpenStack Infrastructure (Controller)
 - OpenStack Compute
 - OpenStack Storage
 - OpenStack SAH
3. The DTK Configurator automatically configures the RAID and BIOS settings. Once finished, it will ask you to provide basic iDRAC connectivity information, including:
 - a. Whether the iDRAC should use DHCP
 - b. Or, basic IPv4 settings if not using DHCP

4. The system configures the iDRAC with some default settings plus the network settings from Step 3 above. Once it finishes applying those settings, it prompts you to reboot the system.
5. Assuming there were no errors, remove the USB key and then reboot the system.

The changes are applied, and the system is configured for its role.

Chapter

3

Dell Storage PS Series Storage Group

Topics:

- [*Dell Storage PS Series Configuration Information*](#)


The PS Series Storage Group can consist of one or more storage arrays with one or more storage groups.



Note: The configuration of the arrays is beyond the scope of this document. Please refer to the Dell Storage PS Series Support Website (<https://eqsupport.dell.com/secure/login.aspx>) for the latest guides, whitepapers, and best practices on how to setup your Storage Group for your application.

Dell Storage PS Series Configuration Information

Once the Storage Group(s) are setup, the information contained in [Table 8: PS Series Information Needed from Configuration](#) on page 17 must be collected to configure your storage backend.

 **Note:** The `san_thin_provision` variable should be left at the default if available; if not, then it must be set to `False`.

More information can be found at <https://access.redhat.com/documentation/en/red-hat-openstack-platform/8/dell-equallogic-back-end-guide/dell-equallogic-back-end-guide>.

Table 8: PS Series Information Needed from Configuration

[DEFAULT]	Description
<code>volume_driver = cinder.volume.drivers.eqlx.DellEQLSanISCSIDriver</code>	Dell Storage PS Series volume driver
<code>san_ip = <IP_address_of_EQLX></code>	IP address used to reach the PS Series Group through SSH
<code>san_login = <user_name></code>	User name to login to the Group manager via SSH at the <code>san_ip</code>
<code>san_password = <password></code>	Password to login to the Group manager via SSH at the <code>san_ip</code> (not used when <code>san_private_key</code> is set)
<code>san_thin_provision = <true false></code>	Enable/disable creation of thin-provisioned volumes
<code>san_ssh_port = 22</code>	Port used for SSH
<code>ssh_conn_timeout = 30</code>	Timeout value, in seconds, used by CLI commands over SSH
<code>san_private_key = <filename></code>	Filename of the private key used for SSH authentication
<code>ssh_min_pool_conn = 1</code>	Minimum number of SSH connections in the pool
<code>ssh_max_pool_conn = 5</code>	Maximum number of SSH connections in the pool
<code>eqlx_chap_login = admin</code>	Existing CHAP account name
<code>eqlx_chap_password = password</code>	Password for specified CHAP account name
<code>eqlx_cli_max_retries = 5</code>	Maximum retry count for reconnection
<code>eqlx_cli_timeout = 30</code>	Timeout for the Group Manager CLI command execution
<code>eqlx_group_name = group-0</code>	Group name to use for creating volumes

[DEFAULT]	Description
<code>eqlx_pool = default</code>	Pool in which volumes will be created
<code>eqlx_use_chap = False</code>	Use CHAP authentication for targets?

Chapter

4

Dell Storage SC Series Storage Arrays

Topics:

- [Dell Storage SC Series Configuration Information](#)

The SC Series can consist of one or more Dell Storage Centers with Dell Storage Enterprise Manager platform.



Note: The configuration of the cluster is beyond the scope of this document. Please refer to the Dell Storage SC Series support website, <http://www.dell.com/support/contents/us/en/19/article/Product-Support/Dell-Subsidiaries/compellent>, for the latest guides, white papers, and best practices on how to setup your storage cluster.

Dell Storage SC Series Configuration Information

Once the Dell Storage SC Series with the Dell Storage Enterprise Manager platform is setup according to the [Dell EMC Ready Bundle for Red Hat OpenStackReference Architecture](#), the information contained in [Table 9: SC Series Information Needed from Configuration](#) on page 20 must be collected to configure your storage backend.

More information can be found at <https://access.redhat.com/documentation/en/red-hat-openstack-platform/version-8/dell-storage-center-back-end-guide/>

Table 9: SC Series Information Needed from Configuration

[DEFAULT]	Description
Required Values	
<code>volume_backend_name = delliscsi</code>	Name given to the storage backend
<code>volume_driver = cinder.volume.drivers.dell.dell_storagecenter_iscsi.DellStorageCenterISCSIDriver</code>	Dell Storage SC Series iSCSI volume driver
<code>san_ip = <IP_address></code>	IP address of Enterprise Manager
<code>san_login = <user_name></code>	User name to log into Enterprise Manager at the <code>san_ip</code>
<code>san_password = <password></code>	Password to log into the Enterprise Manager at the <code>san_ip</code>
<code>iscsi_ip_address = <IP_address></code>	The Storage Center iSCSI IP address
<code>dell_sc_ssn = <serial_number></code>	The Storage Center serial number to use
Optional Vaules	
<code>dell_sc_api_port = <port_to_use></code>	Configured Enterprise Manager API port, default is 3033
<code>dell_sc_server_folder = <folder_name></code>	Server folder in which to place new server definitions
<code>dell_sc_volume_folder = <folder_name></code>	Volume folder in which to place created volumes
<code>iscsi_port = <port_number></code>	iSCSI port to use, if you do not wish to use the default port number 3260

Chapter

5

Configuring Your Network

Topics:

- [*Network Configuration Overview*](#)
- [*Third-Party Network Hardware*](#)
- [*Using the Workbook*](#)
- [*Dell Networking Switches*](#)
[*Default Solution Values*](#)

This topic describes the procedures required to configure the Dell EMC Ready Bundle for Red Hat OpenStack network.

Network Configuration Overview

Complete the following steps to set up your network:

1. Determine the VLANs to be used and how they are used.
2. Determine the IP ranges and associate them to a VLAN.
3. Fill in the Solution Workbook. See [Using the Workbook](#) on page 22.
4. Ensure that the cabling matches your Workbook.
5. Configure your switches per the Workbook:
 - [Dell Networking Switches Default Solution Values](#) on page 23

Third-Party Network Hardware

If you are not using Dell Networking S3048-ON and/or S4048-ON switches, you must program the switches to support your cloud instantiation. Your switches are expected to support the following:

- Support for IEEE 802.1Q VLAN traffic and port tagging
- Support for using one untagged and multiple tagged VLANs on the same port
- The ability to provide a minimum of 170 Gigabit Ethernet ports, in a non-blocking configuration, within the Provisioning VLAN
 - Configuration can be a single switch or a combination of stacked switches, to meet the additional requirements
- The ability to create link aggregation groups (LAGs) with a minimum of two physical links in each LAG
- If multiple switches are stacked:
 - The ability to create a LAG across stacked switches
 - Full-bisection bandwidth
 - Support for VLANs to be available across all switches in the stack
- 250,000 packets-per-second capability per switch
- A managed switch that supports both SSH and serial line configuration
- SNMP v3 support

Using the Workbook



Note: The Solution Workbook was designed for Dell EMC and Red Hat deployment services to use as a general worksheet for planning a deployment. It is available upon request, as explained in [Dependencies](#), for customers performing a self-deployment. For the Network Configuration portion of the deployment procedure, only the worksheets on Dell Networking are required. The rest of the worksheets are optional.

The *Solution Workbook* is set up to enable the installers to use the same information to:

- Program the switches
- Build the configuration for each node

Using the worksheet you must complete the following tasks for each connection from Server to Switch.

On Any Page:

- If the information is indicated as *required*, then it is needed in order to ensure a successful install.

- We provide a table for you to complete, similar to [Table 10: Example VLAN Assignments](#) on page 23.



Note: When configuring your networks they must be aligned so that the tenant networks can be expanded by adding a VLAN for each OpenStack virtual network. This is accomplished by assigning all the other networks to lower VLAN numbers than that of the internal tenant network. The solution, as tested, uses a single external network for tenants. A service motion can be arranged to allow dedicated external tenant networks.

Table 10: Example VLAN Assignments

VLAN Name	Recommended VLAN
Management/Out of Band (OOB) Network	110
Provisioning Network VLAN	120
Private API Network VLAN	140
Storage Network VLAN	170
Storage Clustering Network VLAN	180
Public API Network VLAN (API, GUI)	190
External Network VLAN for Tenants (tenants' floating IP addresses)	191
Internal Networks VLAN for Tenants	200+



Note: Management/Out of Band network ports Management 1/1 is used by the VLT for the heartbeat, and must terminate on the same VLAN in the same IP address range.

On the General Configuration Page:

- Fill in the information needed as required by the site.

On the Switch Configuration Pages:

- **Name** - The Port name on the switch.
- **Connector** - The type of connector used.
- **Device Name** - The name of the server/device connected to the switch. It is helpful to use a name that describes the server usage and associated bond.
- **Port** - The Network Interface Card (NIC) name and port number as the OS would generate.
- **Untagged** and **Tagged** - Used to indicate what VLAN(s) the port should be used, and how.
- **Port-channel number** - The unique number on the switch that represents the port-channel. Each pair in a server bond must have their own unique port-channel number, which is the same on both switches.
- **Mode** - The mode the port-channel will use [802.3ad](#) for all nodes.

Working switch configurations based on the validated solution are included within the DTK tgz file.

Dell Networking Switches Default Solution Values



Note: The VLT ports differ, and are defined in the example.

Table 11: Switch Port Defaults

CLI Command	Reccomended Default	Example
ip address	No IP address assigned	no ip address
portmode	Hybrid mode	portmode hybrid
switchport	Enabled - after portmode hybrid executed	switchport
mtu	9216 on S3048-ON; 9216 on S4048-ON	mtu 9216 or mtu 9216
flowcontrol	Flow control receive on, transmit off	flowcontrol rx on tx off
spanning-tree	Rapid Spanning Tree set to Edge-Port going to servers.	spanning-tree rstp edge-port

Appendix

A

References

Topics:

- [To Learn More](#)

Additional information can be obtained at <http://www.dell.com/en-us/work/learn/openstack-cloud> or by e-mailing openstack@dell.com.

If you need additional services or implementation help, please contact your Dell EMC sales representative.

To Learn More

For more information on the Dell EMC Ready Bundle for Red Hat OpenStack visit <http://www.dell.com/learn/us/en/04/solutions/red-hat-openstack>.

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