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

Design and deploy a SAP HANA solution based on standalone Cisco UCS C-Series M5 rack servers with SUSE Linux Enterprise Server 12 SP4 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 a scale-up solution with pre-validated, 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 semi structured 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 SUSE Linux Enterprise Server (SLES) 12 SP4 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 M	5 Rack	Server	configuration
	010111011	01 01000	000	0400 100	o i tuoit	001101	ooninguruuon

CPU specifications	2.70-GHz Intel® Xeon® Platinum 8280L processor: Q	uantity 2 or 4	
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)	 SAP Business Suite on SAP HANA (SoH): 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) 128-GB DDR4: Quantity 48 (6 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 (for 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 HDD	DG0	50	VD0
Slot (1 through 8)	SSD	DG0	5	VD0
Slot (1 through 3; up to 1.5 TB of RAM)	SSD	DG0	5	VDO

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	 RAID 50 RAID 5 RAID 5 	Data file system	XFS
• 3 x 3.8-TB SSD		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 L	JCS C240	M5 Rack S	Server conf	iguration

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	VD0

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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 UC	S C220 M5	Rack	Server	configuration
						0

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	Used for	File system
Any of the following:	Any of the following:	Operating system	Ext3
• 8 x 3.8-TB SSD	RAID 5 RAID 5	Data file system	XFS
• 3 x 3.0-10 330	• 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

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- 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.





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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 SLES for SAP 12 SP2.

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

Cisco 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).





- 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: http://<<var cimc ip address>>.
- 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



Figure 11 shows the results.

Figure 11. Cisco IMC summary screen

cisco Cisco	Integrated Managemer	nt Controller		-	* 🗠	0 admin@	- C480-FCH2243W02V
Chassis / Sum	mary 👘				Refresh Host Power L	aunch KVM Ping	CIMC Reboot Locator LED 🔞
Server Proper	ties		Cisco Integrated M	Management Controll	er (Cisco IMC) Info	rmation	
Product Name: Serial Number:	UCS C480 M5 FCH2243W02V		Hostname: IP Address:	C480-FCH2243W02V			
PID: UUID: BNOS Version:	UCSC-C480-M5 68F3FE17-610D-4FF1-84FA-DAC	FE70EF29F	MAC Address: Firmware Version:	AS B4 56 A3 ED 52 4.0(2 213)			
Description:	Unknown		Local Time: Timezone:	Wed Jan 23 22 41 03 2019 Wed Jan 23 22 41 03 2019 UTC	: +0000 Select Tin	102010	
Power Overall Server 5 Tempe Overall DIMM 5 Power Su	Status: Cri Status: C Good rature: C Good Status: C Good pplies: C Good		Overali Utilizat CPU Utilizat Memory Utilizat IO Utilizat	ion (%): N/A ion (%): N/A ion (%): N/A			
Locato Overali Storage !	Fans: Cood or LED: Col Status: Cood						
							Save Changes Reset Values

Launching the KVM console

You next need to launch the KVM console and map the SLES 12 for SAP SP2 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.

Figure 12. Cisco IMC home screen

 "tisco integrated Management Controlle Chassin (Summan) 			+ 10	admin@	- C480-FCH2243W02V
/ Chassis / Summary ···		Rafresh Host	Power Launch	KVM Ping C	IMC Reboot Locator LED Ø
Server Properties	Cisco Integrated I	Management Controller (Cisco IN	Java based K	VM KVM	
Product Name: UCS C480 M5	Hostname:	C480-FCH2243W02V			
Serial Number: FCH2243W02V	IP Address:				
PID: UCSC-C480-M5	MAC Address:	A8.84 56 A3 ED 62			
UUID: 68F3FE17-610D-4FF1-84FA-DACFE70EF29F	Firmware Version:	4 0(2 213)			
BIO5 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	÷	
Power State: On	Overall Utilizat	ion (%): N/A			
Overall Server Status: Scool	CPU Utilizat	ion (%): N/A			
Temperature: 🖾 Good	Memory Utilizat	ion (%): N/A			
Overall DIMM Status: Sood	IO Utilizat	ion (%): N/A			
Power Supplies: Good					
Fans: Good					
Locator LED: Or					
Overall Storage Status: 2 Good					

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

and a second sec			
KVM server certificate has	been accepted. Click this https:///html.kvmViewer.html	ding the KVM client application: ml	
		https://www.https://www.https://www.https://www.https://www.https://www.https://www.https://www.https://www.htt	https://www.bitml.kvmViewer.html

The KVM window will appear (Figure 14).

Figure 14. KVM window

diude Cisco Integrated Management Controllar	admin - C460-FCH2243W02V 🄅
File View Macros Tools Pawer Boot Device Vintual Media Hele	
No Signal	
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).

cisco Integrated Manag	ement Controller	admin - C480-FCH2243W02V
File Vere Macros Tools Power Book	Device Virtual Media Halp Cristals Image Deactivath Virtual Devices May CODVD Map Perminutise Disk May Pippy Disk	
	No Signal	

Figure 15. Beginning the CD/DVD mapping process

4. Browse for the SLES 12 for SAP SP4 DVD ISO file and click Map Drive (Figure 16).

Figure 16. Click Map Drive

diade Cisco Integrated Management Controller	30000 - 0.420 FCH2243W02V
File View Macros Toole Prove Root Davice Vinter Media Histo	
Virtual Media - CD/DVD Image File (SLE-12:SP4-SAP-DVD-305_64-GM-DVD1 in Decat (Step Map Drive) Cancel	

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

"livel" Cisco Integrated Mana	gement Controller		ədmin - C400 FCH2243W02V 🏼 🍅
File View Macros Toota Power Bod	Device Virtual Media Help		
Preer On 3	šýbben		
		No Signal	

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



Figure 18. Press F2

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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 2933 Mhz M.2 SWRAID configuration is not detected. Switching to AHCI mode.
Cisco IMC IPv4 Address Cisco IMC MAC Address :
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	1000 0400 10	Set the Date. Use Tab to
Product Name	0050-0480-M5	switch between Date elements.
Version	C480M5.4.0.2.113	Detault Ranges;
Build Date	01/09/2019 07:34:34	Year: 1998-9999
Platform Information		Days: Dependent on month
Processor	50656 - CLX BO	Range of Years may vary.
PCH Info	LBG QS/PRQ - 1G - S1	
RC Revision	0563.D11	
Memory Information		
Total Memory	1536 GB	
Effective Memory	1536 GB	and the second second second
		++: Select Screen
Logged in as	Administrator	14: Select Item
System Date	[Wed 01/23/2019]	+/-: Change Opt.
System Time	[23:19:39]	F1: General Help
		F9: Optimized Defaults
Example 1		F10: Save & Reset System
	# 4 T A	ESC: Exit
LSC F1 F2 F3 F4 F5 F0 F7 F8 F9 F10 F11 F12 Num /		K/M: Scroll help UP/DOWN
	6 scroll	
Caps a s d f g h j k l : 'Enter 1 2	3 Prnt Scrn	
shift z x c v b n m , . / shift 0 .	Enter	
Ctrl Win Alt Alt Ctrl	· · · · ·	

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

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Figure 20. Choose UEFI Mode

Aptio Setup Utility Main Advanced Server Mgmt Sec	y – Copyright (C) 2019 Americ curity Boot Options Save &	an Megatrends, Inc. Exit
Boot Configuration		Set either UEFI Boot mode or
Setup Prompt Timeout	3	Legacy Boot Mode. In UEFI Boot
Bootup NumLock State	[0n]	mode, only UEFI BootOptions, UEFI OpROM will load and
SecureBoot Support	Disabled	display. LEGACY BOOTOPTIONS
Boot Mode	[UEFI Mode]	and PCIOpROM will load and
CDN Control	[Enabled]	execute in LEGACY mode.
Adaptive Memory Training	[Enab1ed]	
OptionROM Launch Optimization	[Enabled]	
BIOS Techlog Level	[Minimum]	
	Boot Mode	
Boot Option Priorities	UEFI Mode	
Boot Option #1	LEGACY Mode	
		++: Select Screen
	Ro	14: Select Item
Boot Option #2	[UEFI: PXE IP4	Enter: Select
	Intel(R) Ethernet	+/-: Change Opt.
	Controller X5501	E1: General Help
Boot Option #3	INFET: Built-in FET	F9: Ontimized Defaults
boot option no	Shelll	F10: Save & Reset Sustem
Boot Option #4	[UEET: Cisco	FSC: Evit
boot option with	VKVM-Menned VDVD1 241	K/M: Scholl hein UR/DOWN
	in in happed vo vo in it.	with berott help brybolik
Add New Boot Option		
▶ Delete Boot Option		
Coloro boor oprion		
Version 2 20 1274	Conuciant (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

 Trusted Computing Serial Port Console Redirection PCI Subsystem Settings USB Configuration LOM and PCIE Slots Configuration TIs Auth Configuration Network Stack Configuration All Cpu Information LSI Software RAID Configuration Utility (SATA) AVAGO MegaRAID <cisco (max="" 126="" 26="" 468="" cache="" controller="" drives)="" modular="" raid="" with=""> Configuration Utility - 07.06.08.08</cisco> Intel(R) Ethernet Controller X550 - A8:B4:56:A3:ED:66 Intel(R) Ethernet Controller X550 - A8:B4:56:A3:ED:67 Driver Health Platform Configuration Socket Configuration Socket Configuration Socket Configuration Socket Configuration Socket Configuration 	Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc. Main <mark>Advanced</mark> Server Mgmt Security Boot Options Save & Exit		
K/M: Scroll help UP/DOWN	 Trusted Computing Serial Port Console Redirection PCI Subsystem Settings USB Configuration LOM and PCIE Slots Configuration Tls Auth Configuration Network Stack Configuration All Cpu Information LSI Software RAID Configuration Utility (SATA) AVAGO MegaRAID <cisco (max="" 126="" 26="" 468="" 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 Oriver Health Platform Configuration Socket Configuration 	Select to navigate to Intel Socket Configuration pages ++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN	

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



Aptio Setup Utility – Copyright (C) 2019 America Socket Configuration	n Megatrends, Inc.
Socket Configuration Processor Configuration Common RefCode Configuration UPI Configuration Memory Configuration IIO Configuration Advanced Power Management Configuration	Displays and provides option to change the Power Management Settings ++: Select Screen fl: Select Item Enter: Select +/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit V/W: Screel hele UP/DDWN
Version 2.20.1274 Copyright (C) 2019 American	Megatrends. Tor

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

Figure 23. Disabling C-states

Aptio Setup Util: CPU C State Control	ity – Copyright (C) 2019	American Megatrends, Inc.
CPU C State Control		Autonomous Core C-State Control
Autonomous Core C-State CPU C6 report Enhanced Halt State (C1E) OS ACPI Cx	[Disable] [Disable] [Disable] [ACPI C2]	
		<pre>++: 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</pre>

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	RAID 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).

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Figure 24. Select Avago MegaRAID

Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc. Main <mark>Advanced</mark> Server Mgmt Security Boot Options Save & Exit		
 Trusted Computing Serial Port Console Redirection PCI Subsystem Settings USB Configuration LOM and PCIE Slots Configuration Tls Auth Configuration Network Stock Configuration 	Manage RAID Controller Configurations.	
 Notwork Stack configuration iSCSI Configuration All Cpu Information LSI Software RAID Configuration Utility (SATA) AVAGO MegaRAID (Cisco 12G Modular Raid Controller with 4GB cache (max 26 drives)) Configuration Utility - 07.06.08.03 Intel(R) Ethernet Controller X550 - A8:B4:56:A3:ED:66 Intel(R) Ethernet Controller X550 - A8:B4:56:A3:ED:67 	++: Select Screen 11: 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	
Version 2.20.1274. Copyright (C) 2019 American	Megatrends. Inc.	

3. Choose Main Menu (Figure 25).

Figure 25. Choose Main Menu

Aptio Setup Utility – Copyright (C) 2019 American Megatrends, Inc. AVAGD MegaRAID <cisco (max="" 12g="" 26="" 4gb="" cache="" controller="" drives)="" modular="" raid="" with=""> Co</cisco>		
 Main Menu Help PROPERTIES Status Backplane BBU Enclosure 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 OPTION	None None S	<pre>**: 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 *</pre>

4. Choose Configuration Management (Figure 26).

Figure 26. Choose Configuration Management

Aptio Setup Main Menu	Utility – Copyright (C) 2019 Americ	an Megatrends, Inc.
 Configuration Management Controller Management Virtual Drive Management Drive Management Hardware Components 		Displays configuration options. Some options appear only if the controller supports them. Options are: Create Profile Based Virtual Drive, Create Virtual Drive, Create CacheCade Virtual Drive, Make JBOD, Make Unconfigured Good, Clear configuration, Manage Foreign Configuration, View Drive
Version 2.2	0.1274. Copyright (C) 2019 American	Megatrends, Inc.

5. Choose Create Virtual Drive (Figure 27).

Figure 27. Choose Create Virtual Drive

Aptio Setup Utility – Copyright (C) 2019 Configuration Management	American Megatrends, Inc.
 Create Virtual Drive Create Profile Based Virtual Drive Make Unconfigured Good Clear Configuration 	Creates a virtual drive by selecting the RAID level, drives, and virtual drive parameters.
	<pre>++: Select Screen 14: Select Item Enter: Select +/-: Change Opt. F1: General Help F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DDWN</pre>

- 6. 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.
 - 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 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>
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]	▲ 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 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) Check All Uncheck All	[Enabled]	F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN
▶ Apply Changes		
Version 2.20.1274. 0	opyright (C) 20	019 American Megatrends, Inc.

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) :	2019 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]	
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) Check All	[Enabled]	F9: Optimized Defaults F10: Save & Reset System ESC: Exit K/M: Scroll help UP/DOWN
► Apply Changes		
Version 2.20.1274.	Copyright (C) 20	19 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).

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Figure 31. Add more spans



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





- 9. Configure the virtual drive parameters as shown in Figure 33.
 - a. Name the virtual drive <<var_raid5_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

Aptio Setup Utility - Advanced	Copyright (C) 2019 Americar	Megatrends, Inc.
▶ Apply Changes		Submits the changes made to the entire form.
VIRTUAL DRIVE PROPERTIES:		
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]	L + 4
VIRTUAL DRIVE POLICIES:		++: Select Screen
Access	[Read/Write]	14: 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 (I/O)	[Direct]	K/M: Scroll help UP/DOWN
Apply Changes		
Version 2,20,1274, D	opyright (C) 2019 American M	legatrends, Inc.

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 SLES 12 for SAP SP4 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

SUSE Linux Enterprise for SAP Applications 12 SP4
Boot from Hard Disk
Installation
Upgrade
More
The highlighted entry will be executed outeractically in 40s
The highlighted entry will be executed automatically in 49s.

- 2. On the Language, Keyboard, and License Agreement page, select the English language and your preferred keyboard layout, agree to the license terms, and click Next.
- 3. On the Network Settings page, click Next. You will return to the network configuration as part of the post-installation tasks.
- 4. On the Registration page, click Skip Registration. You will register later as part of the post-installation tasks.
- On the Choose Operating System Edition page, select the SUSE Linux Enterprise Server for SAP Applications option (Figure 35).

Figure 35. Select the product installation mode

SUSE.			
▶			
Choose Operation System Edition			
	Please select the operating system you want to install SUSE Linux Enterprise Server SUSE Linux Enterprise Server for SAP Applications 		
	 Launch SAP product installation wizard right after operating system is Enable RDP (Remote Desktop Protocol) Service and open in Firewall 	nstalled	
Help Release Notes		Abo <u>r</u> t <u>B</u> a	ck <u>N</u> ext

- 6. On the Add On Product page, click Next. In this configuration example, there are no additional products to install.
- 7. On the Suggested Partitioning page, click Expert Partitioner (Figure 36).

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Figure 36. Suggested partitioning initial proposal: Select Expert Partitioner

SUSE.		
k	Suggested Partitioning	 e. Create boot volume /dev/sda1 (156.88 MiB) with vfat e. Greate volume /dev/sda2 (24.45 TiB) e. Method volume /dev/system/root (60.00 GiB) with btrfs e. Greate volume /dev/system/root (60.00 GiB) with btrfs e. Greate sub volume /dev/system/root (20.00 GiB) e. Greate subvolume @/boot/grub2/J886_p6 on device /dev/system/root e. Greate subvolume @/pont on device /dev/system/root e. Greate subvolume @/tmp on device /dev/system/root e. Greate subvolume @/usr/local on device /dev/system/root e. Greate subvolume @/var/cache on device /dev/system/root e. Greate subvolume @/var/lib/libvirt/images on device /dev/system/root with option "no copy on write" e. Greate subvolume @/var/lib/mailman on device /dev/system/root e. Greate subvolume @/var/lib/mailman on device /dev/system/root with option "no copy on write" E. Git Proposal Settings
		<u>C</u> reate Partition Setup
<u>H</u> elp	Rejease Notes	Abo <u>r</u> t <u>B</u> ack <u>N</u> ext

- 8. At the left, choose System View > Linux > Hard Disks > sda.
- 9. Clear the suggested partitions. The example here shows two suggested partitions: sda1 and sda2. Use the following steps to delete sda1 and sda2.
 - a. Delete partition sda2 (Figures 37 and 38).



Figure 37. Expert Partitioner: Delete partition sda2



Figure 38. Expert Partitioner: Confirm deletion of partition sda2

Expert Partitione	er
System View	Partition: /dev/sda2
✓ Image Hard Disks ✓ sda sda1	Device: • Device: /dev/sda2
RAID Volume Management Crypt Files Device Mapper NFS Btrfs Impfs Unused Devices Device Graph Mount Graph Installation Summary Settings	 Confirm Deleting Partition Used by Volume group "/dev/system". To keep the system in a consistent state, the following volume group and its logical volumes will be deleted: ./dev/system ./dev/system. ./dev/system/root ./dev/system/swap Delete partition "/dev/sda2" and volume group "/dev/system" now?
Help Release Notes	Resize Delete

b. Delete partition sda1 (Figures 39 and 40).



Figure 39. Expert Partitioner: Delete partition sda1



Figure 40. Expert Partitioner: Confirm deletion of partition sda1

Expert Partitioner		
System View	Partition: /dev/sda1	
 Inux Inux<td> Device: Device: /dev/sda1 Size: 156.88 MIB Encrypted: No Device Path: pcl-0000:33:00.0-scsl-0:2:0.0-part1 Device ID 1: scsl-360027e370b10a98023dbbb9df6fc18c3-part1 Device ID 3: wwn-0x60027e370b10a98023dbb9df6fc18c3-part1 FS ID: 0) File System: Really delete /dev/sda1? File Syst Mount P Label: No </td><td>:02-part1</td>	 Device: Device: /dev/sda1 Size: 156.88 MIB Encrypted: No Device Path: pcl-0000:33:00.0-scsl-0:2:0.0-part1 Device ID 1: scsl-360027e370b10a98023dbbb9df6fc18c3-part1 Device ID 3: wwn-0x60027e370b10a98023dbb9df6fc18c3-part1 FS ID: 0) File System: Really delete /dev/sda1? File Syst Mount P Label: No 	:02-part1
	Edit Move	
	Regize Delete	

Now, from the unpartitioned device sda, you will use the steps here to do the following:

- Create a 200-MB /boot/efi partition (/dev/sda1) from the disk device available (/dev/sda).
- Create another partition (/dev/sda2), assigning the rest of the available space in the device (/dev/sda). Assign this partition to Linux LVM, thus making it a physical volume.
- Create a volume group (hanavg) and assign the available physical volume (/dev/sda2) to it.
- Create a logical volume for /filesystem with a size of 100 GB and using the Ext3 file system.
- Create a swap volume with a size of 2 GB.

10. In the Expert Partitioner, choose the device /dev/sda and click Add (Figure 41).

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Figure 41. Add new partition



11. Create a partition with a size of 200 MB for /boot/efi (Figure 42).



SUSE.					
Add Partition on /dev/sda					
*					
New F	Partition Size				
c	Maximum Size (24.45 Til	3)			
-	Size				
	200 MB				
C	Custom Region Start Cylinder				
	0				
	3267972				
Help Release Notes			Abort	<u>B</u> ack	Next

12. Click Next. For Role, select EFI Boot Partition (Figure 43).

Figure 43. Adding a partition: Specify the role

SUSE.		
Add Partition	n /dev/sda	
	Bala	
ŀ	 Operating System Data and ISV Applications EFI Boot Partition Swan 	
	 G Raw Volume (unformatted) 	
Help Release Notes	Abort Back Next	

13. Click Next. By default, the FAT file system is selected, and /boot/efi is selected as the mount point (Figure 44).

Figure 44. Adding a partition: Select formatting and mounting options

SUSE.					
Add Partition o	n /dev/sda				
▶					
	Formatting Options Format partition File System FAT Options Do not format partition File system [D: Ox00 EFI Boot Encrypt Device	Mounting Options Mount partition Mount Point /boot/efi Fstab Options Do not mount partition			
Help Release Notes			Abo <u>r</u> t	<u>B</u> ack	<u>F</u> inish

14. Click Finish. Then click Add to add another partition (Figure 45).





15. Allocate the rest of available space to the partition (Figure 46).

Figure 46. Another partition: Specify the partition size

	SUSE.					
	Add Partition on /dev/sda					
k						
	New Partiti	ion Size				
	• Ma:	ximum Size (24.45	TiB)			
	O <u>C</u> us	stom Size				
		24.45 HB				
		stom Region Start Cylinder				
		25				
		End Cylinder				
		3267972				
	Help Release Notes			Abo <u>r</u> t	<u>B</u> ack	<u>N</u> ext

16. Click Next. For Role, choose Data and ISV Applications (Figure 47).

Figure 47. Adding another partition: Specify the role

SUSE.				
Add Partition on /dev/sda	a			
	Pole			
	Operating System Data and ISV Applications EFI Boot Partition Swap Raw Volume (unformatted)			
Help Release Notes		Abo <u>r</u> t	<u>B</u> ack	<u>N</u> ext

17. Assign the partition with the file system ID 0x8E Linux LVM (Figure 48).

Figure 48. Adding another partition: Specify formatting and mounting options

SUSE.					
Add Partition o	on /dev/sda				
	Formatting Options Format partition File System VFS Options Do not format partition File system JD: VX8E Linux LVM Encrypt Device	Mounting Options Mount partition Mount Point / Fstab Options Do not mount partition			
Help Release Notes			Abo <u>r</u> t	<u>B</u> ack	<u>F</u> inish

18. Click Finish. You will see an overview of your partitions (Figure 49).

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Figure 49. Expert Partitioner: Hard disk /dev/sda partitions overview

stem View	🔄 📔 Hard Dis	k: /dev/sc	la							
T Inux		Overview			<u>P</u> arti	tions				
					sc 24.4	la2 5 TiB				
Volume Management	Device S	Size	F Enc	Туре	FS Type	Label	Mount Point	Start	End	
Device Mapper	/dev/sda1_1s /dev/sda2	24.45 TIB	F	EFI DOOL	FAI		/boot/en	25-8	24 9267972	
Enris Impfs Unused Devices Device Graph Mount Graph Installation Summary Settings										
	Agd	Edit								
	Move	Resize								

19. In the System View pane on the left, select Volume Management. Choose Add > Volume Group (Figure 50).

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Figure 50. Expert Partitioner volume management: Add a volume group



20. Provide a name for the volume group, select /dev/sda2 from the list of available physical volumes, and click Add (Figures 51 and 52).



Figure 51. Add Volume Group: Select an available physical volume

SUSE.	
Add Volume Group	
Physical Extent Size 4 MiB	
Available Physical Volumes:	Selected Physical Volumes:
Device Size Enc Type	Device Size Enc Type Add All + Remove Remove All
Total size: 24.45 TIB	Resulting size: 0 B
Help Release Notes	Abort Back Finish

Figure 52. Add Volume Group (continued)

SUSE.	
Add Volume Group Volume Group Name hanavg Physical Extent Size 4 MiB Available Physical Volumes:	Selected Physical Volumes:
Device Size Enc Type	Device Size Enc Type /dev/sda2_24.45 TIB C Linux LVM
	- Remove All
Total size: 0 B	Resulting size: 24.45 TiB
Help Release Notes	Abort Back Ein

21. Click Finish.

22. Under Volume Management, click Add and select Logical Volume (Figure 53).





23. Add a logical volume with the name rootlv in the volume group (Figures 54).



SUSE.			
Add Logical Volume on /	′dev/hanavg		
	Name		
₩	rootly		
	Type Normal Volume		
	O Thin Pool O Thin Volume		
Help Release Notes		Abort	<u>Back</u> <u>N</u> ext

24. Click Next. Specify a size of 100 GB and 1 stripe (Figure 55).



SUSE.		
Add Logical volume rootly	v on /dev/hanavg	
ħ	Size Maximum Size (24.45 TiB) Size 100 GiB	
	Stripes Number Size 1 T 64 KiB T	
Help Release Notes	Abo <u>r</u> t <u>B</u> ack	Next

25. Click Next. For Role, specify Operating System (Figure 56).

Figure 56. Adding a logical volume: Specify the role

SUSE				
Add Logical volume rootlv	on /dev/hanavg			
*				
	Role Operating System Data and ISV Applications EFI Boot Partition Swap Raw Volume (unformatted)			
Help Release Notes		Abort	<u>B</u> ack	Next

26. Click Next. Specify the formatting and mounting options. Format the 100-GB logical volume rootlv with the Ext3 file system and assign the / mount point (Figure 57).



SUSE					
Add Logical volume	e rootlv on /d	ev/hanavg			
▶					
	Formatting Options Form<u>at</u> partition File <u>System</u> Ext3 •	Mounting Options Mount partition Mount Point 			
	O Do not format partition	O Do not mount partition			
	Encrypt Device				
Help Release Notes			Abort	<u>B</u> ack	<u>F</u> inish

27. Click Finish.

28. Create a swap volume with a size of 2 GB. Under Volume Management, click Add and select Logical Volume (Figure 58).

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Figure 58. Expert Partitioner volume management: Add another logical volume



29. Add a logical volume for swapping with the name swapvol (Figure 59). Then click Next.



SUSE.				
Add Logical Volume o	n /dev/hanavg			
k				
	Name			
	Logical Volume			
	swapvol			
	Type			
	O Thin Pool			
	Used Pool			
Help Release Notes		Abort	<u>B</u> ack	Next

30. Assign a space of 2 GB and one stripe (Figure 60). Then click Next.



SUSE.				
Add Logical volume swap	vol on /dev/hanavg			
•	Size Maximum Size (24.35 TiB) Custom Size Size 2 GiB			
	Stripes Number Size			
Help Release Notes		Abo <u>r</u> t	<u>B</u> ack	Next

31. For Role, select Swap (Figure 61). Then click Next.



SUSE			
Add Logical volume swapvol on /dev/hanavg			
Role Operating System Data and ISV Applications EFI Boot Partition Swap Raw Volume (unformatted)			
Help Rejease Notes	Abo <u>r</u> t	Back	Next

32. Specify the formatting a mounting options (Figure 62).



SUSE.						
Add I	_ogical volun	ne swapvol on	/dev/hanavg			
k		Formatting Options Form<u>at partition</u> File <u>System</u> Swap • Options	Mounting Options Mount partition Mount Point swap Fstab Options 			
		<u>D</u> o not format partition <u>Encrypt Device</u>	O Do not mo <u>u</u> nt partition			
<u>H</u> elp	Re <u>l</u> ease Notes			Abo <u>r</u> t	Back	<u>F</u> inish

33. Click Finish. A summary page appears (Figure 63).

Figure 63. Expert Partitioner: Volume management summary page

Expert Partitioner								
System View	Solume Management							
Kala Kala	Device /dev/hanavg /dev/hanavg/rootiv /dev/hanavg/rootiv	Size 24.45 TIB 100.00 GIB	F Enc F	Type LVM2 hanavg LV	FS Type La Ext3	bel Mount Point 7 swap	Metadata LVM2	PE Size 4 MiB
Crypt Files Device Mapper NFS Btrfs tmpfs Unused Devices Device Graph Mount Graph Installation Summary Settings								
	Add., E	lit R	sire	Delete				

- 34. Click Accept to return to the Installation Settings page.
- 35. Review the updated partition information (Figure 64). Then click Next.

Figure 64. Updated partition information

SUSE				
Suggested Partitioning	Create boot volume /dev/sda1 (196.11 MiB) with vfat Create volume /dev/sda2 (24.45 TiB) Create volume group hanavg (24.45 TiB) from /dev/sda2 Create logical volume /dev/hanavg/rootlv (100.00 GiB) for / with Create swap logical volume /dev/hanavg/swapvol (2.00 GiB)	ext3		
	E <u>d</u> it Proposal Settings <u>C</u> reate Partition Setup <u>Expert Partitioner</u>			
Help Release Notes		Abort	<u>B</u> ack	<u>N</u> ext

36. For Clock and Time Zone, choose the appropriate time zone and select the hardware clock set to UTC.

37. For the password for the system administrator root, enter the appropriate password using <<var_sys_root-pw>>.

38. On the Installation Settings screen, review the default information (Figure 65).

.1 1.1 1.

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SUSE.	
	Click a headline to make changes.
	Software
Ninstallation Settings	 Product: SUSE Linux Enterprise Server for SAP Applications 12 SP4 Patterns: Help and Support Documentation Base System 32-Bit Runtime Environment Minimal System (Appliances) YaST2 configuration packages GNOME Desktop Environment X Window System Printing SAP Application Server Base Web-Based Enterprise Management C/C++ Compiler and Tools Size of Packages to Install: 4.2 GiB
	Booting
	Boot Loader Type: GRUB2 EFI Enable Secure Boot: yes Enable Trusted Boot: no
	Firewall and SSH
	Firewall will be enabled (<u>disable</u>) SSH port will be blocked (<u>open</u>) SSH service will be enabled (<u>disable</u>)
	Default systemd target
	Graphical mode
	System and Hardware Settings
Help Release Notes	Abo <u>r</u> t <u>Back</u> <u>Install</u>

- 39. Customize the software selection. Click the Software headline to make changes as shown in Figure 66.
 - a. Deselect Gnome Desktop Environment.
 - b. Deselect Web-Based Enterprise Management
 - c. Select C/C++ Compiler and Tools.
 - d. Select SAP HANA Server Base.

Figure 66. Software Selection and System Tasks: Customized settings



40. Click OK.

41. Under then Firewall and SSH headline, disable the firewall. This selection will automatically enable Secure Shell (SSH) service (Figure 67).

Figure 67. Firewall and SSH service customized

Firewall and SSH
 Firewall will be disabled (<u>enable</u>) SSH service will be enabled (<u>disable</u>)

42. Click the Kdump headline and select Disable Kdump (Figure 68).

Figure 68. Disabling Kdump



43. Click OK.

44. Click the "Default systemd target" headline and choose "Text mode" (Figure 69).



SUSE.		
Set Default Systemd Target		
X		
r.		
	Available Targets	
	 <u>G</u>raphical mode <u>T</u>ext mode 	
Help Release Notes		<u>Cancel</u>

45. Click OK.

46. Click the Clone System Configuration headline and click "do not write it" (Figures 70 and 71).

Figure 70. Clone system configuration selection

Clone System Configuration

The AutoVaST profile will be written under /root/autoinst.xml (do not write it).

Figure 71. Clone system configuration selection (continued)

Clone System Configuration • The AutoYaST profile will not be saved (<u>write it</u>).

47. Leave the Booting and System default selections unchanged (Figure 72).

Figure 72. Installation Settings: Final selections

SUSE.				
	Click a headline to make changes.			
	Software			
Installation Settings	 Product: SUSE Linux Enterprise Server for SAP Applications 12 SP4 Patterns: Help and Support Documentation Base System 32-Bit Runtime Environment Minimal System (Appliances) YaST2 configuration packages X Window System Printing SAP HANA Server Base SAP Application Server Base Web-Based Enterprise Management C/C++ Compiler and Tools Size of Packages to Install: 4 GiB 			
	Booting			- 1
	• Boot Loader Type: GRUB2 EFI • Enable Secure Boot: yes • Enable Trusted Boot: no			- 1
	Firewall and SSH			- 1
	 Firewall will be disabled (<u>enable</u>) SSH service will be enabled (<u>disable</u>) 			- U
	Default systemd target			- 1
	 The installer is recommending you the default target 'Graphical mod X11 packages have been selected for installation 			- U
	• Text mode			- 1
	System			
	System and Hardware Settings			
Help Release Notes		Abort	Back	Install

48. Click Install. Also select Install at subsequent Confirm Installation prompts. The installation starts, and you can monitor the status (Figures 73).

Figure 73. Performing the installation

SUSE	
Performing Installation	DetailsSLE-12-SP4-SAP Release NotesMediaRemainingPackagesTimeTotal3.866 GiB1436SLE-12-SP4-SAP-12.4-03.866 GiB1436Medium 13.866 GiB1436
	Actions performed: Installing libnl-config-3.2.23-2.21.noarch.rpm (installed size 2.6 KiB) Installing man-pages-4.02-6.31.noarch.rpm (installed size 3.70 MiB) Installing man-pages-posix-2003a-30.188.noarch.rpm (installed size 2.20 MiB) Installing manufacturer-PPDs-10.2-270.58.noarch.rpm (installed size 2.20 MiB) Installing pam-doc-1.1.8-24.14.1.noarch.rpm (installed size 15.52 MiB) Installing popler-data-0.4.6-6.17.noarch.rpm (installed size 1.21 MiB) Installing sles-admin_en-pdf-12.4-1.3.noarch.rpm (installed size 7.37 MiB) Installing sles-deployment_en-pdf-12.4-1.3.noarch.rpm (installed size 1.45 MiB) Installing sles-installquick_en-pdf-12.4-1.3.noarch.rpm (installed size 1.47 MiB) Installing sles-security_en-pdf-12.4-1.3.noarch.rpm (installed size 3.48 MiB) Installing sles-storage_en-pdf-12.4-1.3.noarch.rpm (installed size 2.45 MiB)
	Installing sles-storage_en-pdf-12.4-1.3.noarch.rpm (installed size 2.45 MiB) 81% Installing Packages (Remaining: 3.866 GiB, 1436 packages) 8%
Help	Abo <u>r</u> t <u>B</u> ack <u>N</u> ext

After the installation is complete, a reboot alert appears. The system will reboot and boot from disk on startup (Figure 74).

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Figure 74. Booting from hard disk

SUSE.	
SLES 12-SP4	
Advanced options for SLES 12-SP4	
The highlighted entry will be executed automatically in 1s.	

The system then displays the login prompt (Figure 75).



Figure 75. Login prompt

-		
ſ	OK	J Stopped Setup Virtual Console. Stopping Setup Virtual Console Starting Setup Virtual Console
r.	OV.	1 Startal Sotur Histuri Concele
1	UN	i startea setup virtual console.
L.	UK	J Started YaSTZ Second Stage.
Γ	OK	J Started Getty on tty1.
E	OK	J Reached target Login Prompts.
ſ	OK] Started /etc/init.d/after.local Compatibility.
ſ	OK	J Started Postfix Mail Transport Agent.
Ē	OK	J Started Command Scheduler.
Г	OK] Reached target Multi-User Sustem.
		Starting Update UTMP about System Runlevel Changes
ſ	OK] Started Update UTMP about System Runlevel Changes.
W	elco	me to SOSE Linux Enterprise Server for SAP Applications 12 SP4 (x86_64) - Kernel 4.12.14-94.41-default (ttyl),
1	inux	-Sorbe login)
	- macre	

49. Use the KVM console to log in to the installed system as the user root with the password <<var_sys_root-pw>> (Figure 76).

Figure 76. Login using root

Welcome to SUSE Linux Enterprise Server for SAP Applications 12 SP4 (x86_64) - Kernel 4.12.14-94.41-default (tty1). linux-8qhr login: root Password: linux-8qhr:~ # _

50. Configure the host name and disable IPv6 (Figure 77):

#yast2

Figure 77. YaST Control Center: Network Settings

YaST Control Center								
Software	/etc/sysconfig Editor							
System	Boot Loader							
Hardware	Date and Time							
High Availability	ailability Kernel Kdump							
Network Services Language								
Security and Users	Network Settings							
Virtualization	Partitioner							
Support	Services Manager							
Miscellaneous	Sustem Tuning for SAP							

51. Choose System > Network Settings and press Alt+S to select the Hostname/DNS tab (Figure 78).

Figure 78. YaST Control Center: Hostname/DNS

YaST2 - lan @ linux-8qhr	
Network Settings Global Options—Overview—Hostname/DNS—Routing— Hostname and Domain Name— Hostname cishana32 [] Assign Hostname to Loopback IP Set Hostname via DHCP yes: any 4	Domain Name custdom.local
L Modify DNS Configuration Custom Policy Rule Use Default Policy	
Name Server 1	[Domain Search
Name Server 2	
Name Server 3	

- 52. Enter <<var_hostname.domain>>. Also enter the Domain Name System (DNS) server address of your network for resolution, if necessary. Then press Alt+O.
- 53. On the Global Options tab, using Alt+G, disable IPv6 by deselecting the Enable IPv6 option as shown in Figure 79. Note that changing the IPv6 setting requires a reboot to make the change take effect.

Figure 79. YaST: IPv6 setting

YaST2 – lan 🛛 cishana32	
Network Settings Global Options—Overview—Hostname/DNS- General Network Settings- Network Setup Method Wicked Service	-Routing
IPv6 Protocol Settings [] Enable IPv6	
DHCP Client Options DHCP Client Identifier	
Hostname to Send AUTO	
[x] Change Default Route via DHCP	
	Warning To apply this change, a reboot is needed.

- 54. Press Alt+O to save the network configuration. Press Alt+Q to quit the YaST Control Center.
- 55. Reboot the server to make the IPv6 selection and the host-name settings take effect: #reboot

56. Identify the Ethernet interface port that is connected to the top-of-the-rack (ToR) switch. For now, you can use that port for management connectivity to the host. You can also check the port by using the **ifconfig** command, as shown in the example in Figure 80.

Figure 80. Network interface configuration

cishana32:~	#	for	ì	in	\$(seq	Ð	5);	do	ifconfig eth\$i up; done
cishana32:~	#	for	i	in	\$(seq	0	5);	do	cat /sys/class/net/eth\$i/operstate; done
down									
down									
down									
down									
սթ									
down									
cishana32:~	#	1							

- 57. Assign <<var_mgmt_ip_address>> as the IP address and enter <<var_mgmt_nw_netmask>> as the subnet mask for the available interface (for example, eth5). You can use this configuration temporarily until you port it to a high-availability bond device and create another with the Cisco VIC's 10-Gbps ports.
- 58. Go to the network configuration directory and create a configuration for eth5:

```
#cd /etc/sysconfig/network
#vi ifcfg-eth5
BOOTROTO='static' IPADDR='<<var_mgmt_ip_address>>' NETMASK='<<var_mgmt_nw_netmask>>' NETWORK=''
MTU='' REMOTE_IPADDR='' STARTMODE='auto' USERCONTROL='no'
Add the default gateway:
```

59. Add the default gateway:

#cd /etc/sysconfig/network
#vi routes

default <<var_mgmt_gateway_ip>> - -

Note: Be sure that the system has access to the Internet or a SUSE update server to install the patches.

60. Verify /etc/hosts as shown in the example in Figure 81.

Figure 81. Verify /etc/hosts

cishana01:~ # m	ore /etc/hosts
#	
# hosts	This file describes a number of hostname-to-address
#	mappings for the TCP/IP subsystem. It is mostly
#	used at boot time, when no name servers are running.
#	On small systems, this file can be used instead of a
#	"named" name server.
# Syntax:	
#	
# IP-Address F	ull-Qualified-Hostname Short-Hostname
#	
127.0.0.1	localhost
<pre># special IPv6</pre>	addresses
::1	localhost ipv6-localhost ipv6-loopback
fe00::0	ipv6-localnet
ff00::0	ipv6-mcastprefix
ff02::1	ipv6-allnodes
ff02::2	ipv6-allrouters
ff02::3	ipv6-allhosts
	cishana01.custdom.local cishana01

61. Set up a proxy service so that the appliance can reach the Internet (Figure 82): #yast2

Figure 82. YaST: Proxy configuration

	YaST Control Center
Software System	Authentication Client Authentication Server
Hardware Network Services	DNS Server
Becurity and Users Jirtualization	FTP Server HTTP Server
Support Miscellaneous	Hostnames Mail Server
	NFS Client
	NIS Client
	NIS Server NTP Configuration
	Network Services (xinetd) OpenLDAP MirrorMode
	Proxy
	Remote Administration (UNC)
	Samba Server
	Squid TETD Server
	Hake-on-LAN
	Windows Domain Membershin
	iSCSI Initiator
	iSNS Server

62. Enter the proxy server and port as shown in the sample configuration in Figure 83. Select OK and then quit YaST to save the configuration.

Figure 83. YaST: Proxy configuration (continued)

YaST2 -	proxy @ cishana01		
Proxy (Configuration		
[3	Enable Proxy		
г	Proxy Settings-		1
	HTTP Proxy URL		
	http://173.36.215.33:3128		
	HTTPS Proxy URL		
	http://		
	FTP Proxy URL		
	http://		
	[x] Use the Same Proxy for All Proto	cols	
	No Proxy Domains		
	localhost, 127.0.0.1		
-	Proxy Authentication-		-
	Proxy User Name	Proxy Password	
	[Test Proxy	Settings]	-
[Help]		[Cancel]	[OK]

63. Register the system with SUSE to receive the latest patches. For more information, refer to the SUSE knowledgebase article at https://www.suse.com/de-de/support/kb/doc?id=7016626.

The system must have access to the Internet to proceed with this step.

#SUSEConnect -r <<registration_code>> -e <<email_address>>

- 64. Update the system with the following command. Again, the system must have access to the Internet to proceed with this step. #zypper update
- 65. Follow the on-screen instructions to complete the update process. Reboot the server and log in to the system again.

Post-installation OS configuration

To optimize the use of the SAP HANA database with SLES 12 or SLES for SAP 12 SP1, apply the settings by referring to SAP Note 2205917 - SAP HANA DB: Recommended OS settings for SLES 12 / SLES for SAP Applications 12.

Note: Following is the information from <u>SAP Note 2205917</u> mentioned above and is current at the time of publishing this whitepapaer. For latest updates please follow the SAP notes.

To customize the SLES 12 SP4 System for HANA Servers, follow these steps:

- 1. Turn off autoNUMA balancing, disable transparent hugepages and configure C-States for lower latency
- Edit /etc/default/grub, search for the line starting with "GRUB_CMDLINE_LINUX_DEFAULT" and append the following: numa_balancing=disable transparent_hugepage=never intel_idle.max_cstate=1 processor.max_cstate=1
- 3. Save your changes and run:

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

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/init.d/boot.local: cpupower set -b 0 cpupower frequency-set -g performance

- echo 0 > /sys/kernel/mm/ksm/run
- Activate tuned and Enable tuned profile saptune daemon start

saptune solution apply HANA

6. Reboot the OS issuing reboot command

To optimize the network configuration, apply the settings by referring SAP Note <u>2382421 – Optimizing the Network Configuration</u> <u>on HANA- and OS-Level</u>.

Configuring bonding for high availability

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 1225 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 85, 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, eth0 and eth2 form one possible slave pair for creating a 10-Gbps bond device.

Likewise, 1-Gbps interfaces eth4 and eth5 are potential slave interfaces for a 1-Gbps bond device.

In this section, you will manually create these two bond interfaces.

Note: In SLES, use of YaST is recommended. It provides an easy wizard-like approach for creating bond devices. For ease of implementation, this section provides steps for manual configuration.

Figure 84. The ifconfig output provides an overview of the interfaces

```
cishana01:~ 🕴 ifconfig -a | grep HW
          Link encap:Ethernet HMaddr 84:B8:02:8B:31:40
Link encap:Ethernet HMaddr 84:B8:02:8B:31:41
ethO
ethi
           Link encap:Ethernet HMaddr 84:88:02:58:DE:20
eth2
          Link encap:Ethernet HWaddr 84:B8:02:58:DE:21
eth3
          Link encap:Ethernet HMaddr 88:1D:FC:39:F2:12
Link encap:Ethernet HMaddr 88:1D:FC:39:F2:13
ethe
eth5
         Link encapiEthernet HMaddr 88:1D:FC:39:F2:16
Link encap:Ethernet HMaddr 88:1D:FC:39:F2:18
ethe
eth7
cishama01:~ 🕴 for i in 'seq -w 0 7';do ethtool eth$i > /tmp/ethinfo; head -n 5 /tmp/ethinfo;done
Settings for eth0:
        Supported ports: [ FIBRE ]
        Supported link modes:
                                   10000baseT/Full
        Supports auto-negotiation: No
        Advertised link modes: 10000baseT/Full
Settings for ethl:
        Supported ports: [ FIBRE ]
        Supported link modes: 10000baseT/Full
        Supports auto-negotiation: No
        Advertised link modes: 10000baseT/Full
Settings for eth2:
        Supported ports: [ FIBRE ]
        Supported link modes: 10000baseT/Full
        Supports auto-negotiation: No
        Advertised link modes: 10000baseT/Full
Settings for eth3:
        Supported ports: [ FIBRE ]
                                   10000baseT/Full
        Supported link modes:
        Supports auto-negotiation: No
        Advertised link modes: 10000baseT/Full
Settings for eth4:
        Supported ports: [ TP ]
                                   10baseT/Half 10baseT/Full
        Supported link modes:
                                   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
sishana01:- 🛊 📘
```

1. Create 1-Gbps bond device ifcfg-bond0 with eth4 and eth5 as slaves.

a. Create a bond0 configuration file:

```
# vi /etc/sysconfig/network/ifcfg-bond0 BONDING MASTER='yes' BONDING MODULE OPTS='mode=active-
backup miimon=100' BOOTPROTO='static'
BROADCAST=''
ETHTOOL OPTIONS='' IPADDR=' << var mgmt ip address>>/<< var mgmt netmask prefix>>' MTU=''
NAME=''
NETWORK=''
REMOTE IPADDR=''
STARTMODE='auto'
USERCONTROL= 'no'
BONDING SLAVE0='eth4'
BONDING SLAVE1='eth5'
b. Modify the eth4 and eth5 configuration files:
# vi /etc/sysconfig/network/ifcfg-eth4 BOOTPROTO='none'
BROADCAST=''
ETHTOOL OPTIONS=''
IPADDR=''
MTU=''
NAME='VIC Ethernet NIC' NETMASK=''
NETWORK='' REMOTE IPADDR='' STARTMODE='hotplug' USERCONTROL='no'
# vi /etc/sysconfig/network/ifcfg-eth5 BOOTPROTO='none'
BROADCAST=''
ETHTOOL OPTIONS=''
IPADDR=''
MTU=''
NAME='VIC Ethernet NIC' NETMASK=''
NETWORK='' REMOTE IPADDR=''
STARTMODE='hotplug' USERCONTROL='no'
```

```
c. Test the configuration.
```

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

rcnetwork restart

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

cat /proc/net/bonding/bond0

Figure 85 shows sample output.

Figure 85. Sample bond0 configuration test output

```
cishana01:/etc/sysconfig/network # cat /proc/net/bonding/bond0
Ethernet Channel Bonding Driver: v3.7.1 (April 27, 2011)
Bonding Mode: fault-tolerance (active-backup)
Primary Slave: None
 Currently Active Slave: eth5
MII Status: up
MII Polling Interval (ms): 100
 Up Delay (ms): 0
Down Delay (ms): 0
Slave Interface: eth4
MII Status: down
Speed: Unknown
 Duplex: Unknown
Link Failure Count: 0
Permanent HW addr: 88:1d:fc:39:f2:12
Slave queue ID: 0
Slave Interface: eth5
MII Status: up
Speed: 1000 Mbps
 Duplex: full
Link Failure Count: 0
Permanent HW addr: 88:1d:fc:39:f2:13
Slave queue ID: 0
 cishana01:/etc/sysconfig/network #
2. Create 10-Gbps bond device ifcfg-bond1 with eth0 and eth2 as slaves.
  a. Create a bond1 configuration file:
  # vi /etc/sysconfig/network/ifcfg-bond1 BONDING MASTER='yes' BONDING MODULE OPTS='mode=active-
  backup miimon=100' BOOTPROTO='static'
  BROADCAST='' ETHTOOL OPTIONS=''
```

IPADDR='<<ip_address_customer_usecase>>/<<netmask_prefix>>' MTU=''

NAME=''

NETWORK=''

REMOTE IPADDR='' STARTMODE='auto' USERCONTROL='no' BONDING SLAVE0='eth0' BONDING SLAVE1='eth2'

b. Modify the eth0 and eth2 configuration files:

```
# vi /etc/sysconfig/network/ifcfg-eth0 BOOTPROTO='none'
BROADCAST=''
ETHTOOL_OPTIONS=''
IPADDR=''
NAME='VIC Ethernet NIC' NETMASK=''
NETWORK='' REMOTE_IPADDR='' STARTMODE='hotplug' USERCONTROL='no'
# vi /etc/sysconfig/network/ifcfg-eth2 BOOTPROTO='none'
BROADCAST=''
ETHTOOL_OPTIONS=''
IPADDR=''
MTU=''
NAME='VIC Ethernet NIC' NETMASK=''
NETWORK='' REMOTE_IPADDR='' STARTMODE='hotplug' USERCONTROL='no'
c. Test the configuration.
```

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

rcnetwork restart

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

cat /proc/net/bonding/bond1

Figure 86 shows sample output.

Figure 86. Sample bond1 configuration test output

```
cishana01:/etc/sysconfig/network # cat /proc/net/bonding/bond1
Ethernet Channel Bonding Driver: v3.7.1 (April 27, 2011)
Bonding Mode: fault-tolerance (active-backup)
Primary Slave: None
Currently Active Slave: None
MII Status: down
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0
Slave Interface: eth0
MII Status: down
Speed: Unknown
Duplex: Unknown
Link Failure Count: 0
Permanent HW addr: 84:b8:02:8b:31:40
Slave queue ID: 0
Slave Interface: eth2
MII Status: down
Speed: Unknown
Duplex: Unknown
Link Failure Count: 0
Permanent HW addr: 84:b8:02:5b:de:20
Slave queue ID: 0
cishana01:/etc/sysconfig/network #
```

Preparing SAP HANA data, log, and shared file systems

To prepare the file systems, you start by carving out logical volumes for the data, log, and HANA shared files. Then you create the file systems. Then you update /etc/fstab and mount the volumes.

 Use the following command to check for the available physical volume (PV), as shown in Figure 87: #pvdisplay Figure 87. Checking for the physical volume

Physical volume -	
PV Name	/dev/sda2
VG Name	hanavg
PV Size	24.45 TiB / not usable 2.12 MiB
Allocatable	yes
PE Size	4.00 MiB
Total PE	6408641
Free PE	6382529
Allocated PE	26112
PV UUID	4ygrmp-s6vo-lixM-91pZ-bMOe-JbKR-o7i6RS

 Use the following command to check for the available volume group (VG) hanavg (Figure 88): #vgdisplay Figure 88. Checking for the volume group

Volume group	
VG Name	hanavg
System ID	
Format	lum2
Metadata Areas	1
Metadata Sequence No	3
VG Access	read/write
VG Status	resizable
MAX LV	0
Cur LV	2
Open LV	2
Max PV	0
Cur PV	1
Act PV	1
VG Size	24.45 TiB
PE Size	4.00 MiB
Total PE	6408641
Alloc PE / Size	26112 / 102.00 GiB
Free PE / Size	6382529 / 24.35 TiB
VG UUID	sQH1Rn-t71W-50o5-TEJu-D5pw-dcxE-14tAEs

3. Create logical volumes (LVs) for the data, log, and HANA shared file systems (Figure 89): lvcreate -name <<lvname>> -I<<stripesize>> -L<<volume-size>> <<parent-vg-name>> # lvcreate -name datalv -I256 -L9T hanavg

Note: The lvcreate command doesn't require you to specify the stripe size when creating volumes on SSDs.

- # lvcreate --name loglv -I256 -L512G hanavg
- # lvcreate --name sharedlv -I256 -L3T hanavg

Figure 89. Creating logical volumes

```
[root@cishana01 ~]# lvcreate --name datalv -I256 -L9T hanavg
Ignoring stripesize argument with single stripe.
Logical volume "datalv" created.
[root@cishana01 ~]# lvcreate --name loglv -I256 -L512G hanavg
Ignoring stripesize argument with single stripe.
Logical volume "loglv" created.
[root@cishana01 ~]# lvcreate --name sharedlv -I256 -L3T hanavg
Ignoring stripesize argument with single stripe.
Logical volume "sharedlv" created.
```

4. Create file systems in the data, log, and HANA shared volumes (Figure 90):

#mkfs.xfs -f /dev/hanavg/datalv
#mkfs.xfs -f /dev/hanavg/loglv
#mkfs.xfs -f /dev/hanavg/sharedlv

Figure 90. Creating file systems

[root@cis	shana01 ~]# mkfs.xfs -f /	/dev/hanavg/da	atalv
meta-data	a=/dev/hanavg/datalv	isize=256	agcount=9, agsize=268435455 blks
	=	sectsz=512	attr=2, projid32bit=0
data	=	bsize=4096	blocks=2415919095, imaxpct=5
	=	sunit=0	swidth=0 blks
naming	=version 2	bsize=4096	ascii-ci=0
log	=internal log	bsize=4096	blocks=521728, version=2
	=	sectsz=512	sunit=0 blks, lazy-count=1
realtime	=none	extsz=4096	blocks=0, rtextents=0
[root@cis	shana01 ~]# mkfs.xfs -f /	/dev/hanavg/lo	oglv
meta-data	a=/dev/hanavg/loglv	isize=256	agcount=4, agsize=33554432 blks
	=	sectsz=512	attr=2, projid32bit=0
data	=	bsize=4096	blocks=134217728, imaxpct=25
	=	sunit=0	swidth=0 blks
naming	=version 2	bsize=4096	ascii-ci=0
log	=internal log	bsize=4096	blocks=65536, version=2
	=	sectsz=512	sunit=0 blks, lazy-count=1
realtime	=none	extsz=4096	blocks=0, rtextents=0
[root@cis	shana01 ~]# mkfs.xfs -f /	/dev/hanavg/sh	haredlv
meta-data	a=/dev/hanavg/sharedlv	isize=256	agcount=4, agsize=201326592 blks
	=	sectsz=512	attr=2, projid32bit=0
data	=	bsize=4096	blocks=805306368, imaxpct=5
	=	sunit=0	swidth=0 blks
naming	=version 2	bsize=4096	ascii-ci=0
log	=internal log	bsize=4096	blocks=393216, version=2
	=	sectsz=512	<pre>sunit=0 blks, lazy-count=1</pre>
realtime	=none	extsz=4096	blocks=0, rtextents=0

5. Create mount directories for the data, log, and HANA shared file systems:

#mkdir -p /hana/data #mkdir -p /hana/log #mkdir -p /hana/shared

6. Mount options vary from the default Linux settings for XFS for SAP HANA data and log volumes. The following is a sample /etc/fstab entry. Make sure that you use the same mount options for the data and log file systems as shown in the example.

/dev/mapper/hanavg- defaults	-rootlv 1	1	/		ext3
UUID=fc2e52c4-e6f6- 1 2	-4e9a-9ad	- 1-86aeb3369942	/boot	ext3	defaults
/dev/mapper/hanavg- 0 0	swapvol		swap		defaults
/dev/hanavg/datalv	/hana/da	ata xfs			

nobarrier, noatime, nodiratime, logbufs=8, logbsize=256k, async, swalloc, allocsize=131072k 1 2

/dev/hanavg/loglv	/hana/log	xi	fs			
nobarrier, noatime,	nodiratime,	logbufs	s=8,	<pre>logbsize=256k,async,swalloc,allocsize=131072k 1</pre>	L	2
/dev/hanavg/shared	lv /hana/sl	hared	xfs	defaults 1 2		

This example illustrates the use of default settings for mount options when configuring SSDs.

/dev/hanavg/swapvol	swap		defaults	0 0	
/dev/hanavg/rootlv	/	ext3	acl,user_xa	attr	1 1
UUID=912D-A3CB	/boot/efi	vfat	umask=0002	,utf8=true	0 0
/dev/hanavg/datalv	/hana/data	xfs	defaults	1 2	
/dev/hanavg/loglv	/hana/log	xfs	defaults	1 2	
/dev/hanavg/sharedlv	/hana/log	xfs	defaults	1 2	

7. Use the following command to mount the file systems: $\label{eq:mount} \# \texttt{mount} - \texttt{a}$

8. Use the df -h command to check the status of all mounted volumes (Figure 91).

Figure 91. Checking the status of mounted volumes

[root@cishana01 ~]#	df -h					
Filesystem	Size	Used	Avail	Use%	Mounted on	
/dev/mapper/hanavg-i	rootlv					
	99G	882M	93G	18	1	
/dev/sda1	485M	47M	414M	11%	/boot	
tmpfs	1.5T	0	1.5T	0%	/dev/shm	
/dev/mapper/hanavg-o	datalv					
	9.0T	33M	9.OT	1%	/hana/data	
/dev/mapper/hanavg-1	loglv					
	512G	33M	512G	1%	/hana/log	
/dev/mapper/hanavg-sharedlv						
	3.0T	33M	3.0T	18	/hana/shared	
[root@cishana01 ~]#						

9. Change the directory permissions before you install SAP HANA. Use the **chown** command on each SAP HANA node after the file systems are mounted:

#chmod -R 777 /hana/data

#chmod -R 777 /hana/log

#chmod -R 777 /hana/shared

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 <u>SAP Notes and Knowledge base</u>.

SAP HANA 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
- <u>SAP Note 2380257</u>: SAP HANA 2.0 Release Notes
- <u>SAP Note 1780950</u>: Connection problems due to host name resolution
- SAP Note 1755396: Released disaster tolerant (DT) solutions for SAP HANA with disk replication
- SAP Note 2519630: Check whether power save mode is active
- 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 BW on HANA: Sizing the SAP HANA database
- SAP Note 1793345: Sizing for Suite on HANA
- <u>SAP Note 2399079</u>: Elimination of hdbparam in HANA 2
- SAP Note 2186744: FAQ: SAP HANA Parameters

Linux notes

- <u>SAP Note 2205917</u>: SAP HANA DB: Recommended OS settings for SLES 12 and SLES for SAP Applications 12
- <u>SAP Note 2235581</u>: SAP HANA: Supported operating systems
- SAP Note 1944799: SAP HANA guidelines for the SLES operating system
- <u>SAP Note 1731000</u>: 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
- <u>SAP Note 2382421</u>: Optimizing the Network Configuration on HANA- and OS-Level

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 2031547: 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, 866:37:37, 41711 hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2019 02 13 08:51:56, 866:37:31, 41839 hdbwebdispatcher, HDB Web Dispatcher, GREEN, Running, 2019 02 13 08:53:11, 866:36:16, 42431 hdbxsengine, HDB XSEngine, GREEN, Running, 2019 02 13 08:52:00, 866:37:27, 41865 bwladm@cishana01-bwl:/usr/sap/BWL/HDB00>

Commands for checking SAP HANA database information

```
bwladm@cishana01:/usr/sap/BWL/HDB00> HDB info
USER
               PID
                        PPID
                                %CPU
                                        VSZ
                                                  RSS
                                                         COMMAND
bwladm
            59578 59577
                            0.0
                                    108472 1944
                                                   -sh
            59663 59578
                            0.0
                                    114080 2020
                                                   \ /bin/sh /usr/sap/BWL/HDB00/HDB info
bwladm
            59692 59663
bwladm
                            0.0
                                    118048 1596
                                                   \ ps fx -U bwladm -o
user, pid, ppid, pcpu, vsz, rss, args
      bwladm
                                      0.0
                   41683
                                  1
                                               22188
                                                        1640
                                                               sapstart
pf=/hana/shared/BWL/profile/BWL HDB00 cishana01-bwl
            41691 41683
                                    582888 290988 \ /usr/sap/BWL/HDB00/cishana01-
bwladm
                            0.0
bwl/trace/hdb.sapBWL HDB00 -d -nw -f /usr/sap/BWL/HDB00/cishana01-bwl/daemon.ini
bwladm
            41711 41691
                           0.3
                                    54292416 2058900 \ hdbnameserver
bwladm
            41837
                   41691
                          0.1
                                    4278472
                                             1243356
                                                        \ hdbcompileserver
                    41691 0.2
bwladm
                                   11773976 8262724
                                                        \ hdbpreprocessor
            41839
bwladm
            41863
                    41691 6.2
                                    22143172 18184604 \ hdbindexserver
bwladm
            41865
                    41691 0.5
                                    8802064
                                               2446612
                                                         \ hdbxsengine
                                                         \ hdbwebdispatcher
bwladm
            42431
                    41691
                          0.1
                                    4352988
                                              823220
bwladm.
            41607
                            1
                                0.0
                                         497576
                                                    23232
/usr/sap/BWL/HDB00/exe/sapstartsrv
pf=/hana/shared/BWL/profile/BWL HDB00 cishana01-bwl -D -u bwladm
bwladm@cishana01-bwl:/usr/sap/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

- SAP Note 2399079: Elimination of hdbparam in HANA 2
- SAP Note 2186744: FAQ: SAP HANA Parameters

Performing maintenance operations

This section discusses how to maintain and operate SUSE and SAP HANA.

Maintaining the operating system

The customer is responsible for implementing security updates and patches, adding software components, and changing OS settings that may be requested by SAP for future releases of SAP HANA or that may be required by SUSE to help ensure system security and stability. See the related SAP OSs notes for required OS settings.

This section describes how to update the OS and the implications of updating OS components. It is not meant to replace the Linux administration documentation.

Prerequisites

Whenever you change the OS or parts of the OS such as drivers and kernel parameters, be sure that you have at least a backup copy of your SAP HANA system, preferably not stored on the appliance. You also should check the related OS notes and Cisco support channels for additional information.

Some changes may require a reboot and should be applied when SAP HANA is shut down.

Updating the OS

Not all updates and patches update the OS kernel. But if a kernel update is necessary, you need to take specific precautions. During the entire update process, SAP HANA must be shut down.

These are the general steps for updating the kernel:

- Perform these tasks before updating the kernel:
 - Stop SAP HANA and back up the existing log area (in case the device causes a problem and needs to be re-created).
- Update the kernel using YaST (or zypper).
- Perform these tasks after updating the kernel:
 - Check the GRUB file and boot sector (menu.lst).
 - Reboot

Updating SUSE online

You can update the operating system and kernel either through YaST or manually.

Using YaST

You can update the OS online using YaST. This method will update all OS components; a kernel update may also be included.

Note: Stop SAP HANA and back up the existing log area (in case the device causes a problem and needs to be re-created).

- Set up a proxy service, if necessary, so that the appliance can reach the Internet. Make sure that PROXY_ENABLED is set to "yes" and that the appropriate proxy server host, IP address, and port are configured and used. cishana01:~ # cd /etc/sysconfig/ cishana01:/etc/sysconfig # vi proxy PROXY_ENABLED="yes" HTTP_PROXY="http://<Proxy_server_IP>:<Proxy_Service_port>" HTTPS_PROXY="http://<Proxy_server_IP>:<Proxy_service_port>" FTP_PROXY="http://<Proxy_server_IP>:<Proxy_service_port>"
 Start YaST and choose Software > Online Undete
- 2. Start YaST and choose Software > Online Update.
 - i. Select Yes to configure the update repository (Figure 92).

Figure 92. YaST: Online update



ii. Log in with the account you used for licensing to register the server (Figure 93). Then click Next.



Figure 93. YaST online update: Registration

YaST2 - online_upo	date 🤅 cishana01		
Registration		[Network Co	onfiguration]
SUSE Linux Ente	erprise Server for SAP	Applications 12 SP1	
Please enter a User Name/E-mai Access to secui a registered si	registration or evalu il address from the SU rity and general softw ystem.	ation code for this produc SE Customer Center in the are updates is only possib	ct and your fields below. ble on
	E-mail Address		
	Registration Co	de	
	[Local Registr [Skip Re	ation Server] gistration]	
[Help]	[Back]	[Abort]	[Next]

iii. An overview of the available extension and modules is displayed (Figure 94). Click Next.



Figure 94. YaST online update: Extension and Module Selection

YaST2 - online_updat	te 🖗 cishana01		
Extension and Module	e Selection		
Available Extension:	s and Modules		
<pre>[] SUSE Enterprise [] SUSE Enterprise [] SUSE Linux Enter [] SUSE Linux Enter [] SUSE Linux Enter [] SUSE Linux Enter [] Advanced System [] Certifications I [] Containers Moduly</pre>	Storage 2.1 x86_6 Storage 3 x86_6 rprise High Availability GE rprise Live Patching 12 x86 rprise Workstation Extension rprise Software Development & Management Module 12 x86_ Module 12 x86_6 Le 12 x86_6	[] Legacy Module 12 x86_6 CO Extension 12 S[] Public Cloud Module 12 5_6 on 12 SP1 x86_6 [] Toolchain Module 12 x8 c Kit 12 SP1 x86_ 6 [] Web and Scripting Modu	5 2 x8 36_6 11e
Details SUSE Linux Enterprise Enterprise Server of applications (offic to combine both pro	ise Workstation Extension e with packages of SUSE Linux ce suite, email client, gra oducts to create a full fea	extends the functionality of SUSE Linux & Enterprise Desktop, like additional deskt aphical editor) and libraries. It allow atured Workstation.	cop rs
[Help]	[Back]	[Aboxt]	ext]

iv. A list of the available patches form the online repository is displayed (Figure 95). Click Accept.

Figure 95. YaST online update: Patches list

YaST2 - online_up	date @ cishana01		
[Filterâ]	[Actionsâ]	[Viewâ]	[Dependenciesâ]
Name SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H	A-12-SP1-2016-1010 A-12-SP1-2016-102 A-12-SP1-2016-1049 A-12-SP1-2016-1052 A-12-SP1-2016-1121 A-12-SP1-2016-1142 A-12-SP1-2016-1158	Kind recommended recommended recommended recommended security recommended	Summary - Recommended update for libdlm Recommended update for sle-ha-manuals Recommended update for crmsh Recommended update for libdlm Recommended update for pssh Security update for hawk2 Recommended update for resource-agents
SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H SUSE-SLE-H	A-12-SP1-2016-1204 A-12-SP1-2016-284 A-12-SP1-2016-312 A-12-SP1-2016-360 A-12-SP1-2016-365 A-12-SP1-2016-390	recommended recommended recommended recommended optional	Recommended update for crmsh Recommended update for fence-agents Recommended update for yast2-drbd Recommended update for hawk2 and yast2 Recommended update for crmsh Initial release of aws-vpc-move-ip
Filter: Online Up Patch: SUSE-SLE- This update for a changes: - Don't SIGKILL (- Make systemd s - dlm_controld: - Fix rejection (- Make fail_time - Fix segmentation)	date Patches HA-12-SP1-2016-1010 M libdlm to version 4.0 dlm_controld top dlm on corosync r don't log error from of valid connections in dlm_stonith optic	(ind: recommend).4 includes th cestart cpg_dispatch in dlm_control onal as printing in	Total Download Size: 18.5 MB ded Version: 1 he following ld libdlmcontrol
- Add dim_stonit. - Output of dim_ message. (bnc#	n man page tool 1s should distin 977201)	nguish causes t	for wait fencing [Cancel][Accept]

The system will download all available patches (Figures 96 and 97).

Figure 96. YaST online update: Package update

YaST2 - online_update @ cishana01 Packages for package management were updated. Finishing and restarting YaST now. [OK]

[ilterâ]	[Actionsâ]	[Viewâ]	[Dependenciesâ]
Nam	e	Kind	Summary
a+ SUS	E-SLE-HA-12-5P1-2016-1010	recommended	Recommended update for libdlm
a+ SUS	E-SLE-HA-12-SP1-2016-1049	recommended	Recommended update for crmsh
a+ SUS	E-SLE-HA-12-SP1-2016-1052	recommended	Recommended update for libdlm
a+ SUS	E-SLE-HA-12-SP1-2016-1158	recommended	Recommended update for resource-agent
a+ SUS	E-SLE-HA-12-SP1-2016-1204	recommended	Recommended update for crmsh
a+ SUS	E-SLE-HA-12-SP1-2016-284	recommended	Recommended update for fence-agents
a+ SUS	E-SLE-HA-12-SP1-2016-365	recommended	Recommended update for crmsh
a+ SUS	E-SLE-HA-12-SP1-2016-423	recommended	Recommended update for resource-agent
a+ SUS	E-SLE-HA-12-SP1-2016-595	recommended	Recommended update for pacemaker
a+ SUS	E-SLE-HA-12-SP1-2016-681	recommended	Recommended update for sbd
a+ SUS	E-SLE-HA-12-SP1-2016-758	recommended	Recommended update for resource-agent
a+ SUS	E-SLE-HA-12-SP1-2016-799	recommended	Recommended update for crmsh
a+ SUS	E-SLE-HA-12-SP1-2016-954 eded Patches	recommended	Recommended update for python-dateuti Total Download Size: 2.12 GB
a+ SUS lter: Ne Patch: SU Chis upda	E-SLE-HA-12-SP1-2016-954 eded Patches SE-SLE-HA-12-SP1-2016-1010 Ki te for libdlm to version 4.0.	recommended ind: recommend .4 includes th	Recommended update for python-dateuti Total Download Size: 2.12 GB ded Version: 1 he following

Figure 97. YaST online update: List of packages updated

v. Some patches may require reboot after installation. Select Continue (Figure 98).

Figure 98. YaST online update: Package update



Patches are downloaded and installed at this time (Figure 99).

Figure 99. YaST online update: Package update progress



vi. When the packages have been updated, the release notes are displayed (Figure 100). Select Close.


Figure 100. YaST online update: Release Notes



vii. Click OK to acknowledge the reboot prompt (Figure 101).





viii. Quit YaST.

ix. Reboot the system to make the patch installation to take effect.

Operating and maintaining SAP HANA

SAP HANA operation and maintenance are described in detail in many related SAP documents. For a complete list of the documentation, 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 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

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:~ #
```

Get a list of installed SAP HANA instances or databases:

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

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

sapcontrol

In a shell, use the sapcontrol function GetProcessList to display a list of running SAP 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, 11582
hdbxsengine, HDB XSEngine, 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 SAP HANA database. 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 19.02.2019
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** info command, which needs to be issued by the <SID>adm user: the OS user who owns the SAP HANA database.

As the root user on the SAP HANA appliance, enter the command shown here:

```
cishana01:~ # su - hanadm
```

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

Starting and stopping SAP HANA

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

sapcontrol

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

Stop the system with the **StopSystem** function:

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function StopSystem HDB 19.02.2019
15:05:35
StopSystem
OK
```



Use the following command to check that the database has stopped:

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList 19.02.2019
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 19.02.2019
15:07:52
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus cishana01, 0,
50013, 0, 0.3, HDB, GRAY
```

Alternatively, use the **HDB info** command:

cishana01:~ # su -l hanadm cishana01:/usr/sap/HAN/HDB00> HDB info USER PID PPID %CPU VSZ RSS COMMAND hanadm 61477 61476 2.0 13840 2692 -sh hanadm 61562 61477 0.0 11484 1632 _ /bin/sh /usr/sap/HAN/HDB00/HDB info hanadm 61585 61562 0.0 4904 872 _ ps fx -U hanadm -o user,pid,ppid,pcpu,vsz,rss,args hanadm 8368 1 0.0 216784 75220 /usr/sap/HAN/HDB00/exe/sapstartsrv pf=/hana/shared/HAN/profile/HAN_HDB00_cishana01 -D -u cishana01:/usr/sap/HAN/HDB00>

You can start the database again with the **sapcontrol** command **StartSystem** function:

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function StartSystem HDB 19.02.2019
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 19.02.2019
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 SAP HANA database.

Use **HDB stop** to stop the database:

```
cishana01:~ # su - hanadm
cishana01:/usr/sap/HAN/HDB00> HDB stop
hdbdaemon will wait maximal 300 seconds for NewDB services finishing.
Stopping instance using: /usr/sap/HAN/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -function
19.07.2019 19:10:37
Stop
OK
StopWait 400 2
```

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

```
cishana01:/usr/sap/HAN/HDB00> HDB start
StartService
Impromptu CCC initialization by 'rscpCInit'.
    See SAP note 1266393.
OK
OK
Starting instance using: /usr/sap/HAN/SYS/exe/hdb/sapcontrol -prot NI_HTTP -nr 00 -function
StartWait 2700 2
19.02.2019 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 <u>SAP HANA master guide</u> for update procedures for SAP HANA.

For more information

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

For information about certified and supported SAP HANA hardware, <u>see 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.

Table 14. Solution variables used in this document

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>></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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