

# **Oracle® Private Cloud at Customer**

## **Deployment Guide for Release 1.0**

**ORACLE®**

F14152-01  
January 2019

---

## Oracle Legal Notices

Copyright © 2019, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, then the following notice is applicable:

**U.S. GOVERNMENT END USERS:** Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure its safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information about content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services unless otherwise set forth in an applicable agreement between you and Oracle. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services, except as set forth in an applicable agreement between you and Oracle.

---

---

# Table of Contents

Preface .....	v
1 Introduction to Oracle Private Cloud at Customer Deployment .....	1
1.1 System Deployment Procedures .....	1
1.2 Operational Procedures for Oracle Private Cloud at Customer .....	2
1.2.1 Emergency Power-off Considerations .....	2
1.2.2 Cautions and Warnings .....	2
2 Installation Preparations .....	3
2.1 Safety Documents and Notices .....	3
2.2 Review Safety Guidelines .....	3
2.3 Prepare the Installation Site .....	4
2.4 Unpacking Information .....	4
3 Site Requirements .....	7
3.1 Space Requirements .....	7
3.1.1 Receiving and Unpacking Requirements .....	7
3.1.2 Maintenance Access Requirements .....	8
3.2 Flooring Requirements .....	8
3.3 Electrical Power Requirements .....	9
3.3.1 Facility Power Requirements .....	10
3.3.2 Circuit Breaker Requirements .....	10
3.3.3 Grounding Guidelines .....	11
3.4 Temperature and Humidity Requirements .....	11
3.5 Ventilation and Cooling Requirements .....	12
4 Network Requirements .....	15
4.1 Networks and Network Services .....	15
4.2 Cabling Requirements .....	16
4.3 IP Address Requirements .....	17
4.4 Network Configuration Worksheet .....	18
A Site Checklists .....	19
A.1 System Components Checklist .....	19
A.2 Data Center Room Checklist .....	19
A.3 Data Center Environmental Checklist .....	20
A.4 Access Route Checklist .....	21
A.5 Facility Power Checklist .....	23
A.6 Safety Checklist .....	24
A.7 Logistics Checklist .....	24
A.8 Network Specification Checklist .....	26



---

# Preface

This document is part of the documentation library for Oracle Private Cloud at Customer.

## Audience

The Oracle Private Cloud at Customer documentation is written for system administrators who monitor a private cloud environment deployed at the customer site, and manage virtual machines for users. It is assumed that readers are familiar with web and virtualization technologies and have a general understanding of operating systems such as UNIX (including Linux) and Windows.

## Feedback

Provide feedback about this documentation at:

<http://www.oracle.com/goto/docfeedback>

## Conventions

The following text conventions are used in this document:

Convention	Meaning
<b>boldface</b>	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.

## Document Revision

Document generated on: 2019-01-22 (revision: 58)

## Access to Oracle Support

Oracle customers that have purchased support 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.



---

# Chapter 1 Introduction to Oracle Private Cloud at Customer Deployment

## Table of Contents

1.1 System Deployment Procedures .....	1
1.2 Operational Procedures for Oracle Private Cloud at Customer .....	2
1.2.1 Emergency Power-off Considerations .....	2
1.2.2 Cautions and Warnings .....	2

This chapter provides an overview and concise description of how Oracle Private Cloud at Customer is deployed at your site.

## 1.1 System Deployment Procedures

The deployment of Oracle Private Cloud at Customer at your site is broken down into steps in the table below.

Step	Description	Links
1	Review the online pages for any late-breaking information about Oracle Private Cloud at Customer.	This information is currently not available in the documentation.
2	Review important safety information.	Before performing the installation, refer to the following safety information: <ul style="list-style-type: none"><li>• <a href="#">safety documents</a></li><li>• <a href="#">safety guidelines</a></li><li>• <a href="#">emergency power-off</a></li></ul>
3	Review information about Oracle Private Cloud at Customer features and hardware components.	<ul style="list-style-type: none"><li>• <a href="#">introduction to Oracle Private Cloud at Customer</a></li><li>• <a href="#">architecture overview</a></li></ul>
4	Ensure that the installation site meets all physical requirements.  Learn about the Oracle Private Cloud at Customer network configuration and ensure that the data center meets the network requirements.	<ul style="list-style-type: none"><li>• <a href="#">installation preparations</a></li><li>• <a href="#">site requirements</a></li><li>• <a href="#">network requirements</a></li></ul>
5	Understand the respective responsibilities of Oracle and the customer in an Oracle Private Cloud at Customer deployment.	<ul style="list-style-type: none"><li>• <a href="#">initial configuration and setup</a></li><li>• <a href="#">day-to-day management</a></li><li>• <a href="#">account management</a></li></ul>
6	Get started with deploying virtual machines and configuring cloud services and applications in your Oracle Private Cloud at Customer environment.	<a href="#">Learn the basics and get started</a>

## 1.2 Operational Procedures for Oracle Private Cloud at Customer

This section provides important operational instructions to help you minimize the risk of injury or damage.

### 1.2.1 Emergency Power-off Considerations

If there is an emergency, then power to the entire Oracle Private Cloud at Customer environment should be halted immediately. The following emergencies might require powering off the system:

- Natural disasters such as an 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 Private Cloud at Customer, turn off power at the circuit breaker or pull the emergency power-off switch in the computer room.

### Emergency Power-off Switch

Emergency power-off (EPO) switches are required in a computer room when computer equipment contains batteries capable of supplying more than 750 volt-amperes for more than five minutes. Systems that have these batteries include internal EPO hardware for connection to a site EPO switch or relay. Use of the EPO switch will remove power from the Oracle Private Cloud at Customer system.

### 1.2.2 Cautions and Warnings

The following cautions and warnings apply to Oracle Private Cloud at Customer:

- Do not touch the parts of this product that use high-voltage power. Touching them might result in serious personal injury.
- Do not power off Oracle Private Cloud at Customer unless there is an emergency. In that case, follow the [Emergency Power-off Procedure](#).
- 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 cabinets clear to allow proper airflow and prevent overheating of components.
- Use only the supplied hardware.

---

# Chapter 2 Installation Preparations

## Table of Contents

2.1 Safety Documents and Notices .....	3
2.2 Review Safety Guidelines .....	3
2.3 Prepare the Installation Site .....	4
2.4 Unpacking Information .....	4

This chapter describes the preparation steps to perform prior to the installation of Oracle Private Cloud at Customer at your site. It also covers unpacking details and important safety information.

## 2.1 Safety Documents and Notices

In anticipation of the installation Oracle Private Cloud at Customer, or any expansion of an existing environment, read the *Important Safety Information for Oracle's Hardware Systems (7063567)* document that is shipped with the system.

Observe all safety notices printed on the packaging and listed in the *Oracle Rack Cabinet 1242 Safety and Compliance Guide (Part No: E87279)* and the *Oracle Rack Cabinet 1242 Power Distribution Units User's Guide (Part No: E87281)*. Go to [https://docs.oracle.com/cd/E85660\\_01/index.html](https://docs.oracle.com/cd/E85660_01/index.html) to download these guides.

## 2.2 Review Safety Guidelines

Before your Oracle Private Cloud at Customer equipment arrives, review the following safety precautions to ensure that the site is safe, as well as ready for delivery. Failure to observe these precautions can result in personal injury, equipment damage, or malfunction.

- Do not block ventilation openings.
- Do not install the system in a location that is exposed to direct sunlight or near a device that may become hot.
- Do not install the system in a location that is exposed to excessive dust, corrosive gases, or air with high salt concentrations.
- Do not install the system in a location that is exposed to frequent vibrations. Install the system on a flat, level surface.
- Use a power outlet that uses proper grounding. When using 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.
- Ensure that each grounding wire used for the system is used exclusively for Oracle Private Cloud at Customer. Also 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 too tightly.
- Do not disconnect power cords from the equipment while its power is on.
- Do not place anything on top of the system or perform any work directly above it.

- 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 let the room temperature rise sharply, especially in winter. Sudden temperature changes can cause condensation to form inside the system. Allow for a sufficient warm-up period prior to server operation.
- Do not install the system 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 the system can cause malfunctions. Static electricity is often generated on carpets.
- Confirm that the supply voltage and frequency match the electrical ratings indicated on your Oracle Private Cloud at Customer equipment.
- Do not insert anything into any system opening, unless doing so is part of a documented procedure. The system contains high-voltage parts. If a metal object or other electrically-conductive object enters an opening in the system, then it could cause a short circuit. This could result in personal injury, fire, electric shock, and equipment damage.

## 2.3 Prepare the Installation Site

The following procedure describes how to prepare the site prior to unpacking and situating your Oracle Private Cloud at Customer system.

1. Thoroughly clean and vacuum the area in preparation for the installation.
2. Note problems or peculiarities at the site that require special equipment.
3. Verify that the installation site flooring has a strength rating to withstand the combined weight of Oracle Private Cloud at Customer and any other installed equipment.

For more information, see [Section 3.1, "Space Requirements"](#).

4. Install all necessary electrical equipment and ensure that sufficient power is provided.

Refer to the *Oracle Rack Cabinet 1242 Power Distribution Units User's Guide* for the system Power Distribution Unit (PDU) power requirements.

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

For details, see [Chapter 3, Site Requirements](#).

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

## 2.4 Unpacking Information

Before unpacking the system from the shipping carton, refer to the labels on the carton and to the instructions that they provide. After unpacking the system, follow local laws and guidelines to recycle the packaging properly.

Carefully unpack the system from the packaging and shipping pallet. Rocking or tilting a rack can cause it to fall over and cause serious injury or death. For unpacking and installation, professional movers should always be used.

After unpacking the rack from the packaging, save the shipping brackets used to secure the rack to the shipping pallet. You can use these shipping brackets to secure the rack permanently to the installation site floor. Do not dispose of these brackets, because you cannot order replacement brackets.

**Caution**

Shipping brackets are not for use for bracing or anchoring the rack during seismic events.



---

# Chapter 3 Site Requirements

## Table of Contents

3.1 Space Requirements .....	7
3.1.1 Receiving and Unpacking Requirements .....	7
3.1.2 Maintenance Access Requirements .....	8
3.2 Flooring Requirements .....	8
3.3 Electrical Power Requirements .....	9
3.3.1 Facility Power Requirements .....	10
3.3.2 Circuit Breaker Requirements .....	10
3.3.3 Grounding Guidelines .....	11
3.4 Temperature and Humidity Requirements .....	11
3.5 Ventilation and Cooling Requirements .....	12

This chapter describes the site requirements for Oracle Private Cloud at Customer.



### Note

For site checklists, refer to [Appendix A, Site Checklists](#).

## 3.1 Space Requirements

Oracle Private Cloud at Customer racks have the following space requirements:

- Height: 42U - 2000 mm (78.74 inches)
- Width: 600 mm with side panels (23.62 inches)
- Depth (front door handle to rear door handle): 1197 mm (47.12 inches)
- Depth (doors removed): 1112 mm (43.78 inches)
- Weight (base rack, fully populated): 1000 kg (2204 lbs)

The minimum ceiling height for the cabinet is 2914 mm (114.72 inches), measured from the true floor or raised floor, whichever is higher. This includes an additional 914 mm (36 inches) of space required above the rack height for maintenance access. The space surrounding the cabinet must not restrict the movement of cool air between the air conditioner and the front of the systems within the cabinet, or the movement of hot air coming out of the rear of the cabinet.

### 3.1.1 Receiving and Unpacking Requirements

Before your Oracle Private Cloud at Customer arrives, ensure that the receiving area is large enough for the package. The following are the package dimensions and weights for an Oracle Private Cloud at Customer system:

- Shipping height: 2159 mm (85 inches)
- Shipping width: 1219 mm (48 inches)
- Shipping depth: 1575 mm (62 inches)

- Shipping weight (base rack, fully populated): 1118 kg (2465 lbs)

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 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.

When your Oracle Private Cloud at Customer arrives, leave the rack in its shipping packaging until it arrives at its installation site. Use a conditioned space to remove the packaging material to reduce particles before entering the data center. The entire access route to the installation site should be free of raised-pattern flooring that can cause vibration.

Allow enough space for unpacking the system from its shipping cartons. Ensure that there is enough clearance and clear pathways for moving the Oracle Private Cloud at Customer system from the unpacking location to the installation location. [Table 3.1](#) lists the access route requirements for Oracle Private Cloud at Customer.

**Table 3.1 Access Route Requirements**

Access Route Item	With Shipping Pallet	Without Shipping Pallet
Minimum door height	2184 mm (86 inches)	2000 mm (78.74 inches)
Minimum door width	1220 mm (48 inches)	600 mm (23.62 inches)
Minimum elevator depth	1575 mm (62 inches)	1058.2 mm (41.66 inches)
Maximum incline	6 degrees	6 degrees
Maximum elevator, pallet jack, and floor loading capacity	1145 kg (2520 lbs)	1145 kg (2520 lbs)

### 3.1.2 Maintenance Access Requirements

The maintenance area must be large enough for Oracle Private Cloud at Customer, and have the required access space. [Table 3.2](#) lists the maintenance access requirements for Oracle Private Cloud at Customer.

**Table 3.2 Maintenance Access Requirements**

Location	Maintenance Access Requirement
Rear maintenance	914 mm (36 inches)
Front maintenance	1232 mm (48.5 inches)
Top maintenance	914 mm (36 inches)

## 3.2 Flooring Requirements

Oracle recommends that Oracle Private Cloud at Customer be installed on raised flooring. The site floor and the raised flooring must be able to support the total weight of the system as specified in [Section 3.1, "Space Requirements"](#).

[Table 3.3](#) lists the floor load requirements.

**Table 3.3 Floor Load Requirements**

Description	Requirement
Maximum allowable weight of installed rack equipment	952.54 kg (2100 lbs)

Description	Requirement
Maximum allowable weight of installed power distribution units	52.16 kg (115 lbs)
Maximum dynamic load (maximum allowable weight of installed equipment including power distribution units)	1004.71 kg (2215 lbs)

### 3.3 Electrical Power Requirements

Oracle Private Cloud at Customer can operate effectively over a wide range of voltages and frequencies. However, it must have a reliable power source. Damage might occur if the ranges are exceeded. Electrical disturbances such as the following might damage the system:

- 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 your system from such disturbances, you should have a dedicated power distribution system, power-conditioning equipment, as well as lightning arresters or power cables to protect from electrical storms.

Each rack has two pre-installed power distribution units (PDUs). The PDUs accept different power sources. You must specify the type of PDU that is correct for your data center.

[Table 3.4](#) lists the PDU low-voltage requirements.

**Table 3.4 PDU Requirements for Low Voltage**

Item	15 kVA PDU	22 kVA PDU	24 kVA PDU
Size	15 kVA	22 kVA	24 kVA
Market Part Number	6442A	7100873	6444A
Manufacturing Part Number	597-0566-01	7018123	594-5596-01
Input Voltage Range	200-240 VAC	200-240 VAC	190-220 VAC
Number of Input Cords per PDU	3	3	2
Electrical Input Ratings	3x 1ph. [2W+ground] 208VAC 50/60Hz, max. 24A per phase	3x 1ph. [2W+ground] 208VAC 50/60Hz, max. 36.8A per phase	2x 3ph. [3W+ground] 208VAC 50/60Hz, max. 34.6A per phase
Data Center Receptacle	NEMA L6-30R	Hubbell CS8265C	IEC309-3P4W-IP67  (60A, 250V, AC, 3ph)  IEC309 60A 3ph 4 Wire  Hubbell HBL460R/ C9W or equivalent
Number of Outlets Per Rack	6	6	4

[Table 3.5](#) lists the PDU high-voltage requirements.

**Table 3.5 PDU Requirements for High Voltage**

Item	15 kVA PDU	22 kVA PDU	24 kVA PDU
Size	15 kVA	22 kVA	24 kVA
Market Part Number	6443A	7100874	6445A
Manufacturing Part Number	597-0567-01	7018124	594-5600-01
Input Voltage Range	220-240 VAC	220-240 VAC	380-415 VAC
Number of Input Cords per PDU	3	3	2
Electrical Input Ratings	3x 1ph. [2W+ground] 230VAC 50/60Hz, max. 24A per phase	3x 1ph. [2W+ground] 230VAC 50/60Hz, max. 32A per phase	2x 3ph. [4W+ground] 230/400VAC 50/60Hz, max. 18A per phase
Data Center Receptacle	IEC309-2P3W-IP44  (32A, 250V, AC, 3ph)  IEC309 32A 1ph 3 Wire  Hubbell HBL332R/ C9W or equivalent	Hubbell CS8265C	IEC309-4P5W-IP44  (32A, 400V, AC, 3ph)  IEC309 32A 3ph 5 Wire  Hubbell HBL532R/ C9W or equivalent
Number of Outlets Per Rack	6	6	4

### 3.3.1 Facility Power 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). 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 will be routed within the rack cabinet. The installation site AC power receptacle must be within 2 meters (6.6 feet) of the rack.

### 3.3.2 Circuit Breaker Requirements

To prevent catastrophic failures, the design of your power system must ensure that adequate power is provided to all of the compute nodes. Use dedicated AC breaker panels for all power circuits that supply power to the compute nodes. Electrical work and installations must comply with applicable local, state, or national electrical codes. Compute nodes require electrical circuits to be grounded to the Earth.

In addition to circuit breakers, provide a stable power source, such as an uninterruptable 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**

Circuit breakers are supplied by the customer. One circuit breaker is required for each power cord.

### 3.3.3 Grounding Guidelines

The cabinets for Oracle Private Cloud at Customer are 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. Ensure that the facility administrator or qualified electrical engineer verifies the grounding method for the building, and performs the grounding work.

## 3.4 Temperature and Humidity Requirements

Airflow through the Oracle Private Cloud at Customer system is from front to back. For information, see [Section 3.5, “Ventilation and Cooling Requirements”](#).

Studies have shown that temperature increases of 10 degrees Celsius (18 degrees Fahrenheit) above 20 degrees Celsius (68 degrees Fahrenheit) reduce long-term electronics reliability by 50 percent. Excessive internal temperatures might result in full or partial shutdown of Oracle Private Cloud at Customer.

[Table 3.6](#) lists the temperature, humidity and altitude requirements for operating and non-operating systems.

**Table 3.6 Temperature, Humidity, and Altitude Requirements**

Condition	Operating Requirement	Non-operating Requirement	Optimum
Temperature	5 ° to 32 ° Celsius (41 ° to 89.6 ° Fahrenheit)	-40 ° to 68 ° Celsius (-40 ° to 154 ° Fahrenheit)	For optimal rack cooling, data center temperatures from 21 ° to 23 ° Celsius (69.8 ° to 73.4 ° 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	3,000 meters (9,840 feet) maximum	12,000 meters (39,370 feet)	Ambient temperature is reduced by 1 ° Celsius per 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 Private Cloud at Customer for extended periods at or near the operating range limits, or installing it in an environment when it remains at or near non-operating range limits could significantly increase hardware component failure.

The ambient temperature range of 21 ° to 23 ° Celsius (69.8 ° to 73.4 ° Fahrenheit) is optimal for server reliability and operator comfort. Most computer equipment can operate in a wide temperature range, but near 22 ° Celsius (71.6 ° Fahrenheit) is desirable because it is easier to maintain safe humidity levels. Operating in this temperature range provides a safety buffer in the event that the air conditioning system goes down for a period of time.

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:

- Optimal range helps protect computer systems from corrosion problems associated with high humidity levels.

- Optimal range provides the greatest operating time buffer in the event of air conditioner control failure.
- This range helps to 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. It is not difficult to maintain humidity in a data center because of the high-efficiency vapor barrier and low rate of air changes normally present.

## 3.5 Ventilation and Cooling Requirements

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 airflow 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 airflow and cooling within the rack.

Relative humidity is the percentage of the total water vapor that can exist in the air without condensing, and 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 ° Celsius (75.2 ° Fahrenheit) has a relative humidity of 65 percent at a temperature of 18 ° Celsius (64.4 ° Fahrenheit). As the temperature drops, the relative humidity rises to more than 65 percent, and water droplets are formed.

Air conditioning facilities usually do not precisely monitor or control temperature and humidity throughout an entire computer room. Generally, monitoring is done at individual points corresponding to multiple exhaust vents in the main unit, and other units in the room. Special consideration should be paid to humidity when using underfloor ventilation. When underfloor ventilation is used, monitoring is done at each point close to an exhaust vent. Distribution of the temperature and humidity across the entire room is uneven.

Oracle Private Cloud at Customer has been designed to function while installed in a natural convection air flow. The following requirements must be followed to meet the environmental specification:

- Ensure that there is adequate airflow through the system.
- Ensure that the system has front-to-back cooling. The air intake is at the front of the system, and the air outlet is at the rear of the system.
- Allow a minimum clearance of 1219.2 mm (48 inches) at the front of the system, and 914 mm (36 inches) at the rear of the system for ventilation.

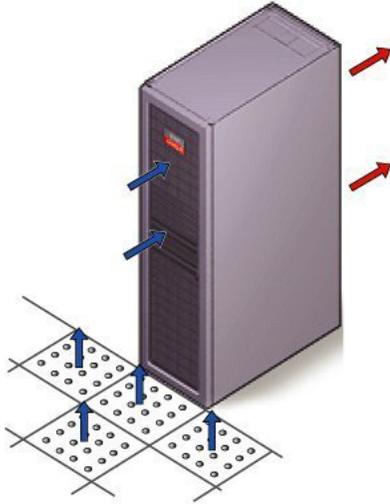
Use perforated tiles, approximately 400 CFM/tile, in front of the rack for cold air intake. The tiles can be arranged in any order in front of the rack, as long as cold air from the tiles can flow into the rack. Inadequate cold airflow could result in a higher intake temperature in the system due to exhaust air recirculation. The following is the recommended number of floor tiles:

- Four floor tiles for Oracle Private Cloud at Customer with up to 25 compute nodes (fully loaded)
- Three floor tiles for Oracle Private Cloud at Customer with up to 16 compute nodes (half loaded)

- One floor tile for Oracle Private Cloud at Customer with 8 compute nodes (quarter loaded)

Figure 3.1 shows a typical installation of the floor tiles in a data center for Oracle Private Cloud at Customer with more than 16 compute nodes.

**Figure 3.1 Typical Data Center Configuration for Perforated Floor Tiles**





---

# Chapter 4 Network Requirements

## Table of Contents

4.1 Networks and Network Services .....	15
4.2 Cabling Requirements .....	16
4.3 IP Address Requirements .....	17
4.4 Network Configuration Worksheet .....	18

This chapter describes the network requirements for Oracle Private Cloud at Customer.

## 4.1 Networks and Network Services

Oracle Private Cloud at Customer relies on different physical and logical networks to provide secure and reliable network connectivity for different application and management functions. This section outlines the minimum network requirements to install an Oracle Private Cloud at Customer system.

- **Infrastructure Management Network**

All infrastructure components inside the base rack are physically connected to this Gigabit Ethernet network, which uses the [192.168.4.0/24](#) subnet. A single uplink connects it to an Oracle-managed switch, which integrates the management interfaces of the external ZFS storage appliance and the Oracle Advanced Support Gateway. With a second network interface, the support gateway connects to the data center network, enabling Oracle to access the infrastructure management network remotely. No customer or external access to this network is permitted.

- **Virtual Machine Management Private Network**

A Private Virtual Interconnect (PVI), a virtual Ethernet network configured on top of the physical InfiniBand fabric, connects the management nodes and compute nodes in the [192.168.140.0/24](#) subnet. It is used for all network traffic inherent to Oracle VM Manager, Oracle VM Server and the Oracle VM Agents. No external access is provided.

- **Optical Storage Network**

Four 10GbE optical connections run between the base rack and internal 10GbE switches to provide resilient connectivity between the compute nodes and the external Oracle ZFS Storage Appliance ZS7-2. This dedicated 10GbE Ethernet internal network allows customer VMs to access shared storage on the external ZFS storage appliance. No external access is provided.

- **InfiniBand Storage Private Network**

For storage connectivity between the management nodes, compute nodes, and internal and external ZFS storage appliances, a high bandwidth IPoIB network is used. The components are assigned an IP address in the [192.168.40.0/24](#) subnet. This network also fulfills the heartbeat function for the clustered Oracle VM server pool. No external access is provided.

- **Virtual Machine Networks**

For network traffic to and from virtual machines (VMs), virtual Ethernet networks are configured on top of the physical InfiniBand fabric. Untagged traffic is supported by default; the customer can request the addition of VLANs to the network configuration, and subnets appropriate for IP address assignment at

the virtual machine level. The default configuration includes one private VM network and one public VM network. Additional custom networks can be configured to increase network capacity. Contact Oracle for more information about expanding the network configuration.

External VM connectivity is provided through public VM networks, which terminate on the I/O modules installed in the Fabric Interconnects and are routed externally across the 10GbE ports. The I/O ports must be cabled to redundant external 10GbE switches, which in turn must be configured to accept the tagged VLAN traffic to and from the VMs.

- **Client Network**

This information is currently not available in the documentation.

In addition, Oracle Private Cloud at Customer requires the following data center network services:

- **DNS Service**

As part of the deployment process, you work together with Oracle to determine the host names and IP addresses to be used when deploying Oracle Private Cloud at Customer. The fully qualified domain names (FQDN) and IP addresses of the management nodes must be registered in the data center Domain Name System (DNS).

- **NTP Service**

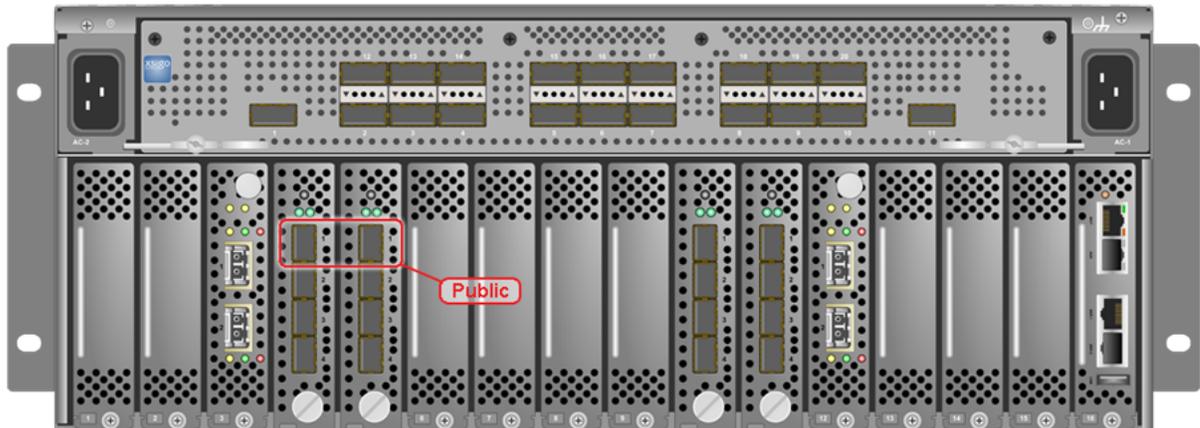
At least one reliable Network Time Protocol (NTP) server is required and should be accessible on the client network. The management nodes are configured to synchronize with the NTP server. All other Oracle Private Cloud at Customer components are configured to reference the active management node for clock synchronization.

## 4.2 Cabling Requirements

Every Oracle Private Cloud at Customer rack is shipped with all the required network equipment and cables to support the Oracle Private Cloud at Customer environment. Depending on your particular deployment, this includes InfiniBand and Ethernet cabling between the base rack and the Oracle ZFS Storage Appliance ZS7-2, as well as additional Oracle Private Cloud switches and hardware running the Oracle Advanced Support Gateway and Oracle Cloud Control Plane. Every base rack also contains pre-installed cables for all rack units where additional compute nodes can be installed during a future expansion of the environment.

Before the Oracle Private Cloud at Customer system is powered on for the first time, the Fabric Interconnects must be properly connected to the next-level data center switches. You must connect two 10 Gigabit Ethernet (GbE) IO module ports labeled “Public” on each Fabric Interconnect to the data center public Ethernet network.

[Figure 4.1](#) shows the location of the 10 GbE Public IO module ports on the Oracle Fabric Interconnect F1-15.

**Figure 4.1 Oracle Fabric Interconnect F1-15 10 GbE Public IO Module Ports**

It is critical that **both** Fabric Interconnects have **two** 10GbE connections each to a pair of next-level data center switches. This configuration with four cable connections provides redundancy and load splitting at the level of the Fabric Interconnects, the 10GbE ports and the data center switches. This outbound cabling should not be crossed or meshed, because the internal connections to the pair of Fabric Interconnects are already configured that way. The cabling pattern plays a key role in the continuation of service during failover scenarios involving Fabric Interconnect outages and other components.

**Caution**

The IO modules only support 10 GbE transport and cannot be connected to gigabit Ethernet switches. The Oracle Private Cloud at Customer system must be connected externally to 10GbE optical switch ports.

**Caution**

It is not possible to configure any type of link aggregation group (LAG) across the 10GbE ports: LACP, network/interface bonding or similar methods to combine multiple network connections are not supported.

To provide additional bandwidth to the environment hosted on Oracle Private Cloud at Customer, additional custom networks can be configured. Please contact your Oracle representative for more information.

## 4.3 IP Address Requirements

During the initial software configuration of Oracle Private Cloud at Customer, the network settings of the management nodes must be reconfigured. For this purpose, you should reserve three IP addresses in the public (data center) network: one for each management node, and one to be used as virtual IP address shared by both management nodes.

Oracle Private Cloud at Customer also requires a large number of preassigned private IP addresses. To avoid network interference and conflicts, you must ensure that the data center network does not overlap with any of the infrastructure subnets of the Oracle Private Cloud at Customer default configuration. These are the subnets you should keep clear:

- 192.168.140.0/24
- 192.168.40.0/24

- 192.168.100.0/24
- 192.168.0.0/20

## 4.4 Network Configuration Worksheet

Table 4.1 is a general network configuration worksheet to help you prepare important configuration parameters for your Oracle Private Cloud at Customer deployment. Oracle uses this information during the initial software configuration of your system.

**Table 4.1 Network Configuration Worksheet**

Item	Your Configuration	Description and Example
Domain Name		Company network domain name.  Example: <a href="#">abc.example.com</a>
Region		Name of the country in which Oracle Private Cloud at Customer resides.
Time Zone		Valid time zone.
IP address of the Domain Name Server		IP address of one or more network name servers (up to three servers).  Example: <a href="#">10.25.45.123</a> , <a href="#">10.25.45.125</a>
NTP Server		IP address of a Network Time Protocol server.  Example: <a href="#">10.12.13.14</a>
Search Domains		A list of search domains for name lookup.  Example: <a href="#">example.com</a> , <a href="#">example.org</a>
Default Gateway		IP address of the default gateway in your data center.  Example: <a href="#">10.203.72.2</a>
IP address of Management Node 1		IP address of the first management node in your company network.  Example: <a href="#">10.203.72.101</a>
IP address of Management Node 2		IP address of the second management node in your company network.  Example: <a href="#">10.203.72.102</a>
Management Virtual IP address		Shared virtual IP address of the management node cluster in your company network.  Example: <a href="#">10.203.72.100</a>

---

# Appendix A Site Checklists

## Table of Contents

A.1 System Components Checklist .....	19
A.2 Data Center Room Checklist .....	19
A.3 Data Center Environmental Checklist .....	20
A.4 Access Route Checklist .....	21
A.5 Facility Power Checklist .....	23
A.6 Safety Checklist .....	24
A.7 Logistics Checklist .....	24
A.8 Network Specification Checklist .....	26

This appendix contains site checklists to help you ensure that your site is prepared for installing Oracle Private Cloud at Customer.

## A.1 System Components Checklist

Complete the following checklist to ensure that the system component considerations have been addressed.

**Table A.1 System Component Checklist**

System Components Considerations	Yes	No	N/A	Comment
Will more than one base rack be installed?				
Is the rack installation a new system or an addition to an existing system?				
Will the base rack be connected to an expansion rack?				
Are all machine racks adjacent to each other?				
If the connecting racks are not within the specified proximity, then have the following been done:				
				<ul style="list-style-type: none"><li>• Purchased approved longer InfiniBand cables from an approved third-party vendor?</li><li>• Asked Oracle Support Services to provide and schedule the custom multi-rack cabling service with the installation?</li></ul>

## A.2 Data Center Room Checklist

Complete the following checklist to ensure that the data center room requirements are met. For information about the data center requirements, see [Section 3.2, "Flooring Requirements"](#).

**Table A.2 Data Center Room Checklist**

<b>Data Center Room Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Has the Oracle Private Cloud at Customer location been allocated?				
Is there a vacant location for the new equipment?				
Does the floor layout meet the equipment maintenance access requirements?				
Is there adequate space available for maintenance?				
Will the equipment be positioned so that the exhaust air of one rack does not enter the air inlet of another rack?				
Have cabinet stabilization measures been considered?				
Does the raised floor satisfy the weight requirements for the new hardware?				
Can floor tiles be removed without permission to accommodate service?				
Are there cable routing channels or cutouts?				
Are you providing any additional hardware?				
Is the hardware you are providing fully compatible with Oracle Private Cloud at Customer?				
Will the new hardware location require any non-standard cable lengths?				
Is the floor to ceiling height a minimum of 3214 mm or 3.2 m (10.5 feet)?				
Is the depth of the raised floor a minimum of 46 cm (18 inches)?				

### A.3 Data Center Environmental Checklist

Complete the following checklist to ensure that the data center environment requirements are met. For information, see [Section 3.5, "Ventilation and Cooling Requirements"](#).

**Table A.3 Data Center Environmental Checklist**

<b>Data Center Environmental Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Does the computer room air handling meet temperature and humidity requirements?				
Does the installation floor layout satisfy the ventilation requirements?				
Will the equipment be positioned so the exhaust air of one rack does not enter the air intake of another rack?				
Are the perforated floor tiles each rated at 400 CFM or greater?				
Do the data center air conditioners provide sufficient front to back airflow?				
Is airflow adequate to prevent hot spots?				
Can the data center continuously satisfy environmental requirements?				
Can more vented floor tiles be obtained if required?				

## A.4 Access Route Checklist

Complete the following checklist to ensure that the access route requirements are met. For information about preparing your data center access route, see [Section 3.1.1, "Receiving and Unpacking Requirements"](#).

**Table A.4 Access Route Checklist**

<b>Access Route Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Has the access route been checked for clearances of the packaged equipment?				
Do all the doors and entry ways conform to the width and height requirements for transportation, including the width of the unpacked unit?				
Do all the doors meet the height requirement of minimum 218 cm (86 inches) for packaged delivery?				
Does the access route provide sufficient space for transport of the packed devices?				
Are there any ramps or thresholds that are of concern? If yes, then provide details.				

Access Route Checklist

---

Access Route Considerations	Yes	No	N/A	Comment
Are there any stairs or ramps in the path when moving the new hardware?				
Have you confirmed that all route incline angles are within the permitted range?				
Have you confirmed that the access route is free of any obstacles that would expose the device to shock?				
Are all the surfaces acceptable for rolling the new unpacked and packed equipment?				
<p>If a pallet jack is to be used, then have you confirmed the following:</p> <ul style="list-style-type: none"> <li>• The pallet jack supports the device weight?</li> <li>• The pallet jack tines are compatible with the shipping pallet?</li> </ul>				
If there are stairs, then is a loading elevator accessible for the equipment?				
<p>If an elevator is to be used, then have you confirmed the following:</p> <ul style="list-style-type: none"> <li>• The elevator car is wide enough for the device to be carried into it?</li> <li>• The elevator car is high enough for the device to be carried into it?</li> <li>• The load limit of the elevator is greater than the device weight?</li> <li>• Are elevators available to handle up to 996 kg (2197 lbs) fully-loaded rack capacity?</li> <li>• The elevator door meets the minimum height requirement of 218 cm (86 inches) for packaged rack delivery?</li> </ul>				
Does the path from the receiving location to the designated data center area support the weight of the unpacked equipment?				
Is the path onto the raised floor rated for dynamic loading of the				

Access Route Considerations	Yes	No	N/A	Comment
server? Refer to <a href="#">Section 3.2</a> , "Flooring Requirements".				

## A.5 Facility Power Checklist

Complete the following checklist to ensure that the facility power requirements are met. For information about power requirements, see [Section 3.3](#), "Electrical Power Requirements".

**Table A.5 Facility Power Checklist**

Facility Power Considerations	Yes	No	N/A	Comment
Do you know the required operating voltage and electric current level of the device and peripherals?				
Will you be using single-phase (low-voltage or high-voltage) or 3-phase (low-voltage or high-voltage) power?				
Are enough power outlets provided within 2 meters (6.5 feet) for each rack?				
Do the power outlets have appropriate socket receptacles for the PDU option ordered? Options are low voltage or high voltage, single-phase or 3-phase.				
Will optional ground cables be attached to the rack?				
Are the circuit breakers for the equipment suitable in terms of voltage and current-carrying capacities?				
Does the power frequency meet the equipment specifications?				
Are power outlets available for the new equipment at the designated location?				
Will system power be delivered from two separate grids?				
Is there a UPS to power the equipment?				
Do you have the minimum required power sources to support the power load for the new hardware? Use kilowatt (kW) /kilovolt (kVA) to express power load.				

## A.6 Safety Checklist

Complete the following checklist to ensure that the safety requirements are met. For information about safety, see [Section 1.2, “Operational Procedures for Oracle Private Cloud at Customer”](#) and [Section 3.5, “Ventilation and Cooling Requirements”](#).

**Table A.6 Safety Checklist**

Safety Checklist Considerations	Yes	No	N/A	Comment
Is there an emergency power shut off?				
Is there a fire protection system in the data center room?				
Is the computer room adequately equipped to extinguish a fire?				
Is antistatic flooring installed?				
Is the floor below the raised floor free of obstacles and blockages?				

## A.7 Logistics Checklist

Complete the following checklist to ensure that the logistics requirements are met. For information about unpacking and space requirements, see [Section 3.1, “Space Requirements”](#).

**Table A.7 Logistics Checklist**

Logistics Checklist Considerations	Yes	No	N/A	Comment
Do you have contact information for the data center personnel?				
Is there security or access control for the data center?				
Are there any security background checks or security clearances required for vendor personnel to access the data center? If yes, then do you have a recommended agency?				
How many days in advance must background checks be completed?				
Are there any additional security access issues?				
Is computer room access available for installation personnel?				
Are laptops, cell phones, and cameras allowed in the data center?				
Does the building have a delivery dock?				
Is there a delivery/unpacking/staging area?				

Logistics Checklist

Logistics Checklist Considerations	Yes	No	N/A	Comment
Is the delivery inside?				
If the delivery is not inside, then is the site prepared for uncrating?				
Is the unpacking/staging area protected from the elements?				
Does the building have adequate receiving space?				
Is the unpacking area air-conditioned to avoid thermal shock for various hardware components?				
Will sufficient moving personnel be available to install the hardware?				
Is union labor required for any part of the delivery or installation?				
Are you prepared for uncrating and trash removal?				
Is uncrating of cabinet and cabinet trash removal required?				
Are there any restrictions on delivery truck length, width, or height?				
Does the customer allow cardboard boxes and other packing material in the computer room? If no, then do ground level deliveries require a truck with a side rail lift?				
Is there a time constraint on dock access? If yes, then provide time constraints.				
Is tail lift required on delivery carrier to unload the equipment at the delivery dock?				
Will any of the following be required to place equipment in computer room?				
<ul style="list-style-type: none"> <li>• Stair walkers</li> <li>• Lifters</li> <li>• Ramps</li> <li>• Steel plates</li> <li>• Floor covers</li> </ul>				
Does the delivery carrier require any special equipment, such as non-				

Logistics Checklist Considerations	Yes	No	N/A	Comment
floor damaging rollers, transport dollies, pallet jacks, or fork lifts?				

## A.8 Network Specification Checklist

Complete the following checklist to ensure that the network specification requirements are met. For information about IP addresses, see [Chapter 4, Network Requirements](#).



### Note

By default, there is one InfiniBand partition at the Oracle Private Cloud at Customer level. All compute nodes in the system are members of the default InfiniBand partition. The most common model for application isolation involves multiple IP subnetting, in which the most mission-critical applications are assigned their own IP subnets layered about the default IPoB link. In this model, some subnets may also contain applications that have less stringent or otherwise different resource requirements.

**Table A.8 Network Specification Checklist**

Network Specification Considerations	Yes	No	N/A	Comment
Did you complete the networking worksheet, which is included in <a href="#">Section 4.4, "Network Configuration Worksheet"</a> ?				
Have you received the site-specific installation template from your Oracle technical representative?				
Did you review the installation template and consult with your Oracle technical representative regarding any site-specific changes, if any?				
Did you verify that IP addresses in the installation template are currently not in use?				
Have you performed the required configuration within your network infrastructure to allow the Oracle Private Cloud at Customer to use the IP addresses specified in the template?				
Have you registered IP addresses in the installation template with DNS?				
Did you run the required network cables from your network equipment to the location where the Oracle				

## Network Specification Checklist

---

<b>Network Specification Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
---	------------	-----------	------------	----------------

---

Private Cloud at Customer will be installed?

---

Did you label the network cables that will connect to the Oracle Private Cloud at Customer?

---

