

Oracle® Big Data Appliance

Owner's Guide

Release 2 (2.2.1)

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Describes data center site planning, network configuration, hardware and software installation, and maintenance of Oracle Big Data Appliance.

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Preface

This guide describes Oracle Big Data Appliance, which is used for acquiring, organizing, and analyzing very large data sets. It includes information about hardware operations, site planning and configuration, and physical, electrical, and environmental specifications.

This preface contains the following topics:

- [Audience](#)
- [Documentation Accessibility](#)
- [Related Documentation](#)
- [Conventions](#)
- [Backus-Naur Form Syntax](#)

Audience

This guide is intended for Oracle Big Data Appliance customers and those responsible for data center site planning, installation, configuration, and maintenance of Oracle Big Data Appliance.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at
<http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc>.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info> or visit <http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs> if you are hearing impaired.

Related Documentation

The following Oracle libraries contain hardware information for Oracle Big Data Appliance. Links to these libraries are available through the Big Data library at

http://docs.oracle.com/cd/E41604_01/index.htm

- Sun Server X3-2L library:
http://docs.oracle.com/cd/E23393_01/index.html

- Sun Rack II 1042 and 1242 library:
<http://docs.oracle.com/cd/E19844-01/>
- Sun Network QDR InfiniBand Gateway library:
http://docs.oracle.com/cd/E26699_01/index.html
- Sun Datacenter InfiniBand Switch 36 library:
http://docs.oracle.com/cd/E26698_01/index.html
- Oracle Integrated Lights Out Manager (ILOM) 3.0 library:
<http://docs.oracle.com/cd/E19860-01/>

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
<code>monospace</code>	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.
# prompt	The pound (#) prompt indicates a command that is run as the Linux root user.

Backus-Naur Form Syntax

The syntax in this reference is presented in a simple variation of Backus-Naur Form (BNF) that uses the following symbols and conventions:

Symbol or Convention	Description
[]	Brackets enclose optional items.
{ }	Braces enclose a choice of items, only one of which is required.
	A vertical bar separates alternatives within brackets or braces.
...	Ellipses indicate that the preceding syntactic element can be repeated.
delimiters	Delimiters other than brackets, braces, and vertical bars must be entered as shown.
boldface	Words appearing in boldface are keywords. They must be typed as shown. (Keywords are case-sensitive in some, but not all, operating systems.) Words that are not in boldface are placeholders for which you must substitute a name or value.

Changes in This Release for Oracle Big Data Appliance Owner's Guide

This preface contains:

- [Changes in Oracle Big Data Appliance Release 2 \(2.2.1\)](#)
- [Changes in Oracle Big Data Appliance Release 2 \(2.2\)](#)
- [Changes in Oracle Big Data Appliance Release 2 \(2.1\)](#)
- [Changes in Oracle Big Data Appliance Release 2 \(2.0.1\)](#)
- [Changes in Oracle Big Data Appliance Release 2 \(2.0\)](#)

Changes in Oracle Big Data Appliance Release 2 (2.2.1)

The following are changes in Oracle Big Data Appliance release 2 (2.2.1):

New Features

- One-Off Patch Installation Support

The Mammoth Utility now supports one-off patching. See ["Installing a One-Off Patch"](#) on page 10-15.

- Oracle Enterprise Manager System Monitoring Plug-in

The Mammoth Utility provides additional support for deploying Enterprise Manager agents on Oracle Big Data Appliance.

See ["Mammoth Installation Steps"](#) on page 10-17.

The Enterprise Manager command-line utility (`emcli`) is installed on Oracle Big Data Appliance.

See the *Oracle Big Data Appliance Software User's Guide*.

- Upgraded Software Versions

Java HotSpot Virtual Machine 6 Update 51 and Cloudera Manager Enterprise 4.6.3 are installed with this release.

See the *Oracle Big Data Appliance Software User's Guide*.

Changes in Oracle Big Data Appliance Release 2 (2.2)

The following are changes in Oracle Big Data Appliance release 2 (2.2).

New Features

- Separate Clusters for Oracle NoSQL Database

HDFS and Oracle NoSQL Database do not share a cluster. Clusters are dedicated to either CDH or Oracle NoSQL Database. To upgrade a 2.1 or earlier cluster, you must first remove Oracle NoSQL Database. See "[Upgrading the Software on Oracle Big Data Appliance](#)" on page 10-7.
- Multiple Clusters in One Rack You can configure a rack with multiple clusters in several different configurations.
- Job Tracker High Availability

Clusters support two Job Trackers to ensure that one is always up and running. To support this change, some software services now run on different nodes in the cluster.

See *Oracle Big Data Appliance Software User's Guide*.
- Perfect Balance

Perfect Balance is a new tool for improving the performance of some MapReduce jobs.

See *Oracle Big Data Appliance Software User's Guide*.

Other Changes

- The location of some services has changed and vary slightly between starter racks, full racks, and multiple-rack clusters.
 - JobTrackers and failover controllers run one node03 and node04.
 - ZooKeeper is configured with servers running on node01, node02, and node03.
 - Oozie is configured with a server running on node04.

See Also: *Oracle Big Data Appliance Software User's Guide* for more detailed information about the version 2.2 software.

Changes in Oracle Big Data Appliance Release 2 (2.1)

The following are changes in *Oracle Big Data Appliance Owner's Guide* for Oracle Big Data Appliance release 2 (2.1).

New Features

- Starter Rack and In-Rack Upgrade Kit

Oracle Big Data Appliance is now available as a starter rack with six servers instead of the full rack of 18 servers. An upgrade kit expands the starter rack to 12 servers, and a second upgrade kit expands it to 18 servers.

See "[Oracle Big Data Appliance Rack Components](#)" on page 1-1 and "[Oracle Big Data Appliance Rack Layout](#)" on page C-1.
- Multiple Clusters in a Rack

You can now configure a full Oracle Big Data Appliance rack with multiple Hadoop clusters. The smallest cluster size is six servers. Larger clusters must have multiples of three servers.

This support affects the *Oracle Big Data Appliance Configuration Worksheets*, the network configuration, and the Mammoth software installation.

See [Chapter 7](#).

- Cloudera Software Upgrade

Mammoth 2.2.0 installs Cloudera's Distribution including Apache Hadoop (CDH) 4.3.0 and Cloudera Manager 4.6.0. Cloudera Manager manages Hive, so you must now use Cloudera Manager to start, stop, and configure Hive.

You can upgrade from Oracle Big Data Appliance 2.1, 2.0, or 1.1 software.

See ["Upgrading the Software on Oracle Big Data Appliance" on page 10-7](#).

- Oracle NoSQL Database Enterprise Edition

If you have a license, you can have Mammoth install Oracle NoSQL Database Enterprise Edition instead of the Community Edition.

See ["Software Configuration" on page 4-8](#).

- The `dcli` utility uses the Ethernet IP addresses that are stored in the `BdaDeploy.json` and `BdaShip.json` files. The `rack-hosts-infiniband` file is obsolete.

See [Chapter 13](#).

Other Changes

- The location of some services has changed:

- Cloudera Manager runs on node03.
- MySQL Database master runs on node03, and the backup database runs on node02.
- The directory mounted on all nodes of a cluster is exported from node03.

Changes in Oracle Big Data Appliance Release 2 (2.0.1)

The following are changes in *Oracle Big Data Appliance Owner's Guide* for Oracle Big Data Appliance release 2 (2.0.1).

New Features

- Mammoth Upgrade Support

The Mammoth Utility supports upgrades from software version 1.1 to 2.0.1.

See ["Upgrading the Software on Oracle Big Data Appliance" on page 10-7](#).

- Oracle Enterprise Manager Support

Agents run on Oracle Big Data Appliance to support the Enterprise Manager system monitoring plug-in.

See ["Software Configuration" on page 4-8](#).

Changes in Oracle Big Data Appliance Release 2 (2.0)

The following are changes in *Oracle Big Data Appliance Owner's Guide* for Oracle Big Data Appliance release 2 (2.0).

New Features

- Oracle Big Data Appliance X3-2

Oracle Big Data Appliance racks are now shipped with a different hardware configuration named Oracle Big Data Appliance X3-2. The Sun Server X3-2L-based racks supersede the Sun Fire X4270 M2-based racks. All versions of the Oracle Big Data Appliance software run on both hardware configurations.

See "[Oracle Big Data Appliance Rack Components](#)" on page 1-1

- Cloudera's Distribution including Apache Hadoop Version 4 (CDH4)

CDH4 replaces CDH3. CDH4 provides automatic failover of the NameNode and uses different services than CDH3.

See "[Port Assignments for Oracle Big Data Appliance Software](#)" on page 3-7 for the ports used by CDH4.

See *Oracle Big Data Appliance Software User's Guide* for more information about using CDH4.

Part I

Preinstallation

You must complete the preinstallation procedures before receiving shipment of Oracle Big Data Appliance, to avoid delays with the installation.

Part I contains the following chapters:

- [Chapter 1, "Introduction to Oracle Big Data Appliance"](#)
- [Chapter 2, "Site Requirements for Oracle Big Data Appliance"](#)
- [Chapter 3, "Understanding the Network Requirements"](#)
- [Chapter 4, "Using the Oracle Big Data Appliance Configuration Utility"](#)
- [Chapter 5, "Setting Up Auto Service Request"](#)

Introduction to Oracle Big Data Appliance

This chapter describes the features and hardware components of Oracle Big Data Appliance. It also includes usage information.

This chapter contains these sections:

- [About Oracle Big Data Appliance](#)
- [Oracle Big Data Appliance Rack Components](#)
- [Server Components](#)
- [Spare Parts Kit Components](#)
- [Oracle Big Data Appliance Management Software](#)
- [Oracle Big Data Appliance Restrictions on Use](#)

About Oracle Big Data Appliance

Oracle Big Data Appliance is an engineered system of hardware and software optimized to capture and analyze the massive volumes of unstructured data generated by social media feeds, email, web logs, photographs, smart meters, sensors, and similar devices.

Oracle Big Data Appliance is engineered to work with Oracle Exadata Database Machine and Oracle Exalytics In-Memory Machine to provide the most advanced analysis of all data types, with enterprise-class performance, availability, supportability, and security.

The Oracle Linux operating system and Cloudera's Distribution including Apache Hadoop (CDH) underlie all other software components installed on Oracle Big Data Appliance.

See Also: [Oracle Big Data Appliance Software User's Guide](#)

Oracle Big Data Appliance Rack Components

Oracle Big Data Appliance consists of a rack and the components to connect to your network.

[Table 1-1](#) lists the components in an Oracle Big Data Appliance rack. An in-rack expansion kit contains six Sun Server X3-2L servers.

Table 1–1 Oracle Big Data Appliance Rack Components

Full Rack	Starter Rack	Description
18	6	Sun Server X3-2L or Sun Fire X4270 M2 (full rack only)
1	1	Sun Rack II 1242 base
2	2	Sun Network QDR InfiniBand Gateway NM2-GW switches
1	1	Sun Datacenter InfiniBand Switch 36 NM2-36P switches
1	1	Cisco Catalyst 4948-E-F Ethernet switch (4948 with Sun Fire X4270 M2)
2	2	Power distribution units
0 or 1	0	KVM (only in Sun Fire X4270 M2-based racks)

Server Components

[Table 1–2](#) lists the components of a Sun Server X3-2L.

Table 1–2 Sun Server X3-2L Server Components

Quantity	Description
1	Sun Server X3-2L server base
2	Eight-core Intel Xeon E5-2660 processors (2.2 GHz)
8	8 GB DDR3 2RX4 1600 MHz DIMMs (64 GB RAM expandable up to 512 GB)
12	3 TB 3.5-inch 7200 RPM drives high capacity SAS (hot swap)
1	Oracle Integrated Lights Out Manager v3.1 with an Ethernet port for remote management
2	InfiniBand 4 x QDR (4 Gbps) ports (One dual-port PCIe 2.0 Host Channel Adapter network interface card)
4	Embedded 10 gigabit Ethernet port
1	Host bus adapter (disk controller) with 8 internal ports and 512 MB battery-backed write cache. SAS III 6 GBPS
2	Redundant hot-swappable power supplies and fans
1	USB-2 4 GB flash drive

[Table 1–3](#) lists the components of a Sun Fire X4270 M2.

Table 1–3 Sun Fire X4270 M2 Server Components

Quantity	Description
1	Sun Fire X4270 M2 server base
2	Six-core Intel Xeon X5675 processors (3.06 GHz)
6	8 GB DDR3 2RX4 1333 MHz DIMMs (48 GB RAM)
12	3 TB 3.5-inch 7200 RPM drives
1	Ethernet port for Oracle Integrated Lights Out Manager v3.0 for remote management
1	Dual-port 4X QDR (40 Gbps) InfiniBand Host Channel Adapter Network Interface Card

Table 1–3 (Cont.) Sun Fire X4270 M2 Server Components

Quantity	Description
1	Host bus adapter (disk controller) with 8 internal ports and 512 MB battery-backed write cache
2	Redundant power supplies and fans
4	Embedded 1 gigabit Ethernet port
1	USB-2 4 GB flash drive

Spare Parts Kit Components

The Oracle Big Data Appliance spare parts kit includes disk drives, accessory kits, cables, and documentation. [Table 1–4](#) and [Table 1–5](#) identify the bundled spares.

Table 1–4 Bundled Components and Accessories

Part Number	Quantity	Description
390-0476-03	1 or 2	3 TB 3.5-inch 7200 RPM drives (1 for a starter rack or 2 for a full rack)
590-896-501B	1	LCD Accessory Kit (Sun Fire X4270 M2-based racks only)
	1	Sun Server X3-2L Documentation Kit
	1	Sun Rack II Accessory Kit
53-2332-xx	1	Cisco Switch Documents and Accessory Kit

Table 1–5 Bundled Cables

Part Number	Length	Quantity	Description
530-4446-01	5 meters	10	QSFP passive copper cable for multiracking
530-4445-01	3 meters	6	QSFP passive copper cable for multiracking
350-1519-01	--	3	ASSY, NM2 serial cable sets for the InfiniBand switches

[Table 1–6](#) lists the spare parts that are secured to the center section of an Oracle Big Data Appliance rack.

Table 1–6 In-Rack Spare Cables

Part Number	Length	Quantity	Description
530-4445-01	3 meters	2	QSFP passive copper replacement cables
530-4437-01	10 feet	1	Orange Cat 5
530-4435-01	10 feet	1	Black Cat 5
530-4433-01	10 feet	1	Red Cat 5
530-4432-01	7 feet	1	Blue Cat 5

Oracle Big Data Appliance Management Software

The software components are installed on all servers in an Oracle Big Data Appliance rack. Oracle Linux, required drivers, firmware, and hardware verification utilities are factory installed. Among them are the following tools:

Note: See [Chapter 12](#) except where directed otherwise.

- Oracle Integrated Lights Out Manager (Oracle ILOM) consists of preinstalled, dedicated hardware and software that you can use to manage and monitor the servers and switches in an Oracle Big Data Appliance rack. See [Chapter 14](#).
- The `setup-root-ssh` utility sets up passwordless SSH for the root user among all the servers in an Oracle Big Data Appliance rack. See ["Setting Up Passwordless SSH" on page 13-1](#).
- The `dcli` utility executes commands across a group of servers on Oracle Big Data Appliance and returns the output. See [Chapter 13](#).
- The `bdacheckcluster` utility checks the health of the cluster.
- The `bdacheckib` utility checks the private InfiniBand network.
- The `bdachecknet` utility checks the network configuration.
- The `iblinkinfo` utility lists the connections in the InfiniBand network.
- The `listlinkup` utility identifies the active Ethernet ports.
- The `showvlan` utility lists the virtual local area networks (VLANs) configured on a Sun Network QDR InfiniBand Gateway switch.
- The `showvnics` utility lists the virtual network interface cards (VNICs) created on a Sun Network QDR InfiniBand Gateway switch.

All end-user software is installed on site using the Mammoth Utility. See [Chapter 10](#).

See Also: *Oracle Big Data Appliance Software User's Guide*

Oracle Big Data Appliance Restrictions on Use

The following restrictions apply to hardware and software modifications to Oracle Big Data Appliance. Violating these restrictions can result in the loss of warranty and support.

- Oracle Big Data Appliance hardware cannot be modified or customized, with two exceptions:
 1. Replace the administrative 48-port Cisco 4948 Ethernet switch. Customers can do the following:
 - Replace the Gigabit Ethernet switch with an equivalent 1U 48-port Gigabit Ethernet switch that conforms to their internal data center network standards. This replacement must be performed by customers at their own expense and labor, after delivery of Oracle Big Data Appliance. If customers choose to make this change, then Oracle cannot make or assist with this change given the numerous possible scenarios involved, and it is not included as part of the standard installation. Customers must supply the replacement hardware, and make or arrange for this change through other means.
 - Remove the Cat 5 cables connected to the Ethernet switch and connect them to the customer network through an external switch or patch panel. Customers must perform these changes at their expense and labor. In this case, the Cisco 4948 Ethernet switch in the rack can be turned off and disconnected from the data center network.

2. In a Sun Server X3-2L-based rack, install a top-of-rack (TOR) switch that supports both 10 GbE (or 40 GbE) and 1 GbE, such as the Sun Network 10 GbE Switch 72p, in rack slots 41 and 42. These slots are empty in the factory configuration. Customers must perform this installation at their expense and labor. It is not included as part of the standard installation.

This modification is not permitted in Sun Fire X4270 M2-based racks, which have no empty slots.

- Customers cannot update the firmware directly on Oracle Big Data Appliance servers. Oracle Big Data Appliance patches update the firmware of the server ILOM/BIOS, InfiniBand host channel adapters (HCA), disk controller host bus adapters (HBA), and hard drives (HDD).

The only exception is if the customer replaces a faulty server component (such as a disk drive) with a unit installed with firmware at a lower version than the faulty component. The upgrade must be performed using the [bdaupdatefw](#) utility.

- Customers can update the firmware of the other components of Oracle Big Data Appliance:

- Customers can update the IOS and firmware versions on the Cisco 4948 Ethernet switch to meet their data center requirements.
 - Customers can update the firmware of the InfiniBand switches if the updates comply with the validated versions documented in My Oracle Support ID 1528190.1.
 - Customers can update the firmware of the power distribution units (PDUs) if the updates comply with the validated versions documented in My Oracle Support ID 1528190.1.
 - Customers can update the firmware of the KVM switch and the KMM (keyboard, monitor, mouse) as needed (Sun Fire X4270 M2-based rack only).

- Customers can install additional software on Oracle Big Data Appliance servers. Oracle does not support questions or issues with the nonstandard modules. If a server fails, and Oracle suspects that the failure may have been caused by a nonstandard module, then Oracle Support may refer the customer to the vendor of the nonstandard module or ask that the issue be reproduced without the nonstandard module.

Modifying the server operating system other than by applying official patches and upgrades is not supported.

InfiniBand-related packages must always be maintained at the officially supported release.

You can install third-party software that complies with the following restrictions:

- The software must support the version of 64-bit Oracle Linux running on Oracle Big Data Appliance.
 - The software must be related to the use of Cloudera's Distribution including Apache Hadoop (CDH) or Oracle NoSQL Database installed on the cluster, or to Information Technologies (IT) or data center requirements, such as monitoring software.
 - The software must not overwrite, update, replace, or invalidate the software components already installed on Oracle Big Data Appliance. Run `bdachecksw` on each server where new software is installed, to ensure that the original software components are still valid. See [bdachecksw](#) on page 12-7.

- The software must not consume CPU, disk, or memory resources to the extent that it adversely affects the operating system, the CDH cluster, or Oracle NoSQL Database.

Customers are responsible for supporting all software on Oracle Big Data Appliance that they install in addition to the software installed by the Mammoth utility.

- Customers can use Cloudera Manager to stop and start services, but cannot use it to move services from one server to another. The Hadoop services such as NameNode and JobTracker must remain on the servers where they were installed by the Mammoth Utility.

See Also: *Oracle Big Data Appliance Software User's Guide* for service locations

- Customers cannot connect USB devices to Oracle Big Data Appliance servers except as documented in this guide. In those documented situations, the USB device should not draw more than 100 mA of power.
- The network ports on the servers can connect to external non-Sun servers using Internet small computer system interface (iSCSI) or network file system (NFS) protocols. However, the Fibre Channel over Ethernet (FCoE) protocol is not supported.
- Only switches specified for use in Oracle Big Data Appliance, Oracle Exadata Database Machine, and Oracle Exalogic Elastic Cloud can be connected to the InfiniBand network. Connecting third-party switches and other switches not used in these engineered systems is not supported.

Site Requirements for Oracle Big Data Appliance

This chapter describes the site requirements for Oracle Big Data Appliance. Use this chapter while you complete the *Oracle Big Data Appliance Site Checklists*.

This chapter contains these sections:

- [General Environmental Requirements](#)
- [Space Requirements](#)
- [Flooring Requirements](#)
- [Electrical Power Requirements](#)
- [Temperature and Humidity Requirements](#)
- [Ventilation and Cooling Requirements](#)
- [Network Connection Requirements](#)
- [Ensuring That the Site Is Ready](#)

See Also: *Oracle Big Data Appliance Site Checklists*

General Environmental Requirements

Table 2–1 shows the general environmental requirements for Oracle Big Data Appliance. The other sections in this chapter provide detailed information.

Table 2–1 Environmental Requirements for Oracle Big Data Appliance Full Rack

Environmental Component	Oracle Big Data Appliance X3-2	Oracle Big Data Appliance ¹
Net Weight See Also: "Flooring Requirements" on page 2-4	816.5 kg (1800 lb)	816.5 kg (1800 lb)
Acoustic levels	8.3 Bel	8.3 Bel
Power See Also: "Electrical Power Requirements" on page 2-4	Maximum: 10 kW (10.2 kVA) Typical: 7 kW (7.15 kVA)	Maximum: 12.0 kW (12.25 kVA) Typical: 8.4 kW (8.6 kVA) ²
Cooling See Also: "Temperature and Humidity Requirements" on page 2-9 and "Ventilation and Cooling Requirements" on page 2-10	Maximum: 34,142 BTU/hour (34,838 kJ/hour) Typical: 23,940 BTU/hour (24,420 kJ/hour)	Maximum: 40,971 BTU/hour (41,807 kJ/hour) Typical: 28,680 BTU/hour (29,265 kJ/hour)

Table 2-1 (Cont.) Environmental Requirements for Oracle Big Data Appliance Full Rack

Environmental Component	Oracle Big Data Appliance X3-2	Oracle Big Data Appliance ¹
Air flow front-to-back (subject to actual data center environment) See Also: "Temperature and Humidity Requirements" on page 2-9, and "Ventilation and Cooling Requirements" on page 2-10	Maximum: 1,573 CFM Typical: 1,103 CFM	Maximum: Approximately 1,886 CFM Typical: Approximately 1,340 CFM
IP addresses See Also: Chapter 3, "Understanding the Network Requirements."	24 for Ethernet network 18 for InfiniBand network	24 for Ethernet network 18 for InfiniBand network
Network drops See Also: Chapter 3, "Understanding the Network Requirements."	One network connection	Minimum of two network connections
External connectivity See Also: Chapter 3, "Understanding the Network Requirements."	1 x 1 Gbps Ethernet ports 18 x 10 Gbps Ethernet ports	2 x 1 Gbps Ethernet ports 18 x 10 Gbps Ethernet ports

¹ Sun Fire X4270 M2-based rack² Varies based on application load.

Table 2-2 shows the general environmental requirements for the starter rack and in-rack expansion kit.

Table 2-2 Environmental Requirements for Oracle Big Data Appliance Starter Rack

Environmental Component	Starter Rack	Starter Rack with One In-Rack Expansion Kit
Net Weight See Also: "Flooring Requirements" on page 2-4	470.4 kg (1037 lb)	635 kg (1400 lb)
Acoustic levels	76 Bel	79 Bel
Power See Also: "Electrical Power Requirements" on page 2-4	Maximum: 4.2 kW Typical: 3 kW	Maximum: 7.7 kW Typical: 5.4 kW ¹
Cooling See Also: "Temperature and Humidity Requirements" on page 2-9 and "Ventilation and Cooling Requirements" on page 2-10	Maximum: 14,052 BTU/hour (14,825.6 kJ/hour) Typical: 9,836 BTU/hour (10,377.5 kJ/hour)	Maximum: 26,411 BTU/hour (27,865.1 kJ/hour) Typical: 18,487 BTU/hour (19,504.8 kJ/hour)
Air flow front-to-back (subject to actual data center environment) See Also: "Temperature and Humidity Requirements" on page 2-9, and "Ventilation and Cooling Requirements" on page 2-10	Maximum: 676 CFM Typical: 473 CFM	Maximum: 1223 CFM Typical: 856 CFM

Table 2–2 (Cont.) Environmental Requirements for Oracle Big Data Appliance Starter Rack

Environmental Component	Starter Rack	Starter Rack with One In-Rack Expansion Kit
IP addresses See Also: Chapter 3, "Understanding the Network Requirements."	12 for Ethernet network 6 for InfiniBand network	18 for Ethernet network 12 for InfiniBand network
Network drops See Also: Chapter 3, "Understanding the Network Requirements."	One network connection	One network connection
External connectivity See Also: Chapter 3, "Understanding the Network Requirements."	1 x 1 Gbps Ethernet port 6 x 10 Gbps Ethernet ports	1 x 1 Gbps Ethernet port 12 x 10 Gbps Ethernet ports

¹ Varies based on application load.

Space Requirements

The space requirements for Oracle Big Data Appliance are as follows:

- Height: 200 cm (79 inches)
- Width: 60 cm with side panels (24 inches)
- Depth: 120 cm (47.5 inches)

The minimum ceiling height for the cabinet is 230 cm (90 inches), measured from the true floor or raised floor, whichever is higher. An additional 92 cm (36 inches) is for top clearance. The space above the cabinet and its surroundings must not restrict the movement of cool air between the air conditioner and the cabinet, or the movement of hot air coming out of the top of the cabinet.

Receiving and Unpacking Requirements

Before Oracle Big Data Appliance arrives, ensure that the receiving area is large enough for the package. The following are the package specifications:

- Shipping height: 216 cm (85 inches)
- Shipping width: 122 cm (48 inches)
- Shipping depth: 157.5 cm (62 inches)
- Shipping weight: 993 kg (2189 lb)

If your loading dock meets the height and ramp requirements for a standard freight carrier truck, then you can use a pallet jack to unload the rack. If not, you must provide a standard forklift or other means to unload the rack. You can also request that the rack be shipped in a truck with a lift gate.

Leave Oracle Big Data Appliance in its shipping container until it arrives at the installation site. Ensure sufficient clearance and clear pathways for moving it from the unpacking location to the installation location. The entire access route to the installation site should be free of raised-pattern flooring that can cause vibration.

Use a conditioned space when removing the packaging material to reduce particles before entering the data center. Allow enough space for unpacking Oracle Big Data Appliance from its shipping cartons. [Table 2–3](#) lists the access route requirements.

Table 2–3 Access Route Requirements for Oracle Big Data Appliance

Access Route Item	With Shipping Pallet	Without Shipping Pallet
Minimum door height	218.4 cm (86 inches)	204 cm (80.5 inches)
Minimum door width	127 cm (50 inches)	64 cm (25.5 inches)
Minimum elevator depth	162.6 cm (64 inches)	124 cm (49 inches)
Maximum incline	6 degrees	6 degrees
Minimum elevator, pallet jack, and floor loading capacity	1134 kg (2500 lb)	1134 kg (2500 lb)

Maintenance Access Requirements

The maintenance area must be large enough for Oracle Big Data Appliance and have the required access space. For example, the required space to remove the side panels is 67.6 cm (26.6 inches). [Table 2–4](#) lists the maintenance access requirements.

Open tiles are required for electrical access.

Table 2–4 Maintenance Access Requirements for Oracle Big Data Appliance

Location	Maintenance Access Requirement
Rear maintenance	91.4 cm (36 inches)
Front maintenance	91.4 cm (36 inches)
Top maintenance	91.4 cm (36 inches)

Flooring Requirements

Oracle recommends that Oracle Big Data Appliance be installed on raised flooring. The site floor and the raised flooring must be able to support the total weight.

[Table 2–5](#) lists the floor load requirements.

Table 2–5 Floor Load Requirements for Oracle Big Data Appliance

Description	Requirement
Maximum allowable weight of installed rack equipment	998 kg (2200 lb)
Maximum allowable weight of installed power distribution units	52 kg (115 lb)
Maximum dynamic load (maximum allowable weight of installed equipment including PDUs)	1050 kg (2315 lb)

Electrical Power Requirements

Oracle Big Data Appliance can operate effectively over a wide range of voltages and frequencies. However, it must have a reliable power source. Damage may occur if the ranges are exceeded. Electrical disturbances such as the following may damage Oracle Big Data Appliance:

- Fluctuations caused by brownouts
- Wide and rapid variations in input voltage levels or in input power frequency
- Electrical storms
- Faults in the distribution system, such as defective wiring

To protect Oracle Big Data Appliance from such disturbances, you should have a dedicated power distribution system, power-conditioning equipment, and lightning arresters or power cables to protect from electrical storms.

Each rack has two preinstalled power distribution units (PDUs). The PDUs accept different power sources. You must specify the type of PDU that is correct for your Oracle Big Data Appliance and data center.

PDUs for Oracle Big Data Appliance

The type of PDU depends on the location where Oracle Big Data Appliance is installed:

- North America, South America, Japan, and Taiwan use low-voltage PDUs.
- Europe, the Middle East, and Africa (EMEA) use high-voltage PDUs.
- Asia Pacific (APAC) locations, except for Japan and Taiwan, use high-voltage PDUs.

Refer to the appropriate sections for your location:

- [Low-Voltage 15 kVA Single-Phase PDUs](#)
- [Low-Voltage 15 kVA Three-Phase PDUs](#)
- [High-Voltage 15 kVA Single-Phase PDUs](#)
- [High-Voltage 15 kVA Three-Phase PDUs](#)

Low-Voltage 15 kVA Single-Phase PDUs

[Table 2–6](#) lists the requirements for low-voltage single-phase PDUs for North America, South America, Japan, and Taiwan. There are two PDUs per rack.

Table 2–6 Low-Voltage 15 kVA Single-Phase PDUs

Option	Requirement per PDU
Number of inputs	3 x 30A single phase
Voltage	200 to 240 VAC
Frequency	50/60 Hz
Current	24A maximum per input
Power rating	15 kVA
Output current	72A (3 x 24A)
Outlets	42 x C13; 6 x C19
Outlet groups	6
Group protection ¹	20A
Data center receptacle	15 kVA, with three 30A/250V 2-pole/3-wire NEMA L6-30P plugs

¹ UL489 2-pole circuit breaker

The following are needed to connect Oracle Big Data Appliance to a low-voltage single-phase power source:

- 6 power cords for two PDUs, 30A at 200 to 240 VAC
- 6 receptacles to connect the PDUs to 6 NEMA L6-30 data center receptacles

[Figure 2–1](#) shows the low-voltage, single-phase PDU power connector for North America, South America, Japan, and Taiwan.

Figure 2–1 Low-Voltage, Single-Phase Power Connector



Low-Voltage 15 kVA Three-Phase PDUs

[Table 2–7](#) lists the requirements for low-voltage three-phase PDUs for North America, South America, Japan, and Taiwan. There are two PDUs per rack.

Table 2–7 Low-Voltage 15 kVA Three-Phase PDUs

Option	Requirement per PDU
Number of inputs	1 x 60A three-phase 4-wire
Voltage	190 to 220 VAC
Frequency	50/60 Hz
Current	40A maximum per phase
Power rating	14.4 kVA
Output current	69A (3 x 23A)
Outlets	42 x C13; 6 x C19
Outlet groups	6
Group protection ¹	20A
Data center receptacle	15 kVA IEC 60309 60A 4-pin 250 VAC three-phase IP67

¹ UL489 2-pole circuit breaker

The following are needed to connect Oracle Big Data Appliance to a low-voltage three-phase power source:

- 2 power cords for two PDUs, 60A at 190 to 220 VAC three-phase
- 2 receptacles to connect the PDUs to 2 IEC 60309 60A 4-pin 250 VAC three-phase IP67 data center receptacles

[Figure 2–2](#) shows the low-voltage three-phase PDU power connector for North America, South America, Japan, and Taiwan.

Figure 2-2 Low-Voltage Three-Phase Power Connector**High-Voltage 15 kVA Single-Phase PDUs**

[Table 2-8](#) lists the requirements for 15 kVA high-voltage single-phase PDUs for Europe, the Middle East, Africa, and Asia Pacific, except Japan and Taiwan. There are two PDUs per rack.

Table 2-8 High-Voltage 15 kVA Single-Phase PDUs

Option	Requirement per PDU
Number of inputs	3 x 25A single phase
Voltage	220 to 240 VAC
Frequency	50/60 Hz
Current	25A maximum per input
Power rating	15 kVA
Output current	72A (3 x 24A)
Outlets	42 x C13; 6 x C19
Outlet groups	6
Group protection ¹	20A
Data center receptacle	15 kVA, with three blue 32A/240V splash-proof 2-pole/3-wire IEC 60309 plugs

¹ UL489 1-pole circuit breaker

The following are needed to connect Oracle Big Data Appliance to a high-voltage single-phase power source:

- 6 power cords for two PDUs, 25A at 220/380 to 240/415 VAC single-phase voltage
- 6 receptacles to connect the PDUs to 2 IEC 60309 32A 3-pin 250 VAC IP44 data center receptacles, and requires 22 kVA, single-phase

[Figure 2-3](#) shows the high-voltage single-phase PDU power connector for EMEA and APAC, except for Japan and Taiwan.

Figure 2-3 High-Voltage Single-Phase Power Connector

High-Voltage 15 kVA Three-Phase PDUs

[Table 2-9](#) lists the requirements for high-voltage three-phase PDUs for Europe, the Middle East, Africa, and Asia Pacific, except Japan and Taiwan. There are two PDUs per rack. The following specifications are per PDU.

Table 2-9 High-Voltage 15 kVA Three-Phase PDUs

Option	Requirement per PDU
Number of inputs	1 x 25A three-phase 5 wire
Voltage	220/380 to 240/415 VAC three-phase
Frequency	50/60 Hz
Current	25A maximum per phase
Power rating	14.4 kVA
Output current	62.7A (3 x 20.9A)
Outlets	42 x C13; 6 x C19
Outlet groups	6
Group protection ¹	20A
Data center receptacle	15 kVA, three-phase, 5-pin, IEC 60309 32A, 5-pin 230/400V, three-phase IP44

¹ UL489 1-pole circuit breaker

The following are needed to connect Oracle Big Data Appliance to a high-voltage three-phase power source:

- 2 power cords for two PDUs, 25A at 220/380 to 240/415 VAC three-phase
- 2 receptacles to connect the PDUs to 2 IEC 60309 32A 5-pin 230/400 VAC three-phase IP44 data center receptacles

[Figure 2-4](#) shows the high-voltage three-phase PDU power connector for EMEA and APAC, except for Japan and Taiwan.

Figure 2-4 High-Voltage Three-Phase Power Connector



Facility Power Requirements

Electrical work and installations must obey applicable local, state, or national electrical codes. Contact your facilities manager or a qualified electrician to determine what type of power is supplied to the building.

To prevent catastrophic failures, design the input power sources to ensure adequate power is provided to the PDUs. Use dedicated AC breaker panels for all power circuits that supply power to the PDU. When planning for power distribution requirements, balance the power load between available AC supply branch circuits. In the United States and Canada, ensure that the overall system AC input current load does not exceed 80 percent of the branch circuit AC current rating.

PDU power cords are 4 meters (13.12 feet) long, and 1 to 1.5 meters (3.3 to 4.9 feet) of the cord is routed within the rack cabinet. The installation site AC power receptacle must be within 2 meters (6.6 feet) of the rack.

Circuit Breaker Requirements

To prevent catastrophic failures, the design of your power system must ensure that adequate power is provided to the servers. Use dedicated AC breaker panels for all power circuits that supply power to the server. Electrical work and installations must obey applicable local, state, and national electrical codes. Servers require that electrical circuits be grounded to the earth.

In addition to circuit breakers, provide a stable power source, such as an uninterruptible power supply (UPS), to reduce the possibility of component failures. If computer equipment is subjected to repeated power interruptions and fluctuations, then it is susceptible to a higher rate of component failure.

Note: The owner supplies the circuit breakers. Each power cord requires one circuit breaker.

Grounding Guidelines

The cabinets for Oracle Big Data Appliance are shipped with grounding-type power cords. Always connect the cords to grounded power outlets. Because different grounding methods are used depending on location, check the grounding type and refer to documentation, such as International Electrotechnical Commission (IEC) documents, for the correct grounding method. Ensure that the facility administrator or qualified electrical engineer verifies the grounding method for the building and performs the grounding work.

Temperature and Humidity Requirements

Airflow through Oracle Big Data Appliance is from front to back. See [Table 2-1](#) for information about cooling and airflow.

Note: Studies show that temperature increases of 10 degrees Celsius (15 degrees Fahrenheit) above 20 degrees Celsius (70 degrees Fahrenheit) reduce long-term electronics reliability by 50 percent.

Excessive internal temperatures may result in full or partial shutdown of Oracle Big Data Appliance.

[Table 2-10](#) lists the temperature, humidity, and altitude requirements for operating and nonoperating systems.

Table 2–10 Temperature, Humidity, and Altitude Requirements

Condition	Operating Requirement	Nonoperating Requirement	Optimum
Temperature	5 to 35 degrees Celsius (40 to 95 degrees Fahrenheit)	-40 to 70 degrees Celsius (-40 to 158 degrees Fahrenheit)	For optimal rack cooling, data center temperatures from 21 to 23 degrees Celsius (70 to 74 degrees Fahrenheit)
Relative humidity	10 to 90 percent relative humidity, noncondensing	Up to 93 percent relative humidity	For optimal data center rack cooling, 45 to 50 percent, noncondensing
Altitude	3,000 meters (9,840 feet) maximum	12,000 meters (39,400 feet) maximum	Ambient temperature is reduced by 1 degree Celsius for each 300 meters above 900 meters altitude above sea level

Set conditions to the optimal temperature and humidity ranges to minimize the chance of downtime due to component failure. Operating Oracle Big Data Appliance for extended periods at or near the operating range limits, or installing it in an environment where it remains at or near nonoperating range limits, could significantly increase hardware component failure.

The ambient temperature range of 21 to 23 degrees Celsius (70 to 74 degrees Fahrenheit) is optimal for server reliability and operator comfort. Most computer equipment can operate in a wide temperature range, but near 22 degrees Celsius (72 degrees Fahrenheit) is desirable because it is easier to maintain safe humidity levels. Operating in this temperature range provides a safety buffer if the air conditioning system fails.

The ambient relative humidity range of 45 to 50 percent is suitable for safe data processing operations. Most computer equipment can operate in a wide range (20 to 80 percent), but the range of 45 to 50 percent is recommended for the following reasons:

- Helps protect computer systems from corrosion problems associated with high humidity levels.
- Provides the greatest operating time buffer if the air conditioner control fails.
- Helps avoid failures or temporary malfunctions caused by intermittent interference from static discharges that may occur when relative humidity is too low.

Note: Electrostatic discharge (ESD) is easily generated and hard to dissipate in areas of low relative humidity, such as below 35 percent. ESD becomes critical when humidity drops below 30 percent. Maintaining humidity in a data center is not difficult, because a high-efficiency vapor barrier and a low rate of air changes are normally present.

Ventilation and Cooling Requirements

Always provide adequate space in front and behind the rack to allow for proper ventilation. Do not obstruct the front or rear of the rack with equipment or objects that might prevent air from flowing through the rack. Rack-mountable servers and equipment typically draw cool air in through the front of the rack and let out warm air

through the rear of the rack. There is no air flow requirement for the left and right sides due to front-to-back cooling.

If the rack is not completely filled with components, then cover the empty sections with filler panels. Gaps between components can adversely affect air flow and cooling within the rack.

Relative humidity is the percentage of the total water vapor that can exist in the air without condensing, and it is inversely proportional to air temperature. Humidity goes down when the temperature rises, and goes up when the temperature drops. For example, air with a relative humidity of 45 percent at a temperature of 24 degrees Celsius (75 degrees Fahrenheit) has a relative humidity of 65 percent at a temperature of 18 degrees Celsius (64 degrees Fahrenheit). As the temperature drops, the relative humidity rises to more than 65 percent, and water droplets form.

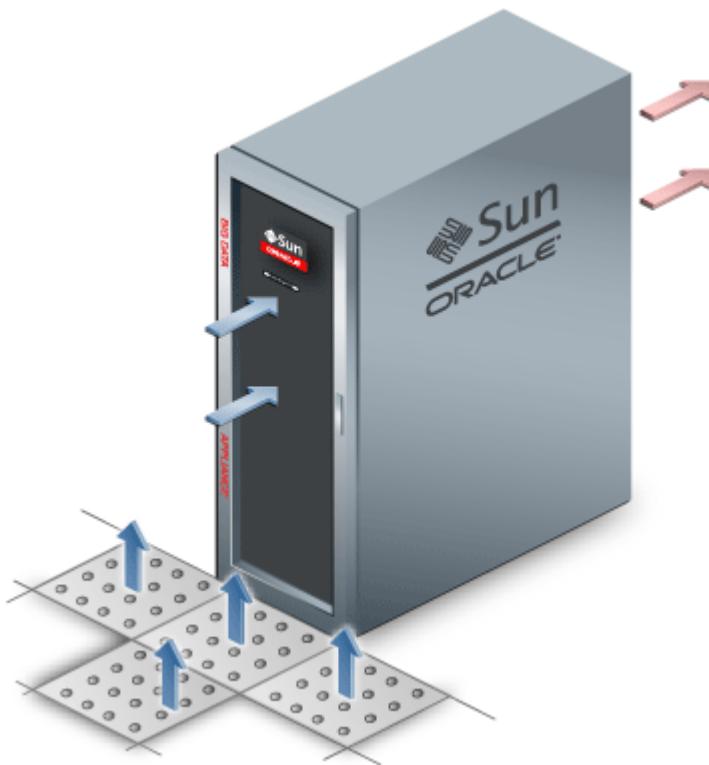
Air conditioning facilities usually do not precisely monitor or control temperature and humidity throughout an entire computer room. Generally, you should monitor individual points corresponding to multiple exhaust vents in the main unit and other units in the room, because the distribution of temperature and humidity is uneven across the room. Pay special consideration to humidity when using underfloor ventilation.

Oracle Big Data Appliance is designed to function while mounted in a natural convection air flow. Follow these requirements to meet the environmental specification:

- Ensure that the rack has adequate air flow.
- Ensure that the rack has front-to-back cooling. The air inlet is at the front of the server, and the air outlet is at the rear.
- Allow a minimum clearance of 91.4 cm (36 inches) at the front of the rack and 91.4 cm (36 inches) at the rear of the rack for ventilation.

Use perforated tiles, rated for 400 cubic feet per minute (CFM) per tile air flow, in front of the rack for cold air intake. The tiles can be arranged in any order in front of the rack, if cold air from the tiles can flow into the rack. Inadequate cold air flow could result in a higher inlet temperature in the servers due to exhaust air recirculation. Oracle recommends four floor tiles for Oracle Big Data Appliance.

[Figure 2-5](#) shows a typical installation of the floor tiles for Oracle Big Data Appliance in a typical data center.

Figure 2–5 Typical Data Center Configuration for Perforated Floor Tiles

Network Connection Requirements

Before installation, network cables must run from your existing network infrastructure to the installation site. The requirements to connect Oracle Big Data Appliance to your existing network infrastructure are as follows:

- Management network connection requirements
 - One 1 Gbps Ethernet connection for the management switch in the rack
 - One 1 Gbps Ethernet connection for the KVM switch in the rack (Sun Fire X4270 M2-based racks only)
- Client access network connection requirements
 - 2 (minimum) to 16 (maximum) 10 Gbps Ethernet connections split between the two Sun Network QDR InfiniBand Gateway switches in the rack. The exact number of connections depends on your bandwidth requirements.

See Also: [Chapter 3, "Understanding the Network Requirements"](#)

Ensuring That the Site Is Ready

Before Oracle Big Data Appliance is delivered to the site, perform these tasks to ensure that the site is ready:

- [Task 1, "Review Site Requirements"](#)
- [Task 2, "Complete the Oracle Big Data Appliance Configuration Worksheets"](#)
- [Task 3, "Configure the Network"](#)

- [Task 4, "Prepare the Site Based on Requirements"](#)

Task 1 Review Site Requirements

Review the site requirements in this chapter and in the *Oracle Big Data Appliance Site Checklists* to understand the requirements of Oracle Big Data Appliance and ensure you are ready for delivery.

Task 2 Complete the Oracle Big Data Appliance Configuration Worksheets

Provide the network configuration details and select the optional software components to be installed. Complete the *Oracle Big Data Appliance Configuration Worksheets* for every set of appliances that will be configured as a single CDH cluster.

Give the completed *Oracle Big Data Appliance Configuration Worksheets* to your Oracle representative. An Oracle representative enters this information in the Oracle Big Data Appliance Configuration Utility and generates the Installation Template, the preinstall-checkip.sh script, and the configuration files.

See Also: [Chapter 4, "Using the Oracle Big Data Appliance Configuration Utility"](#)

Task 3 Configure the Network

Configure the existing network using the Installation Template provided by your Oracle representative. This includes registering the networks in the Domain Name System (DNS), assigning IP addresses, and configuring data center switches and firewalls. Run the preinstall-checkip.sh script and fix any errors.

See Also:

- [Chapter 3, "Understanding the Network Requirements"](#)
- [Chapter 7, "Configuring an Oracle Big Data Appliance Full Rack or Starter Rack"](#)

Task 4 Prepare the Site Based on Requirements

Prepare the site based on the requirements described earlier in this chapter, such as installing the network cables and power supplies, before the arrival of Oracle Big Data Appliance:

1. Review the safety guidelines.

See Also: ["Reviewing Safety Guidelines" on page 6-1](#)

2. Note problems or peculiarities at the site. For example, ensure that the doors are tall enough and wide enough for Oracle Big Data Appliance.

See Also: ["Space Requirements" on page 2-3](#)

3. Verify that the installation site flooring has a strength rating to withstand the combined weight of Oracle Big Data Appliance and any other installed equipment.

See Also: ["Flooring Requirements" on page 2-4](#)

4. Install all necessary electrical equipment, and ensure that sufficient power is provided for Oracle Big Data Appliance.

See Also:

- ["Electrical Power Requirements" on page 2-4](#)
- *Sun Rack II Power Distribution Units User's Guide* for the power distribution unit (PDU) power requirements at
<http://docs.oracle.com/cd/E19844-01/>

5. Ensure that the installation site provides adequate air conditioning.

See Also: ["Ventilation and Cooling Requirements" on page 2-10](#)

6. Operate the air conditioning system for 48 hours to bring the room temperature to the appropriate level.

See Also: ["Temperature and Humidity Requirements" on page 2-9](#)

7. Install the network cables for Oracle Big Data Appliance.

See Also: ["Network Connection Requirements" on page 2-12](#)

8. Clean and vacuum the area thoroughly in preparation for installation.

Understanding the Network Requirements

This chapter describes the network requirements for Oracle Big Data Appliance. This chapter contains these sections:

- [Overview of Network Requirements](#)
- [Cabling the Client Network](#)
- [Factory Network Settings](#)
- [Port Assignments for Oracle Big Data Appliance Software](#)
- [Preparing the Network for Oracle Big Data Appliance](#)

Overview of Network Requirements

Oracle Big Data Appliance includes 6, 12, or 18 servers and the equipment to connect the servers to your network. The network connections allow the servers to be administered remotely and allow clients to connect to them. Use the information in this chapter to configure the environment for Oracle Big Data Appliance.

Each server has the following network components and interfaces:

- 1 Dual-port 4X QDR (40 Gbps) InfiniBand Host Channel Adapter network interface card
- 1 Ethernet port for Oracle Integrated Lights Out Manager v3.0 for remote management
- 1 Gigabit Ethernet port

Default Network Connections

The installation process automatically discovers whether each Sun Network QDR InfiniBand Gateway switch has at least one 10 GbE connection. If they all do, then two virtual network interface cards (VNICs) are configured for each server: one for each switch bonded as `bondeth0` in active/passive failover mode. The VNICs are assigned automatically to the available 10 GbE connections in round-robin fashion. For example, if each switch has three available 10 GbE connections, then the VNIC on server 1 is assigned to 10 GbE port 1, server 2 to port 2, server 3 to port 3, server 4 to port 1, and so on.

All VNICs are assigned to the same default virtual local area network (VLAN). To assign different VLANs to different VNICs, you must delete the initial VNICs and manually create your own.

Minimum Requirements for the Networks

Additional configuration, such as defining multiple VLANs or enabling routing, may be required for the switch to operate properly in your environment. If additional configuration is needed, then your network administrator must perform the necessary configuration steps during installation of Oracle Big Data Appliance.

To deploy Oracle Big Data Appliance, ensure that your network meets the minimum requirements. Oracle Big Data Appliance uses three networks. Each network must be on a distinct and separate subnet from the others. These are the network descriptions:

- **Administrative network:** This 1 gigabit Ethernet (GbE) network connects to your existing administrative network and is used to administer all components of Oracle Big Data Appliance. It connects the servers, Oracle ILOM, and InfiniBand switches connected to the Ethernet switch in the rack.

There are two uplinks to the administrative network:

- From the Ethernet switch in the rack
- From the KVM switch in the rack (Sun Fire X4270 M2-based racks only)

Each server has two network interfaces for administration. One provides administrative access to the operating system through the eth0 Ethernet interface, and the other provides access to the Integrated Lights Out Manager through the Oracle ILOM Ethernet interface. Oracle Big Data Appliance is delivered with the eth0 and ILOM interfaces connected to the Ethernet switch on the rack. Do not use the eth0 interface on the servers for client network traffic. Cabling or configuration changes to these interfaces are not permitted.

Domain Name System (DNS) servers are not required on the administrative network, although Oracle Big Data Appliance uses them if they are available. At least one Network Time Protocol (NTP) server must also be available. The NTP server for the administrative network can be different from the NTP server for the client network.

All Oracle Big Data Appliance components on the administrative network must be on the same subnet; that is, the eth0 IP addresses for all servers, ILOMs, PDUs, InfiniBand switches, and the Cisco Ethernet switch must be on the same subnet.

- **Client access network:** This 10 GbE network connects the servers through the gateway switches to your existing client network and is used for client access to the servers. Client applications access the software through this network by using the client network host names of the servers.

There are two Sun Network QDR InfiniBand Gateway switches in the rack. Each switch supports 1 to 8 connections for client access for a total of up to 16 client network connections. For failover, you must have at least one connection from each switch and scale up according to your requirements for loading data and providing client access.

At least one DNS server must be accessible on the client network. At least one NTP server must also be available. The NTP server for the client network can be different from the NTP server for the administrative network.

- **InfiniBand private network:** This network connects the servers by using the InfiniBand switches on the rack and the bondib0 interface. This nonroutable network is fully contained within Oracle Big Data Appliance and any other Oracle engineered systems that are connected to it with InfiniBand cables. This network does not connect to your existing network. It is automatically configured during installation.

Note: All networks must be on distinct and separate subnets from each other.

Network Diagram

The servers are configured on the network as follows:

- eth0: Provides access to the operating system using the administrative network.
- bondeth0: Provides access to the server using the client access network.
- ILOM: Provides access to Oracle Integrated Lights Out Manager (ILOM) using the administrative network.

Use the `preinstall-checkip.sh` script to verify the readiness of the network environment before cabling Oracle Big Data Appliance to the existing network. See ["Preparing the Network for Oracle Big Data Appliance" on page 3-9](#).

Figure 3-1 shows the network diagram for a Sun Server X3-2L-based rack.

Figure 3-1 Network Diagram for Oracle Big Data Appliance X3-2

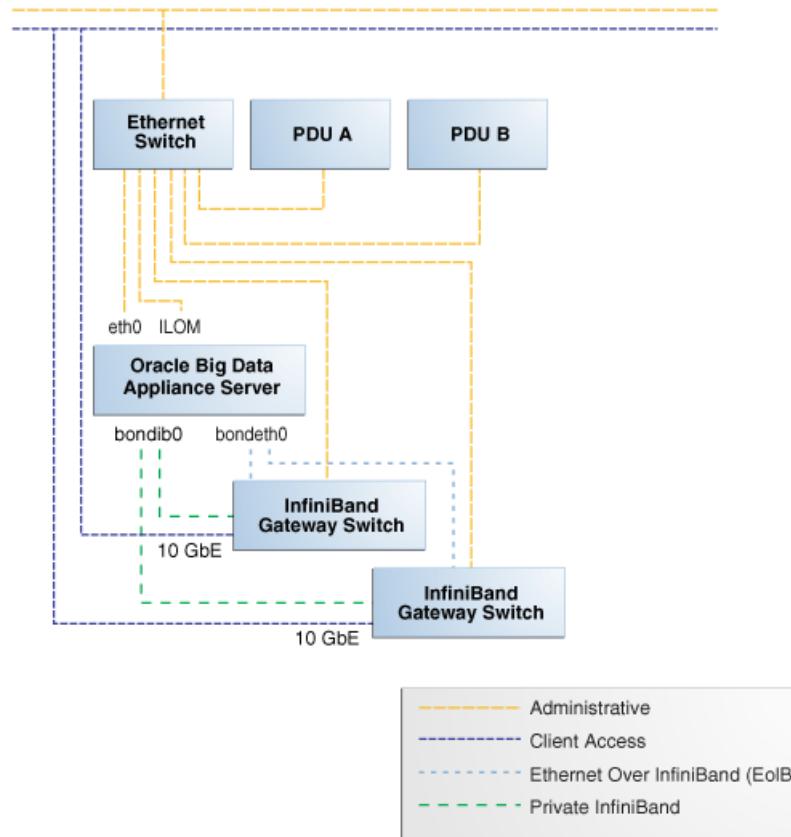
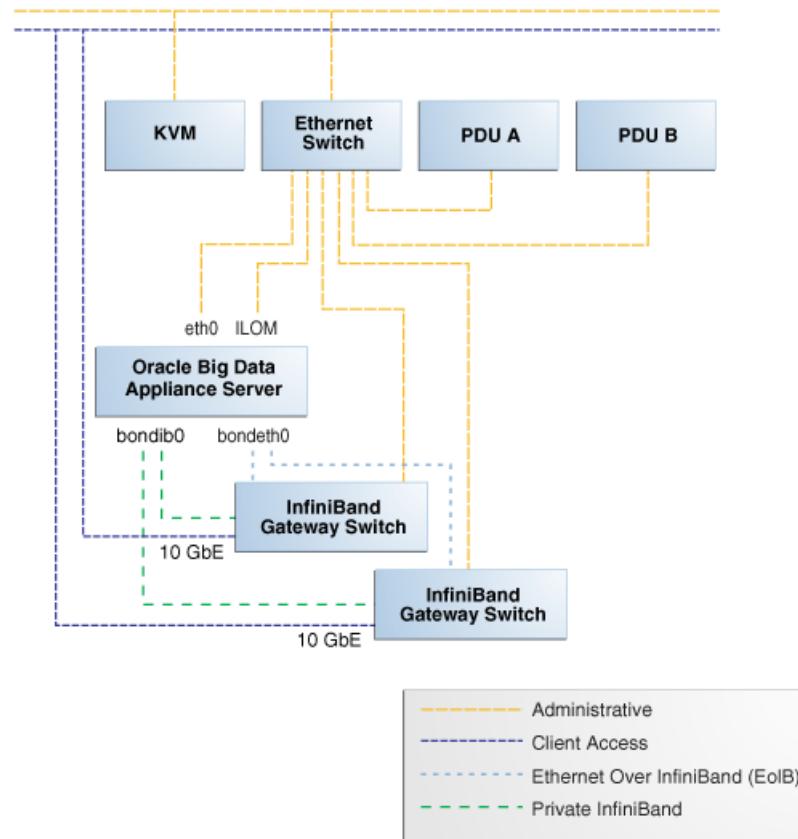


Figure 3-2 shows the network diagram for a Sun Fire X4270 M2 -based rack, which includes a KVM.

Figure 3–2 Network Diagram for Oracle Big Data Appliance

Cabling the Client Network

Each of the two Sun Network QDR InfiniBand Gateway switches in Oracle Big Data Appliance has eight 10 GbE ports. The two switches enable you to create up to 16 10 GbE connections for each rack. You can determine how many connections to create based on the bandwidth needed for the client network. For proper functioning, at least one of the eight ports of each gateway switch must have an active connection to the site's 10 GbE network. Oracle recommends that the two switches have the same number of active 10 GbE connections, so that failover does not result in a loss of available client network bandwidth.

How the Servers Connect to the Gateway Switches

Physical Ethernet connections are created only between the site network and the gateway switches. The Oracle Big Data Appliance servers are connected only by InfiniBand to those switches. Each server has two InfiniBand connections, one to each gateway switch, in an active-passive backup mode; only the active InfiniBand connection is used for all InfiniBand traffic to that server. If that connection fails, it immediately fails over to the other connection.

Half of the Oracle Big Data Appliance servers have active connections to one gateway switch, and the other half have active connections to the other gateway switch. Inside Oracle Big Data Appliance, the client network traffic is transported over those InfiniBand connections using the Ethernet over InfiniBand (EoIB) protocol. As a result, each Oracle Big Data Appliance server has two virtual NICs (VNICs) that are bonded in the same active-passive backup mode. Each VNIC is assigned a specific port on the

gateway switch. If a switch has only one 10 GbE connection, then all VNICs for that switch point to the same port. If a switch has multiple connections, then the VNICs are spread across those ports in round-robin fashion.

For example, if you create three 10 GbE uplinks from each gateway switch, then the client network traffic from the servers is handled by the switches as shown in the following table:

Server Number	Active Link	Backup Link
1	GW Switch 1 Link 1	GW Switch 2 Link 1
2	GW Switch 1 Link 2	GW Switch 2 Link 2
3	GW Switch 1 Link 3	GW Switch 2 Link 3
4	GW Switch 1 Link 1	GW Switch 2 Link 1
...
17	GW Switch 2 Link 2	GW Switch 1 Link 2
18	GW Switch 2 Link 3	GW Switch 1 Link 3

Depending on the number of 10 GbE connections, the client network traffic for multiple servers may be sent across the same physical 10 GbE connection. The maximum number of connections provides 160 gigabits per second (Gbps) of client network bandwidth to Oracle Big Data Appliance.

Using Splitter Cables for Connecting to the 40 Gbps Physical Ports

Although you can create up to eight 10 GbE connections for each gateway switch, its physical ports are 40 Gbps quad small form-factor pluggable (QSFP) ports. Each gateway switch has two of these physical ports reserved for 10 GbE connectivity. The ports are equipped with QSFP transceivers that take an optical cable with an MTP/MPO connector. On the site network side are typically 10 Gbps ports with SFP+ transceivers that take LC connectors. For these connections, you can use splitter cables that have a single male MTP/MPO connector on one end and four pairs of LC connectors on the other end. Each 10 Gbps SFP+ transceiver takes a duplex LC connector for a total of four pairs. Thus, you can use a single splitter cable to create up to four 10 GbE connections. However, all four duplex LC connectors do not require a connection to the site network.

The splitter cables are not provided with Oracle Big Data Appliance and must be ordered separately from Oracle. They are available in lengths of 10, 20, and 50 meters. Oracle recommends that you order the SFP+ transceivers used at the site end of the 10 GbE network from the same manufacturer as the 10 GbE switch.

What About Data Centers Without a 10 GbE Infrastructure?

If your data center does not have a 10 GbE infrastructure, you can still connect Oracle Big Data Appliance to it by using an external switch that supports both 10 GbE (or 40 GbE) and 1 GbE. The Sun Network 10 GbE Switch 72p and numerous third-party switches provide this capability. You can connect the Sun Network QDR InfiniBand Gateway switches to a 10 GbE or 40 GbE port and connect the data center to a 1 GbE port in the external switch.

Configuring Multiple Racks into a Single Hadoop Cluster

When multiple Oracle Big Data Appliance racks are connected to form a single Hadoop cluster, Oracle strongly recommends that you spread the 10 GbE connections across the switches in different racks. Every gateway switch in every rack must have at least one 10 GbE connection. Oracle does not support a configuration in which the 10 GbE connections to the switches in a single rack are used for all servers in all Oracle Big Data Appliance racks.

Factory Network Settings

This initial network configuration is set at the factory for Oracle Big Data Appliance:

- **Gateway:** 192.168.1.254 in all devices as required
- **Subnet Mask:** 255.255.255.0 in all devices as required
- **IP Address Range:** 192.168.1.1 to 192.168.1.211

[Table 3-1](#) lists the default IP addresses for Oracle Big Data Appliance.

Table 3-1 Default IP Addresses for Oracle Big Data Appliance

Host	Administrative IP Addresses	Oracle ILOM IP Addresses	InfiniBand Bonded IP Addresses
bda18 ¹	192.168.1.18	192.168.1.118	192.168.10.18
bda17 ¹	192.168.1.17	192.168.1.117	192.168.10.17
bda16 ¹	192.168.1.16	192.168.1.116	192.168.10.16
bda15 ¹	192.168.1.15	192.168.1.115	192.168.10.15
bda14 ¹	192.168.1.14	192.168.1.114	192.168.10.14
bda13 ¹	192.168.1.13	192.168.1.113	192.168.10.13
bda12 ²	192.168.1.12	192.168.1.112	192.168.10.12
bda11 ²	192.168.1.11	192.168.1.111	192.168.10.11
bda10 ²	192.168.1.10	192.168.1.110	192.168.10.10
bdasw-ib3	192.168.1.203		
Cisco Switch	192.168.1.200		
bdasw-ib2	192.168.1.202		
bda09 ²	192.168.1.9	192.168.1.109	192.168.10.9
bda08 ²	192.168.1.8	192.168.1.108	192.168.10.8
bda07 ²	192.168.1.7	192.168.1.107	192.168.10.7
bda06	192.168.1.6	192.168.1.106	192.168.10.6
bda05	192.168.1.5	192.168.1.105	192.168.10.5
bda04	192.168.1.4	192.168.1.104	192.168.10.4
bda03	192.168.1.3	192.168.1.103	192.168.10.3
bda02	192.168.1.2	192.168.1.102	192.168.10.2
bda01	192.168.1.1	192.168.1.101	192.168.10.1
bdasw-ib1	196.168.1.201		

Table 3–1 (Cont.) Default IP Addresses for Oracle Big Data Appliance

Host	Administrative IP Addresses	Oracle ILOM IP Addresses	InfiniBand Bonded IP Addresses
PDU A	192.168.1.210		
PDU B	192.168.1.211		

¹ Full racks only² Full racks or starter racks with in-rack expansions only

Port Assignments for Oracle Big Data Appliance Software

Table 3–2 Oracle Big Data Appliance Port Numbers identifies the port numbers used by Oracle Big Data Appliance software. Ensure that these ports are free before you configure the network.

Table 3–2 Oracle Big Data Appliance Port Numbers

Port	Used by
22	ssh
80	yumrepos (only during installation)
111	portmap
162	Auto Service Request Manager (optional)
443	Auto Service Request Manager (optional)
668	rpc.statd
3306	MySQL Database
5000	Oracle NoSQL Database registration
5001	Oracle NoSQL Database administration
5010 to 5020	Oracle NoSQL Database processes
6481	Auto Service Request Manager service tags listener (optional)
8139	Puppet nodes
8140	Puppet parent
20910	Oracle Data Integrator agent
30920	Automated Service Monitor (ASM)

Table 3–3 lists the ports used by Cloudera's Distribution including Apache Hadoop version 4 (CDH4). For additional details about these port assignments, go to the Cloudera website at

http://www.cloudera.com/content/cloudera-content/cloudera-docs/CDH4/4.2.0/CDH4-Installation-Guide/cdh4ig_topic_9.html

Table 3–3 CDH Port Numbers

Port	Component	Service	Access
0	MapReduce	TaskTracker	Localhost
1004	HDFS	Secure DataNode	External
1006	HDFS	Secure DataNode	External
2181	HBase	HQuorumPeer	

Table 3–3 (Cont.) CDH Port Numbers

Port	Component	Service	Access
2181	ZooKeeper	Server	External
2888	HBase	HQuorumPeer	
2888	ZooKeeper	Server	Internal
3181	ZooKeeper	Server	Internal
3888	HBase	HQuorumPeer	
3888	ZooKeeper	Server	Internal
4181	ZooKeeper	Server	Internal
8002	Hue	Beeswax Server	Internal
8003	Hue	Beeswax Metastore	Internal
8020	HDFS	NameNode	External
8021	MapReduce	JobTracker	External
8030	YARN	ResourceManager	
8031	YARN	ResourceManager	
8032	YARN	ResourceManager	
8033	YARN	ResourceManager	
8040	YARN	NodeManager	
8041	YARN	NodeManager	
8042	YARN	NodeManager	
8080	HBase	REST Service	External
8088	YARN	ResourceManager	External
8888	Hue	Server	External
9083	Hive	Metastore	External
9090	HBase	Thrift Server	External
9090	HBase	Avro Server	External
9290	MapReduce	JobTracker Thrift Plug-in	Internal
10000	Hive	HiveServer	External
11000	Oozie	Server	External
11001	Oozie	Server	Localhost
16000	Sqoop	Metastore	External
19888	YARN	MapReduce JobHistory Server	
50010	HDFS	DataNode	External
50020	HDFS	DataNode	External
50030	MapReduce	JobTracker	External
50060	MapReduce	TaskTracker	External
50070	HDFS	NameNode	External
50075	HDFS	DataNode	External
50090	HDFS	Secondary NameNode	Internal

Table 3–3 (Cont.) CDH Port Numbers

Port	Component	Service	Access
50470	HDFS	Secure NameNode	External
50495	HDFS	Secure Secondary NameNode	Internal
60000	HBase	Master	External
60010	HBase	Master	External
60020	HBase	RegionServer	External
60030	HBase	RegionServer	External

Preparing the Network for Oracle Big Data Appliance

The Oracle Big Data Appliance Configuration Utility generates two files for you to use before installation:

- **bda-install-template.pdf:** This Installation Template lists the host names and custom IP addresses for Oracle Big Data Appliance. Verify that the Installation Template is correct, and add the host names and IP addresses to a name server on the network.
- **preinstall-checkip.sh:** Checks the network for name and address conflicts.

You can obtain the files from your Oracle representative, who typically runs the Oracle Big Data Appliance Configuration Utility. See ["About the Configuration Files"](#) on page 4-3.

Run the preinstall-checkip.sh script at these points in the installation process:

- Before Oracle Big Data Appliance arrives at the site but after the network administrator has added the new names and IP addresses to the name server. This step ensures that the network configuration parameters are valid and the network is ready to accept Oracle Big Data Appliance connections.
- After Oracle Big Data Appliance arrives but before it is connected to the network. This step ensures that the network has not changed and is still ready to accept Oracle Big Data Appliance connections.

Note: Running preinstall-checkip.sh is a critical pre-installation step. Network errors can cause extensive delays in the installation procedure.

To check the network for conflicts:

1. Copy the preinstall-checkip.sh script to any Linux system with a 10 GB Ethernet connection to the subnet on which Oracle Big Data Appliance will be deployed.
2. Ensure that the script is executable:

```
chmod +x preinstall-checkip.sh
```
3. Execute the script:

```
./preinstall-checkip.sh
```
4. If the script identifies errors, open the bda-checkip.out file for details. It contains information about every test the script performed. The output file is created in the same directory as the script.

5. Resolve all conflicts before proceeding.

[Example 3-1](#) shows success and error messages from the preinstall-checkip.sh script.

Example 3-1 Output from preinstall-checkip.sh

```
Big Data Appliance pre-installation network verification starting ...
```

```
Using name server 198.51.100.21 for all DNS lookups
```

```
Domain is example.com
```

```
Processing DNS name servers : SUCCESS
```

```
Processing NTP time servers : SUCCESS
```

```
Processing gateways : SUCCESS
```

```
Processing factory IP addresses : SUCCESS
```

```
Processing public node names (bondeth0) : SUCCESS
```

```
Processing private IP addresses (bondib0) : ERROR - see bda-checkip.out for details
```

```
Processing admin node names (eth0) : SUCCESS
```

```
Processing ILOM names : SUCCESS
```

```
Processing switch and PDU IP addresses : SUCCESS
```

```
Processing ASR hostname : SUCCESS
```

```
One or more checks report ERROR. Review bda-checkip.out for details
```

Using the Oracle Big Data Appliance Configuration Utility

This chapter describes how to use the Oracle Big Data Appliance Configuration Utility. It contains the following sections:

- [Overview of the Oracle Big Data Appliance Configuration Utility](#)
- [Using the Oracle Big Data Appliance Configuration Utility](#)
- [Network Configuration](#)
- [Software Configuration](#)

Note: The network administrator must check the network configuration, using the output files from the configuration utility, before the installation of Oracle Big Data Appliance. Otherwise, network errors may cause extensive delays. See ["Preparing the Network for Oracle Big Data Appliance"](#) on page 3-9.

Overview of the Oracle Big Data Appliance Configuration Utility

The Oracle Big Data Appliance Configuration Utility is used to generate the installation and deployment files.

The utility is implemented as a spreadsheet containing these worksheets:

- Welcome
- Network Configuration
- Server Group Configuration (1 to 3 worksheets)
- Preview

An Oracle representative typically completes the Oracle Big Data Appliance Configuration Utility from information provided by the customer in the *Oracle Big Data Appliance Configuration Worksheets*. The customer and the Oracle representative work together to ensure that Oracle Big Data Appliance is configured correctly. For the sequence of steps involved in the configuration, see the *Oracle Big Data Appliance Configuration Worksheets*.

Using the Oracle Big Data Appliance Configuration Utility

This section explains how to use the Oracle Big Data Appliance Configuration Utility. It contains these topics:

- [Using OpenOffice Spreadsheet](#)
- [Generating the Configuration Files](#)
- [About the Configuration Files](#)

Using OpenOffice Spreadsheet

You must use Apache OpenOffice Spreadsheet 3.4 or Oracle Open Office Calc 3.3 to configure the spreadsheet. Do not use other spreadsheet programs like Microsoft Office Excel, which can modify the spreadsheet but not generate the files.

To obtain the Oracle Big Data Appliance Configuration Utility, refer to My Oracle Support Information Center ID 1445745.2.

To open the Oracle Big Data Appliance Configuration Utility:

1. Download OpenOffice from this website and follow the instructions for installing it:
<http://www.openoffice.org/>
2. Open Apache OpenOffice Spreadsheet.
3. From OpenOffice Spreadsheet, open the `bda_configurator.ods` file. If the current settings do not allow macros, you see a message.
4. To change the macro setting:
 - a. From the Tools menu, choose **Options**.
 - b. In the navigation tree, expand the OpenOffice.org folder and select **Security**.
 - c. In the right pane, click **Macro Security**.
 - d. Either lower the security level or enter a trusted source.
5. To turn off AutoCorrect:
 - a. From the Tools menu, choose **AutoCorrect Options**.
 - b. Select the **Options** tab.
 - c. Clear all check boxes, and then click **OK**.AutoCorrect settings can make it difficult for you to enter passwords.
6. Save your changes and reload the spreadsheet.
7. If you see a security warning, select **Enable Macros**.

Generating the Configuration Files

This procedure describes how to use the Oracle Big Data Appliance Configuration Utility to customize the default configuration settings for your installation. The other sections in this chapter provide detailed information about each field in the spreadsheet.

To generate the configuration files:

1. Open the spreadsheet with OpenOffice as described in the previous procedure.
2. On the Welcome page, choose the type of installation, then the layout of the servers from the drop-down menus. The layout choices vary depending on your choice of installation type.
3. Click **Next** to edit the Network Configuration sheet.

4. Enter the network configuration settings as specified in the *Oracle Big Data Appliance Configuration Worksheets*. If the server IP addresses are nonsequential, then you can enter them on the Preview page.
5. Click **Next**. If your changes are invalid, then you see an error message. You must correct the errors before continuing to the Server Group 1 sheet.

To discard your changes, click **Reset**.

6. Enter the software configuration settings as specified in the *Oracle Big Data Appliance Configuration Worksheets*. If the group of servers is being added to an existing cluster, then all settings disappear from view.
7. Depending on your choices on the Welcome sheet, you must complete 1 to 3 Server Group sheets. Click **Next** to see the next Server Group sheet.
8. Click **Preview** to view the configuration settings defined by your entries. To make any changes, either click **Previous**, click the tab for a particular sheet, or enter the changes manually on the Preview page. You must click Preview on the Software Configuration sheet for any generated changes to appear on the Preview sheet.
9. When you are satisfied with the configuration, click **Save Configuration** on the Preview sheet to generate the configuration files.

This step does not save the worksheet. To save your changes, click the **Save** icon.

10. Choose a location for the configuration files in the Select Path dialog box. The files are created in a directory named `bda-customer_name/rack_name` in that location, such as `bda-Example Inc/bda1`.
11. If you are configuring a single rack or part of a rack, then you are done. For a multirack cluster, complete the Network Configuration in a separate set of worksheets for each extension that is outside the primary rack.
12. Send the Installation Template to the network administrator to verify that the configuration is correct.
13. Send the final Installation Template, the hosts file, and the `preinstall-checkip.sh` script to the network administrator to prepare the network for the installation of Oracle Big Data Appliance.

About the Configuration Files

The Oracle Big Data Appliance Configuration Utility generates the following files to use when you configure the system. They are stored in a directory named `bda-customer_name/rack_name`, such as `bda-Example Inc/bda1`. If you configure multiple clusters for the rack, then the utility generates a directory for each one.

BdaDeploy.json

Contains the network configuration for a full rack, a starter rack, or a starter rack with one in-rack expansion kit. It contains information about all the servers, switches, and PDUs. Transfer this file to a USB drive for copying to Oracle Big Data Appliance. See ["Configuring the Network" on page 7-22](#).

BdaExpansion.json

Contains the network configuration for one or two in-rack expansion kits. It contains information about all the servers, but no information about the switches and PDUs. Transfer this file to a USB drive for copying to Oracle Big Data Appliance. See ["Configuring the Network" on page 7-22](#).

mammoth-rack_name.params

Contains all information for a server group provided in the spreadsheet, including the network configuration, port numbers, default user names, and passwords. The spreadsheet creates a separate parameter file for each cluster. If several clusters are being configured, then each parameter file is located in a separate subdirectory named *config/cluster_name*. Transfer the files to a USB drive for copying to Oracle Big Data Appliance. See "[Installing the Software on a New Rack](#)" on page 10-4.

If an in-rack expansion kit is being configured as an addition to an existing cluster, then the spreadsheet does not generate a parameter file. The Mammoth utility generates it.

rack_name-bda-install-template.pdf

Reproduces the Installation Preview page of the spreadsheet in a printable format. The network administrator and others can use this Installation Template to verify the settings and make any last minute corrections.

rack_name-hosts

Lists the IP addresses and domains for all hosts on all networks:

- Servers on the public (client) network
- Servers on the administrative network
- Servers on the private (InfiniBand) network
- Oracle ILOMs on the administrative network
- Switches and PDUs on the administrative network

rack_name-preinstall-checkip.sh

Runs a series of tests to ensure the specified names and IP addresses for Oracle Big Data Appliance were added correctly to the name server, and they do not conflict with the existing network configuration. See "[Preparing the Network for Oracle Big Data Appliance](#)" on page 3-9 for instructions on running this script.

Figure 4-1 shows part of the first page of the Installation Template.

Figure 4–1 Installation Template

The screenshot shows the 'BDA Installation Preview' window with the title 'Big Data Appliance Configuration Utility'. The 'Network Configuration' tab is selected. Under the 'General' section, the following configuration is shown:

Cluster Name	bda
Rack Name	bda1
Region	America
Timezone	America/New_York
Domain	example.com

On the right, there are two rows of settings:

Customer Name	Example Inc
Primary Appliance	Yes

Below these are network server settings:

DNS Servers	172.16.100.45
NTP Servers	172.16.215.62
Search Domains	example.com us.example.com

The 'Server Network Info' section shows the following table:

Type	Netmask	Gateway
Administrative – eth0	255.255.255.0	10.18.113.1
Private – bondib0	255.255.255.0	
Client Access–bondeth0	255.255.255.0	10.18.114.1

A message on the right side of the window states: 'BDA will be not be connected to a'.

Welcome Page

You must identify the type of equipment being delivered to the customer site and the planned configuration. [Table 4–1](#) describes these options.

Table 4–1 General Properties for the Installation

Spreadsheet Field	Description
Type of Install	Lists various configurations, including a full rack, a starter rack, and one or two in-rack expansion kits. Your selection in this field restricts the list in Layout of Servers to applicable choices only.
Layout of Servers	Lists the available options for configuring groups of servers into CDH clusters. The number of groups controls the number of Server Group pages in the spreadsheet: one, two, or three.

Network Configuration

[Table 4–2](#) to [Table 4–6](#) briefly describe the fields in the Network Configuration sheet of the Oracle Big Data Appliance Configuration Utility. See the *Oracle Big Data Appliance Configuration Worksheets* for complete details.

[Table 4–2](#) describes the general rack properties.

Table 4–2 General Properties for the Rack

Spreadsheet Field	Description
Rack Name	The name of the Oracle Big Data Appliance rack.

Table 4–2 (Cont.) General Properties for the Rack

Spreadsheet Field	Description
Server Base Name	Base name for all servers. A two-digit suffix uniquely identifies each server.
	The rack name and server base name are used to generate the host names for all network interfaces: eth0, bondib0, bondeth0, and Oracle ILOM. For example, a cluster name of bda and a server base name of node results in host names of bda1node01, bda1node02, and so forth.
Admin Access Suffix	Suffix to the basic host name to form the bondeth0 host names
Private Name Suffix	Suffix to the basic host name to form the bondib0 host name
ILOM Name Suffix	Suffix to the basic host name to form the Oracle ILOM name
Switch Base Name	Suffix to the rack name to form the base name for all switches. For example, a rack name of bda and a switch base name of sw results in switch names of bda02sw-ip, bda02sw-ib1, and so forth.
Customer Name	Name of the enterprise. Required.
Region	Region in which the Oracle Big Data Appliance is located. Click the field, and then click the arrow for a list of regions.
Time Zone	Time zone for your installation. You must select a region before selecting the time zone. Click the field, and then click the arrow for a list of time zones for the region.
Domain Name	Name of the domain in which Oracle Big Data Appliance operates. Required.
Will this rack be connected via InfiniBand to other racks?	Choose Yes or No .

[Table 4–3](#) describes the network properties for the entire rack. If the site has isolated client and administrative networks with different DNS servers, NTP servers, or search domains, then complete this section for the client network and [Table 4–7](#) for the administrative network.

Table 4–3 Network Properties for the Rack

Spreadsheet Field	Description
DNS Servers	Up to four IP addresses for the Domain Name System (DNS) servers. At least one DNS server must be accessible on the client network. DNS servers are not required on the administrative network, although Oracle Big Data Appliance uses them if they are available.
NTP Servers	Up to four IP addresses for the Network Time Protocol (NTP) servers. Both the client network and the administrative network must have access to at least one NTP server. The NTP server for the administrative network can be different from the NTP server for the client network.
Search Domains	Up to four domain names in which Oracle Big Data Appliance operates, such as example.com and us.example.com

[Table 4–4](#) describes the network properties for individual servers in the rack. You specify the IP addresses assigned to node01. Sequential numbers are assigned automatically to the other servers. Ensure that an adequate range of addresses is free for each type of access. If sequential IP addresses are not available for the servers, then you can edit the Preview page.

Table 4–4 Network Properties for Servers

Spreadsheet Field	Description
Administrative - eth0	First IP address of 18 from the administrative network
Private - bondib0	First IP address of 18
Client Access - bondeth0	First IP address of 18 from the client access network
ILOM	First IP address of 18 from the administrative network

[Table 4–5](#) describes the network properties for all switches. You configure the switches manually, as described in [Chapter 7](#). If three sequential IP addresses are not available for the InfiniBand switches, then you can edit the Preview page.

Table 4–5 Network Properties for Switches

Spreadsheet Field	Description
KVM Switch IP	IP address of the KVM switch. Not applicable to Oracle Big Data Appliance X3-2, which does not have a KVM switch.
Cisco Switch IP	IP address of the Cisco switch
First InfiniBand Switch IP	First IP address of three for the InfiniBand switches

[Table 4–6](#) describes the network properties for the power distribution units (PDUs). You configure the PDUs manually, as described in [Chapter 7](#).

Table 4–6 Network Properties for Power Distribution Units

Spreadsheet Field	Description
PDU A	IP address of the first power distribution unit
PDU B	IP address of the second power distribution unit

[Table 4–7](#) describes the network properties for the administrative network if they are different from the client network. Typically, these properties are the same for both networks, and you can leave these fields blank. They default to the values you entered for the general network properties. See [Table 4–3](#).

Table 4–7 Advanced Network Configuration Properties

Spreadsheet Field	Description
Admin Domain	The administrative domain name, if it is different from the domain you identified in the general rack properties.
Are administrative host name entries in the DNS?	Choose Yes or No .
Admin DNS Servers	Up to four IP addresses for the administrative Domain Name System server, if the addresses are different from those you provided for the general network properties.
Admin NTP Servers	Up to four IP addresses for the administrative Network Time Protocol server, if the addresses are different from those you provided for the general network properties.
Admin Search Domains	Up to four domain names in which Oracle Big Data Appliance administrative network operates, if the domains are different from those you provided for the general network properties.

Software Configuration

You can configure a group of servers as a CDH cluster, an Oracle NoSQL Database cluster, or an add-in to an existing cluster. You also have the option of leaving a group of servers unconfigured. Your selection of a cluster type affects the other software choices shown in the spreadsheet:

- CDH cluster: Fields for configuring Oracle NoSQL Database database are removed from view.
- Oracle NoSQL Database: Fields for configuring Oracle Big Data Connectors, MySQL Database, and Cloudera Manager are removed from view.
- Add-on to an existing cluster or not configured: All other fields are removed from view; there are no software configuration choices.

[Table 4–8](#) to [Table 4–12](#) briefly describe all fields in the Software Configuration sheet of the Oracle Big Data Appliance Configuration Utility.

[Table 4–8](#) describes the optional software available for Oracle Big Data Appliance. If you have a license for Oracle Big Data Connectors, then you can install the software. For more information about these components, see the *Oracle Big Data Appliance Software User's Guide*.

Table 4–8 Installed Components

Spreadsheet Field	Description
This group of servers is	You can create a new CDH (Hadoop) cluster, an Oracle NoSQL Database cluster, or add more servers to an existing cluster. If you are adding more servers to an existing cluster or not configuring the servers at this time, then you are done with the software configuration.
Cluster name	The name of the cluster is required information.
Are Big Data Connectors licensed?	Oracle Big Data Connectors facilitate data access between data stored in the CDH cluster and Oracle Database. The connectors require a separate license. If you have a license, choose Yes .
Install Oracle Data Integrator Agent?	The agent is a required component of Oracle Data Integrator, which is a graphical tool for performing extraction, transformation, and loading (ETL) of data into Oracle Database. To configure Oracle Data Integrator for use immediately, choose Yes .
Oracle NoSQL Database Edition?	For Oracle NoSQL Database clusters, choose Community Edition or, if you have a license, Enterprise Edition .

[Table 4–9](#) describes the options for Auto Service Request (ASR). This service monitors the health of Oracle Big Data Appliance hardware. ASR Manager automatically submits a service request to Oracle Support Services when it detects a fault. See [Chapter 5](#) for more information about ASR.

Table 4–9 Oracle Auto Service Request

Spreadsheet Field	Description
Enable Auto Service Request?	Although you can opt out of this service, Oracle strongly recommends that you enable ASR by choosing Yes .
ASR Manager Host	The fully qualified name of a Linux server on the network, where ASR will be installed
ASR Manager Port	The port number for ASR Manager. The default port is 162.

Table 4–9 (Cont.) Oracle Auto Service Request

Spreadsheet Field	Description
ASR Server Root Password	Password for root on the ASR Manager host

Table 4–10 identifies the users, groups, and passwords that can be set during the software installation. If you leave the passwords blank, then the installation prompts for them. The Oracle IDs must match those of a connected Oracle Exadata Database Machine to support the network file system (NFS) protocol.

Table 4–10 Users, Groups, and Passwords

Spreadsheet Field	Description
Cloudera Manager admin password	The password for the admin user for Cloudera Manager
root operating system password	The root password on all servers in the cluster.
oracle operating system password	The oracle password on all servers in the cluster. Oracle applications run under this identity.
oracle user ID	The ID number of the oracle user. It must match the oracle user ID of a connected Oracle Exadata Database Machine.
oinstall group ID	The ID number of the Oracle Inventory Group (oinstall). It must match the oinstall group ID of a connected Oracle Exadata Database Machine.
dba group ID	The ID number of the dba group. It must match the dba group ID of a connected Oracle Exadata Database Machine.
MySQL administration password	The password for the MySQL Database administrative user
MySQL password for Oracle Data Integrator	The password for the Oracle Data Integrator user in MySQL Database

Table 4–11 describes the configuration settings for the email server that Cloudera Manager uses to send alerts from the CDH cluster.

Table 4–11 Cloudera Manager Email Alerts

Spreadsheet Field	Description
Email Server (SMTP) Host	The fully qualified name of the existing SMTP server that the company uses on its internal network
Email Server (SMTP) Port	The port number used by the email server
Email Server uses authentication?	Choose Yes or No .
Email Server (SMTP) User Name	User name for Cloudera Manager to use for authentication on the SMTP server. This field is hidden when authentication is set to No.
Email Server (SMTP) Password	Password for the user name. This field is hidden when authentication is set to No.
Email Server uses SSL?	Choose Yes or No .
Email Alert Recipients	Up to four email addresses. These users receive the alerts from Cloudera Manager.

Table 4–12 describes the configuration settings for the Oracle Enterprise Manager system monitoring plugin for Oracle Big Data Appliance.

Table 4–12 Oracle Enterprise Manager Cloud Control

Spreadsheet Field	Description
Enable Enterprise Manager?	To use the Oracle Enterprise Manager system monitoring plugin, choose Yes .
Cloud Control host	The fully qualified name of the server where Oracle Enterprise Manager is installed with the plugin for Oracle Big Data Appliance.
Cloud Control user name	A Cloud Control user with super-administrative privileges to perform administrative <code>emcli</code> commands. Typically, this user is <code>sysman</code> .
Cloud Control password	Password for the Cloud Control user name.
Cloud Control registration password	The Enterprise Manager agent registration password for validating the Oracle Management agents on Oracle Big Data Appliance.
Cloud Control DBA SYS password	The <code>SYS</code> password for the Cloud Control repository.
OMS port	The port number for the Oracle Enterprise Manager Cloud Control web interface.
OMS upload port	The HTTP upload port number for Oracle Enterprise Manager Cloud Control web interface.

Setting Up Auto Service Request

This chapter explains how to install and configure Auto Service Request for Oracle Big Data Appliance. It contains these sections:

- [Understanding Auto Service Request](#)
- [Getting Ready to Install ASR](#)
- [Installing ASR Manager](#)
- [Verifying the ASR Manager Installation](#)
- [Configuring the Trap Destinations on Oracle Big Data Appliance](#)
- [Verifying ASR Assets](#)
- [Validating Auto Service Request on Oracle Big Data Appliance](#)
- [Troubleshooting ASR](#)

Understanding Auto Service Request

Auto Service Request (ASR) is designed to automatically open service requests when specific Oracle Big Data Appliance hardware faults occur. ASR detects faults in the most common server components, such as disks, fans, and power supplies, and automatically opens a service request when a fault occurs. ASR monitors only server components and does not detect all possible faults.

ASR is not a replacement for other monitoring mechanisms, such as SMTP and SNMP alerts, within the customer data center. It is a complementary mechanism that expedites and simplifies the delivery of replacement hardware. ASR should not be used for downtime events in high-priority systems. For high-priority events, contact Oracle Support Services directly.

When ASR detects a hardware problem, ASR Manager submits a service request to Oracle Support Services. In many cases, Oracle Support Services can begin work on resolving the issue before the administrator is even aware the problem exists.

An email message is sent to both the My Oracle Support email account and the technical contact for Oracle Big Data Appliance to notify them of the creation of the service request.

A service request may not be filed automatically on some occasions. This can happen because of the unreliable nature of the SNMP protocol or a loss of connectivity to ASR Manager. Oracle recommends that customers continue to monitor their systems for faults and call Oracle Support Services if they do not receive notice that a service request has been filed automatically.

See Also:

Oracle Auto Service Request web page at

<http://www.oracle.com/technetwork/systems/asr/overview/index.html>

Oracle Auto Service Request user documentation at

<http://www.oracle.com/technetwork/systems/asr/documentation/index.html>

Getting Ready to Install ASR

Before installing ASR, complete these prerequisites:

1. Create a My Oracle Support account at <http://support.oracle.com>.
2. Ensure that the following are set up correctly:
 - Oracle Premier Support for Systems, Oracle Premier Support for Operating Systems, or Oracle Limited Warranty
 - The technical contact person at the customer site who is responsible for Oracle Big Data Appliance
 - A valid shipping address at the customer site for Oracle Big Data Appliance parts
3. Identify and designate a system to host ASR Manager.

ASR Manager must be installed on a server that has connectivity to Oracle Big Data Appliance and an outbound Internet connection using HTTPS or an HTTPS proxy. To submit a service request (SR), the server must be able to access the Internet.

4. ASR Manager uses the following ports for normal operations. Ensure that the Oracle Big Data Appliance and ASR Manager server ports are open:
 - All Oracle Big Data Appliance servers must have port 6481 open for HTTP-based asset activation requests that they receive from ASR Manager.
 - The server running ASR Manager must have port 162 open for SNMP-based telemetry messages that the Oracle Big Data Appliance servers send to it.
 - The Oracle `transport.oracle.com` web server has port 443 open for HTTPS-based telemetry messages that ASR Manager sends to it.

See [Figure 5-1](#) for the port locations.

5. Ensure that the designated system conforms to the "Hardware and Network Configuration Recommendations for ASR." See the Oracle ASR website:

<http://www.oracle.com/technetwork/systems/asr/overview/hardware-recommendations-330108.html>
6. Confirm that Java Development Kit 6 (JDK 1.6.0_04 or later) is running on the designated ASR Manager system:

```
java -version
```

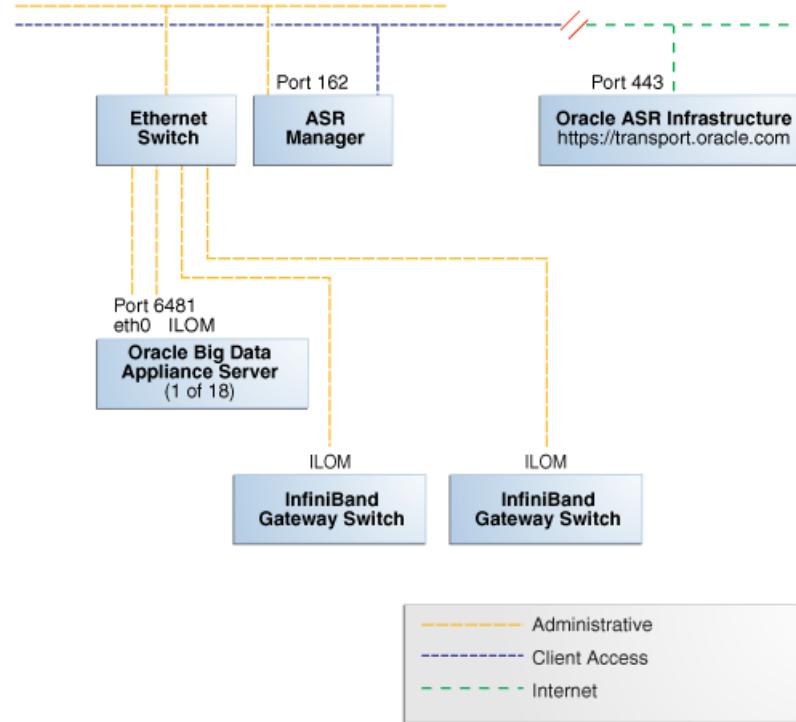
If necessary, download and install the latest version of JDK from the Java SE Downloads website:

<http://www.oracle.com/technetwork/java/javase/downloads/index.html>

7. Obtain root access to the designated ASR Manager host.
8. Identify and verify connectivity to Oracle Big Data Appliance.
9. Verify connectivity to the Internet using HTTPS.

Figure 5–1 shows the network connections between ASR and Oracle Big Data Appliance.

Figure 5–1 Auto Service Request Network Connections



Installing ASR Manager

To install ASR Manager, download version 3.6 or higher from My Oracle Support ID 1185493.1. Then follow the instructions in the *Oracle Auto Service Request Installation and Operations Guide* at

<http://www.oracle.com/technetwork/systems/asr/documentation/index.html>

Verifying the ASR Manager Installation

Perform these checks on ASR Manager to ensure that it is installed properly:

- As the `root` user, verify that the ASR installer created three CRON jobs:

```
crontab -l
```

The following are the recommended settings:

- `asr report`: Set once a month on Sunday
- `asr heartbeat`: Set twice daily or at least once daily
- `asr update_rules.sh`: Set once daily by default
- Verify that ASR Manager 3.5 or later is running:

```
asr show_rules_version
```

- Check the registration status:


```
asr show_reg_status
```
- Test the connection by sending a test message to the transport server.


```
asr test_connection
```

Configuring the Trap Destinations on Oracle Big Data Appliance

ASR is an optional software component of Oracle Big Data Appliance. When planning the initial software configuration, you must complete the section about ASR in the *Oracle Big Data Appliance Configuration Worksheets*. Then during the software installation, Oracle Big Data Appliance Mammoth Utility configures the servers to trap the component fault indicators. See ["Mammoth Installation Steps" on page 10-17](#).

You can reconfigure your appliance at any time to add or drop support for ASR. See ["Changing the Configuration of Optional Software" on page 10-8](#).

Verifying ASR Assets

To verify the ASR assets:

1. In ASR Manager, verify that ASR is activated:

```
asr list_asset -i asset_ip
```

In the preceding command, *asset_ip* is the IP address of a server or an Oracle ILOM. To list all assets, enter this command:

```
asr list_asset
```

The following is an example of the output. You should see a host name and an Oracle ILOM name for each of the servers, for a total of 12, 24, or 36 activations. If you see fewer, then identify the missing ones and activate them. An example of a server name is *bda1node15* and an Oracle ILOM name is *bda1node15-c*.

ADDRESS	HOST_NAME	SERIAL_NUMBER	ASR	PRODUCT_NAME
203.0.114.44	bda1node15	1143FMM023	Enabled	SUN FIRE X4270 M2 SERVER...
203.0.115.139	bda1node15-c	1143FMM073	Enabled	SUN FIRE X4270 M2 SERVER...
203.0.114.45	bda1node16	1143FMM021	Enabled	SUN FIRE X4270 M2 SERVER...
203.0.115.140	bda1node16-c	1143FMM063	Enabled	SUN FIRE X4270 M2 SERVER...
203.0.114.46	bda1node17	1143FMM021	Enabled	SUN FIRE X4270 M2 SERVER...
203.0.115.141	bda1node17-c	1143FMM46B	Enabled	SUN FIRE X4270 M2 SERVER...

2. If no assets are listed, then verify that ASR is configured on Oracle Big Data Appliance. Log in to the first server and enter this command:

```
# cat /opt/oracle/BDAMammoth/mammoth-rack_name.params | grep ASR
```

The following output shows that ASR has not been configured.

```
ASR_ENABLED=false
SETUP_ASR_SERVER=false
ASR_HOST=
ASR_PORT=162
ASR_SERVER_PWD=
```

To configure ASR, see ["Changing the Configuration of Optional Software" on page 10-8](#).

Note: If an IP address or host name changes, then you must deactivate and reactivate the asset.

Validating Auto Service Request on Oracle Big Data Appliance

To validate the ASR installation, you can generate test events.

To set up a test event on Oracle ILOM:

1. Log in to the Oracle ILOM of any server in Oracle Big Data Appliance.
2. Change to the following directory:
-> cd /SP/alertmgmt/rules/3
3. Enter this command:
-> show

The following information is displayed:

```
/SP/alertmgmt/rules/3
Targets:
Properties:
  type = snmptrap
  level = disable
  destination = 0.0.0.0
  destination_port = 0
  community_or_username = public
  snmp_version = 1
  testrule = (Cannot show property)

Commands:
  cd
  set
  show
```

4. Ensure that the properties have valid values, not blank or set to zeros as shown in Step 3. Use the appropriate IP address and port for your site.
5. Set the test trap:
-> set testrule=true
6. You should receive an email about the event. Verify that an email was also sent to the address listed in your customer support identifier (CSI) for Oracle Big Data Appliance.

To set up a test in the operating system environment:

1. Log in to any server on Oracle Big Data Appliance.
2. Enter this command to validate the operating system.
./opt/oracle/bda/compmon/bda_mon_hw_asr.pl -validate_snmp_subscriber -type asr

The sample output shows 10.10.10.123:162 as the ASR Manager address:

Sending test trap to destination - 10.10.10.123:162

3. Verify that an email about the event was sent to you and to the address listed in your customer support identifier (CSI) for Oracle Big Data Appliance.

This test event does not open a case, but it makes a verifiable entry in the ASR back end.

You received the emails from both of the previous tests (Oracle ILOM and operating system environment), then your validation is complete. If not, then proceed to ["Troubleshooting ASR" on page 5-6](#).

If the emails state that there are contract issues, contact your installation coordinator for further assistance.

Troubleshooting ASR

For troubleshooting procedures for the ASR software, see Chapter 5 of the *Oracle ASR Installation and Operations Guide* at:

<http://www.oracle.com/technetwork/systems/asr/documentation/index.html>

If you continue to have issues, contact ASR support. See My Oracle Support Note 1352349.1.

Part II

Hardware Installation and Configuration

An Oracle field engineer typically installs and configures the hardware components of Oracle Big Data Appliance. You must follow these instructions only if you plan to install and configure Oracle Big Data Appliance yourself.

Part II contains the following chapters:

- [Chapter 6, "Installing Oracle Big Data Appliance at the Site"](#)
- [Chapter 7, "Configuring an Oracle Big Data Appliance Full Rack or Starter Rack"](#)
- [Chapter 9, "Connecting Multiple Oracle Big Data Appliance Racks"](#)

Installing Oracle Big Data Appliance at the Site

This chapter describes how to move, install, and configure the hardware—from unpacking Oracle Big Data Appliance to powering on the system. This chapter contains these sections:

- [Reviewing Safety Guidelines](#)
- [Unpacking Oracle Big Data Appliance](#)
- [Placing Oracle Big Data Appliance in Its Allocated Space](#)
- [Powering On the System for the First Time](#)

Reviewing Safety Guidelines

Before Oracle Big Data Appliance arrives, review the following safety precautions to ensure that the site is safe and ready for delivery. Failing to observe these precautions can result in injury, equipment damage, or malfunction.

- Do not block ventilation openings.
- Do not install Oracle Big Data Appliance in a location that is exposed to direct sunlight or near a device that may become hot.
- Do not install Oracle Big Data Appliance in a location that is exposed to excessive dust, corrosive gases, or air with high salt concentrations.
- Do not install Oracle Big Data Appliance in a location that is exposed to frequent vibrations. Install it on a flat, level surface.
- Use a power outlet that provides proper grounding. For shared grounding, the grounding resistance must not be greater than 10 ohms. Ensure that your facility administrator or a qualified electrical engineer verifies the grounding method for the building and performs the grounding work.
- Be sure that each grounding wire used for Oracle Big Data Appliance is used exclusively for Oracle Big Data Appliance. Observe the precautions, warnings, and notes about handling that appear on labels on the equipment.
- Do not place cables under the equipment or stretch the cables tightly.
- Do not disconnect power cords from the equipment while its power is on.
- If you cannot reach the connector lock when disconnecting LAN cables, then press the connector lock with a flathead screwdriver to disconnect the cable. You could damage the system board if you force your fingers into the gap rather than using a flathead screwdriver.

- Do not place anything on top of Oracle Big Data Appliance or perform any work directly above it.
- Do not let the room temperature rise sharply, especially in winter. Sudden temperature changes can cause condensation to form inside Oracle Big Data Appliance. Allow for a sufficient warm-up period before operation.
- Do not install Oracle Big Data Appliance near a photocopier, air conditioner, welding machine, or any other equipment that generates loud, electronic noises.
- Avoid static electricity at the installation location. Static electricity transferred to Oracle Big Data Appliance can cause malfunctions. Static electricity is often generated on carpets.
- Confirm that the supply voltage and frequency match the electrical ratings indicated for Oracle Big Data Appliance.
- Do not insert anything into any Oracle Big Data Appliance opening, unless doing so is part of a documented procedure.

WARNING: Oracle Big Data Appliance contains high-voltage parts. If a metal object or other electrically conductive object enters an opening in Oracle Big Data Appliance, then it could cause a short circuit. This could result in personal injury, fire, electric shock, and equipment damage.

- When using single-phase power distribution units (PDUs), note the following:
 - PDU A input 0 and PDU B input 2 must be on the same phase.
 - PDU A input 1 and PDU B input 1 must be on the same phase.
 - PDU A input 2 and PDU B input 0 must be on the same phase.

The inputs are labeled where they come out of the PDU. Connecting cables as described ensures that the phases are balanced on both sides, A and B, in a failover.

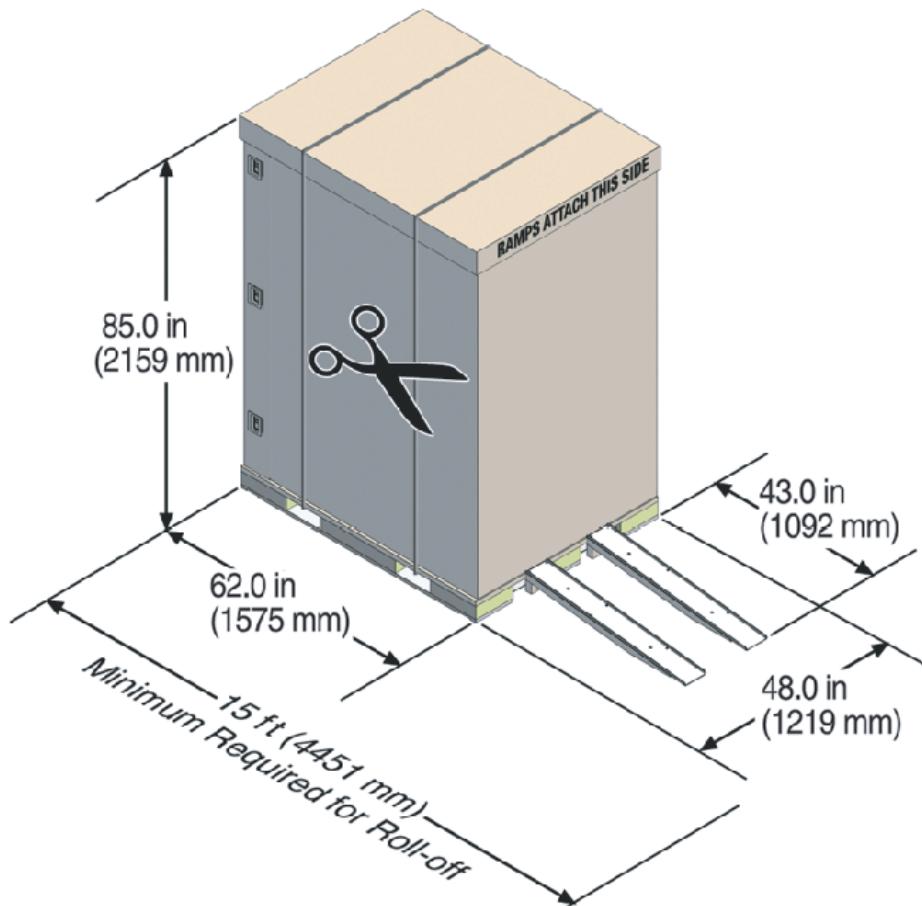
See Also:

- *Important Safety Information for Sun Hardware Systems* (816-7190) included with the rack and available online at
<http://docs.oracle.com/cd/E19115-01/mod.dc.d20/816-7190-12/816-7190-12.pdf>
- *Oracle Big Data Appliance Safety and Compliance Guide* and all safety notices printed on the packaging
- *Sun Rack II Power Distribution Units User's Guide* at
<http://docs.oracle.com/cd/E19844-01/>

Unpacking Oracle Big Data Appliance

You should determine the unpacking location during the site planning process. See [Chapter 2](#).

[Figure 6–1](#) shows the Oracle Big Data Appliance shipping crate.

Figure 6–1 Oracle Big Data Appliance in the Shipping Crate

See Also: *Sun Rack II Unpacking Guide* for additional information about unpacking the rack. The guide is available at

<http://docs.oracle.com/cd/E19844-01/index.html>

Contents of the Shipping Kit

The shipping kit contains the following tools and equipment to install and service Oracle Big Data Appliance:

- 16 mm long No. 2 Phillips screw
- T30 Torx cranked wrench key
- T25 Torx cranked wrench key
- 6 mm hexagon Allen wrench key
- SW 12 mm single-headed wrench
- 2 square jumper brackets with 4 M5 Torx screws
- 2 cable management hooks with 4 spring nuts
- Side panel removal tool
- Keys to the front door, rear door, and side panel locks
- 32 M6 cage nuts

- 32 M6 screws
- Cage nut mounting tool
- SW 17 mm single-headed wrench is included on the shipping pallet

Note: The following items are not included in the shipping kit:

- No. 2 Phillips screwdriver
- Antistatic wrist strap

Removing Oracle Big Data Appliance from the Shipping Crate

Note: Oracle strongly recommends that you use professional movers to unpack and install Oracle Big Data Appliance.

See Also: Sun Rack II unpacking instructions included with the packaging

To unpack Oracle Big Data Appliance:

1. Unpack Oracle Big Data Appliance carefully from the packaging and shipping pallet:
 - a. Remove the shipping carton bands.
 - b. Remove the yellow fasteners and carton top.
 - c. Remove the carton sides and inner top.

WARNING: Rocking or tilting the rack can cause it to fall over and cause serious injury or death.

2. Remove the shipping kit.
3. Attach the ramps to the shipping pallet as follows:
 - a. Remove the ramps from the pallet sides.
 - b. Obtain the parts bag from inside the cabinet.
 - c. Adjust the leveling bolts on the ramps and connect the ramps to the pallet wheel track.
4. Carefully roll Oracle Big Data Appliance off the shipping pallet as follows:
 - a. Unfasten the exterior mounting brackets from the pallet.
 - b. Unfasten the interior mounting brackets from the pallet. Use care when removing the mounting brackets from underneath Oracle Big Data Appliance. Access to the inside mounting brackets might be limited.
 - c. Roll the cabinet down the ramps to the level floor. Oracle recommends having three people available to move the rack down the ramp: one person on each side to help guide the rack and one person in back.

5. Save the mounting brackets that secure the rack to the shipping pallet. You can use these mounting brackets to permanently secure Oracle Big Data Appliance to the installation site floor.

Note: Do not dispose of these brackets, because you cannot order replacement brackets.

6. Recycle the packaging properly. Follow local laws and guidelines to dispose of the material.

Placing Oracle Big Data Appliance in Its Allocated Space

This section describes how to position, stabilize, and ground Oracle Big Data Appliance. This section contains the following topics:

- [Moving Oracle Big Data Appliance](#)
- [Stabilizing Oracle Big Data Appliance](#)
- [Attaching a Ground Cable \(Optional\)](#)

Moving Oracle Big Data Appliance

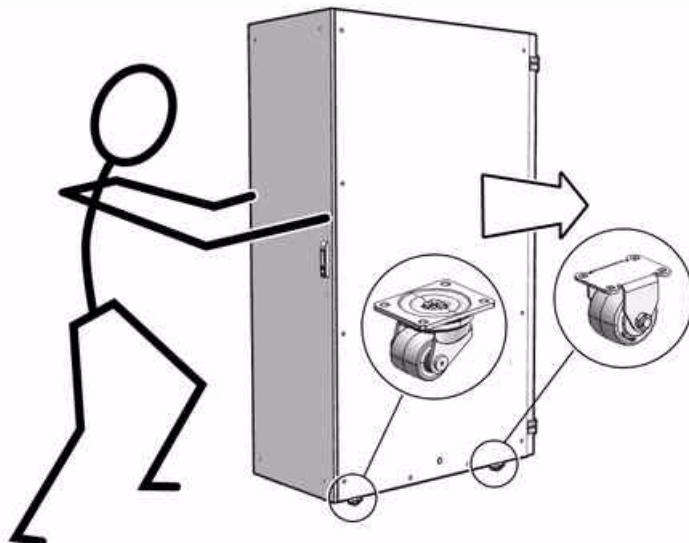
To move Oracle Big Data Appliance:

1. Ensure that the doors are closed and secured.
2. Ensure that the leveling and stabilizing feet on the rack are raised and out of the way.
3. Push Oracle Big Data Appliance from behind to the installation site.

When moving Oracle Big Data Appliance to the installation site, the front casters do not turn; you must steer the unit by moving the rear casters, as shown in [Figure 6-2](#). You can safely maneuver Oracle Big Data Appliance by carefully pushing it.

[Figure 6-2](#) shows the correct way to maneuver Oracle Big Data Appliance.

Figure 6-2 Carefully Push Oracle Big Data Appliance from Behind



Use two people to move the rack: one person in front and one person in back to help guide the rack. When transporting configured racks from one location to another, move them slowly -- 0.65 meters (2 feet) per second or slower.

Carefully examine the transportation path. Avoid obstacles such as doorways or elevator thresholds that can cause abrupt stops or shocks. Go around obstacles by using ramps or lifts to enable smooth transport.

WARNINGS:

- **Never attempt to move Oracle Big Data Appliance by pushing on the side panels. Pushing on the side panels can tip the rack over. This can cause serious personal injury or death, and also damage to the equipment.**
- **Never tip or rock Oracle Big Data Appliance because the rack can fall over.**

Stabilizing Oracle Big Data Appliance

After moving Oracle Big Data Appliance to the installation site, stabilize the rack to ensure that it does not move or tip over. You can stabilize the rack permanently by extending the rack leveling feet, using mounting brackets, or both.

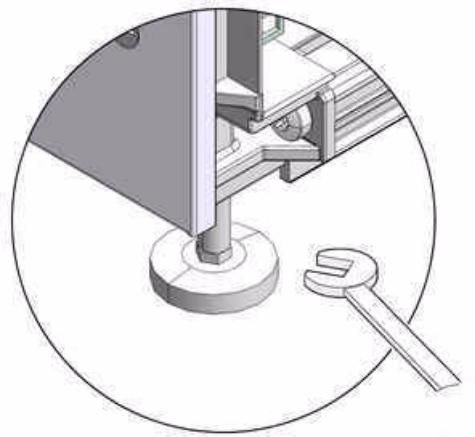
Stabilize the Oracle Big Data Appliance Rack with Leveling Feet

The rack contains four leveling feet that you can lower to stabilize the rack, even when it is permanently secured to the floor.

To adjust the leveling feet:

1. Locate the four leveling feet located at the bottom corners of the rack.
2. Lower the leveling feet to the floor as shown in [Figure 6-3](#) using the SW 12 mm wrench. When lowered correctly, the four leveling feet should support the full weight of the rack.

Figure 6-3 Stabilizing the Oracle Big Data Appliance Rack Using Leveling Feet



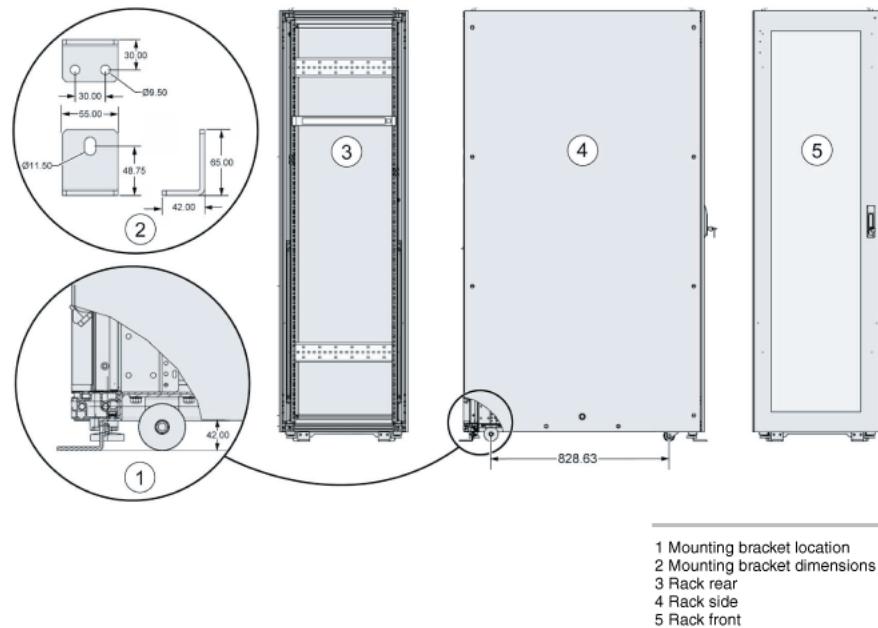
Stabilize the Oracle Big Data Appliance Rack with Mounting Brackets

You can permanently mount the rack to the installation site floor using the same four mounting brackets that secured the rack to the shipping pallet.

To install the mounting brackets:

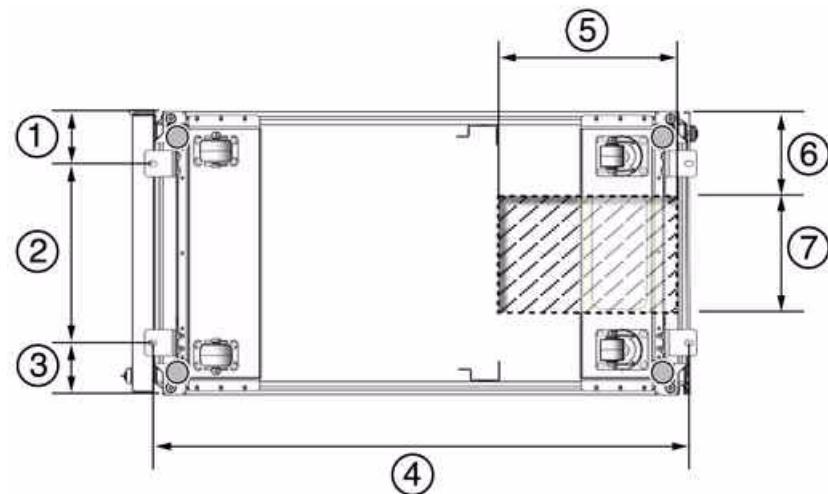
1. Drill the mounting holes in the installation floor. [Figure 6-4](#) shows the location and dimensions of the mounting brackets.

Figure 6-4 Location of Mounting Brackets on the Rack



2. Obtain four bolts and washers to mount the Oracle Big Data Appliance rack to the floor. The bolt holes in the mounting brackets have a 10.0 mm diameter. Oracle does not provide mounting bolts because different floors require different bolt types and strengths. Select bolts that are appropriate for your location.
3. Position the rack over the predrilled holes. [Figure 6-5](#) shows the bottom view of the Oracle Big Data Appliance rack and the location for the mounting hole and floor cut dimensions.

Figure 6-5 Bottom View of the Oracle Big Data Appliance Rack



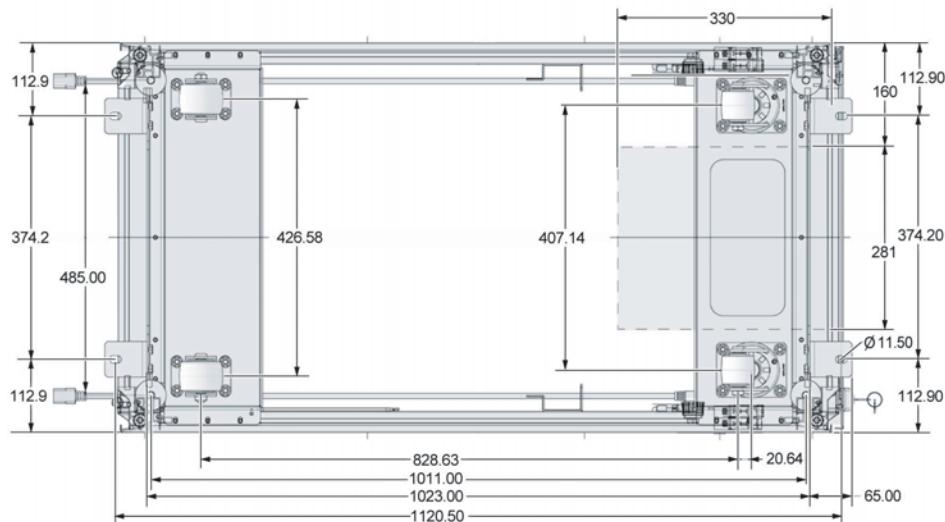
- 1: Distance from the center of the mounting bracket to the edge of the rack is 113 mm (4.45 inches).
- 2: Width between the centers of the mounting hole slots is 374 mm (14.72 inches).
- 3: Distance from the center of the mounting bracket to the edge of the rack is 113 mm (4.45 inches).
- 4: Distance between the centers of the front and rear mounting hole slots is 1120 mm (44.1 inches).
- 5: Depth of cable-routing floor cutout is 330 mm (13 inches).
- 6: Distance between the floor cutout and the edge of the rack is 160 mm (6.3 inches).
- 7: Width of cable-routing floor cutout is 280 mm (11 inches).

If you plan to route data or PDU power cords through the bottom of the rack, then you must cut a hole in the installation floor site. Cut a rectangle below the rear portion of the rack, between the two rear casters and behind the rear RETMA (Radio Electronics Television Manufacturers Association) rails.

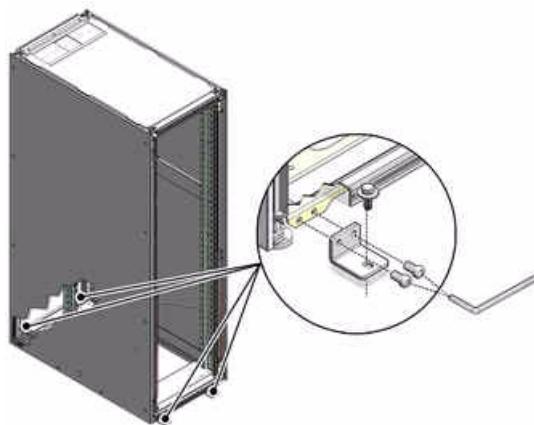
Caution: Do not create a hole where the rack casters or leveling feet brackets will be placed.

Figure 6–6 shows the base positions of the rack from the bottom.

Figure 6–6 Base Position of the Rack to Measure (in mm)



4. Open the front and rear doors.
5. Attach the mounting brackets to the rack as shown in [Figure 6-7](#) using a 6 mm hexagon Allen wrench key.

Figure 6-7 Securing the Oracle Big Data Appliance Rack Using Mounting Brackets

6. Using bolts and washers obtained in Step 2, permanently mount your system to the floor using the four mounting brackets shown in [Figure 6-7](#).
7. Firmly tighten all of the bolts that secure the mounting brackets to the rack and to the floor.

Attaching a Ground Cable (Optional)

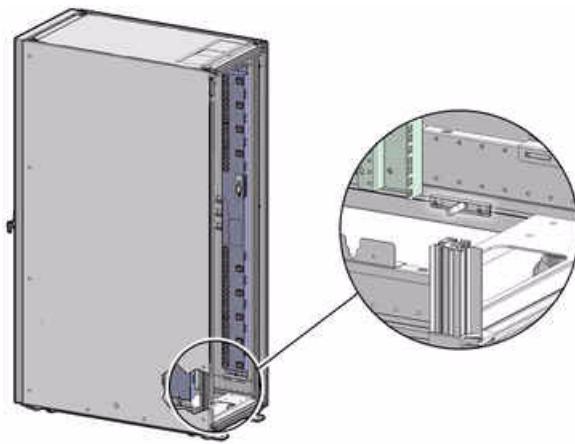
The Oracle Big Data Appliance rack power distribution units (PDUs) achieve earth ground through their power cords. Final chassis ground is achieved by way of the ground prong when you connect the power cord to a socket. For additional grounding, attach a chassis earth ground cable to the rack. The additional ground point enables electrical current leakage to dissipate more efficiently.

WARNING: The PDU power input lead cords and the ground cable must reference a common earth ground. If they do not, then a difference in ground potential can be introduced. If you are unsure of your facility's PDU receptacle grounding, then do not install a ground cable until you confirm that there is a proper PDU receptacle grounding. If a difference in ground potential is apparent, then you must take corrective action.

To attach a ground cable:

1. Obtain a grounding cable. It is not shipped with the system.
2. Ensure that the installation site has properly grounded the power source in the data center. The facility PDU must have earth ground.
3. Ensure that all grounding points, such as raised floors and power receptacles, reference the facility ground.
4. Ensure that direct, metal-to-metal contact is made for this installation. During manufacturing, the ground cable attachment area might have been painted or coated.
5. Attach the ground cable to an attachment point located at the bottom rear of the system frame, as shown in [Figure 6-8](#). The attachment point is an adjustable bolt that is inside the rear of the cabinet.

Figure 6–8 Earth Ground Attachment Bolt Location



Powering On the System for the First Time

Before powering on the system for the first time, you must inspect it and connect the power cords. This section contains the following topics:

- [Inspecting the Oracle Big Data Appliance Rack After It Is in Place](#)
- [Connecting Power Cords](#)
- [Powering On Oracle Big Data Appliance](#)

Inspecting the Oracle Big Data Appliance Rack After It Is in Place

This procedure describes how to visually examine the Oracle Big Data Appliance physical system after it is in place, but before power is supplied.

To inspect the Oracle Big Data Appliance rack:

1. Check the rack for damage.
2. Check the rack for loose or missing screws.
3. Check the rack for the ordered configuration. Refer to the Customer Information Sheet (CIS) on the side of the packaging.
4. Check that all cable connections are secure and firmly in place as follows:
 - a. Check the power cables. Ensure that the correct connectors have been supplied for the data center facility power source.
 - b. Check the network data cables.
5. Check the site location tile arrangement for cable access and airflow.
6. Check the data center airflow that leads into the front of the rack.

See Also: ["Ventilation and Cooling Requirements" on page 2-10](#) for more information

Connecting Power Cords

This procedure describes how to connect power cords to the Oracle Big Data Appliance rack.

To connect power cords to the rack:

1. Open the rear cabinet door.
2. Ensure that the correct power connectors have been supplied.
3. Unfasten the power cord cable ties. The ties are for shipping only and are no longer needed. See [Figure 6-9](#).
4. Route the power cords to the facility receptacles as shown in [Figure 6-10](#) or [Figure 6-11](#). You can route the power cords through the top or the bottom of the rack.
5. Secure the power cords in bundles.
6. Ensure that the breaker switches are OFF before connecting the power cables.
7. Plug the PDU power cord connectors into the facility receptacles.

Figure 6-9 Location of Power Cord Cable Ties

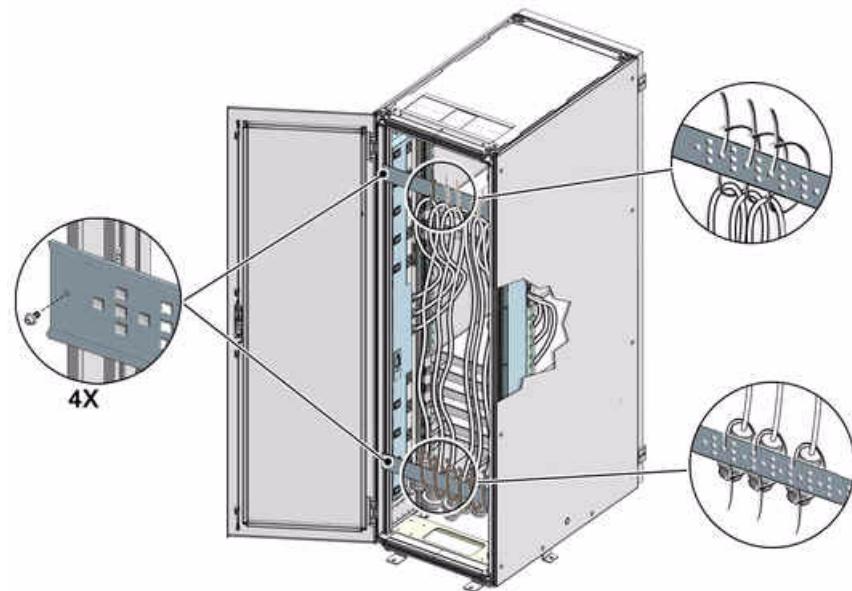


Figure 6–10 Power Cord Routing Out the Bottom

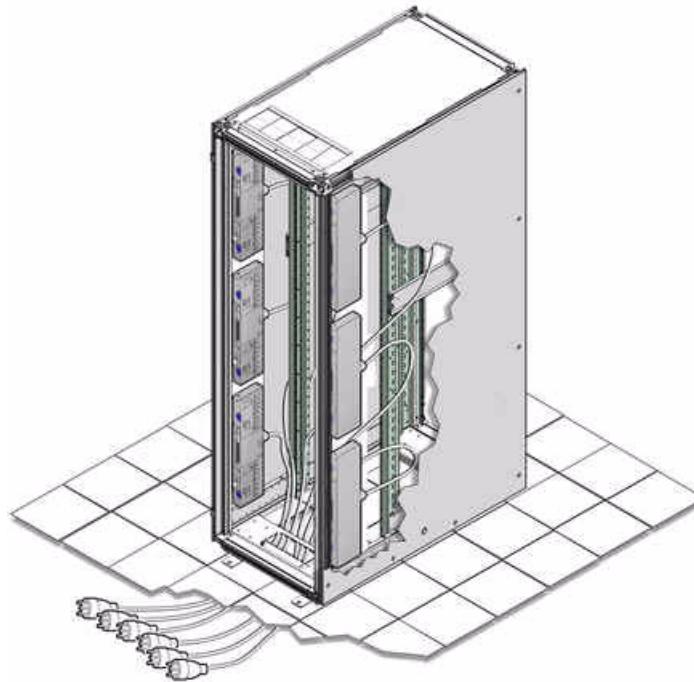
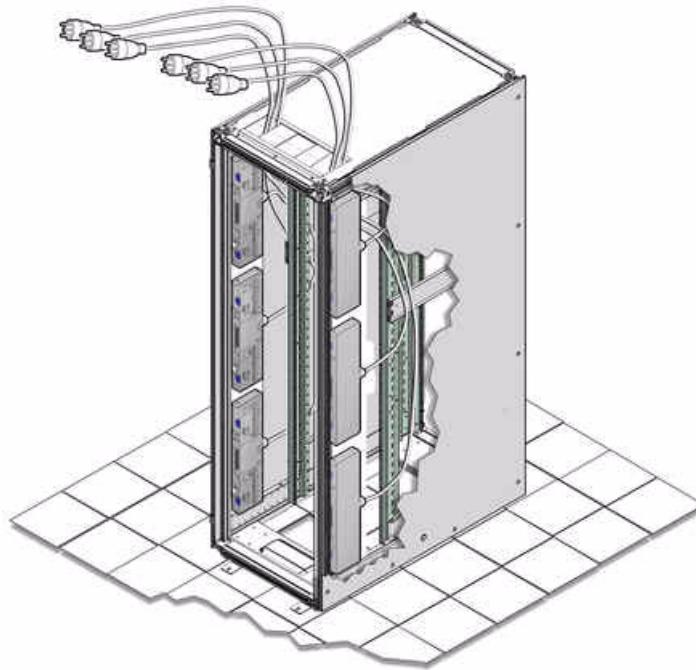


Figure 6–11 Power Cord Routing Out the Top



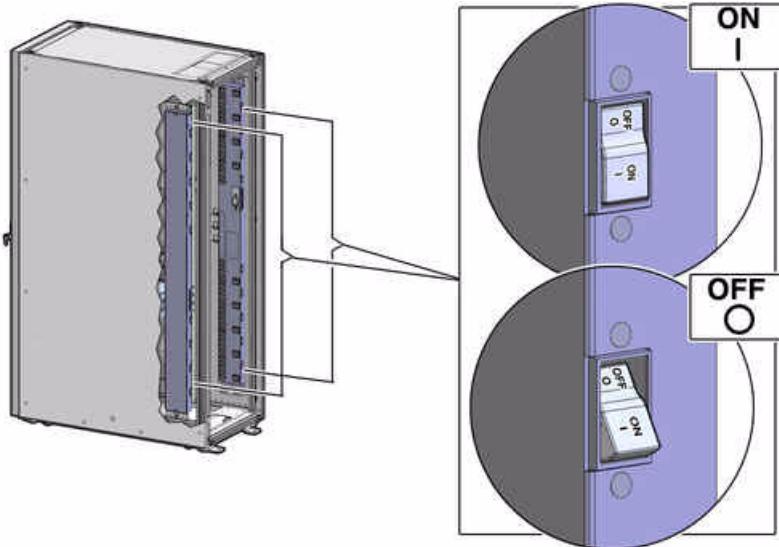
Powering On Oracle Big Data Appliance

Note: Oracle Big Data Appliance nodes may take up to 15 minutes to start through the normal BIOS POST tests.

To power up Oracle Big Data Appliance:

1. Switch on the PDU B circuit breakers, one at a time. PDU B is on the right side of the rack when viewed from the rear. The circuit breakers are on the rear of the rack as shown in [Figure 6-12](#). Press the ON (|) side of the toggle switch. When the breaker is ON, the switch is flush with the side of the PDU.

Figure 6-12 PDU Switch Locations



2. Verify that the expected power light-emitting diodes (LEDs) are on. The LEDs are located as follows:
 - Servers: Top LED
 - Cisco switch: Left LED (viewed from front) is green, and the other LEDs are red
 - InfiniBand switches: Right LED (viewed from front) labeled PS1
 - KVM switch: Lower LED B
 - KMM switch: Only supplied by PDU B
3. Connect power to PDU A. Ensure that the breaker switches are in the OFF position before connecting the power cables.

See Also: ["Reviewing Safety Guidelines"](#) on page 6-1 for information about single-phase PDUs and cabling

4. On single-phase systems, ensure that the following inputs are on the same phase:
 - PDU A Input 2 and PDU B Input 0
 - PDU A Input 1 and PDU B Input 1
 - PDU A Input 0 and PDU B Input 2
5. Switch on the PDU A circuit breakers one at a time.
6. Verify that the expected power LEDs are on throughout the rack.
7. Perform a visual check of all cable connections in the rack. Do not press every connector to verify connection.

8. Verify that the OK LED is blinking standby for all systems. The OK LED blinks every 3 seconds when in standby mode. It is dark for 2 to 3 minutes while Oracle ILOM is booting before going to standby mode.
9. If a system does not go into standby mode:
 - a. Connect a laptop to the service processor SET MGT port with baud settings of 115200,8,N,1.
 - b. At the pre-boot prompt, type boot.

Each time the system restarts, a file is generated in the root directory with the results of the validation check. The file is named either BDA_REBOOT_SUCCEEDED or BDA_REBOOT_FAILED, depending on the success or failure of the validation checks.

Note: After powering on Oracle Big Data Appliance, configure the system as described in [Chapter 7](#).

Configuring an Oracle Big Data Appliance Full Rack or Starter Rack

This chapter describes how to configure the system, accounts, and software for an Oracle Big Data Appliance full rack or starter rack.

This chapter contains the following sections:

- [Configuring the KVM Switch](#)
- [Configuring the Cisco Ethernet Switch](#)
- [Configuring the InfiniBand Leaf and Spine Switches](#)
- [Configuring the Power Distribution Units](#)
- [Configuring the Oracle Big Data Appliance Servers](#)
- [Configuring the Network](#)

See Also:

- [Chapter 8, "Configuring an Oracle Big Data Appliance In-Rack Expansion Kit"](#)
- [Chapter 13, "Using the dcli Utility"](#)
- [Chapter 14, "Using Oracle Integrated Lights Out Manager"](#)

Note:

- You must have the Installation Template to complete these procedures. It identifies the IP addresses and names of the servers and switches required by the manual configuration steps.
- Oracle recommends that an Oracle field engineer performs the configuration steps described in this chapter.

Configuring the KVM Switch

A KVM switch is provided only in Oracle Big Data Appliance racks with Sun Fire X4270 M2 servers. Oracle Big Data Appliance X3-2 does not have a KVM switch.

The KVM configuration consists of these procedures:

- [Starting the KVM Switch](#)
- [Connecting the KVM Switch to the Management Network](#)

- [Checking the KVM Firmware Version](#)
- [Configuring the KVM Switch to Access the Servers](#)
- [Accessing a Server by Using the KVM Switch](#)

Starting the KVM Switch

To start the KVM switch:

1. Ensure that all connected components are powered off.
2. Pull the KVM tray out from the front of the rack, and open it using the handle.
3. Touch the touch pad.
4. Toggle between the host and KVM interface by pressing the Ctrl key on the left side twice, similar to double-clicking with a mouse. You see the main user interface page.
5. In the navigator on the left, select **Target Devices** under Unit View. In the main display area, verify that 18 target devices are listed with Action set to KVM Session.

The sessions are numbered from the bottom of the rack to the top.

6. If 18 sessions are not shown:
 - a. In the navigator under Appliances, expand Ports, and then select **IQ Adaptors**.
 - b. In the main display area, choose the **Port** table heading to sort the sessions by port number.
 - c. Note any missing sessions, so that you can fix them later.
 - d. In the navigator, choose **Target Devices** to return to the Target Devices page.

Connecting the KVM Switch to the Management Network

To connect the KVM switch to the management network:

1. In the navigator under User Accounts, select **Local**.
2. Under Users, choose **Admin**.
3. Set the password for the Admin account to `welcome1`, and then choose **Save**. Do not modify any other parameters.
4. Under Appliance Settings, expand Network, and then choose **IPv4**. The Network Information page appears.
5. Enter values for Address, Subnet, and Gateway, and then choose **Save**.
6. Under Appliance Settings, choose **DNS** to display the DNS Information page.
7. Enter the IP addresses of the DNS servers, and then choose **Save**.
8. Under Network, choose **General** to display the Appliance General Network Settings page.
9. Connect the KVM LAN1 Ethernet port to the management network.
10. To verify that the port has been configured correctly, ensure that the Media Access Control (MAC) address on the Network Settings page matches the label next to the LAN1/LAN2 ports at the rear of the KVM switch.

11. Under Users, select **Overview** to display the Unit Maintenance page.
12. Enter a name for the KVM switch, and then choose **Save**.
13. To restart the KVM switch, choose **Reboot** under Overview and **Yes** to confirm.

Checking the KVM Firmware Version

You may need to upgrade the KVM firmware to the recommended version.

To check the KVM firmware version:

1. In the navigator under Appliance Settings, select **Versions**. There are two version numbers, Application and Boot. Compare the displayed versions with these recommended versions:
 - Application: 1.10.2.17762
 - Boot: 1.9.16473

If the application firmware version is earlier than 1.10.2, then you should upgrade it. To upgrade the firmware, continue with this procedure. Otherwise, you are done.

2. Download the firmware from this website to a USB flash drive:

<http://www.avocent.com/Pages/GenericTwoColumn.aspx?id=12541>

3. Plug the flash drive into the KVM USB port and open a browser session.
4. Log in to the KVM as `Admin` with password `welcome1`.
5. Under Appliance, select **Overview**.
6. From the Tools list, select **Upgrade Firmware**.
7. Select the connection method, such as **FTP** or **HTTP**.
8. Enter the file name of the downloaded firmware.
9. Click **Upgrade**.

The upgrade process takes 5 to 10 minutes, including an automatic restart.

10. Confirm the firmware version by selecting **Versions** under Appliance Settings.

Configuring the KVM Switch to Access the Servers

To configure the KVM switch to access the servers:

1. Under Unit View, select **Target Devices** to display the Target Devices page.
2. Start up the server. The power button is on the front panel.
3. Click the server name in the Name column to display the Unit Overview page.
4. Click **Overview** and overwrite the name with the Oracle standard naming format of customer prefix, node type, and number. For example, `bda1node03` identifies the third server from the bottom of the `bda1` rack.
5. Click **Save**.
6. Repeat Steps 2 through 5 for each server in the rack. Each server boots through BIOS, and boots the operating system with the default factory IP configuration.

Accessing a Server by Using the KVM Switch

To access a server by using the KVM switch:

1. Under Unit View, select **Target Devices** to display the Target Devices page.
2. Click the system name in the Name column.
3. Click **KVM Session** to open a session with the server.

Configuring the Cisco Ethernet Switch

The Cisco Catalyst 4948 Ethernet switch supplied with Oracle Big Data Appliance has IPBASEK9-MZ firmware. The switch is minimally configured during installation. These procedures configure the Cisco Ethernet switch into one large virtual LAN.

The Cisco Ethernet switch configuration consists of these topics and procedures:

- [Scope of the Configuration](#)
- [Prerequisites for Configuring the Ethernet Switch](#)
- [Configuring the Ethernet Switch on the Customer Network](#)
- [Setting Up Telnet Access on the Ethernet Switch](#)
- [Configuring SSH on the Ethernet Switch](#)
- [Setting the Clock and Time Zone on the Ethernet Switch](#)
- [Configuring the NTP Servers for the Ethernet Switch](#)
- [Disabling the Spanning Tree](#)
- [Verifying the Ethernet Configuration](#)

Scope of the Configuration

This configuration disables IP routing and sets the following:

- Host name
- IP address
- Subnet mask
- Default gateway
- Domain name
- Name server
- NTP server
- Time
- Time zone

Prerequisites for Configuring the Ethernet Switch

To avoid disrupting the customer network, observe these prerequisites:

- Do not connect the Cisco Ethernet switch until the network administrator has verified the running configuration and made any necessary changes.
- Do not connect the Cisco Ethernet switch to the customer network until the IP addresses on all components have been configured in Oracle Big Data Appliance.

This sequence prevents any duplicate IP address conflicts, which are possible due to the default addresses set in the components when shipped.

- Configure the Cisco Ethernet switch with the network administrator.

See Also:

- [Chapter 3, "Understanding the Network Requirements"](#)
- [Oracle Big Data Appliance Site Checklists](#)

Configuring the Ethernet Switch on the Customer Network

To configure the Ethernet switch on the customer network:

1. Connect a serial cable from the Cisco switch console to a laptop or similar device. An RJ45 to DB9 serial cable is included with the Cisco documentation package.

The status lights turn on and this message is displayed:

```
Switch con0 is now available
Press RETURN to get started.
```

2. If the Ethernet switch displays status lights and a welcome message, then continue. If it does not, then go to ["Correcting the Autoboot Settings" on page 7-6](#).
3. Ensure that the terminal session is recorded on the laptop by logging the output. You can use the output as a record that the switch has been configured correctly. The default serial port speed is 9600 baud, 8 bits, no parity, 1 stop bit, and no handshake.
4. Change to enable mode using the following command. The default password is welcome1.

```
Switch> enable
Password:
```

5. Configure the network for a single VLAN. The following is an example of the configuration:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface vlan 1
Switch(config-if)# ip address 10.7.7.34 255.255.255.0
Switch(config-if)# end
Switch# *Jan 23 15:54:00.506: %SYS-5-CONFIG_I:Configured from console by
console
Switch# write memory
Building configuration...
Compressed configuration from 2474 bytes to 1066 bytes [OK ]
```

6. If the network does not require IP routing on the switch, and then disable the default IP routing setting and configure the default gateway. This method is preferred. Consult the network administrator if in doubt.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# no ip routing
Switch(config)# ip default-gateway 10.17.7.1
Switch(config)# end
*Jan 23 15:54:00.506: %SYS-5-CONFIG_I:Configured from console by
console
Switch# write memory
Building configuration...
```

```
Compressed configuration from 3600 bytes to 1305 bytes[OK]]
```

7. If the network requires IP routing on the switch, and then keep the default IP routing setting and configure the default gateway as follows:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip route 0.0.0.0 0.0.0.0 10.7.7.1
Switch(config)# end
*Jan 23 15:55:02.506: %SYS-5-CONFIG_I:Configured from console by console
Switch# write memory
Building configuration...
Compressed configuration from 2502 bytes to 1085 bytes [OK ]
```

8. Set the host name of the switch provided in the *Oracle Big Data Appliance Configuration Worksheets*. This example uses the name bdal1sw-ip.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# hostname bdal1sw-ip
bdal1sw-ip(config)# end
*Jan 23 15:57:50.886: %SYS-5-CONFIG_I: Configured from console by console
bdal1sw-ip# write memory
Building configuration...
Compressed configuration from 3604 bytes to 1308 bytes[OK]
bdal1sw-ip#
```

The system host name appears in the prompt.

9. Configure up to three DNS servers, using the IP addresses provided in the *Oracle Big Data Appliance Configuration Worksheets* instead of the examples shown here. If no DNS service is available, then set the domain name anyway, so that the SSH keys are configurable.

```
bdal1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# ip domain-name sodm.com
bdal1sw-ip(config)# ip name-server 10.7.7.3
bdal1sw-ip(config)# ip name-server 129.148.5.5
bdal1sw-ip(config)# ip name-server 10.8.160.1
bdal1sw-ip(config)# end
*Sep 15 14:26:37.045: %SYS-5-CONFIG_I: Configured from console by console
bdal1sw-ip# write memory
Building configuration...
Compressed configuration from 2603 bytes to 1158 bytes[OK]
```

Correcting the Autoboot Settings

If the Cisco Ethernet switch does not display any link or status lights, then the incorrect autoboot settings may prevent it from starting. If the serial console port shows the rommon prompt, then complete the following procedure.

Correcting the autoboot settings of the Cisco switch:

1. Verify that the IPBASE and IPBASEK9 firmware reboot files are available:

```
rommon 1 >dir bootflash:
File Size (Bytes) File Name
-----
25213107 cat4500e-ipbase-mz.150-2.SG2.bin
32288280 cat4500e-ipbasek9-mz.151-1.SG.bin
Total space = 128165888 bytes, Available = 60643328 bytes
```

2. Restart the switch manually using the default image:

```
rommon 2 >boot
Rommon reg: 0x00004780
Reset2Reg: 0x00009EFF
##
Fortooine controller 0x0B5A753B..0x0B70B6CD original
size:0x001C3EA5
#####
diagsk5 version 5.0.1
.
.
.
```

3. Press Enter to get the Switch prompt.
4. Enter enable mode. Enter **welcome1** for the password or just press Enter:

```
Switch>enable
Password: welcome1
Switch#
```

5. Verify that the boot variable is not set:

```
Switch# show bootvar
BOOT variable =
CONFIG_FILE variable does not exist
BOOTLDR variable does not exist
Configuration register is 0x2102
```

6. Verify that IPBASEK9 is available in the boot file system:

```
Switch# dir bootflash:
Directory of bootflash:/
6 -rw- 25213107 Dec 3 2012 17:27:38 +00:00 cat4500eipbase-mz.150-2.SG2.bin
7 -rw- 32288280 Apr 1 2013 11:41:54 +00:00 cat4500eipbasek9-mz.151-1.SG.bin
128165888 bytes total (60643328 bytes free)
```

7. If IPBASEK9 is not listed in the bootflash directory, then you must install it before continuing. See My Oracle Support Document ID 1415044.1.
8. Set the BOOT variable as shown in this example:

```
Switch# config term
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# config-register 0x2102
Switch(config)# no boot system
Switch(config)# boot system bootflash:cat4500e-ipbasek9-mz.151-1.SG.bin
Switch(config)# end
```

9. Verify the new BOOT setting:

```
Switch# show running-config | include boot
boot-start-marker
boot system bootflash:cat4500e-ipbasek9-mz.151-1.SG.bin
boot-end-marker
```

10. Save the changes to the startup configuration:

```
Switch# copy running-config startup-config all
Destination filename [startup-config]? Enter
Switch# write memory
```

```
Building configuration...
Compressed configuration from 3628 bytes to 1281 bytes[OK]
```

11. Reload the firmware.

```
Switch# reload
Proceed with reload? [confirm] y
*Apr 24 09:31:32.887: %SYS-5-RELOAD: Reload requested by console. Reload
reason: Reload command
```

The switch automatically restarts and then continues the reload process.

Setting Up Telnet Access on the Ethernet Switch

Oracle Big Data Appliance ships with a version of the Cisco Ethernet switch software that supports both telnet and SSH. Telnet access is optional. The following procedure describes how to enable and disable remote telnet access.

Note: Telnet access is not secure.

To set up telnet access to the Ethernet switch:

1. Set the password for telnet access if necessary; it should already be set when you receive Oracle Big Data Appliance.

```
bdal1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# enable password welcome1
bdal1sw-ip(config)# enable secret welcome1
The enable secret you have chosen is the same as your enable password.
This is not recommended. Re-enter the enable secret.
bdal1sw-ip(config)# end
bdal1sw-ip# write memory
*Jan 23 15:57:50.886: %SYS-5-CONFIG_I:Configured from console by console
Building configuration...
Compressed configuration from 2502 bytes to 1085 bytes [OK ]
```

2. Set up telnet access. In this example, the first login output shows that the password is not set and telnet access is disabled. If the login command returns nothing, then the password is set and telnet access is available.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# line vty 0 15
bdal1sw-ip(config-line)# login
%Login disabled on line 1,until 'password' is set
%Login disabled on line 2,until 'password' is set
%Login disabled on line 3,until 'password' is set
...
bdal1sw-ip(config-line)# password welcome1
bdal1sw-ip(config-line)# login
bdal1sw-ip(config-line)# end
bdal1sw-ip# write memory
*Jan 23 15:58:53.630: %SYS-5-CONFIG_I: Configured from console by console
Building configuration...
Compressed configuration from 3604 bytes to 1308 bytes[OK ]
```

3. To disable telnet access and prevent remote access, follow this example:

```
Switch# configure terminal
```

```

Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# line vty 0 15
bdal1sw-ip(config-line)# no password
bdal1sw-ip(config-line)# login
%Login disabled on line 1, until 'password' is set
%Login disabled on line 2, until 'password' is set
%Login disabled on line 3, until 'password' is set
...
bdal1sw-ip(config-line)# end
bdal1sw-ip# write memory
*Jan 23 15:58:53.630: %SYS-5-CONFIG_I: Configured from console by console
Building configuration...
Compressed configuration from 3786 bytes to 1468 bytes[OK]

```

Configuring SSH on the Ethernet Switch

The current firmware supports remote connections using SSH. To set up SSH on the Cisco Ethernet switch, follow this example:

```

bdal1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# crypto key generate rsa
% You already have RSA keys defined named bdal1sw-ip.mydomain.com.
% Do you really want to replace them? [yes/no]: yes
Choose the size of the key modulus in the range of 360 to 2048 for
your General Purpose Keys. Choosing a key modulus greater than 512
may take a few minutes.
How many bits in the modulus [512]: 768
% Generating 768 bit RSA keys, keys will be non-exportable...[OK]
bdal1sw-ip(config)# username admin password 0 welcome1
bdal1sw-ip(config)# line vty 0 15
bdal1sw-ip(config-line)# transport input ssh
bdal1sw-ip(config-line)# exit
bdal1sw-ip(config)# aaa new-model
bdal1sw-ip(config)# ip ssh time-out 60
bdal1sw-ip(config)# ip ssh authentication-retries 3
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2012
Task Comment Check
bdal1sw-ip(config)# ip ssh version 2
bdal1sw-ip(config)# end
*Sep 15 14:26:37.045: %SYS-5-CONFIG_I: Configured from console by console
bdal1sw-ip# write memory
Building configuration...
Compressed configuration from 2603 bytes to 1158 bytes[OK]

```

Setting the Clock and Time Zone on the Ethernet Switch

The Cisco Ethernet switch keeps internal time in coordinated universal time (UTC) format.

To set the local time and time zone, ordering is important. The following is an example of setting the local time to the U.S. Eastern time zone:

```

bdal1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# clock timezone EST -5
bdal1sw-ip(config)# clock summer-time EDT recurring
bdal1sw-ip(config)# end
bdal1sw-ip# clock set 15:00:00 January 23 2012
bdal1sw-ip# write memory

```

```
Building configuration...
Compressed configuration from 3778 bytes to 1433 bytes[OK]
bdal1sw-ip# show clock
15:00:18.819 EST Mon Jan 23 2012
```

Clock Commands

The following are descriptions of the commands for setting the clock and time zone:

- To use UTC, enter this command:

```
no clock timezone global configuration
```

- To use a time zone:

```
clock timezone zone hours-offset [minutes-offset]
```

In this command, *zone* is the time zone to display when standard time is in effect, *hours-offset* is the hours offset from UTC, and *minutes-offset* is the minutes offset from UTC.

- To set summer time hours:

```
clock summer-time zone recurring [week day month hh:mm week day month \
hh:mm [offset]]
```

In this command, *zone* is the time zone to be displayed when summer time (daylight savings time) is in effect, *week* is the week of the month (1 to 5 or last), *day* is the day of the week, *month* is the month, *hh:mm* is the time in 24-hour format, and *offset* is the number of minutes to add during summer time. The default offset is 60 minutes. Summer time is disabled by default.

- To manually set the clock to any time:

```
clock set hh:mm:ss month day year
```

In this command, *hh:mm:ss* is the hour, month, and second in 24-hour format, *day* is the day of the month, *month* is the month, and *year* is the year. The time specified is relative to the configured time zone.

See Also: *Cisco IOS Configuration Fundamentals Command Reference* at

http://www.cisco.com/en/US/docs/ios/12_2/configfun/command/reference/frf012.html

Configuring the NTP Servers for the Ethernet Switch

Configure up to two NTP servers. Use IP addresses instead of names, which fail when the switch is not connected to the network. If you must use names, then configure the NTP servers after the switch is connected to the network and DNS is resolving names correctly.

The following example shows the NTP server synchronized to local time when the Cisco switch is connected to the network and has access to NTP.

```
bdal1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bdal1sw-ip(config)# ntp server 10.196.23.254 prefer
bdal1sw-ip(config)# ntp server 192.168.9.19
bdal1sw-ip(config)# end
Jan 23 20:00:41.235: %SYS-5-CONFIG_I:Configured from console by console
bdal1sw-ip# write memory
```

```

Building configuration...
Compressed configuration from 3870 bytes to 1487 bytes [OK ]
bdal1sw-ip# show ntp status
output varies by network
bdal1sw-ip# show clock
15:00:57.919 EST Mon Jan 23 2012

```

A symbol may precede the output of the show clock command:

- * (star): The time is not authoritative.
- . (dot) The time is authoritative, but NTP is not synchronized.
- (blank) The time is authoritative, as shown in the example.

Disabling the Spanning Tree

By default, spanning tree is enabled on Cisco switches, but it is disabled in the factory on all the server connection ports 1 to 47.

Adding a switch with spanning tree enabled can cause problems on networks where it is disabled intentionally. As a precaution, disable spanning tree on the uplink port's VLAN prior to connecting to the customer network.

If spanning tree needs to be turned on before or after the connection, then the network administrator can specify the appropriate protocol settings, as described in the Cisco switch configuration documentation.

To disable the spanning tree:

1. If the port must be disabled, then enter these commands:

```

bdal1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# no spanning-tree vlan 1
Switch(config)# end
Jan 23 20:01:15.083: %SYS-5-CONFIG_I: Configured from console by console
bda1sw-ip# write memory
Building configuration...
Compressed configuration from 2654 bytes to 1163 bytes[OK]

```

2. To verify the disabling of the spanning tree:

```

bdal1sw-ip# show spanning-tree vlan 1
Spanning tree instance(s) for vlan 1 does not exist.

```

3. To re-enable the default protocol settings, if necessary:

```

Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# spanning-tree vlan 1
Switch(config)# end
Switch# write memory

```

Verifying the Ethernet Configuration

To verify the Cisco Ethernet switch configuration:

1. Verify the configuration by entering the following command:

```

bdal1sw-ip# show running-config

```

The following is an example of the output:

```

Building configuration...

```

```
Current configuration :2654 bytes
!
version 12.2
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
service compress-config
.
.
.
```

2. If any setting is incorrect, then repeat the appropriate step. To erase a setting, enter `no` in front of the same command. For example, to erase the default gateway, enter these commands:

```
bd1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
bd1sw-ip# no ip default-gateway 10.7.7.1
bd1sw-ip# end
bd1sw-ip#
*Sep 15 14:13:26.013: %SYS-5-CONFIG_I: Configured from console by console
bd1sw-ip# write memory
```

3. Save the current configuration by entering this command:

```
bd1sw-ip# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
Compressed configuration from 2654 bytes to 1189 bytes[OK]
```

4. Exit from the session with this command:

```
bd1sw-ip#exit
bd1sw-ip con0 is now available
Press RETURN to get started.
```

5. Disconnect the cable from the Cisco console.
6. To check the configuration, attach a laptop to port 48 and ping the IP address of the internal management network.

Caution: Do not connect the Cisco Ethernet switch to the management network until after the system is configured with the customer's IP addresses and the switch configuration is complete.

Configuring the InfiniBand Leaf and Spine Switches

Oracle Big Data Appliance has two Sun Network QDR InfiniBand Gateway leaf switches and one Sun Datacenter InfiniBand Switch 36 spine switch. To configure the switches, follow these procedures for each one:

- [Configuring an InfiniBand Switch](#)
- [Setting the Time Zone and Clock on an InfiniBand Switch](#)
- [Checking the Health of an InfiniBand Switch](#)
- [Checking the Sun Network QDR InfiniBand Gateway Switches](#)

Configuring an InfiniBand Switch

To configure an InfiniBand switch:

1. Connect to the switch using a serial or an Ethernet connection.
 - For a remote Ethernet connection to 192.168.1.201, 192.168.1.202, or 192.168.1.203, see ["Connecting to Oracle ILOM Using the Network" on page 14-3](#).
 - For a local serial connection, see ["Connecting to Oracle ILOM Using a Serial Connection" on page 14-4](#).

2. Log in as `ilom-admin` with password `welcome1`.

The switch has a Linux-like operating system and an Oracle ILOM interface that is used for configuration.

3. Change to the `/SP/network` directory.

```
cd /SP/network
```

4. Enter these commands to configure the switch:

```
set pendingipaddress=ip_address
set pendingipnetmask=ip_netmask
set pendingipgateway=ip_gateway
set pendingipdiscovery=static
set commitpending=true
```

In these commands, `ip_address`, `ip_netmask`, and `ip_gateway` represent the appropriate settings on your network.

5. Enter a `show` command to view the changes. If any values are wrong, reenter the `set` commands ending with `set commitpending=true`.

```
-> show
```

```
/SP/network
  Targets:
    interconnect
    ipv6
    test

  Properties:
    commitpending = (Cannot show property)
    dhcp_ser_ip = none
    ipaddress = 10.135.42.24
    ipdiscovery = static
    ipgateway = 10.135.40.1
    ipnetmask = 255.255.255.0
    macaddress = 00:21:28:E7:B3:34
    managementport = SYS/SP/NET0
    outofbandmacaddress = 00:21:28:E7:B3:33
    pendingipaddress = 10.135.42.23
    pendingipdiscovery = static
    pendingipgateway = 10.135.42.1
    pendingipnetmask = 255.255.248.0
    pendingmanagementport = /SYS/SP/NET0
    sidebandmacaddress = 00:21:28:E7:B3:35
    state = enabled

  Commands:
    cd
```

```
set
show

->

6. Set and verify the switch host name, replacing hostname with the valid name of the
switch, such as bda1sw-ib2. Do not include the domain name.

-> set /SP hostname=hostname
-> show /SP hostname

/SP
Properties:
  hostname = bda1sw-ib2

7. Set the DNS server name and the domain name:
-> set /SP/clients/dns auto_dns=enabled
-> set /SP/clients/dns nameserver=ip_address
-> set /SP/clients/dns searchpath=domain_name

In these commands, ip_address is one to three comma-separated IP addresses of the
name servers in the preferred search order, and domain_name is the full DNS
domain name, such as us.example.com.

8. Verify the settings:
-> show /SP/clients/dns
/SP/clients/dns
Targets:

Properties:
  auto_dns = enabled
  nameserver = 10.196.23.245, 172.32.202.15
  retries = 1
  searchpath = us.example.com
  timeout = 5

Commands:
  cd
  set
  show
```

Setting the Time Zone and Clock on an InfiniBand Switch

To set the time zone on an InfiniBand switch:

1. Check the current time setting:

```
-> show /SP/clock
```

If the setting is not accurate, continue with these steps.

2. Set the time zone, replacing *zone_identifier* with the time zone in the Configuration
Template, such as America/New_York:

```
-> set /SP/clock timezone=zone_identifier
```

3. Check the current time setting:

```
-> show /SP/clock
```

If the setting is not accurate, continue with these steps.

4. Set the SP clock manually, replacing *MMDDHHmmCCyy* with the month, day, hour, minute, century, and year.

```
-> set datetime=MMddHHmmCCyy
```

5. Check the current time setting:

```
-> show /SP/clock
```

6. Configure the Network Time Protocol (NTP), replacing *ip_address* with the server address. Server 1 is the primary NTP server and Server 2 is the secondary server.

```
-> set /SP/clients/ntp/server/1 address=ip_address
-> set /SP/clients/ntp/server/2 address=ip_address
```

7. Enable the NTP servers:

```
-> set /SP/clock usentpserver=enabled
```

Note: Properly synchronized clocks are required for the Mammoth Utility software installation to succeed. If no NTP server is available on the administrative network, then configure the first Oracle Big Data Appliance server as an NTP server.

8. Verify the settings:

```
-> show /SP/clients/ntp/server/1
-> show /SP/clients/ntp/server/2
-> show /SP/clock
```

Checking the Health of an InfiniBand Switch

To check the health of an InfiniBand leaf or spine switch:

1. Open the Fabric Management shell:

```
-> show /SYS/Fabric_Mgmt
```

The prompt changes from -> to FabMan@*hostname*->

2. Check the firmware version, which should be 2.0.5-2 or later. Check My Oracle Support ID 1474875.1 for the current version.

```
FabMan@bda1sw-02->version
SUN DCS gw version: 2.0.5-2
Build time: Nov 29 2011 16:05:05
FPGA version: 0x34
SP board info:
Manufacturing Date: 2011.05.31
Serial Number: "NCD6Q0126"
Hardware Revision: 0x0006
Firmware Revision: 0x0000
BIOS version: SUN0R100
BIOS date: 06/22/2010
FabMan@bda1sw-02->
```

3. Check the overall health of the switch and correct any issues:

```
FabMan@bda1sw-ib2-> showunhealthy
OK - No unhealthy sensors
```

4. Check the environment. Ensure that all tests return OK and PASSED, and correct any issues before continuing. This example shows a problem with PSU1 caused by a loose power cord. See the line starting with WARNING PSU.

```
FabMan@bdal1sw-ib2-> env_test
Environment test started:
Starting Environment Daemon test:
Environment daemon running
Environment Daemon test returned OK
Starting Voltage test
Voltage ECB OK
Measured 3.3V Main = 3.25
Measured 3.3V Standby = 3.37 V
Measured 12V = 11.97 V
Measured 5V = 4.99 V
Measured VBAT = 3.09 V
Measured 1.0V = 1.01 V
Measured I4 1.2V = 1.22 V
Measured 2.5V = 2.52 V
Measured V1P2 DIG = 1.19 V
Measured V1P2 ANG = 1.18 V
Measured 1.2V BridgeX = 1.22 V
Measured 1.8V = 1.78 V
Measured 1.2V Standby = 1.20 V
Voltage test returned OK
Starting PSU test:
PSU 0 present OK
WARNING PSU 1 present AC Loss
PSU test returned 1 faults
Starting Temperature test:
Back temperature 30
Front temperature 29
SP temperature 36
Switch temperature 52,
.
.
```

5. Verify a priority setting of 5 for the InfiniBand Gateway leaf switches or 8 for the InfiniBand Switch 36 spine switch:

```
FabMan@bdal1sw-ib2-> setsmpriority list
Current SM settings:
smpriority 5
controlled_handover TRUE
subnet_prefix 0xfe80000000000000
```

If smpriority is correct, then you can skip the next step.

6. To correct the priority setting:

- Stop the InfiniBand Subnet Manager:

```
FabMan@bdal1sw-ib2-> disablesm
```

- Set the priority to 5 for the InfiniBand Gateway leaf switches or 8 for the InfiniBand Switch 36 spine switch. This example is for a leaf switch:

```
FabMan@bdal1sw-ib2-> setsmpriority 5
```

- Restart the InfiniBand Subnet Manager:

```
FabMan@bdal1sw-ib2-> enablesm
```

7. Exit the Fabric Management shell:

```
FabMan@bdal1sw-ib2-> exit
->
```

8. Exit the Oracle ILOM shell:

```
-> exit
```

9. Log in to the switch as **root** and restart it to ensure that all changes take effect:

```
reboot
```

10. Repeat these steps for the other InfiniBand switches.

Checking the Sun Network QDR InfiniBand Gateway Switches

You must check all gateway switch instance numbers (NM2-GW) in the fabric to ensure that the automatic setup assigned unique instance numbers to each switch, both within each rack and among all racks in a multirack environment.

If two switches in the fabric share the same instance number, then the IB-10GbE ports might not work correctly.

The switches must not use consecutive numbers. Oracle recommends even numbers only. From the factory, the Oracle Big Data Appliance gateway switches use the numbers 10 and 20.

If Oracle Big Data Appliance racks are connected to Oracle Exadata Database Machine racks, then verify that the instance numbers are even and unique to each switch in the fabric.

To check the gateway switches:

1. Login as user **ilom-admin** on rack 1 gateway switch 1:

```
localhost: ilom-admin
password: welcome1
```

2. Enter the Fabric Management shell:

```
-> show /SYS/Fabric_Mgmt
NOTE: show on Fabric_Mgmt will launch a restricted Linux shell.
User can execute switch diagnosis, SM Configuration and IB
monitoring commands in the shell. To view the list of commands,
use "help" at rsh prompt.
Use exit command at rsh prompt to revert back to
ILOM shell.
FabMan@hostname->
```

3. Display the current number:

```
FabMan@bdal1sw-ib2->setgwinstance --list
No BXM system name set, using 6 last bits of the ip-address, value: 24
```

If you see No BXM system name set (as shown here), or a system name of 0, then you must set the instance number manually.

4. If rack 1 gateway switch 1 is not set to 10:

```
FabMan@bdal1sw-ib2->setgwinstance 10
Stopping Bridge Manager... [ OK ]
```

```

Starting Bridge Manager. [ OK ]
FabMan@bdalsw-ib2->setgwinstance --list
BXM system name set to 10

```

5. Repeat Steps 1 to 4 for gateway switch 2. Set it to 20 instead of 10.
6. If multiple racks are cabled together (Oracle Big Data Appliance racks and Oracle Exadata Database Machine racks), then repeat Steps 1 to 5 on each rack. Increment the instance numbers from the previous rack by 2 to get a unique number:
 - Set rack 2 gateway switch 1 to 12 (10+2).
 - Set rack 2 gateway switch 2 to 22 (20+2).

Continue in this way, assigning even numbers between 0 and 63.

Configuring the Power Distribution Units

The power distribution unit (PDU) configuration consists of these procedures:

- [Connecting the PDUs to the Network](#)
- [Updating the PDU Firmware Version](#)

Connecting the PDUs to the Network

The power distribution units (PDUs) are configured with a static IP address to connect to the network for monitoring. Ensure that you have the following network information before connecting the PDUs:

- Static IP address
- Subnet mask
- Default gateway

To connect the PDUs to the network:

1. Use a web browser to access the PDU metering unit by entering the factory default IP address for the unit. The address of PDU A is 192.168.1.210, and the address of PDU B is 192.168.1.211.

The Current Measurement page opens. If the PDUs do not respond, then they probably have different IP addresses:

- a. Press and hold the red RESET button.
 - b. When the display starts to count down in about 10 to 15 seconds, release the button and then press it again without holding it down.
 - c. When the monitor is restarting, note the current IP setting, and whether it is a dynamic host configuration protocol (DHCP) or static address. Use those addresses to connect.
2. Log in as the **admin** user on the PDU metering unit. The default password is **adm1n** or **admin**. Change this password after configuring the network.
3. To check the firmware version, select **Module Info**. If the version is 1.04 or lower, then you can upgrade the firmware. See "[Updating the PDU Firmware Version](#)" on page 7-19.
4. Click **Net Configuration** in the upper left of the page.
5. Confirm that the **DHCP Enabled** option is not selected.

6. Enter the following network settings for the PDU metering unit:
 - IP address
 - Subnet mask
 - Default gateway
7. Click **Submit** to set the network settings and reset the PDU metering unit.
8. Repeat Steps 6 and 7 for the second PDU.

Updating the PDU Firmware Version

To update the PDU firmware version:

1. Download the latest firmware version from My Oracle Support:
 - a. Log in at <http://support.oracle.com>.
 - b. Select the **Patches & Updates** tab.
 - c. For Patch Search, click **Product or Family (Advanced)**.
 - d. For Product, select Sun Rack II PDU.
 - e. For Release, select Sun Rack II PDU 1.0.6.
 - f. Click **Search** to see the Patch Search Results page.
 - g. Click the patch name, such as **16523441**.
 - h. Download the file.
2. Unzip the file on your local system. It has a name such as p16523441_1060_Generic.zip. Then unzip the PDU file, which has a name like OraclePDU_v1.0.6.zip.
3. In the PDU web interface, select **Net Configuration** and log in as **admin** with password **adm1n**.
4. Scroll down to **Firmware Update**.
5. Click **Browse**, select the MKAPP_V1.06.DL file, and click **Submit**.
6. Click **Browse**, select the HTML_V1.06.DL file, and click **Submit**.
7. Click **Module Info** to verify the firmware version number.
8. Click **Net Configuration**, and then click **Logout**.

Configuring the Oracle Big Data Appliance Servers

Before configuring the network, ensure that the Oracle Big Data Appliance servers are set up correctly.

Note: If you must connect to the Oracle ILOM serial management port, then the baud rate setting on the servers changes from the default Oracle ILOM setting of 9600 to 115200 baud, 8 bits, no parity, and 1 stop bit.

To check the Oracle Big Data Appliance servers:

1. Power on all servers by pressing the power button on the front panel of each server. The servers take 5 to 10 minutes to run through the normal startup tests.

2. Use a laptop to connect to a server:
 - a. Open an SSH connection using PuTTY or a similar utility.
 - b. Enter the default IP address of the server.
3. Log in as the `root` user to the first server. The password is `welcome1`.
4. Set up passwordless SSH for `root` by entering the `setup-root-ssh` command, as described in "[Setting Up Passwordless SSH](#)" on page 13-1.

For starter racks, with or without an in-rack expansion kit, you must use the `-j` parameter. See [setup-root-ssh](#) on page 12-29.

```
# setup-root-ssh -j "eth0_ips[range]"
```

5. Verify that SSH keys are distributed across the rack:

```
# cd /opt/oracle/bda
# dcli "hostname ; date"
```

6. If prompted for a password, enter `Ctrl+C` several times. This prompt confirms distribution of the keys, so that you can continue to the next step. Otherwise, generate the root SSH keys across the rack, replacing `password` with a valid password and using the `-j` parameter for a starter rack:

```
# setup-root-ssh -p password [-j "eth0_ips[range]"]
```

Enter the `dcli` command in Step 5 again to verify the keys.

7. Verify that the InfiniBand ports are up, two on each server (36 total for a full rack of 18 servers).

```
# dcli ibstatus | grep phys
192.168.10.1: phys state: 5: LinkUp
192.168.10.1: phys state: 5: LinkUp
...
192.168.10.18: phys state: 5: LinkUp
192.168.10.18: phys state: 5: LinkUp
```

8. Verify that the InfiniBand ports are running at 40 Gbps (4X QDR):

```
# dcli ibstatus | grep rate | more
192.168.10.1: rate: 40 Gb/sec (4X QDR)
192.168.10.1: rate: 40 Gb/sec (4X QDR)
...
192.168.10.18: rate: 40 Gb/sec (4X QDR)
192.168.10.18: rate: 40 Gb/sec (4X QDR)
```

9. Verify that Oracle ILOM does not detect any faults:

```
# dcli 'ipmitool sunoem cli "show faulty"'
```

The output should appear as follows for each server:

```
bda1node02-adm.example.com: Connected. Use ^D to exit.
bda1node02-adm.example.com: -> show faulty
bda1node02-adm.example.com: Target      | Property      | Value
bda1node02-adm.example.com:-----+-----+-----+
bda1node02-adm.example.com:
bda1node02-adm.example.com: -> Session closed
bda1node02-adm.example.com: Disconnected
```

10. Power up each server and verify that the following files are in the `/root` directory:

```
BDA_IMAGING_SUCCEEDED
BDA_REBOOT_SUCCEEDED
```

11. Save the hardware profile output from each system in a file for review, replacing *filename* with a file name of your choice:

```
# dcli bdacheckhw > filename
```

12. Check the hardware profile output file using commands like the following. In these example, the file name is all-bdahwcheck.out.

- To verify that there are no failures in the hardware profile:

```
grep -v SUCCESS ~/all-bdahwcheck.out
```

This command returns all lines that do not show SUCCESS, so no returned lines means no failures.

- To verify 32 cores:

```
grep cores ~/all-bdahwcheck.out
```

- To verify 63 GB of memory:

```
grep memory ~/all-bdahwcheck.out
```

- To verify four fans:

```
grep fans ~/all-bdahwcheck.out
```

- To verify that the status is OK for both power supplies:

```
grep supply ~/all-bdahwcheck.out
```

- To verify that disks 0 to 11 are all the same model, online, spun up, and no alert:

```
grep disk ~/all-bdahwcheck.out | grep "model\|status" | more
```

- To verify that the host channel adapter model is Mellanox Technologies MT26428 ConnectX VPI PCIe 2.0:

```
grep Host ~/all-bdahwcheck.out | grep model | more
```

13. Save the RAID configuration in a file, replacing *filename* with a file name of your choice:

```
dcli MegaCli64 -ldinfo -lall -a0 | grep "Virtual Drive\|State" > filename
```

14. Verify that 12 virtual drives (0 to 11) are listed for each server. In this example, the RAID configuration is stored in a file named all-ldstate.out.

```
less ~/all-ldstate.out
```

15. Save the software profile output from each system into a file for review, replacing *filename* with a file name of your choice:

```
dcli bdachecksw > filename
```

16. Verify that the partition setup and software versions are correct. In this example, the software profile is stored in a file named all-bdaswcheck.out.

```
less ~/all-bdaswcheck.out
```

17. Verify the system boots in this order: USB, RAID Slot 0, PXE:

```
# dcli "ubiosconfig export all -x /tmp/bios.xml"  
[# dcli "grep -m1 -A20 boot_order /tmp/bios.xml" | more
```

18. If the boot order is incorrect:

- a. Log in to the ILOM for that server and force the next restart into BIOS setup:

```
# set /HOST boot_device=bios
```

- b. Restart the server and correct the BIOS.

Configuring the Network

The Oracle Big Data Appliance Configuration Utility generates the BdaDeploy.json file, which is used to configure the administrative network and the private InfiniBand network. See ["Generating the Configuration Files" on page 4-2](#) if you do not have this file.

The network configuration consists of these procedures:

- [Copying the Configuration Files to Oracle Big Data Appliance](#)
- [Starting the Network Configuration](#)
- [Connecting to the Administrative Network](#)
- [Completing the Network Configuration](#)
- [Checking the Virtual Interface Cards \(VNICs\)](#)
- [Verifying Access to the Network Services](#)

Copying the Configuration Files to Oracle Big Data Appliance

To copy the configuration files to Oracle Big Data Appliance:

1. Copy the configuration files to a USB flash drive.
2. Use a laptop or the KVM switch to open a console session to the first server. The first server is the lowest server in the rack. See [Figure D-1](#).
3. Log in as the root user on the first server. The initial password is welcome1.
4. Plug the USB drive into the USB port of the first server. The port is on the right front of the server. Information like the following is displayed on the console:

```
# scsi 0:0:0:0: Direct-Access      CBM      USB 2.0  
Q: 0 ANSI:2  
sd 0:0:0:0: Attached scsi generic sg14 type 0  
sd 0:0:0:0: [sdn] 7954432 512-byte logical blocks: (4.07 GB/3.79 GiB)  
sd 0:0:0:0: [sdn] Write Protect is off  
sd 0:0:0:0: [sdn] Assuming drive cache: write through  
sd 0:0:0:0: [sdn] Assuming drive cache: write through  
sd 0:0:0:0: [sdn] Assuming drive cache: write through  
sd 0:0:0:0: [sdn] Attached SCSI removable disk
```

5. Enter the showusb command to locate the USB drive. The command returns with the mapped device or, if no USB drive is connected, with no output.

```
# showusb  
/dev/sdn1
```

6. Create a directory on the server:

```
# mkdir /mnt/usb
```

7. Mount the device using the device name given in Step 5. The following is an example of the command.

```
# mount -t vfat /dev/sdn1 /mnt/usb
```

8. Verify the location of the file on the USB flash drive:

```
# ls /mnt/usb
BdaDeploy.json
bin
boot
.
.
.
```

9. Copy BdaDeploy.json or BdaExpansion.json from the USB flash drive to the /opt/oracle/bda directory on the server:

```
# cd /mnt/usb
# cp BdaDeploy.json /opt/oracle/bda
```

Note: If *mammoth-rack_name.params* is also on the drive, you can copy it to /opt/oracle/BDAMammoth for use in [Chapter 10](#).

10. Dismount the USB flash drive and remove the device:

```
# umount /mnt/usb
# rmdir /mnt/usb
```

11. Remove the USB flash drive from the server.

Starting the Network Configuration

The networksetup-one script sets up the host names and Oracle ILOM names for all servers and configures the administrative network and the private InfiniBand network. The procedure varies slightly depending on whether you are configuring a new rack—either a full rack or a starter rack—or configuring one or two in-rack expansion kits after deploying the starter rack.

To start the network configuration on a new rack:

1. Log in as the `root` user on the first server. The initial password is `welcome1`. For example:

```
# ssh root@192.168.10.1
```

2. For a new rack, verify that /opt/oracle/bda contains the new BdaDeploy.json file.

For one or two in-rack expansion kits, verify that /opt/oracle/bda contains both BdaDeploy.json from an existing node and the new BdaExpansion.json file.

3. Verify that the InfiniBand network is healthy:

```
# cd /opt/oracle/bda
# bdacheckib BdaShip.json
```

```
LINK bdasw-ib1.0B ... bdasw-ib3.8B UP
```

```
LINK bdasw-ib1.1B ... bdasw-ib2.8B UP
LINK bdasw-ib3.15A ... bda02.HCA-1.2 UP
LINK bdasw-ib3.15B ... bda01.HCA-1.2 UP
LINK bdasw-ib3.14A ... bda04.HCA-1.2 UP
LINK bdasw-ib3.14B ... bda03.HCA-1.2 UP
LINK bdasw-ib3.13A ... bda06.HCA-1.2 UP
.
.
.
```

The InfiniBand network is used extensively during software installation. To perform more in-depth checks of the fabric, run the `iblinkinfo` utility.

4. Remove passwordless SSH. See "["remove-root-ssh"](#) on page 12-26.
5. Reconnect to the server using its ILOM instead of SSH:

```
# ssh root@192.168.1.101
Password: welcome1
-> start -f /HOST/console
bda01 login:
User: root
Password: welcome1
```

The `networksetup-one` script restarts the network services, so you do not see all of the output using an ssh connection.

6. Begin the network configuration:

```
# cd /opt/oracle/bda/network
# ./networksetup-one
```

[Example 7-1](#) shows sample output from the `networksetup-one` script.

Example 7-1 Sample Output from `networksetup-one`

```
# ./networksetup-one
networksetup-one: check syntax and static semantics of
/opt/oracle/bda/BdaDeploy.json
networksetup-one: passed
networksetup-one: ping servers on ship admin network
networksetup-one: passed
networksetup-one: test ssh to servers on ship admin network
hello from node02
hello from node03
.
.
.
networksetup-one: passed
networksetup-one: copy /opt/oracle/bda/BdaDeploy.json to servers
BdaDeploy.json 0% 0 0.0KB/s  --- ETABdaDeploy.json 100% 4304 4.2KB/s 00:00
BdaDeploy.json 0% 0 0.0KB/s  --- ETABdaDeploy.json 100% 4304 4.2KB/s 00:00
.
.
.
networksetup-one: passed
networksetup-one: executing network settings on all servers
networksetup-one: wait a few seconds for the network to restart on 192.168.1.2
.
.
.
bdalnode02.example.com BdaUserConfigNetwork: reset network
```

```

bda1node03.example.com BdaUserConfigNetwork: reset network
bda1node04.example.com BdaUserConfigNetwork: reset network
.
.
.
networksetup-one: deploying this server
networksetup-one: network will restart momentarily, pardon our dust
bda1node01.example.com BdaUserConfigNetwork: reset network
networksetup-one: generate dcli bda host file lists
networksetup-one: ping server ips on admin network
networksetup-one: passed
networksetup-one: passed
networksetup-one: test ssh server ips on admin network
hello from bda1node02.example.com
hello from bda1node03.example.com
hello from bda1node04.example.com
.
.
.
networksetup-one: passed

```

Connecting to the Administrative Network

Before completing the network configuration, you must connect Oracle Big Data Appliance to the 1 GbE administrative (management) network.

To connect Oracle Big Data Appliance to the administrative network:

1. Connect port 48 of the Cisco Ethernet switch to the administrative network.
2. To use the small form-factor pluggable (SFP) ports for a fiber uplink in port 48 (optional), reconfigure the port:

```

bda1sw-ip# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.

```

```

bda1sw-ip(config)# interface gigabitEthernet 1/48
bda1sw-ip(config-if)# media-type sfp
bda1sw-ip(config-if)# end
bda1sw-ip#
*Sep 15 14:12:06.309: %SYS-5-CONFIG_I: Configured from console by console
bda1sw-ip# write memory
bda1sw-ip# copy running-config startup-config

```

See Also: For SFP port configuration details, the *Cisco Catalyst 4948 Install Guide* at

<http://www.cisco.com/en/US/docs/switches/lan/catalyst4900/4948/05modcfg.html>

Connecting to the Client Network

You must also connect Oracle Big Data Appliance to the 10 GbE client network.

To connect Oracle Big Data Appliance to the client network:

1. Connect the two Sun Network QDR InfiniBand Gateway leaf switches to the data center.
2. After the cables are routed, the network administrator may need to alter the network switch end configuration to recognize the links.

3. Use SSH to connect to a Sun Network QDR InfiniBand Gateway switch, and log in as the `ilom-admin` user.

4. Enter the Fabric Management shell:

```
-> show /SYS/Fabric_Mgmt
```

5. Ensure that the Bridge entries have active links from the leaf switches to the customer network switch:

```
FabMan@bdal1sw-ib2-> listlinkup
```

This output shows four ports connected to each switch:

```
Connector 0A-ETH Present
Bridge-0 Port 0A-ETH-1 (Bridge-0-2) up (Enabled)
Bridge-0 Port 0A-ETH-2 (Bridge-0-2) down (Enabled)
Bridge-0 Port 0A-ETH-3 (Bridge-0-1) up (Enabled)
Bridge-0 Port 0A-ETH-4 (Bridge-0-1) down (Enabled)
Connector 1A-ETH Present
Bridge-1 Port 1A-ETH-1 (Bridge-1-2) up (Enabled)
Bridge-1 Port 1A-ETH-2 (Bridge-1-2) down (Enabled)
Bridge-1 Port 1A-ETH-3 (Bridge-1-1) up (Enabled)
Bridge-1 Port 1A-ETH-4 (Bridge-1-1) down (Enabled)
```

6. Repeat Steps 3 to 5 on the second gateway switch (-ib3).

Completing the Network Configuration

The `networksetup-two` script completes some steps started by `networksetup-one` that require a network connection. It also configures the default VLAN and all required VNICs for the 10 GbE client network. It then verifies all network connections and displays a message if it discovers any unexpected ones, including those caused by cabling mistakes.

The 10 GbE ports of the Sun Network QDR InfiniBand Gateway switches must be connected to the data center.

To complete the network configuration:

1. Ensure that both the administrative network and the client network are connected to Oracle Big Data Appliance.

Note: This procedure fails if the networks are not connected. See ["Connecting to the Administrative Network" on page 7-25](#).

2. Run the following script to complete the network setup:

```
./networksetup-two | tee /tmp/network-conf.out
```

The previous command captures the output in a file named `/tmp/network-conf.out`.

[Example 7-2](#) shows sample output from the script.

Example 7-2 Sample Output from `networksetup-two`

```
# ./networksetup-two
networksetup-two: check syntax and static semantics of
/opt/oracle/bda/BdaDeploy.json
networksetup-two: passed
```

```
networksetup-two: ping server ips on admin network
networksetup-two: passed
networksetup-two: test ssh server ips on admin network
hello from bdalnode02.example.com
hello from bdalnode03.example.com
hello from bdalnode04.example.com
.

.

.

networksetup-two: passed
networksetup-two: run connected network post script on each server
networksetup-two: post network setup for 10.133.42.253
networksetup-two: post network setup for 10.133.42.254
networksetup-two: post network setup for 10.133.43.1
.

.

.

networksetup-two: post network setup for this node
networksetup-two: ping admin servers by name on admin network
networksetup-two: passed
networksetup-two: verify infiniband topology
networksetup-two: passed
networksetup-two: start setup client network (10gigE over Infiniband)
networksetup-two: ping both gtw leaf switches
networksetup-two: passed
networksetup-two: verify existence of gateway ports
networksetup-two: passed
networksetup-two: ping server ips on admin network
networksetup-two: passed
networksetup-two: ping servers by name on admin network
networksetup-two: passed
networksetup-two: test ssh server ips on admin network
hello from bdalnode02.example.com
hello from bdalnode03.example.com
.

.

.

networksetup-two: passed
networksetup-two: check existence of default vlan for port 0A-ETH-1 on bdalsw-ib2
networksetup-two: no default vlan for port, create it
spawn ssh root@10.133.43.36 createvlan 0A-ETH-1 -vlan -1 -pkey default
networksetup-two: verify default vlan for port 0A-ETH-1 for bdalsw-ib2
.

.

.

networksetup-two: passed
networksetup-two: apply eoib on each server
networksetup-two: wait a few seconds for the network to restart on 10.133.42.253
networksetup-two: wait a few seconds for the network to restart on 10.133.42.254
.

.

.

check and delete vNIC for bdalnode02 eth9 on switch bdalsw-ib2
check and delete vNIC for bdalnode02 eth9 on switch bdalsw-ib3
create vNIC eth9 bdalnode02 using switch bdalsw-ib3
vNIC created
check and delete vNIC for bdalnode02 eth8 on switch bdalsw-ib2
.

.

.
```

```
networksetup-two: ping server ips on client network
networksetup-two: passed
networksetup-two: test ssh server ips on client network
hello from bdalnode02.example.com
hello from bdalnode03.example.com

.
.

networksetup-two: passed
networksetup-two: end setup client network
```

Checking the Virtual Interface Cards (VNICs)

Verify that the VNICs were created correctly on both gateway switches.

To check the VNICs:

1. Use SSH to connect to a Sun Network QDR InfiniBand Gateway switch, and log in as the `ilom-admin` user.
2. Enter the Fabric Management shell:

```
-> show /SYS/Fabric_Mgmt
```

3. Verify that the active ports are assigned to the default VLAN (0):

```
FabMan@bdalsw-ib2-> showvlan
Connector/LAG VLN PKEY
-----
0A-ETH-1      0  ffff
0A-ETH-3      0  ffff
1A-ETH-1      0  ffff
1A-ETH-3      0  ffff
```

4. Verify that the VNICs were created round-robin on each server and 10 GbE interface:

```
FabMan@hostname-> showvnics
ID STATE FLG IOA_GUID NODE
IID MAC VLN PKEY GW
-----
561 UP N 0021280001CF4C23 bdalnode12 BDA 192.168.41.31 0000
CE:4C:23:85:2B:0A NO ffff 0A-ETH-1
.
.
```

5. Ensure that you can ping in to and out from the 10 GB interfaces.

Verifying Access to the Network Services

Ensure that all network services are running correctly.

To verify access to the network services:

1. Verify that the `dcli` command is working:

```
# cd /opt/oracle/bda
# dcli "hostname ; date"
```

2. If you are prompted for a password, then enter Ctrl+c several times. Otherwise, generate new SSH keys with the setup-root-ssh utility. See "["setup-root-ssh"](#) on page 12-29.
3. Use the output from the date command to check that the servers are synchronized within a few seconds. If they are not, then restart each device. Time differences can cause the software installation to fail.

You can also check the NTP clients:

```
# ntpq -p
```

4. Verify network connectivity:

```
# bdacheknet | tee -a /tmp/bdacheknet_exp.out
bdacheknet: check syntax and static semantics of
/opt/oracle/bda/BdaDeploy.json
bdacheknet: passed
bdacheknet: ping test private infiniband ips (bondib0 40gbs)
bdacheknet: passed
bdacheknet: ping test admin ips (eth0 1gbs)
bdacheknet: passed
bdacheknet: ping test client access ips (bondeth0 10gbs Eoib)
bdacheknet: passed
bdacheknet: test admin network resolve and reverse resolve
bdacheknet: passed
bdacheknet: test admin name array matches ip array
bdacheknet: passed
bdacheknet: test client network (eoib) resolve and reverse resolve
bdacheknet: passed
bdacheknet: test client name array matches ip array
bdacheknet: passed
bdacheknet: test ntp servers
bdacheknet: passed
bdacheknet: test arp -a
bdacheknet: passed
```

5. If the network is not able to resolve both DNS names and IP addresses, then correct the /etc/resolv.conf files. Otherwise, the software installation will fail.
6. Check the accessibility of the PDUs by entering the IP address or host name as the address in a browser.

If the connection is successful, you see the Current Measurement page.

Configuring Multiple Oracle Big Data Appliance Racks

The general process when installing multiple racks is to configure the individual racks, cable the racks together, and validate the multirack network.

Configuring and Cabling Multiple Racks

Complete one of the following procedures. They differ depending on whether you are setting up a new installation or adding racks to an operational installation, and whether there are other engineered systems, such as Oracle Exadata Database Machine.

To install multiple racks:

1. Complete the configuration steps for each rack individually:

- [Configuring the KVM Switch](#)
- [Configuring the Cisco Ethernet Switch](#)
- [Configuring the InfiniBand Leaf and Spine Switches](#)
- [Configuring the Power Distribution Units](#)
- [Configuring the Oracle Big Data Appliance Servers](#)
- [Configuring the Network](#)

2. Cable the Oracle Big Data Appliance racks together. See [Chapter 9](#).
3. Revalidate the InfiniBand network. See "[Validating a Multirack InfiniBand Network](#)" on page 7-31.

To add one or more racks to an operational Oracle Big Data Appliance rack:

1. Complete the configuration steps for each new Oracle Big Data Appliance rack individually:
 - [Configuring the KVM Switch](#)
 - [Configuring the Cisco Ethernet Switch](#)
 - [Configuring the InfiniBand Leaf and Spine Switches](#)
 - [Configuring the Power Distribution Units](#)
 - [Configuring the Oracle Big Data Appliance Servers](#)
 - [Configuring the Network](#)
2. Unplug the power to the InfiniBand switches on the new racks.
3. Cable the Oracle Big Data Appliance racks together. See [Chapter 9](#).
4. Plug in power to the InfiniBand switches. Wait five minutes between switches while the subnet manager fabric is updated.
5. Revalidate the InfiniBand network. See "[Validating a Multirack InfiniBand Network](#)" on page 7-31.

To connect Oracle Big Data Appliance racks to a new Oracle Exadata Database Machine or Oracle Exalogic Elastic Cloud rack:

1. Complete the configuration steps for each Oracle Big Data Appliance rack individually:
 - [Configuring the KVM Switch](#)
 - [Configuring the Cisco Ethernet Switch](#)
 - [Configuring the InfiniBand Leaf and Spine Switches](#)
 - [Configuring the Power Distribution Units](#)
 - [Configuring the Oracle Big Data Appliance Servers](#)
 - [Configuring the Network](#)
2. Cable the Oracle Big Data Appliance racks together. See [Chapter 9](#).
3. Revalidate the InfiniBand network. See "[Validating a Multirack InfiniBand Network](#)" on page 7-31.

To add one or more racks to an operational Oracle Exadata Database Machine or Oracle Exalogic Elastic Cloud rack:

1. Complete the configuration steps for each new Oracle Big Data Appliance rack individually:
 - [Configuring the KVM Switch](#)
 - [Configuring the Cisco Ethernet Switch](#)
 - [Configuring the InfiniBand Leaf and Spine Switches](#)
 - [Configuring the Power Distribution Units](#)
 - [Configuring the Oracle Big Data Appliance Servers](#)
 - [Configuring the Network](#)
2. Unplug the power to the InfiniBand switches on the new racks.
3. Cable the Oracle Big Data Appliance, Oracle Exadata Database Machine, or Oracle Exalogic Elastic Cloud racks together. See [Chapter 9](#).
4. Plug in power to the InfiniBand switches. Wait five minutes between switches while the subnet manager fabric is updated.
5. Ensure that the subnet manager only runs on the switches with the highest firmware versions:

For example, if Oracle Big Data Appliance has the highest firmware version, then make its spine switch the master and its gateway switches the failover. On the racks that have lower firmware versions than the Oracle Big Data Appliance InfiniBand switches (both spine and gateway), disable the subnet manager.

- a. Log into the Exadata master switch as `root`.
- b. Verify that the Oracle Big Data Appliance switches are visible:


```
# ibswitches
```
- c. Disable the subnet manager on Oracle Exadata Database Machine:


```
# disablesm
```
- d. Log in to each additional lower-version InfiniBand switch and verify that the master switch changes to the Oracle Big Data Appliance spine switch:


```
# getmaster
```
- e. Disable subnet manager on each lower-version InfiniBand switch:


```
# disablesm
```
6. Revalidate the InfiniBand network. See ["Validating a Multirack InfiniBand Network" on page 7-31](#).

Validating a Multirack InfiniBand Network

After cabling the racks together, verify that the InfiniBand network is operating correctly.

Note: The `bdacheckib` utility validates connections among Oracle Big Data Appliance and Oracle Exadata Database Machine racks. It does not check other types of racks, such as Oracle Exalogic Elastic Cloud.

To validate the InfiniBand network:

1. Generate a topology file for the network:

```
# bdacheckib -g
```

The name of the generated file is sample-multi-rack.json

2. Open sample-multi-rack.json in a text editor.
3. Reorder the elements to start with the rack at the left and end with the rack on the right. Save the file.
4. Validate the configuration:

```
# bdacheckib sample-multi-rack.json
Verifing rack #1
leaf: bdalsw-ib2
LINK ... to rack2 UP
LINK ... to rack2 UP
LINK ... to rack1 UP
LINK ... to rack2 UP
LINK ... to rack3 UP
LINK ... to rack3 UP
LINK ... to rack1 UP
LINK ... to rack1 UP
leaf: bdalsw-ib3
LINK ... to rack2 UP
LINK ... to rack2 UP
LINK ... to rack1 UP
.
.
```

[Example 7-3](#) shows a sample configuration file.

Example 7-3 Multirack Configuration File sample-multi-rack.json

```
# cat sample-multi-rack.json
# This json multirack spec is generated. The array elements are sorted
# alphabetically. A proper arranged json spec representing racks from left to
right
# can be used as input mr.json to bdacheckib (bdacheckib mr.json)
# Commas separating rack elements are optional.
[{"SPINE_NAME": "bdalsw-ib1", "LEAF1_NAME": "bdalsw-ib2", "LEAF2_NAME":
"bdalsw-ib3"},
 {"SPINE_NAME": "bda2sw-ib1", "LEAF1_NAME": "bda2sw-ib2", "LEAF2_NAME":
"bda02sw-ib3"},
 {"SPINE_NAME": "exa1sw-ib1", "LEAF1_NAME": "exa1sw-ib2", "LEAF2_NAME":
"exa01sw-ib3"}]
```

Configuring an Oracle Big Data Appliance In-Rack Expansion Kit

You can install and configure up to two in-rack expansion kits in an Oracle Big Data Appliance starter rack. This chapter explains how to configure the hardware provided in an expansion kit.

This chapter consists of the following sections:

- [About Expanding an Oracle Big Data Appliance Starter Rack](#)
- [Installing the Servers in the Oracle Big Data Appliance Rack](#)
- [Configuring the Oracle Big Data Appliance Servers](#)
- [Setting Up the Network](#)
- [Configuring the Network](#)
- [Installing Oracle Big Data Appliance Software on the New Servers](#)

Note: Oracle recommends that an Oracle field engineer performs the procedures described in this chapter.

About Expanding an Oracle Big Data Appliance Starter Rack

An Oracle Big Data Appliance starter rack has the same hardware configuration as a full rack, except that it comes with six servers instead of 18. All switches and power supplies are included in the starter rack, and do not need to be upgraded or supplemented to support additional servers.

An in-rack expansion kit provides six more servers and the components needed to install them. You can install one expansion kit to form a 12-server rack, or two expansion kits to form a full, 18-server rack.

If you install the second rack at a later time, then you must repeat the instructions provided in this chapter. Otherwise, you can install and configure all 12 new servers together.

Checking the Contents of the In-Rack Expansion Kit

Before starting the installation, ensure that you received all components, cables, and accessories, as shown in the following tables.

[Table 8-1](#) lists the components and accessories.

Table 8–1 In-Rack Expansion Kit Components and Accessories

Part Number	Quantity	Description
250-2020	1	Velcro roll
7071129	1	Cable labeling kit
	6	Sun Server X3-2L
350-1719	6	2U snap-in slide rail kit
7042273	6	1U-2U slim-rail CMA kit
	1	Sun Server X3-2L documentation and license packages

Table 8–2 lists the cables.

Table 8–2 In-Rack Expansion Kit Cables

Part Number	Length	Quantity	Description
530-4433	10 feet	6	Red Ethernet Cat 5 or Cat 5e
530-4435	10 feet	6	Ethernet Black Cat 5 or Cat 5e
7019244	3 meters	12	InfiniBand QSFP
180-2380	2 meters	12	Power

Checking the Status of the Starter Rack

Ensure that the starter rack is in good working order before you install the in-rack expansion kit:

- Check the LEDs on all components to verify a normal operating state. Resolve any issues before proceeding.
- Verify that the Sun Rack II PDU firmware is at or above the minimum version of 1.06. See ["Updating the PDU Firmware Version" on page 7-19](#).

Installing the Servers in the Oracle Big Data Appliance Rack

The following instructions describe how to physically install the new servers in the starter rack.

Caution: Two people are needed to install the servers in the rack.

To install the servers in the rack:

1. Unpack all power cables, Ethernet cables, and InfiniBand cables, and mark them with the labels provided in the kit:
 - Mark each end of a cable with the appropriate label. Take care to put the "from" and "to" labels on the correct end.
 - Select the appropriate PDU power cord labels for your installation, either single-phase or three-phase.
2. Plug in the cables at both ends. Refer to the cabling tables in [Appendix C](#).
3. Install the server rack mount kits in the rack. Start at the first empty unit at the bottom and work up toward the top of the rack.

4. Install the servers in the rack rails. After installing each server, ensure that both it and the unit below it can slide in and out normally.
5. Install the cable arms and cables into each server, starting with the first new server at the bottom (server 7 or 13) and working up to the top unit. Ensure that all InfiniBand cables are plugged in to the correct ports on both ends. Keep the power cables out of the way while you route the InfiniBand and Ethernet cables.

Caution: Do not plug the power cables into the PDU strips until you are ready to turn on the PDU and configure it. Plug the power cables only into the servers now.

Configuring the Oracle Big Data Appliance Servers

After installing the new servers in the rack, you can configure them.

To configure the new servers:

1. Disconnect the Cisco switch uplink cable (port 48) from the network, in case the factory IP addresses duplicate those on the local network.
2. Plug the power cords into the appropriate outlets. Route the cables to PDU-A last. When you are done, Oracle ILOM starts, the service processor LED is solid green, and the system is in Standby mode with a flashing OK LED.
3. Press the power button on the servers to turn them on. The system automatically detects the factory IP addresses. See ["Factory Network Settings" on page 3-6](#).
4. Using a laptop connected to the first new server (server 7 or 13), log in as `root` using SSH. The default password is `welcome1`.
5. Set up passwordless SSH for the `root` user. For *range*, enter [7:12] when you install the first expansion kit, [13-18] for the second expansion kit, or [7:18] for both kits.

```
# setup-root-ssh -j "eth0_ips[range]" -p welcome1
```

See ["setup-root-ssh" on page 12-29](#).

6. Confirm that passwordless SSH works properly across the range of new servers. Use the same value for *range* as you did in step 5.

```
# dcli -j "eth0_ips[range]" "hostname; date"
```

7. Compare the output of the following command with the system serial number (S/N) sticker on the front of each system. Verify the order of each server assignment, where the range for the first expansion kit is 7 to 12, and for the second expansion kit is 13 to 18.

```
[# dcli -j "eth0_ips[7:12]" "dmidecode -s chassis-serial-number"
192.168.1.7: 1143FMM064
```

.

.

```
192.168.1.12: 1144FMM1A0
```

If you find inconsistencies, then verify that the InfiniBand cables are plugged into the correct ports on the gateway switches for each node.

8. Set the rack master serial number in the ILOM to the S/N on the front left rack sticker (also displayed on the rear of the rack near PDU-A):

```
# dcli -j "eth0_ips[range]" "ipmitool sunoem cli 'set /SP \system_
```

```
identifier=\"Oracle Big Data Appliance rack-master-serial-number\"""
```

This example sets the range to [7:12] for the first expansion kit, and sets the serial number to AK00086253:

```
# dcli -j "eth0_ips[7:12]" "ipmitool sunoem cli 'set /SP \system_
identifier=\"Oracle Big Data Appliance AK00086253\"""
```

The system identifier has a 40-character limit.

9. Verify that the rack master serial number is set correctly. This example uses the range for the first expansion rack:

```
# dcli -j "eth0_ips[7:12]" "ipmitool sunoem cli 'show /SP system_identifier'" |
grep =
192.168.1.7: system_identifier = Oracle Big Data Appliance AK00086253
.
.
.
192.168.1.12: system_identifier = Oracle Big Data Appliance AK00086253
```

10. Complete the physical hardware checks beginning with Step 7 in ["Configuring the Oracle Big Data Appliance Servers" on page 7-1](#). In all dcli commands, be sure to enter the range, using the `eth0_ips [range]` syntax shown previously.

Setting Up the Network

The following topics explain how to add the new servers to the Ethernet administrative network:

- [Copying the Configuration Files](#)
- [Configuring the Network](#)
- [Verifying the Network Configuration](#)

See Also: ["Configuring the Network" on page 7-22](#).

Copying the Configuration Files

These instructions use a serial connection to Oracle ILOM. If you use an SSH connection instead, then you lose the console connection when the IP addresses change from the factory settings to the custom settings in ["Configuring the Network" on page 8-5](#).

Follow these steps to copy the configuration files to the first new server in the rack.

To copy the configuration files:

1. Plug your laptop into the Oracle ILOM "SER MGT" port of the first new server (server 7 or server 13).
2. Log in as root with the default `welcome1` password:

```
login as: root
Using keyboard-interactive authentication.
Password: welcome1
Oracle(R) Integrated Lights Out Manager
Version 3.1.2.12 r74388
Copyright (c) 2012, Oracle and/or its affiliates. All rights reserved.
->
```

3. Open the console and log in with the same credentials:

```
-> start /SP/console
Are you sure you want to start /SP/console (y/n)? y
Serial console started. To stop, type ESC (
bda07 login:
User: root
Password: welcome1
#
```

4. If you do not see a prompt, press **Enter**.

5. Copy the original Oracle Big Data Appliance configuration file from the first server in the rack (server 1) to the new server where you are logged in. Replace *IP_address* with the real IP address of server 1:

```
# scp root@IP_address:/opt/oracle/bda/BdaDeploy.json /opt/oracle/bda
```

Alternatively, use a USB flash drive to copy the file between servers.

6. Copy the new BdaExpansion.json configuration file from a USB flash drive to the same /opt/oracle/dba directory:

```
# mkdir /mnt/usb
# /opt/oracle/bda/bin/showusb /dev/sdm1
# mount /dev/sdm1 /mnt/usb
# cp /mnt/usb/BdaExpansion.json /opt/oracle/bda
```

See ["Copying the Configuration Files to Oracle Big Data Appliance" on page 7-22](#) for general instructions on using a flash drive.

Configuring the Network

Complete the following procedure to configure the network.

1. Run the networksetup-one script:

```
# cd /opt/oracle/bda
# cd network
# ./networksetup-one
```

After this step completes, the servers have their custom IP addresses.

2. Reconnect the Cisco switch uplink cable to the local network.
3. If you lost your SSH connection when the IP addresses changed, then reconnect:
 - a. Use SSH to connect to Oracle ILOM of the first server, using the custom IP address.
 - b. Log in as the **root** user with the default **welcome1** password.

If you use a serial connection, you may still be connected when networksetup-one completes. If not, type Esc+(to get the Oracle ILOM prompt before reconnecting.

4. Verify the InfiniBand topology:

```
# cd /opt/oracle/bda
# bdacheckib BdaDeploy.json
```

5. Verify that passwordless SSH still works:

```
# cd /opt/oracle/bda
[# dcli "hostname ; date"
```

If you are prompted for a password, type Ctrl+c several times. If the `dcli` command fails, then repeat Steps 5 and 6 of the first procedure to configure the servers.

6. Use the output from the `date` utility in Step 5 to verify that the clocks for all servers and switches are synchronized. The times should be within a few seconds.

If they are not synchronized, then you can manually change the time, restart the device, or check the routing through the Cisco switch to the NTP server. Issue this command to check the status of an NTP client:

```
# ntpq -p
```

7. Run `networksetup-two`:

```
# ./networksetup-two | tee /tmp/bdanet_exp.out
```

The `tee` utility captures the output in a file while still allowing it to appear on your screen.

8. Log out of the server, unless it is the first server in the cluster.

Verifying the Network Configuration

Complete the following procedure to ensure that the network is working properly

1. Log in to the first server in the cluster.
2. Verify that the network and all network services are working properly:

```
# bdachecknet | tee -a /tmp/bdanet_exp.out
bdachecknet: check syntax and static semantics of opt/oracle/bda/BdaDeploy.json
bdachecknet: passed
bdachecknet: ping test private infiniband ips (bondib0 40gbs)
bdachecknet: passed
bdachecknet: ping test admin ips (eth0 1gbs)
bdachecknet: passed
```

3. If the systems are not able to resolve and use the DNS names, then manually correct the `/etc/resolv.conf` files and verify the reverse lookup.
4. Submit an install base update service request in My Oracle Support to update your assets.

Installing Oracle Big Data Appliance Software on the New Servers

You can add the new servers to an existing cluster, or configure them as a new cluster.

To add the servers to an existing cluster:

- Complete the instructions in ["Adding Servers to a Cluster" on page 10-5](#).

To configure the servers as a separate cluster:

1. Complete the *Oracle Big Data Appliance Configuration Worksheets*.
2. Enter the information from the worksheets into the Oracle Big Data Appliance Configuration Utility, and generate the configuration files. See [Chapter 4](#).
3. Run the Mammoth Utility to install the software. See ["Installing the Software on a New Rack" on page 10-4](#).

Connecting Multiple Oracle Big Data Appliance Racks

This chapter describes how to combine multiple Oracle Big Data Appliance racks into one large cluster. It contains the following sections:

- [Extending a Rack by Adding Another Rack](#)
- [Cabling Two Racks Together](#)
- [Cabling Several Racks Together](#)

Extending a Rack by Adding Another Rack

When creating a multirack Hadoop cluster or providing access to Oracle Big Data Appliance from an Oracle Exadata Database Machine, you must connect multiple racks to each other. Racks can be cabled together with no downtime.

During the cabling procedure, note the following:

- There is some performance degradation while you are cabling the racks together. This degradation results from reduced network bandwidth, and the data retransmission due to packet loss when a cable is unplugged.
- The environment is not a high-availability environment because one leaf switch must be off. All traffic goes through the remaining leaf switch.
- Only the existing rack is operational, and any new rack is powered down.
- The software running on the systems must not have problems related to InfiniBand restarts.
- The new racks must be configured with the appropriate IP addresses to be migrated into the expanded system before any cabling, and duplicate IP addresses are not allowed.
- The existing spine switch is set to priority 10 during the cabling procedure. This setting gives the spine switch a higher priority than any other switch in the network fabric. The spine switch is first to take the Subnet Manager Master role whenever a new Subnet Manager Master is set during the cabling procedure.

See Also:

- [Appendix D](#) for information about ports and cables for the racks
- *Sun Datacenter InfiniBand Switch 36 Administration Guide* for monitoring the Subnet Manager at
http://docs.oracle.com/cd/E26698_01/html/E26434/z40001039112.html#scrolltoc

Cabling Two Racks Together

The following procedure describes how to cable two racks together. This procedure assumes that the racks are adjacent to each other. In the procedure, the existing rack is R1, and the new rack is R2.

To cable two racks together:

1. Set the priority of the current, active Subnet Manager Master to 10 on the spine switch, as follows:
 - a. Log in to any InfiniBand switch on the active system.
 - b. Use the `getmaster` command to verify that the Subnet Manager Master is running on the spine switch.
 - c. Log in to the spine switch.
 - d. Use the `disablesm` command to stop the Subnet Manager.
 - e. Use the `setsmpriority 10` command to set the priority to 10.
 - f. Use the `enablesm` command to restart the Subnet Manager.
 - g. Repeat Step b to ensure that the Subnet Manager Master is running on the spine switch.
2. Ensure that the new rack is near the existing rack. The InfiniBand cables must be able to reach the servers in each rack.
3. Completely shut down the new rack (R2).
4. Cable the leaf switch in the new rack according to [Table E–2](#).
5. Power off leaf switch R1 IB2. This causes all servers to fail over their InfiniBand traffic to R1 IB3.
6. Disconnect all interswitch links between R1 IB2 and R1 IB3.
7. Cable leaf switch R1 IB2 according to [Table E–1](#).
8. Power on leaf switch R1 IB2.
9. Wait for 3 minutes for R1 IB2 to become completely operational.

To check the switch, log in to it and run the `ibswitches` command. The output should show three switches: R1 IB1, R1 IB2, and R1 IB3.
10. Power off leaf switch R1 IB3. This causes all servers to fail over their InfiniBand traffic to R1 IB2.
11. Cable leaf switch R1 IB3 according to [Table E–1](#).
12. Power on leaf switch R1 IB3.
13. Wait for 3 minutes for R1 IB3 to become completely operational.

To check the switch, log in to it and run the `ibswitches` command. The output should show three switches: R1 IB1, R1 IB2, and R1 IB3.

14. Power on all the InfiniBand switches in R2.
15. Wait for 3 minutes for the switches to become completely operational.

To check the switch, log in to it and run the `ibswitches` command. The output should show six switches: R1 IB1, R1 IB2, R1 IB3, R2 IB1, R2 IB2, and R2 IB3.

16. Ensure that the Subnet Manager Master is running on R1 IB1 by running the `getmaster` command from any switch.
17. Power on all servers in R2.
18. Log in to spine switch R1 IB1, and lower its priority to 8 as follows:
 - a. Use the `disablesm` command to stop the Subnet Manager.
 - b. Use the `setsmpriority 8` command to set the priority to 8.
 - c. Use the `enablesm` command to restart the Subnet Manager.
19. Ensure that the Subnet Manager Master is running on one of the spine switches.

After cabling the racks together, proceed to configure the racks.

Cabling Several Racks Together

The following procedure describes how to cable several racks together. This procedure assumes that the racks are adjacent to each other. In the procedure, the existing racks are R1, R2,... R n , the new rack is R $n+1$, and the Subnet Manager Master is running on R1 IB1.

To cable several racks together:

1. Set the priority of the current, active Subnet Manager Master to 10 on the spine switch, as follows:
 - a. Log in to any InfiniBand switch on the active system.
 - b. Use the `getmaster` command to verify that the Subnet Manager Master is running on the spine switch.
 - c. Log in to the spine switch.
 - d. Use the `disablesm` command to stop the Subnet Manager.
 - e. Use the `setsmpriority 10` command to set the priority to 10.
 - f. Use the `enablesm` command to restart the Subnet Manager.
 - g. Repeat Step b to ensure that the Subnet Manager Master is running on the spine switch.
2. Ensure that the new rack is near the existing rack. The InfiniBand cables must be able to reach the servers in each rack.
3. Completely shut down the new rack (R $n+1$).
4. Cable the leaf switch in the new rack according to the appropriate table in [Appendix E](#). For example, if rack R $n+1$ was R4, then use [Table E-9](#).
5. Complete the following procedure for each of the original racks. In these steps, Rx represents a rack number from R1 to R n .

- a. Power off leaf switch Rx IB2. This causes all servers to fail over their InfiniBand traffic to Rx IB3.
- b. Cable leaf switch Rx IB2 according to [Appendix E](#).
- c. Power on leaf switch Rx IB2.
- d. Wait for 3 minutes for Rx IB2 to become completely operational.

To check the switch, log in to it and run the `ibswitches` command. The output should show $n*3$ switches for IB1, IB2, and IB3 in racks R1, R2, ..., R n .

- e. Power off leaf switch Rx IB3. This causes all servers to fail over their InfiniBand traffic to Rx IB2.
- f. Cable leaf switch Rx IB3 according to [Appendix E](#).
- g. Power on leaf switch Rx IB3.
- h. Wait for 3 minutes for Rx IB3 to become completely operational.

To check the switch, log in to the switch and enter the `ibswitches` command. The output should show $n*3$ switches for IB1, IB2, and IB3 in racks R1, R2, ..., R n .

All racks should now be rewired according to [Appendix E](#).

6. Power on all the InfiniBand switches in R $n+1$.
7. Wait for 3 minutes for the switches to become completely operational.

To check the switch, log in to the switch and run the `ibswitches` command. The output should show $(n+1)*3$ switches for IB1, IB2, and IB3 in racks R1, R2, ..., R $n+1$.

8. Ensure that the Subnet Manager Master is running on R1 IB1 by entering the `getmaster` command from any switch.
9. Power on all servers in R $n+1$.
10. Log in to spine switch R1 IB1, and lower its priority to 8 as follows:
 - a. Enter the `disablesm` command to stop the Subnet Manager.
 - b. Enter the `setsmpriority 8` command to set the priority to 8.
 - c. Enter the `enablesm` command to restart the Subnet Manager.
11. Ensure that the Subnet Manager Master is running on one of the spine switches by entering the `getmaster` command from any switch.
12. Ensure that the Subnet Manager is running on every spine switch by entering the following command from any switch:
`ibdiagnet -r`
Each spine switch should show as running in the Summary Fabric SM-state-priority section of the output. If a spine switch is not running, then log in to the switch and enable the Subnet Manager by entering the `enablesm` command.
13. If there are now four or more racks, then log in to the leaf switches in each rack and disable the Subnet Manager by entering the `disablesm` command.

Part III

Software Installation and Configuration

An Oracle service representative typically configures the network configuration, and installs and configures the software.

Part III contains the following chapter:

- [Chapter 10, "Installing the Oracle Big Data Appliance Software"](#)

Installing the Oracle Big Data Appliance Software

This chapter explains how to install, reinstall, or reconfigure the software on Oracle Big Data Appliance. This chapter contains these sections:

- [About the Mammoth Utility](#)
- [Installation Prerequisites](#)
- [Downloading the Mammoth Software Deployment Bundle](#)
- [Installing the Software on a New Rack](#)
- [Adding Servers to a Cluster](#)
- [What If an Error Occurs During the Installation?](#)
- [Upgrading the Software on Oracle Big Data Appliance](#)
- [Changing the Configuration of Optional Software](#)
- [Reinstalling the Base Image](#)
- [Mammoth Utility](#)
- [Mammoth Reconfiguration Utility Syntax](#)
- [Oracle Big Data Appliance Base Imaging Utilities](#)

Note: Because Mammoth does not store passwords, you are prompted to enter each one. Ensure that you know the current passwords for the operating system root and oracle users, the Cloudera Manager admin user, and the MySQL administrator. If you are reinstalling Oracle Big Data Connectors, then you also need the MySQL password for Oracle Data Integrator.

About the Mammoth Utility

Mammoth is a command-line utility for installing and configuring the Oracle Big Data Appliance software. Using Mammoth, you can:

- Create a cluster on one or more racks.
- Create multiple clusters on a Oracle Big Data Appliance rack.
- Extend a cluster to new servers.
- Update a cluster with new software.

- Deploy Auto Service Request during or after the initial software installation.
- Deploy the Oracle Enterprise Manager system monitoring plug-in for Oracle Big Data Appliance during or after the initial software installation.

Installation Prerequisites

The Auto Service Request and Oracle Enterprise Manager options require software on a remote server on the same network as Oracle Big Data Appliance. Those installations must be complete before you run the Mammoth Utility, or it will fail.

Auto Service Request Requirements:

- Your My Oracle Support account is set up.
- ASR Manager is up and running.

Enterprise Manager Requirements:

- Oracle Management System (OMS) version 12.1.0.3.0 or higher is up and running.
- The OMS agent pull URL is working.
- The OMS `emcli` download URL is working.
- Both the HTTPS upload port and the console port are open.

Note: Double-check the OMS credentials and ensure that you enter them correctly when running the Mammoth Utility. Invalid credentials are the primary cause of failure in the Enterprise Manager discovery process.

Downloading the Mammoth Software Deployment Bundle

The Mammoth bundle contains the Oracle Big Data Appliance Configuration Utility spreadsheet, the installation files, and the base image. Before you install the software, you must use the Configuration Utility to generate the configuration files, as described in [Chapter 4](#).

You use the same bundle for all procedures described in this chapter, regardless of rack size, and whether you are creating CDH or Oracle NoSQL Database clusters, or upgrading existing clusters.

To download the Mammoth bundle:

1. Log in to My Oracle Support and search the knowledge base for Information Center ID 1445745.2.
2. Locate the Release 2.2.1 download patch p17344065.
3. Download the BDAMammoth ZIP files to any directory (such as `/tmp`) in the first node of the cluster. Depending on the configuration of the rack, this node can be the first, seventh, or thirteenth server from the bottom of the rack. For multirack clusters, this server is in the primary rack.

The 2.2 patch consists of two files:

- `p17344065_221_Linux-x86-64_1of2.zip` contains the Mammoth installation files.
- `p17344065_221_Linux-x86-64_2of2.zip` contains the base image.

4. Log in to the first node of the cluster as `root`.

5. Extract all files from the downloaded zip files:

```
# unzip p17344065_221_Linux-x86-64_1of2.zip
Archive: p17344065_221_Linux-x86-64_1of2.zip
  inflating: README.txt
  creating: BDAMammoth-2.2.1/
  inflating: BDAMammoth-2.2.1/BDAMammoth-2.2.1.run
  inflating: BDAMammoth-2.2.1/bda-configuration-2.2.1.ods

$ unzip p17344065_221_Linux-x86-64_2of2.zip
Archive: p17344065_221_Linux-x86-64_2of2.zip
  creating: BDABaseImage-2.2.1_RELEASE/
  inflating: BDABaseImage-2.2.1_RELEASE/README.txt
  inflating: BDABaseImage-2.2.1_RELEASE/biosconfig
  inflating: BDABaseImage-2.2.1_RELEASE/ubiosconfig
  extracting: BDABaseImage-2.2.1_RELEASE/BDABaseImage-2.2.1_RELEASE.md5sum
  inflating: BDABaseImage-2.2.1_RELEASE/makebdimage
  inflating: BDABaseImage-2.2.1_RELEASE/reimagerack
  inflating: BDABaseImage-2.2.1_RELEASE/BDABaseImage-2.2.1_RELEASE.iso
  inflating: BDABaseImage-2.2.1_RELEASE/reimagecluster
```

6. Change to the BDAMammoth-*version* directory:

```
# cd BDAMammoth-2.2.1
```

7. Extract all files from BDAMammoth-*version*.run:

```
# ./BDAMammoth-2.2.1.run
```

```
Big Data Appliance Mammoth v2.2.1 Self-extraction
```

```
Checking for and testing BDA Base Image in /tmp
```

```
BDABaseImage-2.2.1_RELEASE.iso: OK
```

```
Removing existing temporary files
```

```
Generating /tmp/BDAMammoth.tar
```

```
Verifying MD5 sum of /tmp/BDAMammoth.tar
/tmp/BDAMammoth.tar MD5 checksum matches
```

```
Extracting /tmp/BDAMammoth.tar to /opt/oracle/BDAMammoth
```

```
Extracting Base Image RPMs to bdarepo
```

```
Moving BDABaseImage into /opt/oracle/
```

```
Removing temporary files
```

```
.
```

```
.
```

```
Please "cd /opt/oracle/BDAMammoth" before running "./mammoth -i <rack_name>"
```

```
#
```

The new version of the Mammoth software is installed in /opt/oracle/BDAMammoth, and the previous version (if you are upgrading) is saved in /opt/oracle/BDAMammoth/previous-BDAMammoth.

8. Follow the specific instructions for the type of installation you are performing.

Installing the Software on a New Rack

The Mammoth Utility installs and configures the software on Oracle Big Data Appliance using the files generated by the Oracle Big Data Appliance Configuration Utility. A cluster can be dedicated either to CDH (Hadoop) or Oracle NoSQL Database.

For a CDH cluster, Mammoth minimally installs and configures Cloudera's Distribution including Apache Hadoop. This includes all the Hadoop software and Cloudera Manager, which is the tool for administering your Hadoop cluster. If you have a license, Mammoth optionally installs and configures all components of Oracle Big Data Connectors.

For a NoSQL cluster, Mammoth installs Oracle NoSQL Database. CDH and Oracle NoSQL Database do not share a cluster, beginning with Oracle Big Data Appliance 2.2.

In addition to installing the software across all servers in the rack, the Mammoth Utility creates the required user accounts, starts the correct services, and sets the appropriate configuration parameters. When it is done, you have a fully functional, highly tuned, up and running Hadoop cluster.

Complete the appropriate instructions for your installation:

- For an Oracle Big Data Appliance rack that forms one or more clusters, follow the procedure in ["Installing the Software on a Single or Primary Rack" on page 10-4](#).
- For multiple racks where each rack forms an independent cluster, follow the procedure in ["Installing the Software on a Single or Primary Rack" on page 10-4](#) for each rack.
- For multiple racks that form a single, multirack cluster:
 - Identify the primary rack of the cluster, then follow the procedure in ["Installing the Software on a Single or Primary Rack" on page 10-4](#).
 - For the other racks of the cluster, follow the procedure in ["Adding Servers to a Cluster" on page 10-5](#).

Installing the Software on a Single or Primary Rack

Follow this procedure to install and configure the software on a single Oracle Big Data Appliance rack or on the primary rack of a multiple-rack cluster.

To install the software on a single or primary rack:

1. Verify that the Oracle Big Data Appliance rack is configured according to the custom network settings described in /opt/oracle/bda/BdaDeploy.json. If the rack is still configured to the factory default IP addresses, first perform the network configuration steps described in ["Configuring the Network" on page 7-22](#).
2. Verify that the software is not installed on the rack already. If the software is installed and you want to upgrade it, then use the `mammoth -p` option in Step 6.
3. Download and unzip the Mammoth bundle, as described in ["Downloading the Mammoth Software Deployment Bundle" on page 10-2](#). You must be logged in as root to the first server in the cluster.
4. Change to the BDAMammoth directory.

```
# cd /opt/oracle/BDAMammoth
```
5. Copy `mammoth-rack_name.params` to the current directory. See ["About the Configuration Files" on page 4-3](#).

6. Run the `mammoth` command with the appropriate options. See "Mammoth Utility" on page 10-16. This sample command runs all steps:

```
./mammoth -i rack_name
```

7. If you installed support for Auto Service Request, then complete the steps in "Verifying the Auto Service Request Installation" on page 10-5.
8. To configure another CDH cluster on the server:
 - Copy the BDAMammoth ZIP file to any directory on the first server of the cluster, which is either server 7 or server 13.
 - Repeat Steps 3 to 7. Each cluster has its own `mammoth-rack_name.params` file. The file names are identical, but the Oracle Big Data Appliance Configuration Utility creates the files in separate directories named for the cluster.

Note: The Mammoth Utility stores the current configuration in the `/opt/oracle/bda/install/state` directory. *Do not delete the files in this directory.* The Mammoth Utility fails without this information if you must use it again, such as adding a rack to the cluster.

Verifying the Auto Service Request Installation

1. Log in to My Oracle Support at <http://support.oracle.com>.
2. Search for document ID 1450112.1, *ASR Exadata Configuration Check via ASREXACHECK*, and download the `asrexacheck` script.

Although this check was originally intended for Oracle Exadata Database Machine, it is now supported on Oracle Big Data Appliance.

3. Copy `asrexacheck` to a server in the Oracle Big Data Appliance cluster.
4. Log in to the server as root.
5. Copy `asrexacheck` to all servers in the cluster:

```
# dcli -f asrexacheck -d /opt/oracle.SupportTools
```

See [Chapter 13](#) for information about `dcli`.

6. Change the file access permissions:

```
# dcli chmod 755 /opt/oracle.SupportTools/asrexacheck
```

7. Run the script:

```
# dcli /opt/oracle.SupportTools/asrexacheck
```

8. File an Oracle Support Request (SR) to validate the ASR installation. Include the output of `asrexacheck`.
9. Continue with Step 8.

Adding Servers to a Cluster

You can add servers to an existing cluster in groups of three servers, as defined in the *Oracle Big Data Appliance Configuration Worksheets*. You add a full rack the same way that you add a smaller number of servers. The spreadsheet does not generate the configuration file. Instead, you use Mammoth to generate the configuration file and then use it to configure the servers.

To install the software on additional servers in a cluster:

1. Ensure that all servers are running the same software version. See "[About Software Version Differences](#)" on page 10-6.
2. Ensure that all racks that form a single Hadoop cluster are cabled together. See [Chapter 9](#).
3. Connect as `root` to node01 of the primary rack and change to the BDAMammoth directory:

```
cd /opt/oracle/BDAMammoth
```

Note: Always start Mammoth from the primary rack.

4. Generate a parameter file for the server group. The following example adds six servers beginning with node13:

```
./mammoth -e node13 6
```

See the `-e` option in "[Mammoth Utility](#)" on page 10-16.

5. If you are prompted for an expansion number, enter an integer from 1 to 5.
6. Install the software. The following example begins installing software on the servers in bda3 with an expansion number of 1:

```
./mammoth -i bda3 1
```

7. If you are using Oracle Enterprise Manager Grid Control to monitor Oracle Big Data Appliance, then run rediscovery to identify the hardware and software changes.

If you have a license for Oracle Big Data Connectors, they are installed on all nodes of the non-primary racks, although the services do not run on them. Oracle Data Integrator agent still runs on node03 of the primary rack. You cannot add nodes to an Oracle NoSQL Database cluster after it is set up. However, a logical volume is created on the additional rack for future use when nodes can be added to an Oracle NoSQL Database cluster.

The Mammoth Utility obtains the current configuration from the files stored in `/opt/oracle/bda/install/state`. If those files are missing or if any of the services have been moved manually to run on other nodes, then the Mammoth Utility fails.

About Software Version Differences

All racks configured as one Hadoop cluster must have the same image. A new Oracle Big Data Appliance rack may be factory-installed with a newer base image than the previously installed racks. Use the `imageinfo` utility on any server to get the image version. When all racks of a single Hadoop cluster have the same image version, you can install the software on the new rack.

To synchronize the new rack with the rest of the Hadoop cluster, either upgrade the existing cluster to the latest image version or downgrade the image version of the new rack.

To upgrade the image version:

- Run the Mammoth Utility with the `-p` option to upgrade the software on the cluster to the latest version. See "[Upgrading the Software on Oracle Big Data Appliance](#)" on page 10-7.

To downgrade the image version:

- Reimage the new rack to the older version installed on the cluster. See My Oracle Support Information Center ID 1445745.2.
- Use the older version of the Oracle Big Data Appliance Configuration Utility, which is on the first server of the existing cluster, to extend the cluster onto the new rack.

What If an Error Occurs During the Installation?

Each step generates a detailed log file listing the actions performed on each server and whether the step completed successfully. If an error occurs, the script stops. You can then check the log files in `/opt/oracle/BDAMammoth/bdaconfig/tmp`. The log files are named in this format:

`STEP-i-yyyymmddhhmmss.log`

In this format, *i* is the step number and *yyyymmddhhmmss* identifies the time that the file was created, as the year, month, day, hour, minute, and second.

After fixing the problem, you can rerun all steps or a range of steps. You cannot skip steps or run them out of order.

Upgrading the Software on Oracle Big Data Appliance

The procedure for upgrading the software is the same whether you are upgrading from one major release to another or just applying a patch set. The procedure is also the same whether your Hadoop cluster consists of one Oracle Big Data Appliance rack or multiple racks.

The process upgrades all components of the software stack including the firmware, operating system, CDH, JDK, and Oracle Big Data Connectors (if previously installed).

Software downgrades are not supported.

Note: Because the upgrade process automatically stops and starts services as needed, the cluster is unavailable while the `mammoth` command is executing.

Upgrading from Software Version 2.1, 2.0, or 1.1

Follow these procedures to upgrade the software on an Oracle Big Data Appliance cluster from version 2.1, 2.0, or 1.1 to version 2.1.

Note: This procedure upgrades version 1.1 software from CDH3 to CDH 4. You do not need to upgrade your MapReduce programs, but you do need to recompile them after this upgrade.

Prerequisites

You must know the passwords currently in effect for the cluster, which the Mammoth utility will prompt you for:

- `oracle`
- `root`
- Cloudera Manager `admin`

- MySQL Database admin
- MySQL Database for Oracle Data Integrator (if Oracle Data Integrator agent is installed)

Caution: Oracle Big Data Appliance 2.2 does not support Oracle NoSQL Database in a CDH cluster. An upgrade to 2.2 completely removes Oracle NoSQL Database, including the data. You must create a separate cluster for Oracle NoSQL Database.

To upgrade the software to version 2.2:

1. If the cluster currently supports Oracle NoSQL Database, then complete the standard procedures for creating backup files for Oracle NoSQL Database.
2. Download and unzip the Mammoth bundle, as described in ["Downloading the Mammoth Software Deployment Bundle"](#) on page 10-2. You must be logged in as root to the first server in the cluster.
3. Change to the BDAMammoth directory.

```
# cd /opt/oracle/BDAMammoth
```

4. Remove Oracle NoSQL Database, after you have backed up all your data:

```
# ./mammoth-reconfig remove nosqldb
```

5. Run the `mammoth` command with the `-p` option:

```
# ./mammoth -p
```

6. If you are using Oracle Enterprise Manager Grid Control to monitor Oracle Big Data Appliance, then run rediscovery to identify the software changes.

Changing the Configuration of Optional Software

During the initial configuration of Oracle Big Data Appliance, the optional software components may or may not be installed. Using the Mammoth Reconfiguration Utility, you can reverse some of those decisions. You must provide the relevant server names, ports, user names, and passwords. See the `mammoth-reconfig` `add` and `remove` options.

The following procedure shows how to add support for Auto Service Request.

To support Auto Service Request:

1. Set up your My Oracle Support account and install ASR Manager. You must do this before activating Auto Service Request on Oracle Big Data Appliance. See [Chapter 5](#).
2. Log into the first NameNode (node01) of the primary rack and change to the BDAMammoth directory:

```
cd /opt/oracle/BDAMammoth
```

3. Turn on Auto Service Request monitoring and activate the assets:

```
# cd /opt/oracle/BDAMammoth
# ./mammoth-reconfig add asr
INFO: Logging all actions in
/opt/oracle/BDAMammoth/bdaconfig/tmp/bda1node01-20130205075303.log and traces
in /opt/oracle/BDAMammoth/bdaconfig/tmp/bda1node01-20130205075303.trc
```

```

INFO: Checking configuration file
/opt/oracle/bda/install/state/mammoth-saved.params...
INFO: Using saved configuration file
/opt/oracle/bda/install/state/mammoth-saved.params
INFO: To use the generated configuration file, remove
/opt/oracle/bda/install/state/mammoth-saved.params
INFO: Loading configuration file
/opt/oracle/bda/install/state/mammoth-saved.params...
INFO: Reading component versions from
/opt/oracle/BDAMammoth/bdaconfig/COMPONENTS
INFO: Creating nodelist files...
Enter the value for ASR_HOST [Default: ]: asr-host.example.com
Enter the value for ASR_PORT [Default: 162]:
Enter the value for ASR_SERVER_USER: jdoe

Please Check the values you entered for the ASR parameters

ASR_HOST = asr-host.example.com
ASR_PORT = 162
ASR_SERVER_USER = jdoe

Are these values correct (y/n): y
Enter password for user jdoe on machine asr-host.example.com
Enter password: password
Enter password again: password
INFO: Creating environment.pp file ...
INFO: Making sure all puppet agents can be accessed.
INFO: Pinging puppet agents
INFO: Setting up ASR on all nodes. This will take some time ...
.
.
.

```

4. Complete the steps in "Verifying the Auto Service Request Installation" on page 10-5.

The next procedure shows how to add support for Oracle Enterprise Manager Cloud Control:

To support Oracle Enterprise Manager Cloud Control:

1. Install the system monitoring plug-in for Oracle Big Data Appliance in an Oracle Enterprise Manager Cloud Control installation on the same network. See the *Oracle Enterprise Manager System Monitoring Plug-in Installation Guide for Oracle Big Data Appliance*.
2. Log into the first NameNode (node01) of the primary rack and change to the BDAMammoth directory:

```
cd /opt/oracle/BDAMammoth
```

3. Add support for Oracle Enterprise Manager Cloud Control:

```

# cd /opt/oracle/BDAMammoth
# ./mammoth-reconfig add em
INFO: Logging all actions in
/opt/oracle/BDAMammoth/bdaconfig/tmp/bda1node01-20130205082218.log and traces
in /opt/oracle/BDAMammoth/bdaconfig/tmp/bda1node01-20130205082218.trc
INFO: Checking configuration file
/opt/oracle/bda/install/state/mammoth-saved.params...
INFO: Using saved configuration file
/opt/oracle/bda/install/state/mammoth-saved.params

```

```
INFO: To use the generated configuration file, remove
/opt/oracle/bda/install/state/mammoth-saved.params
INFO: Loading configuration file
/opt/oracle/bda/install/state/mammoth-saved.params...
INFO: Reading component versions from
/opt/oracle/BDAMammoth/bdaconfig/COMPONENTS
INFO: Creating nodelist files...
Enter the value for EM_HOST [Default:]: oem-host.example.com
Enter the value for EM_PORT [Default: 4473]:
Enter the value for EM_USER [Default: sysman]:

Please Check the values you entered for the EM parameters

EM_HOST = oem-host.example.com
EM_PORT = 4473
EM_USER = sysman

Are these values correct (y/n): y
Enter password for user sysman on machine oem-host.example.com
Enter password: password
Enter password again: password
Enter agent registration password for em setup on machine oem-host.example.com
Enter password: password
Enter password again: password
INFO: Checking passwordless ssh setup
INFO: Executing checkRoot.sh on nodes /opt/oracle/BDAMammoth/bdaconfig/tmp/all_
nodes #Step -1#
SUCCESS: Executed checkRoot.sh on nodes
/opt/oracle/BDAMammoth/bdaconfig/tmp/all_nodes #Step -1#
SUCCESS: Password-less root SSH is setup.
INFO: Creating environment.pp file ...
INFO: Making sure all puppet agents can be accessed.
INFO: Pinging puppet agents
INFO: Creating directories for em download This will take some time ...
.
.
```

Reinstalling the Base Image

The operating system and various utilities are factory installed on Oracle Big Data Appliance, as described in ["Oracle Big Data Appliance Management Software"](#) on page 1-3. You may need to reinstall this base image if, for example, you want to return Oracle Big Data Appliance to its original state, or you want to upgrade the base image to a more recent version before using the Mammoth Utility to install the Oracle Big Data Appliance software.

You can reimage all or part of a rack. However, all the servers in a cluster must have the same image. Follow the appropriate instructions:

- [Reimaging a Single Oracle Big Data Appliance Server](#)
- [Reimaging an Oracle Big Data Appliance Rack](#)
- [Reimaging an Oracle Big Data Appliance Cluster](#)

Reimaging a Single Oracle Big Data Appliance Server

Follow this procedure to reimage one server, for example, following replacement of a failed server.

Caution: If you reimage a server, then all files and data are erased.

To reinstall the base image on one server:

1. Download the most recent base image from My Oracle Support and copy it to the server being reimaged. You can use the base image downloaded with the Mammoth 2.2 bundle, or download the separate 17054122 base image patch.

See "[Downloading the Mammoth Software Deployment Bundle](#)" on page 10-2. You can take the same basic steps to download the base image patch from My Oracle Support.

2. If you are reimaging the server to the current customer settings, verify that `/opt/oracle/bda/BdaDeploy.json` reflects the intended network configuration. If it does not, then generate a new file using the Oracle Big Data Appliance Configuration Utility. See [Chapter 4](#).
3. Ensure that 4 GB or more disk space are free in the partition:

```
$ df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/md2        161G  23G  130G  15% /
/dev/md0        194M   40M  145M  22% /boot
tmpfs          24G     0   24G   0% /dev/shm
/dev/sda4       1.7T  197M  1.7T  1% /u01
/dev/sdb4       1.7T  197M  1.7T  1% /u02
/dev/sdc1       1.8T  199M  1.8T  1% /u03
/dev/sdd1       1.8T  199M  1.8T  1% /u04
.
.
```

4. Unzip the downloaded base image ZIP file:

```
$ unzip p17054122_220_Linux-x86-64.zip
Archive: p17054122_220_Linux-x86-64.zip
      creating: BDABaseImage-2.2.0_RELEASE/
      inflating: BDABaseImage-2.2.0_RELEASE/README.txt
      inflating: BDABaseImage-2.2.0_RELEASE/biosconfig
      inflating: BDABaseImage-2.2.0_RELEASE/ubiosconfig
      extracting: BDABaseImage-2.2.0_RELEASE/BDABaseImage-2.2.0_RELEASE.md5sum
      inflating: BDABaseImage-2.2.0_RELEASE/makedbimage
      inflating: BDABaseImage-2.2.0_RELEASE/reimagerack
      inflating: BDABaseImage-2.2.0_RELEASE/BDABaseImage-2.2.0_RELEASE.iso
      inflating: BDABaseImage-2.2.0_RELEASE/reimagecluster
```

See "[Downloading the Mammoth Software Deployment Bundle](#)" on page 10-2. You can take the same basic steps to download the base image patch from My Oracle Support.

5. Change to the `BDABaseImage-2.2.0_RELEASE` directory created in the previous step:

```
$ cd BDABaseImage-2.2.0_RELEASE
```

6. Reimage the server using the `makedbimage` command. The following example reimages server 4, including the internal USB, from the 2.2.0 base image to the custom settings in `BdaDeploy.json`. You must be logged in to the server being reimaged, in this case, server 4.

```
./makedbimage -usbint BDABaseImage-2.2.0_RELEASE.iso
```

```
/opt/oracle/bda/BdaDeploy.json 4
```

See [makebdaimage](#) on page 10-22 for the complete syntax of the command.

7. If the `makedbaimage` command succeeded without errors, reboot the server.

Reimaging an Oracle Big Data Appliance Rack

Follow this procedure to reimagine an entire rack.

Caution: If you reimagine an entire rack, then all clusters, files, and data on the rack are erased.

To reinstall the base image on all servers in a rack:

1. If the Oracle Big Data Appliance software was installed previously on the rack, then save the `/opt/oracle/BDAMammoth/mammoth-rack_name.params` file to a safe place outside Oracle Big Data Appliance.
2. Download the most recent base image from My Oracle Support and copy it to the first (bottom) server of the rack being reimaged. You can use the base image downloaded with the Mammoth 2.2 bundle, or download the separate 17054122 base image patch.

See ["Downloading the Mammoth Software Deployment Bundle"](#) on page 10-2. You can take the same basic steps to download the base image patch from My Oracle Support.

3. Establish an SSH connection to the first server and log in as `root`.
4. If you are reimaging to existing customer network settings, then verify that `/opt/oracle/bda/BdaDeploy.json` reflects the intended network configuration. If it does not, then generate a new file using the Oracle Big Data Appliance Configuration Utility. See [Chapter 4](#).
5. Ensure that passwordless SSH is set up:

```
# dcli hostname
192.168.41.37: bda1node01.example.com
192.168.41.38: bda1node02.example.com
192.168.41.39: bda1node03.example.com
.
.
.
```

This command must run without errors and return the host names of all Oracle Big Data Appliance servers. If not, then follow the steps in ["Setting Up Passwordless SSH"](#) on page 13-1. Do not continue until the `dcli hostname` command runs successfully on all servers.

6. Check all Oracle Big Data Appliance servers for hardware issues:

```
# dcli bdacheckhw | grep -v SUCCESS
```

7. Resolve any hardware errors and warnings before reimaging the rack.

8. Verify that at least 4 GB are available in the root (/) partition of all servers:

```
# dcli df -h /
192.168.41.37: Filesystem      Size  Used Avail Use% Mounted on
192.168.41.37: /dev/md2        161G  21G  132G  14%  /
```

192.168.41.38: Filesystem	Size	Used	Avail	Use%	Mounted on
192.168.41.38: /dev/md2	161G	19G	135G	12%	/
192.168.41.39: Filesystem	Size	Used	Avail	Use%	Mounted on
192.168.41.39: /dev/md2	161G	23G	131G	15%	/

.

.

9. Unzip the downloaded base image ZIP file:

```
$ unzip p17054122_220_Linux-x86-64.zip
Archive: p17054122_220_Linux-x86-64.zip
  creating: BDABaseImage-2.2.0_RELEASE/
  inflating: BDABaseImage-2.2.0_RELEASE/README.txt
  inflating: BDABaseImage-2.2.0_RELEASE/biosconfig
  inflating: BDABaseImage-2.2.0_RELEASE/ubiosconfig
  extracting: BDABaseImage-2.2.0_RELEASE/BDABaseImage-2.2.0_RELEASE.md5sum
  inflating: BDABaseImage-2.2.0_RELEASE/makebdimage
  inflating: BDABaseImage-2.2.0_RELEASE/reimagerack
  inflating: BDABaseImage-2.2.0_RELEASE/BDABaseImage-2.2.0_RELEASE.iso
  inflating: BDABaseImage-2.2.0_RELEASE/reimagecluster
```

10. Change to the BDABaseImage-*version*_RELEASE directory created in the previous step, for example:

```
# cd BDABaseImage-2.2.0_RELEASE
```

11. Complete one of the following procedures:

- To reimagine an Oracle Big Data Appliance that was configured for a customer network to the same customer network settings, execute the ./reimagerack command.
- To reimagine an appliance that still has the factory settings:
 - a. Ensure that /opt/oracle/bda/BdaDeploy.json does not exist.
 - b. Execute the ./reimagerack command.
- To restore the factory network settings on a rack configured with custom network settings:
 - a. Copy /opt/oracle/bda/BdaDeploy.json to a safe location outside Oracle Big Data Appliance.
 - b. Ensure that /opt/oracle/bda/BdaShip.json exists.
 - c. Reimage the rack:

```
./reimagerack deploy ship
```

See [reimagerack](#) on page 10-23 for the complete syntax of the command.

12. Run the Mammoth Utility. See ["Installing the Software on a Single or Primary Rack"](#) on page 10-4.

Reimaging an Oracle Big Data Appliance Cluster

Follow this procedure to reimagine a group of servers that the Mammoth utility has deployed as a cluster. The existing network settings are automatically reapplied after reimaging.

Caution: If you reimagine a cluster, then all files and data on the cluster are erased. Reimaging is *not* required for a software upgrade.

To reinstall the base image on all servers in a cluster:

1. Save the /opt/oracle/BDAMammoth/mammoth-rack_name.params file to a safe place outside Oracle Big Data Appliance.
2. Download the most recent base image from My Oracle Support and copy it to the first server of the cluster being reimaged. You can copy the file to any directory, such as /tmp. For the download location, see My Oracle Support Information Center ID 1445745.2.

You can use the base image downloaded with the Mammoth 2.2 bundle, or download the separate 17054122 base image patch.

Depending on the configuration of clusters in the rack, the first server might be 1, 7, 10, or 13, counting from the bottom

3. Establish an SSH connection to the first server and log in as `root`.
4. Verify that /opt/oracle/bda/BdaDeploy.json reflects the intended network configuration. If it does not, then generate a new file using the Oracle Big Data Appliance Configuration Utility. See [Chapter 4](#).
5. Ensure that passwordless SSH is set up:

```
# dcli -C hostname
192.168.41.37: bdalnode01.example.com
192.168.41.38: bdalnode02.example.com
192.168.41.39: bdalnode03.example.com
.
.
.
```

This command must run without errors and return the host names of all Oracle Big Data Appliance servers in the cluster. If not, then follow the steps in ["Setting Up Passwordless SSH" on page 13-1](#). Do not continue until the `dcli -C hostname` command runs successfully on all servers.

6. Check all Oracle Big Data Appliance servers for hardware issues:

```
# dcli -C bdacheckhw | grep -v SUCCESS
```

7. Resolve any hardware errors and warnings before reimaging the rack.
8. Verify that at least 4 GB are available in the root (/) partition of all servers:

```
# dcli -C df -h /
192.168.41.37: Filesystem          Size  Used Avail Use% Mounted on
192.168.41.37: /dev/md2            161G  21G  132G  14% /
192.168.41.38: Filesystem          Size  Used Avail Use% Mounted on
192.168.41.38: /dev/md2            161G  19G  135G  12% /
192.168.41.39: Filesystem          Size  Used Avail Use% Mounted on
192.168.41.39: /dev/md2            161G  23G  131G  15% /
.
.
```

9. Unzip the downloaded base image ZIP file:

```
$ unzip p17054122_220_Linux-x86-64.zip
Archive: p17054122_220_Linux-x86-64.zip
```

```

creating: BDABaseImage-2.2.0_RELEASE/
inflating: BDABaseImage-2.2.0_RELEASE/README.txt
inflating: BDABaseImage-2.2.0_RELEASE/biosconfig
inflating: BDABaseImage-2.2.0_RELEASE/ubiosconfig
extracting: BDABaseImage-2.2.0_RELEASE/BDABaseImage-2.2.0_RELEASE.md5sum
inflating: BDABaseImage-2.2.0_RELEASE/makebdimage
inflating: BDABaseImage-2.2.0_RELEASE/reimagerack
inflating: BDABaseImage-2.2.0_RELEASE/BDABaseImage-2.2.0_RELEASE.iso
inflating: BDABaseImage-2.2.0_RELEASE/reimagecluster

```

See ["Downloading the Mammoth Software Deployment Bundle" on page 10-2](#). You can take the same basic steps to download the base image patch from My Oracle Support.

10. Change to the BDABaseImage-*version*_RELEASE directory created in the previous step:

```
# cd BDABaseImage-2.2.0_RELEASE
```

11. Reimage the cluster:

```
./reimagecluster
```

See [reimagecluster](#) on page 10-23 for the complete syntax of the command.

12. Run the Mammoth Utility. See ["Installing the Software on a Single or Primary Rack" on page 10-4](#).

Installing a One-Off Patch

One-off patch bundles provide a fix to specific bugs in one or more releases. You use the Mammoth Utility to apply the patch to your cluster.

To install a one-off patch bundle:

1. Download the patch bundle from the Automated Release Update (ARU) system to a directory such as /tmp on the first node of the Oracle Big Data Appliance cluster.

The file is named BDA-patch-*release-patch*.zip. The examples in this procedure use the name BDA-patch-2.2.1-123456.zip.

2. Unzip the file. For example:

```
# unzip BDA-patch-2.2.1-123456.zip
Archive: BDA-patch-2.2.1-123456.zip
      creating: BDA-patch-2.2.1-123456/
      inflating: BDA-patch-2.2.1-123456/BDA-patch-2.2.1-123456.run
      inflating: BDA-patch-2.2.1-123456/README.txt
```

3. Change to the patch directory created in Step 2. For example:

```
$ cd BDA-patch-2.2.1-123456
```

4. Extract the contents of the run file. For example:

```
$ ./BDA-patch-2.2.1-123456.run
Big Data Appliance one-off patch 123456 for v2.2.1 Self-extraction
```

Removing existing temporary files

```
Generating /tmp/BDA-patch-2.2.1-123456.tar
Verifying MD5 sum of /tmp/BDA-patch-2.2.1-123456.tar
/tmp/BDA-patch-2.2.1-123456.tar MD5 checksum matches
```

```
Extracting /tmp/BDA-patch-2.2.1-123456.tar to
/opt/oracle/BDAMammoth/patches/123456
Removing temporary files

Please "cd /opt/oracle/BDAMammoth" before running "./mammoth -p 123456"
```

5. Change to the BDAMammoth directory:

```
$ cd /opt/oracle/BDAMammoth
```

6. Install the patch. For example:

```
$ ./mammoth -p 123456
```

Mammoth Utility

You must log in as root on the first server and change to the /opt/oracle/BDAMammoth directory to use the Mammoth Utility. It has this syntax:

```
./mammoth option [rack_name] [extension_number]
```

In this command, *rack_name* is the name of an Oracle Big Data Appliance rack. You must enter the rack name in the first command exactly as it appears in the configuration file name (mammoth-*rack_name*[-extnumber].params). Afterward, *rack_name* defaults to the rack specified in a previous mammoth command.

You must finish installing one rack before starting the installation of another rack.

Example 10-1 Mammoth Utility Syntax Examples

This command displays Help for the Mammoth Utility:

```
./mammoth -h
```

This command does a complete install on rack bda3:

```
./mammoth -i bda3
```

This command generates a parameter file to add six servers in an in-rack expansion kit, beginning with node07, to an existing cluster:

```
./mammoth -e node07 6
```

The next command runs steps 2 through 6 on the rack being set up:

```
./mammoth -r 2-6
```

Mammoth Utility Options

The syntax of the `mammoth` command supports the configuration of new racks and in-rack expansion kits. You can also use the Mammoth 2.2.1 bundle to upgrade from 2.2.0, 2.1, 2.0, or 1.1.

-c

Run the Oracle Big Data Appliance cluster checks.

-e start_node number_of_nodes

Generates a parameter file for a group of servers being added to a cluster. The file is named `mammoth-rack_name.params` if the new servers are in a rack outside the cluster.

Otherwise, Mammoth prompts for an in-rack expansion number from 1 to 5 that it uses in the name, such as `mammoth-bda1-1`.

`start_node` is the client network host name for the first server in the group being added.

`number_of_nodes` is the number of servers being added to the cluster. The number must be a multiple of three.

No passwords are included in the parameter file, so you must enter them when running Mammoth.

-h

Displays command Help including command usage and a list of steps.

-i [rack_name] [expansion_number]

Runs all mandatory steps, equivalent to `-r 1-18` for a full rack. Use this option when configuring a new rack or adding a group of servers to a cluster.

`rack_name` identifies the location of new servers being added to a cluster when they are outside the primary rack.

`expansion_number` identifies the `mammoth-rack-name.params` file when an expansion number is included in the name. See the `-e` option.

-l

List the steps of the Mammoth Utility.

-p

Upgrades the software on the cluster to the current version or installs a one-off patch.

-r n-N

Run steps `n` through `N` of the Mammoth Utility while no errors occur

-s n [rack_name] [expansion_number]

Runs step `n` on the primary rack. Enter the `rack_name` to identify another rack in the same cluster, and an `expansion_number` if needed. See the `-e` option.

-v

Displays the version number of the Mammoth Utility.

Mammoth Installation Steps

Following are descriptions of the steps that the Mammoth Utility and the Mammoth Reconfiguration Utility perform when installing the software.

Step 1 Preinstall Checks

This step performs several tasks:

- Validates the configuration files and prompts for the passwords.
- Sets up a Secure Shell (SSH) for the root user so you can connect to all addresses on the administrative network without entering a password.
- Sets up passwordless SSH for the root user on the InfiniBand network.
- Generates `/etc/hosts` from the configuration file and copies it to all servers so they use the InfiniBand connections to communicate internally. The file maps private IP addresses to public host names.
- Sets up an alias to identify the node where the Mammoth Utility is run as the puppet master node. For example, if you run the Mammoth Utility from

bda1node01 with an IP address 192.168.41.1, then a list of aliases for that IP address includes bda1node01-master. The Mammoth Utility uses Puppet for the software installation.

- Checks the network timing on all nodes. If the timing checks fail, then there are unresolved names and IP addresses that will prevent the installation from running correctly. Fix these issues before continuing with the installation.

This step also performs a variety of hardware and software checks. A failure in any of these checks causes the Mammoth Utility to fail:

- The ARP cache querying time is 2 seconds or less.
- All server clocks are synchronized within 10 seconds of the current server.
- All servers succeeded on the last restart and generated a /root/BDA_REBOOT_SUCCEEDED file.
- The bdacheckhw utility succeeds.
- The bdachecksw utility succeeds.

Step 2 SetupPuppet

This step configures puppet agents on all nodes and start them, configures a puppet master on the node where the Mammoth Utility is being run, waits for the agents to submit their certificates, and automates their signing. This step also changes the root password on all nodes (optional). After this step is completed, Puppet can deploy the software.

Puppet is a distributed configuration management tool that is commonly used for managing Hadoop clusters. The puppet master is a parent service and maintains a Puppet repository. A puppet agent operates on each Hadoop node.

A file named /etc/puppet/puppet.conf resides on every server and identifies the location of the puppet master.

Puppet operates in two modes:

- Periodic pull mode in which the puppet agents periodically contact the puppet master and asks for an update, or
- Kick mode in which the puppet master alerts the puppet agents that a configuration update is available, and the agents then ask for the update. Puppet operates in kick mode during the Mammoth Utility installation.

In both modes, the puppet master must trust the agent. To establish this trust, the agent sends a certificate to the puppet master node where the sys admin process signs it. When this transaction is complete, the puppet master sends the new configuration to the agent.

For subsequent steps, you can check the Puppet log files on each server, as described in ["What If an Error Occurs During the Installation?"](#) on page 10-7.

Step 3 PatchFactoryImage

Installs the most recent Oracle Big Data Appliance image and system parameter settings.

Step 4 CopyLicenseFiles

Copies third-party licenses to /opt/oss/src/OSSLicenses.pdf on every server, as required by the licensing agreements.

Step 5 CopySoftwareSource

Copies third-party software source code to `/opt/oss/src/` on every server, as required by the licensing agreements.

Mammoth does not copy the source code to Oracle NoSQL Database clusters.

Step 6 CreateLogicalVolumes

Creates a logical volume if physical disks are allocated to Oracle NoSQL Database.

Mammoth does not create logical volumes for Oracle NoSQL Database clusters.

Step 7 CreateUsers

Creates the `hdfs` and `mapred` users, and the `hadoop` group. It also creates the `oracle` user and the `dba` and `oinstall` groups.

The various packages installed in later steps also create users and groups during their installation.

See Also: *Oracle Big Data Appliance Software User's Guide* for more information about users and groups.

Step 8 SetupMountPoints

The NameNode data is copied to multiple places to prevent a loss of this critical information should a failure occur in either the disk or the entire node where they are set up.

Step 9 SetupMySQL

Installs and configures MySQL Database. This step creates the primary database and several databases on node03 for use by Cloudera Manager. It also sets up replication of the primary database to a backup database on node02.

Mammoth does not install MySQL Database on Oracle NoSQL Database clusters.

Step 10 InstallHadoop

Installs all packages in Cloudera's Distribution including Apache Hadoop (CDH) and Cloudera Manager. It then starts the Cloudera Manager server on node03 and configures the cluster.

Mammoth does not install CDH or Cloudera Manager on Oracle NoSQL Database clusters.

Step 11 StartHadoopServices

Starts the agents on all nodes and starts all CDH services. After this step, you have a fully functional Hadoop installation.

Cloudera Manager runs on port 7180 of node03. You can open it in a browser, for example:

`http://bda1node03.example.com:7180`

In this example, `bda1node02` is the name of node02 and `example.com` is the domain. The default user name and password is `admin`, which is changed in [Step 15](#).

Mammoth does not install or start CDH services on Oracle NoSQL Database clusters.

Step 12 InstallIBDA Software

Installs Oracle NoSQL Database Community Edition and the server-side components of Oracle Big Data Connectors, if these options were selected in the Oracle Big Data Appliance Configuration Worksheets. Oracle NoSQL Database must be allocated disk space, and Oracle Big Data Connectors must be licensed separately. Optional.

Step 13 SetupEMAgent

Installs and configures the Oracle Enterprise Manager agents. Optional.

This step does the following:

- Creates following named credentials: Switch Credential, Host Credential, Cloudera Manager credential and ILOM credential.
In a cluster expansion, the same credentials are reused.
- Updates the Oracle Big Data Appliance and Oracle Exadata Database Machine plug-in agents on the Oracle Big Data Appliance servers to the latest version deployed on the management servers.
- Performs discovery of the cluster using the named credentials.

Step 14 SetupASR

Installs and configures Auto Service Request (ASR). Optional.

Note: For this step to run successfully, the ASR host system must be up with ASR Manager running and configured properly. See [Chapter 5](#).

This step does the following:

- Installs the required software packages
- Configures the trap destinations
- Starts the monitoring daemon

To activate the assets from ASR Manager, see ["Verifying ASR Assets"](#) on page 5-4.

Step 15 CleanupInstall

Performs the following:

- Changes the Cloudera Manager password if specified in the Installation Template.
- Deletes temporary files created during the installation.
- Copies log files from all nodes to subdirectories in /opt/oracle/bda/install/log.
- Runs cluster verification checks, including TeraSort, to ensure that everything is working properly. It also generates an install summary. All logs are stored in a subdirectory under /opt/oracle/bda/install/log on node01.

Step 16 CleanupSSHroot (Optional)

Removes passwordless SSH for `root` that was set up in [Step 1](#).

Mammoth Reconfiguration Utility Syntax

You must log in as root on the first server and change to the /opt/oracle/BDAMammoth directory to use the Mammoth Reconfiguration Utility. It has this syntax:

```
./mammoth-reconfig option parameter
```

Note:

- Where *parameter* is a node name in the syntax examples, bda1 is the rack name, node is the server base name, and -adm is the administrative access suffix.
- This utility uses the configuration settings stored in /opt/oracle/bda/install/state/mammoth-saved.params. When the utility makes a change, it modifies this file to reflect the new configuration.

Options

add

Adds a service to the cluster. The *parameter* is a keyword that identifies the service:

- asr: Turns on Auto Service Request monitoring on Oracle Big Data Appliance and activates assets on ASR Manager. The installation process prompts you for the ASR Manager host name, port number, user, and password. See [Chapter 5](#) for more information about Auto Service Request.
- em: Installs support for the Oracle Enterprise Manager system monitoring plug-in for Oracle Big Data Appliance. The installation process prompts you for the Oracle Management System (OMS) host name and port number, the Enterprise Manager super-administrative user and password, and the Enterprise Manager agent registration password.

This example adds Auto Service Request support to all servers in the cluster:

```
# cd /opt/oracle/BDAMammoth
# ./mammoth-reconfig add asr
```

See ["Software Configuration"](#) on page 4-8 for detailed descriptions of the required information, and ["Changing the Configuration of Optional Software"](#) on page 10-8 for example output.

remove

Removes a service from the cluster. The *parameter* is a keyword that identifies the service.

- em: Removes support for the Oracle Enterprise Manager system monitoring plug-in, including the cluster and named credentials from Enterprise Manager and the agents from the Oracle Big Data Appliance servers. You must provide the Enterprise Manager super-administrative user password.
- nosql: Removes the complete Oracle NoSQL Database installation, including the data, from an Oracle Big Data Appliance 2.1 or earlier cluster. These clusters used vertical partitions of the server disks, which are not used in release 2.2 and later releases. You must remove the vertical partitions before upgrading.

Caution: The nosql option deletes all data stored in Oracle NoSQL Database. Before using it, back up your data using standard Oracle NoSQL Database procedures.

This example removes Oracle Enterprise Manager support from all servers in the cluster:

```
# cd /opt/oracle/BDAMammoth
# ./mammoth-reconfig remove em
```

Oracle Big Data Appliance Base Imaging Utilities

The following utilities are distributed in the base image bundle. To run the utilities, you must be logged in as `root`.

- [makebdaimage](#)
- [reimagecluster](#)
- [reimagerack](#)

makebdaimage

Reinstalls the base image on a single server, a cluster, or an entire rack. Both [reimagecluster](#) and [reimagerack](#) call this utility.

The `makebdaimage` utility has this syntax:

```
makebdaimage [--usb | --usbint] [--noiloms] /path/BDABaseImage-version_RELEASE.iso
/path/BDaDeploy.json target_servers
```

Options

--usb | --usbint

Identifies the USB port that will be used for reimaging. Use `--usb` for the external USB drive, or `--usbint` for the internal drive. The internal USB drive contains a full Linux installation.

To use the `--usbint` option, you must be logged in to the target server; otherwise, you reimagine the server using the wrong network information.

--noiloms

The reimaging process does not alter the Oracle ILOMs on the target servers.

target_servers

One or more servers where the image will be installed, which you specify using one of these formats:

- ***node_number***

Identifies one server for reimaging. Enter the position of the server in the rack, from 1 to 18, counting from bottom to top.

- ***from.json to.json***

Identifies the current configuration (*from.json*) and the desired configuration (*to.json*). The JSON files can be either the factory configuration in `BdaShip.json` or a custom configuration in `BdaDeploy.json`. You can find them in `/opt/oracle/bda` on configured servers.

- ***to.json***: Concatenation of JSON files similar to BdaDeploy.json and BdaShip.json, but containing an extra ETH0_MACS array entry. The first entry in the concatenated file with a matching eth0_mac entry is used when reimaging. The *to.json* file is taken as is.

reimagecluster

Reimages all servers in the cluster in parallel using `dcli` and `makebdaimage`.

The `reimagecluster` utility has this syntax:

```
reimagecluster [--no-iloms] [from.json [to.json]]
```

Prerequisites

- Verify that the following command returns the list of servers in the cluster:


```
$ dcli -C hostname
```
- Ensure that exactly one BDABaseImage-*version*_RELEASE*.iso file is in the current directory.

Options

--no-iloms

The reimaging process does not alter the Oracle ILOMs on the target servers.

from.json

The full path to the current configuration file, either `BdaShip.json` or `BdaDeploy.json`.

This option defaults to `/opt/oracle/bda/BdaDeploy.json`. If `BdaDeploy.json` is missing, then the option defaults to `/opt/oracle/bda/BdaShip.json`. The servers must already be set to the values in the JSON file used by `reimagecluster`.

to.json

The full path to the new network configuration in effect after reimaging. It can be either a `BdaDeploy.json` or a `BdaShip.json` file.

reimagerack

Reimages all servers in the rack in parallel using `dcli` and `makebdaimage`.

The `reimagerack` utility has this syntax:

```
reimagerack [--no-iloms] [--no-macs] [--hosts n1, n2...] [from.json [to.json]]
```

Prerequisites

- Verify that the following command returns the list of servers in the rack:


```
$ dcli -hostname
```
- Ensure that exactly one BDABaseImage-*version*_RELEASE*.iso file is in the current directory.

Options

--no-iloms

The reimaging process does not alter the Oracle ILOMs on the target servers.

--no-macs

The utility does not retrieve the server MAC addresses. Instead, it uses the InfiniBand cabling. Use this option only when restoring the factory settings; you must include both JSON files (*from.json* and *to.json*) in the command line.

--hosts *n1, n2...*

Restricts reimaging to the servers identified by a comma-delimited list of host names or IP addresses, whichever one *dcli* accepts. All servers must be in the list of target servers identified by the *dcli -t* command.

This option enforces the --no-macs option, so its restrictions also apply.

current.json

The full path to the current configuration file, either *BdaShip.json* or *BdaDeploy.json*.

This option defaults to */opt/oracle/bda/BdaDeploy.json*. If *BdaDeploy.json* is missing, then the option defaults to */opt/oracle/bda/BdaShip.json*. The servers must already be set to the values in the JSON file used by *reimagerack*.

new.json

The full path to the new network configuration in effect after reimaging. It can be either a *BdaDeploy.json* or a *BdaShip.json* file.

Part IV

Maintenance

Part IV describes procedures and utilities that you use to maintain Oracle Big Data Appliance. It contains the following chapters:

- [Chapter 11, "Maintaining Oracle Big Data Appliance"](#)
- [Chapter 12, "Monitoring the Health of Oracle Big Data Appliance"](#)
- [Chapter 13, "Using the dcli Utility"](#)
- [Chapter 14, "Using Oracle Integrated Lights Out Manager"](#)

Maintaining Oracle Big Data Appliance

This chapter describes how to monitor and maintain Oracle Big Data Appliance. Some procedures use the `dcli` utility to execute commands in parallel on all servers.

This chapter contains the following sections:

- [Monitoring the Ambient Temperature of Servers](#)
- [Powering On and Off Oracle Big Data Appliance](#)
- [Adding Memory to the Servers](#)
- [Maintaining the Physical Disks of Servers](#)
- [Replacing a Server Disk](#)
- [Maintaining the InfiniBand Network](#)
- [Changing the Number of Connections to a Gateway Switch](#)
- [Changing the NTP Servers](#)
- [Monitoring the PDU Current](#)

See Also: [Chapter 13, "Using the dcli Utility"](#)

Monitoring the Ambient Temperature of Servers

Maintaining environmental temperature conditions within design specification for a server helps to achieve maximum efficiency and targeted component service lifetimes. Temperatures outside the ambient temperature range of 21 to 23 degrees Celsius (70 to 74 degrees Fahrenheit) affect all components within Oracle Big Data Appliance, possibly causing performance problems and shortened service lifetimes.

To monitor the ambient temperature:

1. Connect to an Oracle Big Data Appliance server as `root`.
2. Set up passwordless SSH for `root` by entering the `setup-root-ssh` command, as described in ["Setting Up Passwordless SSH" on page 13-1](#).
3. Check the current temperature:

```
dcli 'ipmitool sunoem cli "show /SYS/T_AMB" | grep value'
```
4. If any temperature reading is outside the operating range, then investigate and correct the problem. See [Table 2-10](#).

The following is an example of the command output:

```
bda1node01-adm.example.com: value = 22.000 degree C
```

```
bda1node02-adm.example.com: value = 22.000 degree C
bda1node03-adm.example.com: value = 22.000 degree C
bda1node04-adm.example.com: value = 23.000 degree C
```

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Powering On and Off Oracle Big Data Appliance

This section includes the following topics:

- [Nonemergency Power Procedures](#)
- [Emergency Power-Off Considerations](#)
- [Cautions and Warnings](#)

Nonemergency Power Procedures

This section contains the procedures for powering on and off the components of Oracle Big Data Appliance in an orderly fashion.

Powering On Oracle Big Data Appliance

Oracle Big Data Appliance is powered on by either pressing the power button on the front of the servers, or by logging in to the Oracle ILOM interface and applying power to the system.

To power on Oracle Big Data Appliance:

1. Turn on all 12 breakers on both PDUs.
Allow 4 to 5 minutes for Oracle ILOM to start.
2. Power up the servers.

Powering On Servers Remotely Using Oracle ILOM

You can power on the servers remotely using the Oracle ILOM interface. You can access Oracle ILOM using the web console, the command-line interface (CLI), the intelligent platform management interface (IPMI), or the simple network management protocol interface (SNMP). For example, to apply power to server bda1node01 using IPMI, run the following command as `root` from a server that has `ipmitool` installed:

```
ipmitool -H bda1node01-c -U root chassis power on
```

In this example, `bda1node01-c` is the host name of Oracle ILOM for the server to be powered on. You are prompted for the password.

See Also: [Chapter 14, "Using Oracle Integrated Lights Out Manager"](#)

Powering Off Oracle Big Data Appliance

To power off Oracle Big Data Appliance:

1. Power off the servers.
2. Turn off all 12 breakers on both PDUs.

Powering Off the Servers Use the Linux `shutdown` command to power off or restart the servers. Enter this command as `root` to shut down a server immediately:

```
# shutdown -hP now
```

The following command restarts a server immediately:

```
# shutdown -r now
```

See Also: [Linux SHUTDOWN manual page for details](#)

Powering Off Multiple Servers at the Same Time Use the `dcli` utility to run the `shutdown` command on multiple servers at the same time. Do not run the `dcli` utility from a server that will be shut down. Set up passwordless SSH for root, as described in ["Setting Up Passwordless SSH" on page 13-1](#).

The following command shows the syntax of the command:

```
# dcli -l root -g group_name shutdown -hP now
```

In this command, `group_name` is a file that contains a list of servers.

The following example shuts down all Oracle Big Data Appliance servers listed in the `server_group` file:

```
# dcli -l root -g server_group shutdown -hP now
```

See Also: [Chapter 13, "Using the dcli Utility"](#)

Powering On and Off Network Switches

The network switches do not have power switches. They power off when power is removed by turning off a PDU or a breaker in the data center.

Emergency Power-Off Considerations

In an emergency, halt power to Oracle Big Data Appliance immediately. The following emergencies may require powering off Oracle Big Data Appliance:

- Natural disasters such as earthquake, flood, hurricane, tornado, or cyclone
- Abnormal noise, smell, or smoke coming from the system
- Threat to human safety

Emergency Power-Off Procedure

To perform an emergency power-off procedure for Oracle Big Data Appliance, turn off power at the circuit breaker or pull the emergency power-off switch in the computer room. After the emergency, contact Oracle Support Services to restore power to the system.

Emergency Power-Off Switch

Emergency power-off (EPO) switches are required when computer equipment contains batteries capable of supplying more than 750 volt-amperes for more than 5 minutes. Systems that have these batteries include internal EPO hardware for connection to a site EPO switch or relay. Use of the EPO switch removes power from Oracle Big Data Appliance.

Cautions and Warnings

The following cautions and warnings apply to Oracle Big Data Appliance:

WARNING: Do not touch the parts of this product that use high-voltage power. Touching them might result in serious injury.

Caution:

- Do not power off Oracle Big Data Appliance unless there is an emergency. In that case, follow the "[Emergency Power-Off Procedure](#)" on page 11-3.
- Keep the front and rear cabinet doors closed. Failure to do so might cause system failure or result in damage to hardware components.
- Keep the top, front, and back of the cabinets clear to allow proper airflow and prevent overheating of components.
- Use only the supplied hardware.

Adding Memory to the Servers

You can add memory to all servers in the cluster or to specific servers that need more memory, such as the two NameNodes.

See Also: ["Parts for Oracle Big Data Appliance Servers" on page B-5](#)

Adding Memory to Sun Server X3-2L Servers

Oracle Big Data Appliance X3-2 ships from the factory with 64 GB of memory in each server. Eight of the 16 DIMM slots are populated with 8 GB DIMMs.

Oracle Big Data Appliance X3-2 supports 8 GB, 16 GB, and 32 GB DIMMs. You can expand the amount of memory for a maximum of 512 GB (16 x 32 GB) in a server.

You can mix DIMM sizes, but they must be installed in order from largest to smallest. You can achieve the best performance by preserving symmetry. For example, add four of the same size DIMMs, one for each memory channel, to each processor, and ensure that both processors have the same size DIMMs installed in the same order.

To add memory to a Sun Server X3-2L server:

1. If you are mixing DIMM sizes, then review the DIMM population rules in the *Sun Server X3-2L Service Manual* at
http://docs.oracle.com/cd/E23393_01/html/E27229/ceihcdb.html#scrolltoc
2. Power down the server.
3. Install the new DIMMs. If you are installing 16 or 32 GB DIMMs, then replace the existing 8 GB DIMMs first, and then replace the plastic fillers. You must install the largest DIMMs first, then the next largest, and so forth. You can reinstall the original 8 GB DIMMs last.

See the *Sun Server X3-2L Service Manual* at

http://docs.oracle.com/cd/E23393_01/html/E27229/ceicjagi.html#scrolltoc

4. Power on the server.

Adding Memory to Sun Fire X4270 M2 Servers

Oracle Big Data Appliance ships from the factory with 48 GB of memory in each server. Six of the 18 DIMM slots are populated with 8 GB DIMMs. You can populate the empty slots with 8 GB DIMMs to bring the total memory to either 96 GB (12 x 8 GB) or 144 GB (18 x 8 GB). An upgrade to 144 GB may slightly reduce performance because of lower memory bandwidth; memory frequency drops from 1333 MHz to 800 MHz.

To add memory to a Sun Fire X4270 M2 server:

1. Power down the server.
2. Replace the plastic fillers with the DIMMs. See the *Sun Fire X4270 M2 Server Service Manual* at
http://docs.oracle.com/cd/E19245-01/E21671/motherboard.html#50503715_71311
3. Power on the server.

Maintaining the Physical Disks of Servers

Repair of the physical disks does not require shutting down Oracle Big Data Appliance. However, individual servers can be taken outside of the cluster temporarily and require downtime.

See Also: ["Parts for Oracle Big Data Appliance Servers" on page B-5](#) for the repair procedures

Verifying the Server Configuration

The 12 disk drives in each Oracle Big Data Appliance server are controlled by an LSI MegaRAID SAS 92610-8i disk controller. Oracle recommends verifying the status of the RAID devices to avoid possible performance degradation or an outage. The effect on the server of validating the RAID devices is minimal. The corrective actions may affect operation of the server and can range from simple reconfiguration to an outage, depending on the specific issue uncovered.

Verifying Disk Controller Configuration

Enter this command to verify the disk controller configuration:

```
# MegaCli64 -AdpAllInfo -a0 | grep "Device Present" -A 8
```

The following is an example of the output from the command. There should be 12 virtual drives, no degraded or offline drives, and 14 physical devices. The 14 devices are the controllers and the 12 disk drives.

```
Device Present
=====
Virtual Drives : 12
Degraded      : 0
Offline       : 0
Physical Devices : 14
  Disks        : 12
  Critical Disks : 0
  Failed Disks  : 0
```

If the output is different, then investigate and correct the problem.

Verifying Virtual Drive Configuration

Enter this command to verify the virtual drive configuration:

```
# MegaCli64 -LDInfo -lAll -a0
```

The following is an example of the output for Virtual Drive 0. Ensure that State is Optimal.

```
Adapter 0 -- Virtual Drive Information:
Virtual Drive: 0 (Target Id: 0)
Name          :
RAID Level    : Primary-0, Secondary-0, RAID Level Qualifier-0
Size          : 1.817 TB
Parity Size   : 0
State         : Optimal
Strip Size    : 64 KB
Number Of Drives: 1
Span Depth   : 1
Default Cache Policy: WriteBack, ReadAheadNone, Cached, No Write Cache if Bad BBU
Current Cache Policy: WriteBack, ReadAheadNone, Cached, No Write Cache if Bad BBU
Access Policy   : Read/Write
Disk Cache Policy: Disk's Default
Encryption Type: None
```

Verifying Physical Drive Configuration

Use the following command to verify the physical drive configuration:

```
# MegaCli64 -PDLList -a0 | grep Firmware
```

The following is an example of the output from the command. The 12 drives should be Online, Spun Up. If the output is different, then investigate and correct the problem.

```
Firmware state: Online, Spun Up
Device Firmware Level: 061A
Firmware state: Online, Spun Up
Device Firmware Level: 061A
Firmware state: Online, Spun Up
Device Firmware Level: 061A
.
.
.
```

Replacing a Server Disk

The failure of a disk is never catastrophic on Oracle Big Data Appliance. No user data should be lost. Data stored in HDFS or Oracle NoSQL Database is automatically replicated.

This section contains the following topics:

- [Overview of the Disk Replacement Process](#)
- [About Disk Drive Identifiers](#)
- [Prerequisites for Replacing a Working Disk](#)
- [What If a Server Fails to Restart?](#)
- [Replacing a Disk Drive](#)
- [Identifying the Function of a Disk Drive](#)

- [Configuring an Operating System Disk](#)
- [Configuring an HDFS or Oracle NoSQL Database Disk](#)
- [Verifying the Disk Configuration](#)

Overview of the Disk Replacement Process

The following are the basic steps for replacing a server disk drive:

1. Replace the failed disk drive.
2. Perform the basic configuration steps for the new disk.
3. Identify the dedicated function of the failed disk, as an operating system disk, or as either an HDFS disk or an Oracle NoSQL Database disk.
4. Configure the disk for its dedicated function.
5. Verify that the configuration is correct.
6. For Oracle NoSQL Database disks, install the Oracle Big Data Appliance software.

See Also:

"Servicing Storage Drives and Rear Drives" in the *Sun Server X3-2L Service Manual* at

http://docs.oracle.com/cd/E23393_01/html/E27229/z40000091011460.html

"Servicing Storage Drives and Boot Drives" in the *Sun Fire X4270M2 Server Service Manual* at

http://docs.oracle.com/cd/E19245-01/E21671/hotswap.html#50503714_61628

About Disk Drive Identifiers

The Oracle Big Data Appliance servers contain a disk enclosure cage that is controlled by the host bus adapter (HBA). The enclosure holds 12 disk drives that are identified by slot numbers 0 to 11. The drives can be dedicated to specific functions, as shown in [Table 11-1](#).

Oracle Big Data Appliance uses symbolic links, which are defined in `/dev/disk/by-hba_slot`, to identify the slot number of a disk. The links have the form `snpm`, where *n* is the slot number and *m* is the partition number. For example, `/dev/disk/by-hba_slot/s0p1` initially corresponds to `/dev/sda1`.

When a disk is hot swapped, the operating system cannot reuse the kernel device name. Instead, it allocates a new device name. For example, if you hot swap `/dev/sda`, then the disk corresponding `/dev/disk/by-hba-slot/s0` might link to `/dev/sdn` instead of `/dev/sda`. Therefore, the links in `/dev/disk/by-hba-slot/` are automatically updated when devices are added or removed.

The command output lists device names as kernel device names instead of symbolic link names. Thus, `/dev/disk/by-hba-slot/s0` might be identified as `/dev/sda` in the output of a command.

Standard Disk Drive Mappings

[Table 11-1](#) shows the mappings between the RAID logical drives and the operating system identifiers, and the dedicated function of each drive in an Oracle Big Data Appliance server. Nonetheless, you must confirm that these mappings are correct on

your system. The server with the failed drive is part of either a CDH cluster (HDFS) or an Oracle NoSQL Database cluster.

Table 11–1 Disk Drive Identifiers

Symbolic Link to Physical Slot	Initial Operating System Location	Dedicated Function
/dev/disk/by-hba-slot/s0	/dev/sda	Operating system
/dev/disk/by-hba-slot/s1	/dev/sdb	Operating system
/dev/disk/by-hba-slot/s2	/dev/sdc	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s3	/dev/sdd	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s4	/dev/sde	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s5	/dev/sdf	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s6	/dev/sdg	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s7	/dev/sdh	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s8	/dev/sdi	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s9	/dev/sdj	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s10	/dev/sdk	HDFS or Oracle NoSQL Database
/dev/disk/by-hba-slot/s11	/dev/sdl	HDFS or Oracle NoSQL Database

Standard Mount Points

Table 11–2 show the mappings between HDFS partitions and mount points.

Table 11–2 Mount Points

Symbolic Link to Physical Slot and Partition	HDFS Partition	Mount Point
/dev/disk/by-hba-slot/s0p4	/dev/sda4	/u01
/dev/disk/by-hba-slot/s1p4	/dev/sdb4	/u02
/dev/disk/by-hba-slot/s2p1	/dev/sdc1	/u03
/dev/disk/by-hba-slot/s3p1	/dev/sdd1	/u04
/dev/disk/by-hba-slot/s4p1	/dev/sde1	/u05
/dev/disk/by-hba-slot/s5p1	/dev/sdf1	/u06
/dev/disk/by-hba-slot/s6p1	/dev/sdg1	/u07
/dev/disk/by-hba-slot/s7p1	/dev/sdh1	/u08
/dev/disk/by-hba-slot/s8p1	/dev/sdi1	/u09
/dev/disk/by-hba-slot/s9p1	/dev/sdj1	/u10
/dev/disk/by-hba-slot/s10p1	/dev/sdk1	/u11
/dev/disk/by-hba-slot/s11p1	/dev/sdl1	/u12

Obtaining the Physical Slot Number of a Disk Drive

Use the following `MegaCli64` command to verify the mapping of virtual drive numbers to physical slot numbers. See "Replacing a Disk Drive" on page 11-11.

```
# MegaCli64 LdPdInfo a0 | more
```

Prerequisites for Replacing a Working Disk

If you plan to replace an HDFS disk or an operating system disk before it fails, then you should first dismount the HDFS partitions. You must also turn off swapping before replacing an operating system disk.

Note: Only dismount HDFS partitions. For an operating system disk, ensure that you do not dismount operating system partitions. Only partition 4 (sda4 or sdb4) of an operating system disk is used for HDFS.

To dismount HDFS partitions:

1. Log in to the server with the failing drive.
2. If the failing drive supported the operating system, then turn off swapping:

```
# bdaswapoff
```

Removing a disk with active swapping crashes the kernel.

3. List the mounted HDFS partitions:

```
# mount -l
```

```
/dev/md2 on / type ext3 (rw,noatime)
proc on /proc type proc (rw)
sysfs on /sys type sysfs (rw)
devpts on /dev/pts type devpts (rw,gid=5,mode=620)
/dev/md0 on /boot type ext3 (rw)
tmpfs on /dev/shm type tmpfs (rw)
/dev/sda4 on /u01 type ext4 (rw,nodev,noatime) [/u01]
/dev/sdb4 on /u02 type ext4 (rw,nodev,noatime) [/u02]
/dev/sdc1 on /u03 type ext4 (rw,nodev,noatime) [/u03]
/dev/sdd1 on /u04 type ext4 (rw,nodev,noatime) [/u04]
```

```
.
```

```
.
```

4. Check the list of mounted partitions for the failing disk. If the disk has no partitions listed, then proceed to ["Replacing a Disk Drive" on page 11-11](#). Otherwise, continue to the next step.

Caution: For operating system disks, look for partition 4 (sda4 or sdb4). Do not dismount an operating system partition.

5. Dismount the HDFS mount points for the failed disk:

```
# umount mountpoint
```

For example, `umount /u11` removes the mount point for partition `/dev/sdc1`.

If the `umount` commands succeed, then proceed to ["Replacing a Disk Drive" on page 11-11](#). If a `umount` command fails with a device busy message, then the partition is still in use. Continue to the next step.

6. Open a browser window to Cloudera Manager. For example:

```
http://bda1node03.example.com:7180
```

7. Complete these steps in Cloudera Manager:
 - a. Log in as admin.
 - b. On the Services page, click **hdfs**
 - c. Click the **Instances** subtab.
 - d. In the Host column, locate the server with the failing disk. Then click the service in the Name column, such as **datanode**, to open its page.
 - e. Click the **Configuration** subtab.
 - f. Remove the mount point from the Directory field.
 - g. Click **Save Changes**.
 - h. From the Actions list, choose **Restart this DataNode**.

Note: If you removed the mount point in Cloudera Manager, then you must restore the mount point in Cloudera Manager after finishing all other configuration procedures.

8. Return to your session on the server with the failed drive.

9. Reissue the `umount` command:

```
# umount mountpoint
```

10. Complete the steps in "[Replacing a Disk Drive](#)" on page 11-11.

What If a Server Fails to Restart?

The server may restart during the disk replacement procedures, either because you issued a `reboot` command or made an error in a `MegaCli64` command. In most cases, the server restarts successfully, and you can continue working. However, in other cases, an error occurs so that you cannot reconnect using `ssh`. In this case, you must complete the reboot using Oracle ILOM.

To restart a server using Oracle ILOM:

1. Use your browser to open a connection to the server using Oracle ILOM. For example:

```
http://bda1node12-c.example.com
```

Note: Your browser must have a JDK plug-in installed. If you do not see the Java coffee cup on the log-in page, then you must install the plug-in before continuing.

2. Log in using your Oracle ILOM credentials.
3. Select the **Remote Control** tab.
4. Click the **Launch Remote Console** button.
5. Enter `Ctrl+d` to continue rebooting.
6. If the reboot fails, then enter the server `root` password at the prompt and attempt to fix the problem.

7. After the server restarts successfully, open the Redirection menu and choose **Quit** to close the console window.

See Also: Oracle Integrated Lights Out Manager (ILOM) 3.0 documentation at

<http://docs.oracle.com/cd/E19860-01/>

Replacing a Disk Drive

Complete this procedure for all failed disk drives.

1. If you are replacing a working disk, then see "Prerequisites for Replacing a Working Disk" on page 11-9.
2. Replace the failed disk drive.

See "Parts for Oracle Big Data Appliance Servers" on page B-5.

3. Power on the server if you powered it off to replace the failed disk.
4. Connect to the server as `root` using either the KVM or an SSL connection to a laptop.
5. Store the physical drive information in a file:

```
# MegaCli64 pdlist a0 > pdinfo.tmp
```

Note: This command redirects the output to a file so that you can perform several searches using a text editor. If you prefer, you can pipe the output through the `more` or `grep` commands.

The utility returns the following information for each slot. This example shows a Firmware State of Unconfigured(good), Spun Up.

```
Enclosure Device ID: 20
Slot Number: 8
Drive's position: DiskGroup: 8, Span: 0, Arm: 0
Enclosure position: 0
Device Id: 11
WWN: 5000C5003487075C
Sequence Number: 2
Media Error Count: 0
Other Error Count: 0
Predictive Failure Count: 0
Last Predictive Failure Event Seq Number: 0
PD Type: SAS
Raw Size: 1.819 TB [0xe8e088b0 Sectors]
Non Coerced Size: 1.818 TB [0xe8d088b0 Sectors]
Coerced Size: 1.817 TB [0xe8b6d000 Sectors]
Firmware state: Unconfigured(good), Spun Up
Is Commissioned Spare : NO
Device Firmware Level: 061A
Shield Counter: 0
Successful diagnostics completion on : N/A
SAS Address(0): 0x5000c5003487075d
SAS Address(1): 0x0
Connected Port Number: 0(path0)
Inquiry Data: SEAGATE ST32000SSSUN2.0T061A1126L6M3WX
FDE Enable: Disable
Secured: Unsecured
Locked: Unlocked
Needs EKM Attention: No
```

```
Foreign State: None
Device Speed: 6.0Gb/s
Link Speed: 6.0Gb/s
Media Type: Hard Disk Device
.
.
.
```

6. Open the file you created in Step 5 in a text editor and search for the following:

- Disks that have a Foreign State of Foreign
- Disks that have a Firmware State of Unconfigured

7. For disks that have a Foreign State of Foreign, clear that status:

```
# MegaCli64 CfgForeign clear a0
```

A foreign disk is one that the controller saw previously, such as a reinserted disk.

8. For disks that have a Firmware State of Unconfigured (Bad), complete these steps:

- a. Note the enclosure device ID number and the slot number.

- b. Enter a command in this format:

```
# MegaCli64 pdmakegood physdrv[enclosure:slot] a0
```

For example, [20:10] repairs the disk identified by enclosure 20 in slot 10.

- c. Check the current status of Foreign State again:

```
# MegaCli64 pdlist a0 | grep foreign
```

- d. If the Foreign State is still Foreign, then repeat the clear command:

```
# MegaCli64 CfgForeign clear a0
```

9. For disks that have a Firmware State of Unconfigured (Good), use the following command. If multiple disks are unconfigured, then configure them in order from the lowest to the highest slot number:

```
# MegaCli64 CfgLdAdd r0[enclosure:slot] a0
```

```
Adapter 0: Created VD 1
```

```
Adapter 0: Configured the Adapter!!
```

```
Exit Code: 0x00
```

For example, [20:5] repairs the disk identified by enclosure 20 in slot 5.

10. If the CfgLdAdd command in Step 9 fails because of cached data, then clear the cache:

```
# MegaCli64 discardpreservedcache 11 a0
```

11. Verify the disk is recognized by the operating system.

```
# lsscsi
```

The disk may appear with its original device name (such as /dev/sdc) or under a new device name (such as /dev/sdn). If the operating system does not recognize the disk, then the disk is missing from the list generated by the lsscsi command.

This example output shows two disks with new device names: /dev/sdn in slot 5, and /dev/sdo in slot 10.

```
[0:0:20:0]  enclosu ORACLE  CONCORD14      0960  -
[0:2:0:0]  disk    LSI      MR9261-8i      2.12  /dev/sda
[0:2:1:0]  disk    LSI      MR9261-8i      2.12  /dev/sdb
[0:2:2:0]  disk    LSI      MR9261-8i      2.12  /dev/sdc
[0:2:3:0]  disk    LSI      MR9261-8i      2.12  /dev/sdd
[0:2:4:0]  disk    LSI      MR9261-8i      2.12  /dev/sde
[0:2:5:0]  disk    LSI      MR9261-8i      2.12  /dev/sdn
[0:2:6:0]  disk    LSI      MR9261-8i      2.12  /dev/sdg
[0:2:7:0]  disk    LSI      MR9261-8i      2.12  /dev/sdh
[0:2:8:0]  disk    LSI      MR9261-8i      2.12  /dev/sdi
[0:2:9:0]  disk    LSI      MR9261-8i      2.12  /dev/sdj
[0:2:10:0] disk    LSI      MR9261-8i      2.12  /dev/sdo
[0:2:11:0] disk    LSI      MR9261-8i      2.12  /dev/sdl
[7:0:0:0]  disk    ORACLE  UNIGEN-UFD    PMAP   /dev/sdm
[
```

12. If the disk is listed with a new device name, such as /dev/sdn, then reboot the server to restore the original device mappings:

```
# reboot
```

13. Reconnect to the server and reissue the `lsscsi` command to verify the original disk mappings. See [Table 11-1](#).

14. Check the hardware profile of the server:

```
# bdachckhw
```

15. Identify the function of the drive, so you configure it properly. See ["Identifying the Function of a Disk Drive" on page 11-13](#).

Identifying the Function of a Disk Drive

The server with the failed disk is configured to support either HDFS or Oracle NoSQL Database, and most disks are dedicated to that purpose. However, two disks are dedicated to the operating system. Before configuring the new disk, find out how the failed disk was configured.

Checking for Use by the Operating System

Oracle Big Data Appliance is configured with the operating system on the first two disks.

To confirm that a failed disk supported the operating system:

1. Check whether the replacement disk corresponds to /dev/sda or /dev/sdb, which are the operating system disks.

```
# lsscsi
```

See the output from Step 11 of ["Replacing a Disk Drive" on page 11-11](#).

2. Verify that /dev/sda and /dev/sdb are the operating system mirrored partitioned disks:

```
# mdadm -Q --detail /dev/md2
/dev/md2:
          Version : 0.90
          Creation Time : Mon Jul 22 22:56:19 2013
          Raid Level : raid1
```

Number	Major	Minor	RaidDevice	State	
0	8	2	0	active sync	/dev/sda2
1	8	18	1	active sync	/dev/sdb2

3. If the previous steps indicate that the failed disk is an operating system disk, then proceed to ["Configuring an Operating System Disk" on page 11-14](#).

Configuring an Operating System Disk

The first two disks support the Linux operating system. These disks store a copy of the mirrored operating system, a swap partition, a mirrored boot partition, and an HDFS data partition.

To configure an operating system disk, you must copy the partition table from the surviving disk, create an HDFS partition (ext4 file system), and add the software raid partitions and boot partitions for the operating system.

Complete these procedures after replacing the disk in either slot 0 or slot 1.

- [Partitioning the Operating System Disk](#)
- [Repairing the RAID Arrays](#)
- [Formatting the HDFS Partition of an Operating System Disk](#)
- [Restoring the Swap Partition](#)
- [Restoring the GRUB Master Boot Records and HBA Boot Order](#)

Partitioning the Operating System Disk

Note: Replace `/dev/disk/by-hba-slot/sn` in the following commands with the appropriate symbolic link, either `/dev/disk/by-hba-slot/s0` or `/dev/disk/by-hba-slot/s1`.

To partition a logical drive:

1. Complete the steps in ["Replacing a Disk Drive" on page 11-11](#).
2. Confirm that the new disk does not have a partition table:

```
# parted /dev/disk/by-hba-slot/sn -s print
```

You should see a message about a missing partition table.

3. If the parted command displays a partition table, then clear it:

```
# dd if=/dev/zero of=/dev/disk/by-hba-slot/sn bs=1M count=100
```

Tip: You can use this command to restart an operating system disk configuration, if you make a mistake.

4. Create the partition table:

```
# parted /dev/disk/by-hba-slot/sn -s mklabel gpt print
```

5. List the Cylinder, Head, Sector (CHS) partition information of the *surviving* disk. Thus, if you are partitioning /dev/disk/by-hba-slot/s0, then enter /dev/disk/by-hba-slot/s1 for /dev/disk/by-hba-slot/sm in the following command:

```
# parted /dev/disk/by-hba-slot/sm -s unit chs print

Model: LSI MR9261-8i (scsi)
Disk /dev/sda: 243031,30,6
Sector size (logical/physical): 512B/512B
BIOS cylinder,head,sector geometry: 243031,255,63. Each cylinder is 8225kB.
Partition Table: gpt

Number  Start      End        File system  Name  Flags
 1      0,0,34    25,127,7  ext3        raid
 2      25,127,8  21697,116,20  ext3        raid
 3      21697,116,21 23227,61,35  linux-swap
 4      23227,61,36  243031,29,36  ext3        primary
```

6. Create partitions 1 to 3 on the new drive by duplicating the partitions of the surviving disk. Issue three commands in this format:

```
# parted /dev/disk/by-hba-slot/sn -s mkpart file_system start end
```

Use the start and end addresses that you obtained in Step 5 instead of the addresses shown in the following example:

```
# parted /dev/disk/by-hba-slot/sn -s mkpart ext3 0,0,34 25,127,7
# parted /dev/disk/by-hba-slot/sn -s mkpart ext3 25,127,8 21697,116,20
# parted /dev/disk/by-hba-slot/sn -s mkpart linux-swap 21697,116,21 23227,61,35
```

7. Create primary partition 4 using the start address obtained in Step 5 and an end address of 100%:

```
# parted /dev/disk/by-hba-slot/sn -s mkpart primary ext3 23227,61,36 100%
```

Partition 4 stores HDFS data, and this syntax makes the partition as large as possible.

8. Set the RAID flags:

```
# parted -s /dev/disk/by-hba-slot/sn set 1 raid
# parted -s /dev/disk/by-hba-slot/sn set 2 raid
```

9. Clear the names, using parted in interactive mode:

```
# parted /dev/disk/by-hba-slot/sn
```

```
GNU Parted 1.8.1
Using /dev/sdn
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) name 1 "
(parted) name 2 "
(parted) name 3 "
(parted) quit
```

10. Complete the steps in "Repairing the RAID Arrays" on page 11-15.

Repairing the RAID Arrays

After partitioning the disks, you can repair the two logical RAID arrays:

- /dev/md0 contains /dev/disk/by-hba-slot/s0p1 and /dev/disk/by-hba-slot/s1p1. It is mounted as /boot.
- /dev/md2 contains /dev/disk/by-hba-slot/s0p2 and /dev/disk/by-hba-slot/s1p2. It is mounted as / (root).

Caution: Do not dismount the /dev/md devices, because that action shuts down the system.

To repair the RAID arrays:

1. Remove the partitions from the RAID arrays:

```
# mdadm /dev/md0 -r detached
# mdadm /dev/md2 -r detached
```

2. Verify that the RAID arrays are degraded:

```
# mdadm -Q --detail /dev/md0
# mdadm -Q --detail /dev/md2
```

3. Verify that the degraded file for each array is set to 1:

```
# cat /sys/block/	md0/md/degraded
1
# cat /sys/block/	md2/md/degraded
1
```

4. Restore the partitions to the RAID arrays:

```
# mdadm --add /dev/md0 /dev/disk/by-hba-slot/snp1
# mdadm --add /dev/md2 /dev/disk/by-hba-slot/snp2
```

5. Check that resynchronization is started, so that /dev/md2 is in a state of recovery and not idle:

```
# cat /sys/block/	md2/md/sync_action
repair
```

6. To verify that resynchronization is proceeding, you can monitor the mdstat file. A counter identifies the percentage complete.

```
# cat /proc/mdstat

Personalities : [raid1]
md0 : active raid1 sdb1[1] sda1[0]
      204736 blocks [2/2] [UU]

md2 : active raid1 sdb2[2] sda2[0]
      174079936 blocks [2/1] [U_]
      [=====>.....]  recovery = 61.6% (107273216/174079936)
      finish=18.4min speed=60200K/sec
```

The following output shows that synchronization is complete:

```
Personalities : [raid1]
md0 : active raid1 sdb1[1] sda1[0]
      204736 blocks [2/2] [UU]

md2 : active raid1 sdb2[1] sda2[0]
      174079936 blocks [2/2] [UU]
```

unused devices: <none>

7. Display the content of /etc/mdadm.conf:

```
# cat /etc/mdadm.conf
```

```
# mdadm.conf written out by anaconda
DEVICE partitions
MAILADDR root
ARRAY /dev/md0 level=raid1 num-devices=2 UUID=df1bd885:c1f0f9c2:25d6...
ARRAY /dev/md2 level=raid1 num-devices=2 UUID=6c949a1a:1d45b778:a6da...
```

8. Compare the output of the following command with the content of /etc/mdadm.conf from Step 7:

```
# mdadm --examine --brief --scan --config=partitions
```

9. If the UUIDs in the file are different from UUIDs in the output of the `mdadm` command:

- Open /etc/mdadm.conf in a text editor.
- Select from ARRAY to the end of the file, and delete the selected lines.
- Copy the output of the command into the file where you deleted the old lines.
- Save the modified file and exit.

10. Complete the steps in ["Formatting the HDFS Partition of an Operating System Disk"](#) on page 11-17.

Formatting the HDFS Partition of an Operating System Disk

Partition 4 (sda4) on an operating system disk is used for HDFS. After you format the partition and set the correct label, HDFS rebalances the job load to use the partition if the disk space is needed.

To format the HDFS partition:

1. Format the HDFS partition as an ext4 file system:

```
# mke4fs -t ext4 /dev/disk/by-hba-slot/snp4
```

```
mke4fs 1.41.12 (17-May-2010)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
110354432 inodes, 441393655 blocks
22069682 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
13471 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
4096000, 7962624, 11239424, 20480000, 23887872, 71663616, 78675968,
102400000, 214990848
```

Writing inode tables:

Note: If this command fails because the device is mounted, then dismount the drive now and skip step 3. See ["Prerequisites for Replacing a Working Disk" on page 11-9](#) for dismounting instructions.

2. Verify that the partition label (such as /u01 for s0p4) is missing:


```
# ls -l /dev/disk/by-label
```
3. Dismount the appropriate HDFS partition, either /u01 for /dev/sda, or /u02 for /dev/sdb:


```
# umount /u0n
```
4. Reset the partition label:


```
# tune4fs -c -1 -i 0 .2 -m 0.2 -L /u0n /dev/disk/by-hba-slot/snp4
```
5. Mount the HDFS partition:


```
# mount /u0n
```
6. Complete the steps in ["Restoring the Swap Partition" on page 11-18](#).

Restoring the Swap Partition

After formatting the HDFS partition, you can restore the swap partition.

To restore the swap partition:

1. Set the swap label:


```
# mkswap -L SWAP-sdn3 /dev/disk/by-hba-slot/snp3
Setting up swap space version 1, size = 12582907 kB
LABEL=SWAP-sdn3, no uuid
```
2. Verify that the swap partition is restored:


```
# bdaswapon; bdaswapoff
```

Filename	Type	Size	Used	Priority
/dev/sda3	partition	12287992	0	1
/dev/sdb3	partition	12287992	0	1
3. Complete the steps in ["Restoring the GRUB Master Boot Records and HBA Boot Order" on page 11-18](#).

Restoring the GRUB Master Boot Records and HBA Boot Order

After restoring the swap partition, you can restore the Grand Unified Bootloader (GRUB) master boot record.

To restore the GRUB boot record:

1. Open GRUB:


```
# grub --device-map=/boot/grub/device.map
```

```
GNU GRUB version 0.97 (640K lower / 3072K upper memory)

[ Minimal BASH-like line editing is supported. For the first word, TAB
lists possible command completions. Anywhere else TAB lists the possible
completions of a device/filename.
]
```

The device.map file maps the BIOS drives to operating system devices. The following is an example of a device map file:

```
# this device map was generated by anaconda
(hd0)      /dev/sda
(hd1)      /dev/sdb
```

2. Set the root device, entering hd0 for /dev/sda, or hd1 for /dev/sdb:

```
grub> root (hdn,0)

root (hdn,0)
Filesystem type is ext2fs, partition type 0x83
```

3. Install grub, entering hd0 for /dev/sda, or hd1 for /dev/sdb:

```
grub> setup (hdn)

setup (hdn)
Checking if "/boot/grub/stage1" exists... no
Checking if "/grub/stage1" exists... yes
Checking if "/grub/stage2" exists... yes
Checking if "/grub/e2fs_stage1_5" exists... yes
Running "embed /grub/e2fs_stage1_5 (hdn)"... failed (this is not fatal)
Running "embed /grub/e2fs_stage1_5 (hdn,0)"... failed (this is not fatal)
Running "install /grub/stage1 (hdn) /grub/stage2 p /grub/grub.conf"...
succeeded
Done.
```

4. Close the GRUB command-line interface:

```
grub> quit
```

5. Ensure that logical drive L0 (L + zero) is set as the boot drive in the HBA:

```
# MegaCli64 -AdpBootDrive -get a0
Adapter 0: Boot Virtual Drive - #0 (target id - 0).
```

6. If the previous command does not report L0 or virtual drive 0 target 0, then enter:

```
# MegaCli64 AdpBootDrive set L0 a0
```

7. Ensure that the auto-select boot drive feature is enabled:

```
# MegaCli64 adpBIOS EnblAutoSelectBootLd a0
Auto select Boot is already Enabled on Adapter 0.
```

8. Check the configuration. See "["Verifying the Disk Configuration"](#) on page 11-21.

Configuring an HDFS or Oracle NoSQL Database Disk

Complete the following instructions for any disk that is not used by the operating system. See "["Identifying the Function of a Disk Drive"](#) on page 11-13.

Partitioning a Disk for HDFS or Oracle NoSQL Database

To configure a disk, you must partition and format it.

Note: Replace `snp1` in the following commands with the appropriate symbolic name, such as `s4p1`.

To format a disk for use by HDFS or Oracle NoSQL Database:

1. Complete the steps in "Replacing a Disk Drive" on page 11-11, if you have not done so already.

2. Partition the drive:

```
# parted /dev/disk/by-hba-slot/sn -s mklabel gpt mkpart primary ext3 0% 100%
```

3. Format the partition for an ext4 file system:

```
# mke4fs -t ext4 /dev/disk/by-hba-slot/smp1
```

```
mke4fs 1.41.12 (17-May-2010)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
122011648 inodes, 488036855 blocks
24401842 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
14894 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000, 7962624, 11239424, 20480000, 23887872, 71663616, 78675968,
    102400000, 214990848

Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 23 mounts or
180 days, whichever comes first. Use tune4fs -c or -i to override.
```

4. Reset the appropriate partition label to the missing device. See [Table 11-2](#).

```
# tune4fs -c -1 -i 0 -m 0.2 -L /unn /dev/disk/by-hba-slot/smp1
```

For example, this command resets the label for /dev/disk/by-hba-slot/s2p1 to /u03:

```
# tune4fs -c -1 -i 0 -m 0.2 -L /u03 /dev/disk/by-hba-slot/s2p1
Setting maximal mount count to -1
Setting interval between checks to 0 seconds
Setting reserved blocks percentage to 0.2% (976073 blocks)
```

5. Mount the HDFS partition, entering the appropriate mount point:

```
# mount /unn
```

For example, mount /u03.

6. Restart the server.

7. If you are configuring multiple drives, then repeat the previous steps.

8. If you previously removed a mount point in Cloudera Manager, then restore it to the list.

- a. Open a browser window to Cloudera Manager. For example:

<http://bda1node03.example.com:7180>

- b.** Open Cloudera Manager and log in as admin.
- c.** On the Services page, click **hdfs**
- d.** Click the **Instances** subtab.
- e.** In the Host column, locate the server with the replaced disk. Then click the service in the Name column, such as **datanode**, to open its page.
- f.** Click the **Configuration** subtab.
- g.** If the mount point is missing from the Directory field, then add it to the list.
- h.** Click **Save Changes**.
- i.** From the Actions list, choose **Restart**.
- 9.** Check the configuration. See "[Verifying the Disk Configuration](#)" on page 11-21.

Verifying the Disk Configuration

Before you can reinstall the Oracle Big Data Appliance software on the server, you must verify that the configuration is correct on the new disk drive.

To verify the disk configuration:

- 1.** Check the software configuration:

```
# bdachecksw
```

- 2.** If there are errors, then redo the configuration steps as necessary to correct the problem.
- 3.** When bdachecksw returns no errors, restart the server.
- 4.** Check the /root directory for a file named BDA_REBOOT_SUCCEEDED.

Note: Allow several minutes for the file to refresh after you restart the server. Check the time stamp to ensure that you are seeing the results of the last restart.

- 5.** If you find a file named BDA_REBOOT_FAILED, then read the file to identify the problem.
- 6.** Return to Step 2.
- 7.** Repeat these steps until restarting the server results in a BDA_REBOOT_SUCCEEDED file.

Maintaining the InfiniBand Network

The InfiniBand network connects the servers through the bondib0 interface to the InfiniBand switches in the rack. This section describes how to perform maintenance on the InfiniBand switches.

This section contains the following topics:

- [Backing Up and Restoring Oracle ILOM Settings](#)
- [Replacing a Failed InfiniBand Switch](#)
- [Verifying InfiniBand Network Operation](#)

- Understanding the Network Subnet Manager Master

Backing Up and Restoring Oracle ILOM Settings

Oracle ILOM supports remote administration of the Oracle Big Data Appliance servers. This section explains how to back up and restore the Oracle ILOM configuration settings, which are set by the Mammoth Utility.

See Also: Oracle Integrated Lights Out Manager 3.0 documentation at

<http://docs.oracle.com/cd/E19860-01/>

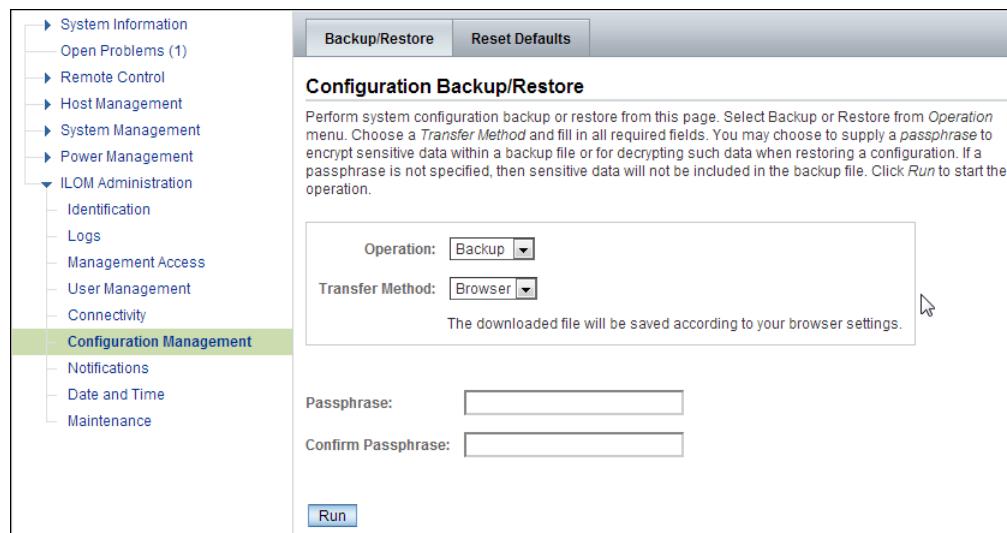
Backing Up the Oracle ILOM Configuration Settings

To back up the Oracle ILOM configuration settings:

1. Open your browser on any system that is on the same network as Oracle Big Data Appliance, and enter the Oracle ILOM address of a server. This example uses the Oracle ILOM address of node08:

`http://bda1node08-c.example.com`
2. Log in as the root user. The initial password is `welcome1`.
3. In the navigation tree, expand the ILOM Administration folder and select **Configuration Management**.
4. Select the Backup operation and the Browser transfer method, as shown in [Figure 11-1](#).
5. Enter a pass phrase. The phrase is used to encrypt sensitive information, such as passwords, in the backup file.
6. Click **Run** to start the backup operation. The results are downloaded to your local system in an XML file named `config_backup.xml`.
7. Save the file in a secure location.
8. Click the **Log Out** button.

Figure 11-1 Oracle ILOM Configuration Backup



Restoring Oracle ILOM Configuration Settings

To restore the Oracle ILOM configuration settings:

1. Open your browser on any system on the same network as Oracle Big Data Appliance and navigate to an Oracle ILOM service processor. This example uses Oracle ILOM on node08:


```
http://bdalnode08-c.us.example.com
```
2. Log in as the `ilom-admin` user. The default password is `welcome1`.
3. Select the **Maintenance** tab.
4. Select the **Backup/Restore** tab.
5. Select the Restore operation and the Browser transfer method.
6. Click **Choose File** and select the `config_backup.xml` file saved previously in a backup operation.
7. Enter the pass phrase that was set during the backup operation.
8. Click **Run** to restore the configuration.

Replacing a Failed InfiniBand Switch

Complete these steps to replace a Sun Network QDR InfiniBand Gateway or a Sun Datacenter InfiniBand Switch 36.

See Also:

- ["In-Rack InfiniBand Switch-to-Server Cable Connections"](#) on page D-7 for information about cabling
- [Sun Network QDR InfiniBand Gateway Switch Installation Guide](#) at http://docs.oracle.com/cd/E26699_01/html/E26706/gentextid-125.html#scrolltoc
- [Sun Datacenter InfiniBand Switch 36 User's Guide](#) at http://docs.oracle.com/cd/E26698_01/html/E26434/gentextid-119.html#scrolltoc

To replace a failed InfiniBand switch:

1. Disconnect the cables from the switch. All InfiniBand cables have labels at both ends indicating their locations. If any cables do not have labels, then label them.
2. Power off both power supplies on the switch by removing the power plugs.
3. Remove the switch from the rack.
4. Install the new switch in the rack.
5. Restore the switch settings using the backup file, as described in ["Backing Up and Restoring Oracle ILOM Settings"](#) on page 11-22.
6. Connect to the switch as `ilom_admin` and open the Fabric Management shell:

```
-> show /SYS/Fabric_Mgmt
```

The prompt changes from `->` to `FabMan@hostname->`

7. Disable the Subnet Manager:

```
FabMan@bdalsw-02-> disablesm
```

8. Connect the cables to the new switch, being careful to connect each cable to the correct port.
9. Verify that there are no errors on any links in the fabric:

```
FabMan@bdal1sw-02-> ibdiagnet -c 1000 -r
```

10. Enable the Subnet Manager:

```
FabMan@bdal1sw-02-> enablesm
```

Note: If the replaced switch was the Sun Datacenter InfiniBand Switch 36 spine switch, then manually fail the master Subnet Manager back to the switch by disabling the Subnet Managers on the other switches until the spine switch becomes the master. Then reenable the Subnet Manager on all the other switches.

Verifying InfiniBand Network Operation

If any component in the InfiniBand network has required maintenance, including replacing an InfiniBand Host Channel Adapter (HCA) on a server, an InfiniBand switch, or an InfiniBand cable, or if operation of the InfiniBand network is suspected to be substandard, then verify that the InfiniBand network is operating properly. The following procedure describes how to verify network operation:

Note: Use this procedure any time the InfiniBand network is performing below expectations.

To verify InfiniBand network operation:

1. Enter the ibdiagnet command to verify InfiniBand network quality:

```
# ibdiagnet -c 1000
```

Investigate all errors reported by this command. It generates a small amount of network traffic and can run during a normal workload.

See Also: *Sun Network QDR InfiniBand Gateway Switch Command Reference* at

http://docs.oracle.com/cd/E26699_01/html/E26706/gentextid-28027.html#scrolltoc

2. Report switch port error counters and port configuration information. The LinkDowned, RcvSwRelayErrors, XmtDiscards, and XmtWait errors are ignored by this command:

```
# ibqueryerrors.pl -rR -s LinkDowned,RcvSwRelayErrors,XmtDiscards,XmtWait
```

See Also: Linux man page for ibqueryerrors.S

3. Check the status of the hardware:

```
# bdacheckhw
```

The following is an example of the output:

```

[SUCCESS: Correct system model : SUN FIRE X4270 M2 SERVER
[SUCCESS: Correct processor info : Intel(R) Xeon(R) CPU X5675 @ 3.07GHz
[SUCCESS: Correct number of types of CPU : 1
[SUCCESS: Correct number of CPU cores : 24
[SUCCESS: Sufficient GB of memory (>=48): 48
[SUCCESS: Correct GB of swap space : 24
[SUCCESS: Correct BIOS vendor : American Megatrends Inc.
[SUCCESS: Sufficient BIOS version (>=08080102): 08080102
[SUCCESS: Recent enough BIOS release date (>=05/23/2011) : 05/23/2011
[SUCCESS: Correct ILOM version : 3.0.16.10.a r68533
[SUCCESS: Correct number of fans : 6
[SUCCESS: Correct fan 0 status : ok
[SUCCESS: Correct fan 1 status : ok
[SUCCESS: Correct fan 2 status : ok
[SUCCESS: Correct fan 3 status : ok
[SUCCESS: Correct fan 4 status : ok
[SUCCESS: Correct fan 5 status : ok
[SUCCESS: Correct number of power supplies : 2
[1m[34mINFO: Detected Santa Clara Factory, skipping power supply checks
[SUCCESS: Correct disk controller model : LSI MegaRAID SAS 9261-8i
[SUCCESS: Correct disk controller firmware version : 12.12.0-0048
[SUCCESS: Correct disk controller PCI address : 13:00.0
[SUCCESS: Correct disk controller PCI info : 0104: 1000:0079
[SUCCESS: Correct disk controller PCIe slot width : x8
[SUCCESS: Correct disk controller battery type : iBBU08
[SUCCESS: Correct disk controller battery state : Operational
[SUCCESS: Correct number of disks : 12
[SUCCESS: Correct disk 0 model : SEAGATE ST32000SSSUN2.0
[SUCCESS: Sufficient disk 0 firmware (>=61A): 61A
[SUCCESS: Correct disk 1 model : SEAGATE ST32000SSSUN2.0
[SUCCESS: Sufficient disk 1 firmware (>=61A): 61A

.

.

.

[SUCCESS: Correct disk 10 status : Online, Spun Up No alert
[SUCCESS: Correct disk 11 status : Online, Spun Up No alert
[SUCCESS: Correct Host Channel Adapter model : Mellanox Technologies MT26428
ConnectX VPI PCIe 2.0
[SUCCESS: Correct Host Channel Adapter firmware version : 2.9.1000
[SUCCESS: Correct Host Channel Adapter PCI address : 0d:00.0
[SUCCESS: Correct Host Channel Adapter PCI info : 0c06: 15b3:673c
[SUCCESS: Correct Host Channel Adapter PCIe slot width : x8
[SUCCESS: Big Data Appliance hardware validation checks succeeded

```

4. Check the status of the software:

```

# bdachecksw

[SUCCESS: Correct OS disk sda partition info : 1 ext3 raid 2 ext3 raid 3
linux-swap 4 ext3 primary
[SUCCESS: Correct OS disk sdb partition info : 1 ext3 raid 2 ext3 raid 3
linux-swap 4 ext3 primary
[SUCCESS: Correct data disk sdc partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdd partition info : 1 ext3 primary
[SUCCESS: Correct data disk sde partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdf partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdg partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdh partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdi partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdj partition info : 1 ext3 primary
[SUCCESS: Correct data disk sdk partition info : 1 ext3 primary

```

```
[SUCCESS: Correct data disk sdl partition info : 1 ext3 primary
[SUCCESS: Correct software RAID info : /dev/md2 level=raid1 num-devices=2
/dev/md0 level=raid1 num-devices=2
[SUCCESS: Correct mounted partitions : /dev/md0 /boot ext3 /dev/md2 / ext3
/dev/sda4 /u01 ext4 /dev/sdb4 /u02 ext4 /dev/sdc1 /u03 ext4 /dev/sdd1 /u04 ext4
/dev/sde1 /u05 ext4 /dev/sdf1 /u06 ext4 /dev/sdg1 /u07 ext4 /dev/sdh1 /u08 ext4
/dev/sdi1 /u09 ext4 /dev/sdj1 /u10 ext4 /dev/sdk1 /u11 ext4 /dev/sdl1 /u12 ext4
[SUCCESS: Correct swap partitions : /dev/sdb3 partition /dev/sda3 partition
[SUCCESS: Correct Linux kernel version : Linux 2.6.32-200.21.1.el5uek
[SUCCESS: Correct Java Virtual Machine version : HotSpot(TM) 64-Bit Server
1.6.0_29
[SUCCESS: Correct puppet version : 2.6.11
[SUCCESS: Correct MySQL version : 5.5.17
[SUCCESS: All required programs are accessible in $PATH
[SUCCESS: All required RPMs are installed and valid
[SUCCESS: Big Data Appliance software validation checks succeeded
```

Understanding the Network Subnet Manager Master

The Subnet Manager manages all operational characteristics of the InfiniBand network, such as the ability to:

- Discover the network topology
- Assign a local identifier to all ports connected to the network
- Calculate and program switch forwarding tables
- Monitor changes in the fabric

The InfiniBand network can have multiple Subnet Managers, but only one Subnet Manager is active at a time. The active Subnet Manager is the Master Subnet Manager. The other Subnet Managers are the Standby Subnet Managers. If a Master Subnet Manager is shut down or fails, then a Standby Subnet Manager automatically becomes the Master Subnet Manager.

Each Subnet Manager has a configurable priority. When multiple Subnet Managers are on the InfiniBand network, the Subnet Manager with the highest priority becomes the master Subnet Manager. On Oracle Big Data Appliance, the Subnet Managers on the leaf switches are configured as priority 5, and the Subnet Managers on the spine switches are configured as priority 8.

The following guidelines determine where the Subnet Managers run on Oracle Big Data Appliance:

- Run the Subnet Managers only on the switches in Oracle Big Data Appliance. Running a Subnet Manager on any other device is not supported.
- When the InfiniBand network consists of one, two, or three racks cabled together, all switches must run a Subnet Manager. The master Subnet Manager runs on a spine switch.
- When the InfiniBand network consists of four or more racks cabled together, then only the spine switches run a Subnet Manager. The leaf switches must disable the Subnet Manager.

See Also:

- Sun Network QDR InfiniBand Gateway library at
http://docs.oracle.com/cd/E26699_01/index.html
- Sun Datacenter InfiniBand Switch 36 library at
http://docs.oracle.com/cd/E26698_01/index.html

Changing the Number of Connections to a Gateway Switch

If you change the number of 10 GbE connections to a Sun Network QDR InfiniBand Gateway switch, then you must run the `bdaredoclientnet` utility. See "bdaredoclientnet" on page 12-15.

To re-create the VNICs in a rack:

1. Verify that `/opt/oracle/bda/BdaDeploy.json` exists on all servers and correctly describes the custom network settings. This command identifies files that are missing or have different date stamps:

```
dcli ls -l /opt/oracle/bda/BdaDeploy.json
```

2. Connect to node01 (bottom of rack) using the administrative network. The `bdaredoclientnet` utility shuts down the client network, so you cannot use it in this procedure.

3. Remove passwordless SSH:

```
/opt/oracle/bda/bin/remove-root-ssh
```

See "Setting Up Passwordless SSH" on page 13-1 for more information about this command.

4. Change directories:

```
cd /opt/oracle/bda/network
```

5. Run the utility:

```
bdaredoclientnet
```

The output is similar to that shown in [Example 7-2](#).

6. Restore passwordless SSH (optional):

```
/opt/oracle/bda/bin/setup-root-ssh
```

Changing the NTP Servers

The configuration information for Network Time Protocol (NTP) servers can be changed after the initial setup. The following procedure describes how to change the NTP configuration information for InfiniBand switches, Cisco switches, and Sun servers. Oracle recommends changing each server individually.

To update the Oracle Big Data Appliance servers:

1. Stop NTP services on the server.
2. Update the `/etc/ntp.conf` file with the IP address of the new NTP server.
3. Repeat these steps for each server.

To update the InfiniBand switches:

1. Log in to the switch as the `ilom-admin` user.
2. Follow the instructions in ["Setting the Time Zone and Clock on an InfiniBand Switch"](#) on page 7-14.

To update the Cisco Ethernet switch:

1. Use telnet to connect to the Cisco Ethernet switch.
2. Delete the current setting:

```
# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
(config)# no ntp server current_IPaddress
```

3. Enter the new IP address:

```
# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
(config)# ntp server new_IPaddress
```

4. Save the current configuration:

```
# copy running-config startup-config
```

5. Exit from the session:

```
# exit
```

See Also: ["Configuring the Cisco Ethernet Switch"](#) on page 7-4

Restart Oracle Big Data Appliance after changing the servers and switches.

Monitoring the PDU Current

The PDU current can be monitored directly. Configure threshold settings as a way to monitor the PDUs. The configurable threshold values for each metering unit module and phase are Info low, Pre Warning, and Alarm.

See Also: *Sun Rack II Power Distribution Units User's Guide* for information about configuring and monitoring PDUs at

<http://docs.oracle.com/cd/E19844-01/index.html>

[Table 11-3](#) lists the threshold values for the Oracle Big Data Appliance rack using a single-phase, low-voltage PDU.

Table 11-3 Threshold Values for Single-Phase, Low-Voltage PDU

PDU	Module/Phase	Info Low Threshold	Pre Warning Threshold	Alarm Threshold
A	Module 1, phase 1	0	18	23
A	Module 1, phase 2	0	22	24
A	Module 1, phase 3	0	18	23
B	Module 1, phase 1	0	18	23
B	Module 1, phase 2	0	22	24
B	Module 1, phase 3	0	18	23

Table 11–4 lists the threshold values for the Oracle Big Data Appliance rack using a three-phase, low-voltage PDU.

Table 11–4 Threshold Values for Three-Phase, Low-Voltage PDU

PDU	Module/Phase	Info Low Threshold	Pre Warning Threshold	Alarm Threshold
A and B	Module 1, phase 1	0	32	40
A and B	Module 1, phase 2	0	34	43
A and B	Module 1, phase 3	0	33	42

Table 11–5 lists the threshold values for the Oracle Big Data Appliance rack using a single-phase, high-voltage PDU.

Table 11–5 Threshold Values for Single-Phase, High-Voltage PDU

PDU	Module/Phase	Info Low Threshold	Pre Warning Threshold	Alarm Threshold
A	Module 1, phase 1	0	16	20
A	Module 1, phase 2	0	20	21
A	Module 1, phase 3	0	16	20
B	Module 1, phase 1	0	16	20
B	Module 1, phase 2	0	20	21
B	Module 1, phase 3	0	16	20

Table 11–6 lists the threshold values for the Oracle Big Data Appliance rack using a three-phase, high-voltage PDU.

Table 11–6 Threshold Values for Three-Phase, High-Voltage PDU

PDU	Module/Phase	Info Low Threshold	Pre Warning Threshold	Alarm Threshold
A and B	Module 1, phase 1	0	18	21
A and B	Module 1, phase 2	0	18	21
A and B	Module 1, phase 3	0	17	21

Monitoring the Health of Oracle Big Data Appliance

This chapter describes the utilities available on Oracle Big Data Appliance. Most of the utilities are for monitoring the health of the hardware and the network.

- [bdacheckcluster](#)
- [bdacheckhw](#)
- [bdacheckib](#)
- [bdachecknet](#)
- [bdachecksw](#)
- [bdaclustersynctime](#)
- [bdadiag](#)
- [bdagetclientconfig](#)
- [bdaid](#)
- [bdaimagevalidate](#)
- [bdaredoclientnet](#)
- [bdaserials](#)
- [bdaswapoff](#)
- [bdaswapon](#)
- [bdaupdatefw](#)
- [iblinkinfo](#)
- [imagehistory](#)
- [imageinfo](#)
- [listlinkup](#)
- [remove-root-ssh](#)
- [reset-boot-order](#)
- [setup-root-ssh](#)
- [showusb](#)
- [showvlan](#)
- [showvnics](#)

bdacheckcluster

Checks the health of a CDH cluster, including the software, hardware, and network, and logs the results in a file in the /tmp directory.

Syntax

```
bdacheckcluster
```

Example

This example shows the output from the utility:

```
# bdacheckcluster
INFO: Logging results to /tmp/bdacheckcluster_1373393815/
Enter CM admin password to enable check for CM services and hosts
Press ENTER twice to skip CM services and hosts checks
Enter password: password
Enter password again: password
SUCCESS: Mammoth configuration file is valid.
SUCCESS: hdfs is in good health
SUCCESS: mapreduce is in good health
SUCCESS: oozie is in good health
SUCCESS: zookeeper is in good health
SUCCESS: hive is in good health
SUCCESS: hue is in good health
SUCCESS: Cluster passed checks on all hadoop services health check
SUCCESS: bdalnode01.us.oracle.com is in good health
SUCCESS: bdalnode02.us.oracle.com is in good health
SUCCESS: bdalnode03.us.oracle.com is in good health

.
.

SUCCESS: Cluster passed checks on all hosts health check
SUCCESS: All cluster host names are pingable
SUCCESS: All cluster hosts passed checks on last reboot
INFO: Starting cluster host hardware checks
SUCCESS: All cluster hosts pass hardware checks
INFO: Starting cluster host software checks
SUCCESS: All cluster hosts pass software checks
SUCCESS: All ILOM hosts are pingable
SUCCESS: All client interface IPs are pingable
SUCCESS: All admin eth0 interface IPs are pingable
SUCCESS: All private Infiniband interface IPs are pingable
SUCCESS: All cluster hosts resolve public hostnames to private IPs

.
.

INFO: Checking local reverse DNS resolve of private IPs on all cluster hosts
SUCCESS: All cluster hosts resolve private IPs to public hostnames
SUCCESS: 2 virtual NICs available on all cluster hosts
SUCCESS: NTP service running on all cluster hosts
SUCCESS: At least one valid NTP server accessible from all cluster servers.
SUCCESS: Max clock drift of 0 seconds is within limits
SUCCESS: Big Data Appliance cluster health checks succeeded
```

bdacheckhw

Checks the hardware profile of the server.

Syntax

bdacheckhw

Usage Notes

See ["Configuring the Oracle Big Data Appliance Servers" on page 7-19](#) for tips about using this utility.

Example

This example shows the output from the utility:

```
# bdacheckhw
SUCCESS: Found BDA v2 server : SUN FIRE X4270 M3
SUCCESS: Correct processor info : Intel(R) Xeon(R) CPU E5-2660 0 @ 2.20GHz
SUCCESS: Correct number of types of CPU : 1
SUCCESS: Correct number of CPU cores : 32
SUCCESS: Sufficient GB of memory (>=63): 63
SUCCESS: Correct BIOS vendor : American Megatrends Inc.
SUCCESS: Sufficient BIOS version (>=08080102): 18021300
SUCCESS: Recent enough BIOS release date (>=05/23/2011):06/19/2012
SUCCESS: Correct ILOM major version : 3.1.2.12
SUCCESS: Sufficient ILOM minor version (>=74388): 74388
SUCCESS: Correct number of fans : 4
SUCCESS: Correct fan 0 status : ok
SUCCESS: Correct fan 1 status : ok
.
.
.
SUCCESS: Big Data Appliance hardware validation checks succeeded
```

bdacheckib

Checks the InfiniBand cabling between the servers and switches of a single rack, when entered with no options.

Run this command after connecting as `root` to any server.

Syntax

```
bdacheckib [parameter]
```

Parameters

-s

The same as running without options except that the network must still be configured with the factory default settings. You can use this option as soon as Oracle Big Data Appliance arrives at the site, even before the switches are configured.

-m *json_file*

Verifies that the InfiniBand switch-to-switch cabling among multiple ranks is correct. To create *json_file*, see the **-g** option.

-g

Generates a sample JSON file named `sample-multi-rack.json`. Use this file as an example of the format required by the **-m** option.

Usage Notes

The network must be configured with custom settings as described by `/opt/oracle/bda/BdaDeploy.json`.

Examples

This example checks the switch-to-server InfiniBand cables:

```
[root@node01 network]# bdacheckib
LINK bdalsw-ib3.15A ... bdalnode02.HCA-1.2 UP
LINK bdalsw-ib3.15B ... bdalnode01.HCA-1.2 UP
LINK bdalsw-ib3.14A ... bdalnode04.HCA-1.2 UP
LINK bdalsw-ib3.14B ... bdalnode03.HCA-1.2 UP
.
.
.
```

The next example generates the JSON file and shows the output.

```
[root@bdalnode01 bda]# bdacheckib -g
[root@bdalnode01 bda]# cat sample-multi-rack.json
# This json multirack spec is generated. The array elements are sorted
# alphabetically. A properly arranged json spec representing racks from left to right
# can be used as input to bdacheckib (bdacheckib -m multi-rack.json)
# Note commas separating rack elements are optional.
[
  {"SPINE_NAME": "bdalsw-ib1", "LEAF1_NAME": "bdalsw-ib2", "LEAF2_NAME": "bdalsw-ib3"}
  {"SPINE_NAME": "bda2sw-ib1", "LEAF1_NAME": "bda2sw-ib2", "LEAF2_NAME": "bda2sw-ib3"}
  {"SPINE_NAME": "dm01sw-ib1", "LEAF1_NAME": "dm01sw-ib2", "LEAF2_NAME": "dm01sw-ib3"}
```

The final example checks all the racks on the InfiniBand network using the edited JSON file created in the previous example:

```
# bdacheckib -m sample-multi-rack.json

Rack #1 leaf to spines topology check
leaf: bdaisw-ib2
  expected 2 links to rack 1, found 4 OK
  expected 2 links to rack 2, found 4 OK
  expected 2 links to rack 3, found 3 OK
  expected 2 links to rack 4, found 3 OK
leaf: bdaisw-ib3
  expected 2 links to rack 1, found 3 OK
  expected 2 links to rack 2, found 4 OK
  expected 2 links to rack 3, found 3 OK
  expected 2 links to rack 4, found 3 OK
.
.
.

Rack #1 cabling details
leaf: bdaisw-ib2
  LINK ... to rack2 ..... UP
  LINK ... to rack2 ..... UP
  LINK ... to rack1 ..... UP
  LINK ... to rack1 ..... UP
  LINK ... to rack3 ..... UP
  LINK ... to rack3 ..... UP
  LINK ... to rack4 ..... UP
  LINK ... to rack4 ..... UP
.
.
.
```

bdachecknet

Checks whether the network configuration is working properly.

Syntax

```
bdachecknet
```

Usage Notes

Run this command after connecting as root to any server.

Example

This example shows the output from the utility:

```
[root@node01 network]# bdachecknet
bdachecknet: analyse /opt/oracle/bda/BdaDeploy.json
bdachecknet: passed
bdachecknet: checking for BdaExpansion.json
bdachecknet: ping test private infiniband ips (bondib0 40gbs)
bdachecknet: passed
bdachecknet: ping test admin ips (eth0 1gbs)
bdachecknet: passed
bdachecknet: test admin network resolve and reverse resolve
bdachecknet: passed
bdachecknet: test admin name array matches ip array
bdachecknet: passed
bdachecknet: test client network (eoib) resolve and reverse resolve
bdachecknet: passed
bdachecknet: test client name array matches ip array
bdachecknet: passed
bdachecknet: test ntp servers
bdachecknet: passed
bdachecknet: ping client gateway
bdachecknet: passed
bdachecknet: test arp -a
bdachecknet: passed
```

bdachecksw

Checks the software profile of a server.

Syntax

bdachecksw

Usage Notes

See ["Configuring the Oracle Big Data Appliance Servers" on page 7-19](#) for tips about using this utility.

Example

This example shows the output from the utility:

```
# bdachecksw
SUCCESS: Correct OS disk s0 partition info : 1 ext3 raid 2 ext3 raid 3 linux-swap
4 ext3 primary
SUCCESS: Correct OS disk s1 partition info : 1 ext3 raid 2 ext3 raid 3 linux-swap
4 ext3 primary
SUCCESS: Correct data disk s2 partition info : 1 ext3 primary
SUCCESS: Correct data disk s3 partition info : 1 ext3 primary
SUCCESS: Correct data disk s4 partition info : 1 ext3 primary
SUCCESS: Correct data disk s5 partition info : 1 ext3 primary
SUCCESS: Correct data disk s6 partition info : 1 ext3 primary
SUCCESS: Correct data disk s7 partition info : 1 ext3 primary
SUCCESS: Correct data disk s8 partition info : 1 ext3 primary
SUCCESS: Correct data disk s9 partition info : 1 ext3 primary
SUCCESS: Correct data disk s10 partition info : 1 primary
SUCCESS: Correct data disk s11 partition info : 1 primary
SUCCESS: Correct software RAID info : /dev/md2 level=raid1 num-devices=2 /dev/md0
level=raid1 num-devices=2
SUCCESS: Correct mounted partitions : /dev/mapper/lvg1-lv1 /lv1 ext4 /dev/md0
/boot ext3 /dev/md2 / ext3 /dev/sd4 /u01 ext4 /dev/sd4 /u02 ext4 /dev/sd1 /u03
ext4 /dev/sd1 /u04 ext4 /dev/sd1 /u05 ext4 /dev/sd1 /u06 ext4 /dev/sd1 /u07 ext4
/dev/sd1 /u08 ext4 /dev/sd1 /u09 ext4 /dev/sd1 /u10 ext4
SUCCESS: Correct matching label and slot : symbolic link to `..../sda4'
SUCCESS: Correct matching label and slot : symbolic link to `..../sdb4'
.
.
.

SUCCESS: Correct Linux kernel version : Linux 2.6.32-200.21.1.el5uek
SUCCESS: Correct Java Virtual Machine version : HotSpot(TM) 64-Bit Server 1.6.0_37
SUCCESS: Correct puppet version : 2.6.11
SUCCESS: Correct MySQL version : 5.5.17
SUCCESS: All required programs are accessible in $PATH
SUCCESS: All required RPMs are installed and valid
SUCCESS: Correct bda-monitor status : bda monitor is running
SUCCESS: Big Data Appliance software validation checks succeeded
```

bdaclustersynctime

Synchronizes the time of all servers in a cluster.

Syntax

```
bdaclustersynctime
```

Usage Notes

To use this utility, you must log in as `root` to the first server in the node. Passwordless `ssh` must also be set up for the cluster. See the `-C` parameter for ["setup-root-ssh"](#) on page 12-29.

This utility creates a log file named `bdaclustersynctime.log` in the directory identified in the output.

Example

The following example successfully runs `bdaclustersynctime`:

```
# bdaclustersynctime
INFO: Logging results to /tmp/bdacluster_1373485952/
SUCCESS: Mammoth configuration file is valid.
SUCCESS: All cluster host names are pingable
SUCCESS: NTP service running on all cluster hosts
SUCCESS: At least one valid NTP server found
SUCCESS: No errors found syncing date and time on all nodes
SUCCESS: Max clock drift of 0 seconds is within limits
SUCCESS: Sync date and time of cluster succeeded
```

bdadiag

Collects diagnostic information about an individual server for Oracle Support.

Syntax

`bdadiag [parameter]`

Parameters

cm

Downloads diagnostics from Cloudera Manager. You must know the Cloudera Manager admin password to use this parameter.

hadoop

Collects the CDH cluster logs from `/var/log`.

hdfs

Collects the output of a complete Hadoop Distributed File System (HDFS) `fsck` check.

ilom

Gathers ILOM data using `ipmitool`. You cannot use `ilom` in the same command as `snapshot`.

osw

Collects Oracle OS Watcher logs, which include historical operating system performance and monitoring data. The output can consume several hundred megabytes of disk space.

snapshot

Collects ILOM snapshot data over the network, and provides most useful output than the `ilom` option. You must know the server `root` password to use this parameter. You cannot use `snapshot` in the same command as `ilom`.

Return Value

The name of the compressed file in the `/tmp` directory where `bdadiag` stored the data. The file name has the form `bdadiag_server-name_server-serial-number_date.tar.bz2`.

The logs are organized in subdirectories, including the following:

asr
ilom
install
messages
net
raid
sysconfig

Usage Notes

You must be connected to the server as `root`.

The optional parameters instruct `bdadiag` to collect additional diagnostics. You can enter the options together on the command line to collect the most information.

You run `bdadiag` at the request of Oracle Support and associate it with an open Service Request (SR). See the *Oracle Big Data Appliance Software User's Guide* for details about providing diagnostics to Oracle Support.

Example

This example shows the basic output from the utility:

```
# bdadiag

Big Data Appliance Diagnostics Collection Tool v2.2.0

Gathering Linux information

Skipping ILOM collection. Use the ilom or snapshot options, or login to
ILOM over the network and run Snapshot separately if necessary.

Generating diagnostics tarball and removing temp directory

=====
Done. The report files are bzip2 compressed in /tmp/bdadiag_bda1node0101_12
16FM5497_2013_01_18_06_49.tar.bz2
=====
```

The next example shows the additional output from the `cm` option.

```
]# bdadiag cm

Big Data Appliance Diagnostics Collection Tool v2.2.0

Getting Cloudera Manager Diagnostics
Password for the Cloudera Manager admin user is needed
Enter password: password
Enter password again: password
Passwords match
Waiting for Cloudera Manager ...
Succeeded. Output in : /opt/oracle/BDAMammoth/bdaconfig/tmp/cm_commands.out
Collecting diagnostic data ...
{ "startTime" : "2013-07-09T13:27", "endTime" : "2013-07-08T13:27" }
Succeeded. Output in : /opt/oracle/BDAMammoth/bdaconfig/tmp/cm_commands_
collectDiagnosticData.out
Command ID is 213
...
Command 213 finished after 20 seconds
Operation completed successfully
Diagnostic data successfully collected
Can be downloaded from URL
http://bda1node03.example.com:7180/cmfc/213/download
Downloading diagnostic data ...
Original Cloudera Manager Diagnostics Bundle Name :
3609df48-4930-11e1-9006-b8ac6f8061c1.cluster22.20130709-20-39.support-bundle.zip
Data successfully downloaded and placed in /tmp/bdadiag_bda1node01_1143FMM06E_
2013_07_09_13_
26/3609df48-4930-11e1-9006-b8ac6f8061c1.AK00023713.cluster22.20130709-20-39.suppor
t-bundle.zip
Gathering Linux information
.
.
.
```

The next example shows the additional output from the `snapshot` option:

```
# bdadiag snapshot

Big Data Appliance Diagnostics Collection Tool v2.2.0

Please enter Host OS root password required for snapshot: password

Gathering Linux information

Gathering ILOM Snapshot data - please be patient, this may take a long time

snapshot running: Tue Jul  9 13:42:28 PDT 2013
snapshot running: Tue Jul  9 13:43:29 PDT 2013
snapshot running: Tue Jul  9 13:44:32 PDT 2013
snapshot running: Tue Jul  9 13:45:35 PDT 2013
snapshot running: Tue Jul  9 13:46:39 PDT 2013
snapshot running: Tue Jul  9 13:47:43 PDT 2013
snapshot running: Tue Jul  9 13:48:47 PDT 2013
Snapshot Collection completed.

Generating diagnostics tarball and removing temp directory

=====
Done. The report files are bzip2 compressed in /tmp/bdadiag_bda1node01_1143FMM06E_
2013_07_09_13_40.tar.bz2
=====
```

bdagetclientconfig

Deploys the HDFS, MapReduce, and Hive client configuration files from Cloudera Manager.

Syntax

```
bdagetclientconfig
```

Usage Notes

You must be connected to the server as root.

To deploy a new client configuration to all nodes of the cluster, use the `dcli -C` command.

Example

This example shows the output from one node in the cluster:

```
# bdagetclientconfig

bdagetclientconfig : Download and deploy HDFS, Map-Reduce and Hive client
configuration files

Logging to /tmp/bdagetclientconfig-1368541073.out

Downloading HDFS and Map-Reduce client configuration zipfile

Downloading Hive client configuration zipfile

Deploying HDFS, Map-Reduce and Hive client configurations

Successfully downloaded and deployed HDFS, Map-Reduce and Hive client
configurations !
```

bdaid

Returns information about an individual server.

If you need to contact Oracle Support about an issue with Cloudera's Distribution including Apache Hadoop, then run this command first.

Syntax

```
bdaid
```

Usage Notes

You must be connected to the server as `root`.

Example

This example shows the output from the utility:

```
# bdaid
Server Hostname      : bda1node09
Rack Serial Number  : AK00023713
Server Serial Number : 1137FMM06Y
Cluster Name         : Cluster 1
Appliance Name       : bda1
```

bdaimagevalidate

Validates the hardware and software by running [bdacheckhw](#), and then [bdachecksw](#).

Syntax

```
bdaimagevalidate
```

Example

```
# bdaimagevalidate
SUCCESS: Found BDA v2 server : SUN FIRE X4270 M3
SUCCESS: Correct processor info : Intel(R) Xeon(R) CPU E5-2660 0 @ 2.20GHz
SUCCESS: Correct number of types of CPU : 1
SUCCESS: Correct number of CPU cores : 32
SUCCESS: Sufficient GB of memory (>=63): 63
SUCCESS: Correct BIOS vendor : American Megatrends Inc.
SUCCESS: Sufficient BIOS version (>=08080102): 18021300
SUCCESS: Recent enough BIOS release date (>=05/23/2011):06/19/2012
SUCCESS: Correct ILOM major version : 3.1.2.12
.
.
.
SUCCESS: Correct puppet version : 2.6.11
SUCCESS: Correct MySQL version : 5.5.17
SUCCESS: All required programs are accessible in $PATH
SUCCESS: All required RPMs are installed and valid
SUCCESS: Correct bda-monitor status : bda monitor is running
SUCCESS: Big Data Appliance software validation checks succeeded
SUCCESS: All Big Data Appliance validation checks succeeded
```

bdaredoclientnet

Re-creates the virtual network interface cards (VNICS) for all servers in the rack and spreads them across the available 10 GbE ports.

Syntax

bdaredoclientnet

Usage Notes

Log in to server 1 and change to the /opt/oracle/bda/network directory to run this utility.

You must run this utility after changing the number of 10 GbE connections to a Sun Network QDR InfiniBand Gateway switch. See ["Changing the Number of Connections to a Gateway Switch"](#) on page 11-27.

The bdaredoclientnet utility performs the following subset of tasks done by the networksetup-two script during the initial configuration of Oracle Big Data Appliance:

- Verifies that the administrative network is working, the InfiniBand cabling is correct, and the InfiniBand switches are available
- Determines how many 10 GbE connections are available and connects them to the InfiniBand Gateway switches
- Deletes all VNICS and re-creates them
- Connects to each server and updates the configuration files
- Restarts the client network and verifies that it can connect to each server using the newly configured client network

Example

The following example shows the output from the bdaredoclientnet utility:

```
# cd /opt/oracle/bda/network
# bdaredoclientnet
bdaredoclientnet: check syntax and static semantics of
/opt/oracle/bda/BdaDeploy.json
bdaredoclientnet: passed
bdaredoclientnet: ping servers by name on admin network
bdaredoclientnet: passed
bdaredoclientnet: verify infiniband topology
bdaredoclientnet: passed
bdaredoclientnet: start setup client network (10gigE over Infiniband)
bdaredoclientnet: ping both gtw leaf switches
bdaredoclientnet: passed
bdaredoclientnet: verify existence of gateway ports
bdaredoclientnet: passed
bdaredoclientnet: removing existing eoib setup for this server
Shutting down interface bondeth0: [ OK ]
Shutting down interface bondib0: [ OK ]
Shutting down interface eth0: [ OK ]
Shutting down loopback interface: [ OK ]
Disabling IPv4 packet forwarding: net.ipv4.ip_forward = 0
Bringing up loopback interface: [ OK ]
```

```
Bringing up interface bondib0: [ OK ]
Bringing up interface eth0: [ OK ]
bdaredoclientnet: ping server ips on admin network
bdaredoclientnet: passed
bdaredoclientnet: ping servers by name on admin network
bdaredoclientnet: passed
bdaredoclientnet: test ssh server ips on admin network
hello from bdalnode02.us.oracle.com
hello from bdalnode03.us.oracle.com

.

.

.

bdaredoclientnet: passed
bdaredoclientnet: check existence of default vlan for port 0A-ETH-1 on bdalsw-ib2
bdaredoclientnet: use existing default vlan for port 0A-ETH-1 on bdalsw-ib2
bdaredoclientnet: check existence of default vlan for port 0A-ETH-1 on bdalsw-ib3
bdaredoclientnet: use existing default vlan for port 0A-ETH-1 on bdalsw-ib3
bdaredoclientnet: passed
bdaredoclientnet: apply eoib on each server
bdaredoclientnet: wait a few seconds for the network to restart on 10.111.22.001
bdaredoclientnet: wait a few seconds for the network to restart on 10.111.22.002

.

.

.

check and delete vNIC for bdalnode02 on switch bdalsw-ib2
vNIC ID 757 deleted
IO Adapter for vNIC deleted
check and delete vNIC for bdalnode02 on switch bdalsw-ib3
check and delete vNIC for bdalnode02 on switch bdalsw-ib2
check and delete vNIC for bdalnode02 on switch bdalsw-ib3
vNIC ID 707 deleted
IO Adapter for vNIC deleted
create vNIC eth9 bdalnode02 on switch bdalsw-ib3
vNIC created
create vNIC eth8 bdalnode02 on switch bdalsw-ib2
vNIC created

.

.

.

bdaredoclientnet: ping server ips on client network
bdaredoclientnet: passed
bdaredoclientnet: test ssh server ips on client network
hello from bdalnode02.us.oracle.com
hello from bdalnode03.us.oracle.com

.

.

.

bdaredoclientnet: passed
bdaredoclientnet: end setup client network
```

bdaserials

Returns the serial numbers and media access control (MAC) addresses for most components of the Oracle Big Data Appliance server that you are connected to.

Syntax

bdaserials

Example

This example shows the output from the utility:

bdaswapoff

Turns off swapping by the operating system.

Syntax

```
bdaswapoff
```

Usage Notes

The `bdaswapoff` utility disables both swap partitions on a server, which disables all swapping by the operating system. This state persists when the server restarts; you must run `bdaswapon` to restore swapping. Swapping is turned off by default to improve performance and to allow high availability if a disk fails.

Use `bdaswapoff` instead of the Linux `swapoff` utility.

See Also

["bdaswapon"](#) on page 12-19

Example

This example turns off swapping:

```
# bdaswapoff
#
```

bdaswapon

Turns on paging and swapping by the operating system.

Syntax

```
bdaswapon
```

Usage Notes

Swapping is turned off by default to improve performance and the ability to recover from disk failure.

Use bdaswapon instead of the Linux swapon utility.

See Also

["bdaswapoff"](#) on page 12-18

Example

This example turns on swapping:

```
# bdaswapon
Filename                                     Type      Size   Used  Priority
/dev/sda3                                     partition 12287992      0      1
/dev/sdb3                                     partition 12287992      0      1
```

bdaupdatefw

Updates the firmware of a particular component of a server, such as a replacement disk drive.

Syntax

```
bdaupdatefw parameter
```

Parameters

-d *N*

Updates the LSI disk firmware for the specified disk (*N*). Each server has 12 disks, which are numbered from 0 to 11.

-f

Specifies the file path to the firmware. If the path is omitted, then `bdaupdatefw` uses the default firmware for the specified component from `/opt/oracle/bda/firmware`.

-h

Displays syntax and usage information for `bdaupdatefw`.

-i

Updates the Oracle ILOM firmware.

-l

Updates the LSI disk controller firmware.

-m

Updates the firmware for the Mellanox host channel adapter (InfiniBand card).

Usage

This utility is typically run by Oracle field engineers when installing or replacing hardware components, which may not be factory-installed with a supported firmware version. During a software installation, the Mammoth Utility copies the currently supported firmware to Oracle Big Data Appliance. The `bdaupdatefw` command uses those files when they are needed to update the firmware of a server component.

You can update one firmware package in a single command. Thus, you can specify only one of the following parameters: `-d`, `-i`, `-l`, or `-m`.

Caution: Only use the firmware provided in a Mammoth bundle. Do not attempt to install firmware downloaded from a third-party site. Doing so may result in result in the loss of warranty and support. See "[Oracle Big Data Appliance Restrictions on Use](#)" on page 1-4.

Examples

This example shows the output from a command to update the Oracle ILOM firmware. To perform the update, you must execute the `ipmiflash` command provided in the output.

```
# bdaupdatefw -i
[INFO:GENERAL] No firmware file specified. Using default firmware file - /opt/or
```

```
          acle/bda/firmware/ILOM-3_2_0_r74388-Sun_Fire_X4270_M3.pkg
[INFO:GENERAL] Updating ILOM firmware with the firmware file /opt/oracle/bda/fir
          mware/ILOM-3_2_0_r74388-Sun_Fire_X4270_M3.pkg
[INFO:GENERAL] Original version is: 3.1.2.12 r74388
[INFO:GENERAL]
[INFO:GENERAL] Please run the following command and enter the root password
[INFO:GENERAL] for the ILOM when requested
[INFO:GENERAL]
[INFO:GENERAL] Note that this command will shutdown the server after flashing.
[INFO:GENERAL] You will need to login to the ILOM to power on the server afterwa
          rds.
[INFO:GENERAL]
[INFO:GENERAL] ipmiflash -v -I lanplus -H 10.133.46.218 -U root write /opt/oracl
          e/bda/firmware/ILOM-3_1_2_12_r74388-Sun_Fire_X4270_M3.pkg
[INFO:GENERAL]
```

iblinkinfo

Lists all InfiniBand connections in the InfiniBand network.

Syntax

iblinkinfo

Usage Notes

Run this command as `root` from any server.

Example

This example shows two Oracle Big Data Appliances and one Oracle Exadata Database Machine on the InfiniBand network:

```
[root@bdalnode01 network]# iblinkinfo
Switch 0x002128df348ac0a0 SUN IB QDR GW switch bdalsw-ib2 10.133.43.36:
149 1[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 130 2[ ] "SUN IB QDR GW switch bdalsw-ib2 10.133...
149 2[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 127 1[ ] "SUN IB QDR GW switch bdalsw-ib2 10.133...
149 3[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 111 2[ ] "SUN IB QDR GW switch bdalsw-ib2 10.133...
149 4[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 109 1[ ] "SUN IB QDR GW switch bdalsw-ib2 10.133...
149 5[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 143 1[ ] "bdalnode02 BDA 192.168.41.20 HCA-1" ( )
149 6[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 137 1[ ] "bdalnode01 BDA 192.168.41.19 HCA-1" ( )
149 7[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 141 1[ ] "bdalnode04 BDA 192.168.41.22 HCA-1" ( )
149 8[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 123 1[ ] "bdalnode03 BDA 192.168.41.21 HCA-1" ( )
149 9[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 151 1[ ] "bdalnode06 BDA 192.168.41.24 HCA-1" ( )
149 10[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 112 1[ ] "bdalnode05 BDA 192.168.41.23 HCA-1" ( )
149 11[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 139 1[ ] "bdalnode07 BDA 192.168.41.25 HCA-1" ( )
149 12[ ] == ( Down/Disabled) ==> [ ] " " ( )
149 13[ ] == ( Down/Disabled) ==> [ ] " " ( )
149 14[ ] == ( 4X 10.0 Gbps Active/ LinkUp) ==> 85 9[ ] "SUN DCS 36P QDR dm01sw-ib1 10.133.40.203" ( )
149 15[ ] == ( Down/Disabled) ==> [ ] " " ( )
.
.
```

imagehistory

Displays a history of operating system upgrades.

Syntax

```
imagehistory
```

Example

This example shows that the appliance was imaged with version 2.1.0 with no upgrades:

```
$ imagehistory
Big Data Appliance Image History

IMAGE_VERSION      : 2.2.0
IMAGE_CREATION_DATE : Wed Jul 3 05:01:50 UTC 2013
IMAGING_START_DATE  : Wed Jul 3 19:01:31 UTC 2013
IMAGING_END_DATE    : Wed Jul 3 12:49:16 PDT 2013
DEPLOYMENT_VERSION   : 2.2.0
DEPLOYMENT_START_DATE : Mon Jul 8 13:23:49 PDT 2013
DEPLOYMENT_END_DATE    : Mon Jul 8 14:09:49 PDT 2013
```

imageinfo

Displays information about the Oracle Big Data Appliance operating system image currently running.

Syntax

imageinfo

Example

This example identifies the 2.2.0 image:

```
$ imageinfo
Big Data Appliance Image Info

IMAGE_CREATION_DATE      : Tue Jul 02 21:52:15 PDT 2013
IMAGE_LABEL                : BDA_2.2.0_LINUX.X64_130702.2
IMAGE_VERSION              : 2.2.0
KERNEL_VERSION              : 2.6.32-200.21.1.el5uek
BDA_RPM_VERSION            : bda-2.2.0-1
OFA_RPM_VERSION            : ofa-2.6.32-200.21.1.el5uek-1.5.5-4.0.55.4
JDK_VERSION                 : jdk-1.6.0_45-fcs
HADOOP_VERSION              : 2.0.0-cdh4.3.0
```

listlinkup

Shows the Ethernet bridge ports with active links.

Syntax

```
listlinkup
```

Usage Notes

Run this command after connecting as root to a Sun Network QDR InfiniBand Gateway switch.

Example

This example shows three active ports (0A-ETH-1, 0A-ETH-3, and 0A-ETH-4) out of the eight available ports on switch bda1sw-ib3:

```
[root@bda1sw-ib3 ~]# listlinkup | grep Bridge
Bridge-0 Port 0A-ETH-1 (Bridge-0-2) up (Enabled)
Bridge-0 Port 0A-ETH-2 (Bridge-0-2) down (Enabled)
Bridge-0 Port 0A-ETH-3 (Bridge-0-1) up (Enabled)
Bridge-0 Port 0A-ETH-4 (Bridge-0-1) up (Enabled)
Bridge-1 Port 1A-ETH-1 (Bridge-1-2) down (Enabled)
Bridge-1 Port 1A-ETH-2 (Bridge-1-2) down (Enabled)
Bridge-1 Port 1A-ETH-3 (Bridge-1-1) down (Enabled)
Bridge-1 Port 1A-ETH-4 (Bridge-1-1) down (Enabled)
```

remove-root-ssh

Removes passwordless SSH previously established by the [setup-root-ssh](#) command.

Syntax

```
remove-root-ssh [-C | -c | -g | -j] [-p]
```

```
remove-root-ssh -h
```

Parameters

-C

Targets all servers in the cluster, using the list of servers in /opt/oracle/bda/cluster-hosts-infiniband.

-c *host1, host2,...*

Targets the servers specified as *host1*, *host2*, and so forth, on the command line.

-g *groupfile*

Targets a user-defined set of servers listed in *groupfile*. You can enter either server names or IP addresses in the file, one per line.

-j "eth0_ips[range]"

Specifies the range of servers in a starter rack [1-6] or a starter rack and expansion kit [1-12]. This parameter is required in the 2.2.x base image when the utility is used before network configuration.

-h

Displays Help.

-p *password*

Specifies the root password on the command line.

Oracle recommends that you omit this parameter. You will be prompted to enter the password, which the utility does not display on your screen.

Usage Notes

You must know the root password to use this command.

If you do not specify the target servers, then `remove-root-ssh` uses all servers in the rack, as listed in /opt/oracle/bda/rack-hosts-infiniband.

See Also

["setup-root-ssh" on page 12-29](#), ["Setting Up Passwordless SSH" on page 13-1](#)

Example

This example shows passwordless SSH being removed:

```
# remove-root-ssh
calling /opt/oracle/bda/bin/dcli -c 192.168.42.37,192.168.42.38,192.168.42.39
--unkey
192.168.42.37: ssh key dropped
192.168.42.38: ssh key dropped
```

```
192.168.42.39: ssh key dropped
remove-root-ssh succeeded
```

reset-boot-order

Resets the boot order of the server to the factory defaults, as specified in the BIOS. By doing so, it clears any ILOM booting overrides.

Syntax

```
reset-boot-order
```

Example

The following example resets the boot order of the current server:

```
# reset-boot-order
Set Boot Device to none

Cleared ILOM boot override - Boot device: none

Found BDA v1 Hardware - setting boot order using biosconfig

Copyright (C) SUN Microsystems 2009.
BIOSconfig Utility Version 2.2.1
Build Date: Aug 24 2009
Build Time: 09:01:30

BIOSconfig Specification Version 2.4

Processing Input BIOS Data.....

Success

Found USB device name : USB:02.82;01 Unigen PSA4000
.

.

.

BIOSconfig Specification Version 2.4

Processing Input BIOS Data.....

Success
New BIOS boot order :
    USB:02.82;01  Unigen PSA4000
    RAID:Slot0.F0:(Bus 13 Dev 00)PCI RAID Adapter
    PXE:IBA GE Slot 0100 v1331
    PXE:IBA GE Slot 0101 v1331
    PXE:IBA GE Slot 0700 v1331
    PXE:IBA GE Slot 0701 v1331
```

setup-root-ssh

Establishes passwordless SSH for the root user.

Syntax

```
setup-root-ssh [-C | -c | -g | -j] [-p]
```

```
setup-root-ssh -h
```

Parameters

-C

Targets all servers in the cluster, using the list of servers in /opt/oracle/bda/cluster-hosts-infiniband.

-c host1, host2,...

Targets the servers specified as *host1*, *host2*, and so forth, on the command line.

-g groupfile

Targets a user-defined set of servers listed in *groupfile*. You can enter either server names or IP addresses in the file, one per line.

-j "eth0_1ps[range]"

Specifies the range of servers in a starter rack [1-6] or a starter rack and expansion kit [1-12]. This parameter is required in the 2.2.x base image when the utility is used before network configuration.

-h

Displays Help.

-p password

Specifies the root password on the command line.

Oracle recommends that you omit this parameter. You will be prompted to enter the password, which the utility does not display on your screen.

Usage Notes

You must know the root password to use this command.

If you do not specify the target servers, then `setup-root-ssh` uses all servers in the rack, as listed in /opt/oracle/bda/rack-hosts-infiniband.

See Also

["remove-root-ssh" on page 12-26](#), ["Setting Up Passwordless SSH" on page 13-1](#)

Example

This example shows passwordless SSH being set up for root:

```
# setup-root-ssh
Enter root password: password
spawn /opt/oracle/bda/bin/dcli -c 192.168.42.37,192.168.42.38... -k
root@192.168.42.37's password:
root@192.168.42.38's password:
```

```
.
.
.
192.168.42.37: ssh key added
192.168.42.38: ssh key added
```

```
.
.
.
setup-root-ssh succeeded
```

showusb

Shows the device location of an inserted USB drive as it is known to the operating system, such as /dev/sdn.

Syntax

```
showusb
```

showvlan

Lists the VLANs configured on the switch.

Syntax

```
showvlan
```

Usage Notes

Run this command after connecting as `root` to a Sun Network QDR InfiniBand Gateway switch.

Example

This example shows the default VLAN, which has an ID of 0, on switch `bda1sw-ib3`:

```
# showvlan
  Connector/LAG  VLN  PKEY
  -----  ---  ----
  0A-ETH-1      0    ffff
  0A-ETH-2      0    ffff
  0A-ETH-3      0    ffff
  0A-ETH-4      0    ffff
  1A-ETH-1      0    ffff
  1A-ETH-3      0    ffff
  1A-ETH-4      0    ffff
```

showvnics

Lists the virtual network interface cards (VNICs) created for the switch.

Syntax

showvnics

Usage Notes

Run this command after connecting as root to a Sun Network QDR InfiniBand Gateway switch.

Example

This example shows the VNICs created in a round-robin process for switch bda1sw-ib3:

```
# showvnics
ID STATE FLG IOA_GUID          NODE                IID  MAC          VLN PKEY  GW
-----  -----
561 UP   N 0021280001CF4C23  bda1node13 BDA 192.168.41.31  0000 CE:4C:23:85:2B:0A NO  ffff  0A-ETH-1
564 UP   N 0021280001CF4C53  bda1node16 BDA 192.168.41.34  0000 CE:4C:53:85:2B:0D NO  ffff  0A-ETH-1
567 UP   N 0021280001CF4B58  bda1node01 BDA 192.168.41.19  0000 CE:4B:58:85:2A:FC NO  ffff  0A-ETH-1
555 UP   N 0021280001CF2A5C  bda1node07 BDA 192.168.41.25  0000 CE:2A:5C:85:2B:04 NO  ffff  0A-ETH-1
552 UP   N 0021280001CF4C74  bda1node04 BDA 192.168.41.22  0000 CE:4C:74:85:2B:01 NO  ffff  0A-ETH-1
558 UP   N 0021280001CF179B  bda1node10 BDA 192.168.41.28  0000 CE:17:9B:85:2B:07 NO  ffff  0A-ETH-1
.
.
```

showvnics

Using the dcli Utility

The `dcli` utility executes commands across a group of servers on Oracle Big Data Appliance and returns the output. You use `dcli` in [Chapter 7](#).

This chapter contains the following sections:

- [Overview of the dcli Utility](#)
- [dcli Syntax](#)
- [dcli Return Values](#)
- [dcli Examples](#)

Overview of the dcli Utility

The `dcli` utility executes commands on multiple Oracle Big Data Appliance servers using the administrative (eth0) interface to make the connections. You can run the utility from any server.

Setting Up Passwordless SSH

The `dcli` utility requires a passwordless Secure Shell (SSH) between the local server and all target servers. You run the `dcli` utility on the local server, and the commands specified in `dcli` execute on the target servers.

Two scripts facilitate the use of SSH on Oracle Big Data Appliance: `setup-root-ssh` and `remove-root-ssh`. These scripts accept two options that are also used by `dcli`:

- `-C`: Targets all the servers in a Hadoop cluster
- `-g`: Targets a user-defined set of servers

See [Table 13–1](#) for details about these options.

To set up passwordless SSH for root:

1. Connect to an Oracle Big Data Appliance server using PuTTY or a similar utility. Select an SSH connection type.
2. Log in as `root`.
3. Set up passwordless SSH for `root` across the rack:
`setup-root-ssh`

You see the message "ssh key added" from each server.

4. You can now run any ssh command on any server in the rack without entering a password. In addition to dcli commands, you can use scp to copy files between servers.
5. To remove passwordless SSH from root:

```
remove-root-ssh
```

See Also: Full parameter descriptions of [setup-root-ssh](#) on page 12-29 and [remove-root-ssh](#) on page 12-26.

Basic Use of dcli

This topic identifies some basic options to the dcli command. For a complete list of options, see [Table 13-1](#).

Getting Help

To see the dcli help page, enter the dcli command with the -h or --help options. You can see a description of the commands by entering the dcli command with no options.

Identifying the Target Servers

You can identify the servers where you want the commands to run either in the command line or in a file. For a list of default target servers, use the -t option. To change the target servers for the current command, use the -c or -g options described in [Table 13-1](#).

You can manually create files with groups of servers to manage together. For example, you might manage servers 5 to 18 together, because they have no special functions like servers 1 to 4.

Specifying the Commands

You typically specify a command for execution on the target servers on the command line. However, you can also create a command file for a series of commands that you often use together or for commands with complex syntax. See the -x option in [Table 13-1](#).

You can also copy files to the target servers without executing them by using the -f option.

Controlling the Output Levels

You can request more information with the -v option or less information with the -n option. You can also limit the number of returned lines with the --maxlines option, or replace matching strings with the -r option.

Following are examples of various output levels using a simple example: the Linux date command.

Note: The output from only one server (node07) is shown. The syntax in these examples executes the date command on all servers.

This is the default output, which lists the server followed by the date.

```
# dcli date
bda1node07-adm.example.com: Tue Feb 14 10:22:31 PST 2012
```

The minimal output returns `OK` for completed execution:

```
# dcli -n date
OK: ['bdalnode07.example.com']
```

Verbose output provides extensive information about the settings under which the command ran:

```
dcli -v date
options.nodes: None
options.destfile: None
options.file: None
options.group: dcservers
options.maxLines: 100000
options.listNegatives: False
options.pushKey: False
options.regexp: None
options.sshOptions: None
options.scpOptions: None
options.dropKey: False
options.serializeOps: False
options.userID: root
options.verbosity 1
options.vmstatOps None
options.execfile: None
argv: ['/opt/oracle/bda/bin/dcli', '-g', 'dcservers', '-v', 'date']
Success connecting to nodes: ['bdalnode07.example.com']
...entering thread for bdalnode07.example.com:
execute: /usr/bin/ssh -l root bdalnode07.example.com ' date'
...Exiting thread for bdalnode07.example.com status: 0
bdalnode07.example.com: Tue Feb 14 10:24:43 PST 2012]
```

dcli Syntax

`dcli [options] [command]`

Parameters

options

The options described in [Table 13–1](#). You can omit all options to run a command on all servers in the current rack.

command

Any command that runs from the operating system prompt. If the command contains punctuation marks or special characters, then enclose the command in double quotation marks.

The backslash (\) is the escape character. Precede the following special characters with a backslash on the command line to prevent interpretation by the shell. The backslash is not needed in a command file. See the `-x` option for information about command files.

- \$(dollar sign)
- '(quotation mark)
- <(less than)
- >(greater than)
- ()(parentheses)

Table 13–1 dcli Options

Option	Description
<code>-c nodes</code>	Specifies a comma-separated list of Oracle Big Data Appliance servers where the command is executed
<code>-C</code>	Uses the list of servers in <code>/opt/oracle/bda/cluster-rack-infiniband</code> as the target. See "Identifying the Target Servers" on page 13-2 .
<code>-d destfile</code>	Specifies a target directory or file name for the <code>-f</code> option
<code>-f file</code>	Specifies files to be copied to the user's home directory on the target servers. The files are not executed. See the <code>-l</code> option.
<code>-g groupfile</code>	Specifies a file containing a list of Oracle Big Data Appliance servers where the command is executed. You can use either server names or IP addresses in the file.
<code>-h, --help</code>	Displays a description of the commands
<code>-k</code>	Pushes the ssh key to each server's <code>/root/.ssh/authorized_keys</code> file. See "Setting Up Passwordless SSH" on page 13-1 for an easier alternative.
<code>-l userid</code>	Identifies the user ID for logging in to another server. The default ID is <code>root</code> .
<code>--maxlines=maxlines</code>	Identifies the maximum lines of output displayed from a command executed on multiple servers. The default is 10,000 lines.
<code>-n</code>	Abbreviates the output for non-error messages. Only the server name is displayed when a server returns normal output (return code 0). You cannot use the <code>-n</code> and <code>-r</code> options together.
<code>-r regexp</code>	Replaces the output with the server name for lines that match the specified regular expression
<code>-s sshoptions</code>	Specifies a string of options that are passed to SSH
<code>--scp=scpoptions</code>	Specifies a string of options that are passed to Secure Copy (SCP), when these options are different from <code>sshoptions</code>
<code>--serial</code>	Serializes execution over the servers. The default is parallel execution.
<code>-t</code>	Lists the target servers
<code>--unkey</code>	Drops the keys from the <code>authorized_key</code> files of the target servers
<code>-v</code>	Displays the verbose version of all messages
<code>--version</code>	Displays the <code>dcli</code> version number
<code>--vmstat=VMSTATOPS</code>	Displays the syntax of the Linux Virtual Memory Statistics utility (<code>vmstat</code>). This command returns process, virtual memory, disk, trap, and CPU activity information. To enter a <code>vmstat</code> command, enclose its options in quotation marks. For example: <code>--vmstat="-a 3 5"</code> See your Linux documentation for more information about <code>vmstat</code> .
<code>-x execfile</code>	Specifies a command file to be copied to the user's home directory and executed on the target servers. See the <code>-l</code> option.

dcli Return Values

- 0: The command ran successfully on all servers.
- 1: One or more servers were inaccessible or remote execution returned a nonzero value. A message lists the unresponsive servers. Execution continues on the other servers.
- 2: A local error prevented the command from executing.

If you interrupt the local dcli process, then the remote commands may continue without returning their output or status.

dcli Examples

Following are examples of the dcli utility.

This example returns the default list of target servers:

```
# dcli -t
Target nodes: ['bda1node01-adm.example.com', 'bda1node02-adm.example.com',
'bda1node03-adm.example.com', 'bda1node04-adm.example.com',
'bda1node05-adm.example.com', 'bda1node06-adm.example.com',
'bda1node07-adm.example.com', 'bda1node08-adm.example.com',
'bda1node09-adm.example.com']
```

The next example checks the temperature of all servers:

```
# dcli 'ipmitool sunoem cli "show /SYS/T_AMB" | grep value'

bda1node01-adm.example.com: value = 22.000 degree C
bda1node02-adm.example.com: value = 22.000 degree C
bda1node03-adm.example.com: value = 22.000 degree C
bda1node04-adm.example.com: value = 23.000 degree C
.
.
.
```

Using Oracle Integrated Lights Out Manager

Oracle Integrated Lights Out Manager (Oracle ILOM) is a preinstalled component of Oracle Big Data Appliance that you can use to monitor the servers and switches. You use Oracle ILOM in [Chapter 7](#).

This chapter contains the following sections:

- [Oracle ILOM Overview](#)
- [Administrative Network Diagram](#)
- [Oracle ILOM IP Addresses for Oracle Big Data Appliance Components](#)
- [Connecting to Oracle ILOM Using the Network](#)
- [Connecting to Oracle ILOM Using a Serial Connection](#)

See Also: Oracle Integrated Lights Out Manager 3.0 Documentation Library at

<http://docs.oracle.com/cd/E19860-01/>

Oracle ILOM Overview

Oracle Integrated Lights Out Manager (Oracle ILOM) provides advanced service processor (SP) hardware and software that you can use to manage and monitor the servers and switches in an Oracle Big Data Appliance rack. Oracle ILOM dedicated hardware and software is preinstalled on these components. It automatically initializes as soon as power is applied.

Oracle ILOM enables you to actively manage and monitor servers in Oracle Big Data Appliance regardless of the operating system state, providing you with a reliable lights-out management (LOM) system.

With Oracle ILOM, you can proactively:

- Learn about hardware errors and faults as they occur
- Remotely control the power state of a server
- View the graphical and nongraphical consoles
- View the current status of sensors and indicators on the system
- Determine the hardware configuration of your system
- Receive generated alerts about system events in advance

The Oracle ILOM service processor runs its own embedded operating system and has a dedicated Ethernet port, which together provide out-of-band management capability. In addition, you can access Oracle ILOM from the server operating system (Oracle

Linux). Using Oracle ILOM, you can remotely manage Oracle Big Data Appliance as if you were using a local KVM.

Oracle ILOM Interfaces

Oracle ILOM supports two interfaces for accessing its features and functions. You can choose to use a browser-based web interface or a command-line interface.

Web Interface

The web interface enables you to use a browser to log in to the SP, and then to perform system management and monitoring.

Command-Line Interface

The command-line interface (CLI) enables you to operate Oracle ILOM using keyboard commands. It adheres to industry-standard DMTF-style CLI and scripting protocols. Oracle ILOM supports SSH v2.0 and v3.0 for secure access to the CLI. From the CLI, you can reuse existing scripts and automate tasks using familiar interfaces.

Oracle ILOM Users

The Oracle Big Data Appliance servers are configured initially with only the `root` user.

The InfiniBand switches are configured with these additional users:

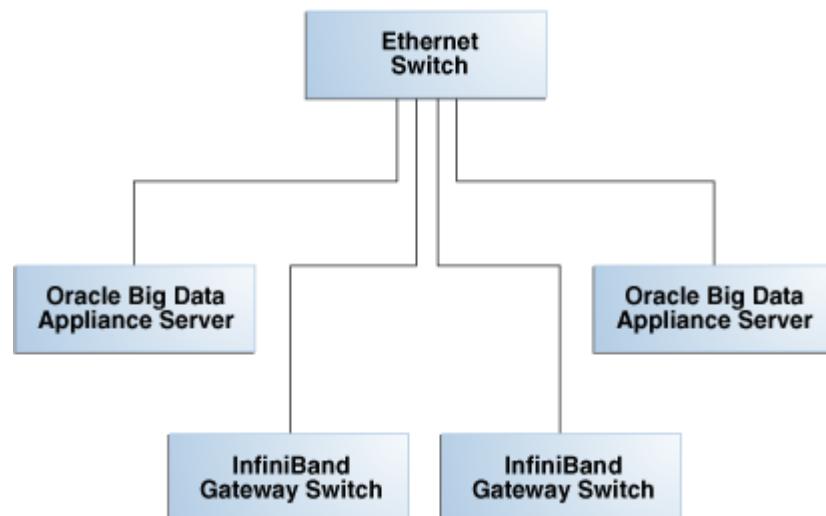
- `ilom-admin`: Provides the write privileges needed to change the system configuration, without the full power of `root`.
- `ilom-operator`: Provides read-only privileges to monitor the system.

As `root`, you can create additional ILOM users if you want.

Administrative Network Diagram

[Figure 14–1](#) illustrates the administrative Oracle ILOM network. It shows two of the 18 servers and the two Sun Network QDR InfiniBand Gateway Switches. The Cisco Ethernet management switch is connected to the servers and the InfiniBand switches.

Figure 14–1 Administrative Network in Oracle Big Data Appliance



Oracle ILOM IP Addresses for Oracle Big Data Appliance Components

You require at least one static IP address for service processor (Oracle ILOM) access. For the list of default Oracle ILOM IP addresses assigned to Oracle Big Data Appliance components at the time of manufacturing, see "Factory Network Settings" on page 3-6.

After you reconfigure these IP addresses using the Oracle Big Data Appliance Configuration Utility, you must use the reconfigured IP addresses to access Oracle ILOM.

Connecting to Oracle ILOM Using the Network

You can typically access Oracle ILOM using the network over an Ethernet connection. You must know the Oracle ILOM Ethernet address. Before system configuration, the address is the factory IP address setting. After system configuration, you can use either the component name or the IP address listed in the Installation Template. You can use either the CLI or the browser interface to access Oracle ILOM. Alternatively, you can launch a remote KVM session.

Note: You can use this connection method when Oracle ILOM IP addresses can be accessed over the network. Oracle recommends that you use this connection method. See [Chapter 7](#)

This section discusses the following topics:

- [Connecting to the Command-Line Interface](#)
- [Connecting to the Web GUI](#)

Connecting to the Command-Line Interface

To connect to the Oracle ILOM command-line interface:

1. Open a secure shell (SSH) client, such as PuTTY.
2. In the **Host Name (or IP address)** field, enter the Oracle ILOM name or IP address of the component to connect to. For example, before configuration, you might enter the factory default IP address of 192.168.1.203 for a Sun Network QDR InfiniBand Gateway switch. After configuration, you might enter the new IP address or a name such as bda1sw-ib2.
3. Ensure that **SSH** is chosen as the **Connection Type**.
4. Type the user name and the password, when prompted. The default user name is **root**, and the default password is **welcome1**.

The CLI command prompt (#) is displayed.

5. Enter help for a list of commands.

See Also: *Oracle ILOM Daily Management -- CLI Procedures Guide* at
<http://docs.oracle.com/cd/E19860-01/>

Connecting to the Web GUI

To connect to the Oracle ILOM web interface:

1. Open a web browser and navigate to the Oracle ILOM name or the IP address of an Oracle Big Data Appliance server or switch.

The login screen is displayed.

2. Enter your user name and password. See "Oracle ILOM Users" on page 14-2 for the factory-configured user names. The initial password is `welcome1`.

Note: Use the `passwd` command to change the password.

3. Click **Log In**.

The web GUI is displayed, as shown in [Figure 14-2](#).

Figure 14-2 Oracle ILOM Web Interface on an Oracle Big Data Appliance X3-2 Server

The screenshot shows the Oracle ILOM Web Interface. The left sidebar has a tree view with 'System Information' expanded, showing 'Summary' selected. The main content area has a 'Summary' section with a table of system details and an 'Actions' panel with power control buttons. Below is a 'Status' section with a table of subsystem status.

General Information	
System Type	Rack Mount
Model	SUN FIRE X4270 M3
Part Number	7046724
Serial Number	1111FM5555
System Identifier	Oracle Big Data Appliance
System Firmware Version	3.1.2.12
Primary Operating System	Not Available
Host Primary MAC Address	00:11:22:ff:0f:b
ILOM Address	10.133.46.218
ILOM MAC Address	00:11:22:FF:0F:b

Status			
Overall Status:	☒ Service Required		
Total Problem Count: 1			
Subsystem	Status	Details	Inventory
Processors	✓ OK	Processor Architecture: x86 64-bit Processor Summary: Two Intel Xeon Processor E5 Series	Processors (Installed / Maximum): 2 / 2

See Also: *Oracle ILOM 3.0 Daily Management -- Web Procedures Guide*
at

<http://docs.oracle.com/cd/E19860-01/>

Connecting to Oracle ILOM Using a Serial Connection

You servers: connecting to Oracle ILOM can connect to Oracle ILOM using a serial connection if you are unable to access it using the network due to any of the following problems:

- Misconfiguration of the network
- Misconfiguration of Oracle ILOM IP addresses
- Misconfiguration of Cisco Ethernet switch ports
- Sideband configuration issues

Connecting to the Oracle ILOM of a Server

To connect to Oracle ILOM of a server using a serial connection:

1. Attach a serial cable from a terminal or a PC running terminal emulation software to the SER MGT port of an Oracle Big Data Appliance server. The cable should be 15 feet or shorter.
2. Verify that your terminal or laptop is operational.
3. Configure the terminal device or the terminal emulation software to use the following settings:
 - 8N1: eight data bits, no parity, one stop bit
 - 9600 baud (default, but can be set to any standard rate up to 115200)
 - Disable software flow control (XON/XOFF)
 - Disable hardware control
4. Verify that power is supplied to either PSU.

If power is supplied to either PSU, then Oracle ILOM is functional regardless of the power state of the servers.

5. Press Enter on the terminal device. A connection between the terminal device and Oracle ILOM is established.

The Oracle ILOM login prompt is displayed.

6. Log in to the CLI as `root` using the default password of `welcome1`.

The Oracle ILOM default command prompt is displayed.

Connecting to the Oracle ILOM of an InfiniBand Switch

To connect to Oracle ILOM of an InfiniBand switch using a serial connection:

1. Attach a USB-to-serial connector to the USB port of the switch.
2. Verify that your terminal or laptop is operational.
3. Configure the terminal device or the terminal emulation software to use the following settings:
 - 8N1: eight data bits, no parity, one stop bit
 - 115200 baud
 - Disable software flow control (XON/XOFF)
 - Disable hardware control
4. Press the Return or Enter key on the serial device several times to synchronize the connection.

You may see text similar to the following:

where `nm2name` is the host name of the management controller. The name might be the word `hostname`.

Even if you do not see the text, go to Step 5.

5. Log in using the administrative user name and password (`ilom-admin` and `welcome1`). The `#` prompt is displayed.

Note: If you do not see this output or prompt, there is a problem with the serial configuration, the USB-to-serial connector, or the CLI.

Part V

Appendices

Part V provides reference information. It contains the following chapters:

- [Appendix A, "Error Messages for Oracle Big Data Appliance"](#)
- [Appendix B, "Replacement Units"](#)
- [Appendix C, "In-Rack Cabling Tables for Oracle Big Data Appliance X3-2"](#)
- [Appendix D, "In-Rack Cabling Tables for Oracle Big Data Appliance"](#)
- [Appendix E, "Multirack Cabling Tables"](#)

A

Error Messages for Oracle Big Data Appliance

This appendix describes the hardware messages for Oracle Big Data Appliance.

Auto Service Request Alerts: DISKALRT-02001 to DISKALRT-02006

The following messages are Auto Service Request (ASR) alerts. ASR automatically submits a service request to Oracle Support Services in response to these alerts.

Information is also written to the system logs.

DISKALRT-02001 System OS hard disk failure

Cause: A physical disk that is hosting the operating system failed or an operating system RAID volume has lost redundancy. HDFS might also raise an alert.

Action: Replace the physical disk as soon as possible. See ["Replacing a Server Disk" on page 11-6](#) and follow the instructions for configuring an operating system disk.

DISKALRT-02002 System OS hard disk predictive failure

Cause: A physical disk that is hosting the operating system is in a state of predictive failure.

Action: Replace the physical disk as soon as possible. See ["Replacing a Server Disk" on page 11-6](#) and follow the instructions for configuring an operating system disk.

DISKALRT-02003 System OS hard disk poor performance

Cause: A physical disk that is hosting the operating system is performing poorly, which indicates that it is failing.

Action: Plan to replace the disk. If multiple disk disks in a server are identified as poor performers, then check for problems with the cable connections, the controllers, and the disk backplane before replacing the disks. To replace a disk, see ["Replacing a Server Disk" on page 11-6](#) and follow the instructions for configuring an operating system disk.

DISKALRT-02004 Data hard disk failure

Cause: A physical disk that is *not* hosting the operating system failed.

Action: Replace the physical disk as soon as possible. See ["Replacing a Server Disk" on page 11-6](#) and follow the instructions for configuring a disk for either HDFS or Oracle NoSQL Database.

DISKALRT-02005 Data hard disk predictive failure

Cause: A physical disk that is *not* hosting the operating system is in a state of predictive failure.

Action: Replace the physical disk as soon as possible. See ["Replacing a Server Disk"](#) on page 11-6 and follow the instructions for configuring a disk for either HDFS or Oracle NoSQL Database.

DISKALRT-02006 Data hard disk poor performance

Cause: A physical disk that is *not* hosting the operating system is performing poorly, which indicates that it is failing.

Action: Replace the physical disk as soon as possible. See ["Replacing a Server Disk"](#) on page 11-6 and follow the instructions for configuring a disk for either HDFS or Oracle NoSQL Database.

DISKALRT-02007 Solid-state drive disk failure

Cause: A solid-state drive failed.

Action: Replace the drive as soon as possible.

DISKALRT-02008 Solid-state disk predictive failure

Cause: A solid-state drive is in a state of predictive failure.

Action: Replace the drive as soon as possible.

DISKALRT-02009 Solid-state disk poor performance

Cause: A solid-state drive is performing poorly, which indicates that it is failing.

Action: Replace the drive as soon as possible.

B

Replacement Units

This appendix lists the replacement units for the components in Oracle Big Data Appliance racks. All replacement units are field replaceable units (FRUs), which are installed by Oracle field engineers.

This appendix contains the following sections:

- [Understanding Repair Categories](#)
- [Disk Controller Batteries](#)
- [LED Status Descriptions](#)
- [Parts for Oracle Big Data Appliance Servers](#)
- [Parts for Sun Datacenter InfiniBand Switch 36](#)
- [Parts for the Cisco Ethernet Switch](#)
- [Parts for Power Distribution Units](#)
- [Cables and Cable Accessories for an Oracle Big Data Appliance Rack](#)

See Also: "Spare Parts Kit Components" on page 1-3

Understanding Repair Categories

Repair categories describe the potential effects of a repair action. [Table B-1](#) describes the categories and related actions.

Table B-1 Oracle Big Data Appliance Repair Categories

Category	Description	Scenario Examples
Hot Swap (HS)	The repair part is hot swappable and can be replaced without shutting down the host system. Procedures may be needed before and after replacement to protect the data.	<ul style="list-style-type: none">■ Disks■ Fans■ Power supplies
Infrastructure Repair (IR)	Repair of a connectivity component within an Oracle Big Data Appliance rack. No downtime of the rack is required; however, individual components may require downtime.	<ul style="list-style-type: none">■ External cables■ InfiniBand switch■ Ethernet switch

Table B-1 (Cont.) Oracle Big Data Appliance Repair Categories

Category	Description	Scenario Examples
BDA Server Offline (BDA-O)	<p>Repair of the part requires shutting down one Big Data Appliance server. No downtime of the rack is required; however, individual servers may require downtime and temporary removal from the cluster. Rebalancing the workload and data duplication may temporarily affect performance.</p> <p>If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2 for additional information.</p> <p>If you monitor the system using Oracle Enterprise Manager Cloud Control, then prevent unnecessary alerts by putting the target in a blackout state. Refer to <i>Oracle Enterprise Manager Administration</i> for additional information.</p>	<ul style="list-style-type: none"> ▪ System boards ▪ PCIe cards ▪ Memory ▪ Processors

Disk Controller Batteries

The disk controllers in the servers have battery-backed write cache to accelerate write performance. If the battery charge capacity degrades such that the battery cannot protect the cached data for a power loss of 48 hours or more, then the write cache is disabled and the disk controller switches to write through mode. This results in reduced write performance but no data loss. The servers generate an alert when the battery charge is insufficient, when the temperature is high, and when the battery should be replaced.

Battery charge capacity degrades over time, and the life expectancy of a battery is inversely proportional to the operating temperature. The worst-case life expectancy of a battery in an Oracle Big Data Appliance rack is as follows:

Inlet Ambient Temperature	Battery Lifetime
< 25 degrees Celsius (77 degrees Fahrenheit)	3 years
< 32 degrees Celsius (90 degrees Fahrenheit)	2 years

Oracle replaces failed batteries at no extra charge if the battery charge capacity in the disk controllers falls below the minimum threshold. As part of Oracle Premier Support for Systems, Oracle attempts to proactively replace the batteries in an Oracle Big Data Appliance rack before the end of the estimated lifetime, on a best effort basis.

LED Status Descriptions

This section describes the light-emitting diodes (LEDs) in an Oracle Big Data Appliance rack. It contains these topics:

- [Sun Server LEDs](#)
- [Sun InfiniBand Switch LEDs](#)

Sun Server LEDs

Table B-2 identifies some LED status indicators on a Sun Server X3-2L that can indicate a fault.

See Also: "About Server and Component LEDs" in the *Sun Server X3-2L Service Manual* at

http://docs.oracle.com/cd/E23393_01/html/E27229/z40003ec1405942.html

Table B-2 LED Status Descriptions

Component	LED Status
General Status	<p>The following LEDs are located on the front and back panels of each server:</p> <p>Service Required (amber)</p> <ul style="list-style-type: none"> ▪ Off indicates normal operation. ▪ Steady on indicates a fault in the server. <p>Power/OK (green)</p> <ul style="list-style-type: none"> ▪ Steady on indicates that the server is powered on. ▪ A slow blink indicates that the server is starting up. ▪ A steady blink indicates that standby power is on. ▪ Off indicates no AC power.
Drives	<p>The following LEDs are located on the storage and boot drives:</p> <p>Service Required (amber)</p> <ul style="list-style-type: none"> ▪ Off indicates normal operation. ▪ Steady on indicates a fault in the drive. <p>Activity (green)</p> <ul style="list-style-type: none"> ▪ Steady on indicates normal inactivity. ▪ A steady blink indicates normal activity. ▪ Off indicates that the power is off or the system does not recognize the drive.
Fans	<p>Each fan module has one bicolored LED.</p> <p>Fan Status (amber/green)</p> <ul style="list-style-type: none"> ▪ Amber indicates that the fan module is faulty. The front and rear panel Service Required LEDs are also lit when the system detects a fan module fault. ▪ Green indicates that the system is powered on and the fan module is functioning correctly.

Table B-2 (Cont.) LED Status Descriptions

Component	LED Status
Power supply	<p>The following LEDs are on each power supply. You can see them from the back of the server.</p> <p>Service Required (amber)</p> <ul style="list-style-type: none"> ▪ Off indicates normal operation. ▪ Steady on indicates that the system has detected a problem in the power supply regarding the voltage, current, temperature, or fans. <p>AC OK/DC OK (green)</p> <ul style="list-style-type: none"> ▪ Steady on indicates normal operation for both AC and DC power. ▪ A slow blink indicates that input AC power is normal and output DC power is disabled. ▪ Off indicates no input AC power. <p>AC OK (green)</p> <ul style="list-style-type: none"> ▪ Steady on indicates normal operation. ▪ Off indicates no AC power.

Sun InfiniBand Switch LEDs

Table B-3 identifies some LED status indicators on Sun Datacenter InfiniBand Switch 36 and Sun Network QDR InfiniBand Gateway switches that can indicate a fault.

See Also:

- "Identifying LEDs" in the *Sun Datacenter InfiniBand Switch 36 Service Manual* at
http://docs.oracle.com/cd/E26698_01/html/E26434/z40000fe1394411.html
- "Identifying LEDs" in the *Sun Network QDR InfiniBand Gateway Switch Service Manual* at
http://docs.oracle.com/cd/E26699_01/html/E26706/z40000fe1394411.html

Table B-3 Sun Datacenter InfiniBand Switch 36 LED Status Descriptions

Component	LED Status
Chassis	<p>The following LEDs are located on the left side of the rear panel.</p> <p>Attention (amber)</p> <ul style="list-style-type: none"> ▪ Steady on indicates a fault. ▪ Off indicates normal operation. ▪ Flashing indicates no function. <p>OK (green)</p> <ul style="list-style-type: none"> ▪ Steady on indicates normal operation. ▪ Off indicates that the switch is off or initializing. ▪ Flashing indicates no function.

Table B-3 (Cont.) Sun Datacenter InfiniBand Switch 36 LED Status Descriptions

Component	LED Status
Link status	<p>The link status LEDs are located by the data cable connectors on the rear panel.</p> <p>Link (green)</p> <ul style="list-style-type: none"> ■ Steady on indicates that a link is established. ■ Off indicates that the link is down. ■ Flashing indicates that there are symbol errors.
Network management ports	<p>The following LEDs are located on the network management connector on the rear panel.</p> <p>Link Speed (amber/green):</p> <ul style="list-style-type: none"> ■ Green steady on indicates a 1000BASE-T link. ■ Amber steady on indicates a 100BASE-T link. ■ Off indicates no link. ■ Flashing indicates no function. <p>Activity (green):</p> <ul style="list-style-type: none"> ■ Flashing indicates packet activity. ■ On indicates no function. ■ Off indicates no activity.
Power supply	<p>The following LEDs are located on the power supply at the front of the chassis.</p> <p>Attention (amber)</p> <ul style="list-style-type: none"> ■ Steady on indicates a fault, and 12 VDC is shut down. ■ Off indicates normal operation. ■ Flashing indicates no function. <p>OK (green)</p> <ul style="list-style-type: none"> ■ Steady on indicates 12 VDC. ■ Off indicates no DC voltage. ■ Flashing indicates no function. <p>AC LED is green</p> <ul style="list-style-type: none"> ■ Steady on indicates AC power is supplied. ■ Off indicates that AC power is not present. ■ Flashing indicates no function.
Fan	<p>The following LED is located on the air inlet on the front of the chassis.</p> <p>FT</p> <ul style="list-style-type: none"> ■ On indicates a problem with the fan. ■ Off indicates normal operation

Parts for Oracle Big Data Appliance Servers

An Oracle Big Data Appliance rack contains either Sun Server X3-2L or Sun Fire X4270 M2 servers.

Note: Oracle Big Data Appliance ships with two spare drives. If a drive is faulty, then the customer can replace the drive before an Oracle service representative arrives if circumstances warrant immediate action.

Table B-4 lists the replaceable parts for the Sun Server X3-2L, which are covered under the Oracle Premier Support for Systems warranty. Unless otherwise noted, the repair procedures are in the *Sun Server X3-2L Service Manual*.

Table B-4 Replacement Parts for a Sun Server X3-2L Server

Part Number	Description	Repair Category	Repair Procedure
150-3993	Battery, 3V, 390 MAH, LITH, COIN	BDA-O	<p>See "Servicing the Battery" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40000f91037456.html#scrolltoc</p> <p>Note: Rear storage drive 1 might be populated with a remote battery module for the host bus adapter (HBA) card. See "Remove a Rear Storage Drive" at http://docs.oracle.com/cd/E23393_01/html/E27229/bbggjgea.html#scrolltoc</p>
371-5002	4 GB USB 2.0 flash drive, RoHS:Y	BDA-O	<p>See "Servicing the Internal USB Flash Drives" at http://docs.oracle.com/cd/E23393_01/html/E27229/ceiicfdbd.html#scrolltoc</p>
371-4985	6 Gigabit SAS RAID PCI battery module, RoHS:Y (LION), BBU-08	BDA-O	<ol style="list-style-type: none"> 1. Power down the server gracefully. See "Powering Down the Server" at http://docs.oracle.com/cd/E23393_01/html/E27229/z400061b1011735.html 2. See <i>Sun Storage 6 Gb SAS PCIe HBA, Internal Installation Guide For HBA Models SGX-SAS6-INT-Z and SG-SAS6-INT-Z</i> (internal only) at http://docs.oracle.com/cd/E19337-01/index.html
7047503	Niwot card	BDA-O	<ol style="list-style-type: none"> 1. Power down the server gracefully. See "Powering Down the Server" at http://docs.oracle.com/cd/E23393_01/html/E27229/z400061b1011735.html 2. See "Servicing PCIe Cards" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40000f91037409.html
7057184	Assembly Battery Carrier Remote	HS	<p>See "Remove a Rear Storage Drive" at http://docs.oracle.com/cd/E23393_01/html/E27229/bbggjgea.html#scrolltoc</p>

Table B-4 (Cont.) Replacement Parts for a Sun Server X3-2L Server

Part Number	Description	Repair Category	Repair Procedure
375-3696	InfiniBand (CX2) dual port CX2 4x QDR PCI-e	BDA-O	<ol style="list-style-type: none"> 1. Power down the server gracefully. See "Powering Down the Server" at http://docs.oracle.com/cd/E23393_01/html/E27229/z400061b1011735.html 2. See "Servicing PCIe Cards" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40000f91037409.html
375-3701	6 Gbps SAS RAID disk PCIe HBA, RoHS:Y	BDA-O	<ol style="list-style-type: none"> 1. Power down the server gracefully. See "Powering Down the Server" at http://docs.oracle.com/cd/E23393_01/html/E27229/z400061b1011735.html 2. See "Servicing PCIe Cards" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40000f91037409.html <p>Note: Do not run any controller commands when replacing the disk.</p>
7010036	DR 3 TB, 3.5-inch, SAS/7200, CORAL	HS	<p>See "Servicing Storage Drives and Rear Drives" at http://docs.oracle.com/cd/E23393_01/html/E27229/z4000091011460.html</p> <p>Do not run any controller commands when replacing the disk.</p> <p>Note: Rear storage drive 1 might be populated with a remote battery module for the host bus adapter (HBA) card. See "Remove a Rear Storage Drive" at http://docs.oracle.com/cd/E23393_01/html/E27229/bbggjgea.html#scrolltoc</p>
7014391	SAS expander assembly	BDA-O	<p>See "Servicing the SAS Expander Module" at http://docs.oracle.com/cd/E23393_01/html/E27229/ceieidja.html</p>
7020486	DIMM, 8 GB, DDR3, 1600 MHz, 1.3V	BDA-O	<p>See "Servicing the DIMMs" at http://docs.oracle.com/cd/E23393_01/html/E27229/ceicjagi.html#scrolltoc</p>
7018704	DIMM, 16 GB, DDR3, 1600 MHz, 1.35V	BDA-O	<p>See "Servicing the DIMMs" at http://docs.oracle.com/cd/E23393_01/html/E27229/ceicjagi.html#scrolltoc</p>
7041013	DIMM, 32 GB, DDR3, RDIMM-1066, QUAD-RANK	BDA-O	<p>See "Servicing the DIMMs" at http://docs.oracle.com/cd/E23393_01/html/E27229/ceicjagi.html#scrolltoc</p>
7020774	Pregreased CPU heatsink	BDA-O	<p>See "Servicing Processors" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40001d31037480.html#scrolltoc</p>

Table B-4 (Cont.) Replacement Parts for a Sun Server X3-2L Server

Part Number	Description	Repair Category	Repair Procedure
7026881	CPU,Intel,E5-2660,2.2 GHz, 8-core	BDA-O	See "Servicing Processors" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40001d31037480.html#scrolltoc
7044130	Power supply, AC, A258, F, 12V, 1000W	HS	See "Servicing Power Supplies" at http://docs.oracle.com/cd/E23393_01/html/E27229/z4000091014153.html
7045042	Dual counter rotating fan module, 80x80 mm	HS	See "Servicing Fan Modules" at http://docs.oracle.com/cd/E23393_01/html/E27229/z4000091014194.html
7047257	12-slot backplane cable kit with the following: <ul style="list-style-type: none">■ Disk drive flex cable■ Dual backplane power cable■ Single backplane power cable■ Disk data cable, iPass+ HD to iPass+ HD, 600 mm	BDA-O	<ol style="list-style-type: none">1. Shut down the rack. See "Powering On and Off Oracle Big Data Appliance" on page 11-2.2. See "Servicing the Front and Rear Storage Drive Backplanes" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40007ac1419009.html
7047768	12-slot 3.5" disk cage, including fan door, and left and right ear assembly	BDA-O	<ol style="list-style-type: none">1. Shut down the rack. See "Powering On and Off Oracle Big Data Appliance" on page 11-2.2. See "Servicing the Front and Rear Storage Drive Backplanes" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40007ac1419009.html
7049382	System board assembly, RoHS:Y	BDA-O	<ol style="list-style-type: none">1. Shut down the rack. See "Powering On and Off Oracle Big Data Appliance" on page 11-2.2. "Servicing the Motherboard Assembly" at http://docs.oracle.com/cd/E23393_01/html/E27229/z40001d31037512.html

Table B-5 lists the replaceable parts for the Sun Fire X4270 M2, which are covered under the Oracle Premier Support for Systems warranty. Unless otherwise noted, the repair procedures are in the *Sun Fire X4270 M2 Server Service Manual*.

Table B-5 Replacement Parts for Sun Fire X4270 M2 Servers

Part Number	Description	Repair Category	Repair Procedure
150-3993	Battery, 3V, 390 MAH, LITH, COIN	BDA-O	See Section 4.6, "Servicing the Server Battery" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_71528
300-2235	Power supply, A249, 1200W, 12V, 2U, RoHS:Y	HS	See Section 3.4, "Servicing Power Supplies" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/hotswap.html#50438178_11706
350-1502	Universal rack mount kit	BDA-O	<ol style="list-style-type: none"> 1. If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2. 2. See Chapter 2, "Installing the Server Into a Rack With Slide-Rails" in <i>Sun Fire X4170 M2 and X4270 M2 Servers Installation Guide</i> at http://docs.oracle.com/cd/E19245-01/E27205/z4000c671007752.html
371-4743	4 GB USB 2.0 flash drive, RoHS:Y	BDA-O	Not applicable
371-4966	LV DIMM, 8 GB, DDR3, 1RX4, 1333 MHz	BDA-O	See Section 4.2, "Servicing Memory Modules (DIMMs)" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_71526
371-4982	6 Gigabit SAS RAID PCI battery module, RoHS:Y (LION), BBU-08	BDA-O	<ol style="list-style-type: none"> 1. If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2. 2. See <i>Sun Storage 6 Gb SAS PCIe HBA, Internal Installation Guide For HBA Models SGX-SAS6-INT-Z and SG-SAS6-INT-Z</i> (internal only) at http://docs.oracle.com/cd/E19337-01/index.html
375-3696	InfiniBand (CX2) dual port CX2 4x QDR PCI-e	BDA-O	<ol style="list-style-type: none"> 1. If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2. 2. See Section 4.5, "Servicing PCIe Cards" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_86021

Table B-5 (Cont.) Replacement Parts for Sun Fire X4270 M2 Servers

Part Number	Description	Repair Category	Repair Procedure
375-3701	6 Gbps SAS RAID disk PCIe HBA, RoHS:Y	BDA-O	<p>1. If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2.</p> <p>2. See Section 4.5, "Servicing PCIe Cards" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_86021</p> <p>Note: Do not run any controller commands in the service manual when replacing the disk.</p>
530-3927	Cable, PDB, MB, 1U+2U, ribbon	BDA-O	See Section 5.10, "Servicing Cables" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_58217
530-4228	Cable, mini-SAS, 36 POS LONG, LY, RoHS:Y	BDA-O	See Section 5.10, "Servicing Cables" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_78806
541-2075	Bus_bar, power, 1U+2U, RoHS:Y	BDA-O	See Section 5.6, "Servicing the Power Distribution Board" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_85936
541-2884	Assembly, riser, X8, X8, 2U, PCI-E, RoHS:Y	BDA-O	See Section 4.4, "Servicing PCIe Risers" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_53252
541-3310	Xeon Heatsink with grease, RoHS:Y, 2U	BDA-O	See Section 4.7, "Servicing CPUs" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_23425
541-3356	x8/x8 switched PCIe riser assembly, RoHS:Y with the following: <ul style="list-style-type: none"> ■ x8/x8 switch PCIe riser ■ bracket 	BDA-O	<p>1. If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2.</p> <p>2. See Section 4.4, "Servicing PCIe Risers" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_53252</p>

Table B-5 (Cont.) Replacement Parts for Sun Fire X4270 M2 Servers

Part Number	Description	Repair Category	Repair Procedure
541-4081	System board assembly, RoHS:Y	BDA-O	<p>1. If the system is currently running, then shut it down gracefully. See "Powering On and Off Oracle Big Data Appliance" on page 11-2.</p> <p>2. See Section 4.8, "Servicing the Motherboard" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_98526</p>
541-4124	Fan deck, Hyde, RoHS:Y	BDA-O	<p>See Section 5.3, "Servicing the Fan Board" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_71556</p>
541-4222	Assembly, fan, CR, 2U, RoHS:Y	HS	<p>See Section 3.3, "Servicing Fan Modules" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/hotswap.html#50438178_28930</p>
541-4223	Power distribution board, 2U, RoHS:Y	BDA-O	<p>See Section 5.6, "Servicing the Power Distribution Board" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_71558</p>
541-4304	Indicator, right, Hyde 12/24, RoHS:Y	BDA-O	<p>See Section 5.5, "Servicing the Front Panel LED Modules" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_71563</p>
541-4305	Assembly, disk, SAS2, XP_DC, Hyde, RoHS:Y	BDA-O	<p>See Section 5.2, "Servicing the SAS Expander Board" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_28246</p>
541-4306	Assembly, connector board bracket, Hyde	BDA-O	<p>See Section 5.7, "Servicing the Connector Board" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#pgfId-1296581</p>
541-4363	12-slot disk backplane, RoHS:Y	BDA-O	<p>See Section 5.4, "Servicing the Disk Backplane" in <i>Sun Fire X4270 M2 Server Service Manual</i> at</p> <p>http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_71557</p>

Table B-5 (Cont.) Replacement Parts for Sun Fire X4270 M2 Servers

Part Number	Description	Repair Category	Repair Procedure
541-4371	Indicator, left, Hyde 12/24, RoHS:Y	BDA-O	See Section 5.5, "Servicing the Front Panel LED Modules" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/infrastructure_x4270_M2.html#50438167_71563
560-2952	Cable kit, Hyde, RoHS:Y with the following: <ul style="list-style-type: none"> ■ Disk backplane power cable ■ 24-slot DBP power cable ■ 12/24 slot disk backplane signal cable ■ Fan signal cable ■ Fan power cable 	BDA-O	Refer to the entries for the individual items in the kit.
7010036	FRU DR 3 TB 3.5-inch SAS/7200, CORAL	--	See Section 3.2, "Servicing Storage Drives and Boot Drives" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/hotswap.html#50438178_61628 Note: Do not run any controller commands in the service manual when replacing the disk.
7012433	3.06 GHz processor	BDA-O	See Section 4.7, "Servicing CPUs" in <i>Sun Fire X4270 M2 Server Service Manual</i> at http://docs.oracle.com/cd/E19245-01/821-0488-12/motherboard.html#50438179_23425

Parts for Sun Datacenter InfiniBand Switch 36

Table B-6 lists the replaceable parts for the Sun Datacenter InfiniBand Switch 36, which are covered under the Oracle Premier Support for Systems warranty. Unless otherwise noted, the repair procedures reference the *Sun Datacenter InfiniBand Switch 36 Service Manual* at

http://docs.oracle.com/cd/E26698_01/index.html

See "Cables and Cable Accessories for an Oracle Big Data Appliance Rack" on page B-15 for information about InfiniBand cables.

Table B-6 Replacement Parts for the Sun Datacenter InfiniBand Switch 36

Part Number	Description	Repair Category	Repair Procedure
300-2299	A247A 760-watt power supply, RoHS:Y	HS	See "Servicing Power Supplies" at http://docs.oracle.com/cd/E26698_01/html/E26434/z40001f49112.html
350-1312	Fan module for Sun Datacenter InfiniBand Switch 36, RoHS:Y	HS	See "Servicing Fans" at http://docs.oracle.com/cd/E26698_01/html/E26434/z40001f59112.html
371-2210	CR2032 3V battery, RoHS:Y	IR	See "Servicing the Battery" at http://docs.oracle.com/cd/E26698_01/html/E26434/z40001f79112.html
541-3495	Sun Datacenter InfiniBand Switch 36, RoHS:YL	IR	<ol style="list-style-type: none"> 1. See "Replacing a Failed InfiniBand Switch" on page 11-23. 2. See "Installing the Switch" in the <i>Sun Datacenter InfiniBand Switch 36 Installation Guide</i> at http://docs.oracle.com/cd/E26698_01/html/E26434/cggfbhhf.html
594-6603	10 Gbps QSFP short wavelength transceiver	IR	See "Servicing Data Cables" at http://docs.oracle.com/cd/E26698_01/html/E26434/z40001f69112.html

Parts for Sun Network QDR InfiniBand Gateway Switches

Table B-7 lists the replaceable parts for the Sun Network QDR InfiniBand Gateway switch, which are covered under the Oracle Premier Support for Systems warranty. Unless otherwise noted, the repair procedures refer to the *Sun Network QDR InfiniBand Gateway Switch Service Manual* at

http://docs.oracle.com/cd/E26699_01/index.html

See "Cables and Cable Accessories for an Oracle Big Data Appliance Rack" on page B-15 for information about InfiniBand cables.

Table B-7 Replacement Parts for the Sun Network QDR InfiniBand Gateway Switch

Part Number	Description	Repair Category	Repair Procedure
300-2299	760 watt power supply, RoHS:Y	HS	See "Servicing Power Supplies" at http://docs.oracle.com/cd/E26699_01/html/E26706/z40001f49112.html
350-1312	Fan module, RoHS:Y	HS	See "Servicing Fans" at http://docs.oracle.com/cd/E26699_01/html/E26706/z40001f59112.html

Table B-7 (Cont.) Replacement Parts for the Sun Network QDR InfiniBand Gateway Switch

Part Number	Description	Repair Category	Repair Procedure
371-2210	CR2032 3V battery, RoHS:Y	IR	See "Servicing the Battery" at http://docs.oracle.com/cd/E26699_01/html/E26706/z40001f79112.html
594-6603	10 Gbps QSFP short wavelength transceiver	IR	See "Servicing Data Cables" at http://docs.oracle.com/cd/E26699_01/html/E26706/z40001f69112.html
7014378	Assembly, system, NM2-Gateway	IR	<ol style="list-style-type: none"> 1. See "Replacing a Failed InfiniBand Switch" on page 11-23. 2. See "Installing the Gateway" in the <i>Sun Network QDR InfiniBand Gateway Switch Installation Guide</i> at http://docs.oracle.com/cd/E26699_01/html/cggfbhhf.html

Parts for the Cisco Ethernet Switch

Table B-8 lists replaceable parts for the Cisco Ethernet switch, which are covered under the Oracle Premier Support for Systems warranty.

See Also: *Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide* at

http://www.cisco.com/en/US/docs/switches/lan/catalyst4900/4948E/installation/guide/4948E_ins.html

Table B-8 Replacement Parts for Cisco Catalyst Ethernet Switch

Part Number	Description	Repair Category	Repair
7055121	Cooling fan tray	HS	See Chapter 4 of the <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .
7055122	Power supply, redundant	HS	See Chapter 4 of the <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .
7055123	SNET, WS-C4948E-F	IR	See Chapter 3 of the <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .

Parts for Power Distribution Units

Table B-9 lists the replacement parts for the power distribution units (PDUs), which are covered under the Oracle Premier Support for Systems warranty. The repair procedures references the *Sun Rack II Power Distribution Units User's Guide* at

<http://docs.oracle.com/cd/E19844-01/E23956/index.html>

Because of the number of cables and connections, Oracle recommends shutting down the Oracle Big Data Appliance rack during the replacement of power distribution unit parts.

Table B-9 Replacement Parts for Power Distribution Units

Part Number	Description	Repair Category	Repair Procedures
180-2379	13A/250V 90 degree IEC 320 Sheet E to IEC 320 C13 cord, 1 meter, RoHS:Y	HS	Not applicable
180-2380	13A/250V 90 degree IEC 320 Sheet E to IEC 320 C13 cord, 2 meter, RoHS:Y	HS	Not applicable
371-3995	Three-phase PDU: 15 kVA, IEC309 60A, 4-pin, 250 VAC, three-phase IP67, North America, RoHS:Y	IR	See "Removing and Replacing PDUs" at http://docs.oracle.com/cd/E19844-01/E23956/z40000121011643.html#scrolltoc
371-4976	Three-phase PDU: 15 kVA, 5-pin, IEC309 32A, 5-pin 230/400V, three-phase IP44, international, RoHS:Y	IR	See "Removing and Replacing PDUs" at http://docs.oracle.com/cd/E19844-01/E23956/z40000121011643.html#scrolltoc
371-4199	Single-phase PDU: 15 kVA, with three 30A/250V 2-pole/3-wire NEMA L6-30P plugs, North America, RoHS:Y	IR	See "Removing and Replacing PDUs" at http://docs.oracle.com/cd/E19844-01/E23956/z40000121011643.html#scrolltoc
371-5040	Single-phase PDU: 22 kVA, with three blue 32A/240V splash-proof 2-pole/3-wire IEC 60309 plugs, international, RoHS:Y	IR	See "Removing and Replacing PDUs" at http://docs.oracle.com/cd/E19844-01/E23956/z40000121011643.html#scrolltoc

Cables and Cable Accessories for an Oracle Big Data Appliance Rack

Table B-10 lists the replacement cables and cable accessories for an Oracle Big Data Appliance rack, which are covered under the Oracle Premier Support for Systems warranty.

See Also:

- *Sun Network QDR InfiniBand Gateway Switch Service Manual* at
http://docs.oracle.com/cd/E26699_01/html/E26706/gentextid-26783.html#scrolltoc
- *Sun Datacenter InfiniBand Switch 36 Service Manual* at
http://docs.oracle.com/cd/E26698_01/html/E26434/gentextid-21904.html#scrolltoc
- See *Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide* at
http://www.cisco.com/en/US/docs/switches/lan/catalyst4900/4948E/installation/guide/4948E_ins.html

Table B-10 Replacement Cables for an Oracle Big Data Appliance Rack

Part Number	Description	Repair Category	Repair
350-1287	Slim rail, CMA, 1U-2U for Sun servers	BDA-O	<ol style="list-style-type: none"> 1. Power down the server gracefully. See "Powering Down the Server" at http://docs.oracle.com/cd/E23393_01/html/E27229/z400061b1011735.html 2. See "Install Cable Management Arm" in the <i>Sun Server X3-2L Installation Guide</i> at http://docs.oracle.com/cd/E23393_01/html/E27229/z40000401014951.html
350-1519	Serial cable kit, RoHS:Y with the following: <ul style="list-style-type: none"> ▪ USB to DB 9-pin M serial cable ▪ DB 9-pin F to DB 9-pin F null modem cable 	HS	<p>See "Understanding Cabling" in the <i>Sun Datacenter InfiniBand Switch 36 Installation Guide</i> at http://docs.oracle.com/cd/E26698_01/html/E26434/cggfhjcc.html</p>
530-4567	4x QSFP copper QDR InfiniBand cable, 2 m, RoHS:Y	HS	<ol style="list-style-type: none"> 1. See "Maintaining the InfiniBand Network" on page 11-21. 2. See "Understanding Cabling" in the <i>Sun Datacenter InfiniBand Switch 36 Installation Guide</i> at http://docs.oracle.com/cd/E26698_01/html/E26434/cggfhjcc.html <p>Note: Redundancy is lost during cable replacement.</p>
530-4445	4x QSFP copper QDR InfiniBand cable, 3 m, RoHS:Y	HS	<ol style="list-style-type: none"> 1. See "Maintaining the InfiniBand Network" on page 11-21. 2. See "Understanding Cabling" in the <i>Sun Datacenter InfiniBand Switch 36 Installation Guide</i> at http://docs.oracle.com/cd/E26698_01/html/E26434/cggfhjcc.html
530-4446	4x QSFP copper QDR InfiniBand cable, 5 m, RoHS:Y	HS	<ol style="list-style-type: none"> 1. See "Maintaining the InfiniBand Network" on page 11-21. 2. See "Understanding Cabling" in the <i>Sun Datacenter InfiniBand Switch 36 Installation Guide</i> at http://docs.oracle.com/cd/E26698_01/html/E26434/cggfhjcc.html
530-4432	Ethernet cable, Cat 5/5E, RJ45 to RJ45, 7 foot, blue, RoHS:Y	HS	See <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .
530-4433	Ethernet cable, Cat 5/5E, RJ45 to RJ45, 10 foot, red, RoHS:Y	HS	See <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .
530-4434	Ethernet cable, Cat 5/5E, RJ45 to RJ45, 7 foot, red, RoHS:Y	HS	See <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .
530-4435	Ethernet cable, Cat 5/5E, RJ45 to RJ45, 10 foot, black, RoHS:Y	HS	See <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .
530-4436	Ethernet cable, Cat 5/5E, RJ45 to RJ45, 7 foot, black, RoHS:Y	HS	See <i>Cisco Catalyst 4948E and Catalyst 4948E-F Switch Installation Guide</i> .

C

In-Rack Cabling Tables for Oracle Big Data Appliance X3-2

The tables in this appendix show the in-rack cable connections for Sun Server X3-2L-based Oracle Big Data Appliance racks. This appendix contains the following sections:

- [Cable Color Coding](#)
- [Oracle Big Data Appliance Rack Layout](#)
- [Administrative Gigabit Ethernet Cable Connections](#)
- [Oracle Integrated Lights Out Manager Cable Connections](#)
- [Single-Phase Power Distribution Unit Cable Connections](#)
- [Three-Phase Power Distribution Unit Cable Connections](#)
- [In-Rack InfiniBand Switch-to-Switch Cable Connections](#)
- [In-Rack InfiniBand Switch-to-Server Cable Connections](#)

Cable Color Coding

The cables used in Oracle Big Data Appliance are color-coded as follows:

- **Black:** InfiniBand cables or AC power jumper cables
- **Red:** Integrated Lights Out Management (Oracle ILOM) Ethernet management cables
- **Blue:** Gigabit Ethernet management (eth0) cables

Oracle Big Data Appliance Rack Layout

The following figures show the front and rear layouts for three configurations of Oracle Big Data Appliance X3-2: full rack, starter rack, and starter rack with one in-rack expansion kit.

[Figure C-1](#) shows the layout of a full rack for Oracle Big Data Appliance X3-2.

Figure C-1 Oracle Big Data Appliance X3-2 Full Rack Layout

Rear View		Front View	
U#	PDU B	U#	PDU A
42	INP0	1U Solid Filler	42
41		1U Solid Filler	41
40		BDA Server 18	40
39		BDA Server 17	39
38		BDA Server 16	38
37		BDA Server 15	37
36		BDA Server 14	36
35		BDA Server 13	35
34		BDA Server 12	34
33		BDA Server 11	33
32	INP1	BDA Server 10	32
31		Sun Network QDR Infiniband GW Switch	31
30		Cisco Ethernet "Admin" Switch	30
29		Sun Network QDR Infiniband GW Switch	29
28		BDA Server 9	28
27		BDA Server 8	27
26		BDA Server 7	26
25		BDA Server 6	25
24		BDA Server 5	24
23		BDA Server 4	23
22	INP2	BDA Server 3	22
21		BDA Server 2	21
20		BDA Server 1	20
19		Sun Datacenter QDR Infiniband Switch	19
18		Power Distribution Unit-A	18
17		Power Distribution Unit-B	17
16			16
15			15
14			14
13			13
12	INP0		12
11			11
10			10
9			9
8			8
7			7
6			6
5			5
4			4
3			3
2	INP1		2
1			1
		1U Vented Filler	
		Power Distribution Unit-A	
		Power Distribution Unit-B	
	INP2		
	INP1		
	INP0		

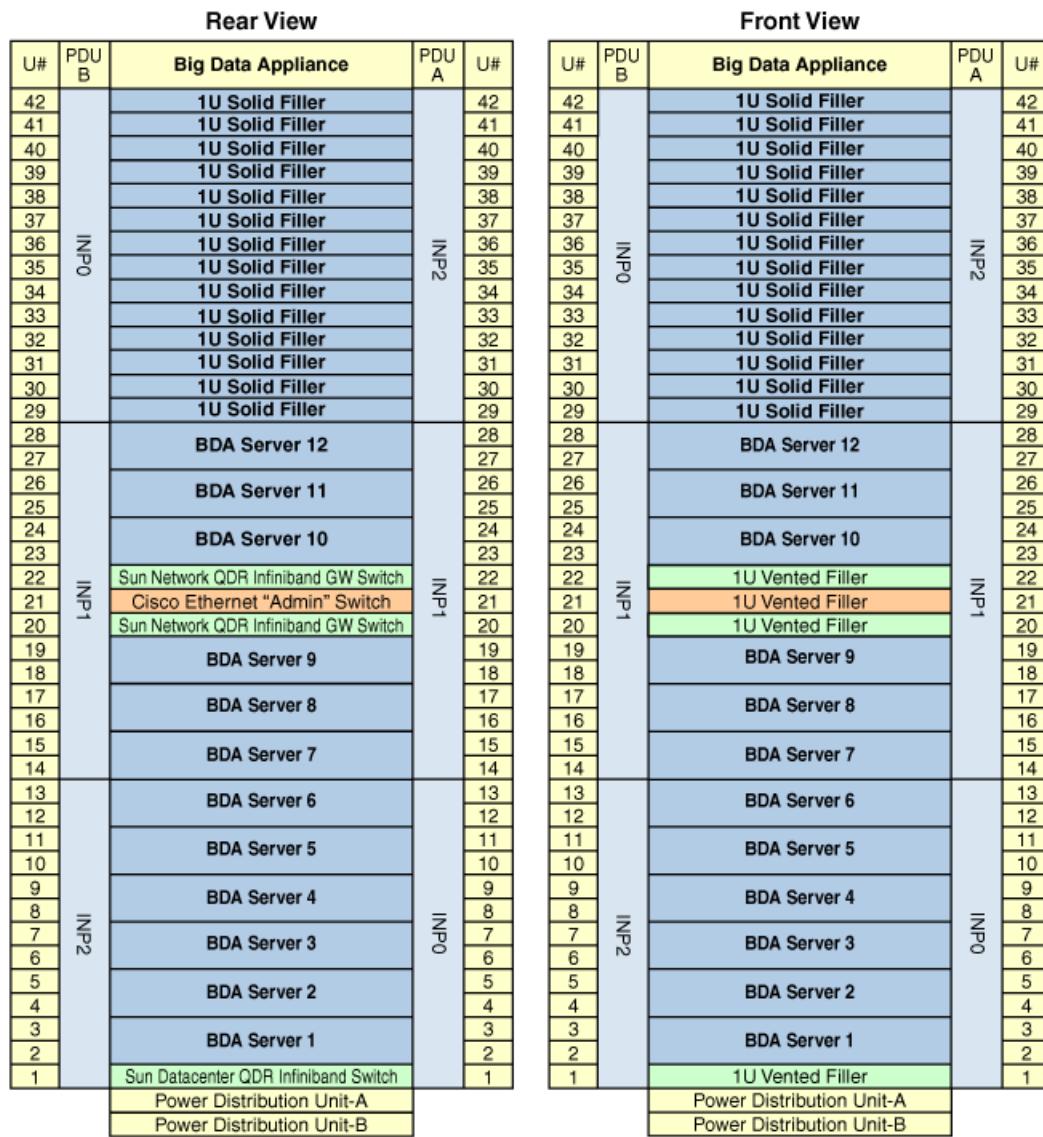
Figure C-2 shows the layout of a starter rack for Oracle Big Data Appliance X3-2.

Figure C-2 Oracle Big Data Appliance X3-2 Starter Rack Layout

Rear View						Front View					
U#	PDU B	Big Data Appliance		PDU A	U#	U#	PDU B	Big Data Appliance		PDU A	U#
42	INP0	1U Solid Filler		42		42	INP0	1U Solid Filler		42	
41		1U Solid Filler		41		41		1U Solid Filler		41	
40		1U Solid Filler		40		40		1U Solid Filler		40	
39		1U Solid Filler		39		39		1U Solid Filler		39	
38		1U Solid Filler		38		38		1U Solid Filler		38	
37		1U Solid Filler		37		37		1U Solid Filler		37	
36		1U Solid Filler		36		36		1U Solid Filler		36	
35		1U Solid Filler		35		35		1U Solid Filler		35	
34		1U Solid Filler		34		34		1U Solid Filler		34	
33		1U Solid Filler		33		33		1U Solid Filler		33	
32	INP1	1U Solid Filler		32		32	INP1	1U Solid Filler		32	
31		1U Solid Filler		31		31		1U Solid Filler		31	
30		1U Solid Filler		30		30		1U Solid Filler		30	
29		1U Solid Filler		29		29		1U Solid Filler		29	
28		1U Solid Filler		28		28		1U Solid Filler		28	
27		1U Solid Filler		27		27		1U Solid Filler		27	
26		1U Solid Filler		26		26		1U Solid Filler		26	
25		1U Solid Filler		25		25		1U Solid Filler		25	
24		1U Solid Filler		24		24		1U Solid Filler		24	
23		1U Solid Filler		23		23		1U Solid Filler		23	
22	INP2	Sun Network QDR Infiniband GW Switch		22		22	INP2	1U Vented Filler		22	
21		Cisco Ethernet "Admin" Switch		21		21		1U Vented Filler		21	
20		Sun Network QDR Infiniband GW Switch		20		20		1U Vented Filler		20	
19		1U Solid Filler		19		19		1U Solid Filler		19	
18		1U Solid Filler		18		18		1U Solid Filler		18	
17		1U Solid Filler		17		17		1U Solid Filler		17	
16		1U Solid Filler		16		16		1U Solid Filler		16	
15		1U Solid Filler		15		15		1U Solid Filler		15	
14		1U Solid Filler		14		14		1U Solid Filler		14	
13	INP0	BDA Server 6		13		13	INP0	BDA Server 6		13	
12		BDA Server 5		12		12		BDA Server 5		12	
11		BDA Server 4		11		11		BDA Server 4		11	
10		BDA Server 3		10		10		BDA Server 3		10	
9		BDA Server 2		9		9		BDA Server 2		9	
8		BDA Server 1		8		8		BDA Server 1		8	
7		Sun Datacenter QDR Infiniband Switch		7		7		1U Vented Filler		7	
6		Power Distribution Unit-A		6		6		Power Distribution Unit-A		6	
5		Power Distribution Unit-B		5		5		Power Distribution Unit-B		5	
4				4		4				4	
3				3		3				3	
2				2		2				2	
1				1		1				1	

Figure C-3 shows the layout of an Oracle Big Data Appliance X3-2 starter rack with one in-rack expansion kit.

Figure C-3 Oracle Big Data Appliance X3-2 Starter Rack With In-Rack Expansion



Administrative Gigabit Ethernet Cable Connections

Table C-1 shows the cable connections for the administrative Gigabit Ethernet network (Net 0). The Ethernet switch is located in rack unit 21. The cables are 10 feet long and black.

Table C-1 Administrative Gigabit Ethernet Cabling

From Rack Unit ¹	Component	To Ethernet Port
U39	Server 18	1
U37	Server 17	3
U35	Server 16	5
U33	Server 15	7
U31	Server 14	9

Table C–1 (Cont.) Administrative Gigabit Ethernet Cabling

From Rack Unit ¹	Component	To Ethernet Port
U29	Server 13	11
U27	Server 12	13
U25	Server 11	17
U23	Server 10	21
U22	NM2-IB Switch	45
U20	NM2-IB Switch	46
U18	Server 9	25
U16	Server 8	29
U14	Server 7	31
U12	Server 6	33
U10	Server 5	35
U8	Server 4	37
U6	Server 3	39
U4	Server 2	41
U2	Server 1	43
U1	NM2-IB Switch	47

¹ *Un* is the unit location in the rack, where *n* is the number.

Oracle Integrated Lights Out Manager Cable Connections

Table C–2 shows the cable connections from the servers to the Oracle ILOM switch. The Oracle ILOM ports on the servers are labeled Net Mgt and connect to the Cisco Ethernet switch located in rack unit 21.

Table C–2 Oracle ILOM Cabling

From Rack Unit ¹	Component	Ethernet Port	Cable Length	Cable Color
U39	Server 18	4	10 feet	Red
U37	Server 17	6	10 feet	Red
U35	Server 16	8	10 feet	Red
U33	Server 15	10	10 feet	Red
U31	Server 14	12	10 feet	Red
U29	Server 13	14	10 feet	Red
U27	Server 12	18	10 feet	Red
U25	Server 11	22	10 feet	Red
U23	Server 10	26	10 feet	Red
U18	Server 9	26	10 feet	Red
U16	Server 8	30	10 feet	Red
U14	Server 7	32	10 feet	Red
U12	Server 6	34	10 feet	Red

Table C-2 (Cont.) Oracle ILOM Cabling

From Rack Unit ¹	Component	Ethernet Port	Cable Length	Cable Color
U10	Server 5	36	10 feet	Red
U8	Server 4	38	10 feet	Red
U6	Server 3	40	10 feet	Red
U4	Server 2	42	10 feet	Red
U2	Server 1	44	10 feet	Red
PDU-A	PDU-A	15	1 meter	White
PDU-B	PDU-B	20	1 meter	White
Not applicable	Service	48	10 feet	Blue

¹ *Un* is the unit location in the rack, where *n* is the number.

Single-Phase Power Distribution Unit Cable Connections

Table C-3 shows the connections for single-phase cabling from each power distribution unit (PDU) to the power supplies in the rack. The cables terminate at PDU-A on the left and are routed to the right to enter the cable management arm (CMA). The cables are bundled in groups of four.

Table C-3 Single-Phase PDU Cabling

Rack Unit ¹	PDU-A/PS-00	PDU-B/PS-01	Cable Length
U39	G5-6	G0-0	2 meters
U37	G5-3	G0-3	2 meters
U35	G5-0	G0-6	2 meters
U33	G4-6	G1-0	2 meters
U31	G4-4	G1-2	2 meters
U29	G4-2	G1-4	2 meters
U27	G3-6	G2-0	2 meters
U25	G3-5	G2-1	2 meters
U23	G3-3	G2-3	2 meters
U24	G3-1	G2-5	2 meters
U23	Not applicable	G3-0	included
U22	G2-5	G3-1	1 meter
U21	G3-0	G2-6	2 meters
U20	G2-4	G3-2	2 meters
U18	G2-2	G3-4	2 meters
U16	G1-6	G4-0	2 meters
U14	G2-0	G3-6	2 meters
U12	G1-4	G4-2	2 meters
U10	G1-2	G4-4	2 meters
U8	G1-0	G4-6	2 meters

Table C-3 (Cont.) Single-Phase PDU Cabling

Rack Unit ¹	PDU-A/PS-00	PDU-B/PS-01	Cable Length
U6	G0-6	G5-0	2 meters
U4	G0-4	G5-2	2 meters
U2	G0-2	G5-4	2 meters
U1	G0-0	G5-6	2 meters

¹ U_n is the unit location in the rack, where n is the number.

Three-Phase Power Distribution Unit Cable Connections

Table C-4 describes three-phase cabling from each power distribution unit (PDU) to the power supplies in the rack. The cables are terminated to PDU-A on the left, are routed to the right to enter the cable management arm (CMA), and are bundled in groups of four.

Table C-4 Three-Phase PDU Cabling

Rack Unit ¹	PDU-A/PS-00	PDU-B/PS-01	Cable Length
U39	G5-6	G2-0	2 meters
U37	G5-3	G2-3	2 meters
U35	G5-0	G2-6	2 meters
U33	G4-6	G1-0	2 meters
U31	G4-4	G1-2	2 meters
U29	G4-2	G1-4	2 meters
U27	G3-6	G0-0	2 meters
U25	G3-5	G0-1	2 meters
U23	G3-3	G0-3	2 meters
U24	G3-1	G0-5	2 meters
U23	Not applicable	G5-0	Included
U22	G2-5	G5-1	1 meter
U21	G3-0	G0-6	2 meters
U20	G2-4	G5-2	2 meters
U18	G2-2	G5-4	2 meters
U16	G1-6	G4-0	2 meters
U14	G2-0	G5-6	2 meters
U12	G1-4	G4-2	2 meters
U10	G1-2	G4-4	2 meters
U8	G1-0	G4-6	2 meters
U6	G0-6	G3-0	2 meters
U4	G0-4	G3-2	2 meters
U2	G0-2	G3-4	2 meters
U1	G0-0	G3-6	2 meters

¹ U_n is the unit location in the rack, where n is the number.

In-Rack InfiniBand Switch-to-Switch Cable Connections

Table C-5 lists the location, ports, and cables for the InfiniBand connections from switch to switch.

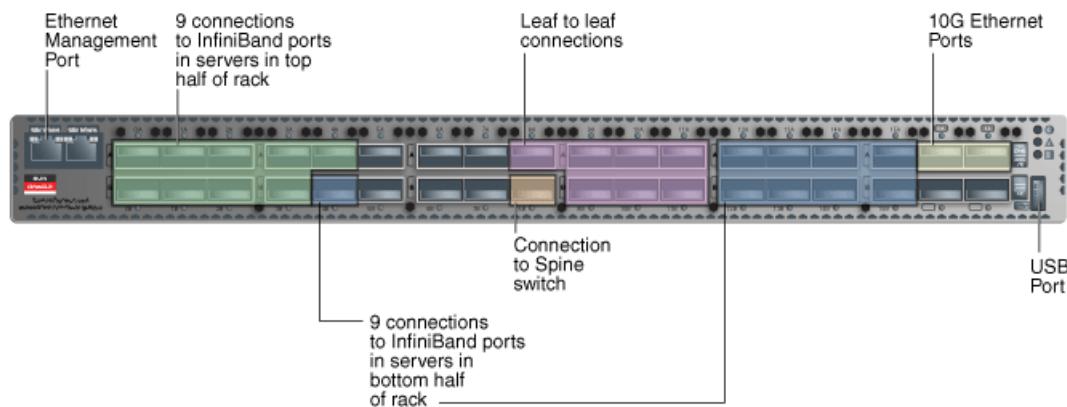
Table C-5 InfiniBand Switch-to-Switch Cabling

From InfiniBand Switch Rack Unit ¹	Port	To InfiniBand Switch Rack Unit ¹	Port	Cable Length	Description
U20	9B	U22	9A	2 meters	Leaf to leaf
U20	10B	U22	10A	2 meters	Leaf to leaf
U20	11B	U22	11A	2 meters	Leaf to leaf
U20	8A	U22	8A	2 meters	Leaf to leaf
U20	9A	U22	9B	2 meters	Leaf to leaf
U20	10A	U22	10B	2 meters	Leaf to leaf
U20	11A	U22	11B	2 meters	Leaf to leaf
U1	0B	U20	8B	3 meters	Spine to leaf
U1	1B	U22	8B	3 meters	Spine to leaf

¹ *Un* is the unit location in the rack, where *n* is the number.

Figure C-4 identifies the locations of the ports on a Sun Network QDR InfiniBand Gateway switch.

Figure C-4 Sun Network QDR InfiniBand Gateway Ports



In-Rack InfiniBand Switch-to-Server Cable Connections

Table C-6 lists the location, ports, and cables for the InfiniBand connections from the leaf switches to the servers.

Table C-6 InfiniBand Switch-to-Server Cabling

From InfiniBand Switch Rack Unit ¹	Port	To Rack Unit ¹	Port ²	Cable Length
U22	0A	U39	PCIe 3 P1	3 meters
U22	0B	U37	PCIe 3 P1	3 meters

Table C–6 (Cont.) InfiniBand Switch-to-Server Cabling

From InfiniBand Switch Rack Unit ¹	Port	To Rack Unit ¹	Port ²	Cable Length
U22	1A	U35	PCIe 3 P1	3 meters
U22	1B	U33	PCIe 3 P1	3 meters
U22	2A	U31	PCIe 3 P1	3 meters
U22	2B	U29	PCIe 3 P1	3 meters
U22	3A	U27	PCIe 3 P1	3 meters
U22	3B	U25	PCIe 3 P1	2 meters
U22	4A	U23	PCIe 3 P1	2 meters
U20	0A	U39	PCIe 3 P2	3 meters
U20	0B	U37	PCIe 3 P2	3 meters
U20	1A	U35	PCIe 3 P2	3 meters
U20	1B	U33	PCIe 3 P2	3 meters
U20	2A	U31	PCIe 3 P2	3 meters
U20	2B	U29	PCIe 3 P2	3 meters
U20	3A	U27	PCIe 3 P2	3 meters
U20	3B	U25	PCIe 3 P2	2 meters
U20	4A	U23	PCIe 3 P2	2 meters
U20	4B	U18	PCIe 3 P1	2 meters
U20	12A	U16	PCIe 3 P1	2 meters
U20	12B	U14	PCIe 3 P1	3 meters
U20	13A	U12	PCIe 3 P1	3 meters
U20	13B	U10	PCIe 3 P1	3 meters
U20	14A	U8	PCIe 3 P1	3 meters
U20	14B	U6	PCIe 3 P1	3 meters
U20	15A	U4	PCIe 3 P1	3 meters
U20	15B	U2	PCIe 3 P1	3 meters
U22	4B	U18	PCIe 3 P2	2 meters
U22	12A	U16	PCIe 3 P2	2 meters
U22	12B	U14	PCIe 3 P2	3 meters
U22	13A	U12	PCIe 3 P2	3 meters
U22	13B	U10	PCIe 3 P2	3 meters
U22	14A	U8	PCIe 3 P2	3 meters
U22	14B	U6	PCIe 3 P2	3 meters
U22	15A	U4	PCIe 3 P2	3 meters
U22	15B	U2	PCIe 3 P2	3 meters

¹ Un is the unit location in the rack, where n is the number.² Pn is the InfiniBand port, where n is the port number.

D

In-Rack Cabling Tables for Oracle Big Data Appliance

The tables in this appendix show the in-rack cable connections for Sun Fire X4270 M2-based Oracle Big Data Appliance racks. This appendix contains the following sections:

- [Cable Color Coding](#)
- [Oracle Big Data Appliance Rack Layout](#)
- [KVM Network Cable Connections](#)
- [Oracle Integrated Lights Out Manager Cable Connections](#)
- [Single-Phase Power Distribution Unit Cable Connections](#)
- [Three-Phase Power Distribution Unit Cable Connections](#)
- [In-Rack InfiniBand Switch-to-Switch Cable Connections](#)
- [In-Rack InfiniBand Switch-to-Server Cable Connections](#)

Cable Color Coding

The cables used in Oracle Big Data Appliance are color-coded as follows:

- Black: InfiniBand cables or AC power jumper cables
- Red: Integrated Lights Out Management (Oracle ILOM) Ethernet management cables
- Blue: Gigabit Ethernet management (eth0) cables
- Orange: KVM switch to dongle cables

Oracle Big Data Appliance Rack Layout

[Figure D-1](#) shows the front and rear layout of an Oracle Big Data Appliance rack.

Figure D-1 Rack Layout of Oracle Big Data Appliance

Rear View						Front View							
U#	PDU B	Big Data Appliance		PDU A	U#	U#	PDU B	Big Data Appliance		PDU A	U#		
42	INP0	BDA Server 18		INP2	42	42	INP0	BDA Server 18		INP2	42		
41		BDA Server 17			41	41		BDA Server 17			41		
40		BDA Server 16			40	40		BDA Server 16			40		
39		BDA Server 15			38	38		BDA Server 15			39		
38		BDA Server 14			37	37		BDA Server 14			38		
37		BDA Server 13			36	36		BDA Server 13			37		
36		BDA Server 12			35	35		BDA Server 12			36		
35		BDA Server 11			34	34		BDA Server 11			35		
34		BDA Server 10			33	33		BDA Server 10			34		
33		Sun Network QDR Infiniband GW Switch			32	32		1U Vented Filler			33		
32	INP1	KVM LCD			31	31		KVM LCD			32		
31		KVM Switch			30	30		1U Vented Filler			31		
30		Cisco Ethernet "Admin" Switch			29	29		1U Vented Filler			30		
29		Sun Network QDR Infiniband GW Switch			28	28		1U Vented Filler			29		
28		BDA Server 9			27	27		BDA Server 11			28		
27		BDA Server 8			26	26		BDA Server 10			27		
26		BDA Server 7			25	25		BDA Server 9			26		
25		BDA Server 6			24	24		BDA Server 8			25		
24		BDA Server 5			23	23		BDA Server 7			24		
23		BDA Server 4			22	22		BDA Server 6			23		
22		BDA Server 3			21	21		BDA Server 5			22		
21		BDA Server 2			20	20		BDA Server 4			21		
20		BDA Server 1			19	19		BDA Server 3			20		
19		Sun Datacenter QDR Infiniband Switch			18	18		BDA Server 2			19		
18		Power Distribution Unit-A			17	17		BDA Server 1			18		
17		Power Distribution Unit-B			16	16		1U Vented Filler			17		
16		BDA Server 7			15	15		Power Distribution Unit-A			16		
15		BDA Server 6			14	14		Power Distribution Unit-B			15		
14		BDA Server 5			13	13		BDA Server 1			14		
13		BDA Server 4			12	12		1U Vented Filler			13		
12		BDA Server 3			11	11		BDA Server 6			12		
11		BDA Server 2			10	10		BDA Server 5			11		
10		BDA Server 1			9	9		BDA Server 4			10		
9		Sun Datacenter QDR Infiniband Switch			8	8		BDA Server 3			9		
8		Power Distribution Unit-A			7	7		BDA Server 2			8		
7		Power Distribution Unit-B			6	6		BDA Server 1			7		
6		BDA Server 1			5	5		1U Vented Filler			6		
5		BDA Server 1			4	4		Power Distribution Unit-A			5		
4		BDA Server 1			3	3		Power Distribution Unit-B			4		
3		BDA Server 1			2	2		BDA Server 1			3		
2		BDA Server 1			1	1		1U Vented Filler			2		
1		Power Distribution Unit-A						Power Distribution Unit-A			1		
		Power Distribution Unit-B						Power Distribution Unit-B					

KVM Network Cable Connections

A KVM switch is provided only in Sun Fire X4270 M2-based rack.

Table D-1 shows the keyboard, video, and mouse (KVM) network cabling to the servers. The cables are orange.

Table D-1 KVM Cabling

From Rack Unit	Component	To KVM Port
U41	Server 18	1
U39	Server 17	2
U37	Server 16	3
U35	Server 15	4
U33	Server 14	5

Table D-1 (Cont.) KVM Cabling

From Rack Unit	Component	To KVM Port
U31	Server 13	6
U29	Server 12	7
U28	Server 11	8
U27	Server 10	9
U26	NM2-IB leaf switch	10
U25	KVM switch	11
U19	KVM tray	12
U18	Cisco switch	13
U17	NM2-IB leaf switch	14
U16	Server 9	15
U14	Server 8	16
U12	Server 7	17
U10	Server 6	18
U8	Server 5	19
U6	Server 4	20
U4	Server 3	21
U2	Server 2	22

Administrative Gigabit Ethernet Cable Connections

Table D-2 shows the cable connections for the administrative Gigabit Ethernet network (Net 0). The Ethernet switch is located in rack unit 21. The cables are 10 feet long and black.

Table D-2 Administrative Gigabit Ethernet Cabling

From Rack Unit ¹	Component	To Ethernet Port
U41	Server 18	1
U39	Server 17	3
U37	Server 16	5
U35	Server 15	7
U33	Server 14	9
U31	Server 13	11
U29	Server 12	13
U27	Server 11	17
U25	Server 11	21
U24	NM2-IB Switch	45
U20	NM2-IB Switch	46
U18	Server 10	25
U16	Server 9	29

Table D-2 (Cont.) Administrative Gigabit Ethernet Cabling

From Rack Unit ¹	Component	To Ethernet Port
U14	Server 8	31
U12	Server 7	33
U10	Server 6	35
U8	Server 5	37
U6	Server 4	39
U4	Server 3	41
U2	NM2-IB Switch	43
U1	Server 2	47

¹ *Un* is the unit location in the rack, where *n* is the number.

Oracle Integrated Lights Out Manager Cable Connections

Table D-3 shows the cable connections from the servers to the Oracle ILOM switch. The Oracle ILOM ports on the servers are labeled Net Mgt and connect to the Cisco Ethernet switch located in rack unit 21.

Table D-3 Oracle ILOM Cabling

From Rack Unit ¹	Component	Ethernet Port	Cable Length	Cable Color
U41	Server 18	2	10 feet	Red
U39	Server 17	4	10 feet	Red
U37	Server 16	6	10 feet	Red
U35	Server 15	8	10 feet	Red
U33	Server 14	10	10 feet	Red
U31	Server 13	12	10 feet	Red
U29	Server 12	14	10 feet	Red
U27	Server 11	18	10 feet	Red
U25	Server 10	22	10 feet	Red
U18	Server 9	26	10 feet	Red
U16	Server 8	30	10 feet	Red
U14	Server 7	32	10 feet	Red
U12	Server 6	34	10 feet	Red
U10	Server 5	36	10 feet	Red
U8	Server 4	38	10 feet	Red
U6	Server 3	40	10 feet	Red
U4	Server 2	42	10 feet	Red
U2	Server 1	44	10 feet	Red
PDU-A	PDU-A	15	1 meter	White
PDU-B	PDU-B	20	1 meter	White
Not applicable	Service	48	10 feet	Blue

¹ *Un* is the unit location in the rack, where *n* is the number.

Single-Phase Power Distribution Unit Cable Connections

Table D-4 shows the connections for single-phase cabling from each power distribution unit (PDU) to the power supplies in the rack. The cables terminate at PDU-A on the left and are routed to the right to enter the cable management arm (CMA). The cables are bundled in groups of four.

Table D-4 Single-Phase PDU Cabling

Rack Unit ¹	PDU-A/PS-00	PDU-B/PS-01	Cable Length
U41	G5-6	G0-0	2 meters
U39	G5-3	G0-3	2 meters
U37	G5-0	G0-6	2 meters
U35	G4-6	G1-0	2 meters
U33	G4-4	G1-2	2 meters
U31	G4-2	G1-4	2 meters
U29	G3-6	G2-0	2 meters
U27	G3-5	G2-1	2 meters
U25	G3-3	G2-3	2 meters
U24	G3-1	G2-5	2 meters
U23	Not Applicable	G3-0	included
U22	G2-5	G3-1	1 meter
U21	G3-0	G2-6	2 meters
U20	G2-4	G3-2	2 meters
U18	G2-2	G3-4	2 meters
U16	G1-6	G4-0	2 meters
U14	G2-0	G3-6	2 meters
U12	G1-4	G4-2	2 meters
U10	G1-2	G4-4	2 meters
U8	G1-0	G4-6	2 meters
U6	G0-6	G5-0	2 meters
U4	G0-4	G5-2	2 meters
U2	G0-2	G5-4	2 meters
U1	G0-0	G5-6	2 meters

¹ *Un* is the unit location in the rack, where *n* is the number.

Three-Phase Power Distribution Unit Cable Connections

Table D-5 describes three-phase cabling from each power distribution unit (PDU) to the power supplies in the rack. The cables are terminated to PDU-A on the left, are routed to the right to enter the cable management arm (CMA), and are bundled in groups of four.

Table D-5 Three-Phase PDU Cabling

Rack Unit ¹	PDU-A/PS-00	PDU-B/PS-01	Cable Length
U41	G5-6	G2-0	2 meters
U39	G5-3	G2-3	2 meters
U37	G5-0	G2-6	2 meters
U35	G4-6	G1-0	2 meters
U33	G4-4	G1-2	2 meters
U31	G4-2	G1-4	2 meters
U29	G3-6	G0-0	2 meters
U27	G3-5	G0-1	2 meters
U25	G3-3	G0-3	2 meters
U24	G3-1	G0-5	2 meters
U23	Not Applicable	G5-0	Included
U22	G2-5	G5-1	1 meter
U21	G3-0	G0-6	2 meters
U20	G2-4	G5-2	2 meters
U18	G2-2	G5-4	2 meters
U16	G1-6	G4-0	2 meters
U14	G2-0	G5-6	2 meters
U12	G1-4	G4-2	2 meters
U10	G1-2	G4-4	2 meters
U8	G1-0	G4-6	2 meters
U6	G0-6	G3-0	2 meters
U4	G0-4	G3-2	2 meters
U2	G0-2	G3-4	2 meters
U1	G0-0	G3-6	2 meters

¹ *Un* is the unit location in the rack, where *n* is the number.

In-Rack InfiniBand Switch-to-Switch Cable Connections

Table D-6 lists the location, ports, and cables for the InfiniBand connections from switch to switch. **Figure D-2** identifies the locations of the ports on a Sun Network QDR InfiniBand Gateway.

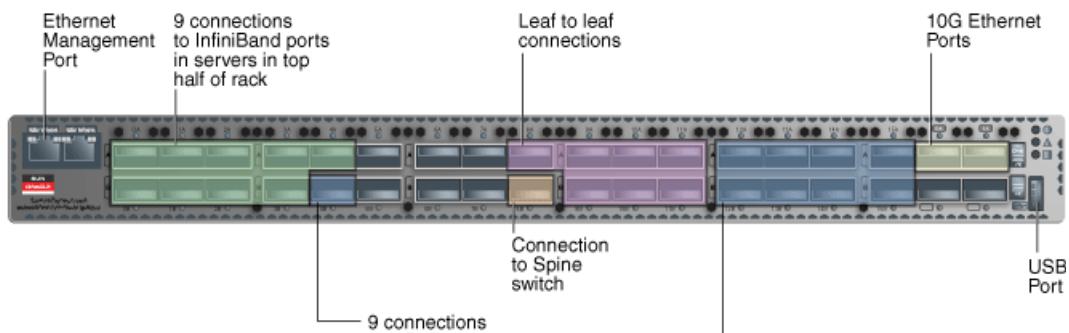
Table D-6 InfiniBand Switch-to-Switch Cabling

From InfiniBand Switch Rack Unit ¹	Port	To InfiniBand Switch Rack Unit ¹	Port	Cable Length	Description
U20	9B	U24	9A	2 meters	Leaf to leaf
U20	10B	U24	10A	2 meters	Leaf to leaf
U20	11B	U24	11A	2 meters	Leaf to leaf
U20	8A	U24	8A	2 meters	Leaf to leaf

Table D-6 (Cont.) InfiniBand Switch-to-Switch Cabling

From InfiniBand Switch Rack Unit ¹	Port	To InfiniBand Switch Rack Unit ¹	Port	Cable Length	Description
U20	9A	U24	9B	2 meters	Leaf to leaf
U20	10A	U24	10B	2 meters	Leaf to leaf
U20	11A	U24	11B	2 meters	Leaf to leaf
U1	0B	U20	8B	3 meters	Spine to leaf
U1	1B	U24	8B	3 meters	Spine to leaf

¹ *Un* is the unit location in the rack, where *n* is the number.

Figure D-2 Sun Network QDR InfiniBand Gateway Ports

In-Rack InfiniBand Switch-to-Server Cable Connections

Table D-7 lists the location, ports, and cables for the InfiniBand connections from the leaf switches to the servers.

Table D-7 InfiniBand Switch-to-Server Cabling

From InfiniBand Switch Rack Unit ¹	Port	To Rack Unit ¹	Port ²	Cable Length
U24	0A	U41	PCIe 3 P1	3 meters
U24	0B	U39	PCIe 3 P1	3 meters
U24	1A	U37	PCIe 3 P1	3 meters
U24	1B	U35	PCIe 3 P1	3 meters
U24	2A	U33	PCIe 3 P1	3 meters
U24	2B	U31	PCIe 3 P1	3 meters
U24	3A	U29	PCIe 3 P1	3 meters
U24	3B	U27	PCIe 3 P1	2 meters
U24	4A	U25	PCIe 3 P1	2 meters
U20	0A	U41	PCIe 3 P2	3 meters
U20	0B	U39	PCIe 3 P2	3 meters
U20	1A	U37	PCIe 3 P2	3 meters
U20	1B	U35	PCIe 3 P2	3 meters
U20	2A	U33	PCIe 3 P2	3 meters

Table D-7 (Cont.) InfiniBand Switch-to-Server Cabling

From InfiniBand Switch Rack Unit¹	Port	To Rack Unit¹	Port²	Cable Length
U20	2B	U31	PCIe 3 P2	3 meters
U20	3A	U29	PCIe 3 P2	3 meters
U20	3B	U27	PCIe 3 P2	2 meters
U20	4A	U25	PCIe 3 P2	2 meters
U20	4B	U18	PCIe 3 P1	2 meters
U20	12A	U16	PCIe 3 P1	2 meters
U20	12B	U14	PCIe 3 P1	3 meters
U20	13A	U12	PCIe 3 P1	3 meters
U20	13B	U10	PCIe 3 P1	3 meters
U20	14A	U8	PCIe 3 P1	3 meters
U20	14B	U6	PCIe 3 P1	3 meters
U20	15A	U4	PCIe 3 P1	3 meters
U20	15B	U2	PCIe 3 P1	3 meters
U24	4B	U18	PCIe 3 P2	2 meters
U24	12A	U16	PCIe 3 P2	2 meters
U24	12B	U14	PCIe 3 P2	3 meters
U24	13A	U12	PCIe 3 P2	3 meters
U24	13B	U10	PCIe 3 P2	3 meters
U24	14A	U8	PCIe 3 P2	3 meters
U24	14B	U6	PCIe 3 P2	3 meters
U24	15A	U4	PCIe 3 P2	3 meters
U24	15B	U2	PCIe 3 P2	3 meters

¹ *Un* is the unit location in the rack, where *n* is the number.² *Pn* is the InfiniBand port, where *n* is the port number.

Multirack Cabling Tables

This appendix contains the tables for multirack cabling. It contains the following sections:

- [Understanding Multirack Cabling](#)
- [Key to Cabling Table Abbreviations](#)
- [Two-Rack Cabling](#)
- [Three-Rack Cabling](#)
- [Four-Rack Cabling](#)
- [Five-Rack Cabling](#)
- [Six-Rack Cabling](#)
- [Seven-Rack Cabling](#)
- [Eight-Rack Cabling](#)

Understanding Multirack Cabling

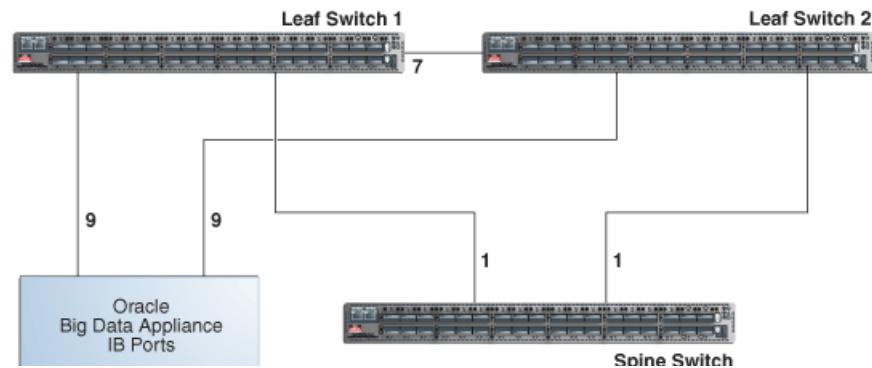
You can connect multiple Oracle Big Data Appliance racks, or a combination of Oracle Big Data Appliance racks and Oracle Exadata Database Machine racks. Exadata full racks, half racks, and quarter racks must have a spine switch. If your Exadata rack does not have a spine switch, then be sure to have an Exadata Expansion Switch Kit on hand for the installation. Exadata eighth racks do not require a spine switch to connect to Oracle Big Data Appliance.

The Oracle Big Data Appliance rack has a Sun Datacenter QDR InfiniBand Switch for the spine switch at rack unit 1 (U1). The rack also has two Sun Network QDR InfiniBand Gateway switches for the leaf switches at rack units 20 and 24 (U20 and U24). See [Figure D-1](#).

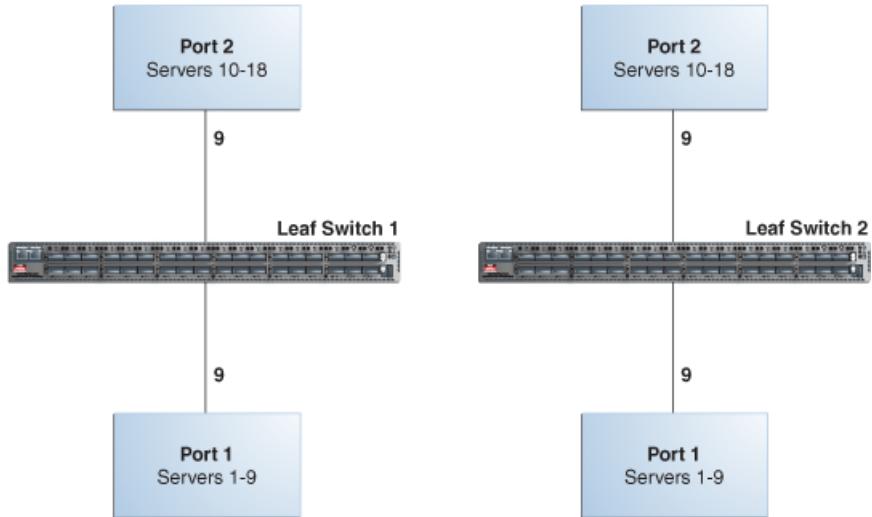
These switches attach to standard quad small form-factor pluggable (QSFP) connectors at the end of the InfiniBand cables. You can cable together up to eight racks without external InfiniBand switches. The cable lengths in this appendix are for adjacent racks. If they are apart, then longer cables may be required for the connections.

Cabling the Switches in One Rack

In a single rack, the two leaf switches are connected by seven cables. Each leaf switch has one cable to the spine switch. Nine servers connect to one leaf switch, and the other nine servers connect to the other leaf switch, as shown in [Figure E-1](#).

Figure E-1 Connections Between Spine Switch and Leaf Switches

The servers connect to the leaf switches as shown in [Figure E-2](#).

Figure E-2 Connections Between the Servers and the Leaf Switches

Cabling the Switches in Two Racks

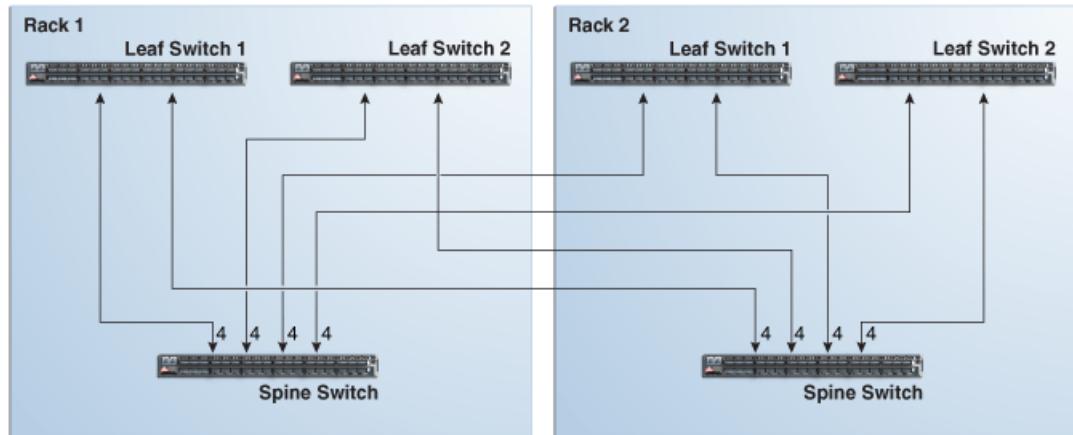
When you connect multiple racks, remove the seven interswitch connections between leaf switches and the two connections between the leaf switches and the spine switch. From each leaf switch, distribute eight connections over the spine switches in all racks. In multirack environments, the leaf switches inside a rack are not directly interconnected, as shown in [Figure E-3](#).

[Figure E-3](#) shows that each leaf switch in rack 1 connects to the following switches:

- Four connections to its internal spine switch
- Four connections to the spine switch in rack 2

The spine switch in rack 1 connects to the following switches:

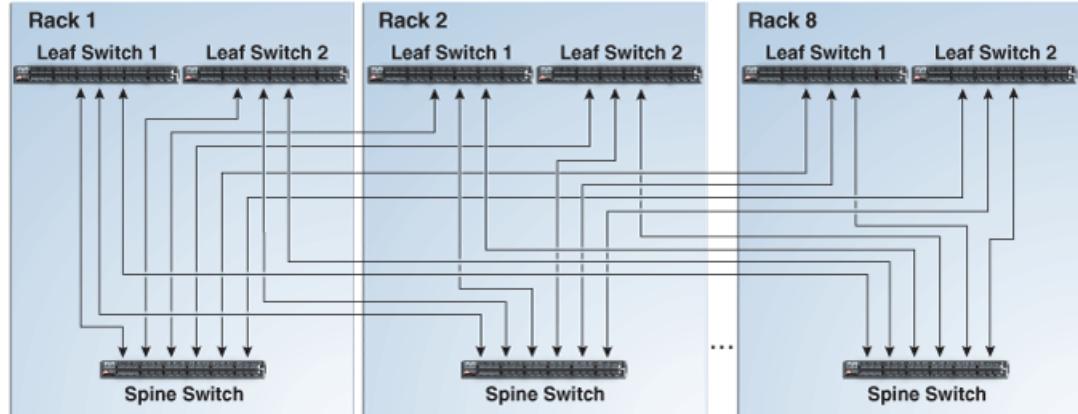
- Eight connections to the internal leaf switches (four to each rack 1 switch)
- Eight connections to the leaf switches in rack 2 (four to each rack 2 switch)

Figure E-3 Connecting Switches Across Two Racks

Cabling the Switches in Up to Eight Racks

As the number of racks increases from two to eight, the pattern continues as shown in [Figure E-4](#). Because not all of the racks are shown, not all of the cables are shown either.

Each leaf switch has eight interswitch connections distributed over all spine switches. Each spine switch has 16 interswitch connections distributed over all leaf switches. The leaf switches are not directly interconnected with other leaf switches, and the spine switches are not directly interconnected with the other spine switches.

Figure E-4 Connecting Switches Across Multiple Racks

Key to Cabling Table Abbreviations

The following abbreviations are used in the tables:

Abbreviation	Description
R n	Rack n , where n is the number of the rack, such as R1.
IB n	Unit location in rack, where n is the number, such as IB3.
P n	InfiniBand port n , where n is port number, such as P8A.

Two-Rack Cabling

[Table E-1](#) shows the cable connections for the first spine switch (R1-U1) when two racks are cabled together.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-1 Leaf Switch Connections for the First Rack in a Two-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-IB3-P8A to R1-U1-P3A R1-IB3-P8B to R1-U1-P4A R1-IB3-P9A to R1-U1-P5A R1-IB3-P9B to R1-U1-P6A	3 meters
R1 IB3 to Rack 2	R1-IB3-P10A to R2-U1-P7A R1-IB3-P10B to R2-U1-P8A R1-IB3-P11A to R2-U1-P9A R1-IB3-P11B to R2-U1-P10A	5 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B R1-IB2-P8B to R1-U1-P4B R1-IB2-P9A to R1-U1-P5B R1-IB2-P9B to R1-U1-P6B	3 meters
R1 IB2 to Rack 2	R1-IB2-P10A to R2-U1-P7B R1-IB2-P10B to R2-U1-P8B R1-IB2-P11A to R2-U1-P9B R1-IB2-P11B to R2-U1-P10B	5 meters

[Table E-2](#) shows the cable connections for the second spine switch (R2-U1) when two racks are cabled together.

Table E-2 Leaf Switch Connections for the Second Rack in a Two-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-IB3-P8A to R2-U1-P3A R2-IB3-P8B to R2-U1-P4A R2-IB3-P9A to R2-U1-P5A R2-IB3-P9B to R2-U1-P6A	3 meters
R2 IB3 to Rack 1	R2-IB3-P10A to R1-U1-P7A R2-IB3-P10B to R1-U1-P8A R2-IB3-P11A to R1-U1-P9A R2-IB3-P11B to R1-U1-P10A	5 meters

Table E-2 (Cont.) Leaf Switch Connections for the Second Rack in a Two-Rack System

Leaf Switch	Connection	Cable Length
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B R2-IB2-P8B to R2-U1-P4B R2-IB2-P9A to R2-U1-P5B R2-IB2-P9B to R2-U1-P6B	3 meters
R2 IB2 to Rack 1	R2-IB2-P10A to R1-U1-P7B R2-IB2-P10B to R1-U1-P8B R2-IB2-P11A to R1-U1-P9B R2-IB2-P11B to R1-U1-P10B	5 meters

Three-Rack Cabling

[Table E-3](#) shows the cable connections for the first spine switch (R1-U1) when three racks are cabled together.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-3 Leaf Switch Connections for the First Rack in a Three-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-U24-P8A to R1-U1-P3A R1-U24-P8B to R1-U1-P4A R1-U24-P9A to R1-U1-P5A	3 meters
R1 IB3 to Rack 2	R1-U24-P9B to R2-U1-P6A R1-U24-P10A to R2-U1-P7A R1-U24-P10B to R2-U1-P8A	5 meters
R1 U24 to Rack 3	R1-U24-P11A to R3-U1-P9A R1-U24-P11B to R3-U1-P10A	5 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B R1-IB2-P8B to R1-U1-P4B R1-IB2-P9A to R1-U1-P5B	3 meters
R1 IB2 to Rack 2	R1-IB2-P9B to R2-U1-P6B R1-IB2-P10A to R2-U1-P7B R1-IB2-P10B to R2-U1-P8B	5 meters
R1 IB2 to Rack 3	R1-IB2-P11A to R3-U1-P9B R1-IB2-P11B to R3-U1-P10B	5 meters

[Table E-4](#) shows the cable connections for the second spine switch (R2-U1) when three racks are cabled together.

Table E-4 Leaf Switch Connections for the Second Rack in a Three-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-U24-P8A to R2-U1-P3A R2-U24-P8B to R2-U1-P4A R2-U24-P9A to R2-U1-P5A	3 meters
R2 IB3 to Rack 1	R2-U24-P11A to R1-U1-P9A R2-U24-P11B to R1-U1-P10A	5 meters
R2 IB3 to Rack 3	R2-U24-P9B to R3-U1-P6A R2-U24-P10A to R3-U1-P7A R2-U24-P10B to R3-U1-P8A	5 meters
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B R2-IB2-P8B to R2-U1-P4B R2-IB2-P9A to R2-U1-P5B	3 meters
R2 IB2 to Rack 1	R2-IB2-P11A to R1-U1-P9B R2-IB2-P11B to R1-U1-P10B	5 meters
R2 IB2 to Rack 3	R2-IB2-P9B to R3-U1-P6B R2-IB2-P10A to R3-U1-P7B R2-IB2-P10B to R3-U1-P8B	5 meters

Table E-5 shows the cable connections for the third spine switch (R3-U1) when three racks are cabled together.

Table E-5 Leaf Switch Connections for the Third Rack in a Three-Rack System

Leaf Switch	Connection	Cable Length
R3 IB3 within Rack 3	R3-IB3-P8A to R3-U1-P3A R3-IB3-P8B to R3-U1-P4A R3-IB3-P9A to R3-U1-P5A	3 meters
R3 IB3 to Rack 1	R3-IB3-P9B to R1-U1-P6A R3-IB3-P10A to R1-U1-P7A R3-IB3-P10B to R1-U1-P8A	5 meters
R3 IB3 to Rack 2	R3-IB3-P11A to R2-U1-P9A R3-IB3-P11B to R2-U1-P10A	5 meters
R3 IB2 within Rack 3	R3-IB2-P8A to R3-U1-P3B R3-IB2-P8B to R3-U1-P4B R3-IB2-P9A to R3-U1-P5B	3 meters
R3 IB2 to Rack 1	R3-IB2-P9B to R1-U1-P6B R3-IB2-P10A to R1-U1-P7B R3-IB2-P10B to R1-U1-P8B	5 meters
R3 IB2 to Rack 2	R3-IB2-P11A to R2-U1-P9B R3-IB2-P11B to R2-U1-P10B	5 meters

Four-Rack Cabling

Table E-6 shows the cable connections for the first spine switch (R1-U1) when four racks are cabled together.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-6 Leaf Switch Connections for the First Rack in a Four-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-IB3-P8A to R1-U1-P3A R1-IB3-P8B to R1-U1-P4A	3 meters
R1 IB3 to Rack 2	R1-IB3-P9A to R2-U1-P5A R1-IB3-P9B to R2-U1-P6A	5 meters
R1 IB3 to Rack 3	R1-IB3-P10A to R3-U1-P7A R1-IB3-P10B to R3-U1-P8A	5 meters
R1 IB3 to Rack 4	R1-IB3-P11A to R4-U1-P9A R1-IB3-P11B to R4-U1-P10A	10 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B R1-IB2-P8B to R1-U1-P4B	3 meters
R1 IB2 to Rack 2	R1-IB2-P9A to R2-U1-P5B R1-IB2-P9B to R2-U1-P6B	5 meters
R1 IB2 to Rack 3	R1-IB2-P10A to R3-U1-P7B R1-IB2-P10B to R3-U1-P8B	5 meters
R1 IB2 to Rack 4	R1-IB2-P11A to R4-U1-P9B R1-IB2-P11B to R4-U1-P10B	10 meters

Table E-7 shows the cable connections for the second spine switch (R2-U1) when four racks are cabled together.

Table E-7 Leaf Switch Connections for the Second Rack in a Four-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-IB3-P8A to R2-U1-P3A R2-IB3-P8B to R2-U1-P4A	3 meters
R2 IB3 to Rack 1	R2-IB3-P11A to R1-U1-P9A R2-IB3-P11B to R1-U1-P10A	5 meters
R2 IB3 to Rack 3	R2-IB3-P9A to R3-U1-P5A R2-IB3-P9B to R3-U1-P6A	5 meters
R2 IB3 to Rack 4	R2-IB3-P10A to R4-U1-P7A R2-IB3-P10B to R4-U1-P8A	5 meters

Table E-7 (Cont.) Leaf Switch Connections for the Second Rack in a Four-Rack System

Leaf Switch	Connection	Cable Length
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B R2-IB2-P8B to R2-U1-P4B	3 meters
R2 IB2 to Rack 1	R2-IB2-P11A to R1-U1-P9B R2-IB2-P11B to R1-U1-P10B	5 meters
R2 IB2 to Rack 3	R2-IB2-P9A to R3-U1-P5B R2-IB2-P9B to R3-U1-P6B	5 meters
R2 IB2 to Rack 4	R2-IB2-P10A to R4-U1-P7B R2-IB2-P10B to R4-U1-P8B	5 meters

Table E-8 shows the cable connections for the third spine switch (R3-U1) when four racks are cabled together.

Table E-8 Leaf Switch Connections for the Third Rack in a Four-Rack System

Leaf Switch	Connection	Cable Length
R3 IB3 within Rack 3	R3-IB3-P8A to R3-U1-P3A R3-IB3-P8B to R3-U1-P4A	3 meters
R3 IB3 to Rack 1	R3-IB3-P10A to R1-U1-P7A R3-IB3-P10B to R1-U1-P8A	5 meters
R3 IB3 to Rack 2	R3-IB3-P11A to R2-U1-P9A R3-IB3-P11B to R2-U1-P10A	5 meters
R3 IB3 to Rack 4	R3-IB3-P9A to R4-U1-P5A R3-IB3-P9B to R4-U1-P6A	5 meters
R3 IB2 within Rack 3	R3-IB2-P8A to R3-U1-P3B R3-IB2-P8B to R3-U1-P4B	3 meters
R3 IB2 to Rack 1	R3-IB2-P10A to R1-U1-P7B R3-IB2-P10B to R1-U1-P8B	5 meters
R3 IB2 to Rack 2	R3-IB2-P11A to R2-U1-P9B R3-IB2-P11B to R2-U1-P10B	5 meters
R3 IB2 to Rack 4	R3-IB2-P9A to R4-U1-P5B R3-IB2-P9B to R4-U1-P6B	5 meters

Table E-9 shows the cable connections for the fourth spine switch (R4-U1) when four racks are cabled together.

Table E-9 Leaf Switch Connections for the Fourth Rack in a Four-Rack System

Leaf Switch	Connection	Cable Length
R4 IB3 within Rack 4	R4-IB3-P8A to R4-U1-P3A R4-IB3-P8B to R4-U1-P4A	3 meters
R4 IB3 to Rack 1	R4-IB3-P9A to R1-U1-P5A R4-IB3-P9B to R1-U1-P6A	10 meters

Table E-9 (Cont.) Leaf Switch Connections for the Fourth Rack in a Four-Rack System

Leaf Switch	Connection	Cable Length
R4 IB3 to Rack 2	R4-IB3-P10A to R2-U1-P7A R4-IB3-P10B to R2-U1-P8A	5 meters
R4 IB3 to Rack 3	R4-IB3-P11A to R3-U1-P9A R4-IB3-P11B to R3-U1-P10A	5 meters
R4 IB2 within Rack 4	R4-IB2-P8A to R4-U1-P3B R4-IB2-P8B to R4-U1-P4B	3 meters
R4 IB2 to Rack 1	R4-IB2-P9A to R1-U1-P5B R4-IB2-P9B to R1-U1-P6B	10 meters
R4 IB2 to Rack 2	R4-IB2-P10A to R2-U1-P7B R4-IB2-P10B to R2-U1-P8B	5 meters
R4 IB2 to Rack 3	R4-IB2-P11A to R3-U1-P9B R4-IB2-P11B to R3-U1-P10B	5 meters

Five-Rack Cabling

Table E-10 shows the cable connections for the first spine switch (R1-U1) when five racks are cabled together.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-10 Leaf Switch Connections for the First Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-IB3-P8A to R1-U1-P3A R1-IB3-P8B to R1-U1-P4A	3 meters
R1 IB3 to Rack 2	R1-IB3-P9A to R2-U1-P5A R1-IB3-P9B to R2-U1-P6A	5 meters
R1 IB3 to Rack 3	R1-IB3-P10A to R3-U1-P7A R1-IB3-P10B to R3-U1-P8A	5 meters
R1 IB3 to Rack 4	R1-IB3-P11A to R4-U1-P9A	10 meters
R1 IB3 to Rack 5	R1-IB3-P11B to R5-U1-P10A	10 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B R1-IB2-P8B to R1-U1-P4B	3 meters
R1 IB2 to Rack 2	R1-IB2-P9A to R2-U1-P5B R1-IB2-P9B to R2-U1-P6B	5 meters
R1 IB2 to Rack 3	R1-IB2-P10A to R3-U1-P7B R1-IB2-P10B to R3-U1-P8B	5 meters
R1 IB2 to Rack 4	R1-IB2-P11A to R4-U1-P9B	10 meters

Table E-10 (Cont.) Leaf Switch Connections for the First Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R1 IB2 to Rack 5	R1-IB2-P11B to R5-U1-P10B	10 meters

Table E-11 shows the cable connections for the second spine switch (R2-U1) when five racks are cabled together.

Table E-11 Leaf Switch Connections for the Second Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-IB3-P8A to R2-U1-P3A R2-IB3-P8B to R2-U1-P4A	3 meters
R2 IB3 to Rack 1	R2-IB3-P11B to R1-U1-P10A	5 meters
R2 IB3 to Rack 3	R2-IB3-P9A to R3-U1-P5A R2-IB3-P9B to R3-U1-P6A	5 meters
R2 IB3 to Rack 4	R2-IB3-P10A to R4-U1-P7A R2-IB3-P10B to R4-U1-P8A	5 meters
R2 IB3 to Rack 5	R2-IB3-P11A to R5-U1-P9A	10 meters
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B R2-IB2-P8B to R2-U1-P4B	3 meters
R2 IB2 to Rack 1	R2-IB2-P11B to R1-U1-P10B	5 meters
R2 IB2 to Rack 3	R2-IB2-P9A to R3-U1-P5B R2-IB2-P9B to R3-U1-P6B	5 meters
R2 IB2 to Rack 4	R2-IB2-P10A to R4-U1-P7B R2-IB2-P10B to R4-U1-P8B	5 meters
R2 IB2 to Rack 5	R2-IB2-P11A to R5-U1-P9B	10 meters

Table E-12 shows the cable connections for the third spine switch (R3-U1) when five racks are cabled together.

Table E-12 Leaf Switch Connections for the Third Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R3 IB3 within Rack 3	R3-IB3-P8A to R3-U1-P3A R3-IB3-P8B to R3-U1-P4A	3 meters
R3 IB3 to Rack 1	R3-IB3-P11A to R1-U1-P9A	5 meters
R3 IB3 to Rack 2	R3-IB3-P11B to R2-U1-P10A	5 meters
R3 IB3 to Rack 4	R3-IB3-P9A to R4-U1-P5A R3-IB3-P9B to R4-U1-P6A	5 meters
R3 IB3 to Rack 5	R3-IB3-P10A to R5-U1-P7A R3-IB3-P10B to R5-U1-P8A	5 meters
R3 IB2 within Rack 3	R3-IB2-P8A to R3-U1-P3B R3-IB2-P8B to R3-U1-P4B	3 meters
R3 IB2 to Rack 1	R3-IB2-P11A to R1-U1-P9B	5 meters

Table E-12 (Cont.) Leaf Switch Connections for the Third Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R3 IB2 to Rack 2	R3-IB2-P11B to R2-U1-P10B	5 meters
R3 IB2 to Rack 4	R3-IB2-P9A to R4-U1-P5B	5 meters
	R3-IB2-P9B to R4-U1-P6B	
R3 IB2 to Rack 5	R3-IB2-P10A to R5-U1-P7B	5 meters
	R3-IB2-P10B to R5-U1-P8B	

Table E-13 shows the cable connections for the fourth spine switch (R4-U1) when five racks are cabled together.

Table E-13 Leaf Switch Connections for the Fourth Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R4 IB3 within Rack 4	R4-IB3-P8A to R4-U1-P3A	3 meters
	R4-IB3-P8B to R4-U1-P4A	
R4 IB3 to Rack 1	R4-IB3-P10A to R1-U1-P7A	10 meters
	R4-IB3-P10B to R1-U1-P8A	
R4 IB3 to Rack 2	R4-IB3-P11A to R2-U1-P9A	5 meters
R4 IB3 to Rack 3	R4-IB3-P11B to R3-U1-P10A	5 meters
R4 IB3 to Rack 5	R4-IB3-P9A to R5-U1-P5A	5 meters
	R4-IB3-P9B to R5-U1-P6A	
R4 IB2 within Rack 4	R4-IB2-P8A to R4-U1-P3B	3 meters
	R4-IB2-P8B to R4-U1-P4B	
R4 IB2 to Rack 1	R4-IB2-P10A to R1-U1-P7B	10 meters
	R4-IB2-P10B to R1-U1-P8B	
R4 IB2 to Rack 2	R4-IB2-P11A to R2-U1-P9B	5 meters
R4 IB2 to Rack 3	R4-IB2-P11B to R3-U1-P10B	5 meters
R4 IB2 to Rack 5	R4-IB2-P9A to R5-U1-P5B	5 meters
	R4-IB2-P9B to R5-U1-P6B	

Table E-14 shows the cable connections for the fifth spine switch (R5-U1) when five racks are cabled together.

Table E-14 Leaf Switch Connections for the Fifth Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R5 IB3 within Rack 5	R5-IB3-P8A to R5-U1-P3A	3 meters
	R5-IB3-P8B to R5-U1-P4A	
R5 IB3 to Rack 1	R5-IB3-P9A to R1-U1-P5A	10 meters
	R5-IB3-P9B to R1-U1-P6A	
R5 IB3 to Rack 2	R5-IB3-P10A to R2-U1-P7A	10 meters
	R5-IB3-P10B to R2-U1-P8A	
R5 IB3 to Rack 3	R5-IB3-P11A to R3-U1-P9A	5 meters
R5 IB3 to Rack 4	R5-IB3-P11B to R4-U1-P10A	5 meters

Table E-14 (Cont.) Leaf Switch Connections for the Fifth Rack in a Five-Rack System

Leaf Switch	Connection	Cable Length
R5 IB2 within Rack 5	R5-IB2-P8A to R5-U1-P3B R5-IB2-P8B to R5-U1-P4B	3 meters
R5 IB2 to Rack 1	R5-IB2-P9A to R1-U1-P5B R5-IB2-P9B to R1-U1-P6B	10 meters
R5 IB2 to Rack 2	R5-IB2-P10A to R2-U1-P7B R5-IB3-P10B to R2-U1-P8B	10 meters
R5 IB2 to Rack 3	R5-IB2-P11A to R3-U1-P9B	5 meters
R5 IB2 to Rack 4	R5-IB2-P11B to R4-U1-P10B	5 meters

Six-Rack Cabling

Table E-15 shows the cable connections for the first spine switch (R1-U1) when cabling six racks.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-15 Leaf Switch Connections for the First Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-IB3-P8A to R1-U1-P3A R1-IB3-P8B to R1-U1-P4A	3 meters
R1 IB3 to Rack 2	R1-IB3-P9A to R2-U1-P5A R1-IB3-P9B to R2-U1-P6A	5 meters
R1 IB3 to Rack 3	R1-IB3-P10A to R3-U1-P7A	5 meters
R1 IB3 to Rack 4	R1-IB3-P10B to R4-U1-P8A	10 meters
R1 IB3 to Rack 5	R1-IB3-P11A to R5-U1-P9A	10 meters
R1 IB3 to Rack 6	R1-IB3-P11B to R6-U1-P10A	10 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B R1-IB2-P8B to R1-U1-P4B	3 meters
R1 IB2 to Rack 2	R1-IB2-P9A to R2-U1-P5B R1-IB2-P9B to R2-U1-P6B	5 meters
R1 IB2 to Rack 3	R1-IB2-P10A to R3-U1-P7B	5 meters
R1 IB2 to Rack 4	R1-IB2-P10B to R4-U1-P8B	10 meters
R1 IB2 to Rack 5	R1-IB2-P11A to R5-U1-P9B	10 meters
R1 IB2 to Rack 6	R1-IB2-P11B to R6-U1-P10B	10 meters

Table E-16 shows the cable connections for the second spine switch (R2-U1) when six racks are cabled together.

Table E-16 Leaf Switch Connections for the Second Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-IB3-P8A to R2-U1-P3A R2-IB3-P8B to R2-U1-P4A	3 meters
R2 IB3 to Rack 1	R2-IB3-P11B to R1-U1-P10A	5 meters
R2 IB3 to Rack 3	R2-IB3-P9A to R3-U1-P5A R2-IB3-P9B to R3-U1-P6A	5 meters
R2 IB3 to Rack 4	R2-IB3-P10A to R4-U1-P7A	5 meters
R2 IB3 to Rack 5	R2-IB3-P10B to R5-U1-P8A	10 meters
R2 IB3 to Rack 6	R2-IB3-P11A to R6-U1-P9A	10 meters
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B R2-IB2-P8B to R2-U1-P4B	3 meters
R2 IB2 to Rack 1	R2-IB2-P11B to R1-U1-P10B	5 meters
R2 IB2 to Rack 3	R2-IB2-P9A to R3-U1-P5B R2-IB2-P9B to R3-U1-P6B	5 meters
R2 IB2 to Rack 4	R2-IB2-P10A to R4-U1-P7B	5 meters
R2 IB2 to Rack 5	R2-IB2-P10B to R5-U1-P8B	10 meters
R2 IB2 to Rack 6	R2-IB2-P11A to R6-U1-P9B	10 meters

Table E-17 shows the cable connections for the third spine switch (R3-U1) when six racks are cabled together.

Table E-17 Leaf Switch Connections for the Third Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R3 IB3 within Rack 3	R3-IB3-P8A to R3-U1-P3A R3-IB3-P8B to R3-U1-P4A	3 meters
R3 IB3 to Rack 1	R3-IB3-P11A to R1-U1-P9A	5 meters
R3 IB3 to Rack 2	R3-IB3-P11B to R2-U1-P10A	5 meters
R3 IB3 to Rack 4	R3-IB3-P9A to R4-U1-P5A R3-IB3-P9B to R4-U1-P6A	5 meters
R3 IB3 to Rack 5	R3-IB3-P10A to R5-U1-P7A	5 meters
R3 IB3 to Rack 6	R3-IB3-P10B to R6-U1-P8A	5 meters
R3 IB2 within Rack 3	R3-IB2-P8A to R3-U1-P3B R3-IB2-P8B to R3-U1-P4B	3 meters
R3 IB2 to Rack 1	R3-IB2-P11A to R1-U1-P9B	5 meters
R3 IB2 to Rack 2	R3-IB2-P11B to R2-U1-P10B	5 meters
R3 IB2 to Rack 4	R3-IB2-P9A to R4-U1-P5B R3-IB2-P9B to R4-U1-P6B	5 meters
R3 IB2 to Rack 5	R3-IB2-P10A to R5-U1-P7B	5 meters
R3 IB2 to Rack 6	R3-IB2-P10B to R6-U1-P8B	5 meters

[Table E-18](#) shows the cable connections for the fourth spine switch (R4-U1) when six racks are cabled together.

Table E-18 Leaf Switch Connections for the Fourth Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R4 IB3 within Rack 4	R4-IB3-P8A to R4-U1-P3A R4-IB3-P8B to R4-U1-P4A	3 meters
R4 IB3 to Rack 1	R4-IB3-P10B to R1-U1-P8A	10 meters
R4 IB3 to Rack 2	R4-IB3-P11A to R2-U1-P9A	5 meters
R4 IB3 to Rack 3	R4-IB3-P11B to R3-U1-P10A	5 meters
R4 IB3 to Rack 5	R4-IB3-P9A to R5-U1-P5A R4-IB3-P9B to R5-U1-P6A	5 meters
R4 IB3 to Rack 6	R4-IB3-P10A to R6-U1-P7A	5 meters
R4 IB2 within Rack 4	R4-IB2-P8A to R4-U1-P3B R4-IB2-P8B to R4-U1-P4B	3 meters
R4 IB2 to Rack 1	R4-IB2-P10B to R1-U1-P8B	10 meters
R4 IB2 to Rack 2	R4-IB2-P11A to R2-U1-P9B	5 meters
R4 IB2 to Rack 3	R4-IB2-P11B to R3-U1-P10B	5 meters
R4 IB2 to Rack 5	R4-IB2-P9A to R5-U1-P5B R4-IB2-P9B to R5-U1-P6B	5 meters
R4 IB2 to Rack 6	R4-IB2-P10A to R6-U1-P7B	5 meters

[Table E-19](#) shows the cable connections for the fifth spine switch (R5-U1) when six racks are cabled together.

Table E-19 Leaf Switch Connections for the Fifth Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R5 IB3 within Rack 5	R5-IB3-P8A to R5-U1-P3A R5-IB3-P8B to R5-U1-P4A	3 meters
R5 IB3 to Rack 1	R5-IB3-P10A to R1-U1-P7A	10 meters
R5 IB3 to Rack 2	R5-IB3-P10B to R2-U1-P8A	10 meters
R5 IB3 to Rack 3	R5-IB3-P11A to R3-U1-P9A	5 meters
R5 IB3 to Rack 4	R5-IB3-P11B to R4-U1-P10A	5 meters
R5 IB3 to Rack 6	R5-IB3-P9A to R6-U1-P5A R5-IB3-P9B to R6-U1-P6A	5 meters
R5 IB2 within Rack 5	R5-IB2-P8A to R5-U1-P3B R5-IB2-P8B to R5-U1-P4B	3 meters
R5 IB2 to Rack 1	R5-IB2-P10A to R1-U1-P7B	10 meters
R5 IB2 to Rack 2	R5-IB3-P10B to R2-U1-P8B	10 meters
R5 IB2 to Rack 3	R5-IB2-P11A to R3-U1-P9B	5 meters
R5 IB2 to Rack 4	R5-IB2-P11B to R4-U1-P10B	5 meters

Table E-19 (Cont.) Leaf Switch Connections for the Fifth Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R5 IB2 to Rack 6	R5-IB2-P9A to R6-U1-P5B R5-IB2-P9B to R6-U1-P6B	5 meters

Table E-20 shows the cable connections for the sixth spine switch (R6-U1) when six racks are cabled together.

Table E-20 Leaf Switch Connections for the Sixth Rack in a Six-Rack System

Leaf Switch	Connection	Cable Length
R6 IB3 within Rack 6	R6-IB3-P8A to R6-U1-P3A R6-IB3-P8B to R6-U1-P4A	3 meters
R6 IB3 to Rack 1	R6-IB3-P9A to R1-U1-P5A R6-IB3-P9B to R1-U1-P6A	10 meters
R6 IB3 to Rack 2	R6-IB3-P10A to R2-U1-P7A	10 meters
R6 IB3 to Rack 3	R6-IB3-P10B to R3-U1-P8A	5 meters
R6 IB3 to Rack 4	R6-IB3-P11A to R4-U1-P9A	5 meters
R6 IB3 to Rack 5	R6-IB3-P11B to R5-U1-P10A	5 meters
R6 IB2 within Rack 6	R6-IB2-P8A to R6-U1-P3B R6-IB2-P8B to R6-U1-P4B	3 meters
R6 IB2 to Rack 2	R6-IB3-P10A to R2-U1-P7B	10 meters
R6 IB2 to Rack 1	R6-IB2-P9A to R1-U1-P5B R6-IB2-P9B to R1-U1-P6B	10 meters
R6 IB2 to Rack 3	R6-IB2-P10B to R3-U1-P8B	5 meters
R6 IB2 to Rack 4	R6-IB2-P11A to R4-U1-P9B	5 meters
R6 IB2 to Rack 5	R6-IB2-P11B to R5-U1-P10B	5 meters

Seven-Rack Cabling

Table E-21 shows the cable connections for the first spine switch (R1-U1) when seven racks are cabled together.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-21 Leaf Switch Connections for the First Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-IB3-P8A to R1-U1-P3A R1-IB3-P8B to R1-U1-P4A	3 meters
R1 IB3 to Rack 2	R1-IB3-P9A to R2-U1-P5A	5 meters

Table E-21 (Cont.) Leaf Switch Connections for the First Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 to Rack 3	R1-IB3-P9B to R3-U1-P6A	5 meters
R1 IB3 to Rack 4	R1-IB3-P10A to R4-U1-P7A	10 meters
R1 IB3 to Rack 5	R1-IB3-P10B to R5-U1-P8A	10 meters
R1 IB3 to Rack 6	R1-IB3-P11A to R6-U1-P9A	10 meters
R1 IB3 to Rack 7	R1-IB3-P11B to R7-U1-P10A	10 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B R1-IB2-P8B to R1-U1-P4B	3 meters
R1 IB2 to Rack 2	R1-IB2-P9A to R2-U1-P5B	5 meters
R1 IB2 to Rack 3	R1-IB2-P9B to R3-U1-P6B	5 meters
R1 IB2 to Rack 4	R1-IB2-P10A to R4-U1-P7B	10 meters
R1 IB2 to Rack 5	R1-IB2-P10B to R5-U1-P8B	10 meters
R1 IB2 to Rack 6	R1-IB2-P11A to R6-U1-P9B	10 meters
R1 IB2 to Rack 7	R1-IB2-P11B to R7-U1-P10B	10 meters

Table E-22 shows the cable connections for the second spine switch (R2-U1) when cabling seven racks.

Table E-22 Leaf Switch Connections for the Second Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-IB3-P8A to R2-U1-P3A R2-IB3-P8B to R2-U1-P4A	3 meters
R2 IB3 to Rack 1	R2-IB3-P11B to R1-U1-P10A	5 meters
R2 IB3 to Rack 3	R2-IB3-P9A to R3-U1-P5A	5 meters
R2 IB3 to Rack 4	R2-IB3-P9B to R4-U1-P6A	5 meters
R2 IB3 to Rack 5	R2-IB3-P10A to R5-U1-P7A	10 meters
R2 IB3 to Rack 6	R2-IB3-P10B to R6-U1-P8A	10 meters
R2 IB3 to Rack 7	R2-IB3-P11A to R7-U1-P9A	10 meters
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B R2-IB2-P8B to R2-U1-P4B	3 meters
R2 IB2 to Rack 1	R2-IB2-P11B to R1-U1-P10B	5 meters
R2 IB2 to Rack 3	R2-IB2-P9A to R3-U1-P5B	5 meters
R2 IB2 to Rack 4	R2-IB2-P9B to R4-U1-P6B	5 meters
R2 IB2 to Rack 5	R2-IB2-P10A to R5-U1-P7B	10 meters
R2 IB2 to Rack 6	R2-IB2-P10B to R6-U1-P8B	10 meters
R2 IB2 to Rack 7	R2-IB2-P11A to R7-U1-P9B	10 meters

Table E-23 shows the cable connections for the third spine switch (R3-U1) when seven racks are cabled together.

Table E-23 Leaf Switch Connections for the Third Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R3 IB3 within Rack 3	R3-IB3-P8A to R3-U1-P3A R3-IB3-P8B to R3-U1-P4A	3 meters
R3 IB3 to Rack 1	R3-IB3-P11A to R1-U1-P9A	5 meters
R3 IB3 to Rack 2	R3-IB3-P11B to R2-U1-P10A	5 meters
R3 IB3 to Rack 4	R3-IB3-P9A to R4-U1-P5A	5 meters
R3 IB3 to Rack 5	R3-IB3-P9B to R5-U1-P6A	5 meters
R3 IB3 to Rack 6	R3-IB3-P10A to R6-U1-P7A	10 meters
R3 IB3 to Rack 7	R3-IB3-P10B to R7-U1-P8A	10 meters
R3 IB2 within Rack 3	R3-IB2-P8A to R3-U1-P3B R3-IB2-P8B to R3-U1-P4B	3 meters
R3 IB2 to Rack 1	R3-IB2-P11A to R1-U1-P9B	5 meters
R3 IB2 to Rack 2	R3-IB2-P11B to R2-U1-P10B	5 meters
R3 IB2 to Rack 4	R3-IB2-P9A to R4-U1-P5B	5 meters
R3 IB2 to Rack 5	R3-IB2-P9B to R5-U1-P6B	5 meters
R3 IB2 to Rack 6	R3-IB2-P10A to R6-U1-P7B	10 meters
R3 IB2 to Rack 7	R3-IB2-P10B to R7-U1-P8B	10 meters

Table E-24 shows the cable connections for the fourth spine switch (R4-U1) when seven racks are cabled together.

Table E-24 Leaf Switch Connections for the Fourth Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R4 IB3 within Rack 4	R4-IB3-P8A to R4-U1-P3A R4-IB3-P8B to R4-U1-P4A	3 meters
R4 IB3 to Rack 1	R4-IB3-P10B to R1-U1-P8A	10 meters
R4 IB3 to Rack 2	R4-IB3-P11A to R2-U1-P9A	5 meters
R4 IB3 to Rack 3	R4-IB3-P11B to R3-U1-P10A	5 meters
R4 IB3 to Rack 5	R4-IB3-P9A to R5-U1-P5A	5 meters
R4 IB3 to Rack 6	R4-IB3-P9B to R6-U1-P6A	5 meters
R4 IB3 to Rack 7	R4-IB3-P10A to R7-U1-P7A	10 meters
R4 IB2 within Rack 4	R4-IB2-P8A to R4-U1-P3B R4-IB2-P8B to R4-U1-P4B	3 meters
R4 IB2 to Rack 1	R4-IB2-P10B to R1-U1-P8B	10 meters
R4 IB2 to Rack 2	R4-IB2-P11A to R2-U1-P9B	5 meters
R4 IB2 to Rack 3	R4-IB2-P11B to R3-U1-P10B	5 meters
R4 IB2 to Rack 5	R4-IB2-P9A to R5-U1-P5B	5 meters
R4 IB2 to Rack 6	R4-IB2-P9B to R6-U1-P6B	5 meters
R4 IB2 to Rack 7	R4-IB2-P10A to R7-U1-P7B	10 meters

Table E-25 shows the cable connections for the fifth spine switch (R5-U1) when seven racks are cabled together.

Table E-25 Leaf Switch Connections for the Fifth Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R5 IB3 within Rack 5	R5-IB3-P8A to R5-U1-P3A R5-IB3-P8B to R5-U1-P4A	3 meters
R5 IB3 to Rack 1	R5-IB3-P10A to R1-U1-P7A	10 meters
R5 IB3 to Rack 2	R5-IB3-P10B to R2-U1-P8A	10 meters
R5 IB3 to Rack 3	R5-IB3-P11A to R3-U1-P9A	5 meters
R5 IB3 to Rack 4	R5-IB3-P11B to R4-U1-P10A	5 meters
R5 IB3 to Rack 6	R5-IB3-P9A to R6-U1-P5A	5 meters
R5 IB3 to Rack 7	R5-IB3-P9B to R7-U1-P6A	5 meters
R5 IB2 within Rack 5	R5-IB2-P8A to R5-U1-P3B R5-IB2-P8B to R5-U1-P4B	3 meters
R5 IB2 to Rack 1	R5-IB2-P10A to R1-U1-P7B	10 meters
R5 IB2 to Rack 2	R5-IB3-P10B to R2-U1-P8B	10 meters
R5 IB2 to Rack 3	R5-IB2-P11A to R3-U1-P9B	5 meters
R5 IB2 to Rack 4	R5-IB2-P11B to R4-U1-P10B	5 meters
R5 IB2 to Rack 6	R5-IB2-P9A to R6-U1-P5B	5 meters
R5 IB2 to Rack 7	R5-IB2-P9B to R7-U1-P6B	5 meters

Table E-26 shows the cable connections for the sixth spine switch (R6-U1) when seven racks are cabled together.

Table E-26 Leaf Switch Connections for the Sixth Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R6 IB3 within Rack 6	R6-IB3-P8A to R6-U1-P3A R6-IB3-P8B to R6-U1-P4A	3 meters
R6 IB3 to Rack 1	R6-IB3-P9B to R1-U1-P6A	10 meters
R6 IB3 to Rack 2	R6-IB3-P10A to R2-U1-P7A	10 meters
R6 IB3 to Rack 3	R6-IB3-P10B to R3-U1-P8A	5 meters
R6 IB3 to Rack 4	R6-IB3-P11A to R4-U1-P9A	5 meters
R6 IB3 to Rack 5	R6-IB3-P11B to R5-U1-P10A	5 meters
R6 IB3 to Rack 7	R6-IB3-P9A to R7-U1-P5A	5 meters
R6 IB2 within Rack 6	R6-IB2-P8A to R6-U1-P3B R6-IB2-P8B to R6-U1-P4B	3 meters
R6 IB2 to Rack 1	R6-IB2-P9B to R1-U1-P6B	10 meters
R6 IB2 to Rack 2	R6-IB3-P10A to R2-U1-P7B	10 meters
R6 IB2 to Rack 3	R6-IB2-P10B to R3-U1-P8B	5 meters
R6 IB2 to Rack 4	R6-IB2-P11A to R4-U1-P9B	5 meters
R6 IB2 to Rack 5	R6-IB2-P11B to R5-U1-P10B	5 meters

Table E-26 (Cont.) Leaf Switch Connections for the Sixth Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R6 IB2 to Rack 7	R6-IB3-P9A to R7-U1-P5B	5 meters

[Table E-27](#) shows the cable connections for the seventh spine switch (R7-U1) when seven racks are cabled together.

Table E-27 Leaf Switch Connections for the Seventh Rack in a Seven-Rack System

Leaf Switch	Connection	Cable Length
R7 IB3 within Rack 7	R7-IB3-P8A to R7-U1-P3A R7-IB3-P8B to R7-U1-P4A	3 meters
R7 IB3 to Rack 1	R7-IB3-P9A to R1-U1-P5A	10 meters
R7 IB3 to Rack 2	R7-IB3-P9B to R2-U1-P6A	10 meters
R7 IB3 to Rack 3	R7-IB3-P10A to R3-U1-P7A	10 meters
R7 IB3 to Rack 4	R7-IB3-P10B to R4-U1-P8A	10 meters
R7 IB3 to Rack 5	R7-IB3-P11A to R5-U1-P9A	5 meters
R7 IB3 to Rack 6	R7-IB3-P11B to R6-U1-P10A	5 meters
R7 IB2 within Rack 7	R7-IB2-P8A to R7-U1-P3B R7-IB2-P8B to R7-U1-P4B	3 meters
R7 IB2 to Rack 1	R7-IB2-P9A to R1-U1-P5B	10 meters
R7 IB2 to Rack 2	R7-IB2-P9B to R2-U1-P6B	10 meters
R7 IB2 to Rack 3	R7-IB2-P10A to R3-U1-P7B	10 meters
R7 IB2 to Rack 4	R7-IB2-P10B to R4-U1-P8B	10 meters
R7 IB2 to Rack 5	R7-IB2-P11A to R5-U1-P9B	5 meters
R7 IB2 to Rack 6	R7-IB2-P11B to R6-U1-P10B	5 meters

Eight-Rack Cabling

[Table E-28](#) shows the cable connections for the first spine switch (R1-U1) when cabling eight racks.

Note:

- The spine switch is in U1 (IB1) for all racks.
- The leaf switches are in U20 (IB2) and U24 (IB3).
- In this section, the leaf switches are called IB2 and IB3.

Table E-28 Leaf Switch Connections for the First Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 within Rack 1	R1-IB3-P8A to R1-U1-P3A	3 meters
R1 IB3 to Rack 2	R1-IB3-P8B to R2-U1-P4A	5 meters
R1 IB3 to Rack 3	R1-IB3-P9A to R3-U1-P5A	5 meters
R1 IB3 to Rack 4	R1-IB3-P9B to R4-U1-P6A	10 meters

Table E-28 (Cont.) Leaf Switch Connections for the First Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R1 IB3 to Rack 5	R1-IB3-P10A to R5-U1-P7A	10 meters
R1 IB3 to Rack 6	R1-IB3-P10B to R6-U1-P8A	10 meters
R1 IB3 to Rack 7	R1-IB3-P11A to R7-U1-P9A	10 meters
R1 IB3 to Rack 8	R1-IB3-P11B to R8-U1-P10A	10 meters
R1 IB2 within Rack 1	R1-IB2-P8A to R1-U1-P3B	3 meters
R1 IB2 to Rack 2	R1-IB2-P8B to R2-U1-P4B	5 meters
R1 IB2 to Rack 3	R1-IB2-P9A to R3-U1-P5B	5 meters
R1 IB2 to Rack 4	R1-IB2-P9B to R4-U1-P6B	10 meters
R1 IB2 to Rack 5	R1-IB2-P10A to R5-U1-P7B	10 meters
R1 IB2 to Rack 6	R1-IB2-P10B to R6-U1-P8B	10 meters
R1 IB2 to Rack 7	R1-IB2-P11A to R7-U1-P8B	10 meters
R1 IB2 to Rack 8	R1-IB2-P11B to R8-U1-P10B	10 meters

Table E-29 shows the cable connections for the second spine switch (R2-U1) when eight racks are cabled together.

Table E-29 Leaf Switch Connections for the Second Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R2 IB3 within Rack 2	R2-IB3-P8A to R2-U1-P3A	3 meters
R2 IB3 to Rack 1	R2-IB3-P11B to R1-U1-P10A	5 meters
R2 IB3 to Rack 3	R2-IB3-P8B to R3-U1-P4A	5 meters
R2 IB3 to Rack 4	R2-IB3-P9A to R4-U1-P5A	5 meters
R2 IB3 to Rack 5	R2-IB3-P9B to R5-U1-P6A	10 meters
R2 IB3 to Rack 6	R2-IB3-P10A to R6-U1-P7A	10 meters
R2 IB3 to Rack 7	R2-IB3-P10B to R7-U1-P8A	10 meters
R2 IB3 to Rack 8	R2-IB3-P11A to R8-U1-P9A	10 meters
R2 IB2 within Rack 2	R2-IB2-P8A to R2-U1-P3B	3 meters
R2 IB2 to Rack 1	R2-IB2-P11B to R1-U1-P10B	5 meters
R2 IB2 to Rack 3	R2-IB2-P8B to R3-U1-P4B	5 meters
R2 IB2 to Rack 4	R2-IB2-P9A to R4-U1-P5B	5 meters
R2 IB2 to Rack 5	R2-IB2-P9B to R5-U1-P6B	10 meters
R2 IB2 to Rack 6	R2-IB2-P10A to R6-U1-P7B	10 meters
R2 IB2 to Rack 7	R2-IB2-P10B to R7-U1-P8B	10 meters
R2 IB2 to Rack 8	R2-IB2-P11A to R8-U1-P9B	10 meters

Table E-30 shows the cable connections for the third spine switch (R3-U1) when eight racks are cabled together.

Table E-30 Leaf Switch Connections for the Third Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R3 IB3 within Rack 3	R3-IB3-P8A to R3-U1-P3A	3 meters
R3 IB3 to Rack 1	R3-IB3-P11A to R1-U1-P9A	5 meters
R3 IB3 to Rack 2	R3-IB3-P11B to R2-U1-P10A	5 meters
R3 IB3 to Rack 4	R3-IB3-P8B to R4-U1-P4A	5 meters
R3 IB3 to Rack 5	R3-IB3-P9A to R5-U1-P5A	5 meters
R3 IB3 to Rack 6	R3-IB3-P9B to R6-U1-P6A	5 meters
R3 IB3 to Rack 7	R3-IB3-P10A to R7-U1-P7A	10 meters
R3 IB3 to Rack 8	R3-IB3-P10B to R8-U1-P8A	10 meters
R3 IB2 within Rack 3	R3-IB2-P8A to R3-U1-P3B	3 meters
R3 IB2 to Rack 1	R3-IB2-P11A to R1-U1-P9B	5 meters
R3 IB2 to Rack 2	R3-IB2-P11B to R2-U1-P10B	5 meters
R3 IB2 to Rack 4	R3-IB2-P8B to R4-U1-P4B	5 meters
R3 IB2 to Rack 5	R3-IB2-P9A to R5-U1-P5B	5 meters
R3 IB2 to Rack 6	R3-IB2-P9B to R6-U1-P6B	5 meters
R3 IB2 to Rack 7	R3-IB2-P10A to R7-U1-P7B	10 meters
R3 IB2 to Rack 8	R3-IB2-P10B to R8-U1-P8B	10 meters

Table E-31 shows the cable connections for the fourth spine switch (R4-U1) when eight racks are cabled together.

Table E-31 Leaf Switch Connections for the Fourth Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R4 IB3 within Rack 4	R4-IB3-P8A to R4-U1-P3A	3 meters
R4 IB3 to Rack 1	R4-IB3-P10B to R1-U1-P8A	10 meters
R4 IB3 to Rack 2	R4-IB3-P11A to R2-U1-P9A	5 meters
R4 IB3 to Rack 3	R4-IB3-P11B to R3-U1-P10A	5 meters
R4 IB3 to Rack 5	R4-IB3-P8B to R5-U1-P4A	5 meters
R4 IB3 to Rack 6	R4-IB3-P9A to R6-U1-P5A	5 meters
R4 IB3 to Rack 7	R4-IB3-P9B to R7-U1-P6A	10 meters
R4 IB3 to Rack 8	R4-IB3-P10A to R8-U1-P7A	10 meters
R4 IB2 within Rack 4	R4-IB2-P8A to R4-U1-P3B	3 meters
R4 IB2 to Rack 1	R4-IB2-P10B to R1-U1-P8B	10 meters
R4 IB2 to Rack 2	R4-IB2-P11A to R2-U1-P9B	5 meters
R4 IB2 to Rack 3	R4-IB2-P11B to R3-U1-P10B	5 meters
R4 IB2 to Rack 5	R4-IB2-P8B to R5-U1-P4B	5 meters
R4 IB2 to Rack 6	R4-IB2-P9A to R6-U1-P5B	5 meters
R4 IB2 to Rack 7	R4-IB2-P9B to R7-U1-P6B	10 meters
R4 IB2 to Rack 8	R4-IB2-P10A to R8-U1-P7B	10 meters

[Table E-32](#) shows the cable connections for the fifth spine switch (R5-U1) when eight racks are cabled together.

Table E-32 Leaf Switch Connections for the Fifth Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R5 IB3 within Rack 5	R5-IB3-P8A to R5-U1-P3A	3 meters
R5 IB3 to Rack 1	R5-IB3-P10A to R1-U1-P7A	10 meters
R5 IB3 to Rack 2	R5-IB3-P10B to R2-U1-P8A	10 meters
R5 IB3 to Rack 3	R5-IB3-P11A to R3-U1-P9A	5 meters
R5 IB3 to Rack 4	R5-IB3-P11B to R4-U1-P10A	5 meters
R5 IB3 to Rack 6	R5-IB3-P8B to R6-U1-P4A	5 meters
R5 IB3 to Rack 7	R5-IB3-P9A to R7-U1-P5A	5 meters
R5 IB3 to Rack 8	R5-IB3-P9B to R8-U1-P6A	10 meters
R5 IB2 within Rack 5	R5-IB2-P8A to R5-U1-P3B	3 meters
R5 IB2 to Rack 1	R5-IB2-P10A to R1-U1-P7B	10 meters
R5 IB2 to Rack 2	R5-IB3-P10B to R2-U1-P8B	10 meters
R5 IB2 to Rack 3	R5-IB2-P11A to R3-U1-P9B	5 meters
R5 IB2 to Rack 4	R5-IB2-P11B to R4-U1-P10B	5 meters
R5 IB2 to Rack 6	R5-IB2-P8B to R6-U1-P4B	5 meters
R5 IB2 to Rack 7	R5-IB2-P9A to R7-U1-P5B	5 meters
R5 IB2 to Rack 8	R5-IB2-P9B to R8-U1-P6B	10 meters

[Table E-33](#) shows the cable connections for the sixth spine switch (R6-U1) when eight racks are cabled together.

Table E-33 Leaf Switch Connections for the Sixth Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R6 IB3 within Rack 6	R6-IB3-P8A to R6-U1-P3A	3 meters
R6 IB3 to Rack 1	R6-IB3-P9B to R1-U1-P6A	10 meters
R6 IB3 to Rack 2	R6-IB3-P10A to R2-U1-P7A	10 meters
R6 IB3 to Rack 3	R6-IB3-P10B to R3-U1-P8A	5 meters
R6 IB3 to Rack 4	R6-IB3-P11A to R4-U1-P9A	5 meters
R6 IB3 to Rack 5	R6-IB3-P11B to R5-U1-P10A	5 meters
R6 IB3 to Rack 7	R6-IB3-P8B to R7-U1-P4A	5 meters
R6 IB3 to Rack 8	R6-IB3-P9A to R8-U1-P5A	5 meters
R6 IB2 within Rack 6	R6-IB2-P8A to R6-U1-P3B	3 meters
R6 IB2 to Rack 1	R6-IB2-P9B to R1-U1-P6B	10 meters
R6 IB2 to Rack 2	R6-IB3-P10A to R2-U1-P7B	10 meters
R6 IB2 to Rack 3	R6-IB2-P10B to R3-U1-P8B	5 meters
R6 IB2 to Rack 4	R6-IB2-P11A to R4-U1-P9B	5 meters
R6 IB2 to Rack 5	R6-IB2-P11B to R5-U1-P10B	5 meters

Table E-33 (Cont.) Leaf Switch Connections for the Sixth Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R6 IB2 to Rack 7	R6-IB3-P8B to R7-U1-P4B	5 meters
R6 IB2 to Rack 8	R6-IB2-P9A to R8-U1-P5B	5 meters

Table E-34 shows the cable connections for the seventh spine switch (R7-U1) when eight racks are cabled together.

Table E-34 Leaf Switch Connections for the Seventh Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R7 IB3 within Rack 7	R7-IB3-P8A to R7-U1-P3A	3 meters
R7 IB3 to Rack 1	R7-IB3-P9A to R1-U1-P5A	10 meters
R7 IB3 to Rack 2	R7-IB3-P9B to R2-U1-P6A	10 meters
R7 IB3 to Rack 3	R7-IB3-P10A to R3-U1-P7A	10 meters
R7 IB3 to Rack 4	R7-IB3-P10B to R4-U1-P8A	10 meters
R7 IB3 to Rack 5	R7-IB3-P11A to R5-U1-P9A	5 meters
R7 IB3 to Rack 6	R7-IB3-P11B to R6-U1-P10A	5 meters
R7 IB3 to Rack 8	R7-IB3-P8B to R8-U1-P4A	5 meters
R7 IB2 within Rack 7	R7-IB2-P8A to R7-U1-P3B	3 meters
R7 IB2 to Rack 1	R7-IB2-P9A to R1-U1-P5B	10 meters
R7 IB2 to Rack 2	R7-IB2-P9B to R2-U1-P6B	10 meters
R7 IB2 to Rack 3	R7-IB2-P10A to R3-U1-P7B	10 meters
R7 IB2 to Rack 4	R7-IB2-P10B to R4-U1-P8B	10 meters
R7 IB2 to Rack 5	R7-IB2-P11A to R5-U1-P9B	5 meters
R7 IB2 to Rack 6	R7-IB2-P11B to R6-U1-P10B	5 meters
R7 IB2 to Rack 8	R7-IB3-P8B to R8-U1-P4B	5 meters

Table E-35 shows the cable connections for the eighth spine switch (R8-U1) when eight racks are cabled together.

Table E-35 Leaf Switch Connections for the Eighth Rack in an Eight-Rack System

Leaf Switch	Connection	Cable Length
R8 IB3 within Rack 8	R8-IB3-P8A to R8-U1-P3A	3 meters
R8 IB3 to Rack 1	R8-IB3-P8B to R1-U1-P4A	10 meters
R8 IB3 to Rack 2	R8-IB3-P9A to R2-U1-P5A	10 meters
R8 IB3 to Rack 3	R8-IB3-P9B to R3-U1-P6A	10 meters
R8 IB3 to Rack 4	R8-IB3-P10A to R4-U1-P7A	10 meters
R8 IB3 to Rack 5	R8-IB3-P10B to R5-U1-P8A	5 meters
R8 IB3 to Rack 6	R8-IB3-P11A to R6-U1-P9A	5 meters
R8 IB3 to Rack 7	R8-IB3-P11B to R7-U1-P10A	5 meters
R8 IB2 within Rack 8	R8-IB2-P8A to R8-U1-P3B	3 meters

Table E-35 (Cont.) Leaf Switch Connections for the Eighth Rack in an Eight-Rack

Leaf Switch	Connection	Cable Length
R8 IB2 to Rack 1	R8-IB2-P8B to R1-U1-P4B	10 meters
R8 IB2 to Rack 2	R8-IB3-P9A to R2-U1-P5B	10 meters
R8 IB2 to Rack 3	R8-IB2-P9B to R3-U1-P6B	10 meters
R8 IB2 to Rack 4	R8-IB2-P10A to R4-U1-P7B	10 meters
R8 IB2 to Rack 5	R8-IB2-P10B to R5-U1-P8B	5 meters
R8 IB2 to Rack 6	R8-IB3-P11A to R6-U1-P9B	5 meters
R8 IB2 to Rack 7	R8-IB3-P1B to R7-U1-P10B	5 meters

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