



CHAPTER 1

Installation Preparation

The Virtual Managed Services Pod consists of the following components as outlined and detailed in further sections. The devices identified as optional may be provided with the Pod, or may be substituted by the customer with an appropriate alternative. The customer will need to provide a Gigabit Ethernet Switch for externally connecting the ISR CPEs to the lab, as well as a Terminal Server for console access to the Top of Rack ASR 9001 Router, Nexus 9300 Series Switch, and the ISR CPE's.

- 5x Cisco UCS C220-M4 Series Servers
- 3x Cisco UCS C240-M4 Series Servers
- 1x Cisco Nexus 9300 Series Top of Rack Switch
- 1x Cisco ASR 9001 Series Top of Rack Router (optional)
- 2-4x Cisco 1900 ISR Series Routers as CPEs (optional)
- 1x Terminal Server (not included)
- 1x Gigabit Ethernet Switch (not included)

Hardware Included

The following tables identify the relevant hardware included for each component type identified above. Note that these tables exclude any software, CD's, features, licensing, support, or otherwise which may be included with the VMS PoC Pod.

Cisco UCS C220-M4S Series Server Hardware

[Table 1-1](#) identifies the relevant hardware included in the Cisco UCS C220-M4 Series Server. Note that this is not a complete materials list.

Table 1-1 Cisco UCS C220-M4S Hardware

Part Number	Description	Quantity
UCSC-C220-M4S	UCS C220 M4 SFF w/o CPU, mem, HD, PCIe, PSU, rail kit	1
UCS-CPU-E52660D	2.60 GHz E5-2660 v3/105W 10C/25MB Cache/DDR4 2133MHz	2
UCSC-HS-C220M4	Heat sink for UCS C220 M4 rack servers	2
UCS-MR-1X162RU-A	16GB DDR4-2133-MHz RDIMM/PC4-17000/dual rank/x4/1.2v	8

Table 1-1 Cisco UCS C220-M4S Hardware (continued)

Part Number	Description	Quantity
UCS-HD12T10KS2-E	1.2 TB 6G SAS 10K rpm SFF HDD	2
N20-BBLKD	UCS 2.5 inch HDD blanking panel	6
UCSC-MRAID12G	Cisco 12G SAS Modular Raid Controller	1
UCSC-MRAID12G-2GB	Cisco 12Gbps SAS 2GB FBWC Cache module (Raid 0/1/5/6)	1
UCSC-SCCBL220	Supercap cable 950mm (RAID Super Capacitor cable)	1
UCSC-MLOM-CSC-02	Cisco UCS VIC1227 VIC MLOM - Dual Port 10Gb SFP+	1
UCSC-PSU1-770W	770W AC Hot-Plug Power Supply for 1U C-Series Rack Server	2
	Power Cord relevant for the associated region	2
UCSC-RAILB-M4	Ball Bearing Rail Kit for C220 M4 and C240 M4 rack servers	1

Cisco UCS C240-M4SX Series Server Hardware

Table 1-2 identifies the relevant hardware included in the Cisco UCS C240-M4 Series Server. Note that this is not a complete materials list.

Table 1-2 Cisco UCS C240-M4SX Hardware

Part Number	Description	Quantity
UCSC-C240-M4SX	UCS C240 M4 SFF 24 HD w/o CPU,mem,HD,PCIe,PS,railkt w/expndr	1
UCS-CPU-E52660D	2.60 GHz E5-2660 v3/105W 10C/25MB Cache/DDR4 2133MHz	2
UCSC-HS-C240M4	Heat sink for UCS C240 M4 rack servers	2
UCS-MR-1X162RU-A	16GB DDR4-2133-MHz RDIMM/PC4-17000/dual rank/x4/1.2v	8
UCS-HD12T10KS2-E	1.2 TB 6G SAS 10K rpm SFF HDD	8
UCS-SD400G0KS2-EP	400GB 2.5 inch Enterprise Performance SAS SSD	2
N20-BBLKD	UCS 2.5 inch HDD blanking panel	14
UCSC-MRAID12G	Cisco 12G SAS Modular Raid Controller	1
UCSC-MRAID12G-2GB	Cisco 12Gbps SAS 2GB FBWC Cache module (Raid 0/1/5/6)	1
UCSC-SCCBL240	Supercap cable 250mm (RAID Super Capacitor cable)	1
UCSC-MLOM-CSC-02	Cisco UCS VIC1227 VIC MLOM - Dual Port 10Gb SFP+	1
UCSC-PCI-1C-240M4	Right PCI Riser Bd (Riser 1) 2onbd SATA bootdrvs+ 2PCI slts	1
UCSC-PSU2V2-1400W	1400W V2 AC Power Supply (200 - 240V) 2U & 4U C Series	2
	Power Cord relevant for the associated region	2
UCSC-RAILB-M4	Ball Bearing Rail Kit for C220 M4 and C240 M4 rack servers	1

Cisco Nexus 9300 Series Switch Hardware

Table 1-3 identifies the relevant hardware included in the Cisco Nexus 9300 Series Top of Rack Switch. Note that this is not a complete materials list.

Table 1-3 Cisco Nexus 9396PX Hardware

Part Number	Description	Quantity
N9K-C9396PX	Nexus 9300 48p 1/10G SFP+	1
N9K-C9300-ACK	Nexus 9300 Accessory Kit	1
N9K-M6PQ	ACI capable Uplink Module for Nexus 9300, 6p 40G QSFP	1
QSFP-H40G-CU1M	40GBASE-CR4 Passive Copper Cable, 1m	1
N9K-C9300-FAN2-B	Nexus 9300 Fan 2, Port-side Exhaust	3
N9K-PAC-650W-B	Nexus 9300 650W AC PS, Port-side Exhaust	2
	Power Cord relevant for the associated region	2
N9K-C9300-RMK	Nexus 9300 Rack Mount Kit	1

Cisco ASR 9001 Series Router Hardware (Optional)

Table 1-4 identifies the relevant hardware included in the optional Cisco ASR 9001 Series Top of Rack Router. Note that this is not a complete materials list.

Table 1-4 Cisco ASR-9001 Hardware

Part Number	Description	Quantity
ASR-9001	ASR 9001 Chassis	1
A9K-9001-MPA-FILR	ASR 9001 MPA Filler	2
ASR-9001-PLENUM	ASR 9001 Plenum Kit includes V2 fan	1
ASR-9001-FAN-V2	ASR 9001 Fan Tray V2 required only for baffle	1
A9K-750W-AC	ASR 9000 Series 750W AC Power Supply for ASR-9001	2
	Power Cord relevant for the associated region	2
ASR-9001-TRAY	ASR 9001 Cable Management Tray	1
ASR-9001-2P-KIT	ASR 9001 2 Post Mounting Kit	1

Cisco 1900 ISR Series Router Hardware (Optional)

Table 1-5 identifies the relevant hardware included in the optional Cisco 1900 ISR Series Router. Note that this is not a complete materials list. The 19-inch rack-mount brackets are included as part of the default accessory kit.

Table 1-5 Cisco 1941 ISR Hardware

Part Number	Description	Quantity
CISCO1941-HSEC+/K9	VPN ISM module HSEC bundles for 1941 ISR platform	1
MEM-1900-512MB-DEF	512MB Default DRAM for Cisco 1941 ISR	1
MEM-CF-256MB	256MB Compact Flash for Cisco 1900, 2900, 3900 ISR	1
ISM-VPN-19	3DES/AES/SUITE-B VPN Encryption module	1

Table 1-5 Cisco 1941 ISR Hardware (continued)

Part Number	Description	Quantity
EHWIC-1GE-SFP-CU	EHWIC 1 port dual mode SFP(100M/1G) or GE(10M/100M/1G)	1
HWIC-BLANK	Blank faceplate for HWIC slot on Cisco ISR	1
PWR-1941-AC	Cisco 1941 AC Power Supply	1
	Power Cord relevant for the associated region	1
ACS-1941-RM-19=	19 inch rack mount kit for Cisco 1941 &1941W ISR	1

Customer Provided Resources

The Virtual Managed Services Pod does not include the transceivers or cables necessary for connectivity. For proper installation and licensing the Pod will require access to the Public Internet. For initial configuration of the Top of Rack ASR 9001 Router and Nexus 9300 Series switch it is anticipated that the customer will provide a Terminal Server. A separate Gigabit Ethernet Switch will also be required for connecting the optionally included ISR 1941 CPE's.

This section identifies each item and its purpose.

Terminal Server

It is recommended that the customer provide a terminal server for remote console connectivity the VMS Pod switch and routers. The terminal server should provide for a total of six (6) console connections inclusive of the Cisco Nexus 9300 switch, Cisco ASR 9001 router, and four (4) Cisco ISR 1900 Series CPEs. For security it is also recommended that the connectivity with the terminal server be made via SSH.

Gigabit Ethernet Switch

It is recommended that the customer provide a Gigabit Ethernet switch for remote connectivity of the ISR 1941 CPE's. The ISR CPEs are not directly attached to the Top of Rack Nexus Switch as the CPE would typically be remote and connect to the VMS Pod through the Pod uplink. This allows for CPE connectivity to the VMS Pod as expected in a Production deployment, as well as providing for the CPEs to be remotely tested.

The Management Ethernet interfaces of the Top of Rack ASR 9001 and Nexus 9300 Series Switch may also be connected to the Service Provider's management network for remote management, if desired.

The Gigabit Ethernet switch should provide for at least six (6) Gigabit Ethernet interfaces to connect with the four (4) ISR 1941 CPE's and (2) Management Ethernet interfaces of the Top of Rack switch and router.

Supported Transceivers & Required Cables

As noted previously, the Virtual Managed Services Pod does not include the transceivers or cables necessary for connectivity. This is done to allow the customer the flexibility to determine whether to utilize copper or fiber cabling in these particular connections.

The VMS Pod utilizes both copper and fiber cables. [Table 1-6](#) identifies each link, the device cabling types, and required cable counts. The Interface Type column identifies whether the device interface is fixed or will require a transceiver (identified as SFP or SFP+).

Where a transceiver is required, the Cabling Type column will indicate the cabling options available. However, recognize that the connection between ASR 9001 and Nexus 9396PX requires a Fiber based transceiver.

[Table 1-7](#) and [Table 1-8](#) identify the 1G and 10G transceivers to be used in the VMS Pod. The customer should select from these recommended transceivers.

At the end of this section are links to a complete list of compatible transceivers for each platform. If you will be using a transceiver not identified in the list of recommended transceivers, ensure that a compatible transceiver is also available for the adjacent connected device.

Table 1-6 Device Cabling Options and Counts

Link ID	Connection Purpose	Device A	Device B	Speed	Interface Type	Cabling Type	Cable Count
1	Router & Switch Management (Console)	ASR 9001	Terminal Server	-	Fixed RJ45	Copper RJ45	6
2		Nexus 9396PX					
3-6		ISR 1941 (1-4)					
7	R&S Mgmt (Ethernet)	ASR 9001	Gigabit Ethernet Switch	1 Gb/s	Fixed RJ45	Copper RJ45	6
8		Nexus 9396PX					
9-12		ISR 1941 (1-4)					
13-22	Data	UCS C220-M4 (1-5)	Nexus 9396PX	10 Gb/s	SFP+	Copper or Fiber	16
23-28		UCS C240-M4 (1-3)		1 Gb/s	N9K: SFP UCS: Fixed RJ45	Copper RJ45	16
29-38	OpenStack Installation & Management	UCS C220-M4 (1-5)	Nexus 9396PX	1 Gb/s	N9K: SFP UCS: Fixed RJ45	Copper RJ45	16
39-44		UCS C240-M4 (1-3)					
45-49	UCS CIMC	UCS C220-M4 (1-5)	Nexus 9396PX	1 Gb/s	N9K: SFP UCS: Fixed RJ45	Copper RJ45	8
50-52		UCS C240-M4 (1-3)					
53-54	Data	ASR 9001	Nexus 9396PX	10 Gb/s	SFP+	Fiber	2
55		Customer Lab Router (for Internet Access)		1/10 Gb/s	SFP/SFP+	Copper or Fiber	1



Note

Refer to [Chapter 2, “Component Installation”](#) for corresponding device cable mapping details.

Table 1-7 Recommended 1 Gb/s SFP Transceivers

1 Gb/s SFP Transceivers				
Link ID	Device	Recommended Transceivers	Description	Type
29-44, 55	Nexus 9396PX	SFP-GE-T=	1000BASE-T SFP transceiver module for Category 5 copper wire, extended operating temperature range, RJ-45 connector	Copper
		GLC-T=	1000BASE-T SFP transceiver module for Category 5 copper wire, RJ-45 connector	Copper
		GLC-SX-MMD=	1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, extended operating temperature range and DOM support, dual LC/PC connector	Fiber
		GLC-SX-MM=	1000BASE-SX SFP transceiver module for MMF, 850-nm wavelength, dual LC/PC connector	Fiber

**Note**

Refer to [Chapter 2, “Component Installation”](#) for corresponding device cable mapping details.

Table 1-8 Recommended 10 Gb/s SFP+ Transceivers

10 Gb/s SFP+ Transceivers				
Link ID	Device	Recommended Transceivers	Description	Type
13-28, 55	Nexus 9396PX	SFP-10G-SR=	10GBASE-SR SFP+ transceiver module for MMF, 850-nm wavelength, LC duplex connector	Fiber
13-28	VIC 1227 on UCS C220/C240	SFP-H10GB-CU3M=	3-m 10G SFP+ Twinax cable assembly, passive ¹	Copper
13-28		SFP-H10GB-CU5M=	5-m 10G SFP+ Twinax cable assembly, passive	Copper
53-54	ASR 9001	SFP-10G-SR=	10GBASE-SR SFP+ transceiver module for MMF, 850-nm wavelength, LC duplex connector	Fiber

1. SFP-H10GB-CU3M. Depending upon the location of the UCS relative to the N9K in the rack, three (3) meter might not provide sufficient length to reach the bottom three (3) UCS through cable management.

Table 1-9 and Table 1-10 provide an example SFP/SFP+ materials list based upon either fiber or copper selection.

Table 1-9 Example Fiber Option Configuration and Cable Count

Link ID	SFP/SFP+	SFP+ Count	Speed	Cable Type (Connector Type)	Length	Cable Count
1-6	-	-	-	CAT5E (RJ45)	-	6
7-12	-	-	1 Gb/s	CAT5E (RJ45)	-	6
13-28	SFP-10G-SR=	32	10 Gb/s	MMF (LC)	4m	16
29-52	SFP-GE-T=	27	1 Gb/s	CAT5E (RJ45)	4m	24
53-54	SFP-10G-SR=	4	10 Gb/s	MMF (LC)	2m	2
55	SFP-10G-SR=	2	10 Gb/s	MMF (LC)	-	1

Table 1-10 Example Copper Option Configuration and Cable Count

Link ID	SFP/SFP+	SFP/SFP+ Count	Speed	Cable Type (Connector Type)	Length	Cable Count
1-6	-	-	-	CAT5E (RJ45)	-	6
7-12	-	-	1 Gb/s	CAT5E (RJ45)	-	6
13-28	SFP-H10GB-CU5M=	32	10 Gb/s	Twinax, passive, 30AWG	5m	16
29-52	SFP-GE-T=	27	1 Gb/s	CAT5E (RJ45)	4m	24
53-54	SFP-10G-SR=	4	10 Gb/s	MMF (LC)	2m	2
55	SFP-GE-T=	2	1 Gb/s	CAT5E (RJ45)	-	1

A complete list of compatible Transceivers can be found in the documents by following the URL links below.

- [Cisco Transceiver Modules Compatibility Information for the Routers and Switches](#) identified in the opening of this chapter.
- [Cisco UCS Virtual Interface Card 1227 Data Sheet](#)

Environmental Requirements

The following sections detail hardware environmental requirements

Operating Temperature and Humidity

Table 1-11 lists the operating temperature and humidity requirements for each product in the VMS Pod. Based upon this data the VMS Pod Operating Temperature is 5-35C (41-95F) and 10-85% non-condensing humidity.

Table 1-11 Equipment Operating Temperature and Humidity

Device	Operating Temperature	Operating Humidity
Cisco UCS-C220-M4S Cisco UCS-C240-M4SX	5-35C (41-95F)	10-90% non-condensing
Cisco Nexus 9396PX	0-40C (32-104F)	5-95% non-condensing
Cisco ASR-9001	5-40C (41-104F)	10-85% Relative Humidity
Cisco 1941 ISR	0-40C (32-104F)	10-85% Relative Humidity

Airflow

The VMS Pod rack equipment layout is designed with consideration of front-to-back airflow. The front side of the rack would be positioned facing the cool aisle while the rear side of the rack is facing the hot aisle ([Figure 2-1](#)).

The Cisco ASR 9001 Router with Air Plenum, as well as the Cisco UCS C220 and C240 Servers, are designed for front-to-back airflow. Therefore:

- The Cisco ASR 9001 Router must be mounted on the front side of the rack (with interfaces accessible from the rack front side).
- The Cisco UCS C220 and C240 Series Servers must be mounted with the Hard Disk Drives facing the front side of the rack (with interfaces accessible from the rack rear side).

The Cisco Nexus 9396PX Switch has two possible airflow options. By default, the VMS materials list includes the N9K port-side exhaust fans and power supply (noted by the blue colorings on the fans and power supply modules). Therefore, the Cisco Nexus 9396PX Switch must be mounted on the rear side of the rack (with interfaces accessible from the rack rear side). It is important to note that the Cisco Nexus 9396PX Switch should be mounted at a level which is below the Cisco ASR 9001 Router so as not to be in the exhaust path of the Cisco ASR 9001 Router.

The Cisco 1941 ISR Router airflow is front-to-side (ingress at front; egress at sides). Therefore, if the Cisco 1941 ISR Router will be placed inside the rack care must be taken to position the Cisco 1941 ISR facing the front of the rack (interfaces accessible from the rack back side).

Airflow details and notices for each piece of equipment in the VMS Pod are discussed below.

Cisco UCS C220/C240 Series Server Airflow

All Cisco UCS C-Series rack servers are shipped with rail kits and are expected to be rack-mounted. To ensure proper airflow it is necessary to rack the servers using the provided rail kits. Physically placing the units on top of one another or “stacking” without the use of the rail kits blocks the air vents on top of the servers, which could result in overheating, higher fan speeds, and higher power consumption. It is recommended that you mount your servers on the rail kits when installing them into the rack because these rails provide the minimal spacing required between the servers. No additional spacing between the servers is required when you mount the units using the provided rail kits.

Ensure that there is adequate space around the server to allow for servicing the server and for adequate airflow. The airflow in these servers is from front to back.

Cisco ASR 9001 Series Router Airflow

The VMS Pod includes the Cisco ASR 9001 Router optional air plenum kit (PID ASR-9001-PLENUM=) that converts the chassis from side-to-side ventilation to front-to-back ventilation.

Do not install the Cisco ASR 9001 Router in any type of fully-enclosed rack that does not have the required perforated sides or doors; the router requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of fully-enclosed rack without proper perforation could disrupt the air flow, trap heat next to the chassis, and cause an over-temperature condition inside the router.

To install a Cisco ASR 9001 Router in a 4-post enclosed cabinet, the front and rear doors of the cabinet must be removed or be perforated with a minimum of 65% open area (70% for ETSI 800mm racks).

If the ASR 9001 Router air plenum kit will not be installed, pay strict attention to the airflow guidelines identified in the “Chassis Air Flow Guidelines” contained in the “Preparing for Installation” section of the [“Cisco ASR 9001 and Cisco ASR 9001-S Routers Hardware Installation Guide”](#).

Cisco Nexus 9300 Series Switch Airflow

The Cisco Nexus 9300 Series switch is designed to be positioned with its ports in either the front or the rear of the rack depending on your cabling and maintenance requirements. Depending on which side of the switch faces the cold aisle, you must have fan and power supply modules that move the coolant air from the cold aisle to the hot aisle in one of the following ways:

- Port-side exhaust airflow—Coolant air enters the chassis through the fan and power supply modules in the cold aisle and exhausts through the port end of the chassis in the hot aisle.
- Port-side intake airflow—Coolant air enters the chassis through the port end in the cold aisle and exhausts through the fan and power supply modules in the hot aisle.

You can identify the airflow direction of each fan and power supply module as follows:

- Fan and AC power supply modules:
 - Blue coloring for port-side exhaust airflow
 - Burgundy coloring for port-side intake airflow
- DC power supply modules have port-side intake airflow and green colored release levers

Cisco 1941 ISR Router Airflow

The Cisco 1940 ISR Series airflow is front-to-side (ingress at front; egress at sides). For details refer to [Cisco 1941 ISR Chassis Airflow Diagram \(4-2\)](#).

