Cisco Scale-Up Solution for SAP HANA on Cisco C880 M5 Servers with Red Hat Enterprise Linux for SAP HANA



Design and deploy an SAP HANA single-node solution based on standalone Cisco C880 M5 Servers with Red Hat Enterprise Linux for SAP HANA 7.3

April 2018



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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 are unable to 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 C880 M5 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 C880 M5 rack-mount server provides a robust platform for SAP HANA workloads in a single node.

Solution Overview

Introduction

The Cisco C880 M5 scale-up solution provides prevalidated, ready-to-deploy infrastructure, reducing the time and complexity involved in configuring and validating a traditional data center deployment. The reference architecture detailed in this document highlights the resiliency and ease of deployment of an SAP HANA solution.

SAP HANA is SAP's implementation of in-memory database 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. As an appliance, the SAP HANA solution 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. In 2013, SAP introduced the SAP HANA Tailored Datacenter Integration (TDI) option. TDI offers a more open and flexible way to integrate SAP HANA trib 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. The TDI option enables organizations to run multiple SAP HANA production systems on a shared infrastructure. It also enables customers to run SAP application servers and the 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.

Solution summary: Cisco C880 M5 Server

The Cisco Scale-Up Solution for SAP HANA is based on the Cisco UCS C880 M5 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 C880 M5 Server configuration

CPU specification	2.10-GHz Intel® Xeon® processor 8176 Platinum CPU
	Quantity: 8
	Memory configuration
Possible memory configurations	 64-GB DDR4: Quantity 48 (3 TB) 64-GB DDR4: Quantity 96 (6 TB) 128-GB DDR4: Quantity 72 (9 TB) 128-GB DDR4: Quantity 96 (12 TB)
Hard-disk drive (HDD) type and quantity	40 x 1.8-TB SAS drives (in 2 x JX40S2 JBODs)
BIOS	Release V1.0.0.0 R1.17.0 for D3858-A1x or later
Unified firmware	Release 1.14Q or later
LSI MegaRAID controller	LSI EP420e 12-Gbps SAS modular RAID controller
Network card	Onboard Intel 1 Gigabit Ethernet controller (2 ports)PCIe Intel 10 Gigabit Ethernet controller (8 ports)
Power supply	Redundant power supplies: Quantity 4

Table 2. Cisco C880 M5 proposed disk layout

Disk	Disk type	Drive group	RAID level	Virtual drive
JBOD 1: Slot (0 through 4)	SAS HDD	DG0	5	VD0
JBOD 1: Slot (5 through 9)	SAS HDD	DG1	5	VD1
JBOD 1: Slot (10 through 14)	SAS HDD	DG2	5	VD2
JBOD 1: Slot (15 through 19)	SAS HDD	DG3	5	VD3
JBOD 2: Slot (0 through 4)	SAS HDD	DG4	5	VD4
JBOD 2: Slot (5 through 9)	SAS HDD	DG5	5	VD5
JBOD 2: Slot (10 through 14)	SAS HDD	DG6	5	VD6
JBOD 2: Slot (15 through 19)	SAS HDD	DG7	5	VD7

Table 3. Cisco C880 M5 proposed disk configuration

Drives used	RAID type	Used for	File system
	RAID 5	Operating system	ext3
		Data file system	XFS
40 x 1.8-1B SAS HDD		Log file system	XFS
		HANA shared file system	XFS

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Infrastructure overview

Cisco C880 M5 Server

The scalable Cisco C880 M5 Server (Figure 1) is an Intel-based rack server for critical business scenarios. For example, it is well suited for database management systems for medium-sized and large databases and as a consolidation platform for running an immensely large number of different applications using virtualization technologies. With its highly developed hardware and software components, the server offers a high level of data security and availability. Security and availability features include hot-pluggable HDD and solid-state disk (SSD) modules, hot-pluggable system fans and power supply units, and automatic server reconfiguration and restart (ASR&R). It is well suited for the following use cases:

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

Figure 1. Cisco C880 M5 Server

Front view of the C880



Front-view detail



Rear view of the C880



Rear-view detail



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 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, please refer to https://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/index.html.

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

File system layout

Figure 2 shows the file system layout and the required storage sizes for installing and operating 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 2. Proposed disk layout with partition mapping with forty 1.8-TB SAS drives



The storage size for the file system is based on the amount of memory on the SAP HANA host.

The following list shows 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)*
- * For solutions based on the Intel Xeon processor Platinum CPU, the size of the log volume must be as follows:
 - Half of the server memory for systems ≤ 256 GB of memory
 - Minimum of 512 GB for systems with ≥ 512 GB of memory

Operating system

SAP HANA supports the following operating systems:

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

Note: This document provides installation steps for RHEL for SAP HANA 7.3.

Deployment hardware and software

Configuration guidelines

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 4 lists the configuration variables that are used throughout this document. This table can be completed based on the specific site variables and used in implementing the configuration steps presented in this document.

Table 4. Configuration variables

Variable	Description	Customer implementation value
< <var_cimc_ip_address>></var_cimc_ip_address>	Cisco C880 M5 Server's iRMC IP address	
< <var_cimc_ip_netmask>></var_cimc_ip_netmask>	Cisco C880 M5 Server's iRMC network netmask	
< <var_cimc_gateway_ip>></var_cimc_gateway_ip>	Cisco C880 M5 Server's iRMC network gateway IP address	
< <var_raid5_vd0-7_name>></var_raid5_vd0-7_name>	Name for virtual drive VD0 to VD7 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 C880 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

Configuring the Cisco C880 M5 integrated remote management controller

To configure the integrated remote management controller (iRMC), connect to the server with cables to the VGA and USB ports for the keyboard.

1. Connect the management network cable to the management port behind the server as shown in Figure 3.

Figure 3. Connecting to the management port



- 2. Power on the server and wait for the BIOS post screen.
- 3. When the BIOS post screen appears, press F2 for the iRMC BIOS setup (Figure 4).

Figure 4. BIOS POST screen



4. On the BIOS setup screen that appears, select the Management tab (Figure 5)

Figure 5. Cisco C880 M5 BIOS setup screen (local display)

Informat	tion Configuration	Management	Security	Boot	Exit	<f1:help></f1:help>
BIOS R	evision	R0.30	.0			
▶ System	Information					
System System	Date Time	[05/1 [04:0	6/2017] 5:05]			
Privil	ege	Admin	istrator			

5. On the Management tab, configure the management interface IP address (Figure 6).

Figure 6. Cisco C880 M5 management interface configuration (local display)

Information	Configuration	Management	Security	Boot	Exit	<f1:help></f1:help>				
iRMC LAN Pa	rameters Configur	ation								
Management 1 iRMC MAC Ad Management 1 Management 1	LAN dress LAN Port LAN Speed	<mark><en< mark=""> 2C : <ma <au< th=""><th>abled> D4:44:E6:57 nagement> to></th><th>:74</th><th></th><th></th></au<></ma </en<></mark>	abled> D4:44:E6:57 nagement> to>	:74						
Management	VLAN	<d i<="" th=""><th colspan="8"><disabled></disabled></th></d>	<disabled></disabled>							
iRMC IPv4 L IP Configur IP Address Subnet Mask Gateway Add	AN Stack ation ress	<en <us 10. 255 10.</us </en 	<enabled> <use configuration="" static=""> 10.24.76.135 255.255.255.0 10.24.76.1</use></enabled>							
iRMC IPv6 L Link Local (-	AN Stack Address	≺En fe8 fee	abled> 0::2ed4:44ff 6:5774	f:						

- 6. Make sure that Management is selected for Management LAN Port.
- 7. Use the console network IP address <<var_iRMC_ip_address>>, netmask <<var_iRMC_ip_netmask>>, and gateway <<var_iRMC __ip_stemask>>, for the IPv4 settings of the iRMC.
- 8. Press F10 to save the configuration and exit the utility.
- 9. Open a web browser on a computer on the same network with Java and Adobe Flash installed.
- 10. Enter the iRMC IP address of the Cisco C880 M5 server: http://<<var_iRMC_ip_address>>.
- 11. Enter the login credentials as updated in the Cisco Integrated Management Controller (IMC) configuration. The default username and password are **admin** and **admin** (Figure 7).

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Figure 7. Logging in

Cisco C880 Web Server	CISCO	
Username	admin	
Password		
		Login

The home screen for the controller appears (Figure 8).

Figure 8. Cisco C880 IMC home screen

RMC S5 Web S	Server					🖨 Languag	pe 🗸	🚊 admin 🗸	Help 🗸	cisc	
System	Logs	Tools	Setting	s					ID 🖾	∆ d	
Systemboard											
Power		Overview									
Cooling		 System Information 									
Mass Storage		 Operating S 	system Inform	ation							
Software		 Systemboa 	rd Information								
Network		 Power statt Running iRI 	MC Firmware								
AlS Connect		 Active Sess 	ions Informat	ion							
		IP Address	User Name	User ID	User Type	Session Type	Se	ssion Privilege	Session	Shell	
		217.9.101.18	admin	2	BMC User	HTTPS	Redfis	h administrator	Redfish		
		 Installed Lie 	cense Keys								

Starting Cisco C880 M5 video redirection

Follow the steps here to configure video redirection to access the console window from the browser.

- 1. Log in to the iRMC with the admin credentials.
- 2. Click the monitor icon at the upper right (Figure 9).

Figure 9. Clicking the monitor icon



3. Click Start Video Redirection. This step opens a new Java window by granting the video console access (Figure 10).

Figure 10. Opening the video console window

••	•			JViewe	er - admin	@iRMCE658BE	- 10 fps			
Video	Keyboard	Mouse	Options	Media	Power	Active Users	Help		Zoom Size : D	Disabled
	X 🖸					হ			l i i i i i i i i i i i i i i i i i i i	5 <u>-</u> O
	Inf	ormation	Config	puration	n Mana	agement Se	curity	Boot Exi	t <f1:help< th=""><th>></th></f1:help<>	>
	BI	OS Revis	ion			R1.31.0				
	► Sy	stem Inf	ormation							
	Sy	stem Dat	е			[12/13/	2017]			
	ទម្ភ	stem lim	e			116:29:	021			
	Pr	iv i lege				Adminis	trator			
							LALT	LCTRL RAL	RCTRL Num	Caps Scroll

Configuring Cisco C880 M5 BIOS CPU settings

After the video console window opens, follow the steps here to configure the CPU settings.

1. From the top menu bar, select Configuration and then select CPU Configuration in the submenu (Figure 11).

Figure 11. Selecting CPU Configuration



2. Configure the CPU settings as shown in Figure 12.

Figure 12. CPU configuration settings

Information	Configuration	Management	Security	Boot Exit					
CPU Configuration									
Humer-Threading									
Active Press	Lilly Decor Coree			JIEuz					
(Current /Aug	(jahle)		24 /	24					
(Current/hya	(IIADIC)		277	21					
Hardware Pre	fetcher		<ena)< td=""><td>oled></td><td></td></ena)<>	oled>					
Adjacent Cac	he Line Prefetc	h	<enal< td=""><td>oled></td><td></td></enal<>	oled>					
DCU Streamer	Prefetcher		<enal< td=""><td>oled></td><td></td></enal<>	oled>					
DCU Ip Prefe	etcher		<enal< td=""><td>oled></td><td></td></enal<>	oled>					
Intel Virtua	lization Techno	logy	<dis.< td=""><td>abled></td><td></td></dis.<>	abled>					
Intel(R) VT-	-d		<dis.< td=""><td>abled></td><td></td></dis.<>	abled>					
Intel TXT Su	ıpport		<dis< td=""><td>abled></td><td></td></dis<>	abled>					
Power Techno	locu		<cus<sup>.</cus<sup>	tom>					
Enhanced Spe	edStep		<enabled></enabled>						
Turbo Mode	*		<enabled></enabled>						
Energy Perfo	ormance		<performance></performance>						
Override OS	Energy Performa	nce	<disabled></disabled>						
Utilization	Profile		<even></even>						
P-State Coor	dination		<hw_all></hw_all>						
HWPM Support	ţ.		<native mode=""></native>						
CPU C1E Supp	ort		<disabled></disabled>						
CPU C6 Repor	`t		<disabled></disabled>						
🛛 Package C St	tate limit		<no 1<="" td=""><td>limit></td><td></td></no>	limit>					
UPI Link Fre	equency Select		<auto< td=""><td>o≻</td><td></td></auto<>	o≻					
Perfmon and I	DFX devices		<di:< td=""><td>sabled></td><td></td></di:<>	sabled>					
ACPI MSCT			<ena< td=""><td>(bled)</td><td></td></ena<>	(bled)					
Uncore Freque	ency Scaling		<ena< td=""><td>(bled)</td><td></td></ena<>	(bled)					
Data Poisoni	ng		<ena< td=""><td>(bled)</td><td></td></ena<>	(bled)					
Sub NUMA Clus	stering		<aut< td=""><td>to></td><td></td></aut<>	to>					
Stale AtoS		<disabled></disabled>							
LLC Dead Lin	e Alloc	<ena< td=""><td>abled></td><td></td></ena<>	abled>						



Configuring Cisco C880 M5 BIOS disk (RAID) settings for the SAP HANA file system

Now create eight virtual drives with RAID 5. Each virtual drive will have five drives associated with it. Follow the steps here until all eight virtual drives are created.

Be sure that the settings for the virtual drives are identical. If they are not, SAP HANA performance will be degraded.

Note: The steps in this section create a single RAID 5 virtual drive. Repeat these steps to create eight RAID 5 virtual drives for the appliance installation.

1. Select the Avago MegaRAID configuration utility on the Configuration screen (Figure 13).

Figure 13. Selecting the configuration utility



2. Select Main Menu (Figure 14).

Figure 14. Selecting the main menu



3. From the main menu, select Configuration Management (Figure 15). You will configure the first virtual drive.

Figure 15. Cisco C880 M5 RAID configuration 1



4. Select Create Virtual Drive (Figure 16).

Figure 16. Creating the virtual drive

Information	Configuration	Management	Security	Boot	Exit	<f1:help></f1:help>
 Create Uir Create Pro Clear Conf 	<mark>tual Drive</mark> file Based Virtua iguratiom	l Drive				

5. Select RAID5 as the RAID level and click Select Drives (Figure 17).

Figure 17. Selecting drives

	Information	Configuration	Management	Security	Boot	Exit	
•	Save Configu Select RAID	uration Level		<raii< th=""><th>)5></th><th></th><th></th></raii<>)5>		
	Protect Virt	tual Drive es From		[] <unco< th=""><th>onfigure</th><th>ed Capa</th><th>city></th></unco<>	onfigure	ed Capa	city>
►	Select Drive	25				k	

6. Select the first five drives in the list (Figure 18).



Information Configuration	Management	Security	Boot Exit	<f1:help></f1:help>
▶ Apply Changes				
Select Media Type		<hdd></hdd>		
Select Interface Type		<both< td=""><td>></td><td></td></both<>	>	
Logical Sector Size		<both< td=""><td>></td><td></td></both<>	>	
CHOOSE UNCONFIGURED DRIVES:				
Drive Port 4 - 7:01:00: HDD	, SAS, 1.091T	8, [X]		
Unconfigured Good, (512B)				
Drive Port 4 - 7:01:01: HDD	, SAS, 1.091T	B, [X]		
Unconfigured Good, (512B)				
Drive Port 4 - 7:01:02: HDD	, SAS, 1.091T	B, [X]		
Unconfigured Good, (512B)				
Drive Port 4 - 7:01:03: HDD	, SAS, 1.091T	8, <mark>[X]</mark>		
Unconfigured Good, (512B)				
Drive Port 4 - 7:01:04: HDD	, SAS, 1.091T	B, [X]		
Unconfigured Good, (512B)				

- 7. Select Apply Changes from the menu above the drive list.
- 8. Assign a virtual drive name and configure the parameters as shown in Figure 19. These parameters are very important. They will manage the performance of the SAP HANA that will be installed. Hence, be sure to set the correct values.
 - a. For Strip Size, specify 256 KB.
 - b. For Read Policy, specify Read Ahead.
 - c. For Write Policy, specify Write Back.
 - d. For I/O Policy, specify Direct.
 - e. For Drive Cache, specify Unchanged.

Figure 19. Configuring virtual drive parameters

Information Configuration Management	Security Boot Exit	<f1:help></f1:help>
► Save Configuration		
Select RAID Level	<raid5></raid5>	
Protect Virtual Drive	[]	
Select Drives From	<unconfigured capacity=""></unconfigured>	
► Select Drives		
CUNFIGURE VIRIOHL DRIVE PHRHMETERS:		
Virtual Drive Name	-	
Virtual Drive Size	4.364	
Virtual Drive Size Unit	<tb></tb>	
Strip Size	<256 KB>	
Read Policy	<read ahead=""></read>	
Write Policy	<write back=""></write>	
I/O Policy	<direct></direct>	
Access Policy	<read write=""></read>	
Drive Cache	<unchanged></unchanged>	
Disable Background Initialization	<no></no>	
Default Initialization	<no></no>	
Emulation Tupe	<default></default>	
► Save Configuration		

- 9. Click Save Configuration.
- 10. Select Yes to confirm the save operation (Figure 20).

Figure 20. Saving the configuration



Note: You need to create eight virtual drives, each with five physical disks, so repeat the steps here until all eight virtual drives are created.



Committing the changes to the BIOS

After the BIOS settings and RAID configurations are applied, you need to commit the changes to the BIOS and exit the BIOS utility to proceed with the OS installation.

- 1. From the top menu, select Exit.
- 2. Select "Commit settings and Exit" (Figure 21).

Figure 21. Committing the settings and exiting



The server will reboot. You can now mount the operating system ISO file on the console.

Installing the operating system

The following procedure shows the steps for installing SLES 12 for SAP SP2 on local drives. Keep the SLES DVD ISO file handy.

1. In the video console window, click the CD icon (Figure 22).

Figure 22. Clicking the CD icon

Video Keybo	baid Mouse	Options	Media	Power	Active Users	Help
			8		ર	

2. Browse for the SLES 12 for SAP Applications SP2 DVD ISO image and click Connect CD/DVD (Figure 23).

Figure 23. Connecting the system

CD/DVD Media : I	
© CD Image Z:ISLESISLE-12-SP1-SAP-DVD-x86_64-GM-DVD1.iso ▼ Brows	Connect CD/DVD
O D	

3. After the system boots, press F12 to display the boot menu (Figure 24).

Figure 24. Boot menu

🚡 JViev	wer - admin	@iRMCE6	SAFE - 0 fp	05							
Video	<u>K</u> eyboard	Mo <u>u</u> se	Options	Me <u>d</u> ia	Po <u>w</u> er	Active Users	Help	Zoc	om Size : Disal	oled	
	×				B					1	🛯 🗖 🕑
				Ent UEF UEF UEF UEF UEF UEF UEF	Ple er Sett [PKEv [PKEv [Fuji [Hard [Hard [Hard [Hard [Hard [Hard [Hard	ase select up 4 (MAC:2CD4 6 (MAC:2CD4 6 (MAC:2CD4 tsu Uirtual Drive 2 Drive 3 Drive 3 Drive 4 Drive 5 Drive 6 Drive 7 Drive 8 and 4 to ma ER to selec ESC to	boot device: 144E6A677) 144E6A677) 1 COROMO 1.00 1 CDROM1 1.00 1 CDROM1 1.00				
								LAL	LCTRL RALT	RCTRL N	um Caps Scroll
2											

4. Choose UEFI Fujitsu Virtual CDROM0. The installation process begins (Figure 25).

Figure 25. Beginning the installation process

Hie View Macros Tools Virtual Media Help
🚙 Boot Server 🜙 Shutdown Server 🤤 Reset
KVM Console Properties
Install Red Hat Enterprise Linux 7.3
Test this media & install Red Hat Enterprise Linux 7.3
Troubleshooting>
Use the ▲ and ▼ keys to change the selection.
Press 'e' to edit the selected item, or 'c' for a command prompt.
192.168.196.146 admin 3.0 fps 23.321 KB/s

5. Select the language and keyboard layout you want (Figure 26).

Figure 26.	Selecting the language and keyboard layout
------------	--

File View Macros Tools Virtual	Media Help		
Boot Server Shutdown Server	Seset		
KVM Console Properties			•
🥞 redhat			RED HAT ENTERPRISE LINUX 7.3 INSTALLATION
			SE LINUX 7.3.
	English	Enalish	English (United States)
	Afrikaans	Afrikaans	English (United Kingdom)
	አማርኛ	Ambaric	English (India)
	العبيية	Arabic	English (Australia)
	অসমীয়া	Arabic	English (Canada)
	Acturianu	Assamese	English (Denmark)
	Asturiariu	Asturian	English (Ireland)
market and a star	Беларуская	Belarusian	English (New Zealand)
	Български	Bulgarian	English (Nigeria)
he break and	বাংলা	Bengali	English (Hong Kong SAR China)
	Bosanski	Bosnian	English (Findpones)
and the second second	Català	Catalan	English (South Africa)
	Čeština	Czech	English (Zambia)
	Cymraeg	Welsh	English (Zimbabwe)
	Dansk	Danish	English (Botswana)
	Type here to search.	G	
			Quit Continue
			192.168.196.146 admin 8.0 fps 37.044 KB/s
A Connected to IP: 192.168.196.146			System Time: 2017-11-15T11:42

Click Continue. The central Installation Summary page appears. Here, you need to configure various features.
 Choose Localization > Date & Time. Choose the appropriate region and city (Figure 27). You will configure the Network Time Protocol (NTP) later. Click Done.

Figure 27. Setting the date and time



7. Choose Security > Security Policy. Turn off the security policy (Figure 28).

Figure 28. Setting security policy

File View Macros Tools Virtual Media Help		
Boot Server Shutdown Server 🤗 Reset		
KVM Concela a ti		
Kim Curisole Properties		
SECURITY POLICY	RED HAT ENTERPRISE LINUX 7.3 INST	ALLATION
Done	🖽 us	Help!
Change content Apply security policy: OFF		
Choose profile below:		
Default		
The implicit XCCDF profile. Usually, the default contains no rules.		
Standard System Security Profile		
This profile contains rules to ensure standard security baseline of Red Hat Enterpri	ise Linux 7 system.	
Regardless of your system's workload all of these checks should pass.		
PCI-DSS v3 Control Baseline for Red Hat Enterprise Linux 7		
This is a *draft* profile for PCI-DSS v3		
C2S for Red Hat Enterprise Linux 7		
U.S. Government Commercial Cloud Services (C2S) baseline.		
e.s. obtenment commercial cloud berrices (c25) baseline.		
This baseline was inspired by the Center for Internet Security		
(CIS) Red Hat Enterprise Linux 7 Benchmark, v1.1.0 - 04-02-2015.		
For the SCAP Security Guide project to remain in compliance with		
CIS terms and conditions, specifically Restrictions(8), note there is no representation or claim that the C2S profile will		
ensure a system is in compliance or consistency with the CIS		
baseline.		
Select profile	2	
Changes that were done or need to be done:		
Not applying security policy		
G roc oppying second policy		
	192.168.196.147 admin 6.0 fps 54.981 KB/s	<u> </u>
@ Connected to IP: 192.168.196.147	System Time: 2017-11-15T14:2	2

8. Select Software Selection. Retain the default selection: Minimal Install (Figure 29).

Figure 29. Software Selection page

ase Environment	Add-Ons for Selected Environment
Minimal Install Basic functionality.	Debugging Tools Tools for debugging misbehaving applications and diagnosing performance
 Infrastructure Server Server for operating network infrastructure services. File and Print Server File, print, and storage server for enterprises. Basic Web Server Server for serving static and dynamic internet content. Virtualization Host Minimal virtualization host. Server with GUI Server for operating network infrastructure services, with a GUI. 	Compatibility Libraries Compatibility Libraries for applications built on previous versions of Red Hat Enterprise Linux. Development Tools A basic development environment. Security Tools Security Tools for integrity and trust verification. Smart Card Support Support for using smart card authentication.

9. Select KDUMP. Deselect the Enable Kdump option to disable it (Figure 30).

ila Viau Macros Taola Viri	tual Madia – Hali	-					
Boot Server + Shutdown Ser	var 🧭 Dacat	,					
	Ver Steven						
				DED			
RDOMP Doco				RED	HATENTERPRI	SE LINUX 7.3 INSTA	Halal
Done				E us	;		metp:
Kdump is a kernel crash dumpin	a mechanism I	n the event of a ru	wstem crash, kdump will cr	nture information from w	our system that ca	n he invaluable in deterr	mining th
cause of the crash. Note that k	dump does req	uire reserving a po	ortion of system memory th	hat will be unavailable for	other uses.	n be invatable in accen	initiang th
Enable kdump							
Kdump Memory Reservation:	 Automatic 	🔘 Manual	l				
Memory To Be Reserved (MB):	128 -	+					
Total System Memory (MB):	772652						
Usable System Memory (MB):	772524						
				192.168.196.14	7 admin 5.8 fps	22.339 KB/s	

Figure 30. Disabling kdump



10. Choose System > Installation Destination. Under the other storage options, select the option to manually configure the disk partition layout: "I will configure partition." (Figure 31). Click Done.

Figure 31. Installation Destination page

🚡 JVie	ewer - admin	@iRMCE65AFE -	5 fps						
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	×			8					<u> 日本</u>
	STALLATI	ON DESTIN	ATION				RED HAT ENTERP	RISE LINUX ⁻	7.3 INSTALLATION Help!
Devi	ce Selecti	ion							
Se	ect the de	vice(s) vou'd	like to install to	They will h	e left i	untouched until you click	on the main menu's "Be	enin Installat	ion" button
Loc	al Standard	Disks	tike to instatt te	. They write		untouched until you click		cym mstattat	John Buttom.
	6704	75.00				470 4 75 0 D	470 4 75 0 P		670475.00
	6704.	75 GIB	6704	4.75 GIB		6704.75 GIB	6704.75 GIB	5	6704.75 GIB
		C	L	C					
	FTS PRAI	D EP420e	FTS PRA	ID EP420e		FTS PRAID EP420e	FTS PRAID EP42	20e	FTS PRAID EP420
s	da / 6704	.75 GiB free	sdb / 670	4.75 GiB fre	e	sdc / 6704.75 GiB free	sdd / 6704.75 Gil	B free s	de / 6704.75 GiB 1
Spe Other Par D Ence	Add a disk. ar Storage titioning Automatica I would like cryption Encrypt my	• Options Ily configure pa • to make addit data. You'll se	artitioning.	vill configure pa le.	artitionin	g.	Disks lefi	t unselected he	re will not be touched.
Full	disk summar	y and boot loa	der				8 disks selected; 52.38	TiB capacity; 5	2.38 TiB free <u>Refresh</u> RCTRL Num Caps Scroll

11. On the Manual Partitioning page that appears, Scroll and select all eight virtual drives and then click Done at the top left of the page (Figure 32).

Figure 32. Manually creating partitions

🚡 JVie	ewer - a	dmin@i	RMCE65/	AFE - 1 fps					_ 🗆 🗙
⊻ideo	<u>K</u> eybo	oard N	lo <u>u</u> se g	Options Me	dia Po <u>w</u> er	Active Users	Help	Zoom Size : Disabled	
	X		80			(<u>に</u>
MAN	NUAL F	PARTI	TIONI	NG				RED HAT ENTERPRISE L	INUX 7.3 INSTALLATION
Add	New Instal You ha Hat End • Create butto St St * St	Red H Illation ven't c terprise lick her on. oount p ning sc andard andard	lat Ent reated a lat Linux 7 mount oints wi heme: Partitio Partitio	AL SPACE 2.38 TIB	nux 7.3 ints for you on yet. You tomatically cking the '+ lowing	ur Red a can: , , Wh the	ien you ir detai	u create mount points for your Red Hat Enterprise Linux 7.3 installa ils here.	ion, you'll be able to view
8	storaq	e devid	es selec	ted					Reset All
								LALT LCTRL F	ALT RCTRL Num Caps Scroll



12. You will first create the /boot partition with a standard partition scheme. Change the default partition scheme from Logical Volume Manager (LVM) to Standard Partition (Figure 33).



MANUAL PARTITIONING	RED HAT ENTERPRISE LINUX 7.2 INSTALLATIC 땓 us Help!
New Red Hat Enterprise Linux 7.2 Installation We haven't created any mount points for your Red Hat Enterprise Linux 7.2 installation yet. You can: Click here to create them automatically. Create new mount points by clicking the '+' button. Or, assign new mount points to existing partitions after selecting them below. We mount points will use the following partitioning scheme: Standard Partition Btrfs LVM LVM Thin Provisioning + - C	When you create mount points for your Red Hat Enterprise Linux 7.2 installation, you'll be able to view their details here.

13. Click the + button and create a /boot partition with a size of 200 MiB. Click "Add mount point" (Figure 34).

Figure 34.	Entering mount point and capacity information
------------	---

😼 J¥iewer - admin@iRMCE65AFE - 2 fps		
Video Keyboard Mouse Options Media Power Activ	ve Users Help Zoom Size : Disabled	
		🔝 🗖 🖓
MANUAL PARTITIONING	REI	D HAT ENTERPRISE LINUX 7.3 INSTALLATION
New Red Hat Enterprise Linux 7.3 Installation SYSTEM	sda1 Mount Point: Device	(s):
/boot/efi 200 MiB > sda1	Desired Capacity: FTS PR	AID EP 42 Oe (sda) and 7 others
	ADD A NEW MOUNT POINT More customization options are available after creating the mount point below. Mount Point: Desired Capacity: Cancel Add mount point sda1	ify
+ - G AVAILABLE SPACE 52.38 TiB 52.38 TiB 8 storage devices selected		Note: The settings you make on this screen will not be applied until you click on the main menu's 'Begin Installation' button. Reset All LALT LCTRL RALT RCTRL Num Caps Scroll

14. Change the file system type from the default XFS to ext3 (Figure 35).

Figure 35. Modifying the file system type

File View Macros Tools Virtual Media Help		
KVM Console Properties		
MANUAL PARTITIONING		RED HAT ENTERPRISE LINUX 7.3 INSTALLATION
• New Red Hat Enterprise Linux 7.3	sdel	
Installation	Mount Point:	Device (s):
/boot 200 MiB >	/boot	
soel	Desired Capacity:	Cisco UCSC-RAID12GP-4G (sde)
	200 Pilo	Modify
	Device Type:	
	File System:	
(ext3	
	Label:	Name:
		sdel
		Update Setting
+ - C		not be applied until you click on the main menu's 'Begin Installation' button.

15. Create /boot/efi partition of 200MiB

Click the + button, select /boot/efi for the mount point, enter 200 MiB as the desired capacity, and click "Add mount point" (Figure 36).

Figure 36. Creating /boot/efi partition

File View Macros Tools Virtual Media Help						
🚙 Boot Server 🛛 🤩 Shutdown Server 😂 Reset						
KVM Console Properties						
MANUAL PARTITIONING	st le		RED HAT ENTERPRISE L	INUX 7.3 INSTALLATION		
New Red Hat Enterprise Linux 7.3	sdel					
SYSTEM	Mount Point:		Device(s):			
/boot 200 MiB >	/boot					
sdel	Desired Capaci	ity:	Cisco UCSC-RAID12GP-4G (sde)	Cisco UCSC-RAID12GP-4G (sde)		
	200 MiB					
	ADD A NEW MO	DUNT POINT	odify			
	More customi	ization options are	available			
	after creating	the mount point b	elow.			
	Mount Point:	/boot/efi				
	Desired Cases situat	200.00 MiB				
	Desired Capacity.					
		Cancel Add n	ount poir			
			sdel			
				Update Settings		
			Note: The settings yo	ou make on this screen will		
+ - C			not be applied until yo	ou click on the main menu's 'Beoin Installation' button		
				and a second		



16. 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 HANA system–related volumes.

Click the + button, select "/" for the mount point, enter 100 GiB as the desired capacity, and click "Add mount point" (Figure 37).

Figure 37. Creating the root file system with 100 GB

File View Macros Tools Virtua	l Media Help					
📣 Boot Server 🔄 Shutdown Server	🥺 🥺 Reset					
KVM Console Properties						1
MANUAL PARTITIONING		, stalle		RED I	HAT ENTERPRISE LI	NUX 7.3 INSTALLATION
• New Red Hat Enterpris	se Linux 7.3	sdel				
Installation		Mount Point:		Device (s)	2	
SYSTEM		/hoot/efi		(o)		
/boot sde2	200 MiB	7500761				
/boot/efi	200 MiB >	Desired Capacity:		Cisco UC	SC-RAID12GP-4G (sde)	
sdel		200 MiB				
		ADD A NEW MOUI More customizati after creating the Mount Point: / Desired Capacity: 10 Car	NT POINT	available below. mount point sde2		
+ - C					Note: The settings yo not be applied until yo	Update Settings u make on this screen will u click on the main menu's Begin Installation' button.

17. Click Modify to change the device type (Figure 38).

Figure 38.	Preparing to change the device type to LVM
Figure 38.	Preparing to change the device type to Ly

and the second second			
			RED HAT ENTERPRISE LINUX 7.3 INSTALLA
New Red Hat Enterp	rise Linux 7.3	sde 3	
Installation		Mount Point:	Device (s):
/boot	200 MiB	1	
sde2 /boot/ofi	200 M/D	Desired Capacity:	Cisco UCSC-RAID12GP-4G (sde)
sdel	200 MIB	100 GiB	
/ sde3	100 GiB >		Modify
		Device Type:	Volume Group
		LVM 🔻 🗌 Er	ncrypt rhel •
		File System:	Modify
		xfs 🔻 Ref	ormat
		label	Nama
			root

18. Change the Device Type selection from Standard Partition to LVM.

19. Change the name of the volume group from the default rhel to hanavg (Figure 39). Then click Save.

Figure 39. Configuring the volume group



20. Change the file system type to ext3 and change the name to rootvol. Click Update Settings (Figure 40).

Figure 40. Updating the file system type and volume group name

Jiewer - admin@iRMCE65AFE - 1 fps							
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) 🥥 🚍 🚳 📼	Q		Image: A marked block in the second sec			
MANUAL PARTITIONIN	NG			RED HAT ENTERPRISE LINUX 7.3 INSTALLATION			
_ New Red Hat Ente	erprise Linux 7.3	hanavg-root					
Installation							
SYSTEM		Mount Point:	D	evice(s):			
/boot	200 MiB						
sda2		Desired Capacity:	F	TS PRAID EP420e (sda) and 7 others			
/boot/efi	200 MiB	100 GiB					
/ hanavg-root	100 GiB 〉			Modify			
		Device Type:	V	olume Group			
		LVM	Encrypt	hanavg (52.28 TiB free) 🔻			
		File System:					
		avt2	▼ Reformat	Modify			
		exts	• Reformat				
		Label:	N	ame:			
				rootvol			
				Urglate Settings			
				Note: The settings you make on this screen will			
+ - C				not be applied until you click on the main menu's 'Beain Installation' button.			

You will now create a 2 GiB swap volume. Click the + button, select "swap" for the mount point, enter 2 GiB as the desired capacity, and click "Add mount point" (Figure 41).

File View Macros Tools Virtual Media Help					
KVM Console Properties					
MANUAL PARTITIONING				RED HAT ENTERF	PRISE LINUX 7.3 INSTALLATION
New Red Hat Enterprise Linux 7.3	hanavg-root	tvol			
Installation	Mount Point:	Mount Point: /			
SYSTEM	1				
3de2	1iB Desired Capac				
/boot/efi 200 M sdel	100 GiB	aty.	Cisc	o UCSC-RAID12GP-	4G (sde)
/ 100 GiB hanavg-rootvol	ADD A NEW M	OUNT POINT	re available	idify	
	arter creating	after creating the mount point below.			(0 B free) 🔻
	Mount Point:	swap	•	dify	
	Desired Capacity:	2 GiB			
		Cancel Add	d mount point	1	
			ro	otvol	
					Update Settings
+ - C				Note: The se not be applie	ettings you make on this screen will d until you click on the main menu's 'Begin Installation' button.

Figure 41. Creating a swap volume

21. Change the device type to LVM, verify that hanavg is the selected volume group, and change the volume group name to **swapvol** (Figure 42).

Figure 42.	Updating swap	volume	properties
	opaacing on ap		p. opc. c.co

File View Macros Tools Virtual Media	Help				
📣 Boot Server 🔄 Shutdown Server 🤤 Re	eset				
KVM Console Properties					
			14	RED HAT ENTERPRISE LINUX 7.3 INSTALLATIO	N
🖕 New Red Hat Enterprise Linu	x 7.3	sde4			
Installation		Mount Point:		Device (s):	
SYSTEM				berteeld.	
/boot sde2	200 MiB	Desired Capacity:		Cisco UCSC-RAID12GP-4G (sde)	
/boot/efi sdel	200 MiB	2048 MiB			
/ hanavg-rootvol	100 GiB			Modify	
swap 20 sde4	048 MiB >				
		Device Type:		Volume Group	
		LVM	Encrypt	hanavg (O B free) 🔻	
		File System:		Modify	
		swap 🔻 🧭 Re	eformat		
		Label:		Name:	
				swapvol	
				Updat Settings	
				Note: The settings you make on this screen will	
+ - C				not be applied until you click on the main menu's 'Begin Installation' button.	

22. Click Done. A summary of the changes will appear. Click Accept Changes (Figure 43).

Figure 43. Summary of changes for manual partition configuration

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Video	<u>K</u> eyboard	Mo <u>u</u> se Op	tions Me <u>d</u> ia	Po <u>w</u> er	Active Users	Help		Zoom Size : Disa	ibled		
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MAI	NUAL PAR	TTIONIN	G						RED HAT EN	NTERPRISE LINUX	7.3 INSTALLATION
D	one								e us		Help!
	New Red	Hat Ente	rprise Linux	7.3	har	navg-swap	ovol				
	Installatio	n							D : 11		
	SYSTEM				MOI	unt Foint.			Device(s):		
	/boot			200	МіВ						
	sda2	SUMM	ARY OF CHAN	IGES							
	/boot/e1 sdal	Your cu	stomizations v	will resul	lt in the follow	ving changes	taking eff	ect after you retu	urn to the main menu	and begin installation	:
	1	Order	Action	Тур	pe	Devid	e Name	Mount point			
	hanavg-roo	tv: 20	Create Devic	e part	tition	sdc1					
	swap	21	Create Form	at phy	sical volume (LVM) sdc1					
	hanavg-sw	22 P	Create Form	at part	tition table (G	PT) sdd					
		23	Create Devid	e part	tition	sddl					R from)
		24	Create Form	at phy	sical volume (LVM) sddl					
		25	Create Form	at part	tition table (G	PT) sde					
		26	Create Devid	ce part	tition	sde1					
		27	Create Form	at phy	sical volume (LVM) sdel					
		28	Create Form	at part	tition table (G	PT) sdf					
		29	Create Devic	e part	tition	sdf1					
		30	Create Form	at phy	sical volume (LVM) sdf1					
							Cance	l & Return to Cus	tom Partitioning	Accept Changes	
										Ĺ	Spoate Settings
									Note:	The settings you make	e on this screen will
	+ -	G							not be	applied until you click 'Beain	on the main menu's Installation' button.
		TOTAL	SDACE							Degin	
í	52.28 TiB	52	38 TiB								
1											
1	8 storage dev	ices selecte	<u>:d</u>								Reset All
										LALT LCTRL RALT RO	TRL Num Caps Scroll

23. On the Installation Summary page that appears, click Begin Installation (Figure 44).

Figure 44.	Beginning the installation
	Beginning the motanation



24. As the installation progresses, set the root password (Figure 45).

Figure 45. Setting the root password

File View Macros Tools Virtual Media Help	
🚙 Boot Server 🛛 🔩 Shutdown Server 🤤 Reset	
KVM Console Properties	
	RED HAT ENTERPRISE LINUX 7.3 INSTALLATION
USER SETTINGS	
ROOT PASSWORD Root password is no Root password is no	t Eqt USER CREATION No user will be created
Creating lympy on /dev/sde3	
RED HAT JBOSS MIDDLEWARE	Build, integrate, and automate faster with middleware for the open hybrid cloud. redhat.com/jboss
🛆 Please complete items marked with this	icon before continuing to the next step.
	192.168.196.147 admin 38.6 fps 122.345 KB/s
A Connected to IP: 192.168.196.147	System Time: 2017-11-15T14:23

- 25. Enter and confirm the root password (Figure 46).
- Figure 46.Entering and confirming the root user password

File View Macros Tools Virtual Media	Help			
🚙 Boot Server 🔄 Shutdown Server 🝳 I	Reset			
KVM Console Properties				
ROOT PASSWORD			RED HAT ENTERPRISE LINUX 7.3 INS	TALLATION
Done			🖽 us	Help!
Т	he root account is used for administe	ring the system. Enter a passw	ord for the root user.	
R	loot Password:	•••••		
		· · · · · · · · · · · · · · · · · · ·	Fair	
c	Confirm:	•••••		

26. The Installation completes (Figure 47). Click Reboot.

Figure 47.	Finishing the configuratior
------------	-----------------------------



Performing post-installation OS customization

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

Customizing the host name

- 1. Use the video 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 48).

Figure 48. Sample hosts file



3. Verify that the host name is displayed 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 49 shows sample output.

```
Figure 49. Sample hostname command output
```

```
[root@cishana01 ~]# hostname
cishana01.custdon.local
[root@cishana01 ~]# hostname -s
cishana01
[root@cishana01 ~]# hostname -f
cishana01.custdon.local
[root@cishana01 ~]# hostname -d
custdon.local
```

Configuring the network

The Cisco C880 M5 Server comes with onboard 1-Gbps NICs and 10 Gigabit Ethernet PCI cards. 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 get an overview of the Ethernet interface configuration, use the ip addr command. Figure 50 shows sample output.

Figure 50. Sample ip addr command output

[root@cishana01 ~]# ip addr
1: lo: <loopback,up,lower up=""> mtu 65536 qdisc noqueue state UNKNOWN</loopback,up,lower>
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
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: enp72s0: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,>
link/ether 84:b8:02:8b:31:40 brd ff:ff:ff:ff:ff
3: enp73s0: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 84:b8:02:8b:31:41 brd ff:ff:ff:ff:ff
4: enp135s0: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,>
link/ether 84:b8:02:5b:de:20 brd ff:ff:ff:ff:ff
5: enp136s0: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,>
link/ether 84:b8:02:5b:de:21 brd ff:ff:ff:ff:ff
6: enp65s0f0: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 88:1d:fc:39:f2:12 brd ff:ff:ff:ff:ff
7: enp65s0f1: <broadcast,multicast,up,lower_up> mtu 1500 qdisc mq state UP qlen 1000</broadcast,multicast,up,lower_up>
link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff
inet 173.36.215.118/24 brd 173.36.215.255 scope global enp65s0f1
valid_lft forever preferred_lft forever
inet6 fe80::8a1d:fcff:fe39:f213/64 scope link
valid_lft forever preferred_lft forever
8: enp80s0f0: <no-carrier, broadcast,="" multicast,="" up=""> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,>
link/ether 88:1d:fc:39:f2:16 brd ff:ff:ff:ff:ff
9: enp80s0f1: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000</no-carrier,broadcast,multicast,up>
link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff
[root@cishana01 ~]#

In RHEL 7, 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, enp72s0, as seen in Figure 50.

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 kernel-native network names.
- 3. Also, you can disable IPv6 support at this time because this solution uses IPv4. You can accomplish this by appending **ipv6.disable=1** to **GRUB_CMDLINE_LINUX** as shown in Figure 51.

Figure 51. Sample grub file with CMDLINE parameter additions



- 4. Run the grub2-mkconfig command to regenerate the grub.cfg file (Figure 52):
 - # grub2-mkconfig -o /boot/grub2/grub.cfg

Figure 52. Updating the grub configuration

```
[root@cishana01 ~]# grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-3.10.0-327.28.3.el7.x86_64
Found initrd image: /boot/initramfs-3.10.0-327.28.3.el7.x86_64.img
Found linux image: /boot/vmlinuz-3.10.0-327.el7.x86_64
Found initrd image: /boot/initramfs-3.10.0-327.el7.x86_64.img
Found linux image: /boot/vmlinuz-0-rescue-2bee164fc0474586a395513638954a08
Found initrd image: /boot/initramfs-0-rescue-2bee164fc0474586a395513638954a08.img
done
[root@cishana01 ~]#
```

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

reboot

 After the reboot, use the KVM console to log in to the installed system as the user root with the password <<var_sys_root-pw>>. 7. Run the ip addr command to see the interfaces in the traditional kernel-native ethX nomenclature (Figure 53).

Figure 53. Checking the interface status with the ip addr command

<pre>Iroot@cishana@1 network-scripts]# ip addr 1: lo: <loopback,up,lower_up> mtu 65536 qdisc noqueue state UNKNOWN link/loopback 00:00:00:00:00:00:00:00:00:00:00:00 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 qlen 1000 link/ether 84:b0:02:8b:31:40 brd ff:ff:ff:ff:ff 3: eth1: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b0:02:8b:31:41 brd ff:ff:ff:ff:ff 4: eth2: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b0:02:5b:de:20 brd ff:ff:ff:ff:ff 5: eth3: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b0:02:5b:de:21 brd ff:ff:ff:ff:ff 6: eth4: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b0:02:5b:de:21 brd ff:ff:ff:ff:ff:ff 6: eth4: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:10:6:39:f2:12 brd ff:ff:ff:ff:ff:ff 7: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:12 brd ff:ff:ff:ff:ff:ff 7: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:13 brd ff:ff:ff:ff:ff:ff 8: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:13 brd ff:ff:ff:ff:ff:ff 9: eth5: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:16 brd ff:ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:11:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff:ff 9: eth7: <</no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></broadcast,multicast,up></broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></loopback,up,lower_up></pre>		_
<pre>1: lo: <loopback,up,lower_up> mtu 65536 qdisc noqueue state UNKNOWN link/loopback 00:00:00:00:00:00:00:00:00:00:00:00 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 qlen 1000 link/ether 84:b8:02:8b:31:40 brd ff:ff:ff:ff:ff 3: eth1: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:8b:31:41 brd ff:ff:ff:ff:ff 4: eth2: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:20 brd ff:ff:ff:ff:ff 5: eth3: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:21 brd ff:ff:ff:ff:ff 6: eth4: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:21 brd ff:ff:ff:ff:ff:ff 7: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:12 brd ff:ff:ff:ff:ff:ff 7: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff:ff 8: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff:ff 9: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff:ff 9: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:16 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:16 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff IrootQcishana01 network-scripts]#</no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></broadcast,multicast,up></no-carrier,broadcast,multicast,up></broadcast,multicast,up></broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></loopback,up,lower_up></pre>	[root@cishana01 network-scripts]# ip addr	
<pre>link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00 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 qlen 1000 link/ether 84:b8:02:8b:31:40 brd ff:ff:ff:ff:ff 3: eth1: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:8b:31:41 brd ff:ff:ff:ff:ff 4: eth2: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:8b:31:41 brd ff:ff:ff:ff:ff 5: eth3: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:20 brd ff:ff:ff:ff:ff 5: eth3: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:21 brd ff:ff:ff:ff:ff 6: eth4: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:12 brd ff:ff:ff:ff:ff 7: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff 8: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff 9: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:16 brd ff:ff:ff:ff:ff:ff 9: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mg state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mg state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff Iroot0cishana01 network-scripts]#</no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></pre>	1: lo: <loopback,up,lower_up> mtu 65536 qdisc noqueue state UNKNOWN</loopback,up,lower_up>	
<pre>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 qlen 1000 link/ether 84:b8:02:8b:31:40 brd ff:ff:ff:ff:ff 3: eth1: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:8b:31:41 brd ff:ff:ff:ff:ff 4: eth2: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:20 brd ff:ff:ff:ff:ff 5: eth3: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:20 brd ff:ff:ff:ff:ff 5: eth3: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 84:b8:02:5b:de:21 brd ff:ff:ff:ff:ff 6: eth4: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:12 brd ff:ff:ff:ff:ff 7: eth5: <broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff 8: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state UP qlen 1000 link/ether 88:1d:fc:39:f2:13 brd ff:ff:ff:ff:ff 8: eth6: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:16 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 9: eth7: <no-carrier,broadcast,multicast,up> mtu 1500 qdisc mq state DOWN qlen 1000 link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff 1Foot@cishana01 network-scripts]#</no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></no-carrier,broadcast,multicast,up></pre>	link/loopback 00:00:00:00:00 brd 00:00:00:00:00	
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[root@cishana01 network-scripts]#	link/ether 88:1d:fc:39:f2:18 brd ff:ff:ff:ff:ff:ff	
	[root@cishana01 network-scripts]#	

- 8. A close observation of the output reveals that the previous IP address setting was lost due to the changes in the interface naming you just implemented. You will have to again find the interface that has the uplink connectivity. Check the link status using the **ethtool** command to ascertain the interface that is connected to the management network (Figure 54).
- Figure 54. Using the ethtool command to check the link status



- 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 54). You can use this configuration temporarily until you port this interface to a high-availability bond device and create another interface with Cisco virtual interface card (VIC) 10-Gbps ports.
- 10. Go to the network configuration directory and create a configuration for eth5 as shown in the following example:

```
#cd /etc/sysconfig/network-scripts
#vi ifcfg-eth5
DEVICE=eth5
TYPE=Ethernet
ONBOOT=yes
BOOTPROTO=static
IPV6INIT=no
```

USERCTL=no NM_CONTROLLED=no IPADDR=<<var_mgmt_ip_addr>> NETMASK=<<var_mgmt_nw_netmask>>

11. Add the default gateway:

#vi /etc/sysconfig/network
NETWORKING=yes
HOSTNAME=<<var_hostname.domain>>
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
```

DNS1=<<IP of DNS Server1>> DNS2=<<IP of DNS Server2>> DOMAIN= <<Domain name>> 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 doesn't include any update information. To 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 subscribed to, use the following command:

#yum repolist

Update only the OS kernel and firmware packages to the latest release that appeared in RHEL 7.3. Set the release version to 7.3:

#subscription-manager release -set=7.3

3. Apply the latest updates for RHEL 7.3. Typically, the kernel is updated as well.

#yum -y update

- 4. Reboot the machine and use the new kernel.
- 5. Install the base package group:

#yum -y groupinstall base

 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 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:
 - # 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
- # systemctl disable chronyd.service

a. Edit /etc/ntp.conf and make sure that the server lines reflect your NTP servers:

grep ^server /etc/ntp.conf
server ntp.example.com
server ntp1.example.com

b. Force an update to the current time:

ntpdate ntp.example.com

c. Enable and start the NTP and date (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

To optimize the use of HANA database (HDB) with SLES for SAP 12 SP2,

- 12. Apply the following SAP Notes settings as instructed. 2292690—SAP HANA DB: Recommended OS settings for RHEL 7
- 13. Optionally, remove old kernels after the OS update:

package-cleanup --oldkernels --count=1

- 14. Reboot the server after applying the SAP notes
 - # reboot

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 the <u>SAP HANA Server Installation Guide</u>.

All other SAP installation and administration documentation is available at http://service.sap.com/instguides.

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: <u>https://service.sap.com/notes</u>.
- SAP HANA in-memory database (IMDB) notes
- SAP Note 1514967: SAP HANA: Central note
- SAP Note 2298750: SAP HANA Platform SPS 12 release note
- SAP Note 1523337: SAP HANA database: Central note
- SAP Note 2000003: FAQ: SAP HANA
- SAP Note 2380257: SAP HANA 2.0 release notes
- SAP Note 1780950: Connection problems due to host name resolution
- SAP Note 1755396: Released disaster tolerant (DT) solutions for SAP HANA with disk replication
- SAP Note 1890444: HANA system slow due to CPU power save mode
- SAP Note 1681092: Support for multiple SAP HANA databases on a single SAP HANA appliance
- SAP Note 1514966: SAP HANA: Sizing the SAP HANA database
- SAP Note 1637145: SAP Business Warehouse (BW) on HANA: Sizing the SAP HANA database
- SAP Note 1793345: Sizing for Suite on HANA

Linux notes

SAP Note 2205917: SAP HANA DB: Recommended OS settings for SLES 12 and SLES for SAP Applications 12

- SAP Note 2235581: SAP HANA: Supported operating systems
- SAP Note 1944799: SAP HANA guidelines for the SLES operating system
- SAP Note 1731000: Nonrecommended configuration changes
- SAP Note 1557506: Linux paging improvements
- SAP Note 1726839: SAP HANA database: Potential crash when using XFS file system
- SAP Note 1740136: SAP HANA: Wrong mount option may lead to corrupt persistency
- <u>SAP Note 1829651</u>: Time-zone settings in SAP HANA scale-out landscapes

Third-party software notes

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

SAP HANA virtualization notes

SAP Note 1788665: SAP HANA running on VMware vSphere virtual machines

SAP HANA post-installation checkup

For an SAP HANA system installed with <SID> set to SKL and the system number <nr> set to 00, log in as <sid>adm i.e skladm and run the commands presented here.

Checking the SAP HANA services

```
skladm@cishana01:/usr/sap/SKL/HDB00> /usr/sap/hostctrl/exe//sapcontrol -nr 00 -function
GetProcessList
19.05.2016 11:29:27
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GREEN, Running, 2016 04 13 08:51:49, 866:37:38, 41691
hdbcompileserver, HDB Compileserver, GREEN, Running, 2016 04 13 08:51:56, 866:37:31, 41837
hdbindexserver, HDB Indexserver, GREEN, Running, 2016 04 13 08:52:00, 866:37:27, 41863
hdbnameserver, HDB Nameserver, GREEN, Running, 2016 04 13 08:51:50, 866:37:37, 41711
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2016 04 13 08:51:56, 866:37:31, 41839
hdbwebdispatcher, HDB Web Dispatcher, GREEN, Running, 2016 04 13 08:53:11, 866:36:16, 42431
hdbxsengine, HDB XSEngine, GREEN, Running, 2016 04 13 08:52:00, 866:37:27, 41865
skladm@cishana01-bwl:/usr/sap/SKL/HDB00>
```

Checking the HANA database information

skladm@cis	hana01	usr/s	ap/SKL/HDB(00> HDB info	
USER	PID	PPID	%CPU VS2	Z RSS COMMAND	
skladm	59578	59577	0.0 108472	2 1944 -sh	
skladm	59663	59578	0.0 114080	0 2020 _ /bin/sh /usr/sap/SKL/HDB00/HDB info	
skladm	59692	59663	0.0 118048	3 1596 _ ps fx -U skladm -o user,pid,ppid,pcpu,vsz,rss,args	
skladm bwl	41683	1	0.0 22188	<pre>3 1640 sapstart pf=/hana/shared/SKL/profile/SKL_HDB00_cishana01-</pre>	
skladm	41691	41683	0.0 582888	3 290988 _ /usr/sap/SKL/HDB00/cishana01-	
bwl/trace/	hdb.sap	SKL_HD	B00 -d -nw	-f /usr/sap/SKL/HDB00/cishana01-bwl/daemon.ini	
skladm	41711	41691	0.3 542924	416 2058900 _ hdbnameserver	
skladm	41837	41691	0.1 427847	72 1243356 _ hdbcompileserver	
skladm	41839	41691	0.2 117739	976 8262724 _ hdbpreprocessor	
skladm	41863	41691	6.2 221431	172 18184604 _ hdbindexserver	
skladm	41865	41691	0.5 880206	64 2446612 _ hdbxsengine	
skladm	42431	41691	0.1 435298	38 823220 _ hdbwebdispatcher	
skladm pf=/hana/s	41607 hared/S	1 SKL/pro	0.0 497576 file/SKL_HI	6 23232 /usr/sap/SKL/HDB00/exe/sapstartsrv DB00_cishana01-bwl -D -u skladm	
skladm@cis	skladm@cishana01-bwl:/usr/sap/SKL/HDB00>				

Tuning the SAP HANA performance parameters

After SAP HANA is installed, tune the parameters as explained in the following SAP Notes and shown in Table 5.

Parameters and file system	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

SAP Note 2399079: Elimination of hdbparam in HANA 2

SAP Note 2186744: FAQ: SAP HANA parameters

SAP HANA operation and maintenance

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

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: SKL, Status: Error
cishana01:~ #
```

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

```
cishana01:~ # /usr/sap/hostctrl/exe/saphostctrl -function ListInstances
Inst Info : SKL - 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
19.07.3016 14:54:45
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GREEN, Running, 2016 07 15 11:57:45, 98:57:00, 8545
hdbnameserver, HDB Nameserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11579
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11580
hdbindexserver, HDB Indexserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11581
hdbstatisticsserver, HDB Statisticsserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11582
hdbxsengine, HDB XSEngine, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11583
sapwebdisp_hdb, SAP WebDispatcher, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11584
hdbcompileserver, HDB Compileserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11584
hdbcompileserver, HDB Compileserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11584
hdbcompileserver, HDB Compileserver, GREEN, Running, 2016 07 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
19.07.3016 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 - skladm

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

Starting and stopping SAP HANA

Before you stop the SAP HANA appliance, you must be able to stop and start the HANA database. You can use the commands shown here.

sapcontrol

You can use the sapcontrol functions StartSystem and StopSystem to start and stop a HANA database.

Stop the system with the StopSystem function.

cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function StopSystem HDB

```
19.07.3016 15:05:35
StopSystem
OK
```

Use the following command to verify that the database has stopped.

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList
19.07.3016 15:05:58
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus
cishana01, 0, 50013, 0, 0.3, HDB, YELLOW
Wait for the status to be GRAY.
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList
19.07.3016 15:07:52
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus
cishana01, 0, 50013, 0, 0.3, HDB, GRAY
```

You can also use the HDB info command.

cishana01:~ # su -l skladm							
cishana01:/usr/sap/SKL/HDB00> HDB info							
USER	PID PPID	%CPU V	SZ RSS	COMMAND			
skladm	61477 61476	2.0 138	40 2692	-sh			
skladm	61562 61477	0.0 114	34 1632	_ /bin/sh /usr/sap/SKL/HDB00/HDB info			
skladm	61585 61562	0.0 49	04 872	_ ps fx -U skladm -o user,pid,ppid,pcpu,vsz,rss,args			
skladm	8368 1	0.0 2167	84 75220	/usr/sap/SKL/HDB00/exe/sapstartsrv			
pf=/hana/shared/SKL/profile/SKL_HDB00_cishana01 -D -u							
cishana01:/usr/sap/SKL/HDB00>							

You can start the database again with the sapcontrol command StartSystem function.

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function StartSystem HDB
19.07.3016 15:08:48
StartSystem
OK
```

To check the system status, use the sapcontrol command GetSystemInstanceList function. Wait for the status to be GREEN.

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList
19.07.3016 15:10:19
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus
cishana01, 0, 50013, 0, 0.3, HDB, GREEN
```

HDB

You can use the HDB start and stop commands to stop and start the HANA database.

Use **HDB stop** to stop the database.

```
cishana01:~ # su - skladm
cishana01:/usr/sap/SKL/HDB00> HDB stop
hdbdaemon will wait maximal 300 seconds for NewDB services finishing.
Stopping instance using: /usr/sap/SKL/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -function
StopWait 400 2
19.07.3016 19:10:37
Stop
OK
```

In contrast to sapcontrol, this command waits until the database is stopped or started.

```
cishana01:/usr/sap/SKL/HDB00> HDB start
StartService
Impromptu CCC initialization by 'rscpCInit'.
   See SAP note 1266393.
OK
OK
Starting instance using: /usr/sap/SKL/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -function
StartWait 2700 2
19.07.3016 19:11:20
Start
OK
```

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 http://help.sap.com/hana/SAP HANA Master Update Guide en.pdf for update procedures for SAP HANA.

For more information

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

For a list of certified and supported SAP HANA hardware, see https://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/index.html.

Appendix: Solution variables used for this document

Before starting the configuration process, you need to collect some specific configuration information. Table 6 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	173.36.215.117
< <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	173.36.215.1
< <var_raid50_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	Saphana1!
< <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	173.36.215.118
< <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	173.36.215.1
< <var_mgmt_netmask_prefix>></var_mgmt_netmask_prefix>	Netmask prefix in CIDR notation	24

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Printed in USA