Oracle® Public Cloud Machine

Oracle Database Exadata Cloud Machine Deployment Guide

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Oracle Public Cloud Machine Oracle Database Exadata Cloud Machine Deployment Guide, Release 17.1

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Contents

Preface

This guide describes the site and network requirements to deploy Oracle Database Exadata Cloud Machine in a customer data center.

This guide focuses specifically on Exadata Cloud Machine and does not include information on other components such as the Oracle Advanced Support Gateway, or the Oracle Cloud Machine that provides the Exadata Cloud Control Plane. For these components see:

- Oracle Advanced Support Gateway Documentation
- Oracle Cloud Machine Customer Deployment Guide

Audience

This document is intended for data center and infrastructure engineers who are preparing to deploy Oracle Database Exadata Cloud Machine.

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.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

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Site Requirements

Learn about the site requirements for Exadata Cloud Machine.

Topics

Space

Learn about the space and maintenance access requirements for Exadata Cloud Machine.

All Exadata Cloud Machine models use the same rack, and have the same space and maintenance access requirements.

The space and maintenance requirements for each rack are as follows:

Description	Millimeters (mm)	Inches (")
Height	1998 mm	78.66″
Width (with side panels)	600 mm	23.62″
Depth from front door handle to rear door handle	1200 mm	47.24″
Depth with doors removed	1112 mm	43.78″
Required clearance to remove each side panel	38 mm	1.50″
Top and rear maintenance access requirement	914 mm	36.00″
Front maintenance access requirement	1232 mm	48.50″

Description	Millimeters (mm)	Inches (”)
Minimum ceiling height (without maintenance access)	2300 mm	90.00″
Minimum ceiling height (with maintenance access)	2912 mm (1998 mm + 914 mm)	114.66″ (78.66″ + 36″)

Note: The space surrounding the cabinet 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 rear and top of the cabinet.

Weight

Learn about the weight of each Exadata Cloud Machine rack.

The following table lists the weight of each Exadata Cloud Machine rack:

Model	Kilograms (kg)	Pounds (lbs)
Eighth Rack	368 kg	811 lbs
Quarter Rack	382 kg	841 lbs
Half Rack	519 kg	1143 lbs
Full Rack	800 kg	1763 lbs

Note:

The shipping pallet and packaging materials add 16 kg (35 lbs) to each rack.

Receiving

Review the shipping details and access route requirements for Exadata Cloud Machine.

Shipping Specifications

Before your Exadata Cloud Machine arrives, make sure that the receiving area is large enough for each package.

The following are the package dimensions for each Exadata Cloud Machine rack:

Description	Millimeters (mm)	Inches (”)
Shipping height	2159 mm	85 inches
Shipping width	1219 mm	48 inches
Shipping depth	1575 mm	62 inches

If your loading dock meets the height and ramp requirements for a standard freight carrier truck, then a pallet jack will be used to unload the rack. If the loading dock

does not meet the requirements, then 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.

Access Route Requirements

Note: Racks should only be unpacked and moved by Oracle Field Services and the delivery team.

Consider the following to allow the delivery team to unpack and move the Exadata Cloud Machine system effectively:

- Use a conditioned space to remove the packaging material to reduce particles before entering the data center.
- Make sure that the entire access route to the installation site is free of raised-pattern flooring that can cause vibration.
- Allow enough space for unpacking it from its shipping cartons.
- Make sure that there is enough clearance and clear pathways for moving the Exadata Cloud Machine and Exadata Cloud Control Plane racks from the unpacking location to the installation location.

The following table lists the access route requirements for Exadata Cloud Machine:

Access Route Item	With Shipping Pallet	Without Shipping Pallet
Minimum door height	2184 mm (86 inches)	2040 mm (80.32 inches)
Minimum door width	1220 mm (48 inches)	600 mm (23.62 inches)
Minimum elevator depth	1575 mm (62 inches)	1200 mm (47.24 inches)
Maximum incline	6 degrees	6 degrees

Flooring

Learn about the flooring requirements for Exadata Cloud Machine.

Oracle recommends that the Exadata Cloud Machine system be installed on raised flooring. The site floor and the raised flooring must be able to support the total weight of Exadata Cloud Machine.

Note:

Open tiles are typically required for electrical access.

Electrical Power

Learn about the electrical power specifications and requirements for Exadata Cloud Machine.

Exadata Cloud Machine 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 an Exadata Cloud Machine:

- 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 the system, dedicated power distribution system and power-conditioning equipment should be used. Lightning arresters or power cables should be used to protect from electrical storms.

Each rack has two pre-installed Power Distribution Units (PDUs). The PDUs accept different power sources. You must select the type of PDU that meets the requirements for your data center.

Available PDUs

The following list outlines the available PDUs for Exadata Cloud Machine depending on your region:

- **Americas, Japan, and Taiwan**
  - Low-Voltage 15kVA Single-Phase
  - Low-Voltage 15kVA Three-Phase
  - Low-Voltage 22kVA Single-Phase
  - Low-Voltage 24kVA Three-Phase
- **Europe, the Middle East and Africa (EMEA), and Asia Pacific (APAC), except for Japan and Taiwan**
  - High-Voltage 15kVA Three-Phase
  - High-Voltage 22kVA Single-Phase
  - High-Voltage 24kVA Three-Phase

Low-voltage PDU electrical specifications

The following table lists the low-voltage PDU specifications. The listed specifications are for each PDU. Each rack contains two PDUs.

Specification	15 kVA, 1 phase	15 kVA, 3 phase	22 kVA, 1 phase	24 kVA, 3 phase
Voltage	200 - 240 VAC	200 - 208 VAC 3ph	200 - 240 VAC	200 - 208 VAC 3ph
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Current	24A maximum per input	40A maximum per phase	36.8 A maximum per input	34.6 A maximum per phase
Power Rating	15 kVA	14.4 kVA	22 kVA	25 kVA

Specification	15 kVA, 1 phase	15 kVA, 3 phase	22 kVA, 1 phase	24 kVA, 3 phase
Output Current	72A (3 x 24A)	69A (3 x 23A)	110.4 A (3 x 36.8 A)	120A (6 x 20A)
Outlets	42 x C13; 6 x C19	42 x C13; 6 x C19	42 x C13; 6 x C19	42 x C13; 6 x C19
Number of Inputs	3 x 30A, 1 phase	1 x 60A, 3 phase	3 x 50 A, 1 phase	2 x 60A, 3 phase
Data Center Receptacle	NEMA L6-30	IEC309 60A 4 PIN 250VAC 3ph IP67	Hubbell CS8264C	IEC309 60A 4 PIN 250VAC 3ph IP67

High-voltage PDU electrical specifications

The following table lists the high-voltage PDU specifications. The listed specifications are for each PDU. Each rack contains two PDUs.

Specification	15 kVA, 3 phase	22 kVA, 1 phase	24 kVA, 3 phase
Voltage	220/380 - 240/415 VAC 3ph	220 - 240 VAC	220/380 - 240/415 VAC 3ph
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Current	25A maximum per phase	32A maximum per input	18A maximum per phase
Power Rating	14.4 kVA	22 kVA	25 kVA
Output Current	62.7A (3 x 20.9A)	96A (3 x 32A)	109A (6 x 18.1A)
Outlets	42 x C13; 6 x C19	42 x C13; 6 x C19	42 x C13; 6 x C19
Number of Inputs	1 x 25A, 3 phase	3 x 32A, 1 phase	2 x 25A, 3 phase
Data Center Receptacle	IEC309 32A 5 PIN 230/400V 3ph IP44	IEC309 32A 3 PIN 250 VAC IP44	IEC309 32A 5 PIN 230/400V 3ph IP44

Facility Power

Review the facility electrical power requirements for Exadata Cloud Machine.

Review the following requirements:

- Electrical work and installations must comply with applicable local, state, or national electrical codes.
- Contact your facilities manager or 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 Power Distribution Units (PDUs). Dedicated AC breaker panels are required for all power circuits that supply power to the PDUs.
- 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 m (13.12 feet) long, and 1 to 1.5 m (3.3 to 4.9 feet) of the cord will be routed within the rack cabinet. The installation site AC power receptacle must be within 2 m (6.6 feet) of the rack.
- 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.
- The Exadata Cloud Machine cabinet is shipped with grounding-type power cords (three-wire). 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 IEC documents, for the correct grounding method.
- Make sure that the facility administrator or qualified electrical engineer verifies the grounding method for the building, and performs the grounding work.

Temperature and Humidity

Review the temperature and humidity requirements for Exadata Cloud Machine systems.

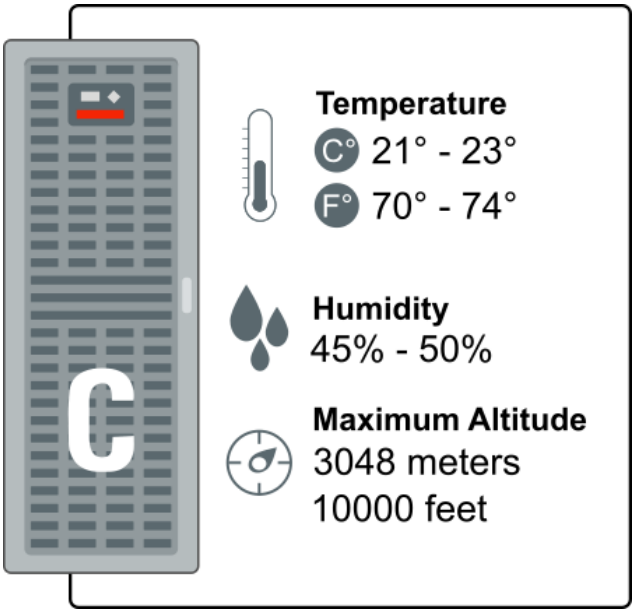
Set conditions to the optimal temperature and humidity ranges to minimize the chance of downtime. Operating the system for extended periods near the operating or non-operating range limits could significantly increase hardware component failure.

The ambient temperature range of 21 to 23 degrees Celsius (70 to 74 degrees Fahrenheit) is optimal for server reliability and operator comfort. Operating in this temperature range provides a safety buffer in the event that the air conditioning system goes down for a period of time.

Most computer equipment can operate in a range of 20 to 80 percent of relative humidity, 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 in the event of air conditioner control failure.
- Helps avoid failures or temporary malfunctions caused by intermittent interference from electrostatic discharges that may occur when relative humidity is too low (below 35 percent).

The following diagram summarizes the optimal operating conditions for Exadata Cloud Machine.



The following table lists the temperature, humidity and altitude requirements for Exadata Cloud Machine.

Condition	Operating Requirement	Non-operating Requirement	Optimal Requirement
Temperature	5 to 32 degrees Celsius (59 to 89.6 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, non-condensing	Up to 93 percent relative humidity.	For optimal data center rack cooling, 45 to 50 percent, non-condensing.
Altitude	3048 meters (10000 feet) maximum	12000 meters (40000 feet).	Ambient temperature is reduced by 1 degree Celsius per 300 m above 900 m altitude above sea level.

Note:

Studies have shown 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 an Exadata Cloud Machine system.

Ventilation and Cooling

Learn about the ventilation and cooling requirements for Exadata Cloud Machine.

Always provide adequate space in front of 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 warm air out the rear of the rack. There is no air flow requirement for the left and right sides due to front-to-back cooling.

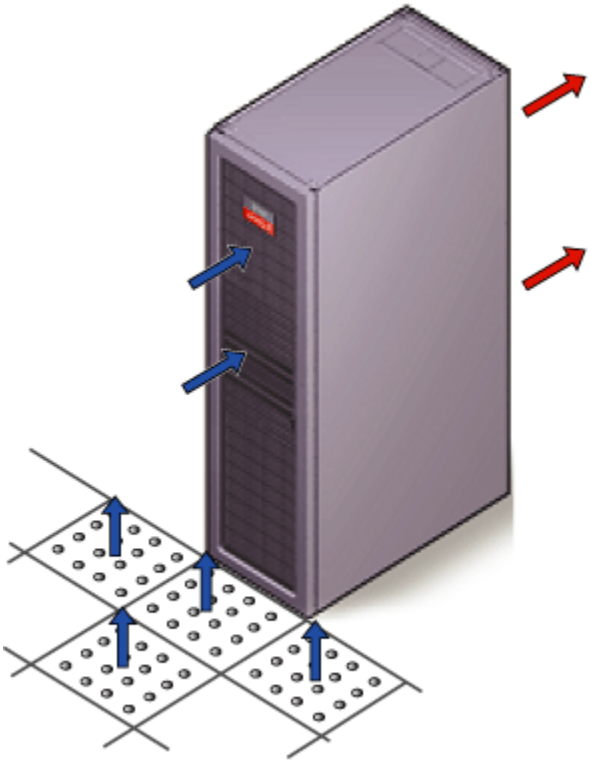
Exadata Cloud Machine systems have been designed to function while mounted in a natural convection air flow. The following requirements must be followed to meet the environmental specification:

- Ensure there is adequate air flow through the server.
- Ensure the server has front-to-back cooling. The air inlet is at the front of the server, and the air is let out the rear.
- Allow a minimum clearance of 914 mm (36 inches) at the front of the server, and 914 mm (36 inches) at the rear of the server for ventilation.

Use perforated tiles, approximately 400 CFM/tile, in front of the rack for cold air intake. The tiles can be arranged in any order in front of the rack, as long as 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. The following is the recommended number of floor tiles:

- Four floor tiles for an Exadata Cloud Machine Full Rack.
- Three floor tiles for an Exadata Cloud Machine Half Rack.
- One floor tile for an Exadata Cloud Machine Quarter Rack or Eighth Rack.

The following diagram shows a typical configuration of perforated floor tiles for an Exadata Cloud Machine Full Rack in a typical data center.



The following table lists the cooling requirement for each Exadata Cloud Machine rack:

Model	BTU/hr	KJ/hr
Eighth Rack	Typical: 7,845 BTU/hr Maximum: 11,207 BTU/hr	Typical: 8,276 KJ/hr Maximum: 11,823 KJ/hr
Quarter Rack	Typical: 9,575 BTU/hr Maximum: 13,679 BTU/hr	Typical: 10,102 KJ/hr Maximum: 14,432 KJ/hr
Half Rack	Typical: 16,996 BTU/hr Maximum: 24,236 BTU/hr	Typical: 17,899 KJ/hr Maximum: 25,569 KJ/hr
Full Rack	Typical: 31,746 BTU/hr Maximum: 45,351 BTU/hr	Typical: 33,492 KJ/hr Maximum: 47,845 KJ/hr

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Network Requirements

This chapter describes the network requirements for Oracle Database Exadata Cloud Machine.

Topics

Required Networks and Services

Learn about the network requirements for Exadata Cloud Machine.

Network Requirements

Exadata Cloud Machine utilizes various different networks to provide secure and reliable network connectivity for different application and management functions. The following list outlines the minimum network requirements to install an Exadata Cloud Machine system:

> **Note:** Each network described below requires its own separate VLAN and subnet.

- **Oracle cloud management network**

  This network connects Exadata Cloud Machine to the Exadata Cloud Control Plane, and is used for administrative work for all Oracle-managed infrastructure components of Exadata Cloud Machine. It connects the servers and network switches to the Ethernet switch in the rack.

  Each database server and Exadata Storage Server has two network interfaces for management. One provides management access to the server through one of the embedded 1/10 GbE Ethernet ports (NET0). The other provides access to the Integrated Lights-Out Management (ILOM) subsystem through a dedicated ILOM Ethernet port. Exadata Cloud Machine is delivered with the ILOM and NET0 ports connected to the Ethernet switch in the rack. The NET0 port on the database servers should not be used for client or application network traffic. Cabling or configuration changes to these interfaces is not permitted.

  There is one uplink required from the Ethernet switch in the Exadata Cloud Machine rack to the Exadata Cloud Control Plane, and one uplink for each power distribution unit (PDU). The following options are available for these connections:

  - Direct connection between the Ethernet switch in the Exadata Cloud Machine rack and the switch in the Exadata Cloud Control Plane.
  - Connection through a customer switch using a single subnet.
  - Connection through a customer switch using routing with different subnets for Exadata Cloud Machine and Exadata Cloud Control Plane.

- **Client access network**

  This network connects the Exadata Cloud Machine database servers to your existing client network and is used for client access to the database servers. Applications access the database through this network using Single Client Access Name (SCAN) and Oracle RAC Virtual IP (VIP) addresses.

  The database servers support channel bonding to provide higher bandwidth or availability for client connections to Exadata Cloud Machine. Oracle recommends channel bonding for the client access network. By default, the client access network uses the interfaces on the dual-port 10 GbE PCIe 2.0 network card (PCI1/PORTA and PCI1/PORTB). Oracle recommends connecting the network interfaces to separate network switches to ensure no single point of failure exists in the physical network.

- **Backup network**

  This network is similar to the client access network, as it connects the Exadata Cloud Machine database servers to your existing network. It can be used for access to the database servers for various purposes, including backups and bulk data transfers.

  Channel bonding is supported for the backup network to provide higher bandwidth or availability, and Oracle recommends channel bonding for the backup network. By default, the backup network uses two of the embedded 1/10 GbE Ethernet ports (NET2 and NET3). Oracle recommends connecting the network interfaces to separate network switches to ensure no single point of failure exists in the physical network.

- **Customer administration network**

  This network connects the Exadata Cloud Machine database servers to your existing network. It provides management access to the virtual machine that supports your user domain (DomU) on each database server through one of the embedded 1/10 GbE Ethernet ports (NET1).

  This network is provided for administration purposes and should not be used for client or application network traffic.

- **InfiniBand private network**

  This network connects the database servers and Exadata Storage Servers using the InfiniBand switches on the rack. Each server contains two InfiniBand network interfaces (IB0 and IB1) that are connected to InfiniBand switches on the rack. Oracle Database uses this network for Oracle RAC cluster interconnect traffic and for accessing data on Exadata Storage Servers. This non-routable network is fully contained in Exadata Cloud Machine, and does not connect to your existing network.

Data Center Network Services

Exadata Cloud Machine requires the following data center network services:

- **DNS server**

  As part of the deployment process, you will work in combination with Oracle to determine the host names and IP addresses to be used when deploying Exadata Cloud Machine.

  The host names and IP addresses for the Oracle cloud management network, client access network, backup network, and customer administration network should be registered in Domain Name System (DNS) prior to deployment. In addition, all single client access name (SCAN) addresses, and VIP addresses should be registered in DNS prior to deployment.

  The SCAN is defined as a single name with three IP addresses on the client access network. The three SCAN addresses provide service access for clients to Exadata Cloud Machine. Configure DNS for round robin resolution for the SCAN name to the three SCAN addresses.

  All addresses registered in DNS must be configured for both forward resolution and reverse resolution. Reverse resolution must be forward confirmed (forward-confirmed reverse DNS) such that both the forward and reverse DNS entries match each other.

- **NTP server**

  At least one reliable NTP server is required and should be accessible on the Oracle cloud management network and the customer administration network. At deployment time, all servers and switches in Exadata Cloud Machine are configured to reference the same NTP servers so that the servers are synchronized to the same time. The NTP sever configuration can also be changed after initial deployment if required.

IP Address Requirements

Learn about the IP address requirements for Exadata Cloud Machine.

Exadata Cloud Machine requires a number of host names and IP addresses during initial configuration. The precise number of IP addresses required for a particular network, such as the Oracle cloud management network, depends on the size of the system. The network configuration, such as host names and IP addresses, used during installation is generated from information you supply to Oracle.

Configure the new IP addresses in your existing networks only after you have completed the configuration information with an Oracle representative. In addition, all IP addresses must be statically assigned IP addresses, not dynamically assigned (DHCP) addresses.

The following table outlines the IP address requirements:

Network Type	IP Address Requirements	Eighth Rack or Quarter Rack	Half Rack	Full Rack
Oracle cloud management network	1 IP address for each database and storage server NET0 interface. 1 IP address for each database and storage server ILOM interface. 3 IP addresses for the InfiniBand and Ethernet network switches (1 per switch). 2 IP addresses for the Power Distribution Units (PDUs) (1 per PDU).	15	25	45
Client access network	1 IP address for client access on each database server. 1 IP address for the Oracle clusterware virtual IP (VIP) on each database server. 3 IP addresses for Single Client Network Access (SCAN) VIPs.	7	11	19
Backup network	1 IP address for each database server.	2	4	8
Customer administration network	1 IP address for each database server.	2	4	8
InfiniBand private network	2 IP addresses for each database server or Exadata Storage Server.	10	20	40

Network Drops

Learn about network drop (uplink) requirements for Exadata Cloud Machine.

The following table outlines the network drop requirements for Exadata Cloud Machine.

Network Type	Drop Requirements	Eighth Rack or Quarter Rack	Half Rack	Full Rack
Oracle cloud management network	1/10 GbE. 1 drop for the Oracle cloud management network Ethernet switch. 1 drop for each PDU.	3	3	3
Client access network	10 GbE. 2 drops for each database server. Oracle recommends connecting the client access network drops to separate network switches to ensure no single point of failure exists in the physical network.	4	8	16
Backup network	1/10 GbE. 2 drops for each database server. Oracle recommends connecting the backup network drops to separate network switches to ensure no single point of failure exists in the physical network.	4	8	16
Customer administration network	1/10 GbE. 1 drop for each database server.	2	4	8

Network Cabling

Learn about network cabling requirements for Exadata Cloud Machine.

You must provide the network cabling to connect Exadata Cloud Machine to your network.

The network interfaces that support the client access network require copper or optical cabling and matching transceivers, which connect the 10 GbE PCIe 2.0 network interfaces in each Exadata Cloud Machine database server to ports on your 10 GbE network switches.

All other network interfaces use copper Ethernet cabling.