Preparing the Site

This chapter includes the following sections:

- Environmental Considerations, page 1
- Temperature, page 2
- Humidity, page 3
- Altitude, page 3
- Dust and Particles, page 3
- Corrosion, page 3
- Electromagnetic and Radio Frequency Interference, page 3
- Grounding, page 4
- Power Source, page 4
- Rack Requirements, page 5

Environmental Considerations

Environmental factors can adversely affect the performance and life span of your Cisco UCS equipment. Cisco UCS equipment requires a dry, clean, well-ventilated, and air-conditioned environment. To ensure normal operation, you must maintain ambient airflow. If the airflow is blocked or restricted, or if the intake air is too warm, an overtemperature condition can occur and the environmental monitor on the blade servers or fabric interconnects will shut down to protect their components.

For stability and safety, it is always best to place the heavier equipment below lighter equipment in racks. With the Cisco UCS equipment, install the Cisco UCS 5108 Blade Server Chassis Series low in the rack and place the Fabric Interconnect above the blade server.

If your site has hot and cold aisles, align the rack air intake at the front to a cold aisle and exhaust at the rear to a hot aisle. Also, make sure that you do not install the Cisco UCS equipment so that it takes in warm exhaust air flow from other equipment.

Temperature

Temperature extremes can cause the Cisco UCS equipment to operate at reduced efficiency and cause a variety of problems, including early degradation, failure of chips, and failure of equipment. In addition, extreme temperature fluctuations can cause CPUs to become loose in their sockets. The Cisco UCS equipment should operate in an environment that provides an inlet air temperature not colder than 50°F (10°C) nor hotter than 95°F (35°C). If sensors on a CPU reach 179.6°F (82°C), the system will take that CPU offline.

To control the equipment temperature, you must make sure that the equipment has adequate airflow. The Cisco UCS equipment requires front-to-back airflow, which requires at least 36.0 inches (91.4 cm) of clearance in front for adequate airflow and component replacement, and at least 16 inches (40.6 cm) of clearance at the chassis rear. These distances do not include the rack front and rear doors provided that the doors are perforated to a minimum of 65% open, and assumes a traditional hot-aisle cold-aisle cooling plan for the room (the installation clearance may still be useful in rooms with other cooling plans). The Cisco R Series Racks are an ideal choice of rack. To assure that cooling air flows as designed, always use blanking panels for unused power supply or server bays. Always use blanking panels to fill empty front panel RU spaces in the rack. Using blanking panels ensures proper airflow and prevents hot air recirculation in the rack. Using a rack without blanking panels results in improper cooling that can lead to thermal warnings or even thermal damage.

Adequate ventilation is particularly important if you are operating a Cisco UCS system at high altitudes. Make sure that all slots and openings on the chassis remain unobstructed, especially the fan vents. Clean the installation site at regular intervals to avoid buildup of dust and debris, which can cause a system to overheat.

If the Cisco UCS Series systems are exposed to abnormally cold temperatures, allow a 2-hour warm-up period to bring it up to a normal operating temperature before you turn the equipment on.

Caution If you do not allow a 2-hour warm-up period when temperatures are abnormally cold, you can damage the internal components.

Heat generated by the Cisco UCS system can vary depending on many factors, but maximums to plan for are listed in this table.

Table 1: System Heat Dissipation

Component	Maximum BTU per hour
Cisco UCS 6120XP Fabric Interconnect	1534
Cisco UCS 6140XP Fabric Interconnect	2561
Cisco UCS 6248 UP Fabric Interconnect	1998
Cisco UCS 6296 UP Fabric Interconnect	3163
Cisco UCS 5108 Blade Server Chassis (fans, power supplies, midplane)	1364
Each Cisco UCS half width blade server [1]	1350 (approximate)
Each Cisco UCS full width blade server [1]	2700 (approximate)

[1] Heat dissipation for blade servers varies from model to model, refer to the installation and service note for the blade servers in your system. Refer to http://www.cisco.com/en/US/products/ps10280/prod_installation_guides_list.html

Humidity

High humidity can cause moisture to seep into the Cisco UCS equipment. Moisture can cause corrosion of internal components and degradation of electrical resistance, thermal conductivity, and physical strength. The Cisco UCS equipment is rated to operate at 10 to 90 percent relative humidity.

Buildings in which the climate is controlled by air-conditioning in the warmer months and by heat during the colder months usually maintain an acceptable level of humidity for the equipment. However, if the Cisco UCS equipment is located in an unusually humid location, you should use a dehumidifier to maintain the humidity within an acceptable range.

Altitude

If you operate the Cisco UCS equipment at a high altitude (low pressure), the efficiency of forced convection cooling is reduced and can result in electrical problems. This condition can also cause sealed components with internal pressure, such as electrolytic capacitors, to fail or to perform at a reduced efficiency. The Cisco UCS equipment is rated to operate at altitudes from 0 to 10,000 feet (0 to 3,000 m). Above 10,000 feet (3000 m), the equipment can operate but the maximum temperature decreases 1°C for every additional 1000 feet (300 m) of elevation above 10000 feet (3000 m). You can store the equipment at altitudes of –1,000 to 30,000 feet (–305 to 9,144 meters).

Dust and Particles

Exhaust fans cool power supplies and system fan trays cool equipment by drawing in air and exhausting air out through various openings in the chassis. However, fans also ingest dust and other particles, causing contaminant buildup in the equipment and increased internal chassis temperature. A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the mechanical components in the equipment.

Corrosion

The corrosion of equipment connectors is a gradual process that can eventually lead to intermittent failures of electrical circuits. The oil from your fingers or prolonged exposure to high temperature or humidity can corrode the gold-plated edge connectors and pin connectors on various components in the Cisco UCS equipment. To prevent corrosion, avoid touching contacts on modules and protect the equipment from extreme temperatures and moist, salty environments.

Electromagnetic and Radio Frequency Interference

To reduce the possibility of EMI and RFI, follow these guidelines:

- Cover all open expansion slots with a metal filler.

- Always use shielded cables with metal connector shells for attaching peripherals to the equipment.

Note To predict and prevent strong EMI, you might need to consult experts in radio frequency interference (RFI).

Grounding

The Cisco UCS equipment is sensitive to variations in voltage supplied by the power source. Overvoltage, under voltage, and transients (or spikes) can erase data from the memory or cause components to fail. To protect against these types of problems, you should always make sure that the racks that hold the blade server chassis and fabric interconnects are grounded. When the racks are grounded, the Cisco UCS equipment installed in them are automatically grounded. Refer to the instructions specific to your rack for grounding steps.

Power Source

You should use dedicated power circuits (rather than sharing circuits with other heavy electrical equipment). For input-source redundancy, it is recommend that you use two dedicated power sources, each of which powers half of the power supply units in the blade server chassis and fabric interconnects. The circuits used for the Cisco UCS 5108 Blade Server Chassis must be rated for 20A, 200 to 250 VAC or up to 62 A @ -48 VDC input. The circuits used for the Cisco UCS 6100 Series Fabric Interconnect must be rated for 15A and 100-240 VAC. The circuits used for the Cisco UCS 6200 Series Fabric Interconnect must be rated for 15A and 100-240 VAC or 62 A @ -72 VDC. The receptacles for these circuits should be within 6 feet (1.8 m) of each power supply unit when it is installed in the equipment. Be sure that there is a DC shutoff switch close to the rack holding the equipment using DC power.

We recommend that you use a UPS to protect the UCS System. Using an unprotected supply exposes you to a risk of a system failure due to input supply voltage variations or failures.

Power Budget

Actual power use will vary depending on the applications used as well as the number and type of servers in your system. The best way to prevent problems in service is to plan for system maximums rather than actual or typical usage. The number of power supplies required depends on the level of redundancy as well as the number of server blades. The power supply configuration in Cisco UCS Manager supports non-redundant, N + 1 redundant, and grid redundant configurations.

Each single slot blade server is budgeted for 550 W at maximum use. Each dual slot blade server is budgeted 1100 W at maximum use. The chassis (including fabric extenders, fans, and power supplies) is budgeted for 600 W. Each power supply can supply 2500 W. With 7 or less populated blade slots, add a 550 W cushion for a budget calculation.

To determine the number of power supplies needed for a given configuration, you may also refer the Cisco UCS Power Calculator.

For example:

- Five B200 blade servers (5 @ 550 W each + 600 W for the system +550 W cushion) would require 3900 W.
- In nonredundant mode two power supplies are needed, and any additional power supplies present are disabled by Cisco UCS Manager and noted as spares. If power to one of the two supplies in this nonredundant system is lost, the whole chassis will power down. A spare power supply that is present in a nonredundant configuration but not online will not come online instantaneously in the event of a power supply loss, so the spare does not function the same as the +1 supply in an N+1 configuration.
- In N+1 redundant mode, three supplies are needed for this example. The power supply that is inserted into the chassis last will be the +1 supply. If power to one of the three supplies is lost, the +1 supply will immediately cut in and the system will continue to function without interruption. If power to two of the three supplies is lost, the system will shut down blade servers starting at the top of the chassis and working downward until the power demands can be met by the available supplies.
- In grid redundant mode, four power supplies are needed for this example. If power to one of the four supplies is lost, the system will continue to function without interruption. If power to two supplies on the same grid is lost, the system will switch over to the other grid and continue to function without interruption. If power is only available to one of the four power supplies, the system will shut down blade servers starting at the top of the chassis and working downward until the power demands can be met by the available supplies.

See the "Configuring System-Related Policies" chapter in the Cisco UCS Manager configuration guides to configure the power policy you want to use on your system.

Rack Requirements

General Requirements for Racks

The Cisco UCS 5108 Blade Server Chassis and Fabric Interconnects were designed for a standard 19-inch (48.26 cm) rack (see specification EIA-310-D) that has a minimum depth of 29 inches (73.66 cm) and a maximum of 35" from front rail to rear rail. The Cisco R Series Racks are an ideal choice of rack.

If your server rack includes closing front and rear doors, the doors must have at least a 65 percent perforated area evenly distributed from top to bottom to permit adequate airflow.

Note In a 29-inch (73.66 cm) rack, the blade server chassis will extend 3 inches (7.62 cm) outside the rear of the rack.

The mounting rails and mounting kits used for the Cisco UCS components require square holes in the vertical mounting racks. Racks with round threaded holes do not work with the Cisco UCS 5108 mounting rails and mounting kits.

To confirm that your chosen rack will allow clearance to service the Cisco UCS equipment, see the following table.

Table 2: Rack Clearance Requirements

Rack Side	Clearance Requirement
Front	36 inches (91.44 cm) plus additional clearance, if needed, for the mechanical lift used to move Cisco UCS equipment.
Rear	16 inches (40.64 cm) from the back side of the rack or chassis, whichever is furthest to the rear.
Sides	N/A (no accessible parts)

Rack Space

This table lists the physical specifications for the unpacked Cisco UCS equipment. A rack providing 42 RU of vertical installation space is recommended, but not required. The Cisco R Series Racks are an ideal choice of rack.

Table 3: Dimensions for the Unpacked Cisco UCS Equipment

Chassis	Width	Depth	Height
Cisco UCS 5108 Blade Server Chassis	17.5 inches (44.5 cm)	32.0 inches (81.2 cm)	10.5 inches (26.7 cm) (6 RU)
Cisco UCS 6120XP Fabric Interconnect	17.3 inches (43.9 cm)	30.0 inches (76.2 cm)	1.72 inches (4.4 cm) (1 RU)
Cisco UCS 6140XP Fabric Interconnect	17.3 inches (43.9 cm)	30.0 inches (76.2 cm)	3.44 inches (8.8 cm) (2 RU)
Cisco UCS 6248UP Fabric Interconnect	17.3 inches (43.9 cm)	29.5 inches (74.9 cm)	1.72 inches (4.4 cm) (1 RU)
Cisco UCS 6296 UP Fabric Interconnect	17.3 inches (43.9 cm)	29.5 inches (74.9 cm)	3.44 inches (8.8 cm) (2 RU)

Rack Distance

A pair of UCS Fabric Interconnects can manage and provide connectivity for up to 20 Cisco UCS 5108 chassis (depending on the Cisco UCS Manager version, see the Cisco UCS Manager release notes) for more information. Ideally, all Cisco UCS 5108 chassis and UCS Fabric Interconnects will be in the same rack or in adjacent racks. In those situations, Twinax copper transceivers are ideal.

Table 4: Supported SFP+ 10 Gb Ethernet Twinax Copper Transceivers

Model	Description
SFP-H10GB-CU1M	10-Gb Ethernet—copper SFP+ (1 m, 3.28 ft.)
SFP-H10GB-CU3M	10-Gb Ethernet—copper SFP+ (3 m, 9.84 ft.)
SFP-H10GB-CU5M	10-Gb Ethernet—copper SFP+ (5 m, 16.4 ft.)
SFP-H10GB-ACU7M	10-Gb Ethernet—copper SFP+ (7 m, 22.9 ft.)
SFP-H10GB-ACU10M	10-Gb Ethernet—copper SFP+ (10 m, 32.8 ft.)

If distances greater than 10 meters (32.8 feet) must be spanned, the Fabric Extender supports the substitution of the copper SFP+ by optical SFP+ transceivers.

Table 5: Supported Optical SFP+ Transceivers

Model	Description
SFP-10G-SR	Short–range optical SFP+ (up to 300 m / 984 feet)
SFP-10G-LR [2]	Long–range optical SFP+ (up to 10 km / 6.2 miles)
FET-10G	Short–range optical SFP+ (up to 100 m / 328 feet)

2 While the SFP-10G-LR is supported by both the fabric interconnect and FEX, the maximum distance will introduce latency issues that will affect overall performance. The effective maximum distance for this application is 300 m.

Documentation for these transceivers is in the Cisco SFP and SFP+ Transceiver Module Installation Notes.

For a Fibre Channel connection between the Chassis and fabric interconnect expansion module, the following transceivers may be used:

Table 6: Supported Fibre Channel Transceivers

Model	Description
DS-SFP-FC4G-SW	4 Gbps Fibre Channel SFP (up to 300 m / 984 feet)
DS-SFP-FC8G-SW	8 Gbps Fibre Channel SFP (up to 150 m / 492 feet)
DS-SFP-FC4G-LW[3]	4 Gbps Fibre Channel SFP (up to 10 km / 6.2 miles)
DS-SFP-FC8G-LW1	8 Gbps Fibre Channel SFP (up to 10 km / 6.2 miles)

3 While the SFP is supported by both the fabric interconnect and FEX, the maximum distance will introduce latency issues that will affect overall performance. The effective maximum distance for this application is 300 m.

Each fabric interconnect can also support a limited number of 1-GB connections using the following models of SFP connector (this requires Cisco UCS Manager 1.4(1) or later):

Table 7: Supported 1 Gb SFP Transceivers

Model	Description
GLC-T (V03 or higher)	Short–range copper SFP (up to 300 m / 984 feet)
GLC-SX-MM	Short–range optical SFP (up to 300 m / 984 fee)
GLC-LH-SM	Long–range optical SFP (550 m / 1804 feet)