ECS EXSeries

Version 3.4

Hardware Guide

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DELL EMC

Dell EMC
Hopkinton, Massachusetts 01748-9103
1-508-435-1000 In North America 1-866-464-7381
www.DellEMC.com

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Welcome to ECS

ECS provides a complete software-defined cloud storage platform that supports the storage, manipulation, and analysis of unstructured data on a massive scale on commodity hardware. ECS can be deployed as a turnkey storage appliance or as a software product that can be installed on qualified commodity servers and disks. ECS offers all the cost advantages of commodity infrastructure with the enterprise reliability, availability, and serviceability of traditional arrays.

The ECS online documentation comprises the following guides:

- Administration Guide
- Monitoring Guide
- Data Access Guide
- Hardware Guide
- API Guide

Administration Guide

The *Administration Guide* supports the initial configuration of ECS and the provisioning of storage to meet requirements for availability and data replication. Also, it supports the ongoing management of tenants and users, and the creation and configuration of buckets.

Monitoring Guide

The *Monitoring Guide* supports the ECS administrator's use of the ECS Portal to monitor the health and performance of ECS and to view its capacity utilization.

Data Access Guide

The *Data Access Guide* describes the protocols that are supported by ECS for user access to ECS object storage. In addition to the S3, EMC Atmos, OpenStack Swift, and Centera (CAS) object APIs, it introduces the ECS Management API, which can be used to configure ECS before user access, and details the use of ECS as a Hadoop Filesystem (HDFS) and the integration of ECS HDFS with a Hadoop cluster.

Hardware Guide

The *Hardware Guide* describes the supported hardware configurations and upgrade paths and details the rack cabling requirements.

API Guide

The *API Guide* use the ECS Management API to configure, manage, and monitor ECS.

PDF versions of these online guides and links to other PDFs, such as the *ECS Security Configuration Guide* and the *ECS Release Notes*, are available from support.emc.com.

CHAPTER 1

EX-Series Hardware Overview

Introduction

This guide describes the hardware components that make up the ECS appliance Generation 3 (Gen3) hardware models.

ECS Gen3 appliance series

The ECS Gen3 appliance series include:

- EX500 series: A dense object storage solution of hyper-converged nodes for small to medium-sized ECS deployments.
  The EX500 supports node expansion in increments of one when the capacity is the same as the previous node. If the capacity is different from the previous node when expanding, EX500 supports expansion in a minimum of five-node increments. The recommended expansion is five nodes. The EX500 series supports from 5 to 16 nodes per rack. With different drive sizes/ quantity and the flexibility of node additions, this platform can scale from 480TB RAW to 4.6PB RAW per rack.
- EX300 series: A dense object storage solution of hyper-converged nodes for small to medium-sized ECS deployments. With different drive sizes and the flexibility of single node addition, this platform can scale from 60 TB RAW to 1.5 PB RAW per rack.
- EX3000 series: An ultra-dense object storage solution of hyper-converged nodes for medium to large-sized ECS deployments. This platform starts at a 2.2 PB RAW minimum configuration and scales to 8.6 PB RAW per rack.

Note: In this document, the term *node* is used interchangeably with *server*, and the term *appliance* refers to a cluster of nodes running ECS software.

Hardware generations

ECS appliances are characterized by hardware generation.

Gen3

- EX500 Gen3 models featuring 8TB or 12 TB disks (12 or 24 x HDD per node) became available in September 2019.
- EX300 Gen3 models featuring 1 TB, 2 TB, 4 TB, or 8 TB disks (12 HDD per 2U node) became available in August 2018.
- EX3000 Gen3 models featuring 12 TB disks (4U chassis with single or dual node configurations) became available in August 2018.

Gen2

For documentation on Gen2 hardware, see the *Dell EMC ECS D- and U-Series Hardware Guide*.

- U-Series Gen2 models featuring 12 TB disks became available in March 2018.
- The D-Series was introduced in October 2016 featuring 8 TB disks. D-Series models featuring 10 TB disks became available March 2017.
- The original U-Series appliance (Gen1) was replaced in October 2015 with second generation hardware (Gen2).

Rack and node host names

Lists the default rack and node host names for an ECS Appliance.

The default rack IDs and color names are assigned in installation order as shown in the following table.

Lists the Rack ID

Table 1 Rack ID

Rack ID	Rack color	Rack ID	Rack color	Rack ID	Rack color
1	red	18	carmine	35	cornsilk
2	green	19	auburn	36	ochre
3	blue	20	bronze	37	lavender
4	yellow	21	apricot	38	ginger
5	magenta	22	jasmine	39	ivory
6	cyan	23	army	40	carnelian
7	azure	24	copper	41	taupe
8	violet	25	amaranth	42	navy
9	rose	26	mint	43	indigo
10	orange	27	cobalt	44	veronica
11	chartreuse	28	fern	45	citron
12	pink	29	sienna	46	sand
13	brown	30	mantis	47	russet
14	white	31	denim	48	brick
15	gray	32	aquamarine	49	avocado
16	beige	33	baby	50	bubblegum
17	silver	34	eggplant		

Nodes are assigned node names based on their order within the server chassis and within the rack itself. The following table lists the default node names.

Table 2 Default node names

Node	Node name	Node	Node name
1	provo	9	boston
2	sandy	10	chicago
3	orem	11	houston
4	ogden	12	phoenix
5	layton	13	dallas
6	logan	14	detroit
7	lehi	15	columbus
8	murray	16	austin

Nodes that are positioned in the same slot in different racks at a site have the same node name. For example, node 4 is called `ogden`, assuming that you use the default node names.

The `getrackinfo` command identifies nodes by a unique combination of node name and rack name. For example, node 4 in rack 1 is identified as `ogden-red` and can be pinged using its NAN resolvable (through mDNS) name: `ogden-red.nan.local`.

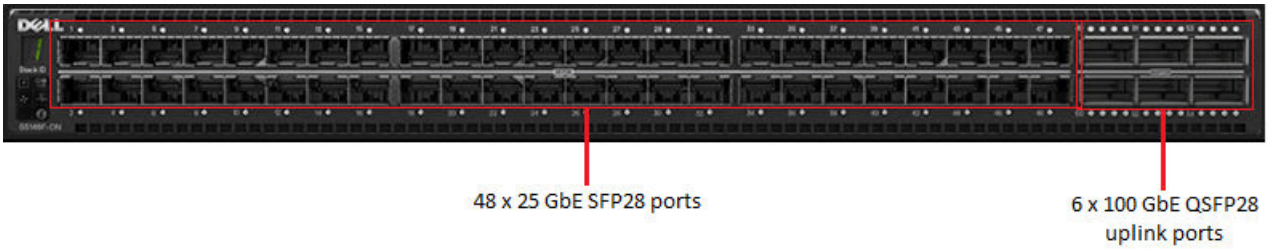
CHAPTER 2

Switches

Dell EMC S5148F switch

The EX500. EX300, and EX3000 appliances all use the Dell EMC S5148F for the front-end pair of switches and for the pair of back-end switches. Note that customers have the option of using their own front-end switches instead of the Dell EMC S5148F switches. The Dell EMC S5148F switches are required for the back-end pair.

Figure 1 Dell EMC S5148F switch ports



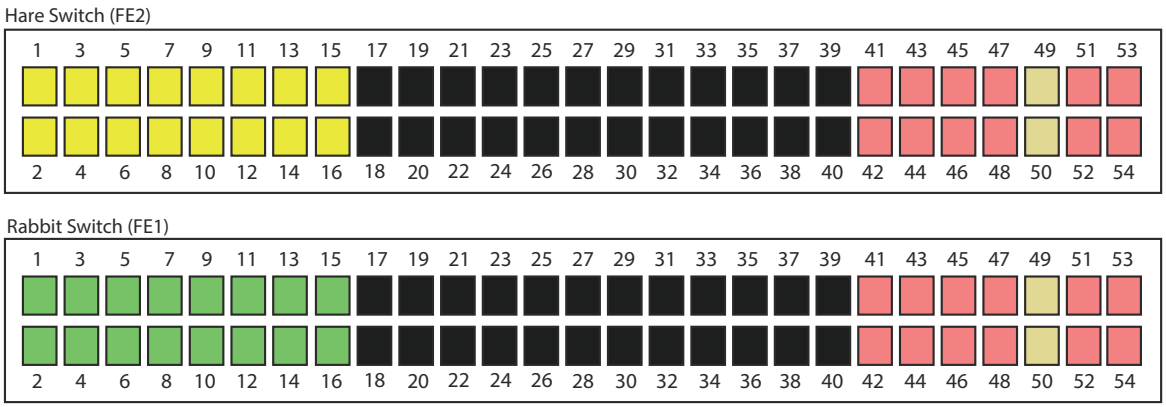
Front-end switch pair

Dell EMC offers an optional HA pair of front-end 25 GbE S5148F switches for customer network connection to the rack. It has two 100 GbE virtual link trunking (VLT) cables per HA pair. These switches are called the Hare (FE2) and the Rabbit (FE1) switches.

Customers can use their own front-end switch pair (10/25 GbE for EX300 and 25 GbE for EX500 and EX3000) using the Dell EMC Request for Product Qualification (RPQ) process. In this case, the customer must provide the appropriate VLT cables, SFPs, or external connection cables.

CAUTION It is required to have connections from the customer's network to both front-end switches (rabbit and hare) in order to maintain the high availability architecture of the ECS appliance. If the customer chooses not to connect to their network in the required HA manner, there is no guarantee of high data availability for the use of this product.

Figure 2 Front-end switches



Lists the switch port numbers:

Table 3 Switch port numbers

Switch	Port number	Description
Hare	1-16	Data network ports connected to nodes (10/25 GbE)

Table 3 Switch port numbers (continued)

Switch	Port number	Description
	17-40	Not designated
	41-48	Customer uplink ports (10/25 GbE)
	49-50	VLT ports (100 GbE)
	51-54	Customer uplink ports (100 GbE)
Rabbit	1-16	Data network ports connected to nodes (10/25 GbE)
	17-40	Not designated
	41-48	Customer uplink ports (10/25 GbE)
	49-50	VLT ports (100 GbE)
	51-54	Customer uplink ports (100 GbE)

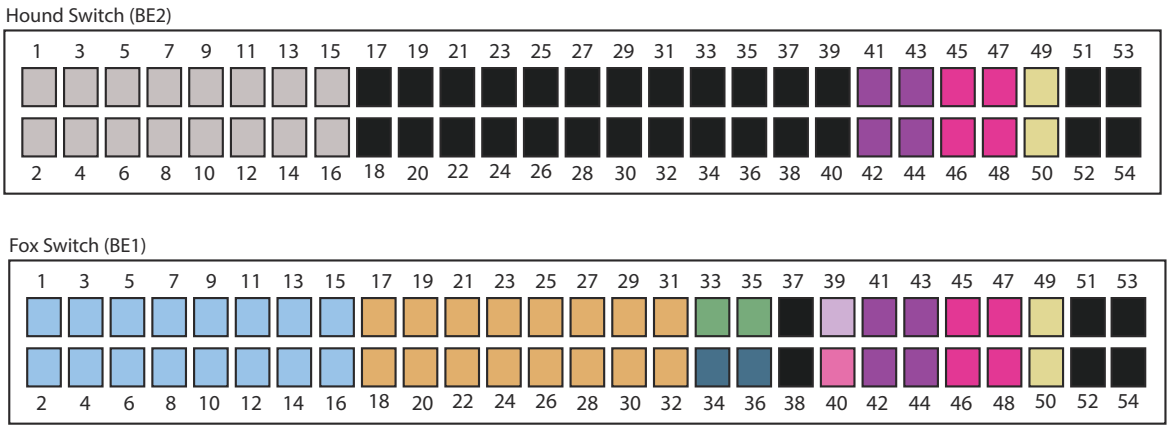
Back-end switch pair

Dell EMC provides two 25 GbE S5148F back-end switches (BE1 and BE2) with two 100 GbE VLT cables. These switches are referred to as the Hound (BE2) and Fox (BE1) switches.

In the following diagram, all labeled ports relate to an ECS virtual data center (VDC) in which all racks/nodes are EX-Series (Gen3 hardware), with the exception of ports 39 and 40. Ports 39 and 40 are only used in the scenario where there is Gen2 hardware series integration with EX-Series hardware in the VDC. When Gen2 hardware is mixed with EX-Series hardware, ports 39 and 40 are the only ports used for connectivity.

All iDRAC cables from nodes and all front-end switch management cable connections route to the Fox (BE1) switch.

Figure 3 Back-end switches



Lists switch port numbers.

Table 4 Switch port number

Switch	Port number	Description
Hound	1-16	Private network ports connected to nodes (10/25 GbE)

Table 4 Switch port number (continued)

Switch	Port number	Description
	17-40	Not designated.
	41-44	In from EX-Series rack when the ECS system has more than one rack (10/25 GbE)
	45-48	Out to EX-Series rack when the ECS system has more than one rack (10/25 GbE)
	49-50	VLT ports (100 GbE)
	51-54	Not designated (100 GbE)
Fox	1-16	Private network ports connected to nodes (10/25 GbE)
	17-32	iDRAC ports
	33	To Rabbit (FE1) switch
	34	To service tray in front
	35	To Hare (FE2) switch
	36	Open for rear service connectivity
	37-38	Not designated
	39	In from Gen2 Turtle switch
	40	Out to Gen2 Turtle switch
	41-44	In from EX-Series rack when the ECS system has more than one rack (10/25 GbE)
	45-48	Out to EX-Series rack when the ECS system has more than one rack (10/25 GbE)
	49-50	VLT ports (100 GbE)
	51-54	Not designated (100 GbE)

Front-end and back-end switch connections

The front-end switch management ports connect to back-end switch ports via two CAT6 cable and two 1GBaseT SFP.

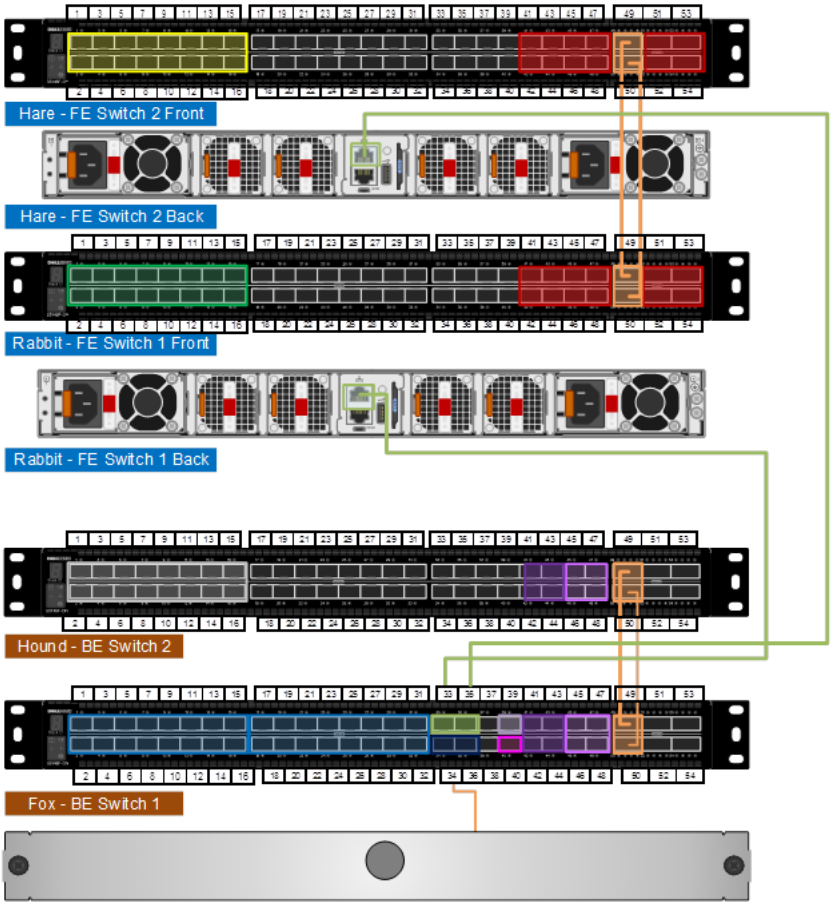
These two cables and two SFP are used for Dell EMC switches. If you are deploying in a third party rack with customer switches, or using customer switches in a Dell EMC rack, these two cables and two SFP are not required.

The connection between the front-end switch ports and back-end switch ports are as follows:

- Hare (FE2) to Fox (BE1)
- Rabbit (FE1) to Hound (BE2)

The connections are shown with green lines in the following diagram.

Figure 4 Connections between front-end and back-end switches within an EX-Series rack



For back-end switch connections between EX-Series racks, port 41 on the back-end switches is used for the inbound connection and port 45 is used for the outbound connection. These ports are used for linear and ring topology rack-to-rack connectivity. For more information, see Network connections between multiple ECS appliances in a single site on page 50.

Figure 5 Back-end switch connections between EX-Series racks

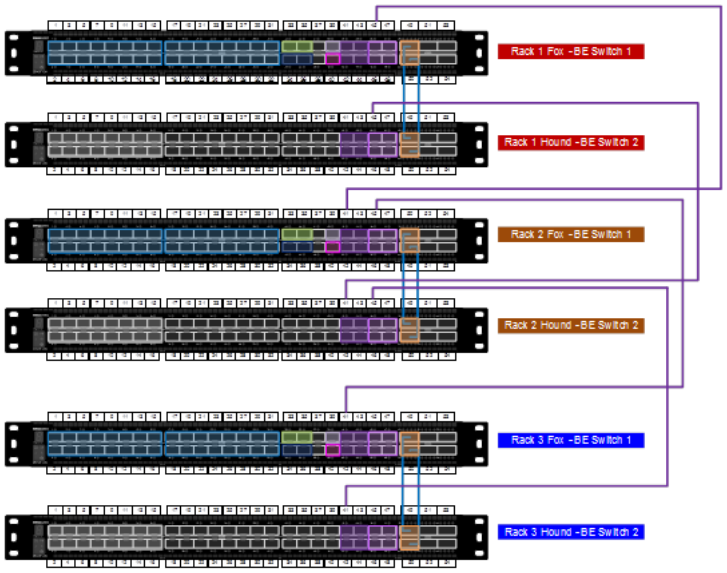
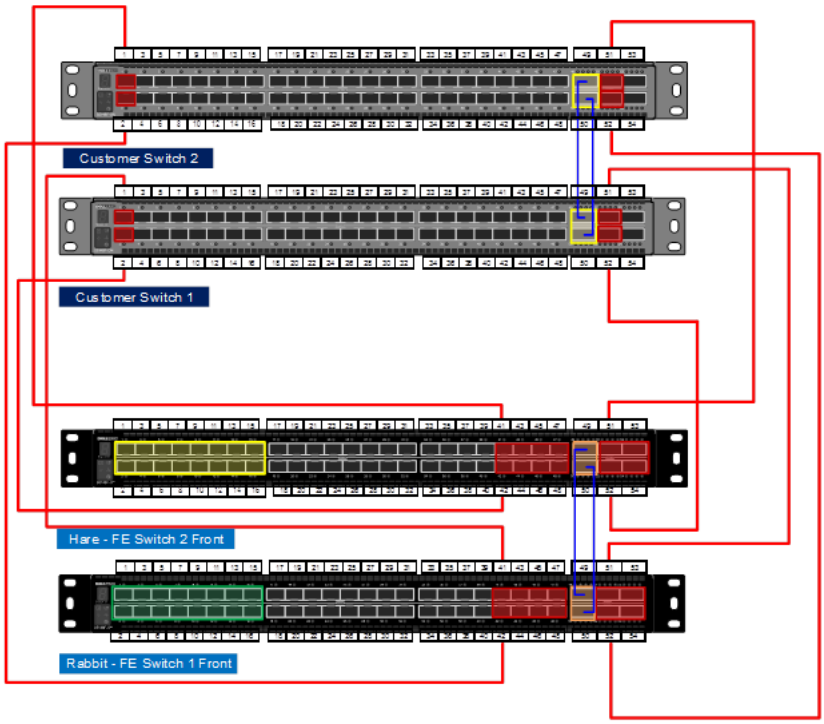


Figure 6 Front-end switch connections to customer switches (example)



CHAPTER 3

EX500 Platform

EX500 hardware components

The EX500 ECS appliance includes the following hardware components.

Lists EX500 hardware components and its description.

Table 5 EX500 hardware components

Component	Description
40U rack	Titan D racks that include: • Gen3 0U PDUs supporting single phase, three-phase delta, and three-phase WYE • Front and rear doors • Racking by Dell EMC manufacturing In addition to the Dell EMC-racked EX500 appliance, the EX500 nodes can be installed in customer-provided racks. For more information on third-party racking requirements, see the *ECS EX500 Third-Party Rack Planning and Installation Guide*.
Back-end (BE) switches for private network connection	• Two Dell EMC S5148F 25 GbE 1U ethernet switches with 48 x 25 GbE SFP ports and 6 x 100 GbE uplink ports. • 2 x 100 GbE VLT cables per HA pair.
Front-end (FE) switches for customer public network connection	• Two optional Dell EMC S5148F 25 GbE 1U ethernet switches can be obtained for network connection or the customer can provide their own 10 GbE or 25 GbE HA pair for the front end. • If the customer provides their own front-end switches, they must supply all VLT cables, SFPs, or external connection cables. • If Dell EMC S5148F 25 GbE front-end switches are used, the 25 GbE ports are configured to run at 25G to connect to the EX500 nodes, and 2 x 100 GbE VLT cables are provided.

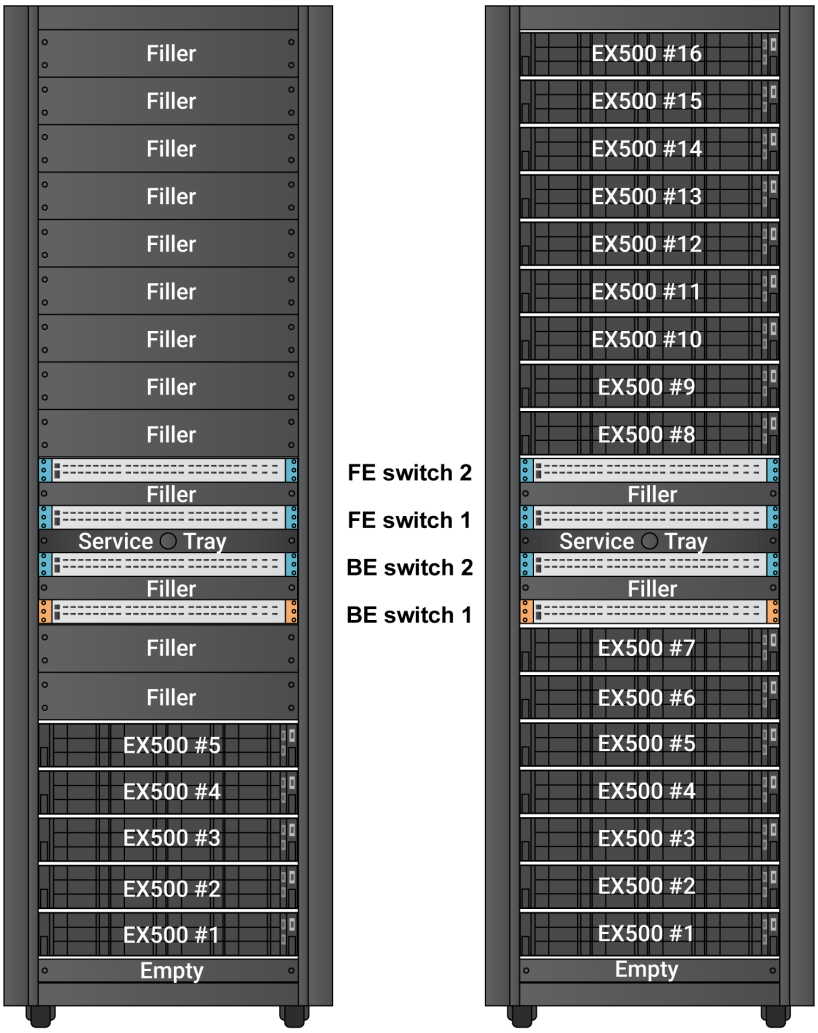
Nodes	• Minimum number of nodes per rack is 1.
	  ▪ Minimum initial configuration is 5.
	  ▪ Supports spill-over expansion racks with just 1 node. For example, a 17-node VDC has a 16-node rack and a 1-node rack.
	• HDD sizes can be 8 or 12TB. (All drive sizes are the same in the node.)
	• Within a Dell EMC manufactured rack delivered from the factory, all nodes within the rack are of the exact same drive size. For node upgrades in the field, nodes with other sized drives are allowed within the rack.
	• 12 (slots 12-23) or 24 (slots 00-23) SATA hard drives (HDDs) in each node.
	• 480 GB M.2 (BOSS) system disk in each node.
	• 64 GB RAM per node.
	• Two 10-core Xeon Silver 85W processors per node.
	• 8x, 8GB RDIMM, 2666MT/s, Single Rank, x8 Data Width.
	• Dual 1100W Platinum power supply.
	• Each node has 4 x 25 GbE networking.

EX500 configurations

Learn about the EX500 ECS appliance configurations.

The front view of an EX500 rack with the minimum node configuration and an EX500 rack with the maximum node configuration is shown in the following diagram. The rear view requires a brace wherever there is empty space above or below an EX500 server.

Figure 7 EX500 minimum and maximum configurations



The EX500 appliance is available in the following configurations within a Dell EMC rack or a customer-provided rack.

>
EX500 supports 5 nodes in the same configuration. You can combine 8 and 12 TB disks, with a minimum of 5 nodes of the same disk configuration.

Lists the nodes, disks in each node, disk size, and the RAW storage capacity.

Table 6 EX500 configurations

Nodes	Disks in each node	Disk Size	RAW Storage capacity
5 (minimum configuration)	12	• 8 TB • 12 TB	• 96 TB • 144 TB

Table 6 EX500 configurations (continued)

Nodes	Disks in each node	Disk Size	RAW Storage capacity
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
6	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
7	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
8	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
9	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
10	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
11	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB

Table 6 EX500 configurations (continued)

Nodes	Disks in each node	Disk Size	RAW Storage capacity
12	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
13	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
14	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
15	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB
16 (maximum configuration)	12	• 8 TB • 12 TB	• 96 TB • 144 TB
	24	• 8 TB • 12 TB	• 192 TB • 288 TB

EX500 upgrade paths

Learn about the EX500 ECS appliance upgrade paths.

- Disk upgrade kits are available in 12-disk increments.
- EX500 upgrades: 12 to 24 disks.
- To add disk capacity to an EX500, disk upgrade kits per node must be ordered based on the existing disk capacity 8 or 12TB.
- All empty drive slots must be filled with a disk filler

Lists the disk upgrade kit details.

Table 7 EX500 Disk Upgrade Kit

Disk Upgrade Kit	Quantity	Upgrade Result Per Server
12-disk upgrade	1	EX500 - 12 to 24 disk upgrade

EX500 server

Learn about the EX500 servers standard features.

Lists the features of EX500 servers.

Table 8 Standard features of EX500 servers

Features	8 TB	12 TB
Chassis	• EX500 24 x 3.5" 2 CPU chassis • One-node server (2U) with two CPUs per node • Maximum chassis weight is 43.2 kg (95.24 lb)	
Riser Configuration	• Each EX500 server supports up to eight PCI express (PCIe) Gen3 expansion cards that can be installed on the system board using three expansion card risers. • Config 1 (1B + 2B) • Four x8 slots and rear storage	
Processors	2x Xeon Silver 10 core/20 thread 85W	
Memory	8 x 8GB RDIMM, 2666MT/s, Single Rank, x8 Data Width	
Disk Controller	HBA330 mini (IOC, JBOD)	
PCIe Slot 1	Broadcom 57414 2x25GbE, QSFP28	
PCIe Slot 2	BOSS controller card + with 1 M.2 stick 480 GB, LP	
PCIe Slot 3	Broadcom 57414 2x25GbE, QSFP28	
Management	iDRAC9 Enterprise	
Power	2 x 1100W Platinum	
HDDs in front slots	8TB 7.2k RPM 512e SATA HDD	12TB 7.2k RPM 512e SATA HDD

Figure 8 EX500 server physical dimensions

Figure 8 EX500 server physical dimensions (continued)

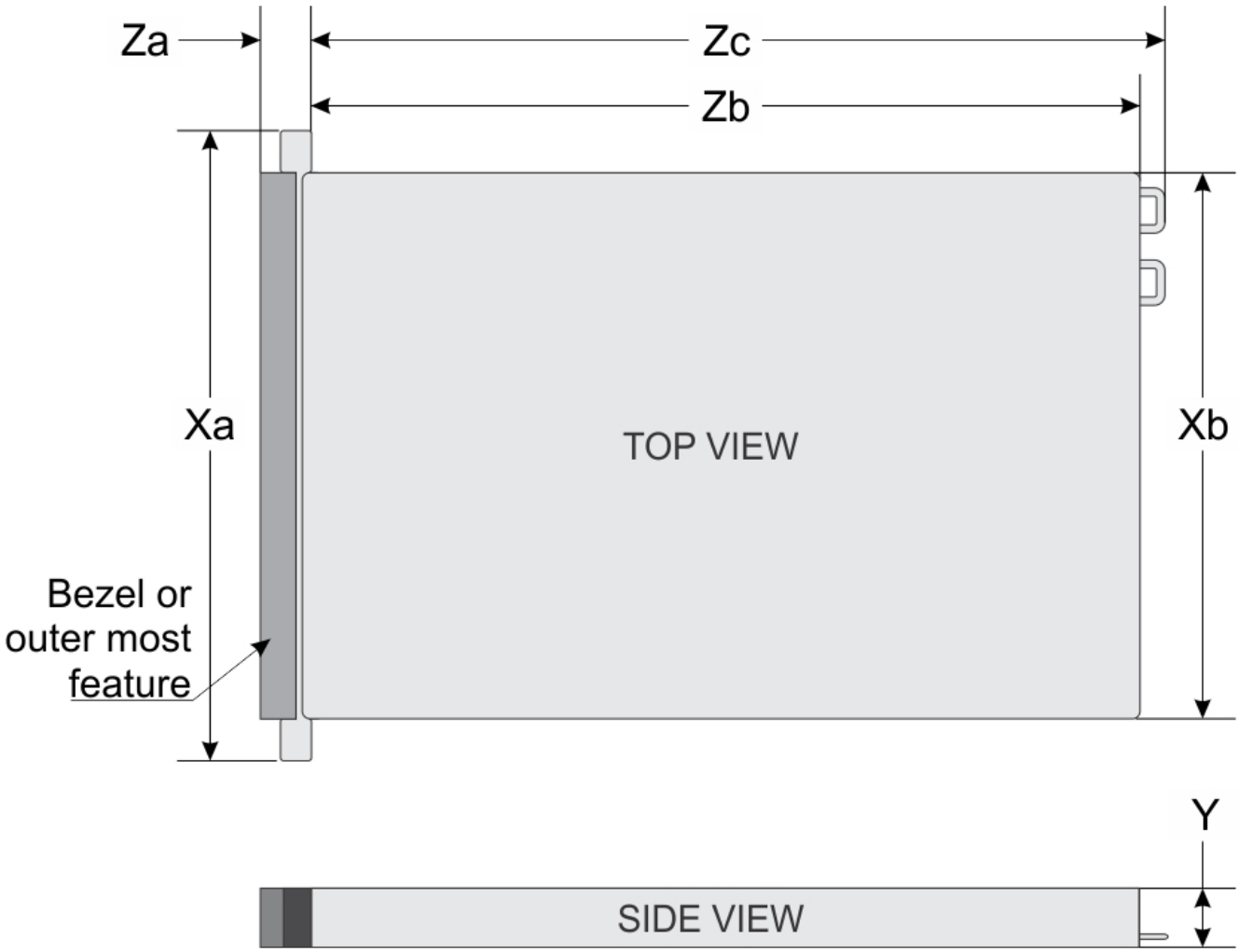


Table 1. Dell EMC PowerEdge R740xd2 chassis dimensions

Xa	Xb	Y	Za	Zb*	Zc
482.0 mm (18.9 inches)	448.0 mm (17.63 inches)	86.8 mm (3.41 inches)	With bezel: 35.93 mm (1.41 inches) Without bezel: 22.0 mm (0.866 inches)	810.264 mm (31.9 inches)	844.826mm (33.260 inches)

NOTE: * - Zb refers to the nominal rear wall external surface, where the system board I/O connectors are located.

Server front view

Learn about the EX500 front view.

The following figure shows the EX500 2U server chassis front with 12 x 3.5" SATA HDDs.

Figure 9 EX500 server chassis front view

LED indicators are on the left and right side of the server front panels.

Figure 10 Left control panel

The left control panel LED behavior is broken into two subsets, the light bar and the status LEDs. The light bar also functions as a button. The light bar indicates chassis health and also functions as System ID when pressed.

Lists the status of LEDs in light bar.

Table 9 Decoding of LEDs in light bar

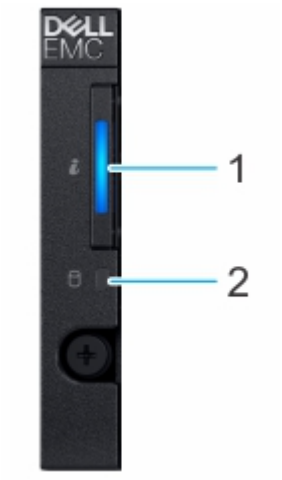
Status	ID button
Indicates that the system is turned on, system is healthy, and system ID mode is not active. Press the system health and system ID button to switch to system ID mode.	Solid Blue
Indicates that the system is in fail-safe mode. If the problem persists, see the Getting help section.	Solid Amber
Indicates that the system is experiencing a fault. Check the System Event Log for specific error messages. For information about the event and error messages generated by the system firmware and agents that monitor system components, see the Error Code Lookup page at qrl.dell.com	Blink Amber

Table 9 Decoding of LEDs in light bar (continued)

Status	ID button
Indicates that the system ID mode is active. Press the system health and system ID button to switch to system health mode.	Blink Blue

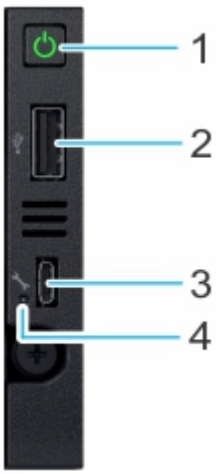
There are two status LEDs to indicate and identify any failed hardware components.

Figure 11 Status LEDs decoded view



1. System health and system ID indicator
2. Drive indicator

Figure 12 Right control panel



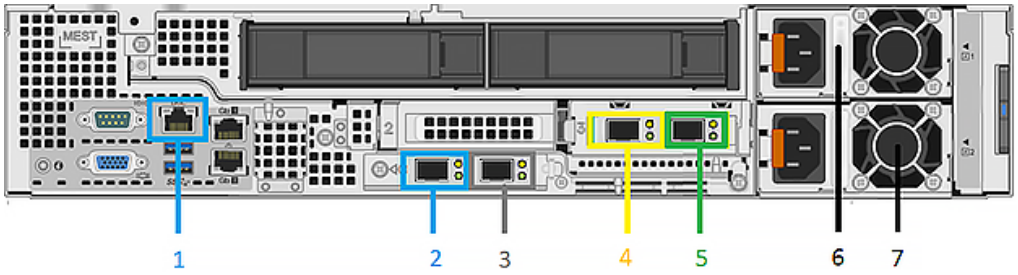
1. Power button
2. USB 2.0-compliant port
3. Micro-USB for iDRAC Direct
4. iDRAC LED indicator

Server back view

Learn about the EX500 back view.

The EX500 server chassis provides dual hot-swappable power supplies with 1 + 1 redundancy, auto-sensing and auto-switching capability.

Figure 13 EX500 server chassis back view



In the table below, *x* is the server number.

Network Cable Description	Labeling
1 - iDRAC management port, back-end switch 1	Server *x* iDRAC *
2 - Back-end switch 1	Server *x* BE 1 *
3 - Back-end switch 2	Server *x* BE 2 *
4 - Front-end switch 2	Server *x* FE 2 *
5 - Front-end switch 1	Server *x* FE 1 *
6 - Power cable (black)	AC PS1
7 - Power cable (grey)	AC PS2

EX500 disk drives

Learn about the disk drives that are integrated into the server chassis of the EX500 appliance.

EX500 nodes contain 24 3.5 inch SATA front-accessible, hot-swappable drives in disk bay 1, slots 0-11 and disk bay 2, slots 12-23. Disk size can be 8TB or 12TB. All drives within a node must be of the same drive size, but there can be nodes of differing drive sizes and quantities (12 or 24) within a rack. In PCIe slot 2 of each node there is a 480 GB Boot Optimized Storage Subsystem (BOSS) controller card with one M.2 stick.

Figure 14 EX500 disk drive in carrier

EX500 power cabling

Review the EX500 ECS appliance cabling diagrams for single-phase AC power and three-phase delta and wye AC power.

Use the power and weight calculator to refine the power and heat values to more-closely match the hardware configuration for your system. The calculator contains the latest information for power and weight planning.

The EX500 appliance connections to 0U PDU and 2U PDU outlets are listed in the following tables.

The table describes EX500 0U PDU single-phase zone A/B mapping.

Table 10 EX500 0U PDU single-phase zone A/B mapping

PDU outlet	Branch	Component	Line cord per zone
37	12	Empty	3
36	12	Empty	3
35	12	Empty	3
34	12	Empty	3
33	11	Node 16	3
32	11	Node 15	3
31	11	Node 14	3
30	10	Empty	2
29	10	Empty	2
28	10	Empty	2
27	9	Empty	2
26	9	Empty	2
25	9	Node 13	2
24	8	Node 12	2
23	8	Node 11	2
22	8	Node 10	2
21	7	Node 9	2
20	7	Node 8	2
19	7	Node 7	2
18	6	Empty	1
17	6	Empty	1
16	6	Empty	1
15	5	Empty	1
14	5	Empty	1
13	5	Empty	1
12	4	FE Switch 2	1
11	4	FE Switch 1	1
10	4	Tray/Light Bar	1
9	3	BE Switch 2	1
8	3	BE Switch 1	1
7	3	Empty	1

Table 10 EX500 0U PDU single-phase zone A/B mapping (continued)

PDU outlet	Branch	Component	Line cord per zone
6	2	Node 6	1
5	2	Node 5	1
4	2	Node 4	1
3	1	Node 3	1
2	1	Node 2	1
1	1	Node 1	1

The table describes EX500 PDU three-phase Delta and WYE zone A/B mapping.

Table 11 EX500 PDU three-phase Delta and WYE zone A/B mapping

PDU outlet	Branch	Component	Line cord per zone
37	12	Empty	1
36	12	Empty	1
35	12	Empty	1
34	12	Empty	1
33	11	Empty	1
32	11	Empty	1
31	11	Empty	1
30	10	Empty	1
29	10	Empty	1
28	10	Empty	1
27	9	Empty	1
26	9	Empty	1
25	9	Empty	1
24	8	Empty	1
23	8	Empty	1
22	8	Empty	1
21	7	Node 16	1
20	7	Node 15	1
19	7	Node 14	1
18	6	Node 13	1
17	6	Node 12	1
16	6	Node 11	1
15	5	Node 10	1
14	5	Node 9	1

Table 11 EX500 PDU three-phase Delta and WYE zone A/B mapping (continued)

PDU outlet	Branch	Component	Line cord per zone
13	5	Node 8	1
12	4	FE Switch2	1
11	4	FE Swtich 1	1
10	4	Tray/Light Bar	1
9	3	BE Switch 2	1
8	3	BE Switch 1	1
7	3	Node 7	1
6	2	Node 6	1
5	2	Node 5	1
4	2	Node 4	1
3	1	Node 3	1
2	1	Node 2	1
1	1	Node 1	1

The table describes EX500 2U PDU single-phase zone A/B mapping.

Table 12 EX500 2U PDU single-phase zone A/B mapping

PDU outlet	Branch	Component	Line cord per zone
24	6	Empty	3
23	6	Empty	3
22	6	Empty	3
21	6	Node 16	3
20	5	Node 11	2
19	5	Node 10	2
18	5	Node 9	2
17	5	Node 8	2
16	4	Node 4	1
15	4	Node 3	1
14	4	FE Switch2	1
13	4	FE Swtich 1	1
12	3	Node 15	3
11	3	Node 14	3
10	3	Node 13	3
9	3	Node 12	3
8	2	Tray/Light Bar	2

Table 12 EX500 2U PDU single-phase zone A/B mapping (continued)

PDU outlet	Branch	Component	Line cord per zone
7	2	Node 7	2
6	2	Node 6	2
5	2	Node 5	2
4	1	Node 2	1
3	1	Node 1	1
2	1	BE Switch 2	1
1	1	BE Switch 1	1

The table describes EX500 2U PDU three-phase Delta and Wye zone A/B mapping.

Table 13 EX500 2U PDU three-phase Delta and Wye zone A/B mapping

PDU outlet	Branch	Component	Line cord per zone
24	6	Empty	1
23	6	Empty	1
22	6	Empty	1
21	6	Node 16	1
20	5	Node 11	1
19	5	Node 10	1
18	5	Node 9	1
17	5	Node 8	1
16	4	Node 4	1
15	4	Node 3	1
14	4	FE Switch2	1
13	4	FE Swtich 1	1
12	3	Node 15	1
11	3	Node 14	1
10	3	Node 13	1
9	3	Node 12	1
8	2	Tray/Light Bar	1
7	2	Node 7	1
6	2	Node 6	1
5	2	Node 5	1
4	1	Node 2	1
3	1	Node 1	1
2	1	BE Switch 2	1

Table 13 EX500 2U PDU three-phase Delta and Wye zone A/B mapping (continued)

PDU outlet	Branch	Component	Line cord per zone
1	1	BE Switch 1	1

In the following diagrams, the switches plug into the front of the rack and route through the rails to the rear.

Figure 15 EX500 Single Phase AC Cabling Diagram

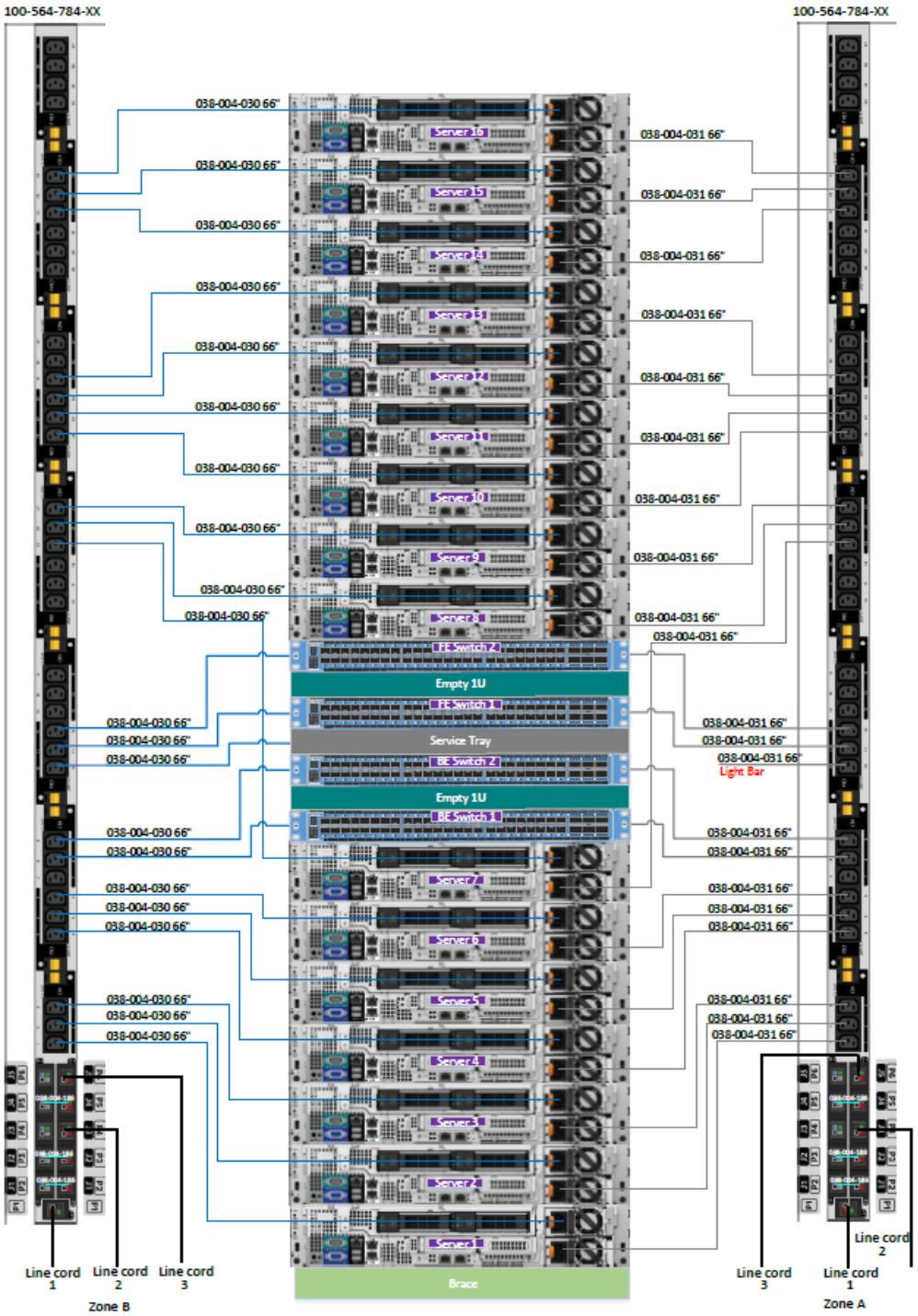


Figure 16 EX500 Three Phase Delta AC Cabling Diagram

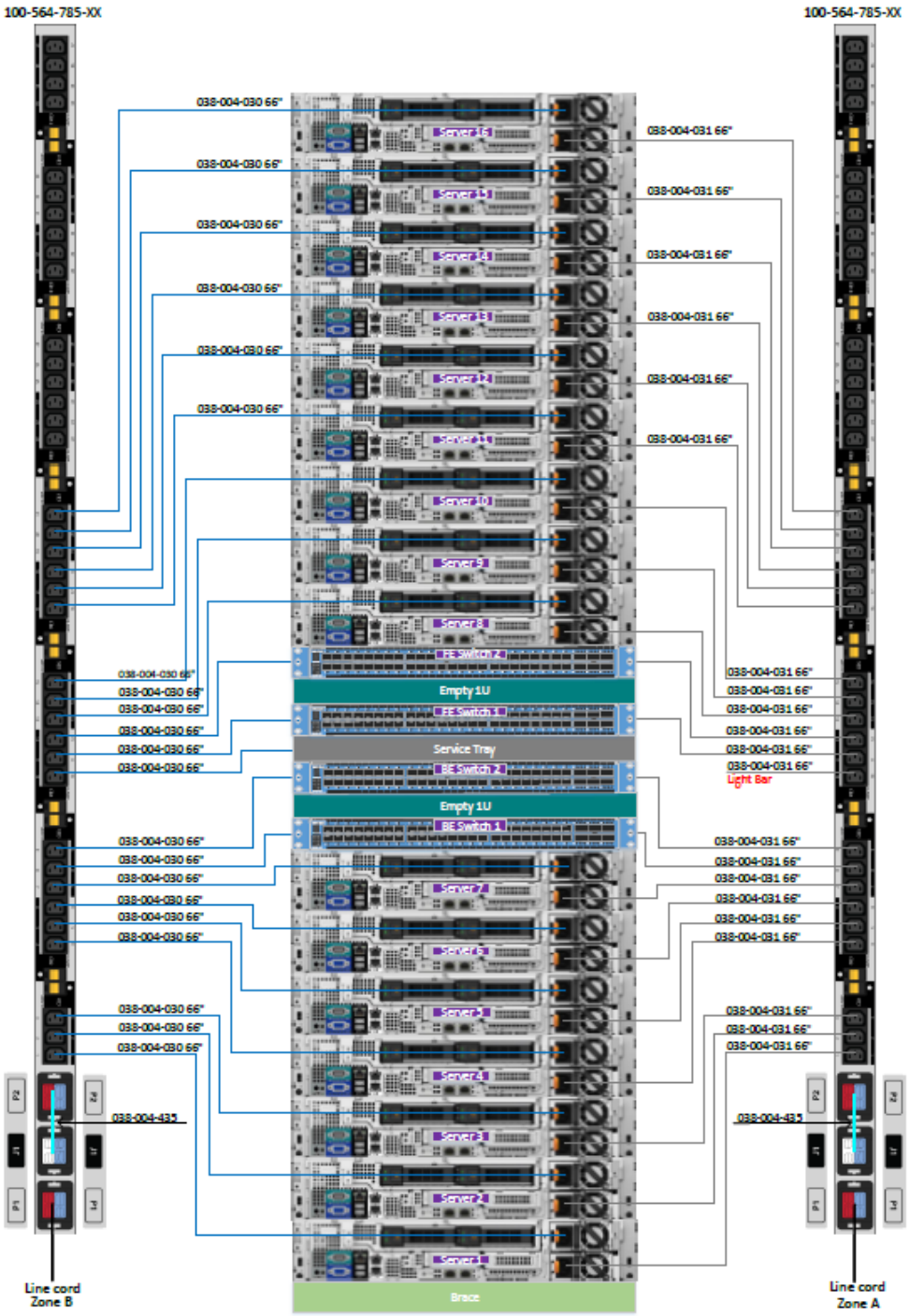
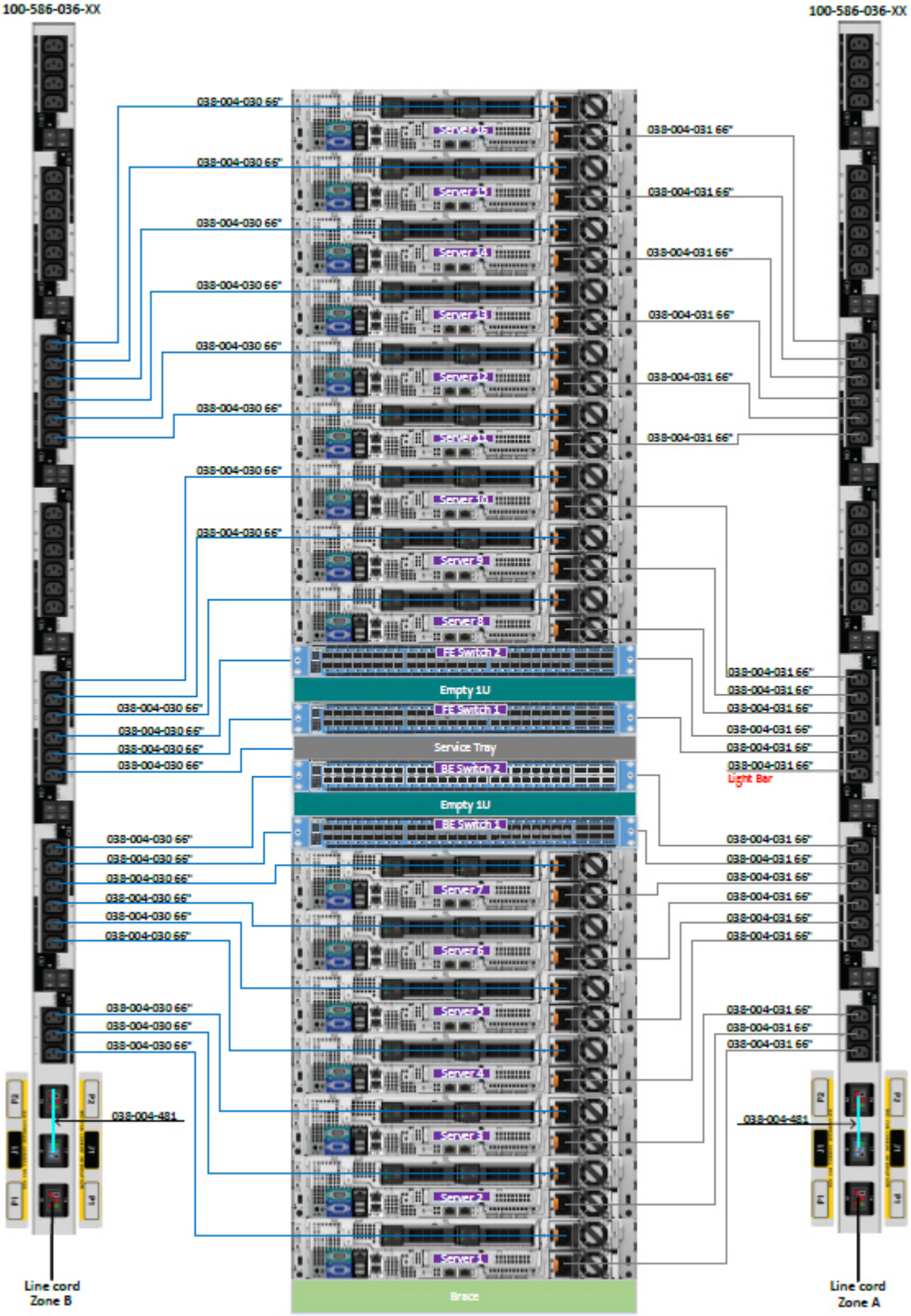

100-564-785-XX
100-564-785-XX
038-004-030 66"
038-004-031 66"
Empty 1U
Service Tray
Empty 1U
Light Bar
038-004-435
038-004-435
Brace
Line cord Zone B
Line cord Zone A

Figure 17 EX500 Three Phase Wye AC Cabling Diagram

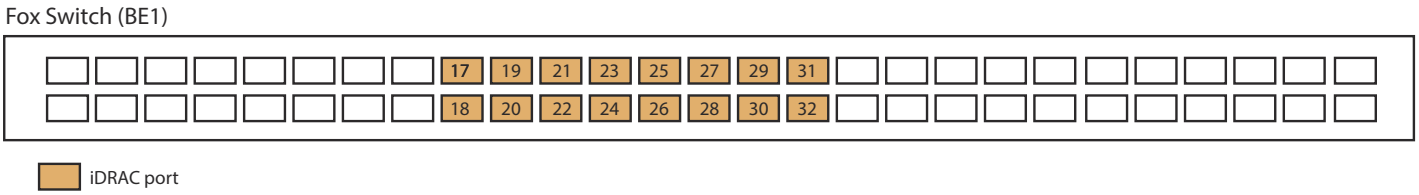


EX500 iDRAC cabling

Review the wiring diagrams for the iDRAC cables that connect the iDRAC port on the node to the Fox back-end switch.

The Fox switch (BE1) port numbers used for connecting to the iDRAC ports on the EX500 nodes are shown in the following diagram.

Figure 18 Fox switch iDRAC ports

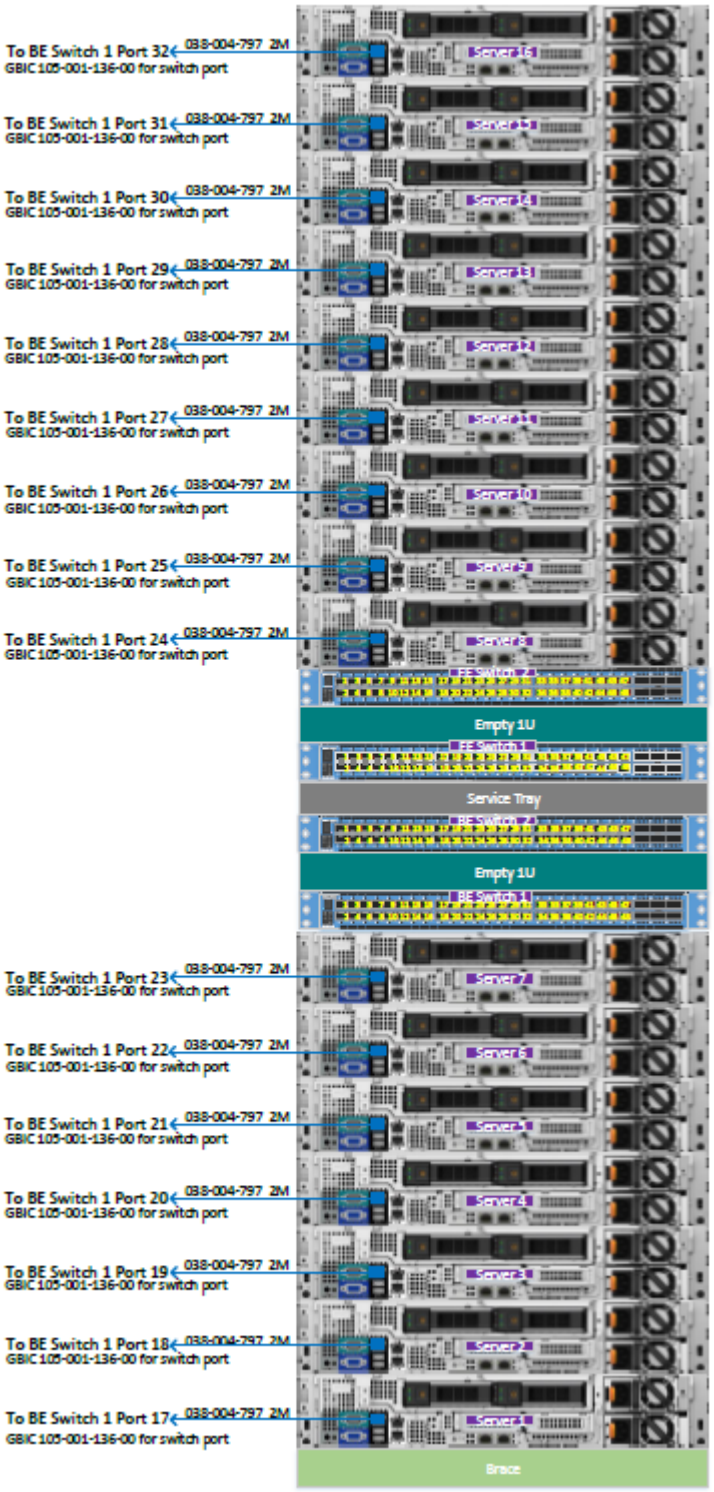


The EX500 node iDRAC port to the Fox switch (BE1) port connections are listed in the following table.

Table 14 EX500 node iDRAC port to BE1 port mapping

Node 1 iDRAC port	BE1 Port 17
Node 2 iDRAC port	BE1 Port 18
Node 3 iDRAC port	BE1 Port 19
Node 4 iDRAC port	BE1 Port 20
Node 5 iDRAC port	BE1 Port 21
Node 6 iDRAC port	BE1 Port 22
Node 7 iDRAC port	BE1 Port 23
Node 8 iDRAC port	BE1 Port 24
Node 9 iDRAC port	BE1 Port 25
Node 10 iDRAC port	BE1 Port 26
Node 11 iDRAC port	BE1 Port 27
Node 12 iDRAC port	BE1 Port 28
Node 13 iDRAC port	BE1 Port 29
Node 14 iDRAC port	BE1 Port 30
Node 15 iDRAC port	BE1 Port 31
Node 16 iDRAC port	BE1 Port 32

Figure 19 iDRAC cabling



EX500 network cabling

The network cabling diagrams apply to the EX500 appliance in a Dell EMC or customer-provided rack.

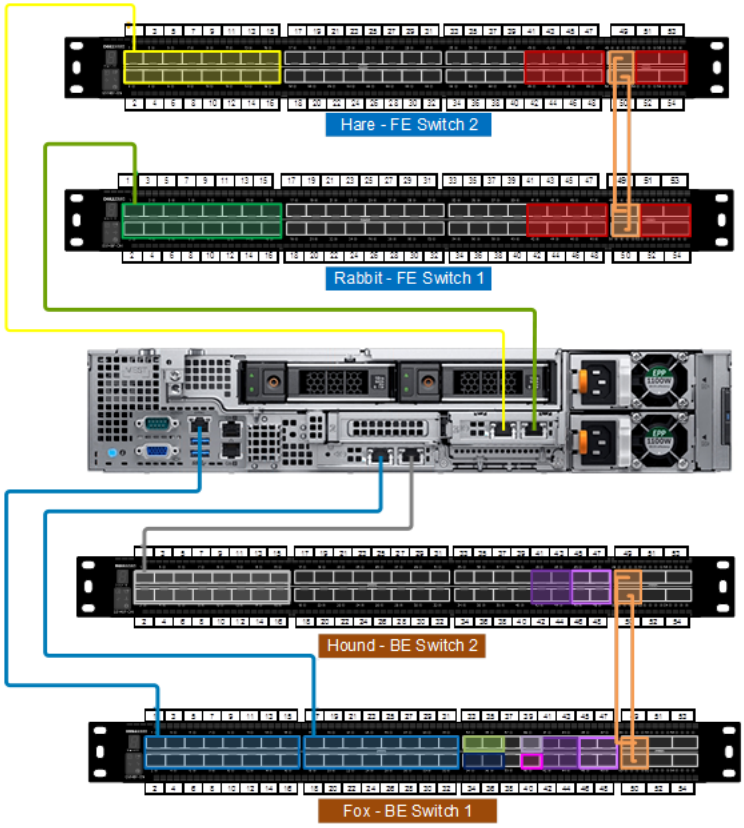
Customers connect to an EX500 appliance by way of 25GbE ports on the front-end switches. For an EX500 appliance, the 25GbE ports run at 25GbE. Customer configurations can include 25GbE front-end switches provided by Dell EMC or customers may provide their own front-end switches.

To distinguish between the two front-end switches and the two back-end switches, each switch has a nickname:

- Hare: The top S5148F 1U 25GbE front-end switch. This switch runs 25GbE SFP28 ports to EX500 nodes. It is located above the Rabbit switch in U22 of the EX500 rack.
- Rabbit: The bottom S5148F 1U 25GbE front-end switch. This switch runs 25GbE SFP28 ports to EX500 nodes. It is located below the Hare switch in U20 of the EX500 rack.
- Hound: The top S5148F 1U 25GbE back-end switch running 25GbE SFP28 ports to the nodes. It is located above the Fox switch in U18 of the EX500 rack.
- Fox: The bottom S5148F 1U 25GbE back-end switch running 25GbE SFP28 ports to the nodes. It is located below the Hound switch in U16 of the EX500 rack.

The front-end switch and back-end switch connections to an EX500 node are shown in the following diagram.

Figure 20 Front-end and back-end switch connections to an EX500 node



The numbered front-end switch ports used for connecting to the ports on the EX500 nodes are shown in the following diagram. Port 1 on the Hare switch (FE2) connects to port 4 on Node 1. Port 2 on the Hare switch (FE2) connects to port 4 on Node 2, and so on. Similarly, Port 1 on the Rabbit switch (FE1) connects to port 3 on Node 1. Port 2 on the Rabbit switch (FE1) connects to port 3 on Node 2, and so on.

Figure 21 Node ports on front-end switches

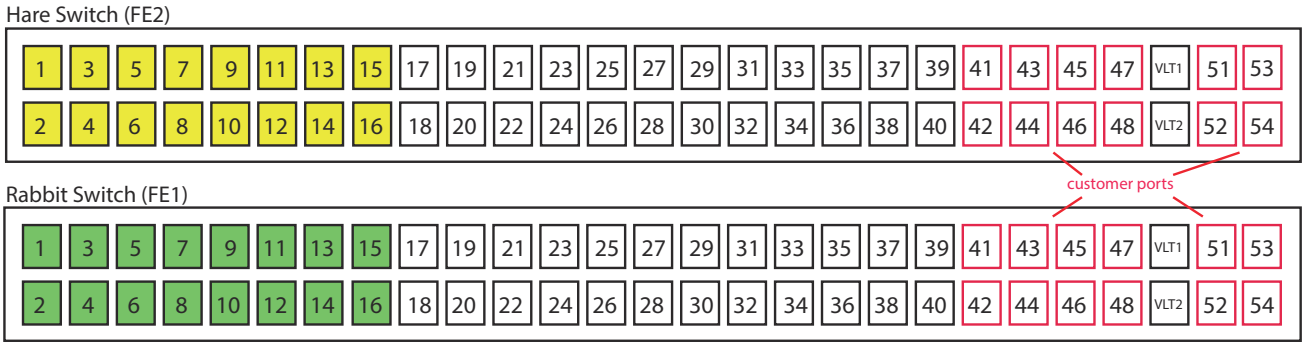
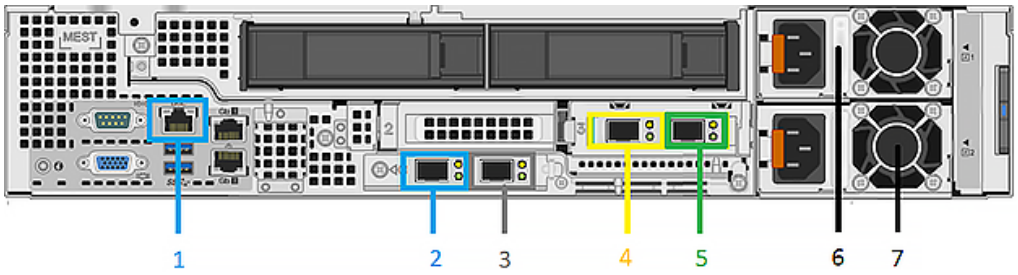


Figure 22 Network cable and labeling

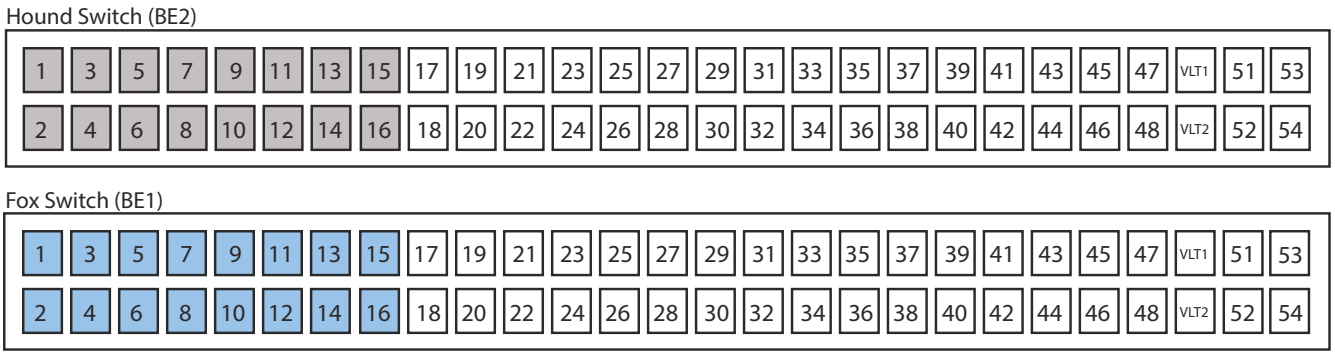


In the table below, *x* is the server number.

Network Cable Description	Labeling
1 - iDRAC management port, back-end switch 1	Server *x* iDRAC *
2 - Back-end switch 1	Server *x* BE 1 *
3 - Back-end switch 2	Server *x* BE 2 *
4 - Front-end switch 2	Server *x* FE 2 *
5 - Front-end switch 1	Server *x* FE 1 *
6 - Power cable (black)	AC PS1
7 - Power cable (grey)	AC PS2

The numbered back-end switch ports used for connecting to the ports on the EX500 nodes are shown in the following diagram. Port 1 on the Hound switch (BE2) connects to port 2 on Node 1. Port 2 on the Hound switch (BE2) connects to port 2 on Node 2, and so on. Similarly, Port 1 on the Fox switch (BE1) connects to port 1 on Node 1. Port 2 on the Fox switch (BE1) connects to port 1 on Node 2, and so on.

Figure 23 Node ports on back-end switches



The EX500 node port to the iDRAC, back-end switch, and front-end switch port connections are listed in the following table.

Figure 24 EX500 node network port cabling connections

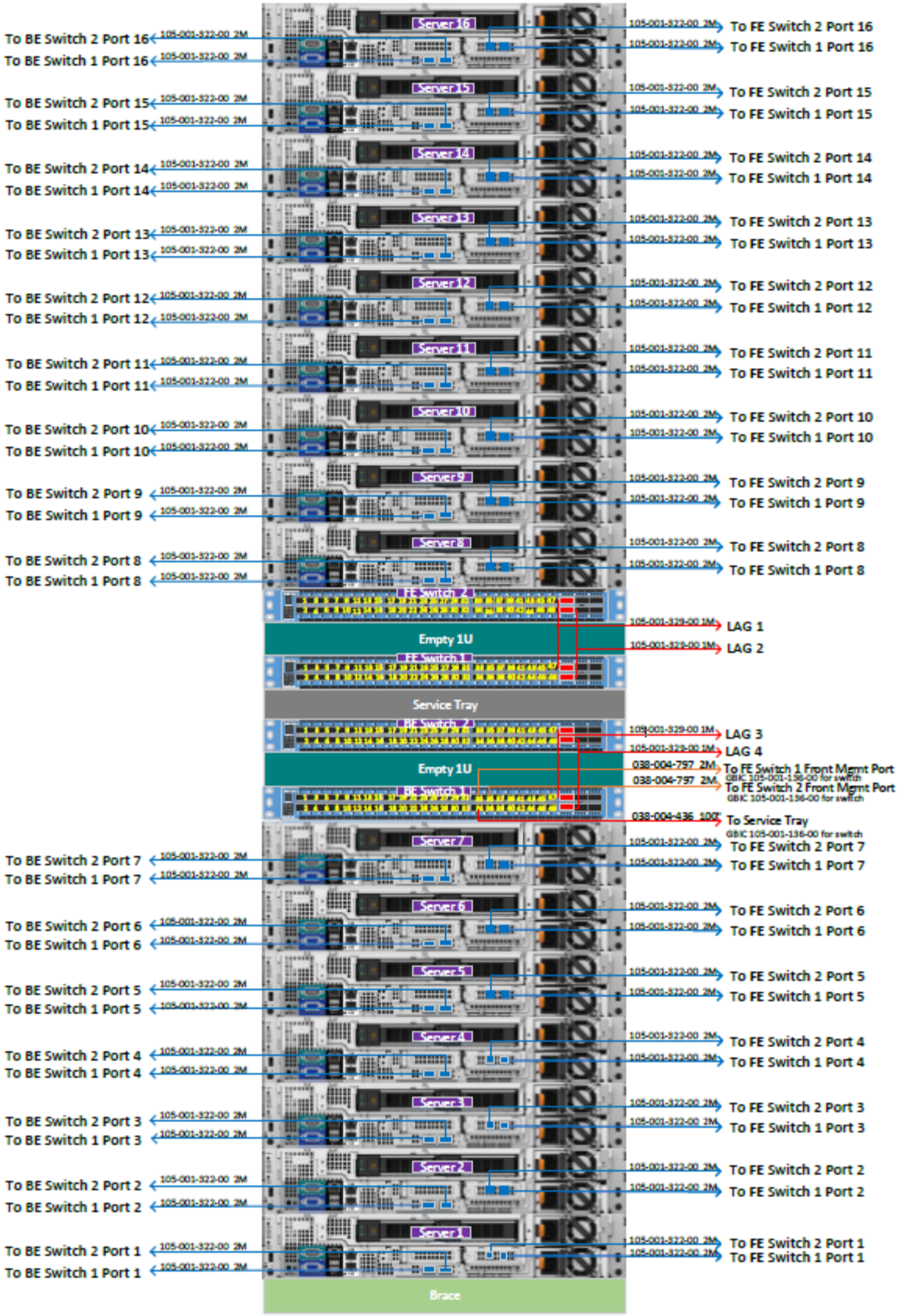
Node Network Port Cabling	iDRAC Port	Left NIC Port 1 BE1/Fox	Left NIC Port 2 BE2/Hound	Right NIC Port 2 FE2/Hare	Right NIC Port 1 FE1/Rabbit
Node 1	Server 1 iDRAC	Server 1 BE1	Server 1 BE2	Server 1 FE2	Server 1 FE1
Node 2	Server 2 iDRAC	Server 2 BE1	Server 2 BE2	Server 2 FE2	Server 2 FE1
Node 3	Server 3 iDRAC	Server 3 BE1	Server 3 BE2	Server 3 FE2	Server 3 FE1
Node 4	Server 4 iDRAC	Server 4 BE1	Server 4 BE2	Server 4 FE2	Server 4 FE1
Node 5	Server 5 iDRAC	Server 5 BE1	Server 5 BE2	Server 5 FE2	Server 5 FE1
Node 6	Server 6 iDRAC	Server 6 BE1	Server 6 BE2	Server 6 FE2	Server 6 FE1
Node 7	Server 7 iDRAC	Server 7 BE1	Server 7 BE2	Server 7 FE2	Server 7 FE1
Node 8	Server 8 iDRAC	Server 8 BE1	Server 8 BE2	Server 8 FE2	Server 8 FE1
Node 9	Server 9 iDRAC	Server 9 BE1	Server 9 BE2	Server 9 FE2	Server 9 FE1
Node 10	Server 10 iDRAC	Server 10 BE1	Server 10 BE2	Server 10 FE2	Server 10 FE1
Node 11	Server 11 iDRAC	Server 11 BE1	Server 11 BE2	Server 11 FE2	Server 11 FE1
Node 12	Server 12 iDRAC	Server 12 BE1	Server 12 BE2	Server 12 FE2	Server 12 FE1
Node 13	Server 13 iDRAC	Server 13 BE1	Server 13 BE2	Server 13 FE2	Server 13 FE1
Node 14	Server 14 iDRAC	Server 14 BE1	Server 14 BE2	Server 14 FE2	Server 14 FE1
Node 15	Server 15 iDRAC	Server 15 BE1	Server 15 BE2	Server 15 FE2	Server 15 FE1
Node 16	Server 16 iDRAC	Server 16 BE1	Server 16 BE2	Server 16 FE2	Server 16 FE1

The EX500 node network cable labeling is listed in the following table.

Figure 25 EX500 node network cable labeling

Node Network Cable Labelling	iDRAC Port		Left NIC Port 1 BE1/Fox	Left NIC Port 2 BE2/Hound	Right NIC Port 2 FE2/Hare	Left NIC Port 1 FE1/Rabbit
Node 1	BE1 port 17		BE1 Port 1	BE2 Port 1	FE2 Port 1	FE1 Port 1
Node 2	BE1 port 18		BE1 Port 2	BE2 Port 2	FE2 Port 2	FE1 port 2
Node 3	BE1 port 19		BE1 Port 3	BE2 Port 3	FE2 Port 3	FE1 port 3
Node 4	BE1 port 20		BE1 Port 4	BE2 Port 4	FE2 Port 4	FE1 Port 1
Node 5	BE1 port 21		BE1 Port 5	BE2 Port 5	FE2 Port 5	FE1 port 2
Node 6	BE1 port 22		BE1 Port 6	BE2 Port 6	FE2 Port 6	FE1 port 3
Node 7	BE1 port 23		BE1 Port 7	BE2 Port 7	FE2 Port 7	FE1 Port 1
Node 8	BE1 port 24		BE1 Port 8	BE2 Port 8	FE2 Port 8	FE1 port 2
Node 9	BE1 port 25		BE1 Port 9	BE2 Port 9	FE2 Port 9	FE1 port 3
Node 10	BE1 port 26		BE1 Port 10	BE2 Port 10	FE2 Port 10	FE1 Port 10
Node 11	BE1 port 27		BE1 Port 11	BE2 Port 11	FE2 Port 11	FE1 port 11
Node 12	BE1 port 28		BE1 Port 12	BE2 Port 12	FE2 Port 12	FE1 port 12
Node 13	BE1 port 29		BE1 Port 13	BE2 Port 13	FE2 Port 13	FE1 Port 13
Node 14	BE1 port 30		BE1 Port 14	BE2 Port 14	FE2 Port 14	FE1 port 14
Node 15	BE1 port 31		BE1 Port 15	BE2 Port 15	FE2 Port 15	FE1 port 15
Node 15	BE1 port 32		BE1 Port 16	BE2 Port 16	FE2 Port 16	FE1 Port 16

Figure 26 EX500 network cabling



Network connections between multiple ECS appliances in a single site

The private.4 network interconnects multiple, co-located ECS intra-rack networks into a single inter-rack network through VLAN 4. Ports 41 - 44 are used to create port channel 100 and ports 45 through 48 are used to create port channel 101 on the back-end switch. Port channels 100 and 101 are used to connect to other intra-rack LANs.

Note: The private.4 network is also referred to as the Nile Area Network (NAN).

The ECS intra-rack backend management networks are connected together to create the inter-rack topology. By connecting either port channel 100 or 101 to another private switch from another ECS intra-rack network, the inter-rack network is created. Through these connections, nodes from any intra-rack network can communicate to any other node on the inter-rack network. There are three types of topologies you can use to connect the intra-rack LANs into an inter-rack network:

- Daisy chain or line topology
- Ring topology
- Star topology

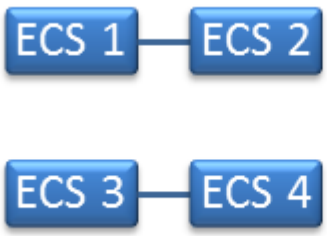
Linear or daisy chain topology

The simplest topology to connect the intra-racks together does not require any extra equipment. All the private switches can be connected together in a linear or Daisy chain fashion as demonstrated below.

Figure 27 Linear or Daisy Chain topology

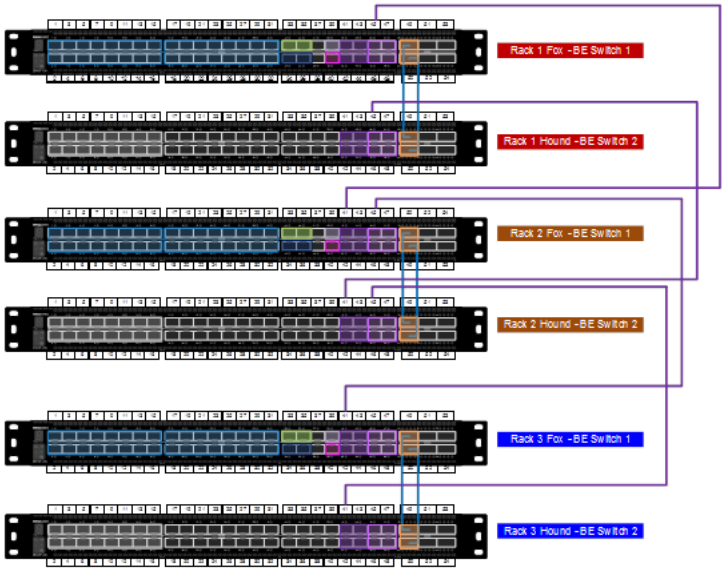
This linear or daisy-chain topology is the least dependable setup and is easily susceptible to split-brain topologies as demonstrated below.

Figure 28 Split-brain topology



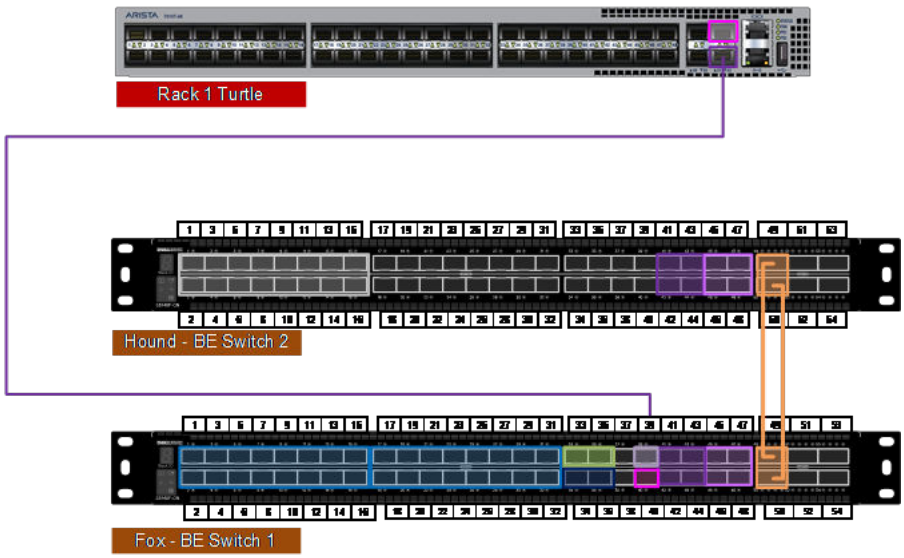
The inter-rack linear topology between EX-Series racks are shown in the following figure.

Figure 29 Inter-rack switch connectivity - linear topology (daisy-chain) between EX Series racks



The inter-rack linear topology between an EX-Series rack and a Gen2 rack is shown in the following figure. For a mixed Gen2 and Gen3 environment, use Turtle switch port 51 for inbound, and port 52 for outbound. On the Gen3 Fox switch, use port 39 for inbound and port 40 for outbound. This is a requirement for mixing Gen2 and Gen3 racks in the same VDC. Ports 39 and 40 are not used in an all Gen3 environment with EX-Series racks.

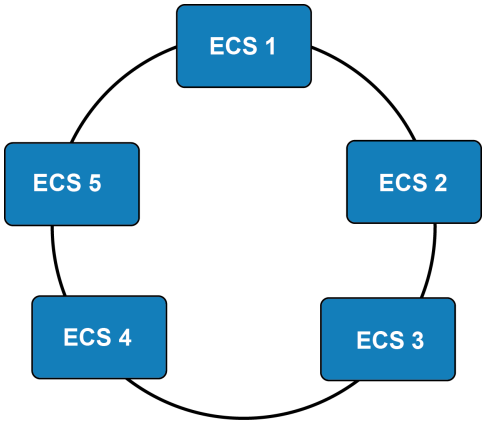
Figure 30 Inter-rack switch connectivity - linear topology (daisy-chain) between an EX-Series rack and a Gen2 U-Series, D-Series, or C-Series rack



Ring topology

For a more reliable network, the ends of the daisy chain topology can be connected together to create a ring network as demonstrated below. The ring topology would require two physical link breaks in the topology to create split-brain issue in the private.4 network.

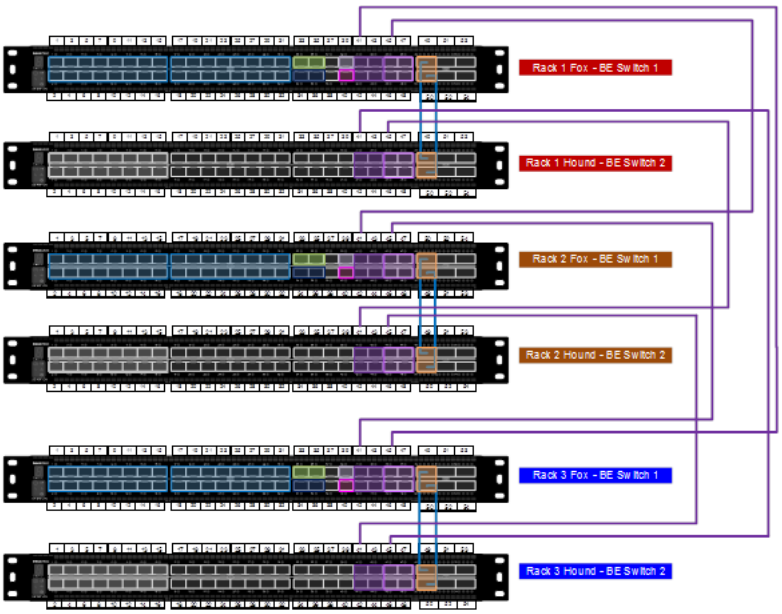
Figure 31 Ring topology



The ring topology is very similar to the daisy chain/line topology, except that it is more robust since it requires two points of failure to break the topology which would cause a split-brain issue.

The inter-rack ring topology between EX-Series racks are shown in the following figure.

Figure 32 Inter-rack switch connectivity - ring topology

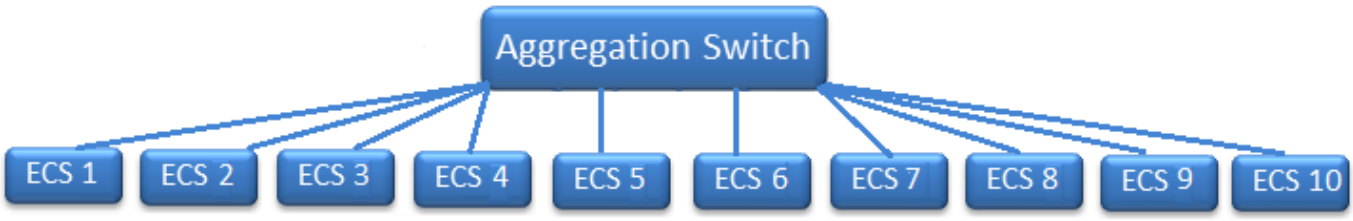


Star topology

The limitation with the daisy chain or ring topologies is that they do not scale well for large installations. For ten or more ECS racks, one or two aggregation switches should be added support the large installation. For high availability, the recommended topology is to use two aggregation switches with port channel (VLT, vPC, MLAG) connectivity between them. If you use a single aggregation switch, both the Fox switch (BE1) and the Hound switch (BE2) are connected to the single switch. The impact of using only one aggregation switch is the loss of high availability for the aggregation switch. For connectivity to aggregation switches, use the inbound port 41 on each back-end switch to link to the aggregation switch(es).

By using aggregation switch(es) to connect to all the intra-rack networks, the star topology provides better protection against the split-brain issue than both the daisy chain/linear or ring topologies. With aggregation switch(es), link failures are isolated to a single intra-rack network in the private.4 network.

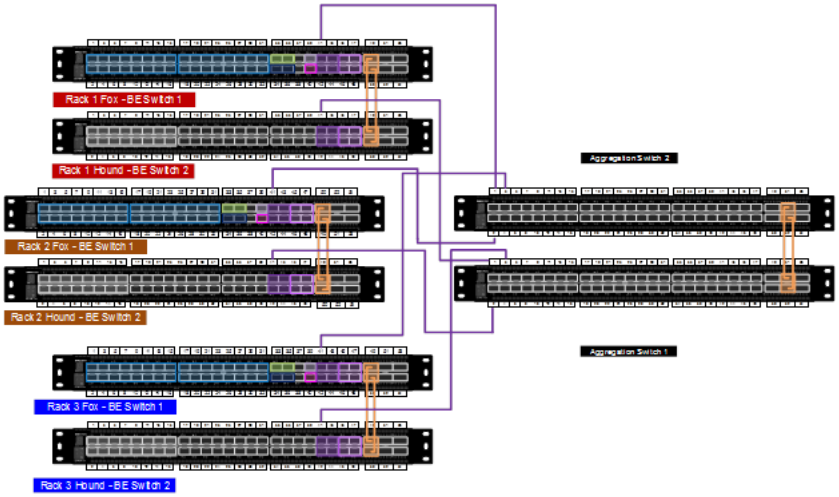
Figure 33 Star topology



The aggregation switch(es) connecting to the intra-rack networks must be set up as a trunk and allow VLAN traffic to flow between all ports in the inter-rack network.

The inter-rack star topology between EX-Series racks are shown in the following figure.

Figure 34 Inter-rack switch connectivity - star topology



CHAPTER 4

EX300 Platform

EX300 hardware components

The EX300 ECS appliance includes the following hardware components.

Table 15 EX300 hardware components

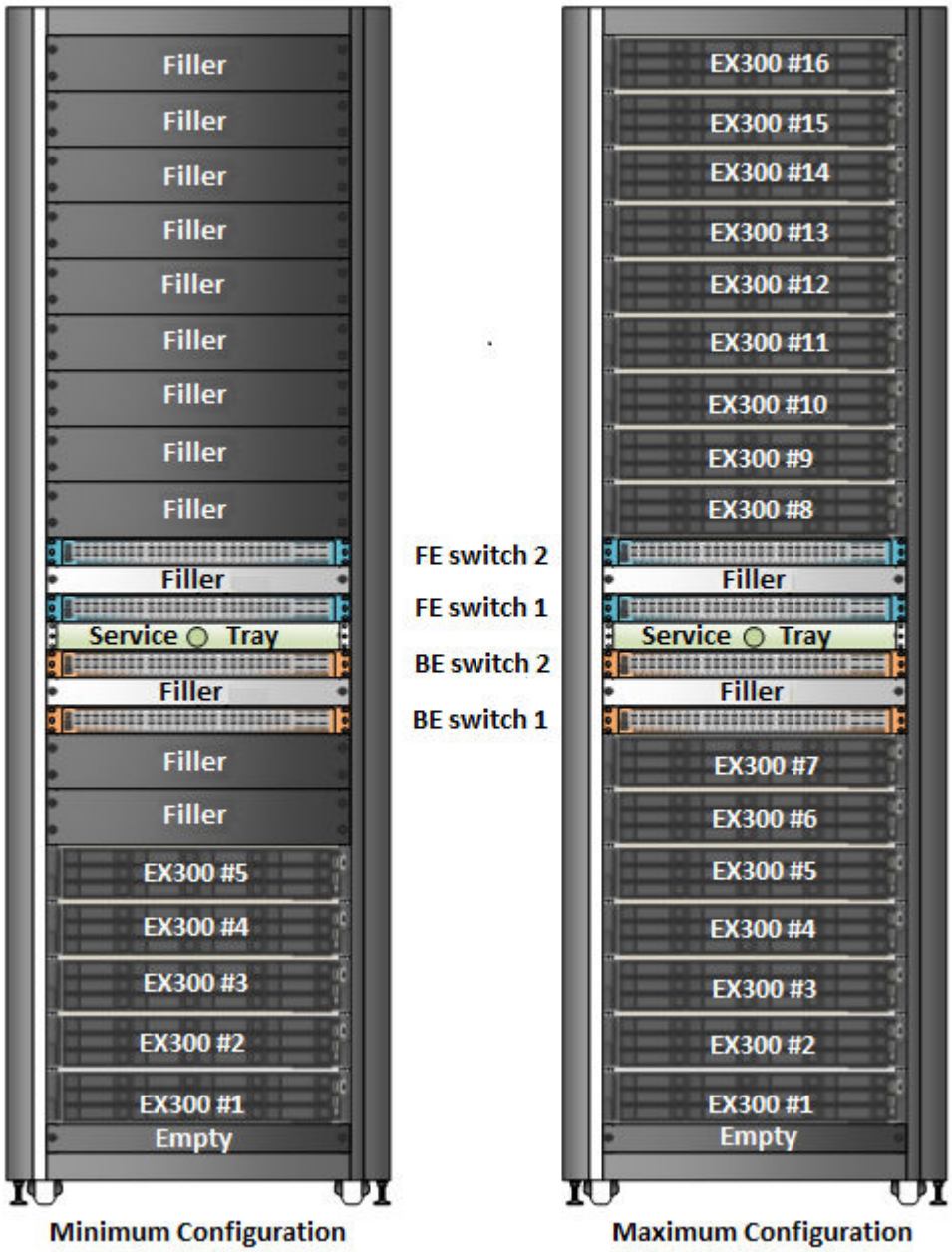
Component	Description
40U rack	Titan D racks that include: • Gen3 0U PDUs supporting single phase, three-phase delta, and three-phase WYE • Front and rear doors • Racking by Dell EMC manufacturing In addition to the Dell EMC-racked EX300 appliance, the EX300 nodes can be installed in customer-provided racks. For more information on third-party racking requirements, see the *ECS EX300 Third-Party Rack Installation Guide*.
Back-end (BE) switches for private network connection	• Two Dell EMC S5148F 25 GbE 1U ethernet switches with 48 x 25 GbE SFP ports and 6 x 100 GbE uplink ports. • 2 x 100 GbE VLT cables per HA pair.
Front-end (FE) switches for customer public network connection	• Two optional Dell EMC S5148F 25 GbE 1U ethernet switches can be obtained for network connection or the customer can provide their own 10 GbE or 25 GbE HA pair for the front end. • If the customer provides their own front-end switches, they must supply all VLT cables, SFPs, or external connection cables. • If Dell EMC S5148F 25 GbE front-end switches are used, the 25 GbE ports are configured to run at 10 GbE to connect to the EX300 nodes, and 2 x 100 GbE VLT cables are provided.
Nodes	• Minimum number of nodes per rack is 5 with increments of 1 node up to a maximum of 16 nodes. • HDD sizes can be 1 TB, 2 TB, 4 TB, or 8 TB. (All drive sizes are the same in the node.) • Within a Dell EMC manufactured rack delivered from the factory, all nodes within the rack are of the exact same drive size. For node upgrades in the field, nodes with other sized drives are allowed within the rack. • Twelve SATA hard disk drives (HDDs) in each node. • 480 GB M.2 (BOSS) system disk in each node. • 64 GB RAM per node. • Single 8-core SkyLake CPU per node. Xeon Bronze 3106 8 core/8 thread-11MB L3, 1.7GHz, 85W. • 4x 16GB RDIMM, 2667MT/s, Dual Rank, x4 Data Width. • Dual 750W Platinum power supply (hot swappable). • Each node has 4 x 10 GbE networking.

EX300 configurations

Describes the EX300 ECS appliance configurations.

The front view of an EX300 rack with the minimum node configuration and an EX300 rack with the maximum node configuration is shown in the following diagram. The rear view requires a brace wherever there is empty space above or below an EX300 server.

Figure 35 EX300 minimum and maximum configurations



The EX300 appliance is available in the following configurations within a Dell EMC rack or a customer-provided rack.

Lists the nodes, disks in each node, disk size, and RAW storage capacity.

Table 16 EX300 configurations

Nodes	Disks in each node	Disk Size	RAW Storage capacity
5 (minimum configuration)	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 60 TB • 120 TB • 240 TB • 480 TB
6	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 72 TB • 144 TB • 288 TB • 576 TB
7	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 84 TB • 168 TB • 336 TB • 672 TB
8	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 96 TB • 192 TB • 384 TB • 768 TB
9	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 108 TB • 216 TB • 432 TB • 864 TB
10	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 120 TB • 240 TB • 480 TB • 960 TB
11	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 132 TB • 264 TB • 528 TB • 1.06 PB
12	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 144 TB • 288 TB • 576 TB • 1.15 PB

Table 16 EX300 configurations (continued)

Nodes	Disks in each node	Disk Size	RAW Storage capacity
13	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 156 TB • 312 TB • 624 TB • 1.25 PB
14	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 168 TB • 336 TB • 672 TB • 1.34 PB
15	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 180 TB • 360 TB • 720 TB • 1.44 PB
16 (maximum configuration)	12	• 1 TB • 2 TB • 4 TB • 8 TB	• 192 TB • 384 TB • 768 TB • 1.54 PB

EX300 upgrade paths

Describes the EX300 ECS appliance upgrade paths.

If there are four or more nodes in the system (VDC) with the same disk size or total node disk capacity, the minimum node expansion is only one. This upgrade is possible when the expansion node has the same disk size or the total disk capacity of the existing nodes.

For example, you have an EX300 appliance with five nodes containing 1TB disks or have a total disk capacity of 12TB. You can add a single node with 1TB disks or a total disk capacity of 12TB.

If you are adding nodes that have different disk sizes than the nodes currently in the system, you must add a minimum of four nodes at a time.

For example, you have an EX300 appliance with five nodes containing 1TB drives. If you want to add nodes of different drive size (2TB, 4TB or 8TB), you must add four or more nodes, at a time.

Note: All drives within a node must be of the same drive size, but there can be nodes of differing drive sizes within a rack.

There are no drive upgrades.

EX300 server

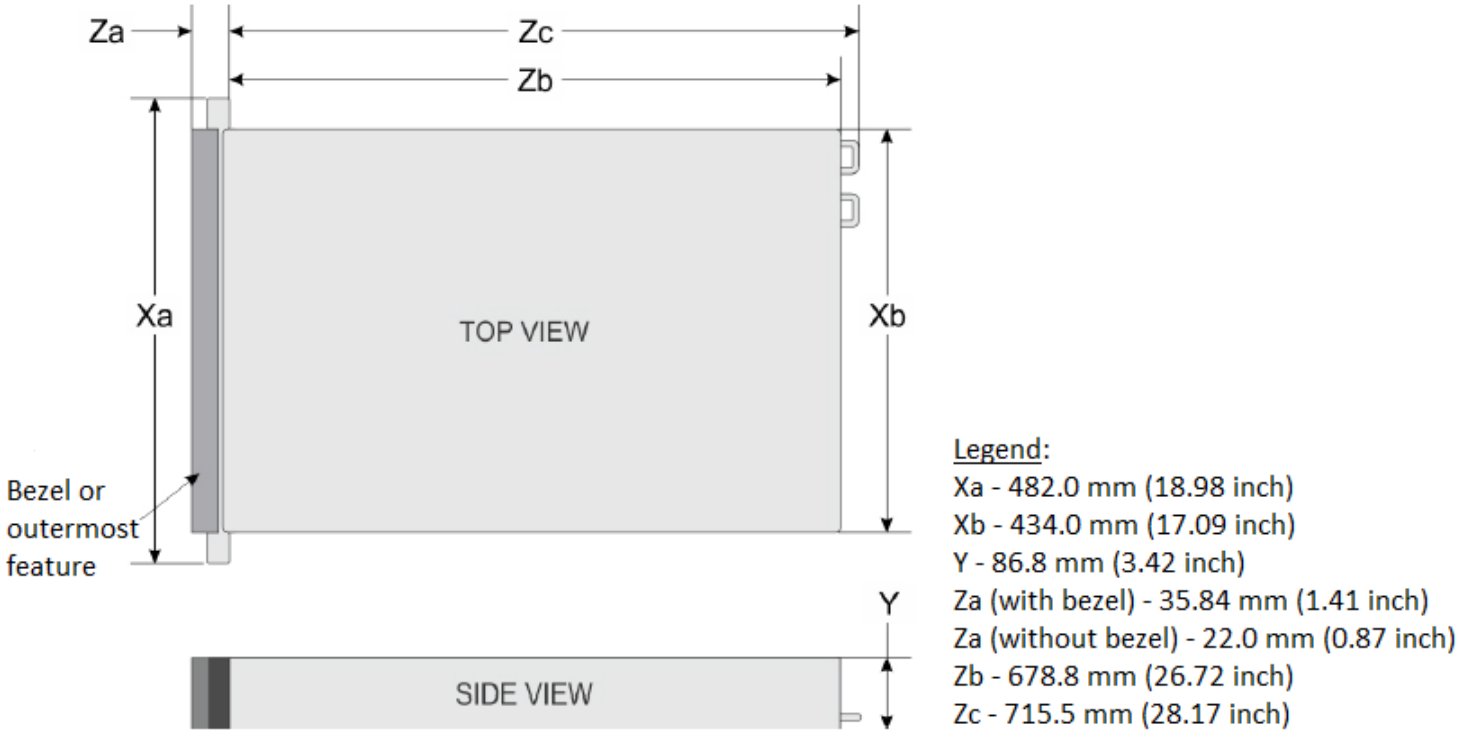
EX300 servers have the following standard features:

Lists the features if EX300 servers

Table 17 Standard features of EX300 servers

Features	1 TB	2 TB	4 TB	8 TB
Chassis	• EX300 12 x 3.5" 1 CPU chassis • One-node server (2U) with one CPU per node • Maximum chassis weight is 33.1 kg (72.91 lb)			
Riser Configuration	• Each EX300 server supports up to eight PCI express (PCIe) Gen3 expansion cards that can be installed on the system board using three expansion card risers. • Config 1 (1B + 2B) • Four x8 slots and rear storage			
Processors	1 x Intel Xeon Bronze 3106 8 core/8 thread, 1.7Ghz, 85W, 11 MB cache, 2400Mhz DIMMs			
Memory	4 x 16 GB RDIMM, 2667MT/s, Dual Rank, x8 Data Width			
Disk Controller	HBA330 mini (IOC, JBOD)			
NDC	Foster Flat (Quad Port 10G SFP+) Intel X710			
PCIe Slot 1	BOSS controller card + with 1 M.2 stick 480 GB, FH			
Management	iDRAC9 Enterprise			
Power	2 x 750W Platinum			
HDDs in front slots	1 TB 7.2k RPM 512n SATA HDD	2 TB 7.2k RPM 512n SATA HDD	4 TB 7.2k RPM 512n SATA HDD	8 TB 7.2k RPM 512e SATA HDD

Figure 36 EX300 server physical dimensions



Server front view

The following figure shows the EX300 2U server chassis front with 12 x 3.5" SATA HDDs.

Figure 37 EX300 server chassis front view

LED indicators are on the left and right side of the server front panels.

Figure 38 Left control panel

The left control panel LED behavior is broken into two subsets, the light bar and the status LEDs. The light bar also functions as a button. The light bar indicates chassis health and also functions as System ID when pressed.

Table 18 Decoding of LEDs in light bar

Status	ID button
Healthy	Solid Blue
Fault	Blink Amber
System ID	Blink Blue

There are five status LEDs to indicate and identify any failed hardware components.

Figure 39 Status LEDs decoded view

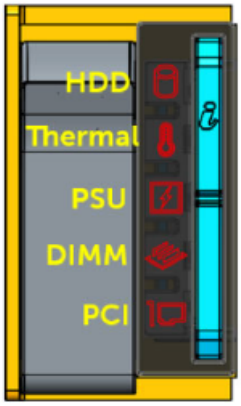
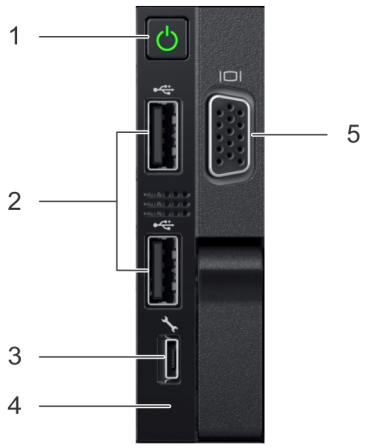


Figure 40 Right control panel



1. Power button with integrated power LED
2. Two USB 3.0 ports
3. Micro-USB for iDRAC Direct
4. Status LED for iDRAC Direct
5. VGA port

Server rear view

The EX300 server chassis provides dual hot-swappable power supplies with 1 + 1 redundancy, auto-sensing and auto-switching capability.

Figure 41 EX300 server chassis rear view

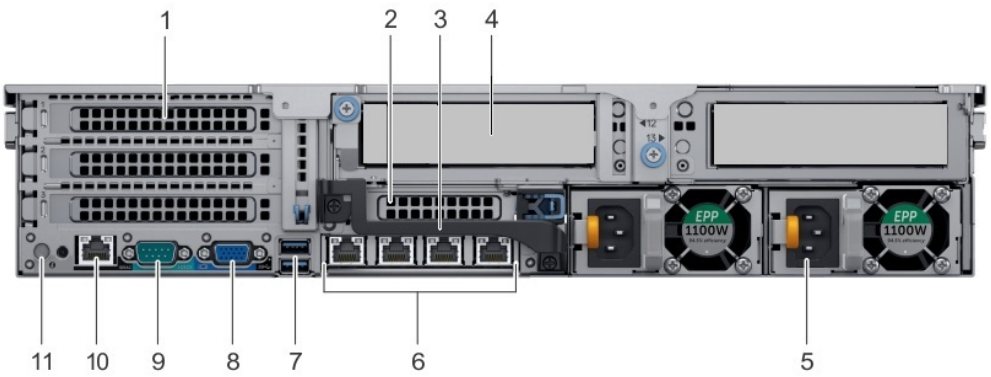


Table 19 Server Panel, Ports, and Slots

Item	Panel, Ports, and Slots	Description
1	Full-height PCIe expansion card slot (3)	The PCIe expansion card slot (riser 1) connects up to three full-height PCIe expansion cards to the system. The Boot Optimized Storage Subsystem (BOSS) controller card with one M.2 stick is in the top PCIe slot (slot 1).
2	Half-height PCIe expansion card slot	The PCIe expansion card slot (riser 2) connects one half-height PCIe expansion cards to the system.

Table 19 Server Panel, Ports, and Slots (continued)

Item	Panel, Ports, and Slots	Description
3	Rear handle	The rear handle can be removed to enable any external cabling of PCIe cards that are installed in the PCIe expansion card slot 6.
4	Drive slots	The two rear 3.5 inch rear drive slots contain fillers.
5	Power supply unit (2)	Two AC or DC power supply units (PSUs)
6	NIC ports	The NIC ports that are integrated on the network daughter card (NDC) provide network connectivity. The two left 10 GbE data ports of each node connect to one of the data ports on the back-end switches. The two right 10 GbE data ports of each node connect to one of the data ports on the front-end switches.
7	USB port (2)	The USB ports are 9-pin and 3.0-compliant. These ports enable you to connect USB devices to the system.
8	VGA port	Enables you to connect a display device to the system.
9	Serial port	Enables you to connect a serial device to the system.
10	iDRAC9 dedicated port	Enables you to remotely access iDRAC. For more information, see the Integrated Dell Remote Access Controller 9 (iDRAC9) User's Guide.
11	System identification button	The System Identification (ID) button is available on the front and back of the systems. Press the button to identify a system in a rack by turning on the system ID button. You can also use the system ID button to reset iDRAC and to access BIOS using the step through mode.

EX300 disk drives

Describes the disk drives that are integrated into the server chassis of the EX300 appliance.

EX300 nodes contain twelve 3.5 inch SATA front-accessible, hot-swappable drives in slots 0 to 11. Disk size can be 1 TB, 2 TB, 4 TB, or 8 TB. All drives within a node must be of the same drive size, but there can be nodes of differing drive sizes within a rack. In PCIe slot 1 of each node there is a 480 GB Boot Optimized Storage Subsystem (BOSS) controller card with one M.2 stick.

Figure 42 EX300 disk drive in carrier

EX300 power cabling

Provides EX300 ECS appliance cabling diagrams for single-phase AC power and three-phase delta and wye AC power.

Use the power and weight calculator to refine the power and heat values to more-closely match the hardware configuration for your system. The calculator contains the latest information for power and weight planning.

The EX300 appliance connections to 0U PDU and 2U PDU outlets are listed in the following tables.

Table 20 EX300 0U PDU cabling

PDU cabling	PS1 outlet numbers	PS2 outlet numbers	Line cord per zone (Single phase)
	Zone B	Zone A	
	Black cables	Gray cables	
Node 16	21	21	2
Node 15	20	20	2
Node 14	19	19	2
Node 13	18	18	1
Node 12	17	17	1
Node 11	16	16	1
Node 10	15	15	1
Node 9	14	14	1
Node 8	13	13	1
FE 2	12	12	1
FE 1	11	11	1
Service Tray and Light Bar	10	10	1
BE 2	9	9	1
BE 1	8	8	1
Node 7	7	7	1
Node 6	6	6	1
Node 5	5	5	1
Node 4	4	4	1
Node 3	3	3	1
Node 2	2	2	1
Node 1	1	1	1

Table 21 EX300 2U PDU cabling

2U PDU cabling	PS1 outlet numbers	PS2 outlet numbers	Line cord per zone (Single phase)
	Zone B	Zone A	
	Black cables	Gray cables	
Node 16	21	21	3
Node 15	12	12	3

Table 21 EX300 2U PDU cabling (continued)

2U PDU cabling	PS1 outlet numbers	PS2 outlet numbers	Line cord per zone (Single phase)
	Zone B	Zone A	
	Black cables	Gray cables	
Node 14	11	11	3
Node 13	10	10	3
Node 12	9	9	3
Node 11	20	20	2
Node 10	19	19	2
Node 9	18	18	2
Node 8	17	17	2
FE 2	13	13	1
FE 1	1	1	1
Service Tray and Light Bar	8	8	2
BE 2	14	14	1
BE 1	2	2	1
Node 7	7	7	2
Node 6	6	6	2
Node 5	5	5	2
Node 4	16	16	1
Node 3	15	15	1
Node 2	4	4	1
Node 1	3	3	1

In the following diagrams, the switches plug into the front of the rack and route through the rails to the rear.

Figure 43 EX300 single-phase AC power cabling

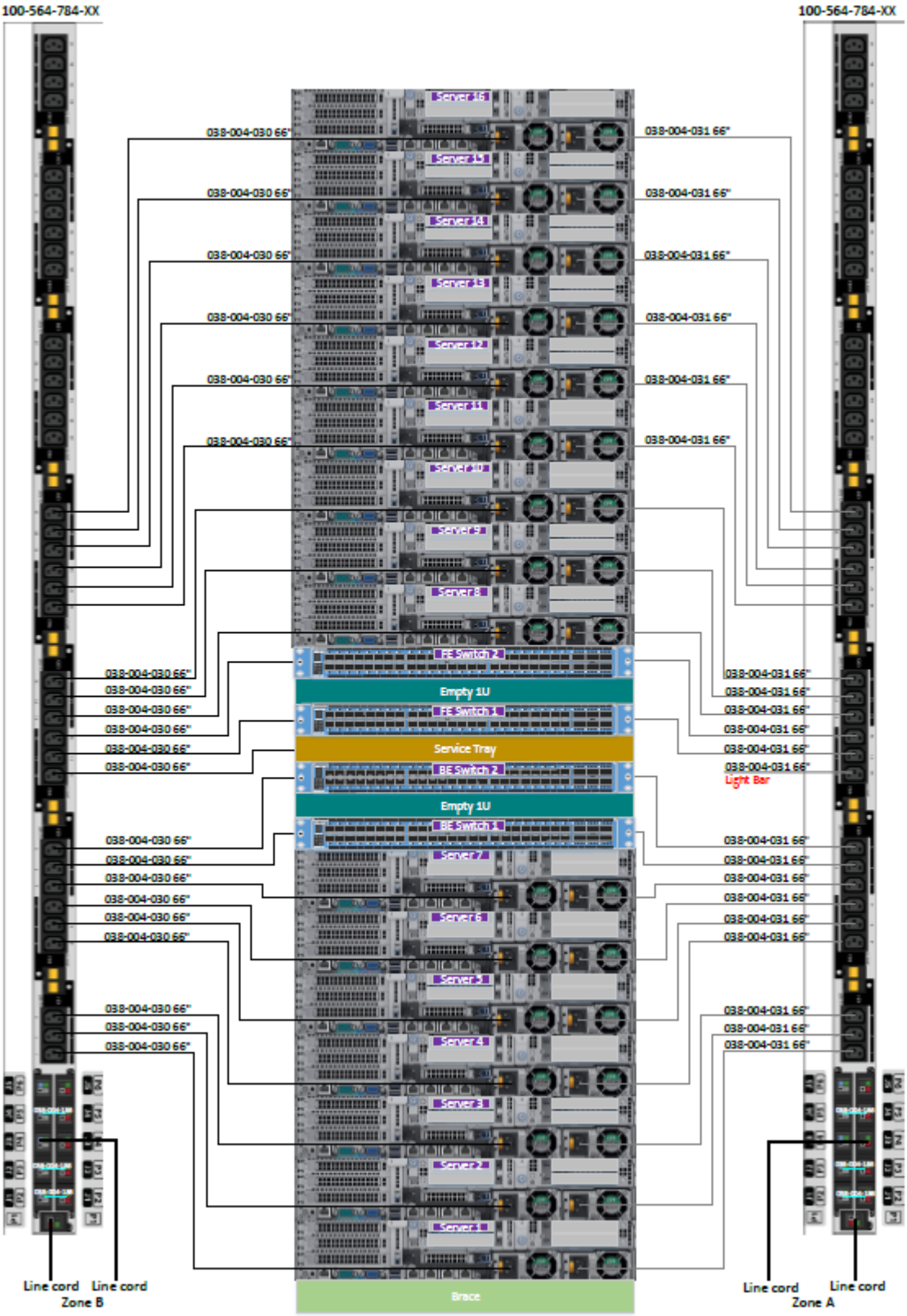


Figure 44 ECSv3 740xd Single Phase AC Cabling Diagram

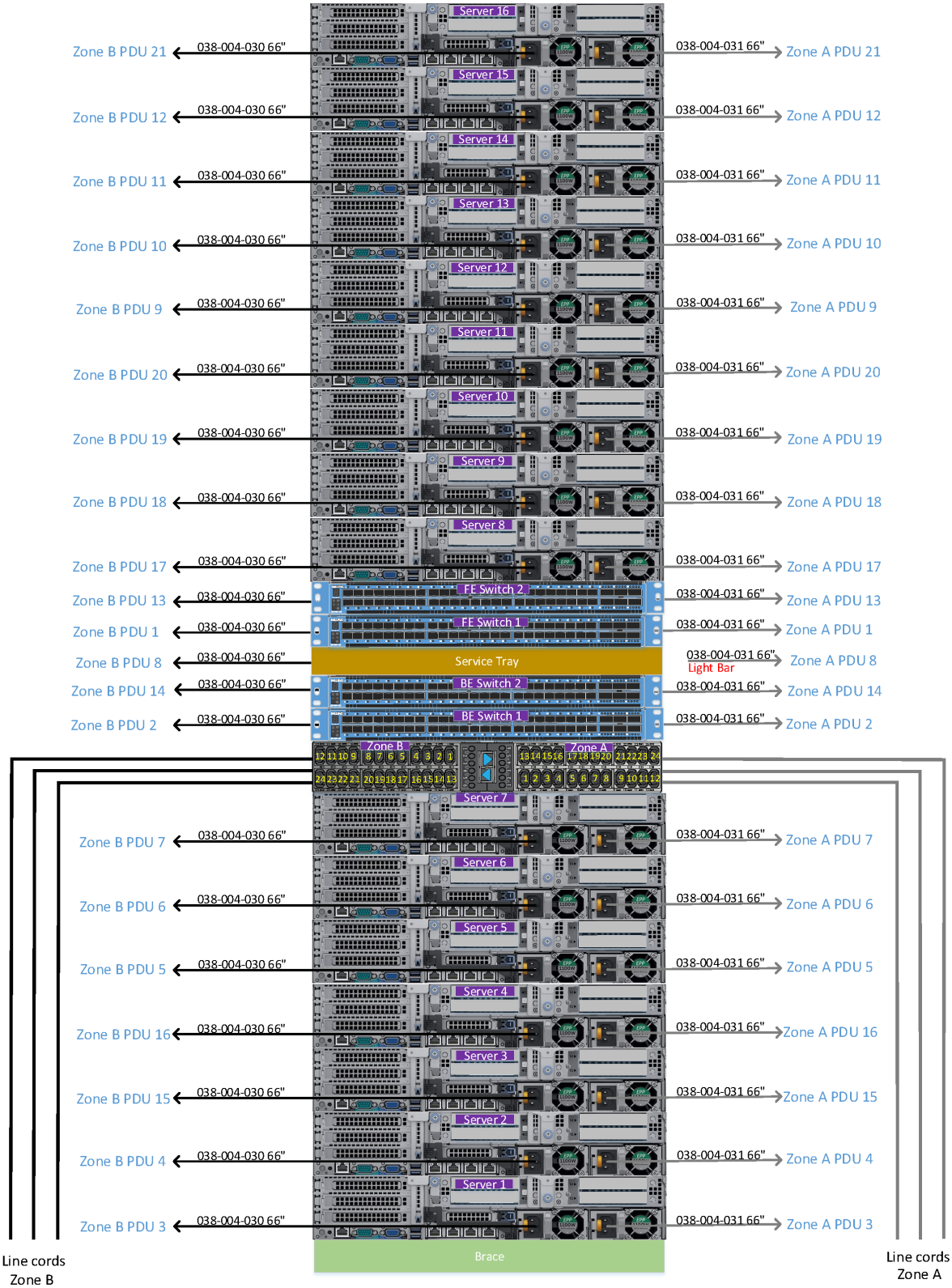


Figure 45 Three-phase Delta AC power cabling

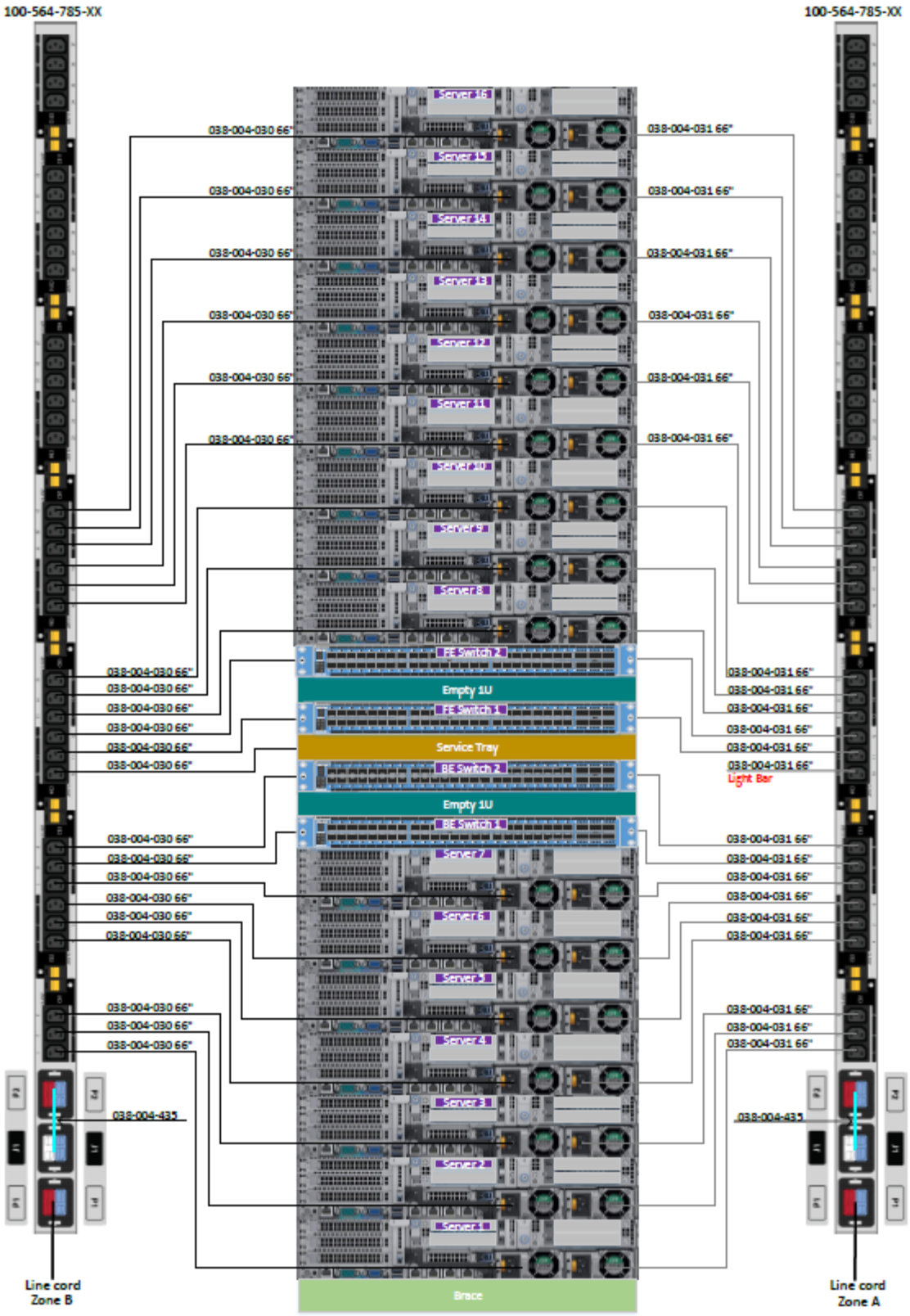


Figure 46 ECSv3 740xd Three Phase Delta AC Cabling Diagram

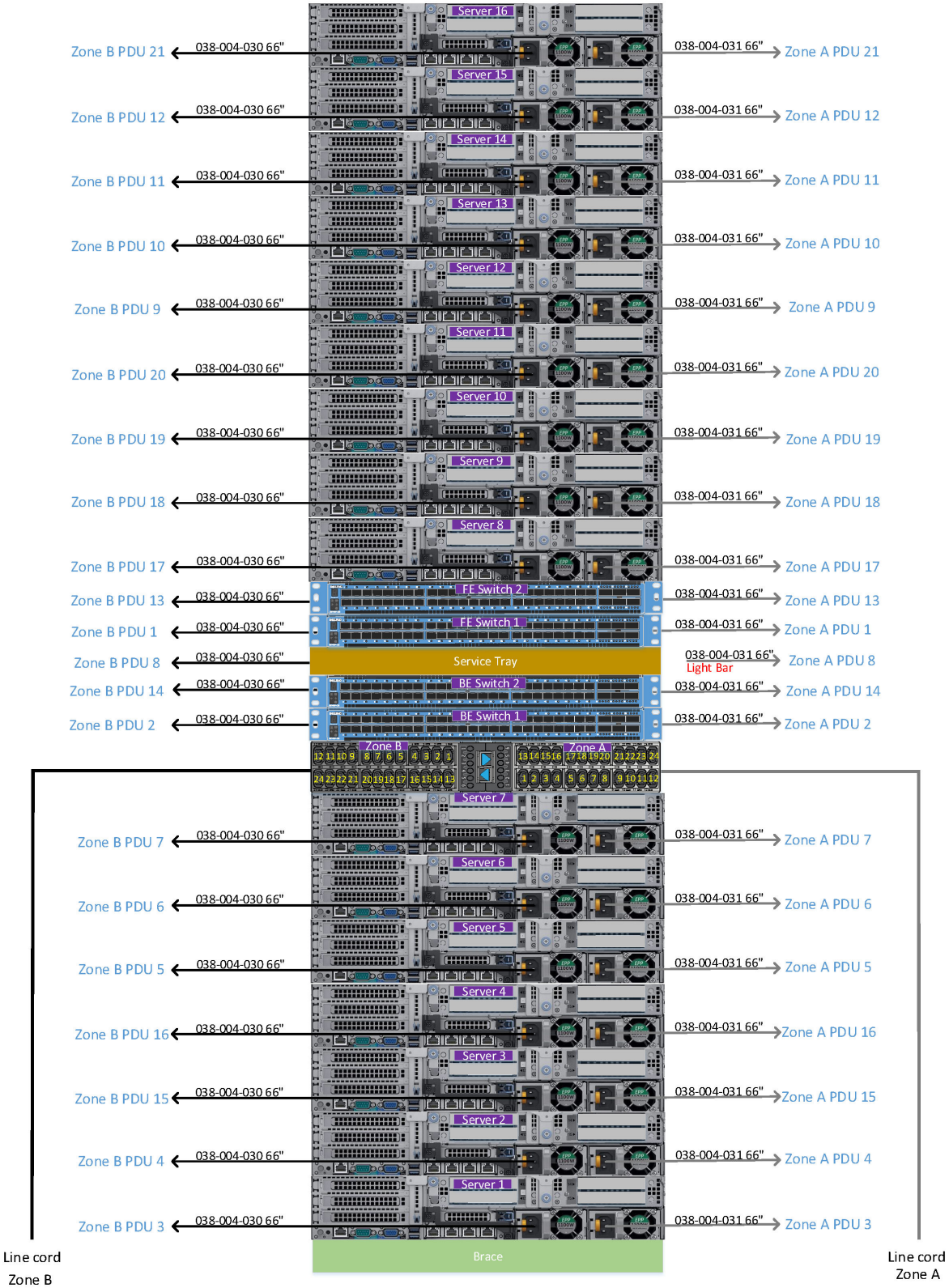


Figure 47 Three-phase WYE AC power cabling

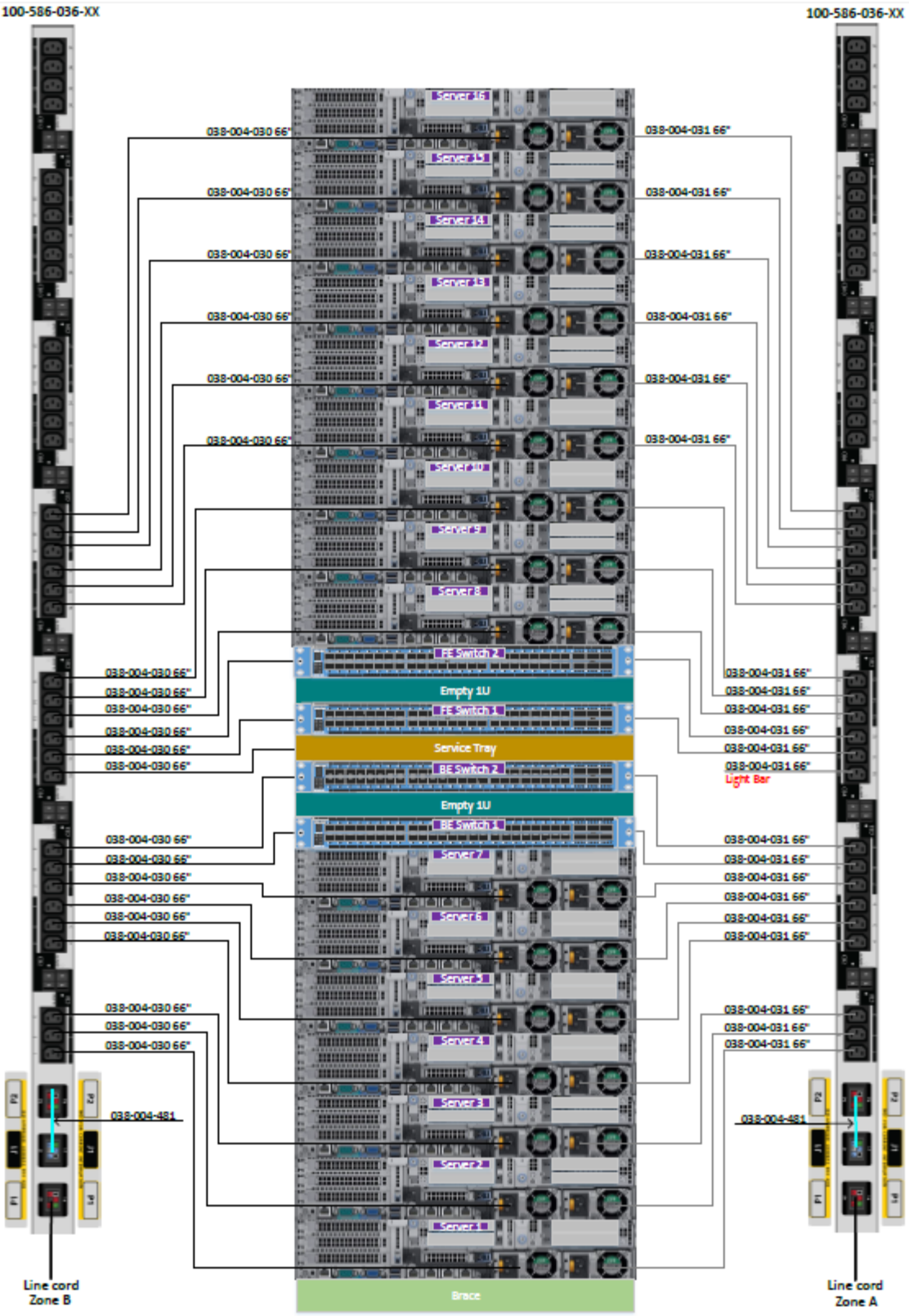
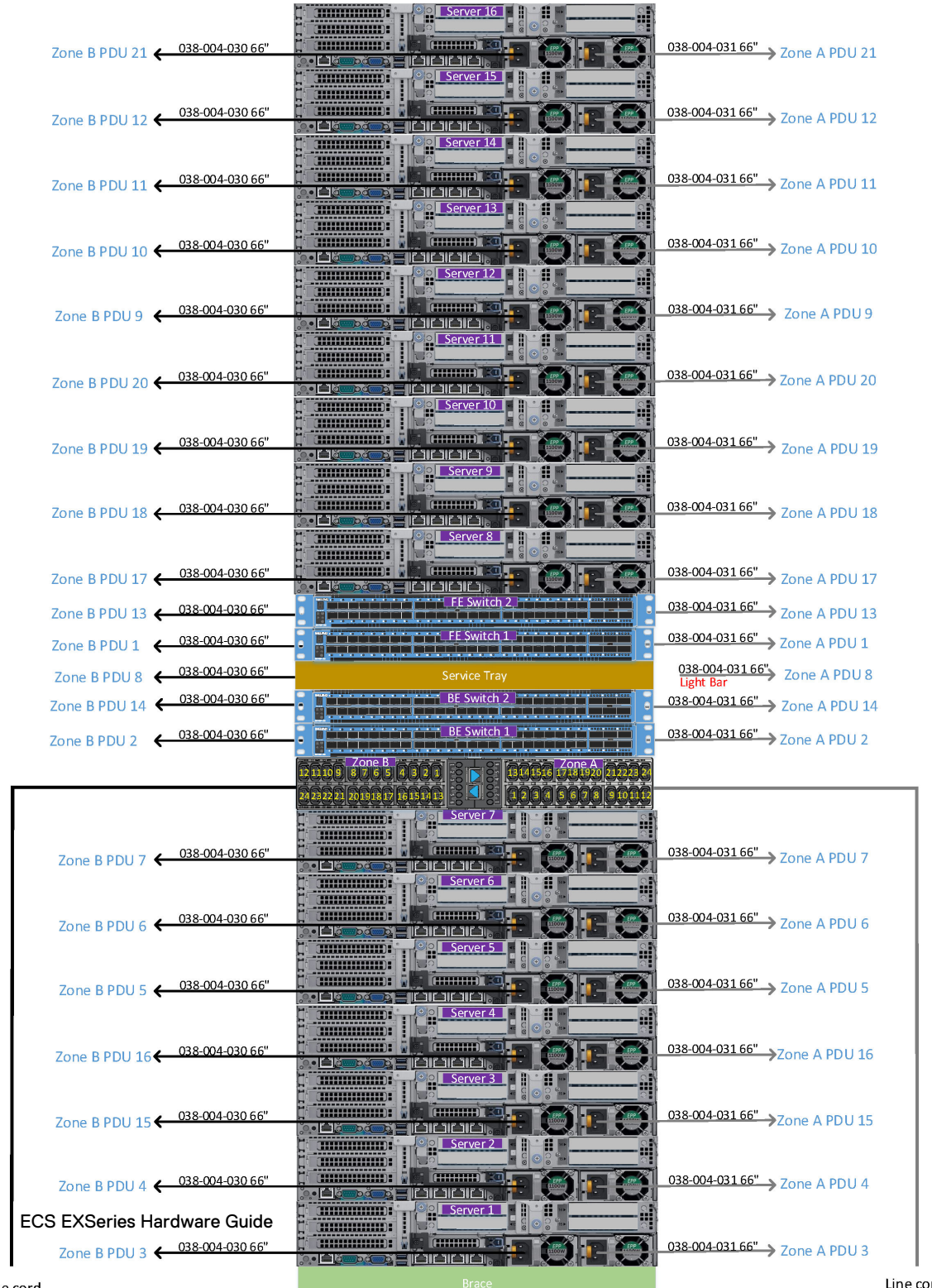


Figure 48 ECSv3 740xd Three Phase Wye AC Cabling Diagram

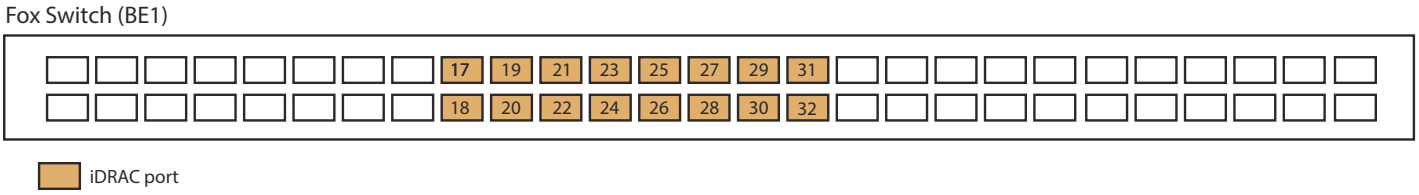


EX300 iDRAC cabling

Provides wiring diagrams for the iDRAC cables that connect the iDRAC port on the node to the Fox back-end switch.

The Fox switch (BE1) port numbers used for connecting to the iDRAC ports on the EX300 nodes are shown in the following diagram.

Figure 49 Fox switch iDRAC ports

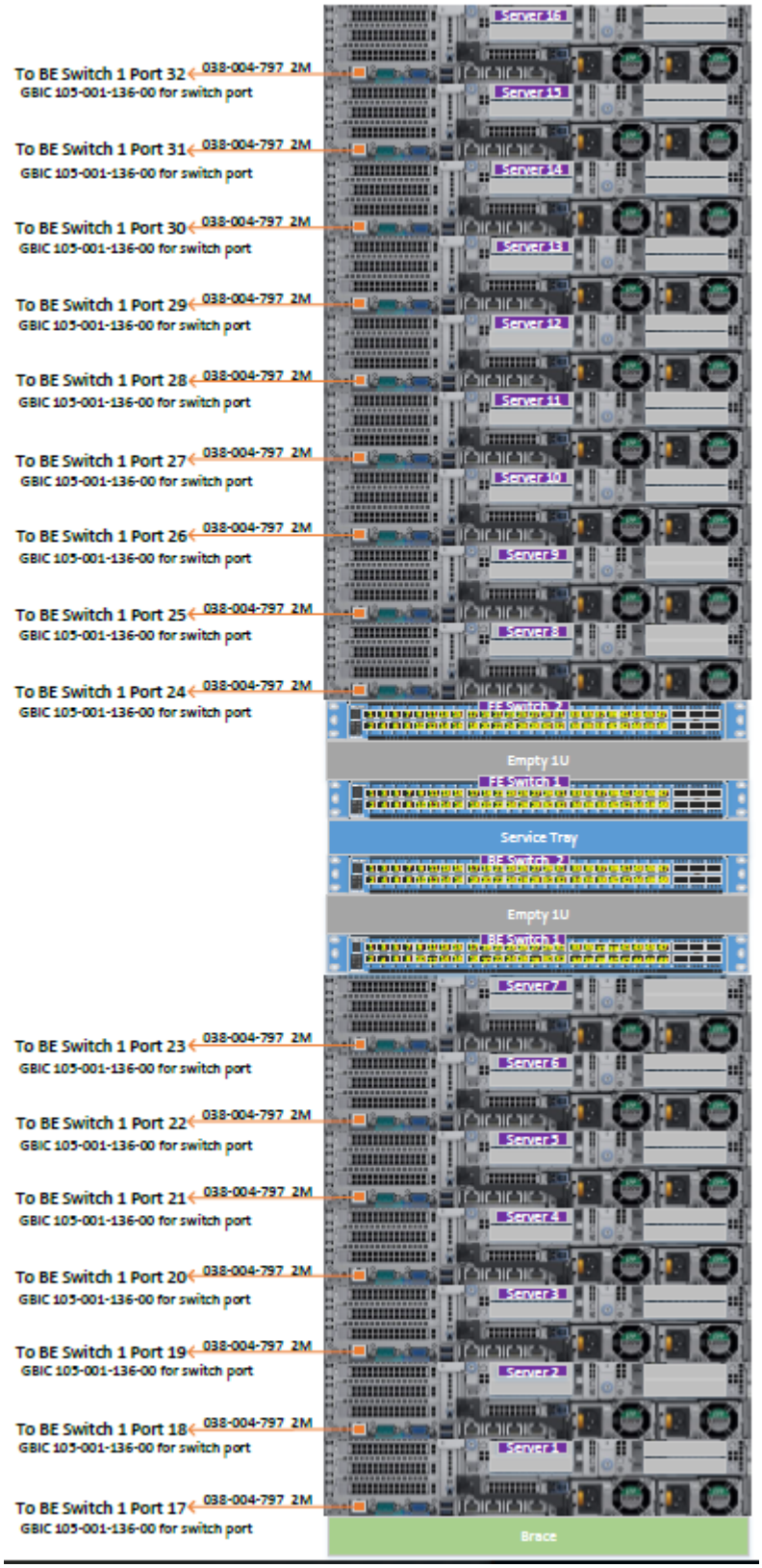


The EX300 node iDRAC port to the Fox switch (BE1) port connections are listed in the following table.

Table 22 EX300 node iDRAC port to BE1 port mapping

Node 1 iDRAC port	BE1 Port 17
Node 2 iDRAC port	BE1 Port 18
Node 3 iDRAC port	BE1 Port 19
Node 4 iDRAC port	BE1 Port 20
Node 5 iDRAC port	BE1 Port 21
Node 6 iDRAC port	BE1 Port 22
Node 7 iDRAC port	BE1 Port 23
Node 8 iDRAC port	BE1 Port 24
Node 9 iDRAC port	BE1 Port 25
Node 10 iDRAC port	BE1 Port 26
Node 11 iDRAC port	BE1 Port 27
Node 12 iDRAC port	BE1 Port 28
Node 13 iDRAC port	BE1 Port 29
Node 14 iDRAC port	BE1 Port 30
Node 15 iDRAC port	BE1 Port 31
Node 16 iDRAC port	BE1 Port 32

Figure 50 iDRAC cabling



EX300 network cabling

The network cabling diagrams apply to the EX300 appliance in a Dell EMC or customer-provided rack.

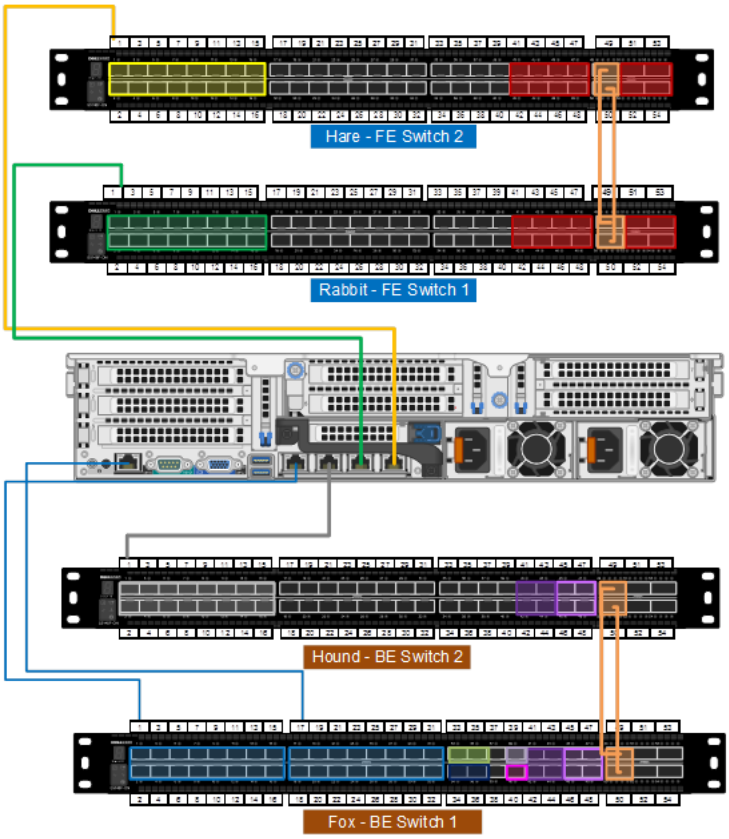
Customers connect to an EX300 appliance by way of 25 GbE ports on the front-end switches. For an EX300 appliance, the 25 GbE ports run at 10 GbE. Customer configurations can include 25 GbE front-end switches provided by Dell EMC or customers may provide their own front-end switches.

To distinguish between the two front-end switches and the two back-end switches, each switch has a nickname:

- Hare: The top S5148F 1U 25 GbE front-end switch. This switch runs 10 GbE SFP28 ports to EX300 nodes. It is located above the Rabbit switch in U22 of the EX300 rack.
- Rabbit: The bottom S5148F 1U 25 GbE front-end switch. This switch runs 10 GbE SFP28 ports to EX300 nodes. It is located below the Hare switch in U20 of the EX300 rack.
- Hound: The top S5148F 1U 25 GbE back-end switch running 10 GbE SFP28 ports to the nodes. It is located above the Fox switch in U18 of the EX300 rack.
- Fox: The bottom S5148F 1U 25 GbE back-end switch running 10 GbE SFP28 ports to the nodes. It is located below the Hound switch in U16 of the EX300 rack.

The front-end switch and back-end switch connections to an EX300 node are shown in the following diagram.

Figure 51 Front-end and back-end switch connections to an EX300 node



The numbered front-end switch ports used for connecting to the ports on the EX300 nodes are shown in the following diagram. Port 1 on the Hare switch (FE2) connects to port 4 on Node 1. Port 2 on the Hare switch (FE2) connects to port 4 on Node 2, and so on. Similarly, Port 1 on the Rabbit switch (FE1) connects to port 3 on Node 1. Port 2 on the Rabbit switch (FE1) connects to port 3 on Node 2, and so on.

Figure 52 Node ports on front-end switches

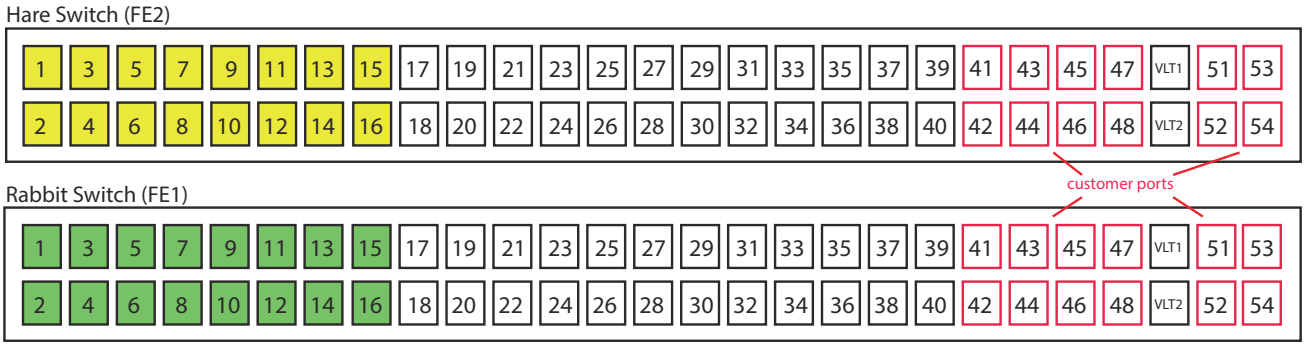
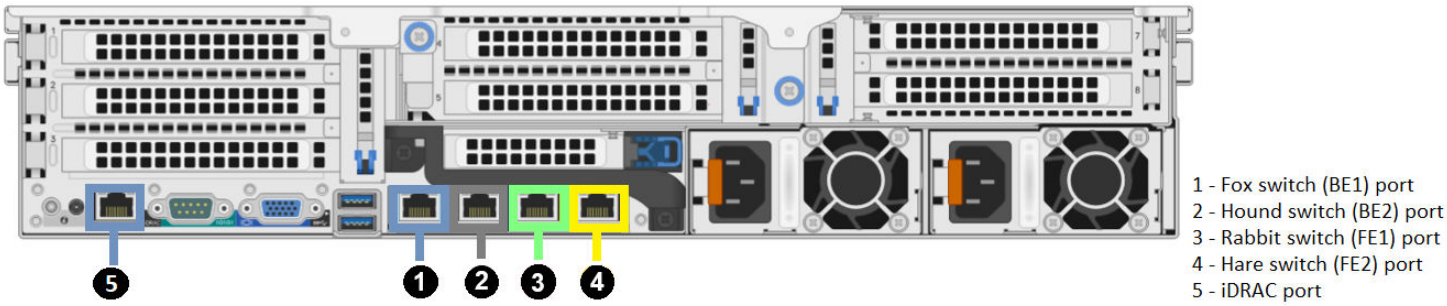
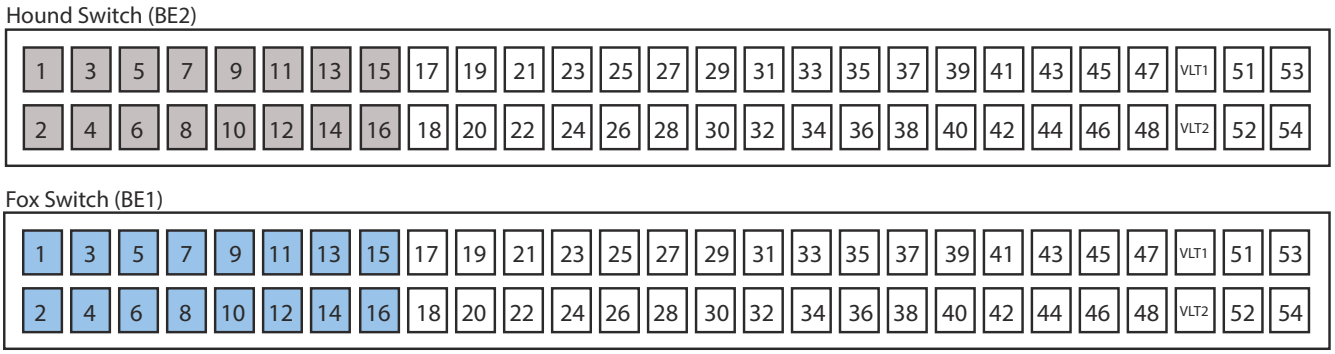


Figure 53 Back-end switch, front-end switch, and iDRAC ports on an EX300 node



The numbered back-end switch ports used for connecting to the ports on the EX300 nodes are shown in the following diagram. Port 1 on the Hound switch (BE2) connects to port 2 on Node 1. Port 2 on the Hound switch (BE2) connects to port 2 on Node 2, and so on. Similarly, Port 1 on the Fox switch (BE1) connects to port 1 on Node 1. Port 2 on the Fox switch (BE1) connects to port 1 on Node 2, and so on.

Figure 54 Node ports on back-end switches



The EX300 node port to the iDRAC, back-end switch, and front-end switch port connections are listed in the following table.

Figure 55 EX300 node network port cabling connections

Node Network Port Cabling	iDRAC Port		Nic 1 BE1/Fox	Nic 2 BE2/Hound	Nic 3 FE1/Rabbit	Nic 4 FE2/Hare
Node 1	Server 1 iDRAC		Server 1 BE1	Server 1 BE2	Server 1 FE1	Server 1 FE2
Node 2	Server 2 iDRAC		Server 2 BE1	Server 2 BE2	Server 2 FE1	Server 2 FE2
Node 3	Server 3 iDRAC		Server 3 BE1	Server 3 BE2	Server 3 FE1	Server 3 FE2
Node 4	Server 4 iDRAC		Server 4 BE1	Server 4 BE2	Server 4 FE1	Server 4 FE2
Node 5	Server 5 iDRAC		Server 5 BE1	Server 5 BE2	Server 5 FE1	Server 5 FE2
Node 6	Server 6 iDRAC		Server 6 BE1	Server 6 BE2	Server 6 FE1	Server 6 FE2
Node 7	Server 7 iDRAC		Server 7 BE1	Server 7 BE2	Server 7 FE1	Server 7 FE2
Node 8	Server 8 iDRAC		Server 8 BE1	Server 8 BE2	Server 8 FE1	Server 8 FE2
Node 9	Server 9 iDRAC		Server 9 BE1	Server 9 BE2	Server 9 FE1	Server 9 FE2
Node 10	Server 10 iDRAC		Server 10 BE1	Server 10 BE2	Server 10 FE1	Server 10 FE2
Node 11	Server 11 iDRAC		Server 11 BE1	Server 11 BE2	Server 11 FE1	Server 11 FE2
Node 12	Server 12 iDRAC		Server 12 BE1	Server 12 BE2	Server 12 FE1	Server 12 FE2
Node 13	Server 13 iDRAC		Server 13 BE1	Server 13 BE2	Server 13 FE1	Server 13 FE2
Node 14	Server 14 iDRAC		Server 14 BE1	Server 14 BE2	Server 14 FE1	Server 14 FE2
Node 15	Server 15 iDRAC		Server 15 BE1	Server 15 BE2	Server 15 FE1	Server 15 FE2
Node 16	Server 16 iDRAC		Server 16 BE1	Server 16 BE2	Server 16 FE1	Server 16 FE2

The EX300 node network cable labeling is listed in the following table.

Figure 56 EX300 node network cable labeling

Node Network Cable Labeling	iDRAC Port		Nic 1 BE1/Fox	Nic 2 BE2/Hound	Nic 3 FE1/Rabbit	Nic 4 FE2/Hare
Node 1	BE1 port 17		BE1 Port 1	BE2 Port 1	FE1 Port 1	FE2 Port 1
Node 2	BE1 port 18		BE1 Port 2	BE2 Port 2	FE1 Port 2	FE2 port 2
Node 3	BE1 port 19		BE1 Port 3	BE2 Port 3	FE1 Port 3	FE2 port 3
Node 4	BE1 port 20		BE1 Port 4	BE2 Port 4	FE1 Port 4	FE2 port 4
Node 5	BE1 port 21		BE1 Port 5	BE2 Port 5	FE1 Port 5	FE2 port 5
Node 6	BE1 port 22		BE1 Port 6	BE2 Port 6	FE1 Port 6	FE2 port 6
Node 7	BE1 port 23		BE1 Port 7	BE2 Port 7	FE1 Port 7	FE2 port 7
Node 8	BE1 port 24		BE1 Port 8	BE2 Port 8	FE1 Port 8	FE2 port 8
Node 9	BE1 port 25		BE1 Port 9	BE2 Port 9	FE1 Port 9	FE2 port 9
Node 10	BE1 port 26		BE1 Port 10	BE2 Port 10	FE1 Port 10	FE2 port 10
Node 11	BE1 port 27		BE1 Port 11	BE2 Port 11	FE1 Port 11	FE2 port 11
Node 12	BE1 port 28		BE1 Port 12	BE2 Port 12	FE1 Port 12	FE2 port 12
Node 13	BE1 port 29		BE1 Port 13	BE2 Port 13	FE1 Port 13	FE2 port 13
Node 14	BE1 port 30		BE1 Port 14	BE2 Port 14	FE1 Port 14	FE2 port 14
Node 15	BE1 port 31		BE1 Port 15	BE2 Port 15	FE1 Port 15	FE2 port 15
Node 16	BE1 port 32		BE1 Port 16	BE2 Port 16	FE1 Port 16	FE2 port 16

Figure 57 EX300 network cabling

Network connections between multiple ECS appliances in a single site

The private.4 network interconnects multiple, co-located ECS intra-rack networks into a single inter-rack network through VLAN 4. Ports 41 - 44 are used to create port channel 100 and ports 45 through 48 are used to create port channel 101 on the back-end switch. Port channels 100 and 101 are used to connect to other intra-rack LANs.

Note: The private.4 network is also referred to as the Nile Area Network (NAN).

The ECS intra-rack backend management networks are connected together to create the inter-rack topology. By connecting either port channel 100 or 101 to another private switch from another ECS intra-rack network, the inter-rack network is created. Through these connections, nodes from any intra-rack network can communicate to any other node on the inter-rack network. There are three types of topologies you can use to connect the intra-rack LANs into an inter-rack network:

- Daisy chain or line topology
- Ring topology
- Star topology

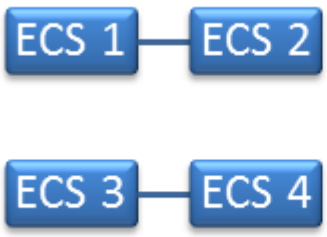
Linear or daisy chain topology

The simplest topology to connect the intra-racks together does not require any extra equipment. All the private switches can be connected together in a linear or Daisy chain fashion as demonstrated below.

Figure 58 Linear or Daisy Chain topology

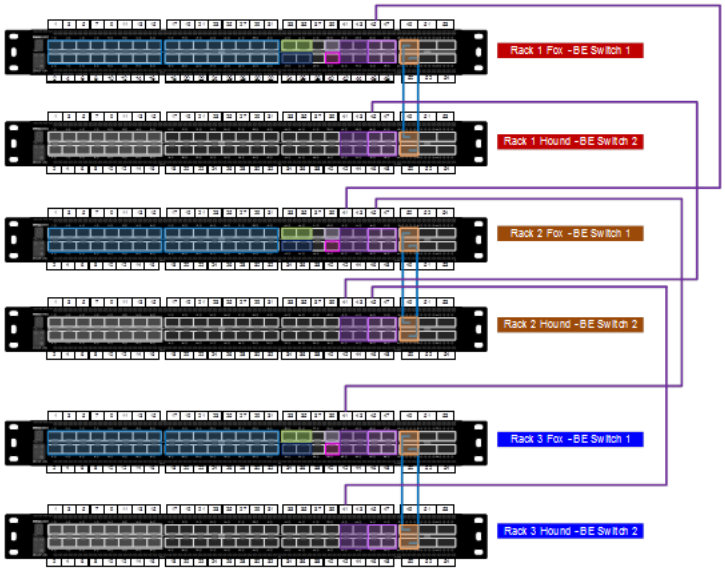
This linear or daisy-chain topology is the least dependable setup and is easily susceptible to split-brain topologies as demonstrated below.

Figure 59 Split-brain topology



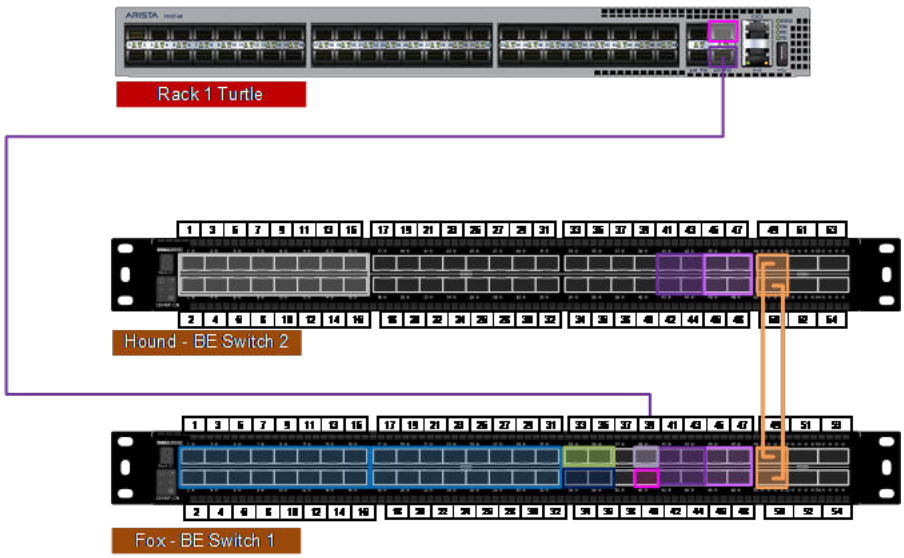
The inter-rack linear topology between EX-Series racks are shown in the following figure.

Figure 60 Inter-rack switch connectivity - linear topology (daisy-chain) between EX Series racks



The inter-rack linear topology between an EX-Series rack and a Gen2 rack is shown in the following figure. For a mixed Gen2 and Gen3 environment, use Turtle switch port 51 for inbound, and port 52 for outbound. On the Gen3 Fox switch, use port 39 for inbound and port 40 for outbound. This is a requirement for mixing Gen2 and Gen3 racks in the same VDC. Ports 39 and 40 are not used in an all Gen3 environment with EX-Series racks.

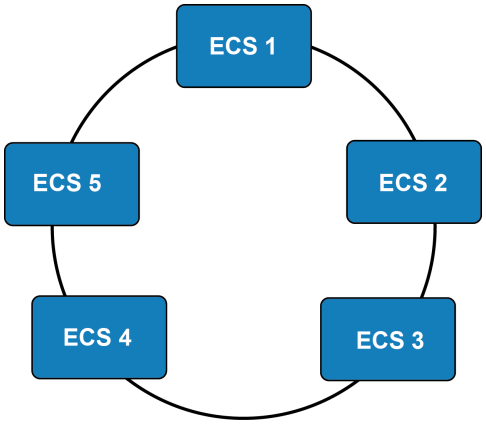
Figure 61 Inter-rack switch connectivity - linear topology (daisy-chain) between an EX-Series rack and a Gen2 U-Series, D-Series, or C-Series rack



Ring topology

For a more reliable network, the ends of the daisy chain topology can be connected together to create a ring network as demonstrated below. The ring topology would require two physical link breaks in the topology to create split-brain issue in the private.4 network.

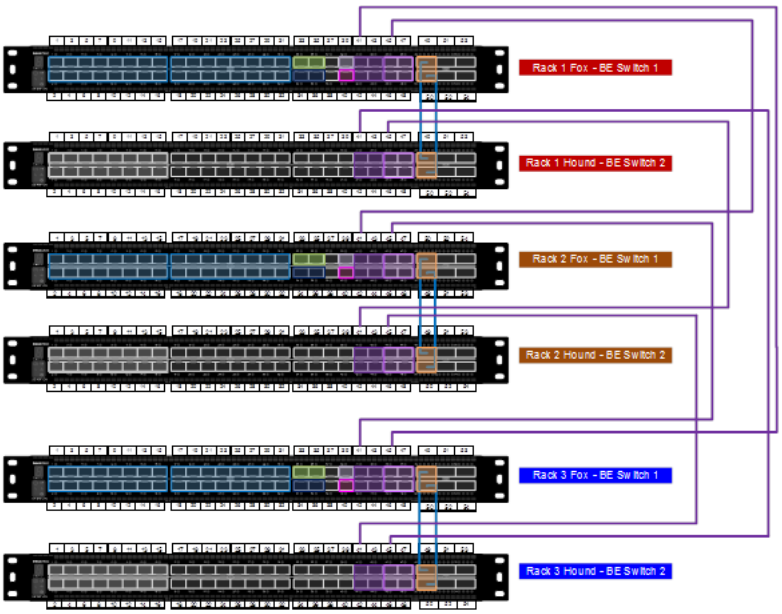
Figure 62 Ring topology



The ring topology is very similar to the daisy chain/line topology, except that it is more robust since it requires two points of failure to break the topology which would cause a split-brain issue.

The inter-rack ring topology between EX-Series racks are shown in the following figure.

Figure 63 Inter-rack switch connectivity - ring topology

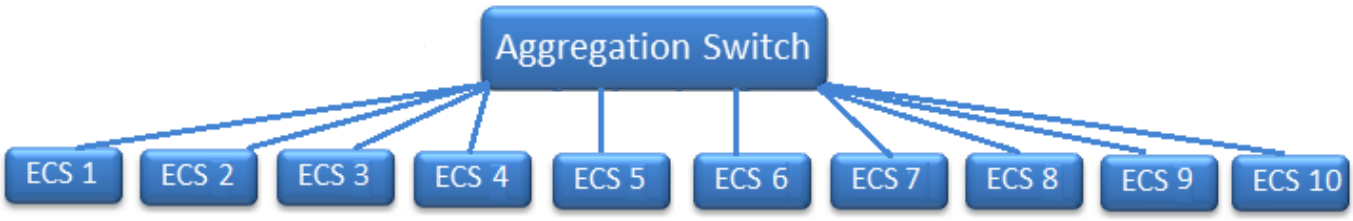


Star topology

The limitation with the daisy chain or ring topologies is that they do not scale well for large installations. For ten or more ECS racks, one or two aggregation switches should be added support the large installation. For high availability, the recommended topology is to use two aggregation switches with port channel (VLT, vPC, MLAG) connectivity between them. If you use a single aggregation switch, both the Fox switch (BE1) and the Hound switch (BE2) are connected to the single switch. The impact of using only one aggregation switch is the loss of high availability for the aggregation switch. For connectivity to aggregation switches, use the inbound port 41 on each back-end switch to link to the aggregation switch(es).

By using aggregation switch(es) to connect to all the intra-rack networks, the star topology provides better protection against the split-brain issue than both the daisy chain/linear or ring topologies. With aggregation switch(es), link failures are isolated to a single intra-rack network in the private.4 network.

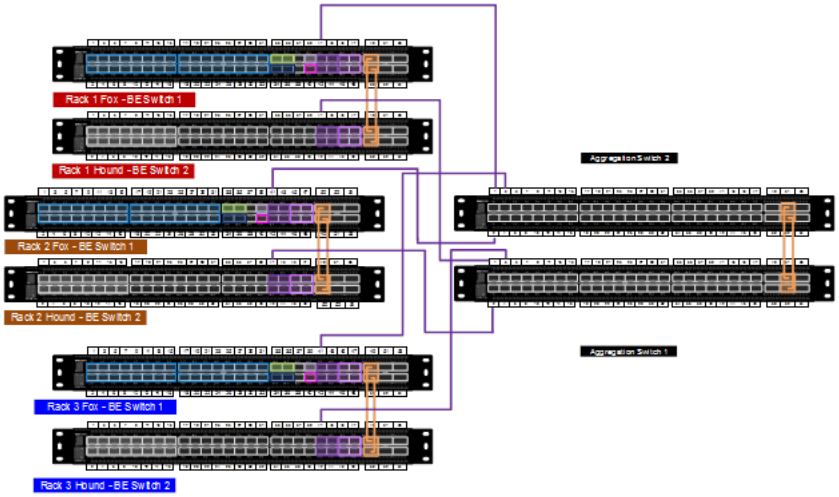
Figure 64 Star topology



The aggregation switch(es) connecting to the intra-rack networks must be set up as a trunk and allow VLAN traffic to flow between all ports in the inter-rack network.

The inter-rack star topology between EX-Series racks are shown in the following figure.

Figure 65 Inter-rack switch connectivity - star topology



CHAPTER 5

EX3000 Platform

EX3000 hardware components

EX3000 S and D are offered in a Dell EMC rack from the factory and in third-party rack. EX3000 nodes include the following hardware components.

Lists the components of EX3000 hardware.

Table 23 EX3000 hardware components

Component	Description
Customer-provided 40U rack	The requirements for customer-provided racks to accommodate the EX3000 nodes are described in the *ECS EX3000 Third-Party Rack Installation Guide*.
Back-end switches for private network connection	• Two Dell EMC S5148F 25 GbE 1U ethernet switches with 48 x 25 GbE SFP ports and 6 x 100 GbE uplink ports • 2 x 100 GbE VLT cables per HA pair
Front-end switches for customer public network connection	• Two optional Dell EMC S5148F 25 GbE 1U ethernet switches can be obtained for network connection or the customer can provide their own 25 GbE HA pair for the front end. • If the customer provides their own front-end switches, they must supply all VLT cables, SFPs, or external connection cables. • If Dell EMC S5148F 25 GbE front-end switches are used, 25 GbE ports connect to the EX3000 nodes and 2 x 100 GbE VLT cables are provided.

Nodes	• Up to eight server chassis in a rack.
	• Chassis are in one- and two-node configurations. (Each server chassis contains either one or two nodes.) One-node chassis configuration is referred to as EX3000S and dual-node chassis configuration is referred to as EX3000D.
	• Chassis have the following disk configurations (all disks are 12 TB):
	  ▪ EX3000S single node with 45, 60, and 90 disks
	  ▪ EX3000D dual node with 60 or 90 disks total (30 and 45 disks per node)
	• You cannot mix EX3000S nodes and EX3000D dual-node chassis in both Dell EMC and customer-provided rack.
	• For chassis/node upgrades in the field, the nodes must match the existing drive configuration. (In a system with EX3000S nodes with 90 disk drives, you can only add EX3000S nodes configured with 90 disk drives. In a system with EX3000D nodes with 30 disk drives, you can only add EX3000D nodes configured with 30 disk drives (60 drives per chassis).
	• EX3000S node has a single server sled with the midplane routing to 90 drive slots. Filler is in the second server sled.
	• EX3000D node has dual server sleds with the midplane routing each to 45 drive slots.
	• Single 480 GB SSD sysdisk per node (hot swappable)
	• 64 GB RAM per node
	• Dual 8-core Broadwell CPU per node. E5-2620v4 8-core/16-thread 2.1GHz 20M cache 85W
	• 4x 16GB RDIMM, 2400MT/s, Dual Rank, x8 Data Width

Table 23 EX3000 hardware components (continued)

Component	Description
	• EX3000S node has 2 x 1600W power supplies (hot swappable). EX3000D node has 4 x 1100W power supplies (hot swappable). • LSI 9361-8i SAS Controller • Each node has 4 x 25 GbE networking

EX3000 configurations

Describes the EX3000 ECS appliance configurations.

The front views of an EX3000S appliance and an EX3000D appliance in both DellEMC and customer-provided racks with the minimum and maximum node configurations are shown in the following diagrams.

Figure 66 EX3000S minimum and maximum configurations for single node chassis

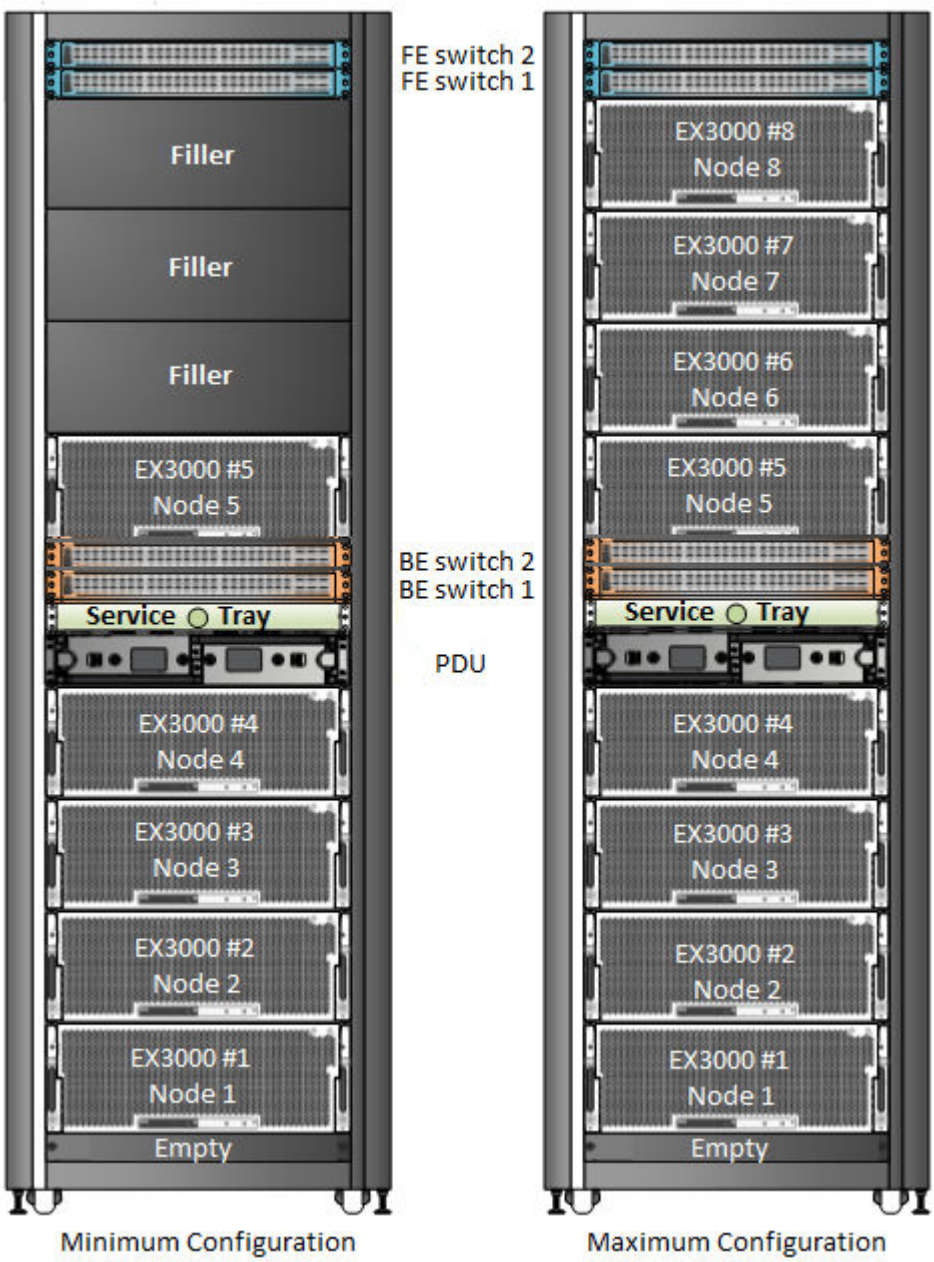
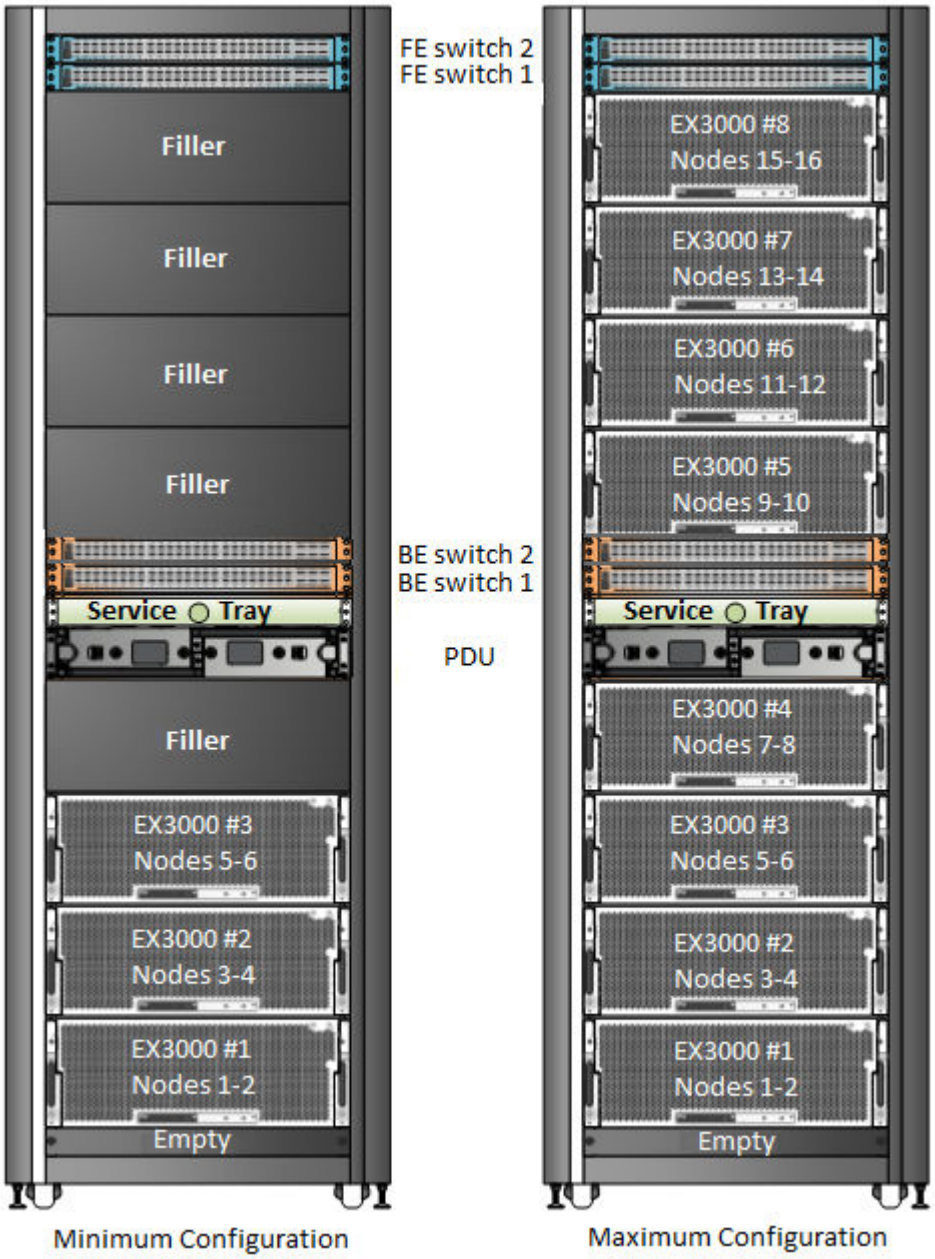


Figure 67 EX3000D minimum and maximum configurations for dual node chassis



There are five SKUs of EX3000 nodes that all have the same configuration except for their drive load and number of nodes.

- EX3000S single node with 45, 60, or 90 12 TB HDDs
- EX3000D dual nodes with 60 or 90 12 TB HDDs total

EX3000S and EX3000D chassis cannot be mixed within a customer-provided rack.

The EX3000 appliance is available in the following configurations in both DellEMC and customer-provided rack.

Lists the nodes, disks in each node, disk size, and RAW storage capacity.

Table 24 EX3000S single node chassis configurations

Nodes	Disks in each node	Disk size	RAW storage capacity
5 (minimum configuration)	• 45 • 60 • 90	12 TB	• 2.7 PB • 3.6 PB • 5.4 PB
6	• 45 • 60 • 90	12 TB	• 3.24 PB • 4.32 PB • 6.48 PB
7	• 45 • 60 • 90	12 TB	• 3.78 PB • 5.04 PB • 7.56 PB
8 (maximum configuration)	• 45 • 60 • 90	12 TB	• 4.32 PB • 5.76 PB • 8.64 PB

Lists the nodes, disks in each node, disk size, and RAW storage capacity.

Table 25 EX3000D dual node chassis configurations

Nodes	Disks in each node	Disk Size	RAW Storage capacity
6 (minimum configuration)	• 30 • 45	12 TB	• 2.16 PB • 3.24 PB
8	• 30 • 45	12 TB	• 2.88 PB • 4.32 PB
10	• 30 • 45	12 TB	• 3.60 PB • 5.40 PB
12	• 30 • 45	12 TB	• 4.32 PB • 6.48 PB
14	• 30 • 45	12 TB	• 5.04 PB • 7.56 PB
16 (maximum configuration)	• 30 • 45	12 TB	• 5.76 PB • 8.64 PB

EX3000 upgrade paths

Describes the EX3000 ECS appliance upgrade paths.

You can add EX3000S nodes in one-node increments to an existing system. The nodes must match the existing drive configuration. For example, if your system contains EX3000S nodes with 90 disk drives you can only add EX3000S nodes configured with 90 disk drives.

You can add EX3000D nodes in two-node increments to add to an existing system. The nodes must match the existing drive configuration. For example, if your system contains EX3000D nodes with 30 disk drives you can only add EX3000D nodes configured with 30 disk drives (60 drives per chassis).

You can add drives to partially populated EX3000 nodes. The following drive upgrades are supported:

- Convert EX3000S-45 to EX3000S-60
- Convert EX3000S-60 to EX3000S-90
- Convert EX3000D-30 to EX3000D-45

EX3000 server

The EX3000 4U server contains the EX3000 chassis and either one server sled (in the EX3000S single node configuration) or two server sleds (in the EX3000D dual node configuration). EX3000 servers have the following standard features:

- One-node or two-node servers (4U) with two CPUs per node
- Dual 8-core Broadwell CPU per node. E5-2620v4 8-core/16-thread 2.1GHz 20M cache 85W
- 4x16GB RDIMM, 2400MT/s, Dual Rank, x8 Data Width
- One system disk per node (480 GB SSD)
- LED indicators for each node
- Dual hot-swap chassis power supplies per node
- One SAS adapter with two SAS ports per node

The EX3000 physical dimensions are listed in the following table.

Table 26 EX3000 physical dimensions

Height	173.8 mm (6.84 inch)
Width with rack latches	482.4 mm (18.99 inch)
Width without rack latches	448.0 mm (17.64 inch)
Depth	1,098.4 mm (43.24 inch)
Total depth of system with cable management (CMA) arm attached	1,242.68 mm (48.92 inch)
Weight (maximum)	134.0 kg (295.42 lb)
Weight (empty)	57.1 kg (125.88 lb)

Server front view

Figure 68 EX3000 server front view in rack

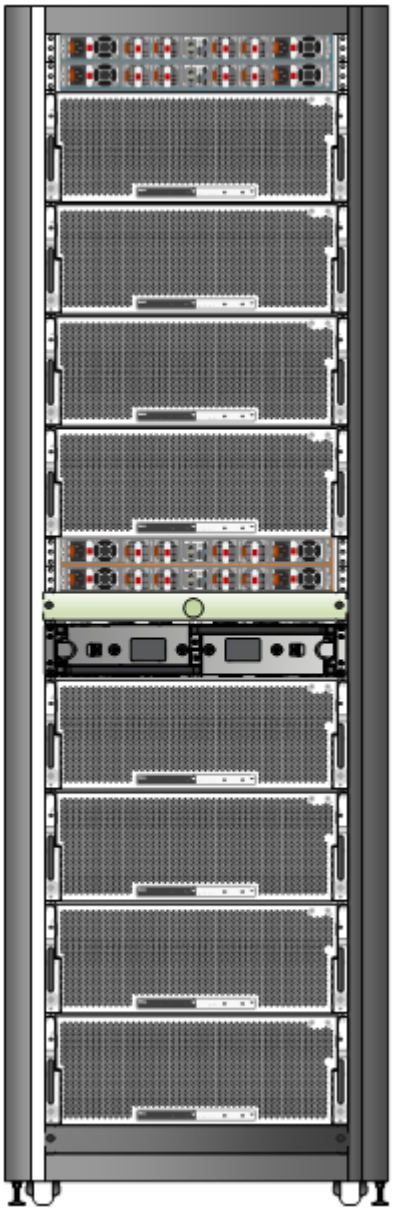


Figure 69 EX3000 external chassis view

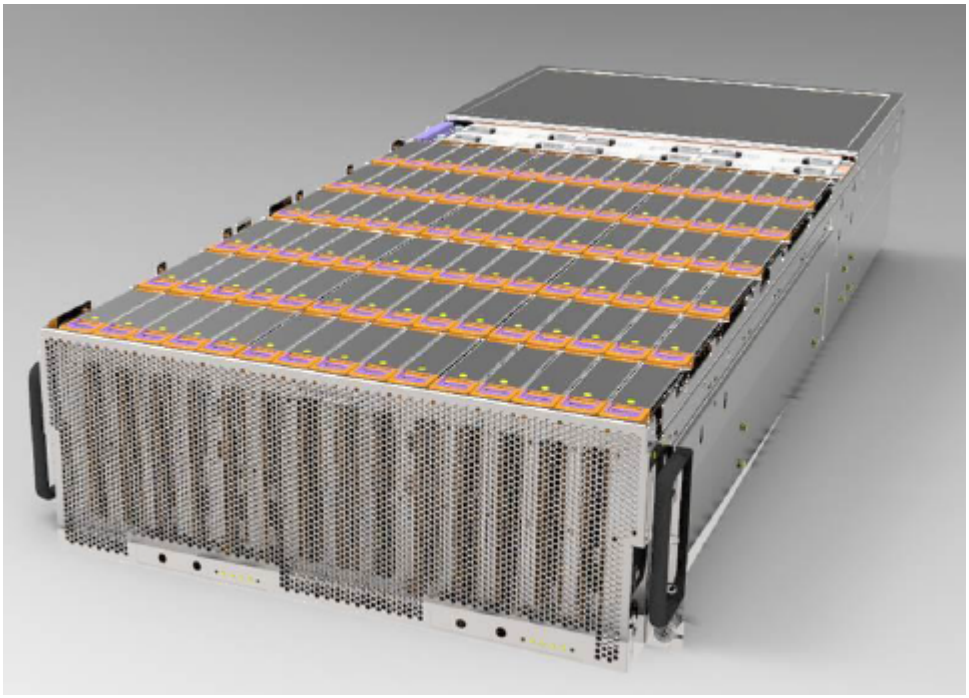
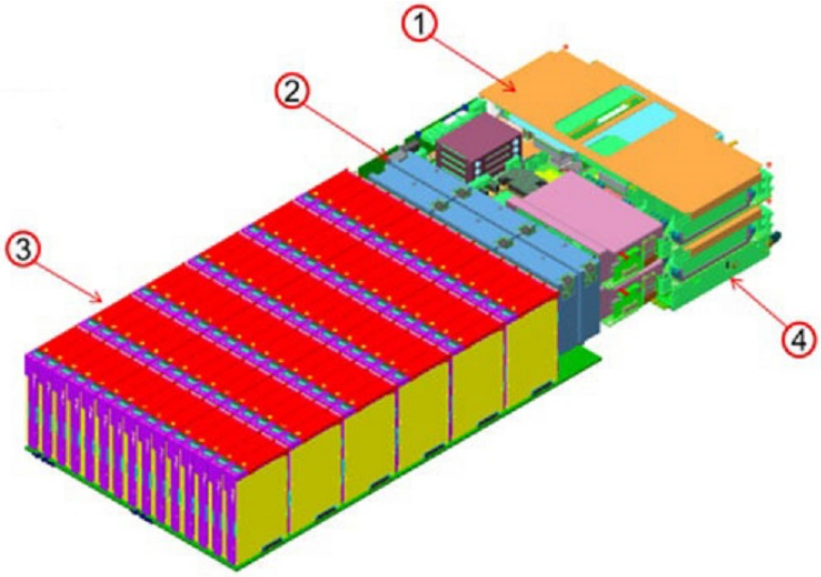
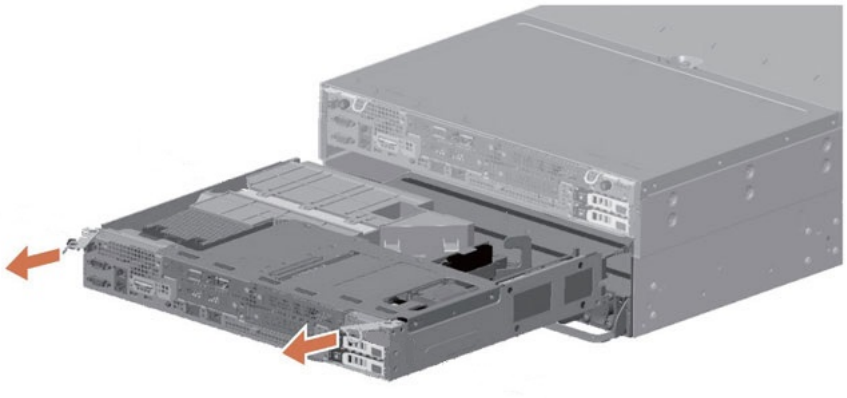


Figure 70 EX3000 internal chassis view



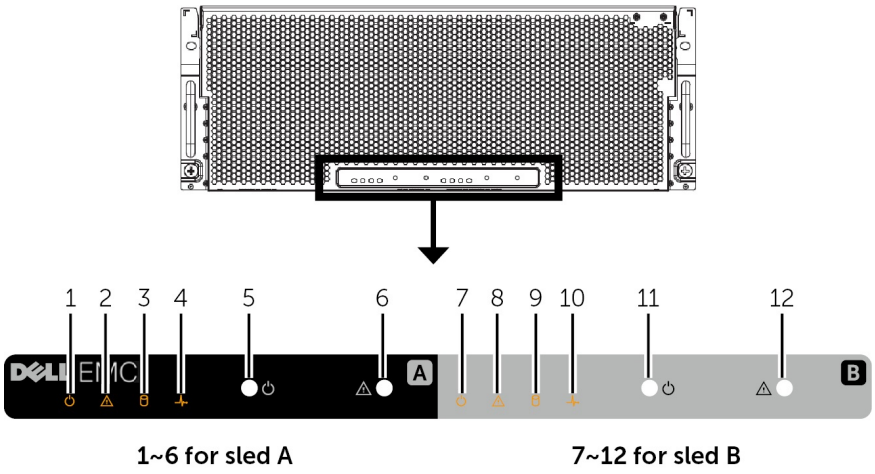
1. Server sled (one or two depending on whether the EX3000 system is single- or dual-node chassis configuration)
2. Fan module (6)
3. 3.5-inch HDDs (up to 90)
4. PSU unit (2 for an EX3000S single node and 4 for an EX3000D dual node)

Figure 71 External view of server sled A in a EX3000D dual node chassis with two sleds



For the EX3000S single-node system, a dummy sled is installed over the bottom sled A compartment and there are air flow covers over the two empty power supply slots.

Figure 72 Front-panel features and indicators



Describes the server indicators, buttons, or connectors

Table 27 Server indicators, buttons, or connectors

Item	Indicator, Button, or Connector	Description
1	Power indicator	The power indicator glows when the system is turned on.
2	ID indicator	When a system identification button is pressed, the ID indicator blinks blue to help locate a particular system within a rack.
3	Sled	A HDD fault status indicator. The indicator blinks amber if an HDD experiences an issue.
4	System board status indicator	If the system is on, and in good health, the indicator glows solid blue. The indicator blinks amber if the system is in standby, and if any issue exists (for example, a failed fan or HDD).
5	Power button	• The power button controls the PSU output to the system. • **Note:** On ACPI-compliant operating systems (OSs), turning off the system using the power button causes the system to

Table 27 Server indicators, buttons, or connectors (continued)

Item	Indicator, Button, or Connector	Description
		perform a graceful shutdown before power to the system is turned off.
6	System identification button	• The identification button can be used to locate a particular system within a rack. • Press to toggle the system ID on and off. • If the system stops responding during POST, press and hold the system ID button for more than five seconds to enter BIOS progress mode. • To reset iDRAC (if not disabled in F2 iDRAC setup) press and hold the button for more than 15 seconds.
7	Power indicator	The power indicator glows when the system is turned on.
8	ID indicator	When a system identification button is pressed, the ID indicator blinks blue to help locate a particular system within a rack.
9	Sled B HDD fault status indicator	• The indicator blinks amber if an HDD experiences an issue. • **Note:** Features of Sled B are for dual-node systems only.
10	System board status indicator	If the system is on, and in good health, the indicator glows solid blue. The indicator blinks amber if the system is in standby, and if any issue exists (for example, a failed fan or HDD).
11	Power button	• The power button controls the PSU output to the system. • **Note:** On ACPI-compliant operating systems (OSs), turning off the system using the power button causes the system to perform a graceful shutdown before power to the system is turned off.
12	System identification button	• The identification button can be used to locate a particular system within a rack. • Press to toggle the system ID on and off. • If the system stops responding during POST, press and hold the system ID button for more than five seconds to enter BIOS progress mode. • To reset iDRAC (if not disabled in F2 iDRAC setup) press and hold the button for more than 15 seconds.

Server rear view

Figure 73 EX3000D server rear view in rack

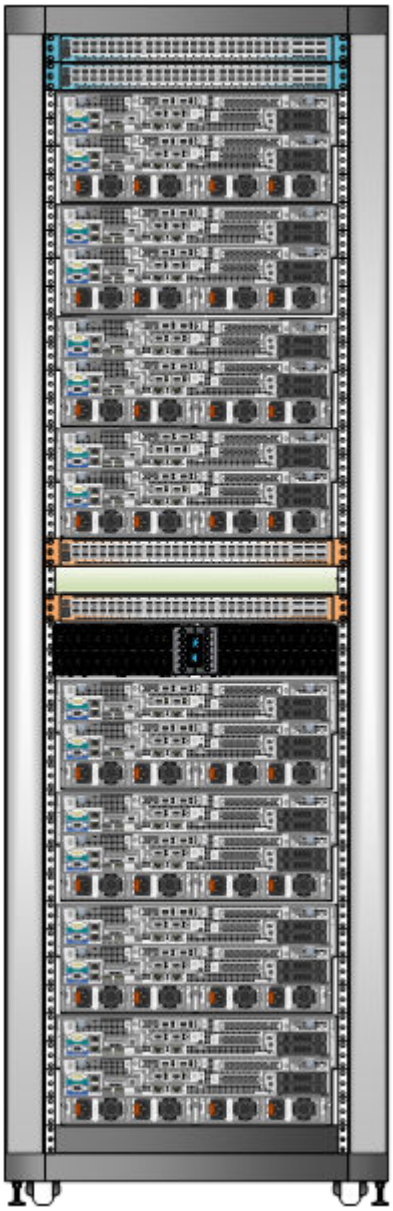
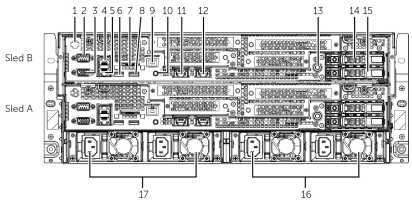


Figure 74 Back-panel features and indicators



Note: Items numbers 4, 5, 7, 11, 12 and 15 are not in use on EX3000.

Table 28 Server indicators, buttons, or connectors

Item	Indicator, Button, or Connector	Description
1	Blade EN connector (optional)	This function is reserved.
2	Serial connector	Enables you to connect a serial device to the system.
3	Video connector	Enables you to connect a VGA display to the system.
4	Ethernet connector 1	Integrated 10/100/1000 Mbps NIC connector.
5	Ethernet connector 2	Integrated 10/100/1000 Mbps NIC connector.
6	USB connector	Enables you to connect USB devices to the system. The port is USB 2.0-compliant.
7	SD vFlash card slot	Provides persistent on-demand local storage and a custom deployment environment that allows automation of server configuration, scripts and imaging. For more information, see the Integrated Dell Remote Access Controller 9 (iDRAC9) User's Guide.
8	USB connector	Enables you to connect USB devices to the system. The port is USB 3.0-compliant.
9	Dedicated Ethernet port	Dedicated management port on the iDRAC ports card.
10	System identification button	• The identification button can be used to locate a particular system within a rack. • Press to toggle the system ID on and off. • If the system stops responding during POST, press and hold the system ID button for more than five seconds to enter BIOS progress mode. • To reset iDRAC (if not disabled in F2 iDRAC setup) press and hold the button for more than 15 seconds.
11	Ethernet connector 3	Integrated 10/100/1000 Mbps NIC connector.
12	Ethernet connector 4	Integrated 10/100/1000 Mbps NIC connector.
13	Power button	• The power button controls the PSU output to the system. • **Note:** On ACPI-compliant operating systems (OSs), turning off the system using the power button causes the system to perform a graceful shutdown before power to the system is turned off.
14	Boot HDD A	2.5-inch boot HDD
15	Boot HDD B	2.5-inch boot HDD
16	Power supply units	Two redundant power supply units (PSUs) for sled A.
17	Power supply units	Two redundant power supply units (PSUs) for sled B.

Note: Features of sled B are for EX3000D dual-node systems only.

Note: A dummy sled (sled B) will be installed over the sled A compartment and two dummy PSUs over the PSU slots for sled B in the EX3000S single-node system.

EX3000 disk drives

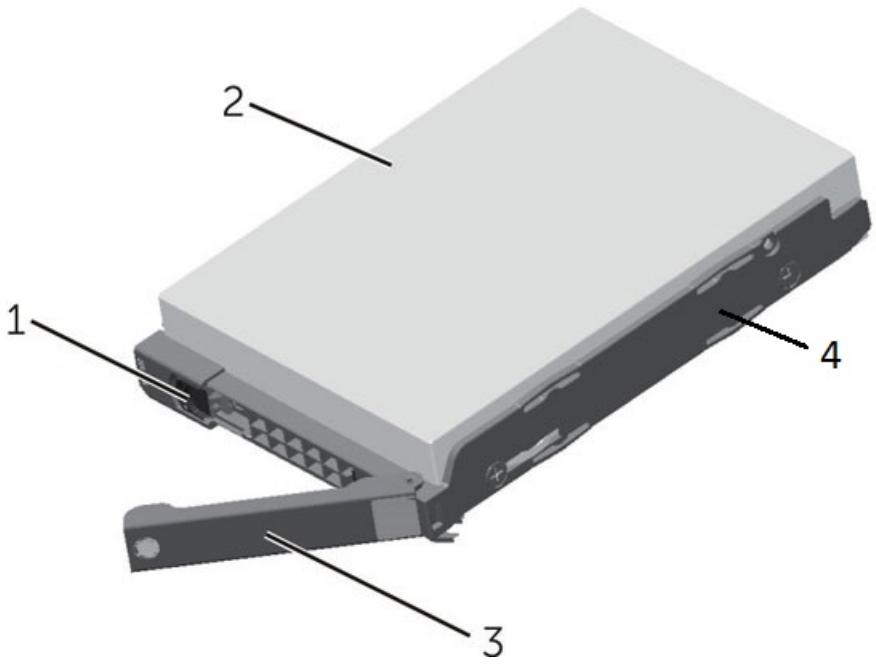
Describes the disk drives that are integrated into the server chassis of the EX3000 appliance.

The EX3000 4U chassis contains one or two server sleds, depending on whether the chassis is a single or dual node configuration. Both chassis configurations support the 12 TB 3.5" 6 Gb/s SATA 512e disk drive.

In EX3000 single node chassis configurations, there can be 45, 60, or 90 12 TB drives per node. In EX3000 dual node chassis configurations, there can be 30 or 45 12 TB drives per node (60 or 90 drives per chassis). Drives are drawer accessible and hot-pluggable. There is a 2.5" 480 GB 1DWPD SATA SSD in each EX3000 node for the OS. You cannot mix single and dual node chassis within the same rack.

Note: EX3000 and EX300 drive carriers are not compatible.

Figure 75 EX3000 disk drive in carrier



1 - release button

2 - 3.5-inch HDD

3 - HDD carrier handle

4 - HDD carrier

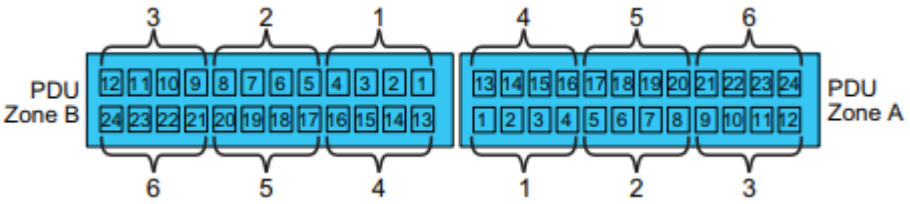
EX3000 power cabling

Provides EX3000S and EX3000D ECS appliance cabling diagrams for single-phase AC power and three-phase delta and wye AC power.

Use the power and weight calculator to refine the power and heat values to more-closely match the hardware configuration for your system. The calculator contains the latest information for power and weight planning.

The following diagram shows the PDU outlet numbers for Zone A and Zone B.

Figure 76 PDU outlet numbers



The EX3000S and EX3000D appliance connections to PDU outlets are listed in the following tables.

Lists the EX3000S PDU cabling.

Table 29 EX3000S PDU cabling

PDU cabling	Node A - PS1 outlet numbers	Node A - PS2 outlet numbers	Switch PS2 outlet numbers	Switch PS1 outlet numbers	Line cord number per zone (single phase)
	Zone B	Zone A	Zone B	Zone A	
	Black cables	Gray cables	Black cables	Gray cables	
FE 2			13	13	1
FE 1			1	1	1
Chassis 8	22	22			3
Chassis 7	11	11			3
Chassis 6	9	9			3
Chassis 5	18	18			2
BE 2			14	14	1
BE 1			2	2	1
Service tray	8				2
Light Bar		20			2
Chassis 4	7	7			2
Chassis 3	5	5			2
Chassis 2	15	15			1
Chassis 1	3	3			1

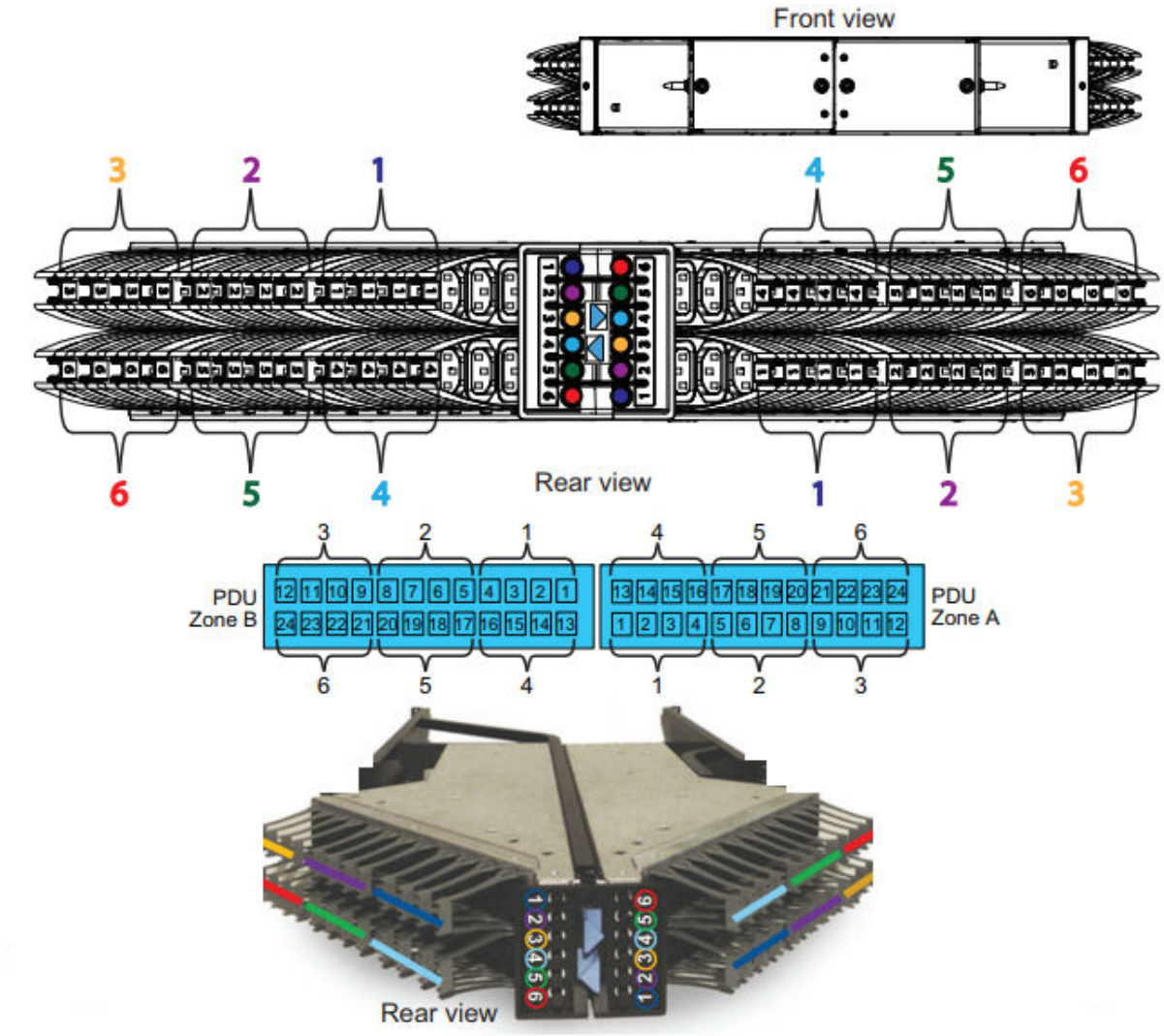
Lists the EX3000D PDU cabling.

Table 30 EX3000D PDU cabling

PDU cabling	Node B - PS1 outlet numbers	Node B - PS2 outlet numbers	Node A - PS1 outlet numbers	Node A - PS2 outlet numbers	Switch PS2 outlet numbers	Switch PS1 outlet numbers	Line cord number per zone (single phase)
	Zone B	Zone A	Zone B	Zone A	Zone B	Zone A	
	Black cables	Gray cables	Black cables	Gray cables	Black cables	Gray cables	
FE 2					13	13	1
FE 1					1	1	1
Chassis 8	22	23	23	22			3
Chassis 7	11	21	21	11			3
Chassis 6	9	10	10	9			3
Chassis 5	18	19	19	18			2
BE 2					14	14	1
BE 1					2	2	1
Service tray	8						2
Light Bar		20					2
Chassis 4	7	17	17	7			2
Chassis 3	5	6	6	5			2
Chassis 2	15	16	16	15			1
Chassis 1	3	4	4	3			1

Single-phase AC power cabling

Figure 77 PDU single-phase diagram



Each EX3000 install kit contains 93" black and gray power cords and 118" gray and black power cords. The 93'' and 118" cords are sent with third party and Dell EMC expansion nodes. However, Dell EMC racks are shipped from the factory with 93" AC cables. You should only use the appropriate length cable per the cabinet position being installed as shown in the following diagrams. EX3000 systems shipped for a third party rack require the extra 118" cables while Dell EMC racks only need the 93" cables. After you complete the power cabling for the EX3000 appliance, you will always have an extra pair of unused power cords. In the following diagram, the switches plug into the front of the rack and route through the rails to the rear.

Figure 78 EX3000S single-phase AC power cabling

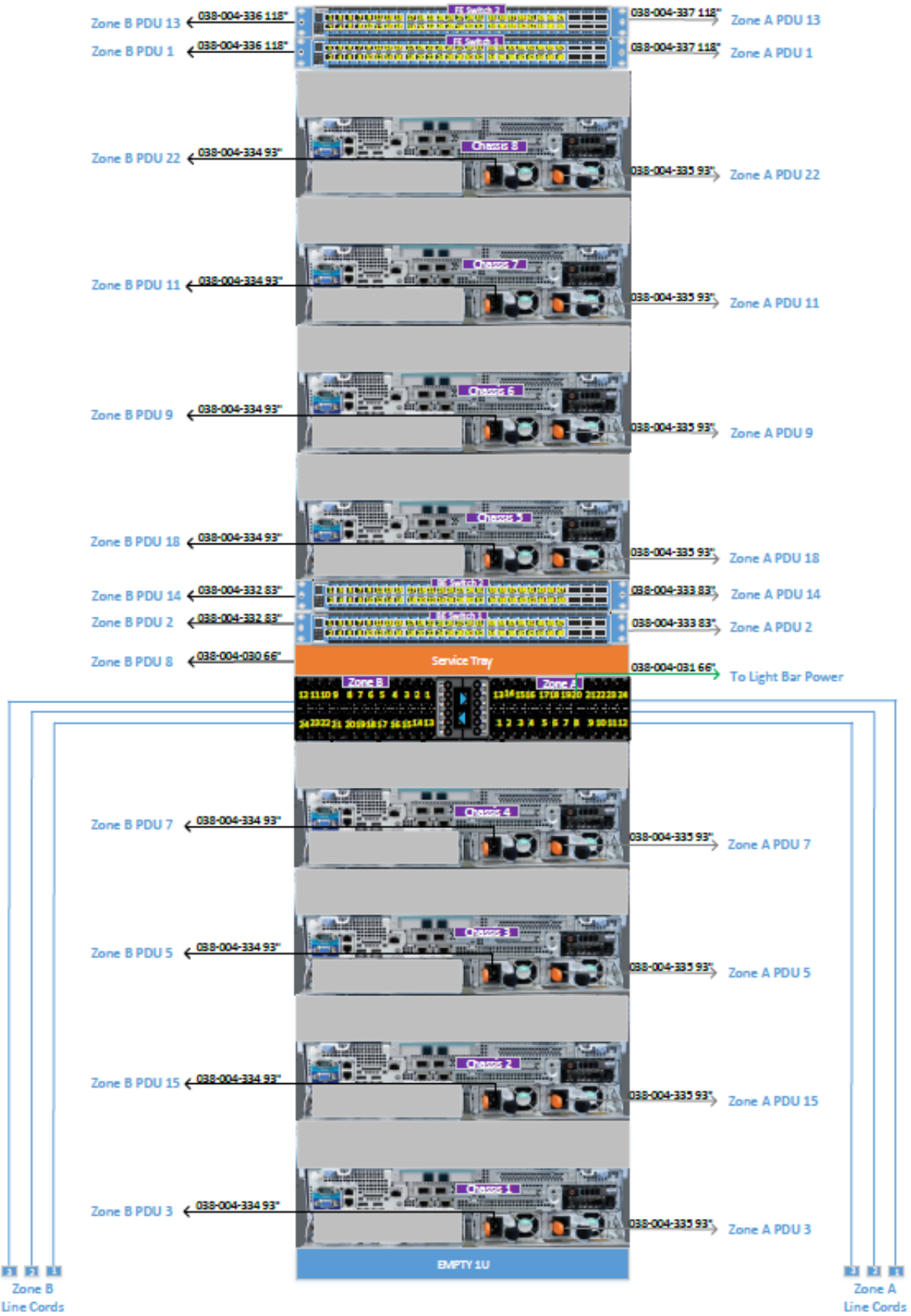
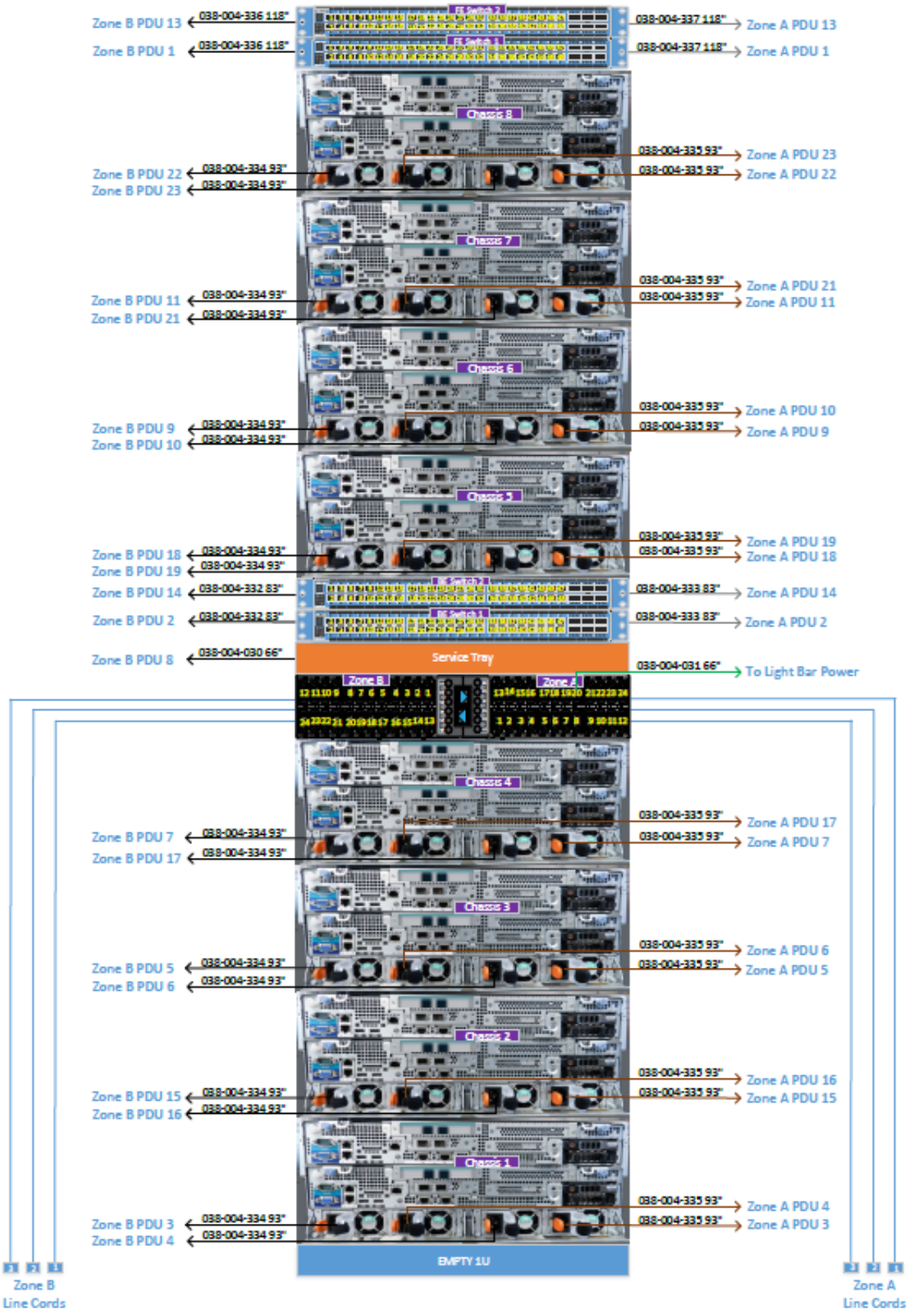
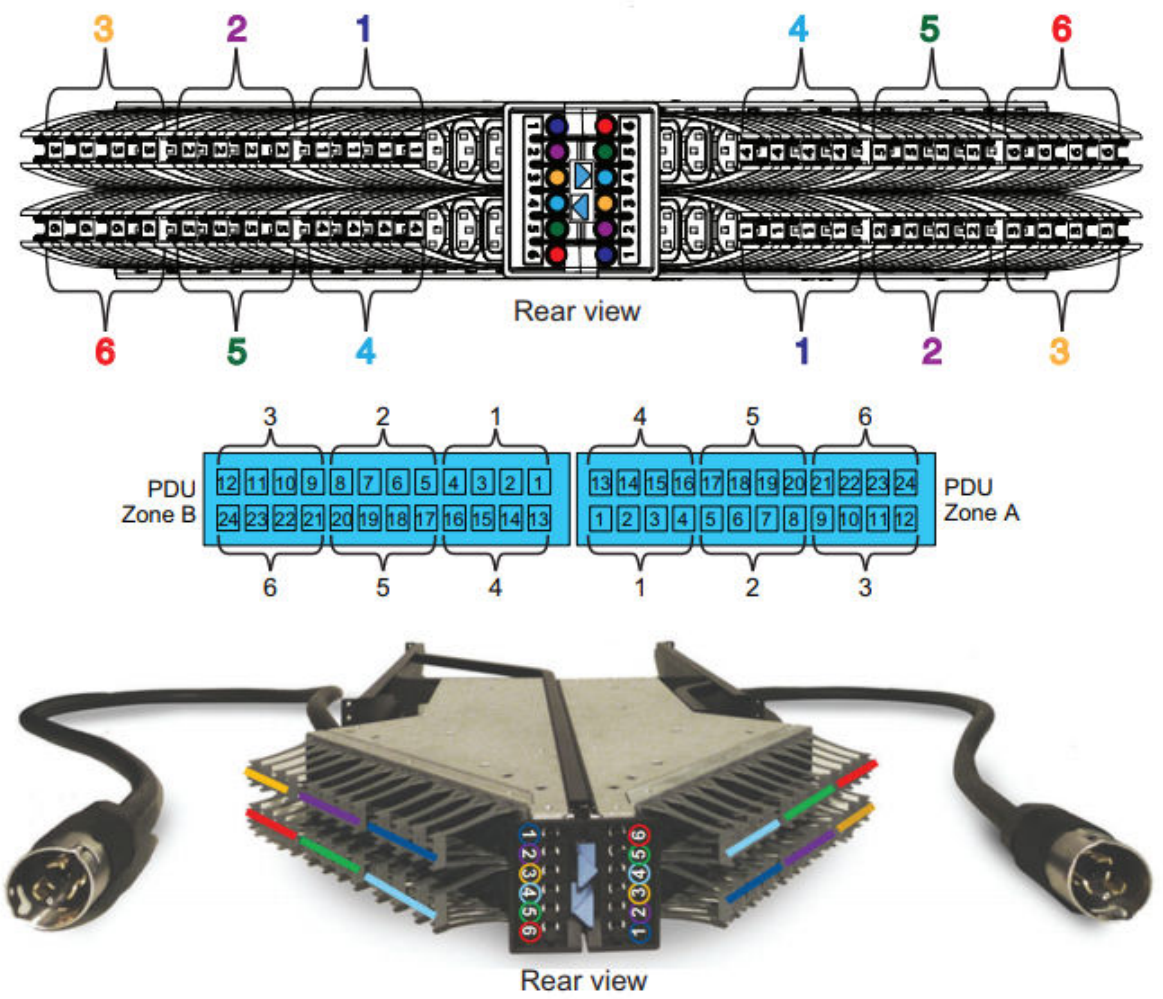


Figure 79 EX3000D single-phase AC power cabling



Three-phase AC power cabling

Figure 80 PDU three-phase diagram



The legends in the following diagrams map colored cables to part numbers and cable lengths.

Figure 81 EX3000S three-phase delta AC power cabling

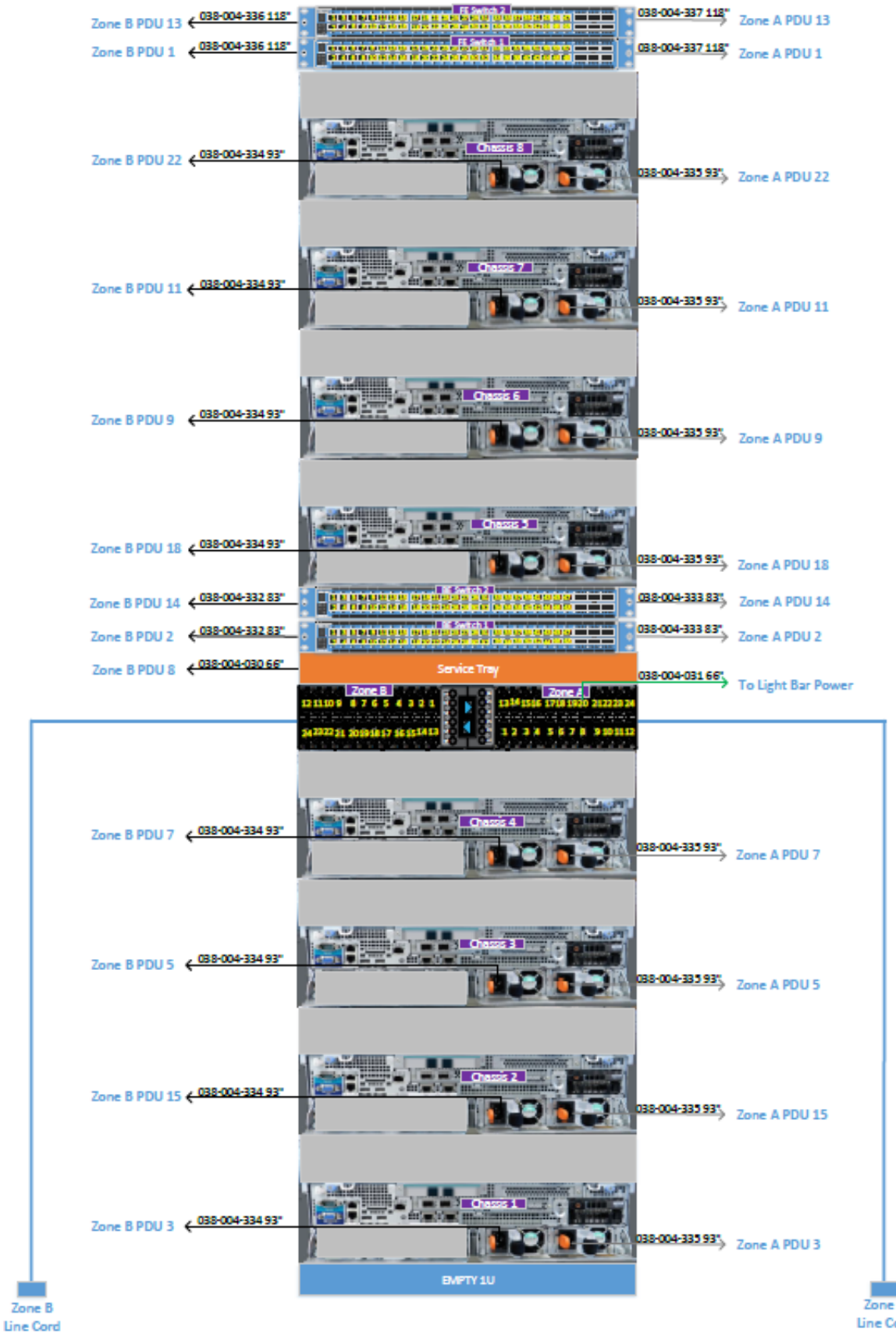


Figure 82 EX3000D three-phase delta AC power cabling

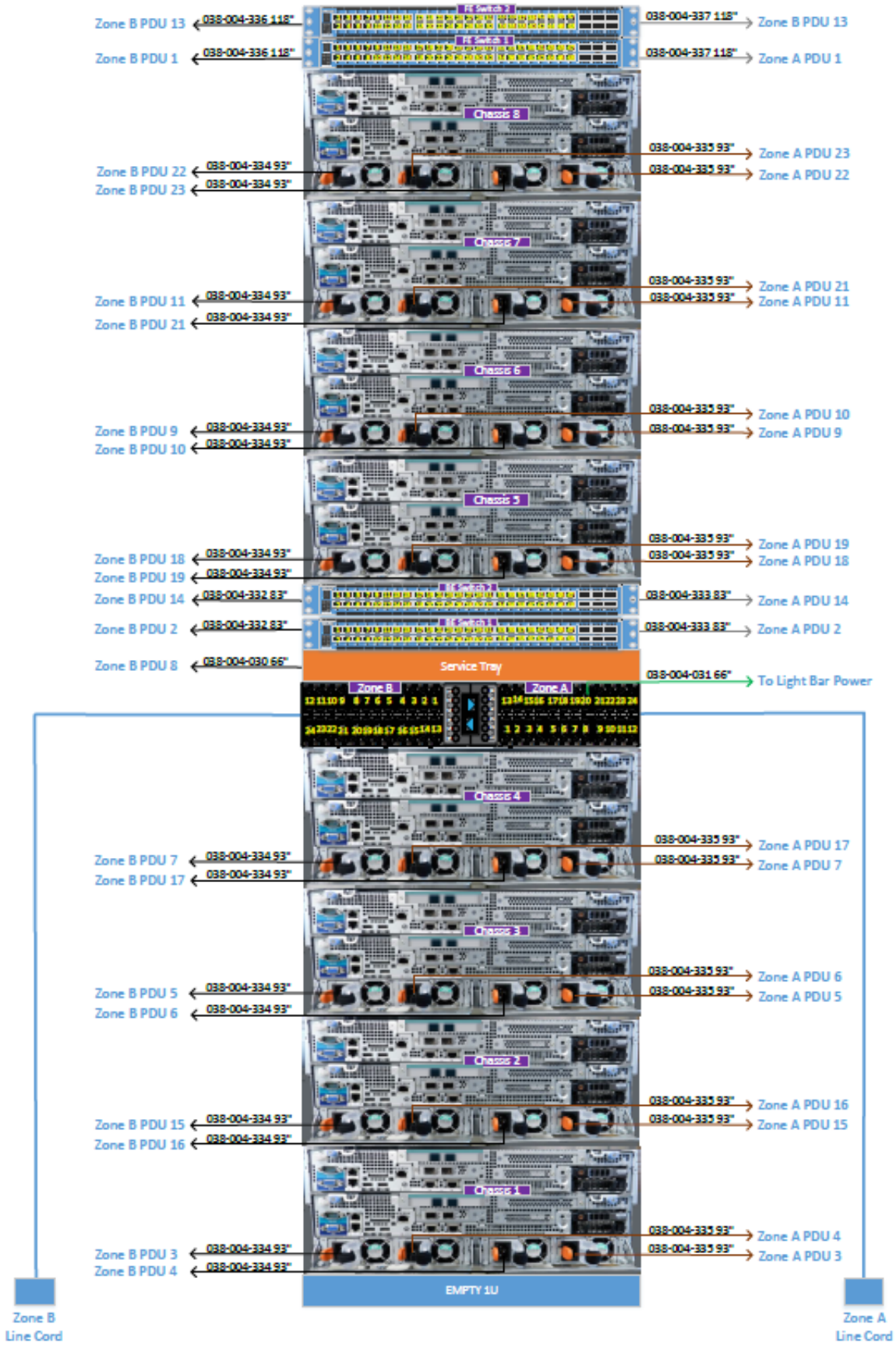


Figure 83 EX3000S three-phase WYE AC power cabling

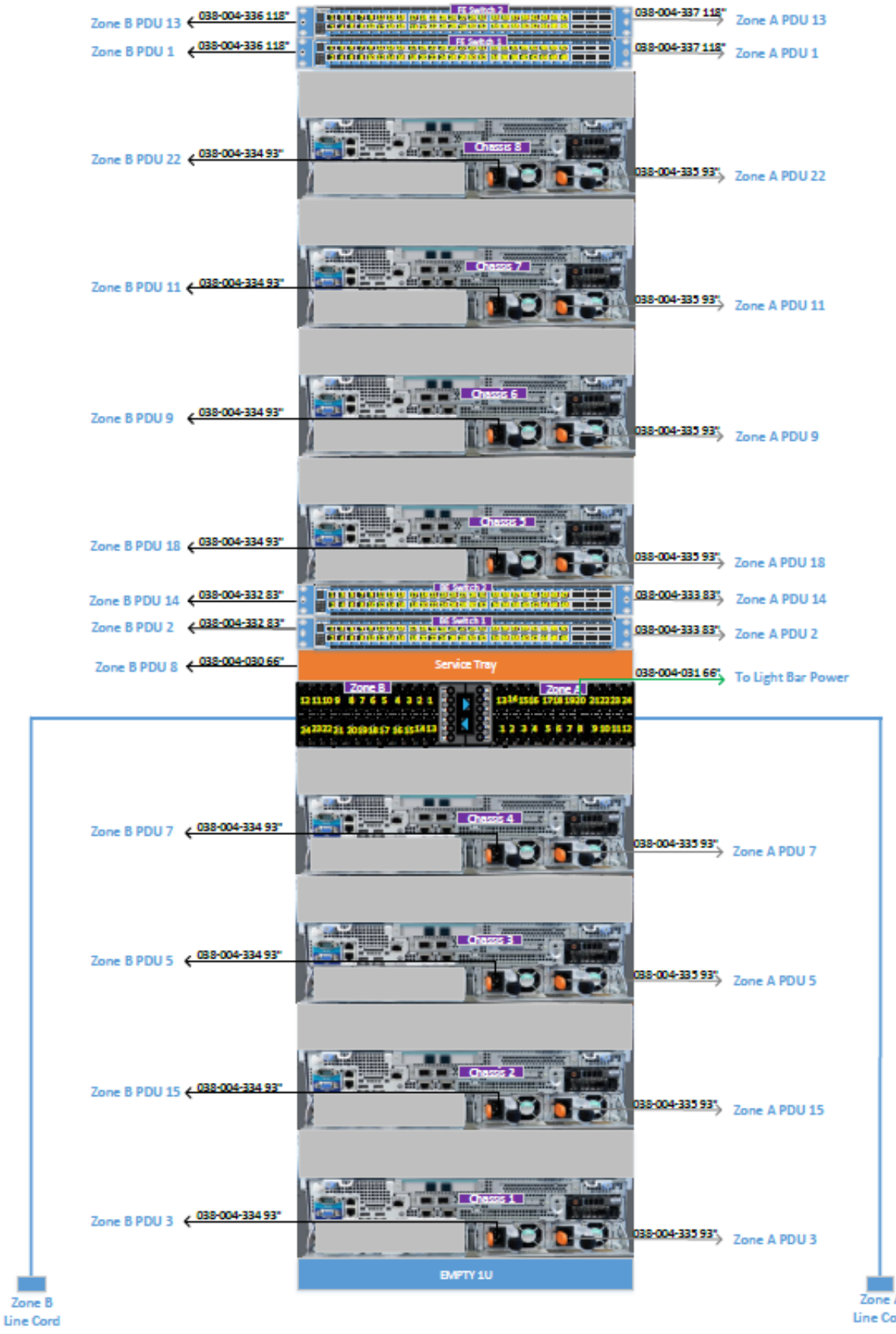
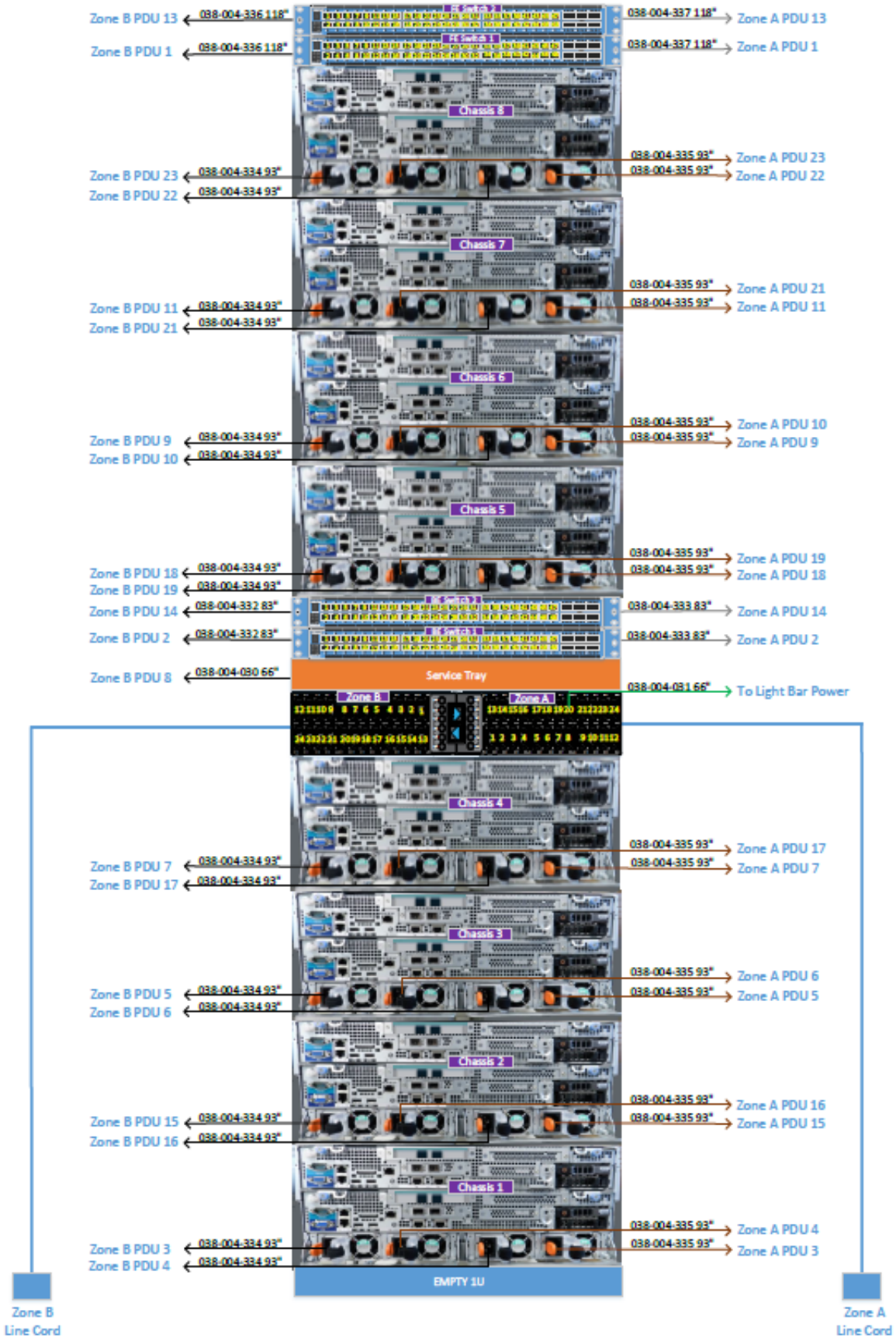


Figure 84 EX3000D three-phase WYE AC power cabling



EX3000 iDRAC cabling

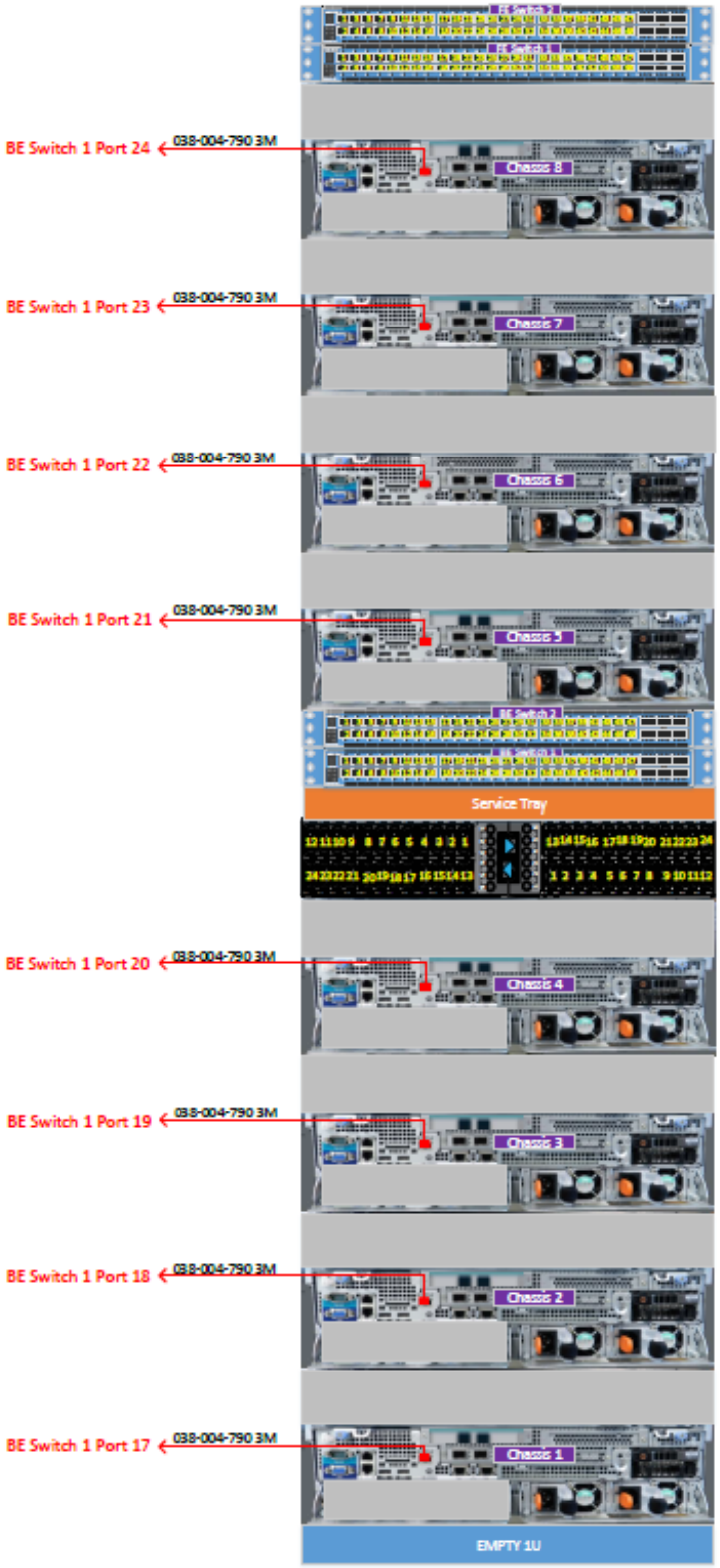
Provides wiring diagrams for the iDRAC cables that connect the iDRAC port on the node to the Fox back-end switch for the EX3000S system (single node chassis configuration) and the EX3000D system (dual node chassis configuration).

The EX3000S node iDRAC port to the Fox switch (BE1) port connections are listed in the following table.

Table 31 EX3000S node iDRAC port to BE1 port mapping

Node 1 iDRAC port	BE1 Port 17
Node 2 iDRAC port	BE1 Port 18
Node 3 iDRAC port	BE1 Port 19
Node 4 iDRAC port	BE1 Port 20
Node 5 iDRAC port	BE1 Port 21
Node 6 iDRAC port	BE1 Port 22
Node 7 iDRAC port	BE1 Port 23
Node 8 iDRAC port	BE1 Port 24

Figure 85 EX3000S iDRAC cabling

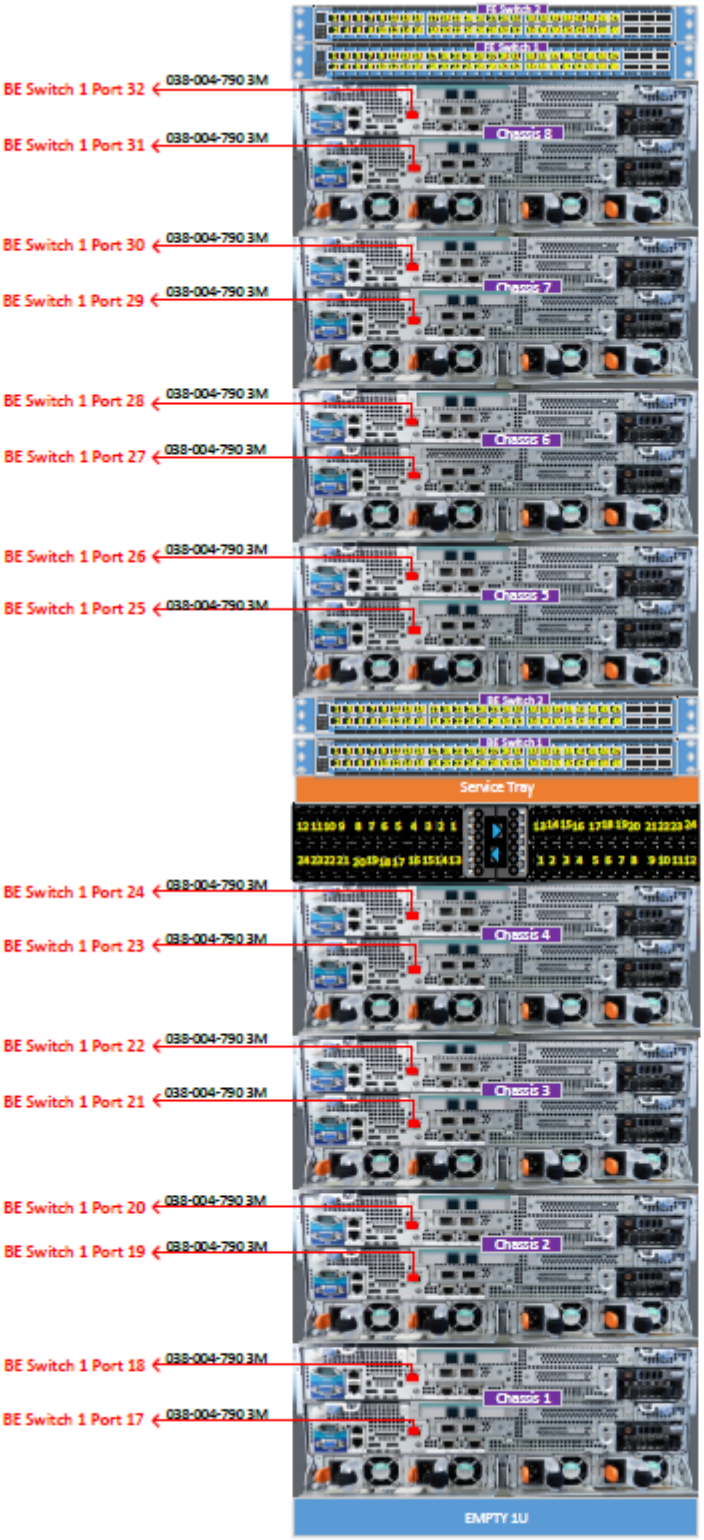


The EX3000D node iDRAC port to the Fox switch (BE1) port connections are listed in the following table.

Table 32 EX3000D node iDRAC port to BE1 port mapping

Node 1 iDRAC port (chassis 1)	BE1 Port 17
Node 2 iDRAC port (chassis 1)	BE1 Port 18
Node 3 iDRAC port (chassis 2)	BE1 Port 19
Node 4 iDRAC port (chassis 2)	BE1 Port 20
Node 5 iDRAC port (chassis 3)	BE1 Port 21
Node 6 iDRAC port (chassis 3)	BE1 Port 22
Node 7 iDRAC port (chassis 4)	BE1 Port 23
Node 8 iDRAC port (chassis 4)	BE1 Port 24
Node 9 iDRAC port (chassis 5)	BE1 Port 25
Node 10 iDRAC port (chassis 5)	BE1 Port 26
Node 11 iDRAC port (chassis 6)	BE1 Port 27
Node 12 iDRAC port (chassis 6)	BE1 Port 28
Node 13 iDRAC port (chassis 7)	BE1 Port 29
Node 14 iDRAC port (chassis 7)	BE1 Port 30
Node 15 iDRAC port (chassis 8)	BE1 Port 31
Node 16 iDRAC port (chassis 8)	BE1 Port 32

Figure 86 EX3000D iDRAC cabling



EX3000 network cabling

The network cabling diagrams apply to the EX3000 appliance in a customer-provided rack.

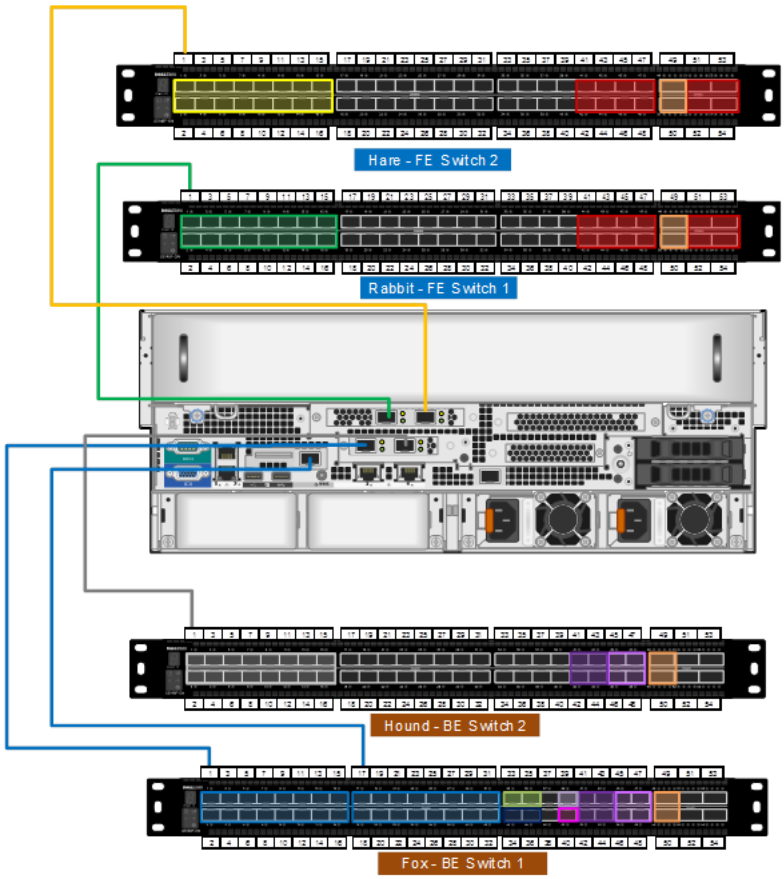
Customers connect to an EX3000 appliance by way of 25 GbE ports on the front-end switches. For an EX3000 appliance, the 25 GbE ports run at 25 GbE. Customer configurations can include 25 GbE front-end switches provided by Dell EMC or customers may provide their own front-end switches.

To distinguish between the two front-end switches and the two back-end switches, each switch has a nickname:

- Hare: The top S5148F 1U 25 GbE front-end switch. This switch runs 25 GbE SFP28 ports to EX3000 nodes.
- Rabbit: The bottom S5148F 1U 25 GbE front-end switch. This switch runs 25 GbE SFP28 ports to EX3000 nodes.
- Hound: The top S5148F 1U 25 GbE back-end switch running 25 GbE SFP28 ports to the nodes.
- Fox: The bottom S5148F 1U 25 GbE back-end switch running 25 GbE SFP28 ports to the nodes.

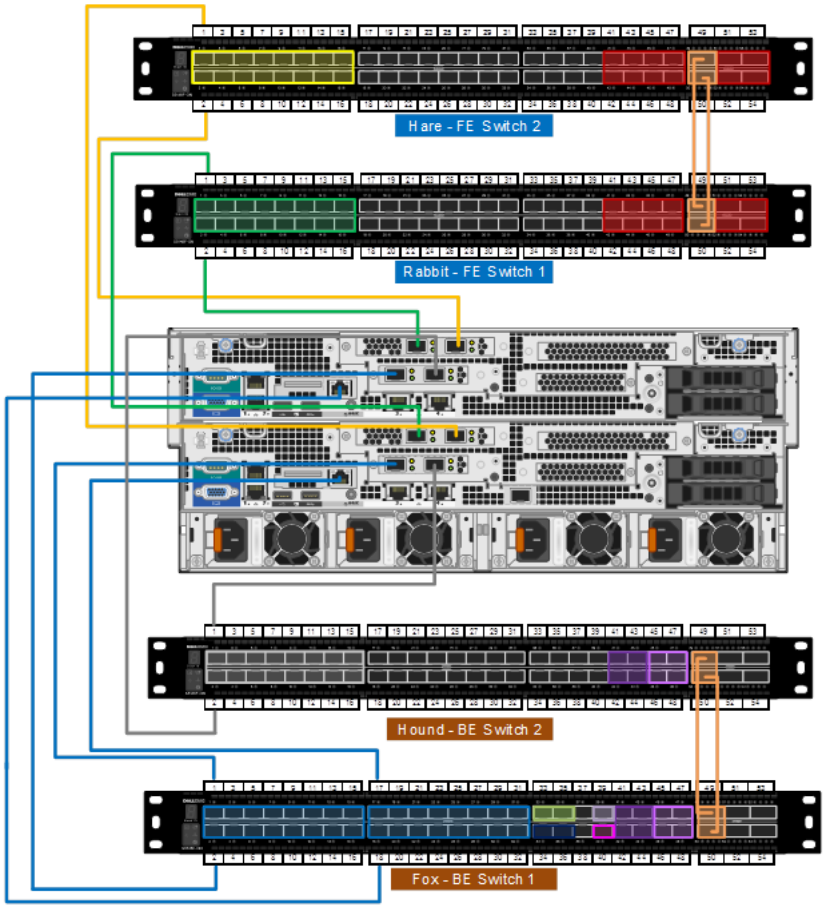
The front-end switch and back-end switch connections to an EX3000S node are shown in the following diagram.

Figure 87 Front-end and back-end switch connections to an EX3000S node



The front-end switch and back-end switch connections to an EX3000D node are shown in the following diagram.

Figure 88 Front-end and back-end switch connections to an EX3000D node



The numbered front-end switch ports used for connecting to the ports on the EX3000 nodes are shown in the following diagram. Port 1 on the Hare switch (FE2) connects to port 4 on Node 1. Port 2 on the Hare switch (FE2) connects to port 4 on Node 2, and so on. Similarly, Port 1 on the Rabbit switch (FE1) connects to port 3 on Node 1. Port 2 on the Rabbit switch (FE1) connects to port 3 on Node 2, and so on.

Figure 89 Node ports on front-end switches

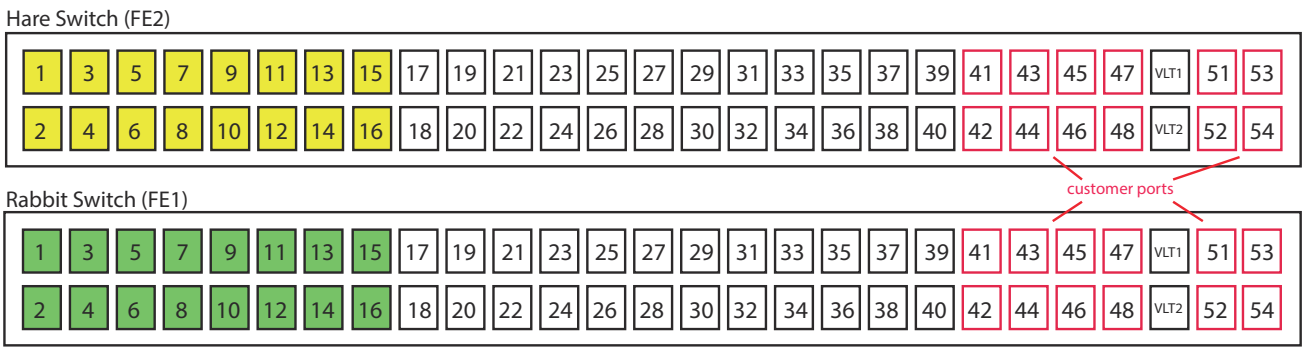


Figure 90 Back-end switch, front-end switch, and iDRAC ports on an EX3000S node

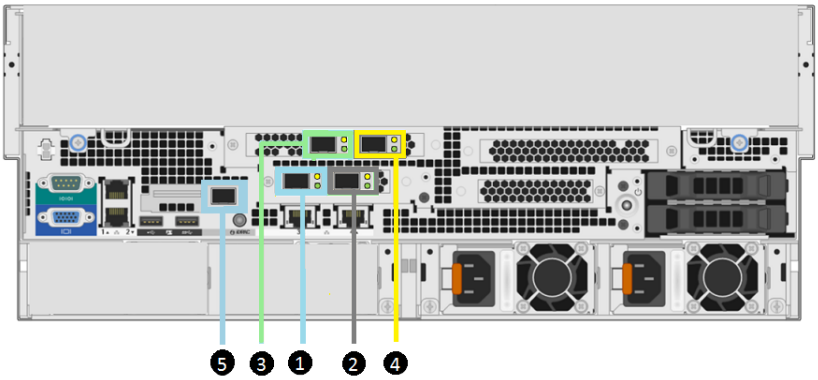
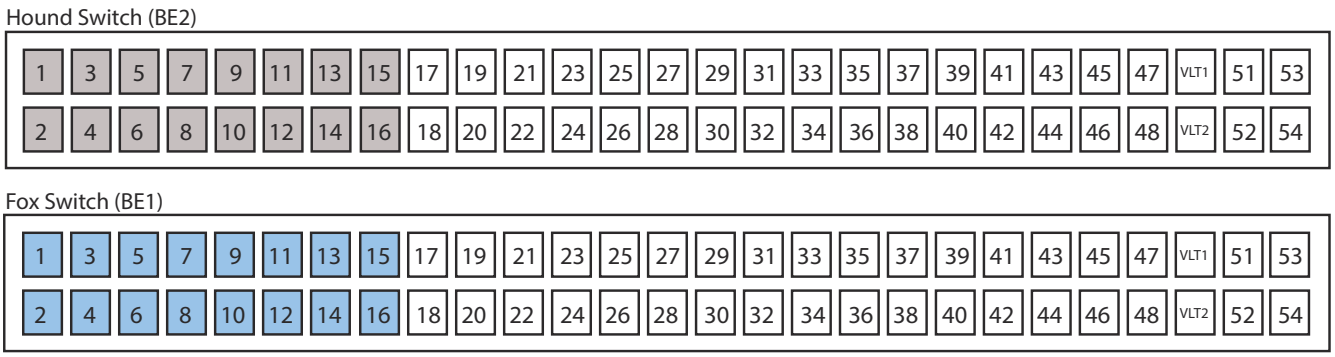


Table 33 Legend for Back-end switch, front-end switch, and iDRAC ports on EX30000S node

Legend	Description
1	BE1 Fox switch port
2	BE2 Hound switch port
3	FE1 Rabbit switch port
4	FE2 Hare switch port
5	iDRAC Port

The numbered back-end switch ports used for connecting to the ports on the EX3000 nodes are shown in the following diagram. Port 1 on the Hound switch (BE2) connects to port 2 on Node 1. Port 2 on the Hound switch (BE2) connects to port 2 on Node 2, and so on. Similarly, Port 1 on the Fox switch (BE1) connects to port 1 on Node 1. Port 2 on the Fox switch (BE1) connects to port 1 on Node 2, and so on.

Figure 91 Node ports on back-end switches



The EX3000 node port to the iDRAC, back-end switch, and front-end switch port connections are listed in the following table.

Figure 92 EX3000 node network port cabling connections

Node Network Port Cabling	iDRAC Port		Nic 1 BE1/Fox	Nic 2 BE2/Hound	Nic 3 FE1/Rabbit	Nic 4 FE2/Hare
Node 1	Server 1 iDRAC		Server 1 BE1	Server 1 BE2	Server 1 FE1	Server 1 FE2
Node 2	Server 2 iDRAC		Server 2 BE1	Server 2 BE2	Server 2 FE1	Server 2 FE2
Node 3	Server 3 iDRAC		Server 3 BE1	Server 3 BE2	Server 3 FE1	Server 3 FE2
Node 4	Server 4 iDRAC		Server 4 BE1	Server 4 BE2	Server 4 FE1	Server 4 FE2
Node 5	Server 5 iDRAC		Server 5 BE1	Server 5 BE2	Server 5 FE1	Server 5 FE2
Node 6	Server 6 iDRAC		Server 6 BE1	Server 6 BE2	Server 6 FE1	Server 6 FE2
Node 7	Server 7 iDRAC		Server 7 BE1	Server 7 BE2	Server 7 FE1	Server 7 FE2
Node 8	Server 8 iDRAC		Server 8 BE1	Server 8 BE2	Server 8 FE1	Server 8 FE2
Node 9	Server 9 iDRAC		Server 9 BE1	Server 9 BE2	Server 9 FE1	Server 9 FE2
Node 10	Server 10 iDRAC		Server 10 BE1	Server 10 BE2	Server 10 FE1	Server 10 FE2
Node 11	Server 11 iDRAC		Server 11 BE1	Server 11 BE2	Server 11 FE1	Server 11 FE2
Node 12	Server 12 iDRAC		Server 12 BE1	Server 12 BE2	Server 12 FE1	Server 12 FE2
Node 13	Server 13 iDRAC		Server 13 BE1	Server 13 BE2	Server 13 FE1	Server 13 FE2
Node 14	Server 14 iDRAC		Server 14 BE1	Server 14 BE2	Server 14 FE1	Server 14 FE2
Node 15	Server 15 iDRAC		Server 15 BE1	Server 15 BE2	Server 15 FE1	Server 15 FE2
Node 16	Server 16 iDRAC		Server 16 BE1	Server 16 BE2	Server 16 FE1	Server 16 FE2

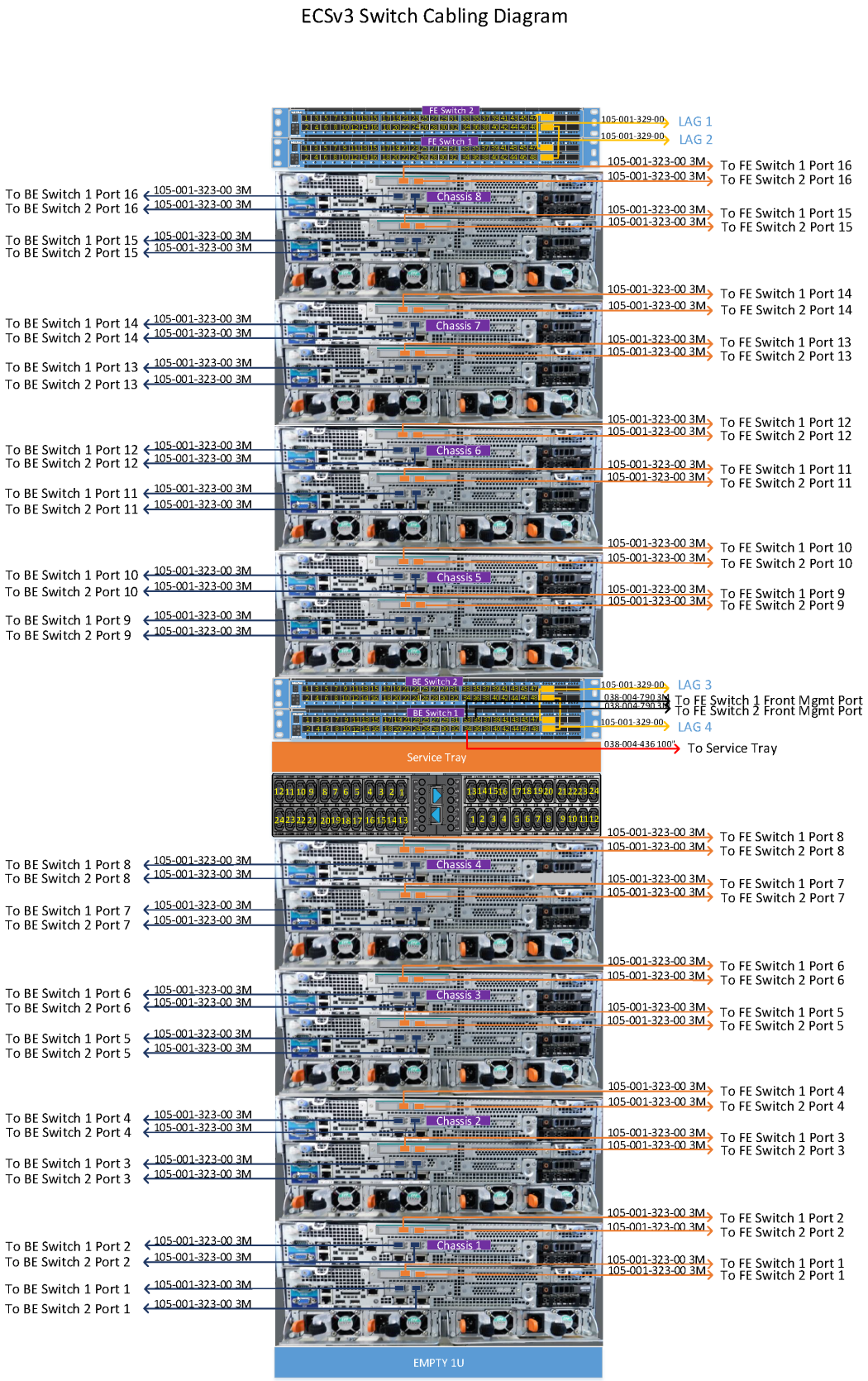
The EX3000 node network cable labeling is listed in the following table.

Figure 93 EX3000 node network cable labeling

Node Network Cable Labeling	iDRAC Port		Nic 1 BE1/Fox	Nic 2 BE2/Hound	Nic 3 FE1/Rabbit	Nic 4 FE2/Hare
Node 1	BE1 port 17		BE1 Port 1	BE2 Port 1	FE1 Port 1	FE2 Port 1
Node 2	BE1 port 18		BE1 Port 2	BE2 Port 2	FE1 Port 2	FE2 port 2
Node 3	BE1 port 19		BE1 Port 3	BE2 Port 3	FE1 Port 3	FE2 port 3
Node 4	BE1 port 20		BE1 Port 4	BE2 Port 4	FE1 Port 4	FE2 port 4
Node 5	BE1 port 21		BE1 Port 5	BE2 Port 5	FE1 Port 5	FE2 port 5
Node 6	BE1 port 22		BE1 Port 6	BE2 Port 6	FE1 Port 6	FE2 port 6
Node 7	BE1 port 23		BE1 Port 7	BE2 Port 7	FE1 Port 7	FE2 port 7
Node 8	BE1 port 24		BE1 Port 8	BE2 Port 8	FE1 Port 8	FE2 port 8
Node 9	BE1 port 25		BE1 Port 9	BE2 Port 9	FE1 Port 9	FE2 port 9
Node 10	BE1 port 26		BE1 Port 10	BE2 Port 10	FE1 Port 10	FE2 port 10
Node 11	BE1 port 27		BE1 Port 11	BE2 Port 11	FE1 Port 11	FE2 port 11
Node 12	BE1 port 28		BE1 Port 12	BE2 Port 12	FE1 Port 12	FE2 port 12
Node 13	BE1 port 29		BE1 Port 13	BE2 Port 13	FE1 Port 13	FE2 port 13
Node 14	BE1 port 30		BE1 Port 14	BE2 Port 14	FE1 Port 14	FE2 port 14
Node 15	BE1 port 31		BE1 Port 15	BE2 Port 15	FE1 Port 15	FE2 port 15
Node 16	BE1 port 32		BE1 Port 16	BE2 Port 16	FE1 Port 16	FE2 port 16

Figure 94 EX3000S network cabling

Figure 95 EX3000D network cabling



For information on connecting multiple ECS appliances, see Network connections between multiple ECS appliances in a single site on page 50.

CHAPTER 6

Third-party rack requirements

Third-party rack requirements

Customers who want to assemble an ECS EX500 appliance using their own racks must ensure that the racks meet the requirements described in the *ECS EX500 Third-Party Rack Planning and Installation Guide*. A Request for Product Qualification (RPQ) is required for transfers of Dell EMC-racked EX500 systems to customer-provided rack(s).

Customers who want to assemble an ECS EX300 appliance using their own racks must ensure that the racks meet the requirements described in the *ECS EX300 Third-Party Rack Installation Guide*. A Request for Product Qualification (RPQ) is required for transfers of Dell EMC-racked EX300 systems to customer-provided rack(s).

EX3000 appliances must be installed in customer-provided racks in accordance with the requirements described in the *ECS EX3000 Third-Party Rack Installation Guide*.