Cisco UCS Scale-Up Solution for SAP HANA on Cisco UCS M5 Rack Servers with Red Hat Enterprise Linux for SAP Applications

Design and deploy an SAP HANA solution based on standalone Cisco UCS C-Series M5 rack servers with Red Hat Enterprise Linux 7.6 for SAP Applications



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Executive summary

Organizations in every industry are generating and using more data than ever before: from customer transactions and supplier delivery information to real-time user-consumption statistics. Without reliable infrastructure that can store, process, and analyze big data sets in real time, companies cannot use this information to their advantage. The Cisco® Scale-Up Solution for SAP HANA with the Cisco Unified Computing System™ (Cisco UCS®) using the Cisco UCS M5 rack server helps companies more easily harness information and make better business decisions that let them stay ahead of the competition. Our solutions help improve access to all your data to accelerate business decision making with policy-based, simplified management, lower deployment risk, and reduced total cost of ownership (TCO). Our innovations help enable you to unlock the intelligence in your data and interpret it with a new dimension of context and insight to help you gain a sustainable, competitive business advantage.

The Cisco solution for SAP HANA with the Cisco UCS C-Series M5 rack-mount server provides a robust platform for SAP HANA workloads in a single node.

Solution overview

This section introduces the solution discussed in this document.

Introduction

The Cisco UCS C480 M5 Rack Server supports the SAP HANA scale-up solution with prevalidated, ready-to-deploy infrastructure. Solution configuration and validation requires less time and is less complex than with a traditional data center deployment. The reference architecture discussed in this document demonstrates the resiliency and ease of deployment of an SAP HANA solution.

SAP HANA is SAP's implementation of in-memory database (IMDB) technology. The SAP HANA database takes advantage of the low-cost main memory (RAM), faster access, and data-processing capabilities of multicore processors to provide better performance for analytical and transactional applications. SAP HANA offers a multiple-engine, query-processing environment that supports relational data (with both row- and column-oriented physical representations in a hybrid engine) as well as graph and text processing for semistructured and unstructured data management within the same system. SAP HANA combines software components from SAP optimized for certified hardware. However, this solution has a preconfigured hardware setup and preinstalled software package that is dedicated to SAP HANA.

SAP HANA Tailored Datacenter Integration (TDI) offers a more open and flexible way to integrate SAP HANA into the data center by reusing existing enterprise storage hardware, thereby reducing hardware costs. With the introduction of SAP HANA TDI for shared infrastructure, the Cisco UCS Integrated Infrastructure solution provides the advantages of an integrated computing, storage, and network stack and the programmability of Cisco UCS. SAP HANA TDI enables organizations to run multiple SAP HANA production systems on a shared infrastructure. It also enables customers to run SAP application servers and an SAP HANA database hosted on the same infrastructure.

For more information about SAP HANA, see the SAP help portal: http://help.sap.com/hana/.

Audience

The intended audience for this document includes sales engineers, field consultants, professional services staff, IT managers, partner engineers, and customers deploying the Cisco solution for SAP HANA. External references are provided wherever applicable, but readers are expected to be familiar with the technology, infrastructure, and database security policies of the customer installation.

Purpose of this document

This document describes the steps required to deploy and configure a Cisco data center solution for SAP HANA. This document showcases one of the variants of Cisco's solution for SAP HANA. Although readers of this document are expected to have sufficient knowledge to install and configure the products used, configuration details that are important to the deployment of this solution are provided in this document.

What's new in this release?

Design and deploy a SAP HANA scale-up solution based on the standalone Cisco UCS C480 M5 Rack Server with Red Hat Enterprise Linux (RHEL) 7.6 for SAP Applications.

Solution summary

This section briefly describes the components of the solution.

Cisco UCS C480 M5 Rack Server

The Cisco Scale-Up Solution for SAP HANA uses the Cisco UCS C480 M5 Rack Server. Tables 1, 2, and 3 summarize the server specifications and show proposed disk configurations for the SAP HANA use case.

 Table 1.
 Overview of Cisco UCS C480 M5 Rack Server configuration

Item	Description		
CPU specifications	.2.70-GHz Intel® Xeon® Platinum 8280L processor: Quantity 2 or 4		
Possible memory configurations	Analytics: SAP Business Suite on SAP HANA (SoH): • 16-GB DDR4: Quantity 12 (192 GB) • 16-GB DDR4: Quantity 12 (192 GB) • 32-GB DDR4: Quantity 12 (384 GB) • 32-GB DDR4: Quantity 12 (384 GB) • 32-GB DDR4: Quantity 24 (768 GB) • 32-GB DDR4: Quantity 24 (768 GB) • 64-GB DDR4: Quantity 24 (1.5 TB) • 64-GB DDR4: Quantity 24 (1.5 TB) • 128-GB DDR4: Quantity 24 (3 TB) • 128-GB DDR4: Quantity 24 (3 TB)		
Hard-disk drive (HDD) type and quantity	 Any of the following: 1.8-TB 10,000-rpm SAS drive: Quantity 20 3.8-TB solid-state disk (SSD): Quantity 8 3.8-TB SSD: Quantity 3 (up to 1.5-TB memory configurations) 		
BIOS	C480M5.4.0.4b.0.0407190307		
Cisco Integrated Management Controller (IMC) firmware	4.0(4b)		
LSI MegaRAID controller	Cisco 12-Gbps SAS modular RAID controller		
Network card	Cisco UCS Virtual Interface Card (VIC) 1385: Quantity 1 • For 10-Gbps connectivity: Onboard Intel 1 Gigabit Ethernet controller: Quantity 2 • Onboard Intel 10BASE-T Ethernet controller: Quantity 2		
Power supply	Redundant power supplies: Quantity 4		

Table 2. Cisco UCS C480 M5 proposed disk layout

Disk	Disk type	Drive group	RAID level	Virtual drive
Slot (1 through 20)	SAS	DG0	50	VD0
	HDD			
Slot (1 through 8)	SSD	DG0	5	VD0
Slot (1 through 3; up to 1.5 TB of RAM)	SSD	DG0	5	VD0

Table 3. Cisco UCS C480 M5 proposed disk configuration

Drives used	RAID type	Used for	File system
Any of the following:	Any of the following:	Operating system	Ext3
 20 x 1.8-TB SAS HDD 8 x 3.8-TB SSD 	 RAID 50 RAID 5 	Data file system	XFS
• 3 x 3.8-TB SSD	• RAID 5 • RAID 5	Log file system	XFS
		SAP HANA shared file system	XFS

Cisco UCS C240 M5 Rack Server

The Cisco Scale-Up Solution for SAP HANA can also be deployed on the Cisco UCS C240 M5 Rack Server. Tables 4, 5, and 6 summarize the server specifications and show proposed disk configurations for the SAP HANA use case.

Table 4.	Overview of Cisco UCS C240 M5 Rack Server configuration

Item	Description
CPU specifications	2.70-GHz Intel Xeon Platinum 8280L processor: Quantity 2
Possible memory configurations	Analytics: • 16-GB DDR4: Quantity 12 (192 GB) • 32-GB DDR4: Quantity 12 (384 GB) • 32-GB DDR4: Quantity 24 (768 GB) • 64-GB DDR4: Quantity 24 (1.5 TB) • 128-GB DDR4: Quantity 24 (3 TB)
HDD type and quantity	 Any of the following: 1.8-TB 10,000-rpm SAS drive: Quantity 20 3.8-TB SSD: Quantity 8 3.8-TB SSD: Quantity 8 3.8-TB SSD: Quantity 3 (for up to 1.5-TB memory configurations)
BIOS	C480M5.4.0.4b.0.0407190307
Cisco IMC firmware	4.0(4b)
Network card	Cisco UCS VIC 1385: Quantity 1 For 10-Gbps connectivity: • Onboard Intel 1 Gigabit Ethernet controller: Quantity 2 • Onboard Intel 10BASE-T Ethernet controller: Quantity 2
Power supply	Redundant power supplies: Quantity 2

Table 5. Cisco UCS C240 M5 proposed disk layout

Disk	Disk type	Drive group	RAID level	Virtual drive
Slot (1 through 20)	SAS	DG0	50	VD0
	HDD			
Slot (1 through 8)	SSD	DG0	5	VD0
Slot (1 through 3; up to 1.5 TB of RAM)	SSD	DG0	5	VDO

Table 6. Cisco UCS C240 M5 proposed disk configuration

Drives used	RAID type	Used for	File system
Any of the following:	Any of the following:	Operating system	Ext3
 20 x 1.8-TB SAS HDD 8 x 3.8-TB SSD 	 RAID 50 RAID 5 	Data file system	XFS
• 3 x 3.8-TB SSD	• RAID 5	Log file system	XFS
		SAP HANA shared file system	XFS

Cisco UCS C220 M5 Rack Server

The Cisco Scale-Up Solution for SAP HANA can also be deployed on the Cisco UCS C220 M5 Rack Server. Tables 7, 8, and 9 summarize the server specifications and show proposed disk configurations for the SAP HANA use case.

Table 7. Overview of Cisco UCS C220 M5 Rack Server configuration

Item	Description
CPU specifications	2.70-GHz Intel Xeon Platinum 8280L processor: Quantity 2
Possible memory configurations	Analytics: • 16-GB DDR4: Quantity 12 (192 GB) • 32-GB DDR4: Quantity 12 (384 GB) • 32-GB DDR4: Quantity 24 (768 GB) • 64-GB DDR4: Quantity 24 (1.5 TB) • 128-GB DDR4: Quantity 24 (3 TB)
HDD type and quantity	Any of the following:3.8-TB SSD: Quantity 83.8-TB SSD: Quantity 3 (for up to 1.5-TB memory configurations)
BIOS	C480M5.4.0.4b.0.0407190307
Cisco IMC firmware	4.0(4b)
Network card	Cisco UCS VIC 1385: Quantity 1 For 10-Gbps connectivity: • Onboard Intel 1 Gigabit Ethernet controller: Quantity 2 • Onboard Intel 10BASE-T Ethernet controller: Quantity 2
Power supply	Redundant power supplies: Quantity 2

Table 8. Cisco UCS C220 M5 proposed disk layout

Disk	Disk type	Drive group	RAID level	Virtual drive
Slot (1 through 8)	SSD	DG0	5	VD0
Slot (1 through 3; up to 1.5 TB of RAM)	SSD	DG0	5	VD0

Table 9. Cisco UCS C220 M5 proposed disk configuration

Drives used	RAID type	9	Used for	File system	
Any of the following:		Any of the fo	llowing:	Operating system	Ext3
 8 x 3.8-TB SSD 3 x 3.8-TB SSD 		 RAID 5 RAID 5 		Data file system	XFS
• 3 × 3.0 TD 30D		I NAID 5	RAID 5	Log file system	XFS
				SAP HANA shared file system	XFS

Infrastructure overview

The Cisco Scale-Up Solution for SAP HANA uses the Cisco UCS M5 generation of Cisco UCS C-Series Rack Servers.

Cisco UCS C480 M5 Rack Server

The Cisco UCS C480 M5 Rack Server (Figure 1) can be deployed as a standalone server or in a Cisco UCS managed environment. When used in combination with Cisco UCS Manager, the C480 M5 brings the power and automation of unified computing to enterprise applications, including Cisco SingleConnect technology, drastically reducing switching and cabling requirements. Cisco UCS Manager uses service profiles, templates, and policy-based management to enable rapid deployment and help ensure deployment consistency. It also enables end-to-end server visibility, management, and control in both virtualized and bare-metal environments.

The C480 M5 is a storage- and I/O-optimized enterprise-class rack server that delivers industry-leading performance for:

- IMDBs
- Big data analytics
- Virtualization and virtual desktop infrastructure (VDI) workloads
- Bare-metal applications

It delivers outstanding levels of expandability and performance for standalone or Cisco UCS managed environments in a 4-rackunit (4RU) form factor. And because of its modular design, you pay for only what you need.

The C480 M5 offers these capabilities:

- Latest Intel Xeon Scalable processors with up to 28 cores per socket and support for two- or four-processor configurations
- 2933-MHz DDR4 memory and 48 DIMM slots for up to 6 TB of total memory
- 12 PCI Express (PCIe) 3.0 slots
- Six x8 full-height, full-length slots
- Six x16 full-height, full-length slots
- Flexible storage options with support up to 32 small-form-factor (SFF) 2.5-inch, SAS, SATA, and PCIe Non-Volatile Memory Express (NVMe) disk drives
- Cisco 12-Gbps SAS modular RAID controller in a dedicated slot
- Internal Secure Digital (SD) and M.2 boot options
- Dual embedded 10 Gigabit Ethernet LAN-on-motherboard (LOM) ports

Figure 1. Cisco UCS C480 M5 Rack Server



Cisco UCS C240 M5 Rack Server

The Cisco UCS C240 M5 Rack Server (Figure 2) is a 2-socket, 2RU rack server offering industry-leading performance and expandability. It supports a wide range of storage and I/O-intensive infrastructure workloads, from big data and analytics to collaboration. Cisco UCS C-Series Rack Servers can be deployed as standalone servers or as part of a Cisco UCS managed environment to take advantage of Cisco's standards-based unified computing innovations that help reduce customers' TCO and increase their business agility.

In response to ever-increasing computing and data-intensive real-time workloads, the enterprise-class C240 M5 server extends the capabilities of the Cisco UCS portfolio in a 2RU form factor. It incorporates the Intel Xeon Scalable processors, supporting up to 20 percent more cores per socket, twice the memory capacity, and five times more NVMe PCle SSDs than the previous generation of servers. These improvements deliver significant performance and efficiency gains that will improve your application performance. The C240 M5 delivers outstanding storage expandability with exceptional performance, with:

- Latest Intel Xeon Scalable CPUs with up to 28 cores per socket
- Up to 24 DDR4 DIMMs for improved performance
- Intel 3D XPoint-ready support, with built-in support for next-generation nonvolatile memory technology
- Up to 26 hot-swappable SFF 2.5-inch drives, including 2 rear hot-swappable SFF drives (up to 10 support NVMe PCIe SSDs on the NVMe-optimized chassis version), or 12 large-form-factor (LFF) 3.5-inch drives plus 2 rear hot-swappable SFF drives
- Support for a 12-Gbps SAS modular RAID controller in a dedicated slot, leaving the remaining PCIe Generation 3.0 slots available for other expansion cards
- Modular LOM (mLOM) slot that can be used to install a Cisco UCS VIC without consuming a PCIe slot, supporting dual 10or 40-Gbps network connectivity
- Dual embedded Intel x550 10GBASE-T LOM ports
- Modular M.2 or SD cards that can be used for bootup
- High performance for data-intensive applications

The Cisco UCS C240 M5 Rack Server is well-suited for a wide range of enterprise workloads, including:

- Big data and analytics
- Collaboration
- Small and medium-sized business (SMB) databases
- Virtualization and consolidation
- Storage servers
- High-performance appliances

C240 M5 servers can be deployed as standalone servers or in a Cisco UCS managed environment. When used in combination with Cisco UCS Manager, the C240 M5 brings the power and automation of unified computing to enterprise applications, including Cisco SingleConnect technology, drastically reducing switching and cabling requirements.

Cisco UCS Manager uses service profiles, templates, and policy-based management to enable rapid deployment and help ensure deployment consistency. If also enables end-to-end server visibility, management, and control in both virtualized and bare-metal environments.

Figure 2. Cisco UCS C240 M5 Rack Server



Cisco UCS C220 M5 Rack Server

The Cisco UCS C220 M5 Rack Server (Figure 3) is among the most versatile general-purpose enterprise infrastructure and application servers in the industry. It is a high-density 2-socket rack server that delivers industry-leading performance and efficiency for a wide range of workloads, including virtualization, collaboration, and bare-metal applications. The Cisco UCS C-Series Rack Servers can be deployed as standalone servers or as part of Cisco UCS to take advantage of Cisco's standards-based unified computing innovations that help reduce customers' TCO and increase their business agility.

The Cisco UCS C220 M5 server extends the capabilities of the Cisco UCS portfolio in a 1RU form factor. It incorporates the Intel Xeon Scalable processors, supporting up to 20 percent more cores per socket, twice the memory capacity, 20 percent greater storage density, and five times more PCIe NVMe SSDs than the previous generation of servers. These improvements deliver significant performance and efficiency gains that will improve your application performance. The C220 M5 server delivers outstanding levels of expandability and performance in a compact package, with:

- Latest Intel Xeon Scalable CPUs with up to 28 cores per socket
- Up to 24 DDR4 DIMMs for improved performance
- Intel 3D XPoint-ready support, with built-in support for next-generation nonvolatile memory technology
- Up to 10 SFF 2.5-inch drives or 4 LFF 3.5-inch drives (77 TB of storage capacity with all NVMe PCIe SSDs)
- Support for a 12-Gbps SAS modular RAID controller in a dedicated slot, leaving the remaining PCIe Generation 3.0 slots available for other expansion cards
- mLOM slot that can be used to install a Cisco UCS VIC without consuming a PCIe slot, supporting dual 10- or 40-Gbps network connectivity
- Dual embedded Intel x550 10GBASE-T LOM ports
- High performance for data-intensive applications

The Cisco UCS C220 M5 Rack Server is well-suited for a wide range of enterprise workloads, including:

- Big data and analytics
- Collaboration
- SMB databases
- Virtualization and consolidation
- Storage servers
- High-performance appliances

C220 M5 servers can be deployed as standalone servers or in a Cisco UCS managed environment. When used in combination with Cisco UCS Manager, the C220 M5 brings the power and automation of unified computing to enterprise applications, including Cisco SingleConnect technology, drastically reducing switching and cabling requirements.

Cisco UCS Manager uses service profiles, templates, and policy-based management to enable rapid deployment and help ensure deployment consistency. If also enables end-to-end server visibility, management, and control in both virtualized and bare-metal environments.

Figure 3. Cisco UCS C220 M5 Rack Server



Solution design

This section describes the SAP HANA system requirements defined by SAP and the architecture of the Cisco UCS solution for SAP HANA.

SAP HANA system

An SAP HANA scale-up system on a single server is the simplest of the SAP HANA installation types. You can run an SAP HANA system entirely on one host and then scale the system up as needed. All data and processes are located on the same server and can be accessed locally. For this option the network must have at least one 1 Gigabit Ethernet access network and one 10 Gigabit Ethernet storage network.

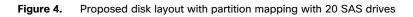
Hardware requirements for the SAP HANA database

SAP defines hardware and software requirements for running SAP HANA systems. For the latest information about the CPU and memory configurations supported for SAP HANA, see https://www.sap.com/dmc/exp/2014-09-02-hana-hardware/enEN/appliances.html.

Note: This document does not cover the updated information published by SAP. Additional information is available at http://saphana.com.

File system layout

Figures 4, 5, and 6 show the file system layouts and the storage sizes required to install and operate SAP HANA. When installing SAP HANA on a host, specify the mount point for the installation binaries (/hana/shared/<SID>), data files (/hana/data/<sid>), and log files (/hana/log/<sid>), where sid is the instance identifier of the SAP HANA installation.



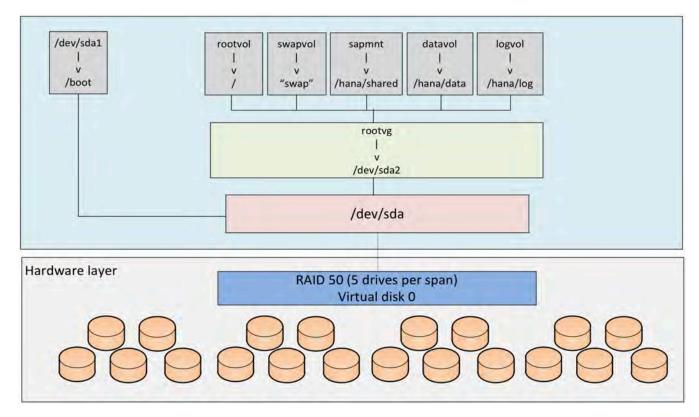
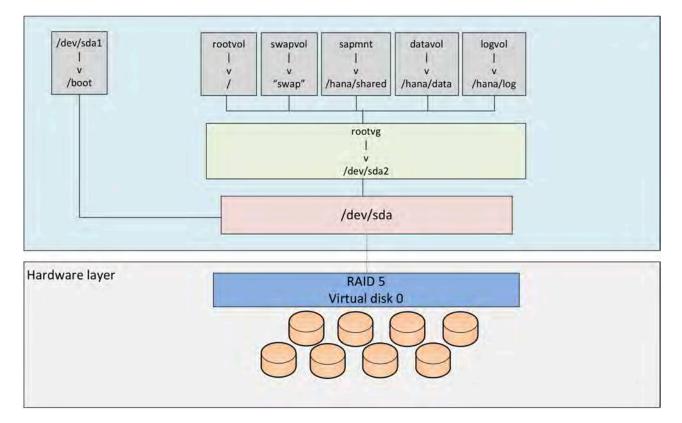


Figure 5. Proposed disk layout with partition mapping with 8 SSD drives



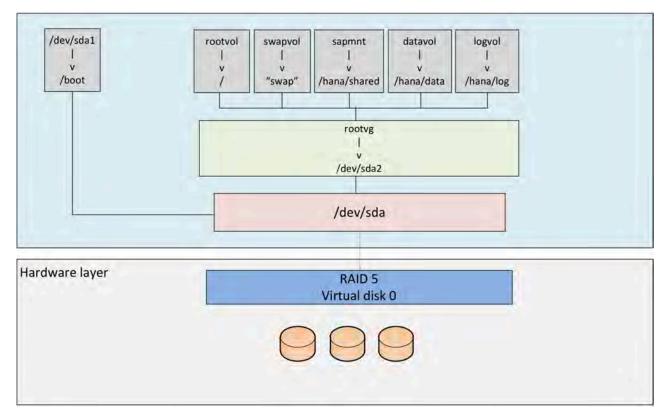


Figure 6. Proposed disk layout with partition mapping with 3 SSD drives (up to 1.5-TB memory configurations)

The storage size for the file system is based on the amount of memory on the SAP HANA host. Here are some sample file system sizes for a single-node system with 3 TB of memory:

- /hana/shared: 1 x memory (3 TB)
- /hana/data: 3 x memory (9 TB)
- /hana/log: 1 x memory (512 GB)

Note: For solutions based on the Intel Xeon Platinum processor, the size of the log volume (/hana/log) must be as follows:

- Half of the server memory for systems of 256 GB of memory or less
- Minimum of 512 GB for systems with 512 GB of memory or more

Operating system

SAP HANA supports the following operating systems:

- SUSE Linux Enterprise Server (SLES) for SAP Applications
- Red Hat Enterprise Linux (RHEL) for SAP Applications

Note: This document provides installation steps for RHEL 7.6 for SAP.

Deployment hardware and software

This section is intended to enable you to fully configure the customer environment. In this process, various steps require you to insert customer-specific naming conventions, IP addresses, and VLAN schemes, as well as to record appropriate MAC addresses. Table 10 lists the configuration variables that are used throughout this document. You can complete this table using your specific site variables and use it in implementing the configuration steps presented in this document.

Table 10. Configuration variables

Variable	Description	Customer implementation value
< <var_cimc_ip_address>></var_cimc_ip_address>	Cisco UCS C480 M5 server's IMC IP address	
< <var_cimc_ip_netmask>></var_cimc_ip_netmask>	Cisco UCS C480 M5 server's IMC network netmask	
< <var_cimc_gateway_ip>></var_cimc_gateway_ip>	Cisco UCS C480 M5 server's IMC network gateway IP address	
< <var_raid50_vd_name>></var_raid50_vd_name>	Name for virtual drive VD0 during RAID configuration	
< <var_hostname.domain>></var_hostname.domain>	SAP HANA node's fully qualified domain name (FQDN)	
< <var_sys_root-pw>></var_sys_root-pw>	SAP HANA node's root password	
< <var_lvm_vg_name>></var_lvm_vg_name>	SAP HANA node's OS logical volume management (LVM) volume group name	
< <var_mgmt_ip_address>></var_mgmt_ip_address>	SAP HANA node's management and administration IP address	
< <var_mgmt_nw_netmask>></var_mgmt_nw_netmask>	SAP HANA node's management network netmask	
< <var_mgmt_gateway_ip>></var_mgmt_gateway_ip>	Cisco UCS C480 M5 server's management and administrative network gateway IP address	
< <var_mgmt_netmask_prefix>></var_mgmt_netmask_prefix>	Netmask prefix in Classless Inter-Domain Routing (CIDR) notation	

Preparing the SAP HANA scale-up node

This section discusses how to prepare the SAP HANA scale-up node for the SAP HANA installation.

Configuring the Cisco Integrated Management Controller

To configure the on-board IMC, you should connect a keyboard, video, and mouse (KVM) switch to the server.

1. After everything is connected, turn on the power to the server (Figures 7 and 8).

Figure 7. BIOS POST screen

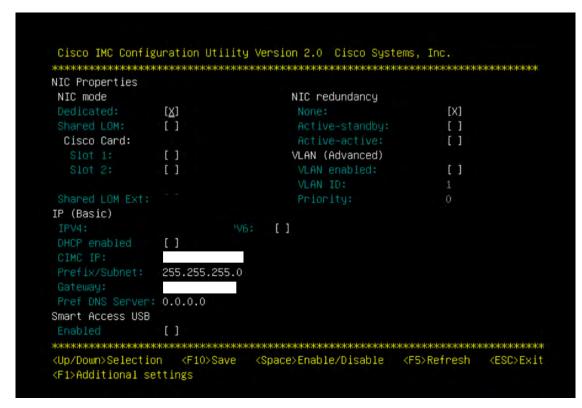
Clsco Systems, Inc. Configuring and testing memory		
Cisco IMC IPv4 : MAC ADDR : A8:B4:56:A3:ED:62		

Figure 8. Bios POST screen (continued)



2. Press F8 to display the IMC configuration (Figure 9).

Figure 9. Cisco UCS C480 IMC configuration view (local display)



- 3. Use the console network IP address <<var_cimc_ip_address>>, netmask <<var_cimc_ip_netmask>>, and gateway <<var_cimc_gateway>> for the IPv4 settings of the IMC. Select None for network interface card (NIC) redundancy.
- 4. Press F10 to save configuration and exit the utility.
- 5. Open a web browser on a computer on the same network with Java and Adobe Flash installed.
- 6. Enter the IMC IP address of the Cisco UCS C480 M5 server: <u>http://<<var_cimc_ip_address</u>>>.
- 7. Enter the login credentials as updated in the IMC configuration. The default user name and password are **admin** and **password** (Figure 10).

Figure 10. Cisco IMC login screen

allulti. cisco
C480-FCH2243W02V
Cisco Integrated Management Controller
Providence
49 2016 Clace Systems, Inc. Clace Date: Systems and Clace Systems loge are registered findements of Clace Systems, Inc. analysis and additions in the U.S. and constitute countries

Figure 11. Cisco IMC summary screen

E diada Cisco	Integrated Management Controll	er		÷ 0	0 admin@	C480-FCH2243W02V
/ Chassis / Sumr	mary 🔺			Refresh Host Power 1	aunch KVM Ping	CIMC Reboot Locator LED @
Server Propert	ties	Cisco Integrated M	anagement Contro	oller (Cisco IMC) Info	ormation	
Product Name: Serial Number:		Hostname: IP Address:	C480-FCH2243W02V			
UUID:	UCSC-C480-M5 68F3FE17-610D-4FF1-84FA-DACFE70EF29F	MAC Address: Firmware Version:				
Description:	C480M5.4.0.2.113.0109190734	Local Time:	Wed Jan 23 22:41:03 2019 Wed Jan 23 22:41:03 2019 0			
Asset Tag:	Unknown	Timezone:	UTC	Select Tr	mezone	
Overall Server S Temper Overall DIMM S	r State: Ch Status: C Good rature: C Good Status: G Good	Memory Utilizat	ion (%): N/A			
	pplies: 🗳 Good Fans: 🗳 Good or LED: 🖤 Off					
Overall Storage S						
					1	Save Changes Reset Values

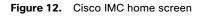
Figure 11 shows the results.

Launching the KVM console

You next need to launch the KVM console and map the RHEL 7.6 for SAP DVD ISO file for the installation.

1. Click Launch KVM in the top-left corner of the IMC home screen (Figure 12).

Starting with Cisco IMC Release 3.0, two options are available for launching the KVM: one using the Java console and another using the browser-based HTML KVM console. In this example, the HTML KVM console has been used.



😕 diale Cisco	Integrated Management Controll	er			admin@	C480-FCH2243W02V
A / Chassis / Sumn	nary 🕷		Refresh Host	Power Launch	KVM Ping C	MC Rebool Locator LED @ 0
Server Propert	ies	Cisco Integrated I	Management Controller (Cisco IM	Java based K	and the second se	
Product Name:	UCS C480 M5	Hostname:	C480-FCH2243W02V	PTIME Dased P	2010	
Serial Number:	FCH2243W02V	IP Address:				
PID:	UCSC-C480-M5	MAC Address:	A8:B4:56:A3:ED:62			
UUID:	68F3FE17-610D-4FF1-84FA-DACFE70EF29F	Firmware Version:	4.0(2.213)			
BIOS Version:	C480M5.4.0.2.113.0109190734	Current Time (UTC):	Wed Jan 23 22:43:46 2019			
Description:		Local Time:	Wed Jan 23 22:43:46 2019 UTC +0000			
Asset Tag:	Unknown	Timezone:	UTC	Select Timezone	é.	
Power : Overall Server St	State: On	Overall Utilizat				
	ature: 🖾 Good		ion (%): N/A			
	tatus: Sood	Memory Utilizat				
	oplies: Good	IO Utilizat	ion (%): N/A			
	Fans: Good					
	LED: Off					
Overall Storage St						

2. After you select the HTML-based console, a certificate confirmation window appears. Click the provided hyperlink to continue (Figure 13).

Figure 13. Click the hyperlink to load the KVM application

A Not secure https://	2068/cert_check_redirect.html?redirect_ur	l=https:///html/kvmViewer.html	
	KVI	en accepted. Click this link to continue loading the KVM client application: https://///////html/kvmViewer.html	

The KVM window will appear (Figure 14).

Figure 14. KVM window

Cisco Integrated Management Controller	udmn - C480-FCH2243W02V 🏩
File View Macros Tools Power BootDevice Vintum/Media Help	
Fie View Matrix Tools Peyer BootDevice Vetalli Media Her	
No Signal	

3. In the menu bar at the top of the KVM window, choose Virtual Media > Activate Virtual Devices > Map CD/DVD (Figure 15).

disco Integrated Management	Controller		admin - C480-FCH2243W02V 🏠
Pite View Macros Tools Power Boot Device Vi			admin - C400 + CH2243W02V
		No Signal	

Figure 15. Beginning the CD/DVD mapping process

4. Browse for the RHEL 7.6 for SAP DVD ISO file and click Map Drive (Figure 16).

Figure 16. Click Map Drive

cisco Integrated Management Controller	admin - C480-FCH2243W02V
File View Macros Tools Power Boot Device Virtual Media Help	

Configuring BIOS settings

You need to power on the server and configure some BIOS settings before proceeding with the RAID configuration.

1. From the menu bar at the top of the KVM window, choose Power > Power on System (Figure 17).

Figure 17. Power on the system

vijvute cisco Integrated Management Controller	admin C480 FCH2243W02V 🔅
File View Macros Tools Power Bool Device Writial Media Help	
Pie View Marcis Task Preet Boal Device Virtual Mode Point On System No Signal	

2. After the server has booted, press F2 to enter the BIOS menu (Figure 18).

Figure 18. Press F2

cisco
Copyright (c) 2019 Cisco Systems, Inc.
Press <f2> BIOS Setup : <f6> Boot Menu : <f7> Diagnostics Press <f8> CIMC Setup : <f12> Network Boot Bios Version : C480M5.4.0.2.113.0109190734 Platform ID : C480M5</f12></f8></f7></f6></f2>
Total Memory = 1536 GB Effective Memory = 1536 GB Memory Operating Speed 2 M.2 SWRAID configuration is not detected. Switching to AHCI mode.
Cisco IMC IPv4 Address : Cisco IMC MAC Address : A8:B4:56:A3:ED:62
Entering BIOS Setup

3. For a better keyboard experience, from the View menu select the on-screen keyboard (Figure 19).

Figure 19. On-screen keyboard

System BIOS Information Product Name Version Build Date	I	C480M	C480-M5 5.4.0.2.113 /2019 07:34:34	Set the Date. Use Tab to switch between Date elements, Default Ranges: Year: 1998-9999
Platform Information Processor PCH Info RC Revision	1		- CLX 80 S/PRQ - 1G - SI D11	Months: 1–12 Days: Dependent on month Range of Years may vary.
Memory Information Totai Memory Effective Memory Logged in as System Date System Time	a F		GB 1strator 01/23/2019]	++: Select Screen 14: Select Item Enter: Select +/-: Change Dot. F1: General Mein F9: Optimized Defaults
English £3c F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 Num * 1 2 2 4 5 6 7 8 9 - - Bksp 7 Tab 9 H e r t y u 1 0 p [] . 4 Caps a 5 f 9 j j k 1 ; Enter .1 shift z x c v b n n , ./ Shift 0 ctr1 win alt t t alt ctr1 shift .2 t ctr1 shift shift 0 ctr1 shift shift shift <t< th=""><th>8 5 2</th><th>* 9 6 5</th><th>n un x + + trrall trint Scrn</th><th>F10: Save & Reset System ESC: Exit K/N: Scroll help UP/DOWN</th></t<>	8 5 2	* 9 6 5	n un x + + trrall trint Scrn	F10: Save & Reset System ESC: Exit K/N: Scroll help UP/DOWN

4. From the BIOS menu, choose Boot Options > Boot Mode > UEFI Mode (Figure 20). This setting selects the Unified Extensible Firmware Interface (UEFI).

Figure 20. Choose UEFI Mode

Aptio Setup Utility Main Advanced Server Mgmt Sec	– Copyright (C) 2019 Americ unity Boot Options Save &	
Boot Configuration		Set either WEFI Boot mode or
Setup Prompt Timeout	3	Legacy Boot Mode. In UEFI Boot
Bootup NumLock State	[0n]	mode, only UEFI BootOptions, UEFI DpROM will load and
SecureBoot Support	Disabled	display. LEGACY BOOTOPTIONS
Boot Mode	(UEFI Mode)	and PCIOpROM will load and
CON Control	[Enabled]	execute in LEGACY mode.
Adaptive Memory Training	(Enabled]	
OptionROM Launch Optimization	[Enabled]	
BIOS Techlog Level	(Minimum]	
	Boot Mode	
Boot Option Priorities	UEFI Mode	
Boot Option #1	LEGACY Mode	
		++: Select Screen
Reading and an and a second	Co	11: Select Item
Boot Option #2	IUEFI: PXE IP4	Enter: Select
	Intel(R) Ethernet	+/-: Change Opt.
and the second	Controller X550]	F1: General Help
Boot Option #3	(UEFI: Built-in EFI	F9: Optimized Defaults
	She11]	F10: Save & Reset System
Boot Option #4	(UEFI: Cisco	ESC: Exit
	vKVM-Mapped vDVD1.24]	K/M: Scroll help UP/DOWN
		A DESCRIPTION OF THE REAL PROPERTY OF THE REAL PROP
Add New Boot Option		
Delete Boot Option		
And a grander was a series of		
Version 2.20.1274.	Copyright (C) 2019 American	Megatrends, Inc.

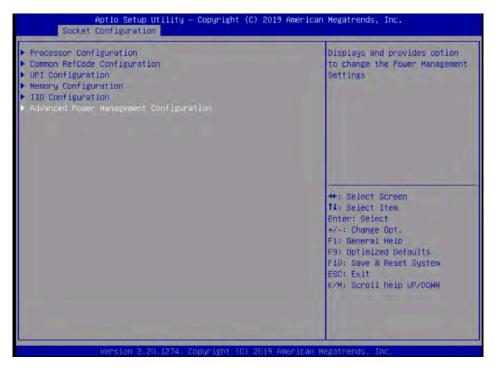
5. Disable the C-states of the CPU as recommended in the SAP for HANA requirements. From the BIOS menu, choose Advanced > Socket Configuration (Figure 21).

Figure 21. Choose Socket Configuration



6. Choose Advanced Power Management Configuration (Figure 22).

Figure 22. Choose Advanced Power Management Configuration



7. Choose CPU C State control and then disable the C-states as shown in Figure 23.

Aptio Setup Utility - Copyright (C) 2019 American Megatrends, Inc. CPU C State Control autonomous Core C-State Control Buttonomous Core C-State Control CPU C State Control autonomous Core C-State Control DPU C6 report CPU C State Control Buttonomous Core C-State Control CPU C State Control Autonomous Core C-State Control DPU C6 report DD C6 report DD C6 report DD C6 report DS ACPI Cx IACPI C2 #*: Select Screen H: Select Item Entrise Select form Entrise Select form Fil: Select Item Fil: Select Item Entrise Select System ESC: Exit K/M: Scroll belp UP/DOWN Version 2.20.1274, Copyright (C) 2019 American Megatrends, Inc. Version 2.20.1274, Copyright (C) 2019 American Megatrends, Inc.

Figure 23. Disabling C-states

8. After disabling the C-states, press F10 and save the BIOS settings.

Rebooting the server to implement BIOS changes

To make the boot options and CPU C-states take effect, reboot the server.

You are now ready to configure RAID.

Configuring RAID

This document covers all scale-up solutions with 2- and 4-socket configurations of the Cisco UCS M5 platform.

Table 11 lists the RAID options and the available platforms.

Table 11. RAID options

Platform	SAS (20 drives)	SSD (3 or 8 drives)
Cisco UCS C480	RAID 50	RAID 5
Cisco UCS C240	RAID 50	RAID 5
Cisco UCS C220	-	RAID 5

Table 12 lists the settings that you need to configure when you create the virtual drives.

Table 12. RAID settings

RAID settings	RAID 50	RAD 5
Stripe size	256	256 (8 SSDs or 20 SAS drives) 128 (3 SSDs)
Read policy	Read ahead	Read ahead
Write policy	Write back	Write back
I/O policy	Cached	Default

The following procedure shows the RAID 50 configuration with SAS drives on the Cisco UCS C480 M5 server used for SAP HANA.

The same procedure applies to the creation of RAID 5 virtual drives with SSD-based options except that the number of drives will be three or eight and the RAID level will be RAID 5.

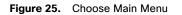
1. Boot the server and press F2 to enter the BIOS menu.

2. Navigate to Advanced and select the Avago MegaRAID utility to proceed with the RAID configuration (Figure 24).

Figure 24. Select Avago MegaRAID

 Trusted Computing Serial Port Console Redirection PCI Subsystem Settings USB Configuration LOM and PCIE Slots Configuration 	Manage RAID Controller Configurations.
 TIs Auth Configuration Network Stack Configuration ISCSI Configuration All Cpu Information LSI Software RAID Configuration Utility (SATA) AVAGO MegaRAID <cisco (max="" 12g="" 26="" 40b="" cache="" controller="" drives)="" modular="" raid="" with=""> Configuration Utility - 07.06.08.03</cisco> Intel(R) Ethernet Controller X550 - A8:B4:56:A3:ED:66 Intel(R) Ethernet Controller X550 - A8:B4:56:A3:ED:67 	++: Select Screen 1↓: Select Item Enter: Select
 Driver Health Platform Configuration Socket Configuration 	+/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN





		American Megatrends, Inc. er with 46B cache (max 26 drives)> Co
 Main Menu Help PROPERTIES Status Backplane BBU Enclosure Drives Drives Drive Groups Virtual Drives View Server Profile 	[Optimal] 0 [Yes] 1 8 0 0	Shows menu options such as Configuration Management, Controller Management, Virtual Drive Management, Drive Management and Hardware Components.
ACTIONS Configure Set Factory Defaults Update Firmware Silence Alarm BACKGROUND OPERATIONS Virtual Drive Operations in Progress Drive Operations in Progress MegaRAID ADVANCED SOFTWARE OPTI	None None ONS	<pre>++: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN </pre>

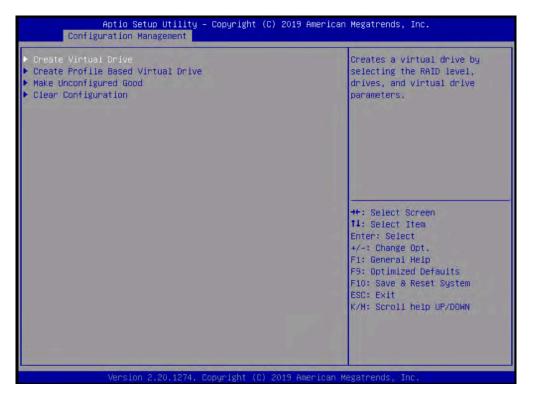
4. Choose Configuration Management (Figure 26).

Figure 26. Choose Configuration Management

Drive, Create Virtual Drive, Create CacheCade Virtual Drive, Make JBOD, Make Unconfigured Good, Clear	Virtual Drive Management Drive Management Hardware Components
configuration, Manage Foreig Configuration, View Drive ++: Select Screen fl: Select Item Enter: Select +/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN	
F10: Sav ESC: Exi	

5. Choose Create Virtual Drive (Figure 27).

Figure 27. Choose Create Virtual Drive



- Choose the following options to create a RAID 50 or RAID 5 virtual drive. With 20 disks, add five spans.
 a. For RAID Level, choose RAID 50 or RAID 5. [[SHOULD THE FIGURE SHOW RAID 50 SELECTED?]]
 - b. Choose Select Drives (Figure 28).

Figure 28. Choose RAID options

Aptio Setup Utility – Create Virtual Drive	Copyright (C) 2019 American	Megatrends, Inc.
 Save Configuration Select RAID Level Secure Virtual Drive Select Drives From Select Drives 	[RAID5] [Disabled] [Unconfigured Capacity]	Dynamically updates to display as Select Drives or Select Drive Group based on the selection made in Select Drives From.
CONFIGURE VIRTUAL DRIVE PARAMETERS: Virtual Drive Name Virtual Drive Size Virtual Drive Size Unit Strip Size Read Policy Write Policy I/O Policy Access Policy Drive Cache Disable Background Initialization Default Initialization Emulation Type ► Save Configuration	[GB] [64 KB] [No Read Ahead] [Write Through] [Direct] [Read/Write] [Unchanged] [No] [No] [Default]	<pre>**: Select Screen f4: Select Item Enter: Select +/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN</pre>
Version 2.20.1274. Co	pyright (C) 2019 American M	egatrends, Inc.

c. Choose Select Drives and then select the eight SSDs by choosing Enabled as shown in Figure 29.

Figure 29. Choose Enabled

Aptio Setup Utility - Select Drives	- Copyright (C) 2019 American	Megatrends,	Inc.
Drive Port 0 - 7:01:02: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	A	Selects all	drives.
Drive Port 0 – 7:01:03: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]			
Drive Port 0 – 7:01:04: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]			
Drive Port 0 – 7:01:05: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]			
Drive Port 0 – 7:01:06: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]		++: Select S ↑↓: Select I	
Drive Port 0 – 7:01:07: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]		Enter: Seleo +/–: Change F1: General	Opt. Help
Drive Port 0 – 7:01:08: SSD, SATA, 3.492TB, Unconfigured Good, (512B) Check All Uncheck All	[Enabled]		ESC: Exit	ed Defaults Reset System help UP∕DOWN
▶ Apply Changes		ļ		
Version 2.20.1274. (Copyright (C)	2019 American Mo	egatrends, Ir	ю.

d. Scroll up or down and on the Select Drives screen and choose Apply Changes (Figure 30).

Figure 30. Apply the changes

Aptio Setup Utility - Select Drives	- Copyright (C) 2	019 American Megatrends, Inc.
Drive Port 0 – 7:01:02: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	▲ Submits the changes made to the entire form.
Drive Port 0 – 7:01:03: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	
Drive Port 0 – 7:01:04: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	
Drive Port 0 – 7:01:05: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	
Drive Port 0 – 7:01:06: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	→++: Select Screen ↑↓: Select Item
Drive Port 0 – 7:01:07: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	Enter: Select +/-: Change Opt. F1: General Help
Drive Port 0 – 7:01:08: SSD, SATA, 3.492TB, Unconfigured Good, (512B)	[Enabled]	F9: Optimized Defaults F10: Save & Reset System ESC: Exit
Check All Uncheck All ▶ Apply Changes		K/M: Scroll help UP/DOWN
Vencion 2 20 1274 (Copupidat (C) 201	9 American Megatrends, Inc.

e. Choose OK in the confirmation window.

7. Add four more spans using the same process as in step 6 when configuring RAID 50 (Figure 31).

Figure 31. Add more spans

English # Uff Esc F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 Num / * - ' 1 2 3 4 5 6 7 8 9 0 - = Bksp 7 8 9 + - ' 1 2 3 4 5 6 7 8 9 - = Bksp 7 8 9 + -	Secure Virtual Drive Frotect Virtual Drive Select Drives from SELECT SPAN(S): Span 1: • Select Drives Hed Hrre Spans	(D1: (Uni (Or) SAS) 7:0: 0 - Fort SAS)	ive () (Dr. 1:03 7:0) t 0 -		7:01 0 - ive P () (Dr1	ty] :02	a s dr. use spa and dr. tt: Ent ++: F1:	spann lve, er to ans. even d an ives : Sel ter: -: Ch : Gen	when hed vi lt al add There even per s lect s sect I Select ange meral timize	Antua lows addl sho per o numb ipan Acree item it opt. Help	the tiona uid b f spa er of for a	1 e ns						
1 2 3 4 5 6 7 8 9 0 - = Bksp 7 8 9 + Tab q w e r t y u 1 o p [] \ 4 5 6 Scroll	CONFIGURE VIRTUAL ORIV Virtual Drive Name Virtual Drive Size Version 2,19,1265	6.5	44		017 A	mer ic	• EST	D: Sa D: Ex H: Sc	ave 8 cit croii	Rese	t: Sys	tem						
I I <th>Virtual Drive Name Virtual Drive Size Version 2,19,1255</th> <th>6.54</th> <th>aa yrigi</th> <th></th> <th>017 A</th> <th>meric</th> <th>• EST</th> <th>D: Sa D: Ex H: Sc</th> <th>ave 8 cit croii</th> <th>Rese</th> <th>t: Sys</th> <th>tem OWN</th> <th></th> <th></th> <th>2.45</th> <th></th> <th></th> <th># 4 1</th>	Virtual Drive Name Virtual Drive Size Version 2,19,1255	6.54	aa yrigi		017 A	meric	• EST	D: Sa D: Ex H: Sc	ave 8 cit croii	Rese	t: Sys	tem OWN			2.45			# 4 1
	Virtual Drive Name Virtual Drive Size Version 2/19/1255	6.5 cory glish	aa yr 1gl	1t (C) a			F10 ESU K/N	D: Sa D: Ex K: Sc Sgaltr	ave 8 dit moll rends.	Reser	UP/D	tem OKN AB		F12	Num	1	ŝć	1
Caps a s d f g h j k l ; ' Enter 1 2 3 Prnt Scr	Virtual Drive Name Virtual Drive Size Version 2,19,1255	6.5 2. Copy glish c F1	aa yrigi L F	1t (0) 2 2 F3	F4	F5	F10 EST K/R an Ke	D: Sa C: Ex H: So F7	rends.	Reser help Inc F9	UP/D	tem OHN AB	11	10.000	I Transie	-		-
	Virtual Drive Name Virtual Drive Size Version 2,19,1255 En ES	6.5 c F1	erigi L F 2	1t (C) 2 2 F3 3 4	F4	F5	F10 EST K/A an Ke	F7	F8	Reserved to the law of	F1(tem OKN AB	11 Bł	sp	7	8	9	- +

8. After repeating the steps to add spans and drives, verify that four spans with five drives per span have been added (Figure 32).

Figure 32. Verify that spans and drives have been added

Select Drives						4 0	mante	cally	inda	100	10						
Span 3:	SF 7: 0 PC SF	(0) (0) (0) (1) (0) (0) (0) (0)	1ve P 3 SAS) 01:14 = 7:0	ort 0 -	Port	d D G s	ispla rives roup l elect	y as s or Si based ton m Drivi	elect on t ade 1	t Dri he n							
Select Drives																	
Spen 4:	8F 7: 0 Fc	(D) (D) (D) (D) (D) (D)	nive P 8 SAS) 01:19 - 7:0	0 - 7:0 ort 0 - (Drive SAS)(Dr 1:20 ort 0 -	Port	t El + F	4: Se nter: /-: C 1: Ge	iect i lect i Selec hange neral timize	tem t Opt. Help		Its						
Add Hone Spans							10: S SC: E /H: S										
Version 2.1	9,1268. Co	ipyr1	sht (C) 2017	Ahier I	1		1992			R						
	Englis		ght (C) 2017	Amer 1	1		1992						-			# 41
		h) 2017 3 F4		can I	Hegati	rends		4	A	B	F12	Num	1	¥	# 11 1
	Englis	:h			F5	can I	Hegati	rends	Inc	4	A	-11	F12 ksp	Num 7	/ 8	*	# Un - +
	Englis Esc I	:h	F2 F	3 F4	F5	Can F6	Hegati	F8	F9	F1	H LO I	-11	ksp	1 Contraction			-
	Englis Esc	h F1	F2 F 3 W	3 F4	F5	F6	F7	F8	Inc F9 0] F1	A	=11 B]	ksp	7	8	9	- +
	Englis Esc 1 Tab	h F1 2 9 a	F2 F 3 W	3 F4 4 5 e r d f	F5 6 t g	F6 7 y	F7 8 u j	F8 9 1 k	F9 0 1	F1 -	A LO I I I I I	=11 B]	ksp \ ter	7	8	9	- + scroll

- 9. Configure the virtual drive parameters as shown in Figure 33.
 - a. Name the virtual drive <<var_raid50_vd_name>>.
 - b. For Strip Size, choose 256 KB.
 - c. For Read Policy, choose Read Ahead
 - d. For Write Policy, choose Write Back.

When you are done, choose Save Configuration and press Enter.

Figure 33. Virtual drive parameters

Apply Changes		Submits the changes made to
VIRTUAL DRIVE PROPERTIES:		the entire form.
Parity Size	3.492 TB	
Logical Sector Size	[512 B]	
Strip Size	[256 KB]	
Starting Logical Block Addressing (LBA)	0	
Emulation Type	[Default]	
Secured	[No]	
Bad Blocks	[No]	
SSD Caching	[Disabled]	
VIRTUAL DRIVE POLICIES:		++: Select Screen
Access	[Read/Write]	11: Select Item
Current Write Cache Policy	[Write Back]	Enter: Select
Default Write Cache Policy	[Write Back]	+/-: Change Opt.
Disable Background Initialization (BGI)	[No]	F1: General Help F9: Optimized Defaults
Read Cache Policy	[Read Ahead]	F10: Save & Reset System
Drive Cache	[Unchanged]	ESC: Exit
Input/Output (1/0)	[Direct]	K/M: Scroll help UP/DOWN
	A REAL PROPERTY AND A REAL	

10. In the next window, the utility will ask for confirmation. Choose OK to proceed.

Note: The RAID settings described here apply only to a configuration using 20 SAS drives with RAID 50. Refer to Table 12 for the RAID options for SSD drives with RAID 5 settings.

- 11. Wait for the initialization process for VD0 to complete, which may take several minutes.
- 12. Press Esc and choose OK to exit the RAID configuration utility.
- 13. Press Ctrl+Alt+Del to reboot the server.

Installing the operating system

This section shows the installation procedure for RHEL 7.6 for SAP on local drives.

1. Follow the steps in the section "Launching the KVM console" to mount and boot the ISO image (Figure 34).

Figure 34. Booting to the ISO image

Install Red Hat Enterprise Linux 7.6
Test this media & install Red Hat Enterprise Linux 7.6 Troubleshooting>
Use the ▲ and ▼ keys to change the selection. Press 'e' to edit the selected item, or 'c' for a command prompt.

2. Select the language and keyboard layout you want to use (Figure 35).

Figure 35. Select your preferred language and keyboard layout

WELCOME TO REL	D HAT ENTERPRISE	LINUX 7.6
WELCOME TO KE		
What language would you	u like to use during the insta	allation process?
English	English 🕽	English (United States)
Afrikaans	Afrikaans	English (United Kingdom)
አማርኛ	Amharic	English (India)
العربية	Arabic	English (Australia)
অসমীয়া	Assamese	English (Canada)
Asturianu	Asturian	English (Denmark)
Беларуская	Belarusian	English (Ireland)
		English (New Zealand)
Български	Bulgarian	English (Nigeria)
বাংলা	Bengali	English (Hong Kong SAR China)
Bosanski	Bosnian	English (Philippines)
Català	Catalan	English (Singapore)
Čeština	Czech	English (South Africa)
Cymraeg	Welsh	English (Zambia) English (Zimbabwe)
Dansk	Danish	English (Botswana)
Deutsch	German	English (Antiqua & Barbuda)
	G	
	-	

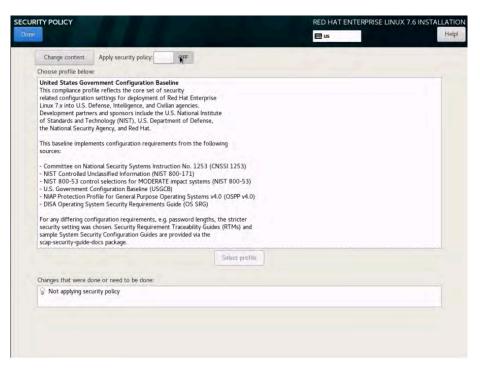
- 3. Click Continue. The central installation summary page appears. Here you need to configure various features.
- 4. Choose Localization > Date & Time. Choose the appropriate region and city (Figure 36). You will configure the Network Time Protocol (NTP) later. Click Done.

Figure 36. Setting the date and time



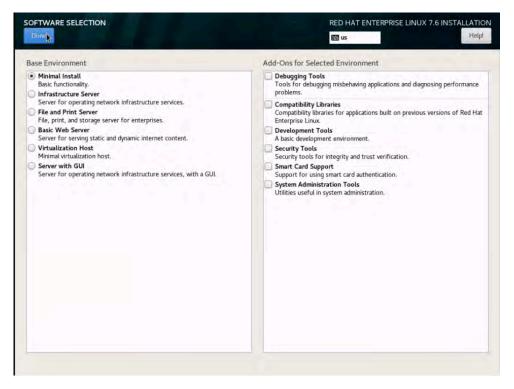
5. Choose Security > Security Policy. Turn off the security policy (Figure 37).

Figure 37. Setting security policy



6. Select Software Selection. Retain the default selection: Minimal Install (Figure 38).

Figure 38. Software Selection page



7. Select KDUMP. Deselect the Enable Kdump option to disable it (Figure 39).

Figure 39. Disabling Kdump

			RED HAT ENTERPRISE LINUX 7.6 INSTALLATIO
Done			题 us Help
Kdump is a kernel crash dumpi Nuse of the crash. Note that	ing mechanism. kdump does rei	In the eve quire rese	ent of a system crash, kdump will capture information from your system that can be invaluable in determining the erving a portion of system memory that will be unavailable for other uses.
Kdump Memory Reservation: Automatic			O Manual
Memory To Be Reserved (MB)	160		
Total System Memory (MB): Jsable System Memory (MB):	1546613		

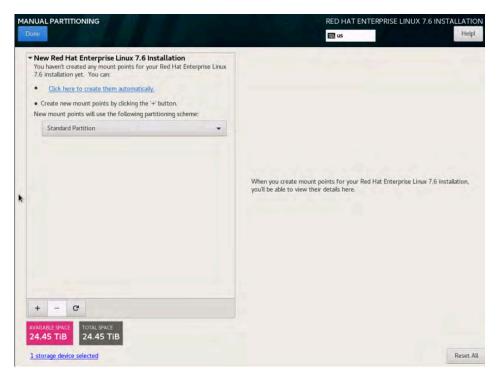
8. Choose System > Installation Destination. Under the other storage options, select the option to manually configure the disk partition layout: "I will configure partition." (Figure 40).

Figure 40. Installation Destination page

	RED HAT ENTERPRISE LINUX 7.6 INSTALLATION
	NEW US
Device Selection	And the second
Select the device(s) you'd like to install to. They will be left untouched until	you click on the main menu's "Begin Installation" button.
Local Standard Disks	
24.45 TiB	
Cisco UCSC-RAID12GP-4G	
sda / 1007 KiB free	
308 / 100/ NB REE	Disks left unselected here will not be touched.
Specialized & Network Disks	Disks left unselected here will not be touched,
Add a disk	
A TOTAL CONTRACTOR	Disks left unselected here will not be touched.
Other Storage Options	
Partitioning	
Automatically configure partitioning. I will configure partitioning.	
I would like to make additional space available.	
Encryption Encrypt my data. You'll set a passpluaise next.	
· · · · · · · · · · · · · · · · · · ·	
Server from the	
Full disk summary and boot loader	1 disk selected; 24.45 TiB capacity; 1007 KiB free Refresh.

9. Click Done. The Manual Partitioning page appears (Figure 41).

Figure 41. Manual Partitioning page





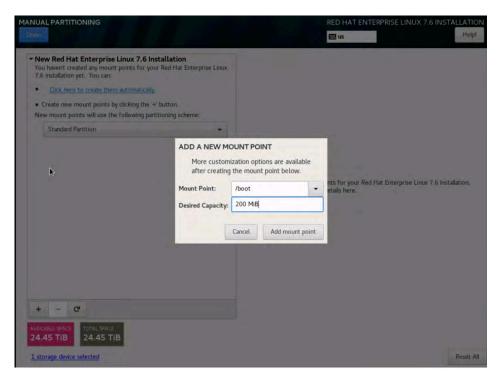
10. You will first create the /boot partition with the standard partition scheme. Change the default partition scheme from Logical Volume Manager (LVM) to Standard Partition (Figure 42).

Figure 42. Choosing the Standard Partition type

IANUAL PARTITIONING Done	RED HAT ENTERPRISE LINUX 7.6 INSTALLATION
New Red Hat Enterprise Linux 7.6 installation You haven't created any mount points for your Red Hat Enterprise Linux 7.6 installation yet. You can: Click here to create them automatically. Create new mount points by clicking the '+' button. New mount points by clicking the '+' button. New mount points will use the following partitioning scheme: Standard Partition	
	When you create mount points for your Red Hat Enterprise Linux 7.6 installation, you'll be able to view their details here.
+ - 0	
AVAILABLE SPACE TOTAL SPACE 24.45 TIB 24.45 TIB	

11. Click the + button and create a /boot partition with a size of 200 MiB. Then click "Add mount point" (Figure 43).

Figure 43. Entering mount-point and capacity information



12. Change the file system from the default XFS to ext3 (Figure 44).

Figure 44. Changing the file system type to ext3

			RED HAT EN	NTERPRISE LINU	X 7.6 INSTALLATIO
 New Red Hat Enterprise Linux 7.6 Installa SYSTEM 	tion	sda1 Mount Point:		Device(s):	
/boot sdal	200 MiB 🗲	/boot		Device(s).	
1994		Desired Capacity: 200 MiB		Cisco UCSC-RAID	12GP-4G (sda)
				Modify	
		Device Type:			
		Standard Partition 👻	Encrypt		
		File System:			
		ext3 🔹	Reformat		
		Label:		Name:	
				sdal	
					Update Settings
+ - C			Note: The be applied	e settings you make d until you click on t	on this screen will no he main menu's 'Begir Installation' button
24.45 TiB 24.45 TiB					
1 storage device selected					Reset

13. Create a /boot/efi partition of 200 MiB. Click the + button, choose /boot/efi as the mount point, enter **200 MiB** as the desired capacity, and click "Add mount point" (Figure 45).

Figure 45. Creating the EFI boot partition

ANUAL PARTITIONING				NTERPRISE LINU	X 7.6 INSTALLATI
New Red Hat Enterprise Linux 7.6 Installa SYSTEM /boot sdal	ation 200 MiB >	sda1 Mount Point: /boot Desired Capacity: 200 MIB		Device(s): Cisco UCSC-RAID	12GP-4G (sda)
	after creating Mount Point: Desired Capacity:	Zation options are available the mount point below. Zoo MiB Cancel Add mount point	Setamo	Modify	
+ - C AVAILABLE SPACE 24.45 TIB 24.45 TIB			Note: The be applie	e settings you make	Update Settings on this screen will no the main menus "Sleg Installation buttor
1 storage device selected					Reset

After you define the /boot and /boot/efi partitions, you will assign the remaining disk space to the LVM as a volume group (VG) and then carve out a root volume, swap volume, and SAP HANA system-related volumes.

 Click the + button, select "/" as the mount point, enter 100 GiB as the desired capacity, and click "Add mount point" (Figure 46).



MANUAL PARTITIONING			RED HAT EI	NTERPRISE LINUX 7.6 INSTALLATION
New Red Hat Enterprise Linux 7.6 SYSTEM /boot da2 /boot/efi eda1	Installation 200 MiB 200 MiB >	sda1 Mount Point: /boot/efi Desired Capacity: 200 MiB		Device(s): Cisco UCSC-RAID12GP-4G (sda)
	after creating th Mount Point: / Desired Capacity: 1	ation options are available ne mount point below.	R Burtomie	Modify
+ - C AVAILABLE SPACE 24.45 TIB I storage device selected			Note: The be applied	e settings you make on this screen will not at until you click on the main mends' Begin Installation button Reset Ali

15. Click Modify to change the device type (Figure 47).

Figure 47. Preparing to change the device type to LVM

ANUAL PARTITIONING		RED HA	NT ENTERPRISE LINUX 7.6 INSTALLATION
• New Red Hat Enterprise Linux 7.6 Installation		sda3	
SYSTEM /boot sda2	200 MiB	Mount Point:	Device(s):
/boot/efi sdal	200 MiB	Desired Capacity:	Cisco UCSC-RAID12GP-4G (sda)
/ sda3	100 GiB >	100 GiB	
			Modify
		Device Type:	Volume Group
		LVM.	t rhel 👻
		File System: xfs 👻 🐼 Reforma	M K dify
		Label:	Name:
			root
			Update Settings
+ - C		Note be a	The settings you make on this screen will no applied until you click on the main menu's 'Begin Installation' button
AVAILABLE SPACE TOTAL SPACE 24.35 TIB 24.45 TIB			
1 storage device selected			Reset A

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- 16. Change the device type from Standard Partition to LVM.
- 17. Change the name of the volume group from the default rhel to hanavg (Figure 48). Then click Save.

Figure 48. Configuring the volume group

onc-			🖽 us	Hel
New Red Hat Enterprise SYSTEM /boot sda2	Linux 7.6 Installation 200 MiB	sda3 Mount Point: /	Device(s):	
/boot/efi sdal	CONFIGURE VOLUME GROUP	1.000	Gsco UCSC-RAID	L2GP-4G (sda)
7 jida]	Please create a name for this volum Name: hanavg Description Nam Cisco UCSC-RAID126P-4G sda	e Capacity Free 24.45 TIB 24.35 TIB	Modify Volume Group	
			Modify	
	RAID Levet: None Size policy: Automatic	• 0B	Modify	
		O B Cancel	Modify	Update Settings

18. Change the file system type to ext3 and change the name to **rootvol**. Click Update Settings (Figure 49).

Figure 49. Updating the file system type and volume group name

MANUAL PARTITIONING	e S he	RED HAT	
Porce * New Red Hat Enterprise Linux 7.6 installation SYSTEM /boot sda2 /boot/efi sda1 / /anavg-root	200 MiB 200 MiB 100 GiB >	in us	Help? Device(s): Cisco UCSC-RAID12GP-4G (sda) Modify Volume Group hanavg (0 B freet, * Modify Name: rootvo(
+ - C AVAILABLE SPACE 24.35 TiB 1 storage device selected		Note: 1 be app	Update settings The settings you make on this screen will not lied until you click on the main menu's Begin Installation button. Reset All

19. You will now create a 2 GiB swap volume. Click the + button, choose swap as the mount point, enter **2 GiB** as the desired capacity, and click "Add mount point" (Figure 50).

Figure 50.	Creating a swap volume

			III US	He
New Red Hat Enterprise Linux 7.6 I		sda2 Mount Point:		Device(s):
/boot	200 MiB >	/boot		
/boot/efi sdal / hwwwg-motivel	200 MiB 100 GiB	Desired Capacity: 200 MiB		Cinco UCSC-RAID12GP-4G (sda)
		INT POINT tion options are available e mount point below.		Madify
	Mount Point:	wap 🗸	Encrypt	
	Desired Capacity:	? GiB		
	0	ancel Add mount point	Returns	Name.
				sda2
				Update Settings
+ - 0				e settings you make on this screen will n id until you click on the main menu's "Beg Installation' butto
24.45 TIB				
1 storage device selected				Rouse

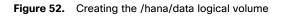
20. Change the device type to LVM, verify that hanavg is selected as the volume group, and change the name to **swapvol** (Figure 51).

Figure 51. Updating swap volume properties

IANUAL PARTITIONING			RED HAT	ENTERPRISE LINUX 7.6 INSTAI	Help
• New Red Hat Enterprise Linux 7.6 Installation		sda4		a destaurant of the	
SYSTEM /boot sda2	200 MiB	Mount Point:		Device(s):	
/boot/efi sdal	200 MiB	Desired Capacity:		Cisco UCSC-RAID12GP-4G (sda)	
/ hanavg-rootvol	100 GiB	2048 MiB			
swap sda4	2048 MiB >			Modify_	
		Device Type:		Volume Group	
		LVM -	Encrypt	hanavg (0.8.fm	iel 🔻
		File System:		Modify	
		swap 👻	Reformat		
		Label:		Name:	
				swapvo(
				Update Sett	tings
+ - 0				The settings you make on this screen lied until you click on the main menu's Installation	s Begi
AVAILABLE SPACE 24.35 TIB 24.45 TIB					
1 storage device selected				15	Reset

21. Next you will create the SAP HANA system's data, log, and shared volumes.

a. Click the + button, choose /hana/data as the mount point and 4.5 TiB as the desired capacity, and click "Add mount point" (Figure 52).



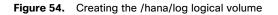
			RED HAT	ENTERPRISE LINUX 7.6 INSTALLATION
New Red Hat Enterprise Linux 7.6 Instal SVETTIM /boot side2 /boot/eff side1 / / booms-monted	llation 200 MiB 200 MiB 100 GiB	hanavg-swapvol Mount Point: Destried Capacity: 2048 M8		Device(s): Circo UCSC-PAID12GP-4G (sds)
ewep houry mayrol	after creating the Mount Point:	UNT POINT ation options are available are mount point below. Anaa/data 4.50 TiB ancel Add mourt point	Encryps	Volume Group Innovg Multify- Name: swapvol
+ - C AVALABLE PACE 24.35 TIB 24.45 TIB 3 storage device selected			Note: 1 be app	Upender Sostneys This settings you make on this socient will not lied antili you click on the main memo's Begin Unchalation barton. Reset All

b. Change the device type to LVM, verify that hanavg is selected as the volume group, and change the name to **datavol** (Figure 53).

Figure 53. Updating /hana/data logical volume properties

New Red Hat Enterprise Linux 7	.6 Installation	sda4	
/hana/data sda4	4608 GiB 义	Mount Point: /hana/data	Device(s):
SYSTEM /boot sda2	200 MiB	Desired Capacity: 4608 GiB	Cisco UCSC-RAID12GP-4G (sda)
/ hanavg-rootvol /boot/efi	100 GiB		Moslify
sdal	200 MiB		
swap	2048 MiB	Device Type:	Volume Group
hanavg-swapvoł		LVM • Encry	t hanavg (A095 Kill Loss) •
		File System:	Modify
		xfs 👻 🛃 Reform	it:
		Label:	Name:
			datavo
			Update Settings
+ - C		Not be	e: The settings you make on this screen will r applied until you click on the main menu's 'Be Installation' butt

c. Click the + button, choose /hana/log as the mount point and 512 GiB as the desired capacity, and click "Add mount point" (Figure 54).



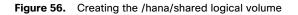
			🕅 us	
New Red Hat Enterprise Line	ux 7.6 Installation	hanavg-datavol		
/hana/data hanevg-datavol	4608 GIB 📏	Mount Point: /hana/data		Device(s):
SYSTEM /boot sdaZ	200 MiB	Desired Capacity: 4608 GiB		Cisco UCSC-RAID12GP-4G (sda)
/ hanavg-rootvol	100 GiB		100	
/boot/efi	ADD A NEW MOU	NT POINT		Modify.
sdal swap haravg-swapvol		tion options are available e mount point below.		Volume Group
nanavd-swabaov	Mount Point: /	hana/log	- Encrypt	hanavg (4000 K00 Pres)
	Desired Capacity: 5	12 GIB		Modify_
			Reformat.	
	G	ncel Add moun poir	t.	Name:
		1		datavol
				Update Setting
10741.59408 .85 TIB 24.45 TIB				The settings you make on this screen will Nied until you click on the main menu's 'B Installation' but
24.43 110				

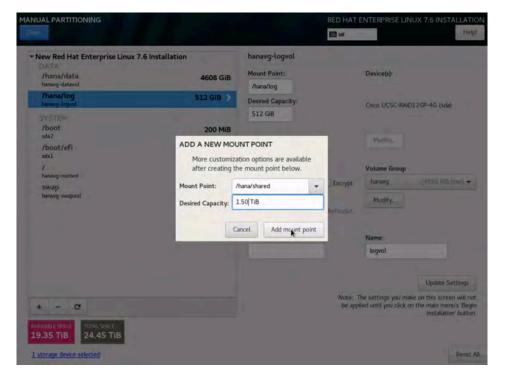
d. Change the device type to LVM, verify that hanavg is selected as the volume group, and change the name to **logvol** (Figure 55).

Figure 55. Updating /hana/log logical volume properties

New Red Hat Enterprise Linux 7.6	Installation	sda4	
/hana/data hanavg-datavol	4608 GIB	Mount Point: /hana/log	Device(s):
/hana/log sda4	512 GiB >	Desired Capacity:	Cisco UCSC-RAID12GP-4G (sda)
SYSTEM /boot sda2	200 MiB	512 GiB	Nodiy_
/boot/efi sda1	200 MiB		
/ hanavg-rooteol	100 GiB	Device Type:	Volume Group
swap hanavg-swapvol	2048 MiB	LVM File System: xfs Ketorm	Modify
		Label:	Name:
		Na	Update Settings
+ - C		be	applied until you click on the main menu's 'Be Installation' butt

e. Click the + button, choose /hana/shared as the mount point and 1.5 TiB as the desired capacity, and click "Add mount point" (Figure 56).





f. Change the device type to LVM, verify that hanavg is selected as the volume group, and change the name to **sharedlv**. Click Update Settings (Figure 57).



MANUAL PARTITIONING			RED HAT	ENTERPRISE LINI	UX 7.6 INSTALLATIO
New Red Hat Enterprise Linux 7.6 Installation DATA /hana/log hanay-logrol /hana/shared	512 GiB	sda4 Mount Point: /hana/shared		Device(s):	
viana/shared sda4	1536 GIB >	Desired Capacity:		Gisco UCSC-RAID	12GP-4G (sda)
/hana/data hanavg-datavol	4608 GiB	1536 GIB			
SYSTEM /boot sda2	200 MiB			Modify_	
/boot/efi sdal	200 MiB	Device Type:		Volume Group	
sdal / haravg-rootvol	100 GiB	LVM •	Encrypt	hanavg	(4096 KiB free) •
swap hanavg-swapvol	2048 MiB	xfs 🔹	Reformat	Modify	
		Label:		Name:	201
				sharediv	
					Up pte Settings
+ - C			Note: 1 be app	The settings you make lied until you click on	e on this screen will not the main menu's Begin Installation' button.
17.85 TIB 24.45 TIB 1 storage device selected					Reset Al

22. Click Done. A summary of changes appears. Click Accept Changes (Figure 58).

Figure 58. Summary of changes for manual partition configuration

DATA /hama/log hanavg-logvol	Enterp	rise Linux 7.6			anavg-swapvol ount Point:		Device(s):	
/hana/share		ARY OF CHANGE		10	_	-	_	
/hana/data			the state of the s	hannes taking	effect after you return to	the main men	u and booin installation	P-4G (sda)
hanavg-datavol		Action	Type	Device Nam		the main men	o ano begin instalación	
SYSTEM	11	Create Format	partition table (GPT)	sda	A			
/boot	12	Create Pormat	partition table (GPT)	sdal				
sda2	12	Create Device	EFI System Partition	sdal	/boot/efi			
/boot/efi	14	Create Device	partition	sda2	Joodrein			
uda1	15	Create Device	partition	sda2				AUSIA KIS (Des)
1	16	Create Format	physical volume (LVM)					
hanavg-rootvol	17	Create Device	lymyg	hanavg				
swap	18	Create Device	lymly	hanavg-share	-			
	19	Create Format	xfs		dlv /hana/shared			
	20	Create Device	lymly	hanavg-logvol				
	21	Create Format	xfs	hanavg-logvol				the second se
	22	Create Device	tymty	hanavo-datavo	Contraction of the second s			and the second s
					cel & Return to Custom F	artitioning	Accept Changes	
	-			-				Upda - Setter
	2						The settings you make blied until you click on t	
+ - 0						The abs	Alea arten you cack arri	Installation but

23. On the Installation Summary page that appears, click Begin Installation (Figure 59).

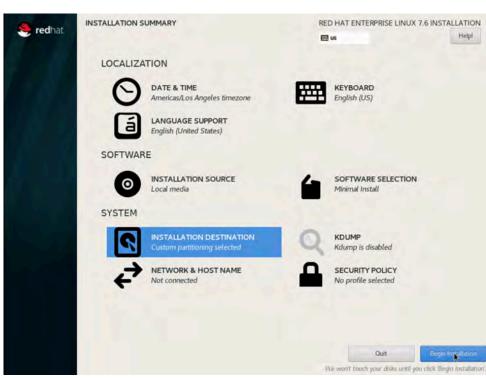


Figure 59. Beginning the installation

24. As the installation progress, set the root password (Figure 60).

Figure 60. Setting the root password

🤶 redhat	CONFIGURATION	RED HAT ENTERPRISE LINUX 7	6 INSTALLATION
realitat		e us	Helpl
	USER SETTINGS		
	ROOT PASSWORD Root password is not set	USER CREATION No user will be created	
	Creating xfs on /dev/mapper/hanavg-datavol		
	Access the Red Hat Customer Portal APPLICATIONS > SYSTEM TOO		1
	\underline{A}_{i} . Phinte complete (from marked with the iron below continuous	g to the control p	

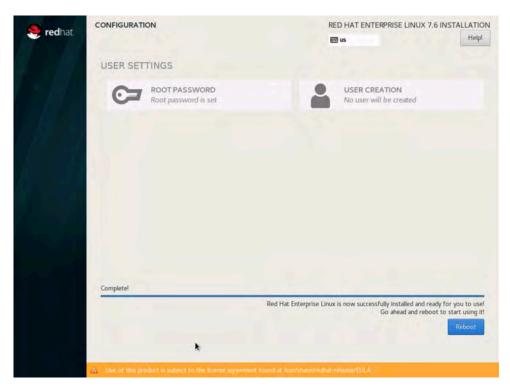
25. Enter and confirm the root password (Figure 61).

Figure 61. Entering and confirming the root user password

ROOT PASSWORD		RED HAT ENTERPRISE LINUX 7.6 INSTALLATION
	The root account is used for	or administering the system. Enter a password for the root user.
	Root Password:	
		Good
	Confirm:	••••••

26. After the installation is complete, click Reboot (Figure 62).

Figure 62. Finishing the installation



Post-installation OS configuration

Follow the steps presented here to customize the server in preparation for SAP HANA installation.

Customizing the host name

You can customize the host name.

- 1. Use the KVM console to log in to the installed system as the user root with the password <<var_sys_root_pw>>.
- 2. Update the /etc/hosts file with an entry matching the host name and IP address of the system (Figure 63).

Figure 63. . Sample hosts file

Iroot@localhost network-scripts]# more /etc/hosts127.0.0.1localhost localhost.localdomain localhost4 localhost4.localdomain4::1localhost localhost.localdomain localhost6 localhost6.localdomain6173.36.215.51cishana01.ciscolab.local

3. Verify that the host name is set correctly.

The operating system must be configured so that the short name of the server is displayed with the command **hostname -s**, and the fully qualified host name is displayed with the command **hostname -f**. Figure 64 shows sample output.

Figure 64. Sample hostname command output

<pre>[root@localhost network-scripts]# ciscohana@1.ciscolab.local</pre>	hostname
<pre>[root@localhost network-scripts]# ciscohana01</pre>	hostname -s
<pre>[root@localhost network-scripts]# ciscohana01.ciscolab.local</pre>	hostname -f
<pre>[root@localhost network-scripts]# ciscolab.local</pre>	hostname -d

Configuring the network

The Cisco UCS C480 M5 server comes with a pair of Cisco VIC 1455 adapters. In addition to the administration and management networks, you can optionally have networks for backup, client access, etc. You can configure additional networks based on customer-specific requirements and use cases.

1. To display an overview of the Ethernet interface configuration, use the ip addr command. Figure 65 shows sample output.

Figure 65. Sample ip addr command output

<pre>[root@localhost ~]# ip addr</pre>
1: 10: <loopback,up,lower_up> mtu 65536 gdisc noqueue state UNKNOWN group default glen 1000</loopback,up,lower_up>
link/loopback 00:00:00:00:00 brd 00:00:00:00:00
inet 127.0.0.1/8 scope host lo
valid_lft forever preferred_lft forever
inet6 ::1/128 scope host
valid_lft forever preferred_lft forever
2: eno5: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 00:b7:71:ff:83:7b brd ff:ff:ff:ff:ff
3: eno6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWM group default qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 00:b7:71:ff:83:7c brd ff:ff:ff:ff:ff
4: eno7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 00:b7:71:7e:02:2e brd ff:ff:ff:ff:ff
5: eno8: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWM group default qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 00:b7:71:7e:02:2f brd ff:ff:ff:ff:ff
6: enp53s0f0: <broadcast,multicast,up,lower_up> mtu 1500 qdisc mq state UP group default qlen 1000</broadcast,multicast,up,lower_up>
link/ether a8:b4:56:a3:ed:66 brd ff:ff:ff:ff:ff
7: enp53s0f1: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,broadcast,multicast,up>
link/ether a8:b4:56:a3:ed:67 brd ff:ff:ff:ff:ff

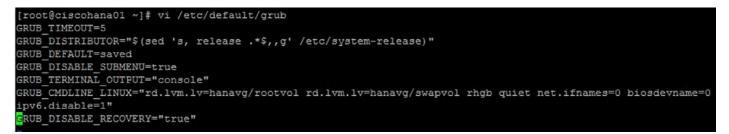
In RHEL 7.0, **systemd** and **udev** support a number of different naming schemes. By default, fixed names are assigned based on firmware, topology, and location information: for instance, eno5, as shown in Figure 66.

With this naming convention, names stay fixed even if hardware is added or removed. However, the names are often more difficult to read than traditional kernel-native ethX names: for instance, eth0.

Another method for naming network interfaces, **biosdevnames**, is also available with the installation.

- Configure the boot parameters net.ifnames=0 biosdevname=0 to disable both approaches to use the original kernelactive network names.
- You can disable IPv6 support at this time because this solution uses IPv4. You accomplish this by appending ipv6.disable=1 to GRUB_CMDLINE_LINUX as shown in Figure 66.

Figure 66. Sample grub file with CMDLINE parameter additions



4. Run the grub2-mkconfig command to regenerate the grub.cfg file (Figure 67):

```
# grub2-mkconfig -o /boot/grub2/grub.cfg
```

```
Figure 67. Updating the grub configuration
```

```
[root@localhost ~1# grub2-mkconfig -o /boot/efi/EFI/redhat/grub.cfg
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-3.10.0-957.e17.x86_64
Found initrd image: /boot/initramfs-3.10.0-957.e17.x86_64.img
Found linux image: /boot/vmlinuz-0-rescue-68a4f0e19736474aa07e1e9c1dc7679e
Found initrd image: /boot/initramfs-0-rescue-68a4f0e19736474aa07e1e9c1dc7679e.img
done
```

5. Reboot the system to make the changes take effect:

reboot

- 6. After the reboot, use the KVM console to log in to the installed system as the user **root** with password <**var_sys_root_pw>>**.
- 7. Run the **ip addr** command to see the interfaces in the traditional kernel-native ethX nomenclature (Figure 68).

Figure 68. Checking the interface status with the ip addr command

[root@localhost ~]# ip addr
1: lo: <loopback,up,lower_up> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000</loopback,up,lower_up>
link/loopback 80:80:80:80:80:00 brd 80:80:80:80:80:80
inet 127.0.0.1/8 scope host lo
valid_lft forever preferred_lft forever
2: eth0: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,>
link/ether 00:b7:71:ff:83:7b brd ff:ff:ff:ff:ff:ff
3: eth1: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,>
link/ether 00:b7:71:ff:83:7c brd ff:ff:ff:ff:ff:ff
4: eth2: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,>
link/ether 00:b7:71:7e:02:2e brd ff:ff:ff:ff:ff:ff
5: eth3: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,>
link/ether 00:b7:71:7e:02:2f brd ff:ff:ff:ff:ff:ff
6: eth4: <broadcast,multicast,up,lower_up> mtu 1500 qdisc mq state UP group default qlen 1000</broadcast,multicast,up,lower_up>
link/ether a8:b4:56:a3:ed:66 brd $ff:ff:ff:ff:ff:ff$
7: eth5: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN group default qlen 1000</no-carrier,>
link/ether a8:b4:56:a3:ed:67 brd ff:ff:ff:ff:ff:ff

 A close observation of the output reveals that the previous IP address setting was lost due to changes in the interface naming you just implemented. You will again have to find the interface that has uplink connectivity. Check the link status using the ethtool command to identify the interface that is connected to the management network (Figure 69). Figure 69. Using the ethtool command to check the link status

[root@ciscohana01 ~]#	for i	in Ş	(seq O	5);	do	ethtool	eth\$i	gre	Link	detected';	done
Link detected:	no										
Link detected:	no										
Link detected:	no										
Link detected:	no										
Link detected:	yes										
Link detected:	no										
[root@ciscohana01 ~]#											

- 9. Assign <<var_mgmt_ip_address>> as the IP address and enter <<var_mgmt_ip_mask>> as the subnet mask for the available interface (eth5 in the example in Figure 70). You can use this configuration temporarily until you post this interface to a high-availability bond device and create another interface with Cisco VIC 10-Gbps ports.
- 10. Go to the network configuration directory and create a configuration for eth4 as shown in this example:

<pre># cd /etc/sysconfig/network-scripts</pre>	
# vi ifcfg-eth4	

DEVICE=eth4

Type=Ethernet

ONBOOT=yes

BOOTPROTO=static

IPV6INIT=no

USERCTL=no

NM_CONTROLLED=no

IPADDR=<<var_mgmt_ip_address>>

NETMASK=<<var_mgmt_ip_mask>>

11. Add the default gateway:

vi /etc/sysconfig/network

NETWORKING=yes

GATEWAY=<<var_mgmt_gateway_ip>>

Configuring the network time

Be sure that the time on all components used for SAP HANA is synchronized. Use the same NTP configuration on all systems.

vi /etc/ntp.conf

server <<NTP-SERVER1 IP>>
server <<NTP-Server2 IP>>

- # service ntpd stop
- # ntpdate ntp.example.com
- # service ntpd start
- # chkconfig ntpd on
- # chkconfig ntpdate on

Configuring the Domain Name System

Configure the Domain Name System (DNS) based on the local requirements. A sample configuration is shown here. Add the DNS IP address if it is required to access the Internet.

vi /etc/resolv.conf
nameserver <<IP of DNS server 1>>
nameserver <<IP of DNS server 2>>

Configuring bonding for high availability (optional)

To configure a bond for high availability, first view the Ethernet interfaces available in the system.

By examining the hardware and MAC addresses of the interfaces using the **ifconfig** command and the properties using **ethtool**, you can clearly differentiate the interfaces for the two dual-port Cisco UCS VIC 1455 adapters installed in the server as well as the onboard 1-Gbps interface.

A bond configured with two 1-Gbps ports can be used for the administration, management, and access networks, and a bond configured with two ports, using one port from each dual-port VIC, can be used for a backup network. Additional interfaces can be configured on the VICs based on needs.

In the example in Figure 70, the **ethtool** output for the interfaces showing Fibre Channel support and 10-Gbps indicates that eth0 through eth4 are VIC ports. In addition, a close observation of their MAC addresses reveals that eth0 and eth1 and that eth2 and eth3 are ports on the same VICs (in both cases, the last octet of the MAC address differs).

Therefore, for high availability, eth2 and eth3 form one possible slave pair for creating a 10-Gbps bond device.

In this section, you will manually create at least one bond interface.

cisco

Figure 70. Identifying VIC ports and their supported link modes

rootscisnanaul network-scripts, ifconfig -a grep eth	
eth0: flags=4099 <up,broadcast,muiticast> mtu 1500</up,broadcast,muiticast>	
ether 84:b8:02:8b:31:40	
eth1: flags=4099 <up,broadcast,muificast> mtu 1500</up,broadcast,muificast>	
ether 84:b8:02:8b:31:41 Exqueuelen 1000 (Ethernet)	
eth2: flags=4099 <up,broadcast,muificast> mtu 1500</up,broadcast,muificast>	
ether 84:b8:02:5b:de:20	
eth3: flags=4099 <up,broadcast,muificast> mtu 1500</up,broadcast,muificast>	
ether 84:b8:02:5b:de:21 (txqueuelen 1000 (Ethernet)	
ch4: flags=4099 <up,broadcast,mu.ticast> mtu 1500</up,broadcast,mu.ticast>	
ether 88:1d:fc:39:f2:12 txqueuelen 1000 (Ethernet)	
<pre>sth5: flags=4163<up,broadcast,runnig,multicast> mtu 1500</up,broadcast,runnig,multicast></pre>	
ether 88:1d:fc:39:f2:13 txqueuelen 1000 (Ethernet)	
<pre>sth6: flags=4099<up,broadcast,muiticast> mtu 1500</up,broadcast,muiticast></pre>	
ether 88:1d:fc:39:f2:16 txqueuelen 1000 (Ethernet)	
eth7: flags=4099 <up,broadcast,mutficast> mtu 1500</up,broadcast,mutficast>	
ether 88:1d:fc:39:f2:18 txqueuelen 1000 (Ethernet)	
[root@cishana0] network-scripts]# for i in `seq -w 0 7`;do ethtool eth\$i > /tmp/ethinfo; head -n 5 /tmp/ethinfo;	lone
Settings for eth0:	
Supported ports: [FIBRE]	
Supported link modes: 10000baseT/Full	
Supported pause frame use: No	
Supports auto-negotiation: No	
Settings for eth1:	
Supported ports: [FIBRE]	
Supported link modes: 10000baseT/Full	
Supported pause frame use: No	
Supports auto-negotiation: No	
Settings for eth2:	
Supported ports: [FIBRF]	
Supported link modes: 10000baseT/Full	
Supported pause frame use: No	
Supports auto-negotiation: No	
Settings for eth3:	
Supported ports: [FIBR]	
Supported link modes: 10000baseT/Full	
Supported pause frame user Hermiter	
Supports auto-negotiation: No	
Settings for eth4:	
Supported ports: [TP]	
Supported link modes: 10baseT/Half 10baseT/Full	
100baseT/Half 100baseT/Full	
1000baseT/Full	
Settings for eth5:	
Supported ports: [TP]	
Supported link modes: 10baseT/Half 10baseT/Full	
100baseT/Half 100baseT/Full	
1000baseT/Full	
Settings for eth6:	
Supported ports: [TP]	
Supported link modes: 100baseT/Full	
1000baseT/Full	
10000baseT/Full	
Settings for eth7:	
Supported ports: [TP]	
Supported link modes: 100baseT/Full	
1000baseT/Full	
10000baseT/Full	
[root@cishana01 network-scripts]#	

- 1. Create 1-Gbps bond device ifcfg-bond0 with eth0 and eth1 as slaves.
 - a. Create a bond0 configuration file:

```
# vi /etc/sysconfig/network-scripts/ifcfg-bond0
```

Device=bond0

- IP ADDR=<<var_mgmt_ip_address>>
- NETMASK=<<var_mgmt_nw_netmask>>

ONBOOT=yes HOTPLUG=no BOOTPROTO=none USERCTL=no BONDING_OPTS="million=100 mode=1" NM_CONTROLLED=no

b. Modify the eth4 and eth5 configuration files:

vi /etc/sysconfig/network-scripts/ifcfg-eth4
DEVICE=eth4
BOOTPROTO=none
ONBOOT=yes
HOTPLUG=no
MASTER=bond0
SLAVE=yes
USERCTL=no
NM_CONTROLLED=no

vi /etc/sysconfig/network/ifcfg-eth5 BOOTPROTO='none'

DEVICE=eth5 BOOTPROTO=none ONBOOT=yes HOTPLUG=no MASTER=bond0 SLAVE=yes USERCTL=no NM_CONTROLLED=no

c. Test the configuration.

Restart the network service to bring up the bond0 interface. Then enter the following command:

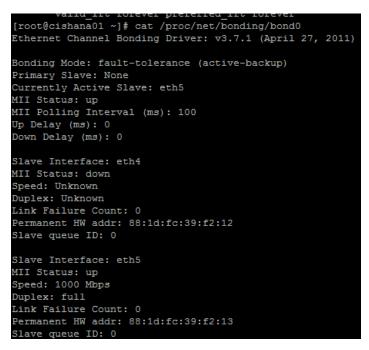
systemctl restart network.service

To query the current status of the Linux kernel bonding driver, enter the following command:

cat /proc/net/bonding/bond0

Figure 71 shows sample output.

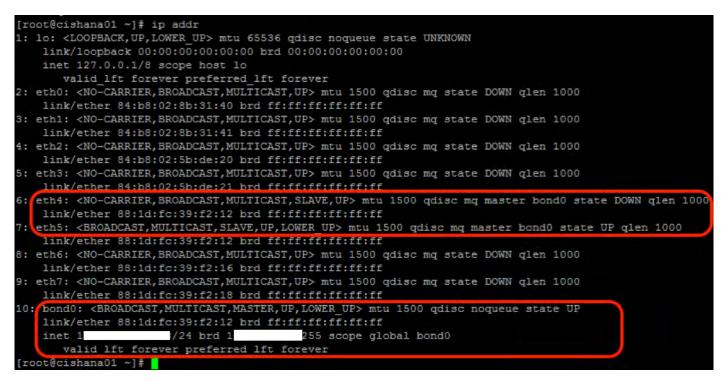
Figure 71. Sample bond0 configuration test output



d. Verify the status of interfaces with the ip addr command (Figure 72):

ip addr





- 2. Create 10-Gbps bond device ifcfg-bond1 with eth0 and eth2 as slaves.
 - a. Create a bond1 configuration file:

```
# vi /etc/sysconfig/network-scripts/ifcfg-bond1
Device=bond1
IP ADDR=<<var_mgmt_ip_address>>
NETMASK=<<var_mgmt_nw_netmask>>
ONBOOT=yes
HOTPLUG=no
BOOTPROTO=none
USERCTL=no
BONDING_OPTS="million=100 mode=1"
NM_CONTROLLED=no
```

- b. Modify the eth0 and eth2 configuration files:
 - # vi /etc/sysconfig/network-scripts/ifcfg-eth0
 - DEVICE=eth0
 - BOOTPROTO=none
 - ONBOOT=yes
 - HOTPLUG=no
 - MASTER=bond1
 - SLAVE=yes
 - USERCTL=no
 - NM_CONTROLLED=no
 - # vi /etc/sysconfig/network-scripts/ifcfg-eth2
 - DEVICE=eth2
 - BOOTPROTO=none
 - ONBOOT=yes
 - HOTPLUG=no
 - MASTER=bond1
 - SLAVE=yes
 - USERCTL=no
 - $\texttt{NM_CONTROLLED=no}$

c. Test the configuration.

Restart the networking service to bring up the bond0 interface. Enter the following command:

systemctl restart network.service

To query the current status of Linux kernel bounding driver, enter the following command:

cat /proc/net/bonding/bond1

Updating the Red Hat system and customizing the OS for SAP HANA

Before you can customize the OS for SAP HANA, you need to update the Red Hat system.

1. Update the Red Hat repository.

To patch the system, you must first update the repository. Note that the installed system does not include any update information. Before you can patch the Red Hat system, the system must be registered and attached to a valid subscription. The following code will register the installation and update the repository information:

#subscription-manager register --auto-attach

Username: <<username>

Password: <<password>>

2. To list the repositories to which the subscription is attached, use the following command:

#yum repolist

Update only the OS kernel and firmware packages to the latest release that appeared in RHEL 7.6. Set the release version to 7.6.

#subscription-manager release -set=7.6

3. Apply the latest update for RHEL 7.6. Typically, the kernel is updated as well.

#yum -y update

- 4. Reboot the system to use the new kernel.
- 5. Install the base package group.

#yum -y groupinstall base

6. Install dependencies in accordance with the SAP HANA Server Installation and Update Guide. Install the numactl package if the benchmark HWCCT is to be used.

#yum install gtk2 libicu xulrunner sudo tcsh libssh2 expect cairo graphviz iptraf-ng krb5workstation krb5-libs libpng12 nfs-utils lm_sensors rsyslog openssl PackageKit-gtk3-module libcanberra-gtk2 libtool-ltdl xorg-x11-xauth numactl xfsprogs net-tools bind-utils screen compat-sap-c++-6 compat-sap-c++-5

7. Disable SELinux.

To help ensure that SELinux is fully disabled, modify the file /etc/selinux/config:

sed -i 's/\(SELINUX=enforcing\|SELINUX=permissive\)/SELINUX=disabled/g' /etc/selinux/config
For compatibility reasons, four symbolic links are required:

- #ln -s /usr/lib64/libssl.so.0.9.8e /usr/lib64/libssl.so.0.9.8
- #ln -s /usr/lib64/libssl.so.1.0.1e /usr/lib64/libssl.so.1.0.1
- #ln -s /usr/lib64/libcrypto.so.0.9.8e /usr/lib64/libcrypto.so.0.9.8
- #ln -s /usr/lib64/libcrypto.so.1.0.1e /usr/lib64/libcrypto.so.1.0.1

8. Configure tuned to use the profile sap-hana. Run the following commands to install tuned-profiles for SAP HANA:

#subscription-manager repos --enable="rhel-sap-hana-for-rhel-7-server-rpms" --enable="rhel-7server-rpms"

- # yum install tuned-profiles-sap-hana tuned
- # systemctl start tuned
- # systemctl enable tuned
- # tuned-adm profile sap-hana
- 9. Disable the abort and crash dump features:
 - # systemctl disable abrtd
 - # systemctl disable abrt-ccpp
 - # systemctl stop abrtd
 - # systemctl stop abrt-ccpp
 - a. Disable core file creation. To disable core dumps for all users, open /etc/security/limits.conf and add the following lines:
 - * soft core 0
 - * hard core 0
 - b. Enable the sapsys group to create an unlimited number of processes:

echo "@sapsys soft nproc unlimited" > /etc/security/limits.d/99-sapsys.conf

- 10. To avoid problems with the firewall during SAP HANA installation, you can disable the firewall completely with the following commands:
 - #systemctl stop firewalld

#systemctl disable firewalld

- 11. Configure the network time and date. Make sure that NTP and its utilities are installed and that chrony is disabled:
 - # yum -y install ntp ntpdate
 - # systemctl stop ntpd.service
 - # systemctl stop chronyd.service
 - # sytemctl disable chronyd.service
 - a. Edit the /etc/ntp.conf file and make sure that the server lines reflect your NTP servers:
 - # grep ^server /etc/ntp.conf

server ntp.example.com

 ${\tt server \ ntpl.example.com}$

server ntp2.example.com

- b. Force an update to the current time:
 - # ntpdate ntp.example.com
- c. Enable and start the NTP daemon (NTPD) service:
 - # systemctl enable ntpd.service
 - # systemctl start ntpd.service
 - # systemctl restart systemd-timedated.service

d. Double-check that the NTP service is enabled:

systemctl list-unit-files | grep ntp

ntpd.service enabled

ntpdate.service disabled

e. The ntpdate script adjusts the time according to the NTP server every time the system comes up. This process occurs before the regular NTP service is started and helps ensure an exact system time even if the time deviation is too large to be compensated for by the NTP service.

- # echo ntp.example.com >> /etc/ntp/step-tickers
- # systemctl enable ntpdate.service

Tuning the OS for SAP HANA: Adapting SAP Notes

Use the following process to optimize the use of HANA database (HDB) with RHEL 7.6 for SAP.

- 1. Apply the SAP Notes settings as instructed. See SAP Note 2292690: SAP HANA DB: Recommended OS settings for RHEL 7.
- 2. Optionally, remove old kernels after the OS update:

Package-cleanup --oldkernels --count=1

3. Reboot the server after applying the SAP Notes

#reboot

The information from <u>SAP Note 2292690</u> mentioned is shown here and is current at the time of publishing this document. For the latest updates, please see the SAP Notes.

To customize the RHEL 7.6 System for HANA Servers, follow these steps:

Turn off autoNUMA balancing

Add "kernel.numa_balancing = 0" to /etc/sysctl.d/sap_hana.conf (please create this file if it does not already exist) and reconfigure the kernel by running

sysctl -p /etc/sysctl.d/sap_hana.conf

Additionally the "numad" daemon must be disabled:

- # systemctl stop numad
- # systemctl disable numad

Disable transparent hugepages and configure C-States for lower latency

Edit /etc/default/grub, search for the line starting with "GRUB_CMDLINE_LINUX": and append the following

transparent_hugepage=never processor.max_cstate=1 intel_idle.max_cstate=1

Energy Performance Bias, CPU frequency/Voltage scaling and Kernel samepage merging (KSM).

Add the following commands to a script executed on system boot, such as /etc/rc.d/boot.local:

cpupower frequency-set -g performance

Add the following commands to a script executed on system boot, such as /etc/init.d/boot.local: cpupower set -b 0 echo 0 > /sys/kernel/mm/ksm/run Activate tuned and Enable tuned profile systemctl enable tuned tuned-adm profile sap-hana

To optimize the network configuration, apply the settings by referring to SAP Note <u>2382421: Optimizing the network configuration</u> on HANA and OS level.

Installing SAP HANA

Use the official SAP documentation, which describes the installation process with and without the SAP unified installer. For the SAP HANA installation documentation, see <u>SAP HANA Server Installation Guide</u>. All other SAP HANA administration documentation is available at <u>SAP HANA Administration Guide</u>.

Important SAP Notes

Read the following SAP Notes before you start the installation. These SAP Notes contain the latest information about the installation, as well as corrections to the installation documentation.

The latest SAP Notes can be found at SAP Notes and Knowledge base.

SAP HANA IMDB notes

- <u>SAP Note 1514967</u>: SAP HANA: Central note
- <u>SAP Note 2298750</u>: SAP HANA Platform SPS 12 Release Note
- <u>SAP Note 1523337</u>: SAP HANA database: Central note
- SAP Note 2000003: FAQ: SAP HANA

Reboot the OS issuing reboot command

- SAP Note 2380257: SAP HANA 2.0 Release Notes
- <u>SAP Note 1780950</u>: Connection problems due to host name resolution
- <u>SAP Note 1755396</u>: Released disaster tolerant (DT) solutions for SAP HANA with disk replication
- <u>SAP Note 2519630</u>: Check whether power save mode is active
- <u>SAP Note 1681092</u>: Support for multiple SAP HANA databases on a single SAP HANA appliance
- SAP Note 1514966: SAP HANA: Sizing the SAP HANA database
- <u>SAP Note 1637145</u>: SAP BW on HANA: Sizing the SAP HANA database
- <u>SAP Note 1793345</u>: Sizing for Suite on HANA

- <u>SAP Note 2399079</u>: Elimination of hdbparam in HANA 2
- <u>SAP Note 2186744</u>: FAQ: SAP HANA parameters

Linux notes

- <u>SAP Note 2292690</u>: SAP HANA DB: Recommended OS settings for RHEL 7
- SAP Note 2235581: SAP HANA: Supported operating systems
- <u>SAP Note 2009879</u>: SAP HANA guidelines for the RHEL operating system
- SAP Note 1731000: Non-recommended configuration changes
- SAP Note 1557506: Linux paging improvements
- <u>SAP Note 1740136</u>: SAP HANA: Wrong mount option may lead to corrupt persistency
- SAP Note 2382421: Optimizing the network configuration on HANA and OS level

Third-party software notes

- <u>SAP Note 1730928</u>: Using external software in an SAP HANA appliance
- <u>SAP Note 1730929</u>: Using external tools in an SAP HANA appliance
- <u>SAP Note 1730930</u>: Using antivirus software in an SAP HANA appliance
- SAP Note 1730932: Using backup tools with Backint for SAP HANA

SAP HANA virtualization notes

• <u>SAP Note 1788665</u>: SAP HANA running on VMware vSphere virtual machines

Performing an SAP HANA post-installation checkup

For an SAP HANA system installed with <SID> set to **BWL** and the system number <nr> set to **00**, log in as **<sid>adm ir bwladm** and run the commands presented here.

Commands for checking SAP HANA services

```
bwladm@cishana01:/usr/sap/BWL/HDB00> /usr/sap/hostctrl/exe//sapcontrol -nr 00 -function
GetProcessList
19.02.2019 11:29:27
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GREEN, Running, 2019 02 13 08:51:49, 866:37:38, 41691
hdbcompileserver, HDB Compileserver, GREEN, Running, 2019 02 13 08:51:56, 866:37:31, 41837
hdbindexserver, HDB Indexserver, GREEN, Running, 2019 02 13 08:52:00, 866:37:27, 41863
hdbnameserver, HDB Nameserver, GREEN, Running, 2019 02 13 08:51:50, 866:37:31, 41839
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2019 02 13 08:51:56, 866:37:31, 41839
hdbwebdispatcher, HDB Web Dispatcher, GREEN, Running, 2019 02 13 08:51:56, 866:37:27, 41865
bwladm@cishana01-bwl:/usr/sap/BWL/HDB00>
```

Commands for checking SAP HANA database information

bwladm@cish	hana01:/	usr/sap/B	WL/HDB	00> HDB inf	0		
USER	PID	PPI	D %(CPU VSZ		RSS	COMMAND
bwladm	59578	59577	0.0	108472	1944	-sh	
bwladm	59663	59578	0.0	114080	2020	\	/bin/sh /usr/sap/BWL/HDB00/HDB info
bwladm	59692	59663	0.0	118048	1596	_ I	os fx -U bwladm -o
user,pid,pp	pid,pcpu	,vsz,rss,	args				
bwla	adm	41683		1 0.0	221	88	1640 sapstart
pf=/hana/sł	nared/BW	L/profile	/BWL_HI	DB00_cishan	a01-bw	1	
bwladm	41691	41683	0.0	582888	290988	<u>_</u> ،	usr/sap/BWL/HDB00/cishana01-
bwl/trace/h	ndb.sapB	WL_HDB00	-d -nw	-f /usr/sa	p/BWL/	HDB0	/cishana01-bwl/daemon.ini
bwladm	41711	41691	0.3	54292416	20589	00	_hdbnameserver
bwladm	41837	41691	0.1	4278472	1243	356	_hdbcompileserver
bwladm	41839	41691	0.2	11773976	82627	24	_hdbpreprocessor
bwladm	41863	41691	6.2	22143172	18184	604	_hdbindexserver
bwladm	41865	41691	0.5	8802064	244	6612	_hdbxsengine
bwladm	42431	41691	0.1	4352988	8232	20	_hdbwebdispatcher
bwladm.	41607		1 0	.0 497	576	232	32
/usr/sap/BW	WL/HDB00	/exe/saps	tartsrv	J			
pf=/hana/sh	nared/BW	L/profile	/BWL_HI	DB00_cishan	a01-bw	1 -D	-u bwladm
bwladm@cish	nana01-b	wl:/usr/s	ap/BWL,	/HDB00>			

Tuning the SAP HANA performance parameters

After SAP HANA is installed, tune the parameters as shown in Table 13 and explained in the following SAP Notes.

Table 13.Tuning parameters

Parameters	Data file system	Log file system
max_parallel_io_requests	256	Default
async_read_submit	On	On
async_write_submit_blocks	All	All
async_write_submit_active	Auto	On

- <u>SAP Note 2399079</u>: Elimination of hdbparam in HANA 2
- <u>SAP Note 2186744</u>: FAQ: SAP HANA parameters

Performing maintenance operations

SAP HANA operation and maintenance procedures are described in detail in many related SAP documents. For a complete list of the documentation available, see http://help.sap.com/hana.

This document summarizes only a few important operation and maintenance procedures. Most of the procedures described in this document are command-line interface (CLI) procedures and are independent of any GUI requiring an X terminal or other GUI front end (Microsoft Windows PC, Linux desktop, etc.). CLI procedures can be started using the KVM or any Secure Shell (SSH) tool such as PuTTY (for Windows) or Terminal (for Mac OS), or any Linux terminal window to connect to the SAP HANA database system (the appliance).

Monitoring SAP HANA

Three easy CLI methods are available to check the running SAP HANA database.

saphostagent

1. Start a shell and connect to the SAP HANA system as the root user.

```
cishana01:~ # /usr/sap/hostctrl/exe/saphostctrl -function ListDatabases
Instance name: HDB00, Hostname: cishana01, Vendor: HDB, Type: hdb, Release: 1.00.60.0379371
Database name: HAN, Status: Error
cishana01:~ #
```

2. Get a list of installed HANA instances or databases.

```
cishana01:~ # /usr/sap/hostctrl/exe/saphostctrl -function ListInstances
Inst Info : HAN - 00 - cishana01 - 740, patch 17, changelist 1413428
cishana01:~ #
```

3. Using this information (system ID [SID] and system number), you can use **sapcontrol** to gather more information about the running HANA database.

sapcontrol

1. In a shell, use the **sapcontrol** function **GetProcessList** to display a list of running HANA OS processes.

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetProcessList
19.02.2019 14:54:45
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GREEN, Running, 2019 02 15 11:57:45, 98:57:00, 8545
hdbnameserver, HDB Nameserver, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11579
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11580
hdbindexserver, HDB Indexserver, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11581
hdbstatisticsserver, HDB Statisticsserver, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11581
hdbstatisticsserver, HDB Statisticsserver, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11583
sapwebdisp_hdb, SAP WebDispatcher, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11584
hdbcompileserver, HDB Compileserver, GREEN, Running, 2019 02 15 12:05:27, 98:49:18, 11584
```

You see processes such as hdbdaemon, hdbnameserver, and hdbindexserver that belong to a running HANA database.

2. You can also get a system instance list, which is more useful for a scale-out appliance.

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList
19.07.2019 15:03:12
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus
cishana01, 0, 50013, 0, 0.3, HDB, GREEN
```

HDB info

Another important tool is the **HDB** command, which needs to be issued by the <SID>adm user: the OS user who owns the HANA database.

As the root user on the HANA appliance, enter the following command:

```
cishana01:~ # su - hanadm
cishana01:/usr/sap/HAN/HDB00> HDB info
          PID PPID %CPU
USER
                           VSZ
                                RSS COMMAND
hanadm
        61208 61207 1.6 13840 2696 -sh
hanadm 61293 61208 0.0 11484 1632 \ /bin/sh /usr/sap/HAN/HDB00/HDB info
hanadm 61316 61293 0.0 4904
                                 872
                                         \ ps fx -U hanadm -o user,pid,ppid,pcpu,vsz,rss,args
hanadm
                1 0.0 20048 1468 sapstart pf=/hana/shared/HAN/profile/HAN HDB00 cishana01
       8532
         8545 8532 1.5 811036 290140 \_ /usr/sap/HAN/HDB00/cishana01/trace/hdb.sapHAN_HDB00 -
hanadm
d -nw -f /usr/sap/HAN/HDB00/cis
       11579 8545 6.6 16616748 1789920
hanadm
                                             \ hdbnameserver
hanadm
       11580 8545 1.5 5675392 371984
                                           \ hdbpreprocessor
hanadm
       11581 8545 10.9 18908436 6632128
                                             \ hdbindexserver
hanadm 11582 8545 8.7 17928872 3833184
                                             \ hdbstatisticsserver
                                             \ hdbxsengine
hanadm 11583 8545 7.4 17946280 1872380
        11584 8545 0.0 203396 16000
hanadm
                                          \ sapwebdisp hdb
pf=/usr/sap/HAN/HDB00/cishana01/wdisp/sapwebdisp.pfl -f /usr/sap/H
        11585 8545 1.5 15941688 475708
                                            \ \ hdbcompileserver
hanadm
hanadm
         8368
                  1 0.0 216268 75072 /usr/sap/HAN/HDB00/exe/sapstartsrv
pf=/hana/shared/HAN/profile/HAN HDB00 cishana01 -D -u
```

This command produces output similar to that from the **sapcontrol GetProcessList** function, with a bit more information about the process hierarchy.

Downloading revisions

To download revisions, you need to connect to the service marketplace and select the software download area to search for available patches.

Refer to <u>SAP HANA Master Guide</u> for update procedures for SAP HANA.

For more information

For information about SAP HANA, see <u>https://hana.sap.com/abouthana.html</u>.

For information about certified and supported SAP HANA hardware, see <u>https://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/index.html</u>.

Appendix: Solution variables used in this document

Before starting the configuration process, you need to collect some specific configuration information. Table 14 provides information to help you assemble the required network and host address, numbering, and naming information. This worksheet can also be used as a "leave behind" document for future reference.

Variable	Description	Value used in the lab for this document
< <var_cimc_ip_address>></var_cimc_ip_address>	Cisco UCS C480 M5 server's IMC IP address	<ip address=""></ip>
< <var_cimc_ip_netmask>></var_cimc_ip_netmask>	Cisco UCS C480 M5 server's IMC network netmask	255.255.255.0
< <var_cimc_gateway_ip>></var_cimc_gateway_ip>	Cisco UCS C480 M5 server's IMC network gateway IP address	<gateway ip=""></gateway>
< <var_raid50_vd_name>> or <<var_raid5_vd_name>></var_raid5_vd_name></var_raid50_vd_name>	Name for virtual drive VD0 during RAID configuration	ucs_hana
< <var_hostname.domain>></var_hostname.domain>	SAP HANA node FQDN	cishana01.custdom.local
< <var_sys_root-pw>></var_sys_root-pw>	SAP HANA node's root password	
< <var_lvm_vg_name>></var_lvm_vg_name>	SAP HANA node's OS LVM volume group name	hanavg
< <var_mgmt_ip_address>></var_mgmt_ip_address>	SAP HANA node's management and administration IP address	<management ip=""></management>
< <var_mgmt_nw_netmask>></var_mgmt_nw_netmask>	SAP HANA node's management network netmask	255.255.255.0
< <var_mgmt_gateway_ip>></var_mgmt_gateway_ip>	Cisco UCS C480 M5 server's management and administration network gateway IP address	<management gw="" ip=""></management>
< <var_mgmt_netmask_prefix>></var_mgmt_netmask_prefix>	Netmask prefix in CIDR notation	24

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