Cisco UCS Scale-Up Solution for SAP HANA on M5 Rack Servers



Design and Deploy an SAP HANA Single-Node Solution Based on Standalone Cisco UCS M5 Rack Servers with SLES 12 for SAP SP2.

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Contents

Solution overview 4 Introduction 4 Audience 4 Purpose of this document. 5 Solution summary: Cisco UCS C480 MS Rack Server. 5 Solution summary: Cisco UCS C240 MS Rack Server. 6 Intraduction Summary: Cisco UCS C220 MS Rack Server. 7 Infrastructure overview 8 Cisco UCS C480 MS Rack Server 8 Cisco UCS C480 MS Rack Server 8 Cisco UCS C220 MS Rack Server 10 High performance for data-intensive applications. 10 Cisco UCS C220 MS Rack Server 10 Solution design 11 Solution design 11 Solution design 11 Solution design 11 Preparing the Cisco Integrated Management Controller 12 Configuring the Cisco Integrated Management Controller 15 Configuring BIOS settings 21 Configuring NAD 29 Configuring NAD 28 Post-installation OS configuration 74 Configuring RAD 29 Configuring MAD 29 Configuring NAD </th <th>Executive summary</th> <th>4</th>	Executive summary	4
Purpose of this document. 5 Solution summary: Cisco UCS C480 M5 Rack Server. 5 Solution summary: Cisco UCS C220 M5 Rack Server. 6 Solution Summary: Cisco UCS C220 M5 Rack Server. 7 Infrastructure overview. 8 Cisco UCS C480 M5 Rack Server 9 High performance for data-intensive applications. 10 Cisco UCS C220 M5 Rack Server 9 High performance for data-intensive applications. 11 Solution summary: Cisco UCS C220 M5 Rack Server 9 Joution design 11 Solution summary: Cisco UCS C220 M5 Rack Server 10 Ligh performance for data-intensive applications. 11 Solution design 11 Hardware requirements for the SAP HANA database 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node 15 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 RAID options. 28 Roll options. 29 Installing SAP HANA 29 Instating S		
Solution summary: Cisco UCS C480 M5 Rack Server. .5 Solution summary: Cisco UCS C240 M5 Rack Server. .6 Solution summary: Cisco UCS C220 M5 Rack Server. .7 Infrastructure overview. .8 Cisco UCS C400 M5 Rack Server .8 Cisco UCS C400 M5 Rack Server .9 High performance for data-intensive applications. .10 Cisco UCS C200 M5 Rack Server .10 High performance for data-intensive applications. .11 Solution design .11 Solution design .11 Hardware requirements for the SAP HANA database .12 File system layout. .12 Operating system .14 Deployment hardware and software configuration guidelines .14 Deployment hardware and software configuration guidelines .11 Rebooting the SAP HANA scale-up node .15 Launching the KVM console .21 Configuring BIOS settings .21 Rebooting the server to implement BIOS changes .28 Ronfiguring RAD .29 Installing the operating system .24 Prost-installation OS configuration .74 <t< td=""><td>Audience</td><td>4</td></t<>	Audience	4
Solution summary: Cisco UCS C240 M5 Rack Server.		
Solution Summary: Cisco UCS C220 M5 Rack Server. .7 Infrastructure overview. .8 Cisco UCS C480 M5 Rack Server .9 High performance for data-intensive applications. .10 Cisco UCS C20 M5 Rack Server .00 Cisco UCS C20 M5 Rack Server .00 High performance for data-intensive applications. .11 Solution design .11 Solution design .11 SAP HANA system .11 Preparing system layout. .12 File system layout. .12 Operating system .14 Deployment hardware and software configuration guidelines .14 Preparing the SAP HANA scale-up node. .15 Configuring the CVM console .19 Configuring the CVM console .19 Configuring BIOS settings .21 Rebooting the server to Implement BIOS changes .28 Rotinguring RAID .29 Installing the operating system .24 Preparing SAP HANA data, log, and shared file systems .79 Installing the operating system .74 Preparing SAP HANA .82		
Infrastructure overview		
Cisco UCS C480 M5 Rack Server 9 High performance for data-intensive applications 10 Cisco UCS C20 M5 Rack Server 10 High performance for data-intensive applications 11 Solution design 11 Solution design 11 Solution design 11 Hardware requirements for the SAP HANA database 12 File system layout 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 RAID options 28 Roboting SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 SAP HANA intols Nervies 83 SAP HANA vintualization notes </td <td>-</td> <td></td>	-	
Cisco UCS C240 M5 Rack Server 9 High performance for data-intensive applications 10 Cisco UCS C220 M5 Rack Server 10 High performance for data-intensive applications 11 Solution design 11 Solution design 11 Solution design 11 Hardware requirements for the SAP HANA database 12 File system layout. 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Deployment hardware and software configuration guidelines 14 Deployment hardware and software configuration guidelines 14 Configuring the Cisco Integrated Management Controller 15 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 RAID options 28 Configuring RAD 29 Installing the operating system 38 Post-installation OS configuration 74 Configuring bonding for high availability 74 Configuring bonding for high availability 74 Poreparing SAP HANA 82 SAP HANA IMDB notes		
High performance for data-intensive applications 10 Cisco UCS C220 MS Rack Server 10 High performance for data-intensive applications 11 SAP HANA system 11 SAP HANA system 11 Hardware requirements for the SAP HANA database 12 File system layout. 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Configuring the KIM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 Configuring BIOS settings 29 Installing the operating system 38 Post-installation OS configuration 74 Preparing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 SAP HANA intualization notes 83 SAP HANA intualization notes 83 SAP HANA intualization notes 83 SAP HANA intualizati		
Cisco UCS C220 M5 Rack Server		
High performance for data-intensive applications 11 Solution design 11 SAP HANA system 11 Hardware requirements for the SAP HANA database 12 File system layout 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 RAID options. 28 Configuring RAID 29 Installing the operating system 38 Post-installation OS configuration 74 Configuring bonding for high availability 74 Preparing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA intuble notes 83 Commands for checking SAP HANA dat		
Solution design 11 SAP HANA system 11 Hardware requirements for the SAP HANA database 12 File system layout. 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node. 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 RAID options 28 Configuring RAID 29 Installing the operating system 38 Post-installation OS configuration 74 Configuring SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 SAP HANA indets 83 Configuring SAP HANA 83 Configuring SAP HANA 83 Configuring SAP HANA 83 Resolut		
SAP HANA system 11 Hardware requirements for the SAP HANA database 12 File system layout 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Derpraying the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 RAID options 28 Configuring RAID 29 Installing the operating system 38 Post-Installation OS configuration 74 Configuring SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 SAP HANA virtualization notes 83 SAP HANA virtualization notes 83 SAP HANA indues 83 Configuring an SAP HANA database (HDB) information 84		
File system layout. 12 Operating system 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node. 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 Configuring RAID 28 Configuring Box 28 Configuring Box 28 Configuring RAID 29 Installing the operating system 29 Installing the operating system 38 Post-installation OS configuration 74 Configuring SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 RAP HANA virtualization notes 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA services 83 <td>•</td> <td></td>	•	
Operating system 14 Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 Configuring RAID 29 Installing the operating system 38 Post-Installation OS configuration 74 Configuring SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 SAP HANA virtualization notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 Commands for checking SAP HANA database (HDB) information 84	Hardware requirements for the SAP HANA database	
Deployment hardware and software configuration guidelines 14 Preparing the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 Configuring RAID 29 Installing the operating system 29 Installing the operating system 74 Post-installation OS configuration 74 Configuring SAP HANA 74 Preparing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA post-installation checkup 83 Commands for checking SAP HANA database (HDB) information 84	File system layout	12
Preparing the SAP HANA scale-up node 15 Configuring the Cisco Integrated Management Controller 15 Launching the KVM console 19 Configuring BIOS settings 21 Rebooting the server to implement BIOS changes 28 Configuring RAID 29 Installing the operating system 38 Post-installation OS configuration 74 Configuring SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA influes 82 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA influes 82 SAP HANA virtualization notes 83 SAP HANA virtualization notes 83 SAP HANA virtualization notes 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA database (HDB) information 84	Operating system	
Configuring the Cisco Integrated Management Controller15Launching the KVM console19Configuring BIOS settings21Rebooting the server to implement BIOS changes28RAID options28Configuring RAID29Installing the operating system38Post-installation OS configuration74Configuring BAP HANA data, log, and shared file systems79Installing SAP HANA82Important SAP Notes82SAP HANA IMDB notes82Linux notes83Third-party software notes83SAP HANA virtualization notes83SAP HANA services83Commands for checking SAP HANA services83Commands for checking SAP HANA database (HDB) information84Tuning the SAP HANA performance parameters84	Deployment hardware and software configuration guidelines	
Launching the KVM console19Configuring BIOS settings21Rebooting the server to implement BIOS changes28RAID options28Configuring RAID29Installing the operating system38Post-installation OS configuration74Configuring SAP HANA data, log, and shared file systems79Installing SAP HANA82Important SAP Notes82SAP HANA IMDB notes82Linux notes83SAP HANA virtualization notes83SAP HANA virtualization notes83Commands for checking SAP HANA services83Commands for checking SAP HANA services83Commands for checking SAP HANA performance parameters84	Preparing the SAP HANA scale-up node	
Configuring BIOS settings21Rebooting the server to implement BIOS changes28RAID options28Configuring RAID29Installing the operating system38Post-installation OS configuration74Configuring bonding for high availability74Preparing SAP HANA data, log, and shared file systems79Installing SAP HANA82Important SAP Notes82SAP HANA IMDB notes82Linux notes83Third-party software notes83SAP HANA virtualization notes83Performing an SAP HANA post-installation checkup83Commands for checking SAP HANA services83Commands for checking SAP HANA database (HDB) information84Tuning the SAP HANA performance parameters.84		
Rebooting the server to implement BIOS changes28RAID options28Configuring RAID29Installing the operating system38Post-installation OS configuration74Configuring bonding for high availability74Preparing SAP HANA data, log, and shared file systems79Installing SAP HANA82Important SAP Notes82SAP HANA IMDB notes82Linux notes83Third-party software notes83SAP HANA virtualization notes83SAP HANA post-installation checkup83Commands for checking SAP HANA database (HDB) information84Tuning the SAP HANA performance parameters84	-	
RAID options. 28 Configuring RAID 29 Installing the operating system 38 Post-installation OS configuration 74 Configuring bonding for high availability 74 Preparing SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA database (HDB) information 84		
Configuring RAID29Installing the operating system38Post-installation OS configuration74Configuring bonding for high availability74Preparing SAP HANA data, log, and shared file systems79Installing SAP HANA82Important SAP Notes82SAP HANA IMDB notes82Linux notes83Third-party software notes83SAP HANA virtualization notes83Performing an SAP HANA post-installation checkup83Commands for checking SAP HANA database (HDB) information84Tuning the SAP HANA performance parameters84		
Installing the operating system38Post-installation OS configuration74Configuring bonding for high availability74Preparing SAP HANA data, log, and shared file systems79Installing SAP HANA82Important SAP Notes82SAP HANA IMDB notes82Linux notes83Third-party software notes83SAP HANA virtualization notes83Performing an SAP HANA post-installation checkup83Commands for checking SAP HANA services83Commands for checking SAP HANA database (HDB) information84Tuning the SAP HANA performance parameters84	•	
Post-installation OS configuration 74 Configuring bonding for high availability 74 Preparing SAP HANA data, log, and shared file systems 79 Installing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 Performing an SAP HANA post-installation checkup 83 Commands for checking SAP HANA database (HDB) information 84 Tuning the SAP HANA performance parameters 84		
Preparing SAP HANA data, log, and shared file systems		
Installing SAP HANA 82 Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 Performing an SAP HANA post-installation checkup 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA database (HDB) information 84 Tuning the SAP HANA performance parameters 84	Configuring bonding for high availability	74
Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 Performing an SAP HANA post-installation checkup 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA database (HDB) information 84 Tuning the SAP HANA performance parameters 84	Preparing SAP HANA data, log, and shared file systems	
Important SAP Notes 82 SAP HANA IMDB notes 82 Linux notes 83 Third-party software notes 83 SAP HANA virtualization notes 83 Performing an SAP HANA post-installation checkup 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA database (HDB) information 84 Tuning the SAP HANA performance parameters 84	Installing SAP HANA	
Linux notes	•	
Third-party software notes 83 SAP HANA virtualization notes 83 Performing an SAP HANA post-installation checkup 83 Commands for checking SAP HANA services 83 Commands for checking SAP HANA database (HDB) information 84 Tuning the SAP HANA performance parameters 84	SAP HANA IMDB notes	82
SAP HANA virtualization notes	Linux notes	83
Performing an SAP HANA post-installation checkup	Third-party software notes	83
Commands for checking SAP HANA services	SAP HANA virtualization notes	83
Commands for checking SAP HANA database (HDB) information	Performing an SAP HANA post-installation checkup	
Tuning the SAP HANA performance parameters		
	Commands for checking SAP HANA database (HDB) information	84
Maintenance operations	Tuning the SAP HANA performance parameters	
	Maintenance operations	

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Maintaining the operating system Prerequisites	
Updating the OS and kernel	
Updating SUSE and the kernel online	
Operating and maintaining SAP HANA Monitoring SAP HANA	
Starting and stopping SAP HANAsapcontrol	
Downloading revisions	100
For more information	100
Appendix: Solution variables used in this document	101

Executive summary

Organizations in every industry are generating and using more data than ever before: from customer transactions and supplier delivery considerations to real-time user-consumption statistics. Without reliable infrastructure that can store, process, and analyze big data sets in real time, companies are unable to use this information to their advantage. The Cisco[®] Scale-Up Solution for SAP HANA with the Cisco Unified Computing System[™] (Cisco UCS[®]) using the Cisco 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 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 scale-up solution provides prevalidated, ready-to-deploy infrastructure, reducing the time and complexity involved in configuring and validating a traditional data center deployment. The reference architecture detailed in this document highlights the resiliency and ease of deployment of an SAP HANA solution.

SAP HANA is SAP's implementation of in-memory database (IMDB) technology. The SAP HANA database takes advantage of the low-cost main memory (RAM), faster access, and data-processing capabilities of multicore processors to provide better performance for analytical and transactional applications. SAP HANA offers a multiple-engine, query-processing environment that supports relational data (with both row- and column-oriented physical representations in a hybrid engine) as well as graph and text processing for semistructured and unstructured data management within the same system. As an appliance, 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.

In 2013, SAP introduced the SAP HANA Tailored Datacenter Integration (TDI) option. 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. The TDI option enables organizations to run multiple SAP HANA production systems on a shared infrastructure. It also enables customers to run SAP application servers and an SAP HANA database hosted on the same infrastructure.

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

Audience

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

Purpose of this document

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

Solution summary: Cisco UCS C480 M5 Rack Server

The Cisco Scale-Up Solution for SAP HANA can use 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.

CPU specifications	2.50-GHz Intel® Xeon® Platinum 8180 processor Quantity: 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) • 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	C480M5.3.1.0.248.0518171057		
Cisco Integrated Management Controller (IMC) firmware	Version 3.1(0.213)		
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 I. Overview of Ci3co 003 0400 MJ Rack Server configuration	Table 1.	Overview of Cisco UCS C480 M5 Rack Server configuration
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Table 2. Cisco UCS C480 M5 proposed disk layout

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

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Table 3.	CISCO UCS	C480 M5	proposed	aisk	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 RAID 5 	Data file system	XFS
• 3 x 3.8 TB SSD		Log file system	XFS
		SAP HANA shared file system	XFS

Solution summary: Cisco UCS C240 M5 Rack Server

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

Table 4.	Overview of Cisco UCS C240 M5 Rack Server configuration
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CPU specifications	2.50-GHz Intel Xeon Platinum 8180 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 3 (for up to 1.5-TB memory configurations)
BIOS	C480M5.3.1.0.248.0518171057
Cisco IMC firmware	Version 3.1(1d)
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



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 RAID 5 	Data file system	XFS
• 3 x 3.8-TB SSD		Log file system	XFS
	SAP HANA shared file system	XFS	

Solution Summary: Cisco UCS C220 M5 Rack Server

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

Table 7.	Overview of Cisco UCS C220 M5 Rack Server configuration
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CPU specifications	2.50-GHz Intel Xeon Platinum 8180 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 8 3.8-TB SSD: Quantity 3 (for up to 1.5-TB memory configurations)
BIOS	C480M5.3.1.0.248.0518171057
Cisco IMC firmware	Version 3.1(1d)
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

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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 3 x 3.8-TB SSD 	 RAID 5 RAID 5 	Data file system	XFS
		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 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.

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

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, VDI, and bare-metal applications. It delivers outstanding levels of expandability and performance for standalone or Cisco UCS managed environments in a 4-rack-unit (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
- 2666-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



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 compared to the previous generation of servers. These improvements deliver significant performance and efficiency gains that will improve your application performance. The C240 M5 delivers outstanding levels of 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 PCle SSDs on the NVMe-optimized chassis version), or 12 large-form-factor (LFF) 3.5-inch drives plus 2 rear hot-swappable SFF drives
- Support for a 12-Gbps SAS modular RAID controller in a dedicated slot, leaving the remaining PCIe Generation 3.0 slots available for other expansion cards
- Modular LOM (mLOM) slot that can be used to install a Cisco UCS VIC without consuming a PCIe slot, supporting dual 10or 40-Gbps network connectivity
- Dual embedded Intel x550 10GBASE-T LOM ports
- Modular M.2 or SD cards that can be used for bootup

High performance for data-intensive applications

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

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

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

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

Figure 2. Cisco UCS C240 M5 Rack Server



Cisco UCS C220 M5 Rack Server

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

The 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 compared to the previous generation of servers. These improvements deliver significant performance and efficiency gains that will improve your application performance. The C220 M5 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 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. The network requirements for this option are at least one 1 Gigabit Ethernet access network and one 10 Gigabit Ethernet storage network.

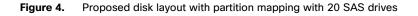
Hardware requirements for the SAP HANA database

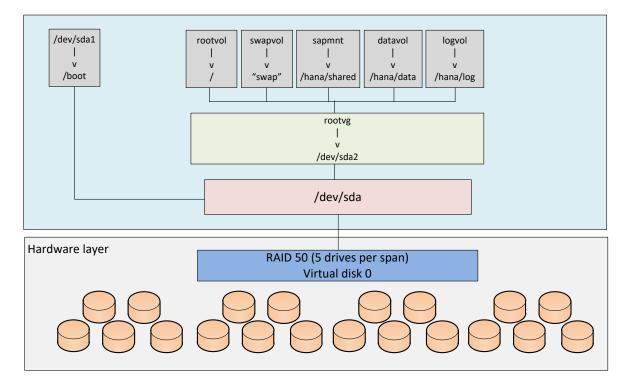
SAP defines hardware and software requirements for running SAP HANA systems. For the latest information about the CPU and memory configurations supported for SAP HANA, see https://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/index.html.

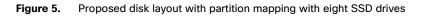
Note: This document does not cover the updated information published by SAP. Additional information is available at http://saphana.com.

File system layout

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







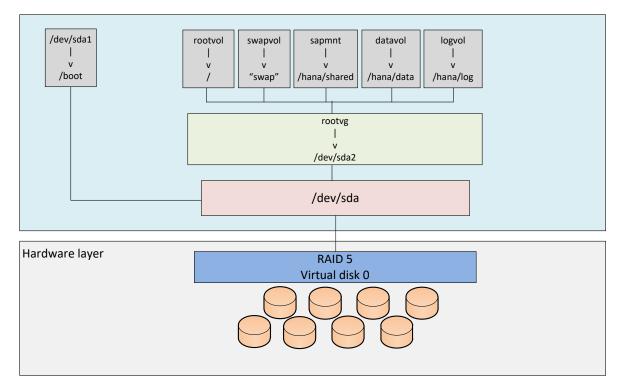
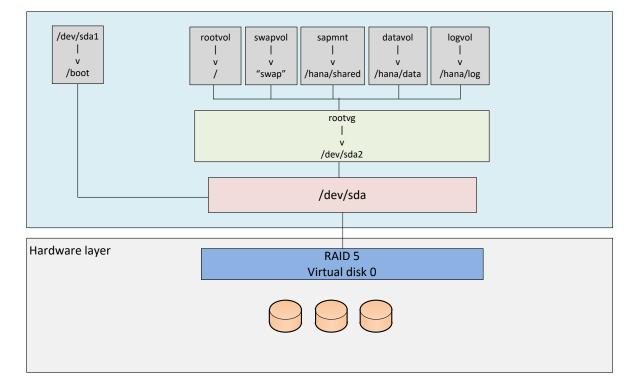


Figure 6. Proposed disk layout with partition mapping with three SSD drives (up to 1.5-TB memory configurations)



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 ≤ 256 GB of memory
- Minimum of 512 GB for systems with \geq 512 GB of memory

Operating system

SAP HANA supports the following operating systems:

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

Note: This document provides installation steps for SLES for SAP 12 SP2.

Deployment hardware and software configuration guidelines

This section is intended to enable you to fully configure the customer environment. In this process, various steps require you to insert customer-specific naming conventions, IP addresses, and VLAN schemes, as well as to record appropriate MAC addresses. Table 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 : Not Available Cisco IMC IPv6 : Not Available MAC ADDR: Not Available

Figure 8. BIOS POST screen (continued)



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

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

NIC mode				
		NIC redundancy		
	[X]		[<u>×</u>]	
	[]		[]	
			[]	
	[]	VLAN (Advanced)		
Shared LOM Ext:	[]	VLAN enabled:	[]	
Default VIC		VLAN ID:		
Slot:	1			
IP (Basic)	5×3			
	[X] IPV6:	[]		
	[]			
	173.36.215.117			
	255.255.255.0			
	173.36.215.1			
	0.0.0.0			
xolakolakolakolakolakolakolakolakol				akokokokokok
<up down="">Selectio</up>	n <f10>Save</f10>	<space>Enable/Disable</space>	<f5>Refresh</f5>	ESC>Exit
<f1>Additional se</f1>	ttings			

- 3. Use the console network IP address <<var_cimc_ip_address>>, netmask <<var_cimc_ip_netmask>>, and gateway <<var_cimc_gateway_ip>> for the IPv4 settings of the IMC. Select None for network interface card (NIC) redundancy.
- 4. Press F10 to save the 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 username and password are **admin** and **password** (Figure 10).

Figure 10. Cisco IMC login screen

ոիժը
cisco
C480-FCH2111W00K
Cisco Integrated Management Controller
Version: 3 1(0 213)
Unimaine Paspeord
Ling for
C480 M5 - 216 (System 1) SAP HAVA Centrication. In Progress
Order Development and the operation of the operation

Figure 11 shows the results.

Figure 11. Cisco IMC summary screen

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😕 📲 Cisco						admin@173.36.215.50 - C480-FCH2111W00K 🔅
A / Chassis / Sum	mary 🖈				Refresh Hos	t Power Launch KVM Ping Reboot Locator LED @ 🛛
Server Proper	ties	Cisco Integrated N	lanagement Controller (Cis	sco IMC) Information		
Product Name:	UCS C480 M5	Hostname:	C480-FCH2111W00K			
Serial Number:	FCH2111W00K	IP Address:	173.36.215.35			
PID:	UCSC-C480-MS	MAC Address:	00:6B:F1:41:E2:6E			
UUID:	16E477E8-5853-4599-AEA5-AF3453F8EB0C	Firmware Version:	3.1(0.213)			
BIOS Version:	C480M5.3.1.0.248.0518171057	Current Time (UTC):	Mon Jul 10 03:59:16 2017			
Description		Local Time:	Sun Jul 9 20:59:16 2017 PDT -0700			
Asset Tag:	Unknown	Timezone:	America/Los_Angeles	Select Timezone		
Overall Server Tempe Overall DIMM Power Su	Status: Con Status: Cood rature: Cood Status: Cood Status: Cood Status: Cood Fame: Cood orf	Server Utilization	sine	Consert Utilization (%) Consert Utilization (%) Conserts (%) C		

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 homepage (Figure 12).

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

Figure 12. Cisco IMC homescreen

[[PLS SUPPLY THE MISSING FIGURE]]

 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

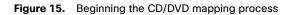
KVM server certificate has been accepted. Click this link to continue loading the KVM client application: https://173.36.215.35/html/kvmViewer.html

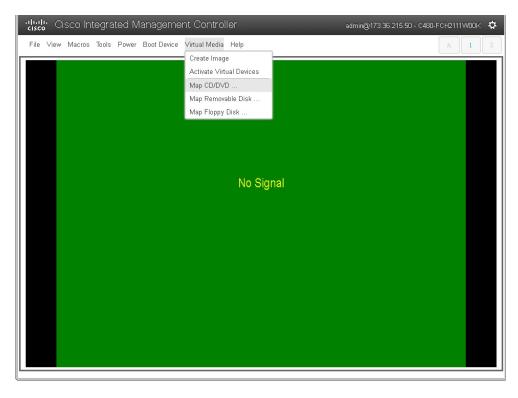
The KVM window will appear (Figure 14).

Figure 14. KVM window

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	File	View	Macros	Tools	Power	Boot Device	Virtual Media	Help		A	1	S
								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).





4. Browse for the SLES 12 for SAP SP2 DVD ISO file and click Map Drive (Figure 16).

Figure 16. Click Map Drive

cisco Integrated Management Controller	admin@173.36.215.50 - C480-FCH2111WOOK 🔅
File View Macros Tools Power Boot Device Virtual Media Help	A I S
Virtual Media - CD/DVD Image File : SLE-12-SP2-SAP-x86_64-GM-DVD1.iso ♥ Map Drive	Arwse Cancel

Configuring BIOS settings

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

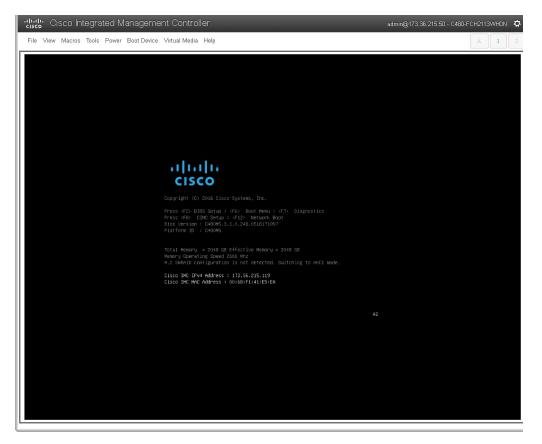
1. From the menu bar at the top of the KVM window, choose Power > Power On System (Figure 17).

Figure 17. Powering on the system

ului cisco	<mark>;</mark> Cisc	o Int	egrate	ed M	anageme	nt Controll	er	admin@173.36.215.50 - C480-F	CH2113W	/HON 🍄
File	View M	acros	Tools F			Virtual Media	Help		A	1 S
					<pre> On System Off System System (warn Cycle System C</pre>					
							No Signal			

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

Figure 18. Press F2



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

Figure 19. On-screen keyboard

cisco Ci	sco Int	egra	ted M	lanageme	nt Control	ler .										admin@	2173.36.3	215.50	- C480-FC	H2113WHON 🕇
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					Main Adv System BIO Product Na Version Build Date	nformation n	Mgmt UCSC-(C480M9 05/18/ 50654	Secur. 0480-M 15.3.1.0 1/2017 : 1 - SKX 1S/PRQ -	5 0.248 LO:57:4	<u>ot Op</u>	cions Set to eli Det Yei Hon Day	Save t the switc ements fault ar: 20 nths: ys: de	& Exit Date. Us h betwee Ranges: 05–2099	se Tab en Date on mor	e					
					Total Memo Effective Logged in System Dat System Tim	Memory as e		GB (istrat) ()5/12/2			Ent +/- F1: F9: F1: ESI	ter: S -: Cha : Gene : Opti 0: Sav C: Exi	nge Opt ral Help mized De e & Rese	o efaults et Syst	tem					
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						ESC	F1	F2 F	-3 F4	F5	F6	F7	F8 F9	F10	F1	1 F12	Num	1	*	
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4. From the BIOS menu, choose Boot Options > Boot Mode > UEFI Mode (Figure 20). This setting selects the Unified Extensible Firmware Interface (UEFI).

Figure 20. Choose UEFI Mode

Lulu Cisco Integrated Managemer	it Controller			admin@173.36.	215.50 - C480-FC	H2113WHON 🛱
File View Macros Tools Power Boot Device '	√irtual Media Help				ſ	A 1 S
	Aptic Setup Utility	- Copyright (C) 2017 Americ	an Megatrends, Inc.			
	Main Advanced Server Boot Configuration	Hgmt Security Boot Option	s Save & Exit			
		3	mode or Legacy Boot Mode. In UEFI Boot			
		Disabled	mode, only UEFI BootOptions, UEFI OpROM			
	Boot Mode CDN Support for VIC	[Disabled]	will load and display. LEGACY BOOTOPTIONS and			
	Boot Option Priorities	UEFI Mode	PCIOpROM will load and			
	Boot Option #1 Boot Option #2	UE LEGACY Mode	++: Select Screen ++: Select Item			
	BOOL ODITION #2	Ethernet Controller	Enter: Select +/-: Change Opt.			
	Boot Option #3	[UEFI: PXE IP4 Intel(R)	F1: General Help F9: Optimized Defaults			
		x550]	F10: Save & Reset System ESC: Exit			
			K/M: Scroll help UP/DOWN			
			AB			
	Eng	Sh F1 F2 F3 F4 F5 F1	6 F7 F8 F9 F10 F11	L F12 Num	/ *	# U A X
	· · · · · ·			Bksp 7	8 9	+
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	Cap			nter 1	2 3	Prnt Scrn
				hift 0	. Enter	
	- Ctr					

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

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						Apt Le Main RC > Trusted C > PCI Subsy > USB Confi > USB Confi > Network S > USB Confi > Diver He > Socket Co > Driver He > Socket Co > Intel(N > ANBO ME > AVBO ME Controlle Configure	vanced omputin t Consistem Se tack Co guratio Defigura figura alth figurat /irtual format are RAI #RAID & with	server g ole Red ttings nfigura n ts Conf ration tion RAID or ion D Confi Clsco 11 4GB cacl	irection tion Iguratio CPU guration 26 Modul re (max	n n util. ar Ra. 26 dr.	ty Bo ity (Si Id	atta)	ions ▲ Se In Co +++ +/1 En +/1 F19 F11 ▼ ES	Save lect tel S nfigu : Sel : Sel : Ser : Ch : Gen : Opt : Gen : Capt : Capt : Save : Sel : Sel	& Exi to nav ocket ration ect Sci ect Iti Select ange Op eral H imized ve & Ro	t igat pag reen em ot. elp Def eset	e to es aults Syst	em						
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6. Choose Advanced Power Management Configuration (Figure 22).

- Cisco Integrated Management Controller admin@173.36.215.50 - C480-FCH2113WH0N 🛛 🔅 🛛 File View Macros Tools Power Boot Device Virtual Media Help 1 Aptio Setup Utility – Copyright (C) 2017 American Megatrends, Inc. Processor Configuration
 Common RefCode Configuration
 UFL Configuration
 HENORY Configuration
 Hild Configuration
 Hild Configuration
 Advanced Power Management Configuration Displays and provides option to change the Power Management Settings +: 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 English # U A X Esc F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 Num / * -1 2 3 4 5 6 7 8 9 0 - = Bksp 7 8 9 +
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 Enter
 4 5 6 scroll 2 1 3 Prnt Scrn shift z x c v b n m , . / shift 0 . Enter Ctrl Win Alt Alt Ctrl
- Figure 22. Choose Advanced Power Management Configuration

7. Disable the C-states as shown in Figure 23.

Figure 23. Disabling C-states

Lisco Integrated Managemei	nt Controller	admin@173.36.215.50 - C480-FCH2113WHON 🔅
File View Macros Tools Power Boot Device	Virtual Media Help	A 1 S
	Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc. CPU C State Control Autonomous Cone [Disable] C-State CPU D S report [Disable] Enhanced Hait State [Enable] (CIE) DS ACPI CX ACPI C2	
	K/M: Scroll help UP/DOWN	
	Version 2.19.1258. Copyright (C) 2017 American Megatrends, Inc. AB	
	English	# U A X
	Esc F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F1	
	<u>`</u> 1234567890-=	Bksp 7 8 9 +
	Tab q w e r t y u i o p [] \ 4 5 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 , . / s	shift 0 . Enter

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.

RAID options

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	128
Read policy	Read ahead	Read ahead
Write policy	Write back	Write back
I/O policy	Cached	Default

Configuring RAID

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.

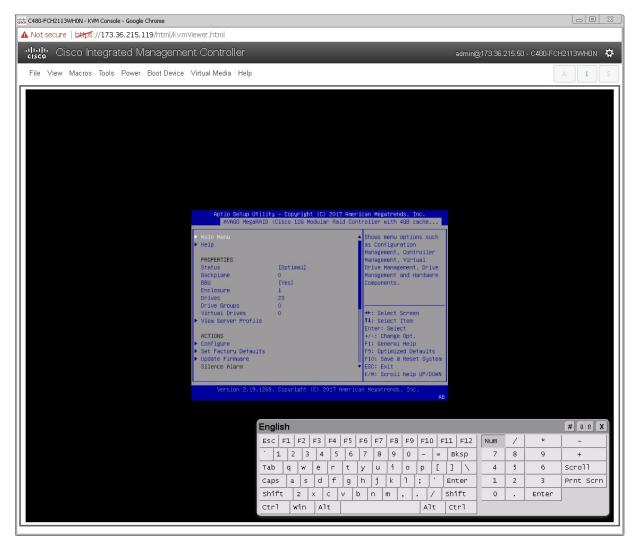
- 1. Boot the server and press F2 to enter the BIOS menu.
- 2. Select the Avago MegaRAID Utility to proceed with the RAID configuration Figure 24).

Figure 24. Select Avago MegaRAID

disco Integrated Management Controller	admin@173.36.2	215.50 - C480-FCH	2113WHON	\$
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Controller with 48B cache (max 26 drives)> [F9: Optimized Default Configuration Utility - 07.01.12.00 Files Reset Syst ESC: Exit K/M: Scroll Help UP/D				
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Controller with 48B cache (max 26 drives)> [F9: Optimized Default Configuration Utility - 07.01.12.00 Files Reset Syst ESC: Exit K/M: Scroll Help UP/D	HN		# U ft X	
Controller with 408 cache (max 26 drives)> Configuration utility - 07.01.12.00 Version 2.19.1268. Copyright (C) 2017 American Megatrends. Inc. English	HN	/ *	# U îì X	
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3. Choose Main Menu (Figure 25).

Figure 25. Choose Main Menu



4. Choose Configuration Management (Figure 26).

Figure 26. Choose Configuration Management

號 C480-FCH2113WH0N - KVM Console - Google Chrome		
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Cisco Integrated Managemen	t Controller	admin@173.36.215.50 - C480-FCH2113WH0N 🛛 🌞
File View Macros Tools Power Boot Device	irtual Media Help	A I S
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	English	# Un X
	ESC F1 F2 F3 F4 F5 F6 F7 F8 F9	F10 F11 F12 Num / * -
	<u>1</u> 234567890	- = Bksp 7 8 9 +
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	shift z x c v b n m ,	. / Shift 0 . Enter
	Ctrl Win Alt	Alt Ctrl

5. Choose Create Virtual Drive (Figure 27).

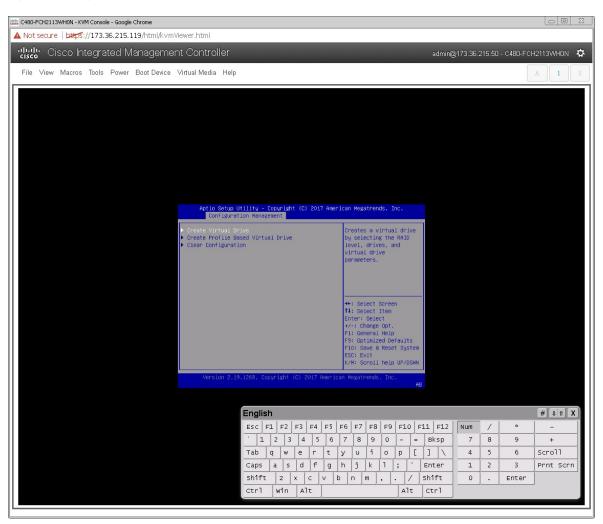
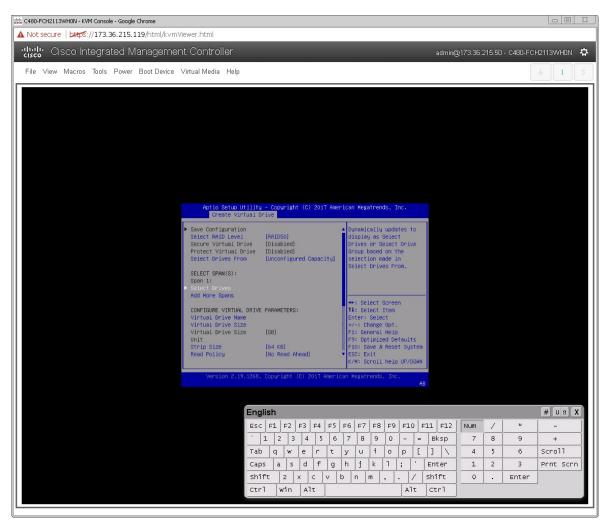


Figure 27. MegaRAID Configuration Utility: Create Virtual Drive

- Choose the following options to create a RAID 50 virtual drive with 20 disks and five spans:
 a. For RAID Level, choose RAID50.
 - b. Choose Select Drives (Figure 28).

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Figure 28. Choosing RAID options



c. Select the first five disks by choosing Enabled as shown in Figure 29.

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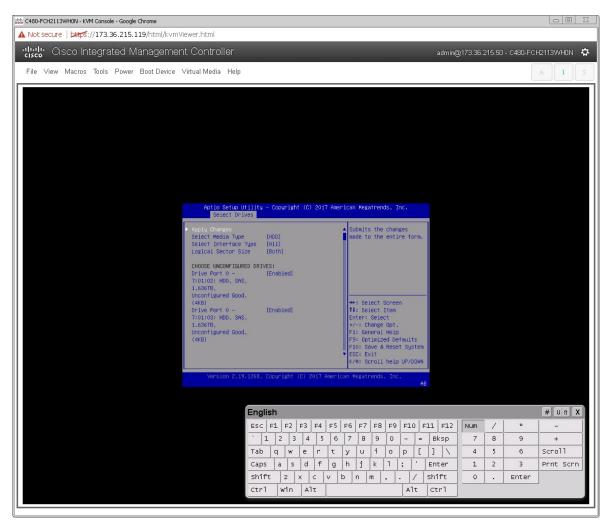
Figure 29. Choose Enabled

C480-FCH2113WH0N - KVM Console - Google Chrome		
A Not secure bit S://173.36.215.119/html/kvmViewer.html		
directory Cisco Integrated Management Controller adm	nin@173.36.215.50 - C480-Fi	СН2113WHON 🌣
File View Macros Tools Power Boot Device Virtual Media Help		A I S
Aptio Setup Utility – Copyright (C) 2017 American Megatrends, Inc.		
Select Drives		
Drive Port 0 - (Enabled) 7:01:04: HDD, SAS,		
1.686TB, Unconfigured Good, (4KB)		
Drive Port 0 - [Enabled] 7:01:05: HDD, SAS,		
Drive Port O - 7:01:05: HDD, SAS, 1.636TB, Unconfigured Good, (4KB) Disabled		
Enabled		
7 1.686TB, Enter: Select		
Unconfigured Good, +/-: Change Opt. (4KB) F1: General Help F3: Optimized Defaults		
F10: Save & Reset System ▼E00: Save & Reset System		
K/M: Scroll help UP/DOHN		
Version 2.19.1268. Copyright (C) 2017 American Megatrends, Inc. AB		
English		# U ft X
ESC F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F1		
` 1 2 3 4 5 6 7 8 9 0 - = Bksp Tab q w e r t y u i o p [] \		+ scroll
$\begin{array}{c cccc} \hline 1 & ab & q & b & c & y & d & r & 0 & p & c & y \\ \hline Caps & a & s & d & f & g & h & j & k & 1 & ; & ' & Enter \end{array}$		Prnt Scrn
shift z x c v b n m , . / shift	0 . Enter	
Ctrl win Alt Alt Ctrl		

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

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Figure 30. Apply the changes



e. Choose OK in the confirmation window.

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

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Figure 31. Add more spans

480-FCH2113WH0N - KVM Console - Google Chrome				
Not secure bttps://173.36.215.119/html/kvmViev	ver.html			
Isto Cisco Integrated Management	Controller	admin@	173.36.215.50 - C480-FCH	2113WHON 🌣
File View Macros Tools Power Boot Device Vir	tual Media Help			A I S
	Aptio Setup Utility – Copyright (C) 2017 Americ Create Virtual Drive	an Megatrends, Inc.		
	Secure Virtual Drive [Disabled]	Active when configuring		
		a spanned virtual drive, it allows the		
		user to add additional spans. There should be		
		an even number of spans and an even number of		
		drives per span for a		
	Port 0 - 7:01:05	++: Select Screen		
	7:01:06 SAS)	t4: Select Item		
	Add More Spans	Enter: Select +/-: Change Opt.		
	CONFIGURE VIRTUAL DRIVE PARAMETERS:	F1: General Help F9: Optimized Defaults		
		F10: Save & Reset System ESC: Exit		
		K/M: Scroll help UP/DOWN		
		i Megatrends, Inc. AB		
	English			# U A X
	ESC F1 F2 F3 F4 F5 F	6 F7 F8 F9 F10 F11 F12	Num /] *]	-
	<u>123456</u>	7 8 9 0 - = Bksp	7 8 9	+
	Tab q w e r t y		4 5 6	Scroll
	Caps a s d f g h		1 2 3	Prnt Scrn
	Shift z x c v b	n m , . / shift	0 . Enter	
	Ctrl Win Alt	Alt Ctrl		

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

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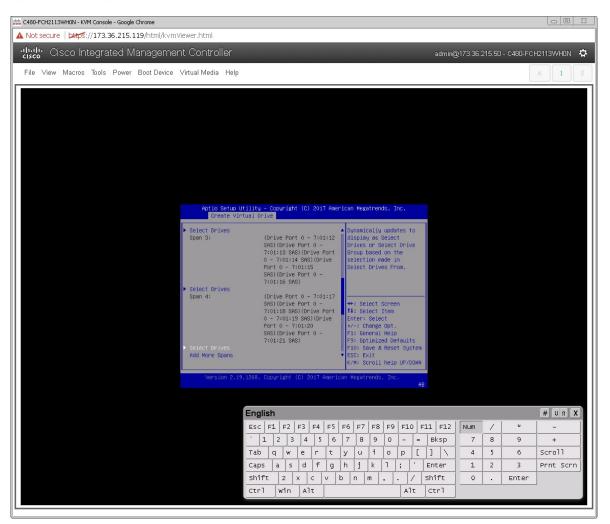


Figure 32. Verifying that the spans and drives have been added

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

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

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Figure 33. Virtual drive parameters

H2113WHON - KV	M Console	- Google	Chrome														00	5
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				Virtual Dr Unit	ive Size	[TB]			speci	fied para	ameters.							
				Strip Size		[256 KB]												
				Write Poli	cy	[Write Bad												
						[Cached] [Read/Writ	el		++: S	elect Scr	reen							
				Drive Cach	ie	[Unchanged			tl: s	elect Ite	em							
						[NO]			+/-:	Change Op	ot.							
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					Так	o q w	e r	t	y u	ic	o p][]] \	4	5	6	Scroll	
					Cap	os a s	d 1	g	h j	k 1	;	·]	Enter	1	2	3	Prnt Scr	'n
					Shi	ift z	x c	V	b n	m ,	1.1	1	shift	0	•	Enter		
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Copyright (C) 2017 American Megatrends, Tre.</td><td>cure Left 10 Setten Uf 1111 y - Copyright (0) 2017 Averican Regatereds, Inc. certe Virtual Media Help certe Virtual Drive Media Help uit Size uit Size uit Size erie Folicy rest Size Erie Disble Beckground Hub Disble</td><td>cure Lawpf://173.36.215.119/html/kvm/lewer.html Cisco Integrated Management Controller iew Macros Tools Power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Media Help Image: Control of the power Boot Device Virtual Control</td><td>cure Lasse Status Utility - Coupright (0) 2012 American Megatrends, Inc. cew Macros Tools Power Boot Device Virtual Media Help reptio Setup Utility - Coupright (0) 2012 American Megatrends, Inc. certer Virtual Drube Utrus Drube Size Utrus Drube Size Virtual Drube Note Virtual Drube Size Virtual D</td><td>care bargs//173.36.215.119/html/kvmViewer.html Cisco Integrated Management Controller iew Macros Tools Power Boot Device Virtual Media Help Image: Controller Virtual Device Media Disble Device Media Disble Device Media Disble Device</td><td>cure LadySt/1/123.35.215.119/html/kvm/Wewer.html Cisco Integrated Management Controller kev Macros Tools Power Boot Device Virtual Media Help Anticol Scale Utility - Sognight (G) 2017 AverCan Vesatrends, Inc. 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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 SP2 on local drives.

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

Figure 34. Booting to the ISO image

A 173.36.215.117 - KVM Console		
File View Macros Tools Power Virtual	Media Help	
[©] SUSE		
	Boot from Hard Disk	
	Installation	
	Upgrade	
	Rescue System	
	Check Installation Media	
	Memory Test	
Boot Optio	ns	
El Holo El Languago El V	lidee Mede E4 Source E5 Kernel E	6 Driver
	Video Mode F4 Source F5 Kernel F Default DVD Default	No
	a the second	73.36.215.117 admin 0.6 fps 0.001 KB/s 🗎

- 2. On the Language, Keyboard and License Agreement page, select your preferred language and keyboard Layout, agree to the license terms, and select Next.
- 3. On the Network Settings page, select Next. You will return to the network configuration as part of the post-installation tasks.
- 4. On the Registration page, select Skip Registration. You will register later as part of the post-installation tasks.
- On the Product Installation Mode page, select the "Proceed with standard SLES for SAP Applications installation" option (Figure 35).

Figure 35. Product Installation Mode page



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

Figure 36. Suggested partitioning initial proposal: Select Expert Partitioner

	Sugge Partitio	Create sloS grub volume /dev/sda2 (1 Create volume group syste Create roat volume dev/sda2 (1) Create solvolume g/boot// Create subvolume @/boot// Create subvolume @/boot// Create subvolume @/boot// Create subvolume @/srv or Create subvolume @/srv or Create subvolume @/war/cr Create subvolume @/war/cr Create subvolume @/war/lib Create subvolume @/war/lib Create subvolume @/war/lib Create subvolume @/war/lib write" Create subvolume @/war/lib write" Create subvolume @/war/lib write"	6.00 TIB) m (16.00 TIB) from /dev/edzi stem/root (60.00 GIB) with b /dev/system/swap (2.00 GIB grub2/1366-pc on device /dev grub2/1366-f64-efi on device / n device /dev/system/root n device /dev/system/root n device /dev/system/root n device /dev/system/root ash on device /dev/system/ro /flibvirt/images on device /dev /mariadb on device /dev/system/ /mariadb on device /dev/system/	trfs)) v/system/root dev/system/root v/system/root tem/root tem/root with opt am/root	with option " option "no co	py on
			Create Partition Setup.			
Help	Release Notes		*	Abort	Back	Next
Treats	neicuse notes					TOAL

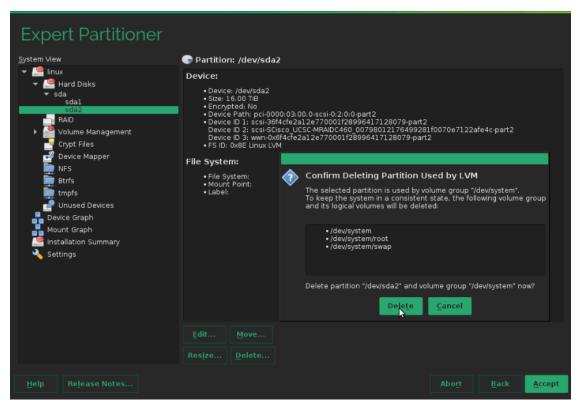
- 8. At the the left, choose System View > Linux > Hard Disks > sda.
- 9. Clear the suggested partitions. The example here shows two suggested partitions: sda1 and sda2. Use the following steps to delete sda1 and sda2.
 - a. Delete partition sda2 (Figures 37 and 38).

Figure 37. Expert Partitioner: Delete partition sda2

Expert Partitioner	Partition: /dev/sda2			
 Inux Hard Disks sda sda1 Copic Files Crypt Files Device Mapper NFS Btrfs tmpfs Unused Devices Device Graph Mount Graph Installation Summary Settings 	Device: • Device: /dev/sda2 • Stre: 16:00 TIB • Encrypted: No • Device Path: pci-0000:03:00.0-scsi-0:2:0:0-part2 Device ID 1: scsi-36f4cfe2a12e770001f28996417128079-part2 Device ID 3: wwn-0x6f4cfe2a12e770001f28996417128079-part2 • FS ID: 0x8E Linux LVM File System: • File System: • Mount Point: • Label:	Lf0070e7122afe4c 2	-part2	
	Edit Move Res <u>i</u> ze Delete			
				<u>A</u> ccept

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Figure 38. Expert Partitioner: Confirm deletion of partition sda2



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

Figure 39. Expert Partitioner: Delete partition sda1

SUSE.				
Expert Partitioner				
<u>S</u> ystem View	🕞 Partition: /dev/sda1			
 Inux Inux Inux Fad Disks sda Solution RAID Volume Management Crypt Files Device Mapper NFS Btrfs Thrfs Device Graph Mount Graph Installation Summary Settings 	Device: • Device: /dev/sda1 • Size: 400.06 Mi8 • Encrypted: No • Device Path: pci-0000:03:00.0-scsi-0:2:0:0-part1 • Device Path: pci-0000:03:00.0-scsi-0:2:0:0-part1 Device ID 2: scsi-36f4cfe2a12e770001f28996417128079-part • FS ID: 0x107 BIOS Grub File System: • File System: • Mount Point: • Label:	1f0070e7122afe4c 1	part1	
	Edit Move Res <u>i</u> ze			
Help Release Notes			<u>B</u> ack Ac	cept

Figure 40. Expert Partitioner: Confirm deletion of partition sda1

Expert Partitioner	
System View	🕞 Partition: /dev/sda1
 Inux Hard Disks sda Sda1 RAID Volume Management Crypt Files Device Mapper NFS Btrfs tmpfs Unused Devices Device Graph Mount Graph Installation Summary Settings 	Device: • Device: /dev/sdal • Size: 400.06 Mi8 • Encrypted: No • Device Path: pc1-0000:03:00.0-scsi-0:2:0:0-part1 • Device ID 1: scsi-36f4cfe2al2e770001f28996417128079-part1 Device ID 2: scsi-Scisco UCSC-MRAIDC460_00798012176499281f0070e7122afe4c-part1 Device ID 3: wwn-0x6f4cfe2al2e770001f28996417128079-part1 • File System: • File System: • File System: • Mount Point: • Label:

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

• Create a 200-MB /boot 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, hence 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).

Figure 41. Add new partition

<u>S</u> ystem View	🦉 Hard	Disk:	/dev/so	a					
▼ ^[S] linux ▼ ^[S] Hard Disks		<u>O</u> ve	rview			<u>P</u> artitio	ns		
sda RAID						Unpartitic 16.00 T	oned īB		
Volume Management Crypt Files Device Mapper NFS Btrfs Tmpfs Unused Devices Device Graph Mount Graph Installation Summary Settings	Device	Size	F Er	с Туре	FS Type	Label	Mount Point	Start	End
	A <u>d</u> d Move Dele <u>t</u> e.								

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

Figure 42. Adding a partition: Specify the new partition size

Add Partition on /dev/sda	
New P	Partition Size
	<u>M</u> aximum Size (16.00 TiB) <u>C</u> ustom Size <u>S</u> ize
	200 MiB
0	C <u>u</u> stom Region Start Cylinder
	0
	2138406

12. Click Next. For Role, select Operating System (Figure 43).

Figure 43. Adding a partition: Specify the role

Add Partition on /dev/sda	
▶	
Role	
O Swap	ystem V Applications e (unformatted)

13. Click Next. Select Ext3 as the file system and /boot for the mount point (Figure 44).

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

Add Partition on /de	v/sda		
e Fo	ng Options rm <u>a</u> t partition File <u>S</u> ystem		Options unt partition Mount Point
	Ext3 O <u>p</u> tions		/boot - Fs <u>t</u> ab Options
O <u>D</u> o	not format partition File system <u>I</u> D: 0x83 Linux	O Do	not mount partition
Er	crypt Device		

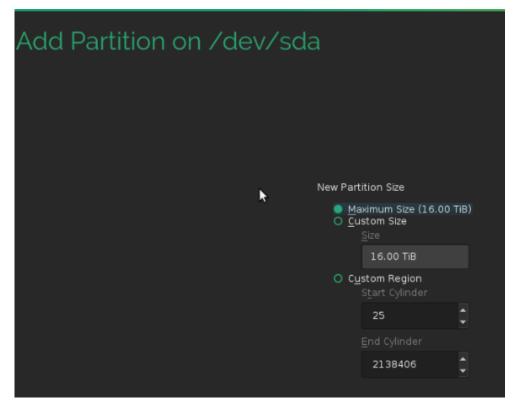
14. Click Finish. Then click Add to add another partition (Figure 45).

Figure 45. Expert Partitioner: Add another partition

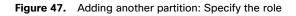
SUSE.										
Expert Partitioner										
<u>S</u> ystem View	/ Hard D	isk: /dev/	sda	a –						
		<u>O</u> verview			P	artitions				
sda						npartitioned 16.00 TiB				
Volume Management	Device	Size	F	Enc	Туре	FS Type	Label	Mount Point	Start	End
Device Mapper	/dev/sdal	196.11 MiB	F		🕞 Linux native	Ext3		/boot	0	24
nfs										
📕 Btrfs										
뻱 tmpfs										
Device Graph										
Mount Graph										
Settings										
• • • • • • • • • • • • • • • • • • •										
	A <u>d</u> d	<u>E</u> dit								
	Move	Res <u>i</u> ze.								
										E <u>x</u> pert… ▼

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

Figure 46. Adding another partition: Specify the partition size



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





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

Figure 48.	Adding anot	her partition	: Specify	formatting	and mounting	options
------------	-------------	---------------	-----------	------------	--------------	---------

Add Partition on /de	v/sda		
	ng Options rm <u>a</u> t partition File System	И	founting Options O Mount partition Mount Point
	XFS Options		
• <u></u> ם -	not format partition File system <u>I</u> D: 0x8E Linux LVM		Do not mount partition
	ncrypt Device		

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

ystem View – 🤷 linux – 🎦 Hard Disks	🧏 Hard I	D isk: /dev, Overview		P	artitions				
 sda RAID Volume Management Crypt Files Device Mapper NFS Btrfs tmpfs Unused Devices Device Graph Mount Graph Installation Summary Settings 		Size 196.11 MB 16.00 TB	F Er		sda2 16.00 TiB FS Type Ext3	Label	Mount Point /boot	Start 0 25	End 24 2138406
	A <u>d</u> d <u>M</u> ove								

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

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



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

		um	e Grou	p					
⊻olume Gr hanavg	oup Name								
Physical E	dent Size								
4 MiB									
Available F	hysical Vol	umes:				Selected F	physical	Volume	3S:
Device	Size	Enc	Туре			Device	Size	Enc	Туре
/dev/sda2	16.00 TiB		🕞 Linux LVM						
					<u>A</u> dd → 🍃				
					A <u>d</u> d All →				
					← Re <u>m</u> ove All				
Total size:	16.00 TiB					Resulting	size: 0 B		

Figure 52. Add Volume Group (continued)

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	Туре	
	<u>A</u> dd → A <u>d</u> d All → ← R <u>e</u> move ← Re <u>m</u> ove All	/dev/sda2 16.00 TiB	Linux LVM	
Total size: 0 B		Resulting size: 16.00 TiB		
				<u>F</u> inish

- 21. Click Finish.
- 22. Under Volume Management, click Add and select Logical Volume (Figure 53).



Expert Partitioner									
<u>S</u> ystem View	🔮 Volume	Manage	ment						
System View System View Hard Disks Sda1 Sda2 RAID Volume Management Crypt Files Device Mapper NFS Btrfs Unused Devices Device Graph Mount Graph Mount Graph Mount Graph Settings	Sevice Device (dev/hanevg	Size	ment F Enc	Type	FS Type	Label	Mount Point	Metadata LVM2	PE t
Help Release Notes	A <u>d</u> d Volume Gr Logical Vo		Res <u>i</u> z	e Dele <u>t</u> e]		Abo <u>r</u> t	<u>B</u> ack A	ccept

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

Figure 54. Adding a logical volume: Specify the name and type

Add Logical Volume on A	/dev/hanavg
	Name Logical Volume
	Type Normal Volume O Thin Pool O Thin Volume Used Pool

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

Figure 55. Adding a logical volume: Specify the size and stripe

Add Logical volume rootlv on /dev/hanavg
Size ○ <u>M</u> aximum Size (16.00 TiB) ● <u>C</u> ustom Size
Size
100 58
Stripes
N <u>u</u> mber Size

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

Figure 56. Adding a logical volume: Specify the role

Add Logical volume rootlv on /dev/hanavg
Role
 Operating System Data and ISV Applications Swap Raw Volume (unformatted)

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

Figure 57. Adding a logical volume: Specify formatting and mounting options

Add Logical volume roo	otlv on /de	ev/hanavg
Formattir	ng Options	Mounting Options
For	rm <u>a</u> t partition File <u>S</u> ystem Ext3 • Options	Mount partition Mount Point / Fstab Options
	not format partition	O Do not mo <u>u</u> nt partition

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).

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

Expert Partitioner								
<u>S</u> ystem View	🔮 Volume Mana	igement						
ystem view ✓ Signature ✓ Signature ✓ Signature ✓ Signature ✓ RAID ✓ Volume Management ✓ Crypt Files ✓ Device Mapper ✓ NFS ✓ Device Mapper ✓ NFS ✓ Device Graph Mount Graph Mount Graph ✓ Installation Summary ✓ Settings	Device /dev/hanavg /dev/hanavg/rootiv	Size 16.00 TiB	F Enc	Type LVM2 hanavg	FS Type Ext3	Label	Mount Point	Metadata LVM2
	Add Edit							
Help Release Notes	Volume Group Logical Volume							Accept

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

Figure 59. Adding another logical volume: Specify the name and type

Add Logical Volume on /	′dev/hanavg
	Name
	Logical Volume
	swapvol
	Туре
	 Normal Volume Thin Pool Thin Volume Used Pool

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

Figure 60. Adding another logical volume: Specify size and stripe information

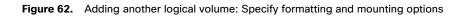
Size Maximum Size (15.90 TiB) Size Size Size 2 GiB	Add Logical volume sw	apvol on /dev/hanavg
O <u>M</u> aximum Size (15.90 TiB) ● <u>C</u> ustom Size <u>S</u> ize		•
Size		O Maximum Size (15.90 TiB)
		Size
Stripes Number Size		Number Size

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

Figure 61. Adding another logical volume: Specify the role

Add Logical volume swapvol on /dev/hanavg
Role
 Operating System Data and ISV Applications Swap Raw Volume (unformatted)

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



Add Logical volume sw	/apvol on /	/dev/hanavg
	ng Options rmat partition	Mounting Options
r.	File System Swap Options not format partition	Mount Point Mount Point Swap Fstab Options Do not mount partition
	ncrypt Device	

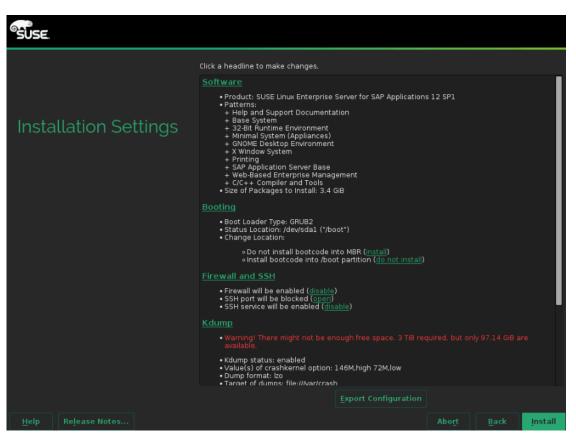
33. Click Finish. A summary page appears (Figure 63).

Expert Partitioner	🚔 Volume Manag	iomont						
ystem view ▼ Set linux	-							
👻 🤐 Hard Disks	Device	Size	Enc	Туре	FS Type	Label	Mount Point	Metada
▼ sda sdal	/dev/hanavg	16.00 TiB 100.00 GiB		볼 LVM2 hanavg 🕞 LV	Ext3			LVM2
sda2	/dev/hanavg/rootlv /dev/hanavg/swapvol				Swap		swap	
RAID	/det/manarg/smaptor	2100 015		0	onup		owap	
 Volume Management Crypt Files 								
Device Mapper								
NFS								
💻 Btrfs								
tmpfs								
🛃 Unused Devices								
Mount Granh								
Installation Summary								
Notes the settings								
							_	
	<u>Ad</u> d ▼ <u>E</u> dit.							
								<u>A</u> ccept

Figure 63. Expert Partitioner: Volume management summary page

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

Figure 64. Installation Settings: Default proposal



- 39. Now customize the software selection. Click the Software headline to make changes as shown in Figure 66:
 - a. Deselect Gnome Desktop Environment.
 - b. Select C/C++ Compiler and Tools.
 - c. Select SAP HANA Server Base.

........

SUSE			
Software Selection ar	nd System ⁻	Tasks	
Pattern .	SAP HANA Ser	ver Base	
GNOME Desktop Environment	Set up the server for in	staling SAP HANA systems.	
🗟 🔀 X Window System			
 Base Technologies 			
2 📥 Base System	× .		
E P AppArnor			
🗟 🚰 32-01 Runtime Environment			
XEN Virtualization Host and tools			
KVM Virtualization Host and tools			
😰 💼 Hinimal System (Appliances)			
📰 🚘 SAP Businesone Server Base			
🛷 🏪 SAP HANA Server Base			
SAP NetWeaver Server Base			
Development			
🖉 🌇 C/C++ Compiler and Tools			
Primary Functions	Name Disk Usage		
High Availability	50-0E 39%	107.0 MB 176.1 MB 93.6 GB 100.0 GB	
Details			
Help Rejease Notes			Back OK

Figure 65. 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).

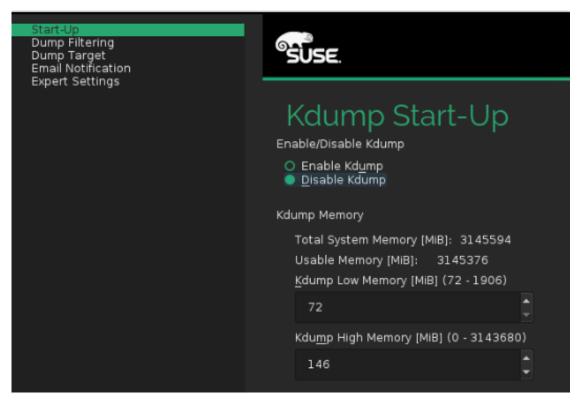
Figure 66. Firewall and SSH service customized



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

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Figure 67. Disabling Kdump



43. Click OK.

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

Figure 68. Setting the default systemd target to Text mode

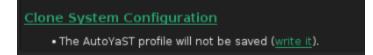
Set Default Systemd Target	
	Available Targets
	○ <u>G</u> raphical mode ■ <u>T</u> ext mode

45. Click OK.

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

Figure 69. Clone system configuration selection





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

SUSE	
	Click a headline to make changes.
Installation Settings	+ 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: 3.2 GiB
	Booting
	• Boot Loader Type: GRUB2 • Status Location: /dev/sda1 (*/boot*) • Change Location:
	∘Do not install bootcode into MBR (<u>install</u>) ∘Install bootcode into <i>f</i> boot partition (<u>do not install</u>)
	Firewall and SSH
	Firewall will be disabled (<u>enable</u>) SSH service will be enabled (<u>disable</u>)
	Kdump
	• Kdump status: disabled
	Default systemd target
	The installer is recommending you the default target 'Graphical mode' X11 packages have been selected for installation
	• Text mode
	<u>System</u>
	<u>System and Hardware Settings</u>
	Clone System Configuration
	The AutoYaST profile will be written under /root/autoinst.xml (<u>do not write it</u>).
	Export Configuration
Help Release Notes	Abo <u>r</u> t <u>B</u> ack <mark>Install</mark>

48. Click Install. Also select Install at subsequent Confirm Installation prompts. The installation starts, and you can monitor the status (Figures 73 and 74).

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Figure 72. Performing the installation

SUSE.						
	Media	Remaining	Packages	Time		
	Total	2.483 GiB	685	16:56		
	SLE-12-SP1-SAP-12.1-0 Medium 1	2.483 GiB	685	16:56		
Performing Installation						
	Actions performed					
	Actions performed: Installing supportutils-: Installing sg3 utils-1.41 Installing gs3 utils-1.41 Installing grocmail-3.22 Installing flex-2.5.37-6. Installing bison-2.7-6.1 Installing bison-2.7-6.1 Installing libtasn1-3.7-4 Installing libtasn1-3.7-4 Installing libtasn1-3.7-4 Installing vibtasn1-3.7-4 Installing vibtasn1-3.7-4 Inst	-32.x86_64.rpm -267.12.x86_64. 261.noarch.rpr 208.x86_64.rpm 07.x86_64.rpm (9-97.1.noarch.rp 1.x86_64.rpm (in 5.x86_64.rpm (in .52.x86_64.rpm (in .62.x86_64.rpm (in .62.x86_64.rpm (in	n' (installed si rpm (installed si (installed size installed size installed size installed size nstalled size 1 pm (installed stalled size 1 (installed size 4.rpm (installed size	ze 1.82 MiB d size 282.3 ize 338.3 KiB e 789.3 KiB 1.67 MiB) size 2.19 Mi 120.5 KiB) size 6.18 M size 397.2 f 951.8 KiB) size 397.2 f 95 MiB) e 2.59 MiB) ed size 1.1) 3 KIB) B) (IB) (IB)	
	Installing tcsh-6.18.01-	7.4.x86_64.rpm ((installed size	518 KiB)		
			1009	6		
	Installing Packages (F	lemaining: 2.483	3 GiB / 16:56, 27%		iges)	
Help						<u>N</u> ext

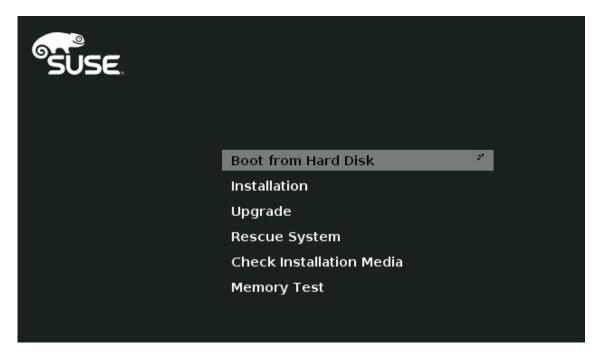
iliili cisco

Ø						
[©] SUSE.						
		Slide Sho <u>w</u>		<u>D</u> etails		<u>s</u> les R₁ ∢ →
Per 💡 Inst	The system will reb	oot now				
Inst						
		2				
		<u>о</u> к				
		Preparing system for init	ial boot			
				100%		
]	
Help				Abo <u>r</u> t	Back	<u>N</u> ext

Figure 73. Performing the installation: Reboot alert when installation is complete

The system will reboot and boot from disk on startup (Figure 75).

Figure 74. Booting from hard disk



The system then displays the login prompt (Figure 76).

Figure 75. Login prompt



49. Use the KVM console to log in to the installed system as the user root with the password <<var_sys_root-pw>> (Figure 77).

Figure 76. Login using root



50. Configure the host name and disable IPv6 (Figure 78):

#yast2

Figure 77. YaST Control Center: Network Settings

YaST2 – menu 🛛 linux-wh5e	
	YaST Control Center
Software System Hardware Network Services Security and Users Virtualization Support Hiscellaneous	<pre>>etc/sysconfig Editor Boot Loader Date and Time Rernel Kdump Language Network Settings Partitioner Services Manager</pre>

51. Choose System > Network Settings and press Alt+S to select the Hostname/DNS tab (Figure 79).

Figure 78. YaST Control Center: Hostname/DNS

AST2 - Ian @ linux-wh5e Network Settings FGlobal Options—Overview—Hostname>DNS—Routing— Hostname and Donain Name— Hostname cishama01 [x] Change Hostname via DHCPNo interface with dhcp [] Assign Hostname to Loopback IP	Dona in Name custdon.local
Modify DNS Configuration Custom Policy Rule Use Default Policy 4 Mame Servers and Domain Search List	
Name Server 1	Domain Search
Name Server 2	
Name Server 3	

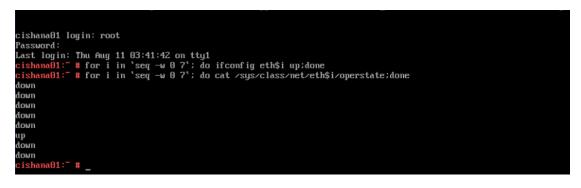
- 52. Enter <<var_hostname.domain>>. Also enter the Domain Name System (DNS) server address of your network for resolution, if necessary. Then press Alt+O.
- 53. On the Global Options tab, using Alt+G, disable IPv6 by deselecting the Enable IPv6 option as shown in Figure 80. Note that changing the IPv6 setting requires a reboot to make the change take effect.

Figure 79. YaST: IPv6 setting

work Settin	
≜	s—Overview—Hostname/DNS—Routing- work Settings—
Network Set	
Wicked Serv	
wiched offv	
IPu6 Protoc	ol Settings
	ol Settings
IPv6 Protoc [] Dnable	
[] Enable	IPv6
	IPv6 Options
[] Enable DHCP Client	IPv6 Options
[] Enable DHCP Client	IPv6 Options Identifier

- 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 81.

Figure 80. Network interface configuration



- 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'
```

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 82.

Figure 81. Verifying /etc/hosts

cishana01:~ # : *	more /etc/hosts
<pre># hosts # # # # # # # # Syntax: #</pre>	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.
# IP-Address #	Full-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
173.36.215.118 cishana01:~ #	cishana01.custdom.local cishana01

61. Set up a proxy service so that the appliance can reach the Internet (Figure 83):

#yast2

Figure 82. YaST: Proxy configuration

	YaST Control Center
Software	Authentication Client
System	Authentication Server
Hardware	DHCP Server
Network Services	DNS Server
Security and Users	FTP Server
Virtualization	HTTP Server
Support	Hostnames
Miscellaneous	Mail Server
	NFS Client
	NFS Server
	NIS Client
	NIS Server
	NTP Configuration
	Network Services (xinetd)
	OpenLDAP MirrorMode
	Proxy
	Remote Administration (VNC)
	Samba Server
	Squid
	TFTP Server
	Wake-on-LAN
	Windows Domain Membership
	iSCSI Initiator
	iSNS Server

62. Enter the proxy server and port as shown in the sample configuration in Figure 84. Select OK and then quit YaST to save the configuration.

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Figure 83. YaST: Proxy configuration (continued)

YaST2 -	proxy @ cishana01		
D			
Proxy (Configuration		
[]	K] Enable Proxy		
г	Proxy Settings		-
	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	
L			
	[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 this SAP HANA note: 2205917 - SAP HANA DB: Recommended OS settings for SLES 12 / SLES for SAP Applications 12.

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).

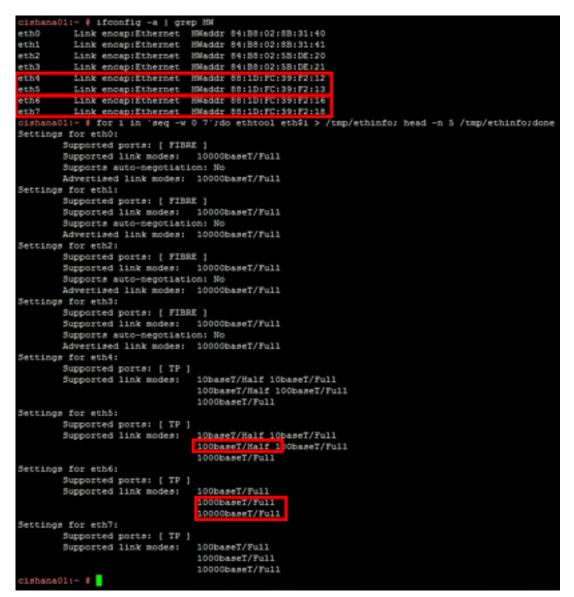
Therefore, for high availability, eth0 and eth2 form one possible slave pair for creating a 10-Gbps bond device.

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 easier wizard like approach for creation of bond devices. For ease of implementation, this section provides steps manual configuration.

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



- 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=''
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:

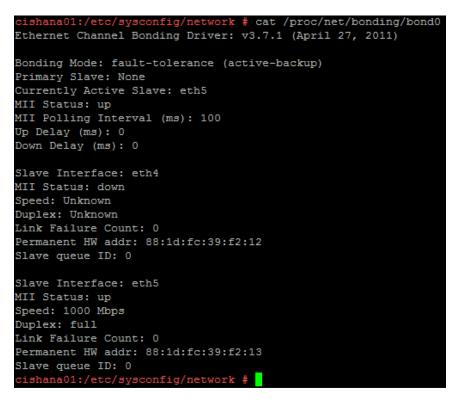
rcnetwork restart

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

cat /proc/net/bonding/bond0

Figure 86 shows sample output.

Figure 85. Sample bond0 configuration test output



- 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=''
MTU=''
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 87 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.

1. Use the following command to check for the available physical volume (PV), as shown in Figure 88:

#pvdisplay

Figure 87. Checking for the physical volume

[root@cishana01 ~]# Physical volum	
PV Name	/dev/sda2
VG Name	hanavg
PV Size	16.00 TiB / not usable 0
Allocatable	уез
PE Size	4.00 MiB
Total PE	4193418
Free PE	4167306
Allocated PE	26112
PV UUID	zvb8AK-Dyf8-fkyU-Xznt-1XHx-RgmZ-9q6qI6

 Use the following command to check for the available volume group (VG) hanavg (Figure 89): #vgdisplay Figure 88. Checking for the volume group

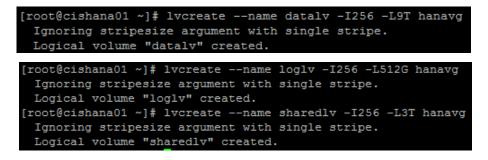
[root@cishana01 ~]# vgd	isplay
Volume group	
VG Name	hanavg
System ID	
Format	lvm2
Metadata Areas	1
Metadata Sequence No	3
VG Access	read/write
VG Status	resizable
MAX LV	0
Cur LV	2
Open LV	2
Max PV	0
Cur PV	1
Act PV	1
VG Size	16.00 TiB
PE Size	4.00 MiB
Total PE	4193418
Alloc PE / Size	26112 / 102.00 GiB
Free PE / Size	4167306 / 15.90 TiB
VG UUID	4sIS1V-tpWq-cSse-qjaY-0V1V-0dFu-38jYrV

3. Create logical volumes (LVs) for the data, log, and HANA shared file systems (Figure 90):

lvcreate -name <<lvname>> -I<<stripesize>> -L<<volume-size>> <<pre>rame>>

- # lvcreate --name datalv -I256 -L9T hanavg
- # lvcreate --name loglv -I256 -L512G hanavg
- # lvcreate --name sharedlv -I256 -L3T hanavg

Figure 89. Creating logical volumes



4. Create file systems in the data, log and HANA shared volumes (Figure 91):

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

Figure 90. Creating file systems

[root@cishana01 ~]# mkfs.xfs -f /dev/hanavg/datalv						
meta-dat	<pre>meta-data=/dev/hanavg/datalv isize=256 agcount=9, agsize=268435455 blks</pre>					
	=	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	<pre>sunit=0 blks, lazy-count=1</pre>			
realtime	=none	extsz=4096	blocks=0, rtextents=0			
[root@ci	shana01 ~]# mkfs.xfs -f	/dev/hanavg/l	oglv			
meta-dat	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	<pre>sunit=0 blks, lazy-count=1</pre>			
realtime	=none	extsz=4096	blocks=0, rtextents=0			
[root@ci	shana01 ~]# mkfs.xfs -f	/dev/hanavg/s	haredlv			
meta-dat	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	<pre>blocks=0, rtextents=0</pre>			

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-rootlv	/	ext3	defaults	1 1	
UUID=fc2e52c4-e6f6-4e9a-9ad 1 2	1-86aeb3369942	/boot		ext3 default	s
/dev/mapper/hanavg-swapvol	swap	swap	defaults	0 0	
/dev/hanavg/datalv	/hana/data				
xfs nobarrier, noatime, nod	iratime,logbufs=8,lo	ogbsize=256k,async	,swalloc,all	locsize=131072k	12
/dev/hanavg/loglv nobarrier,noatime,nodiratim	/hana/log e,logbufs=8,logbsiz	xfs e=256k,async,swall	oc,allocsize	e=131072k	1 2
/dev/hanavg/sharedlv /h	ana/shared xfs	defaults 1 2			

- Use the following command to mount the file systems:
 #mount -a
- 8. Use the df -h command to check the status of all mounted volumes (Figure 92).

Figure 91. Checking the status of mounted volumes

[root@cishana01 ~]#	df -h				
Filesystem	Size	Used	Avail	Use∛	Mounted on
/dev/mapper/hanavg-1	cootlv				
	99G	882M	93G	1%	/
/dev/sda1	485M	47M	414M	11%	/boot
tmpfs	1.5T	0	1.5T	0%	/dev/shm
/dev/mapper/hanavg-o	latalv				
	9.0T	33M	9.0T	1%	/hana/data
/dev/mapper/hanavg-l	Loglv				
	512G	33M	512G	1%	/hana/log
/dev/mapper/hanavg-sharedlv					
	3.0T	33M	3.OT	1%	/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 SAP HANA Server Installation Guide.

All other SAP installation and administration documentation is available at <u>http://service.sap.com/instguides</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>https://service.sap.com/notes</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
- SAP Note 1780950: Connection problems due to host name resolution
- SAP Note 1755396: Released disaster tolerant (DT) solutions for SAP HANA with disk replication
- SAP Note 1890444: HANA system slow due to CPU power save mode
- SAP Note 1681092: Support for multiple SAP HANA databases on a single SAP HANA appliance

- SAP Note 1514966: SAP HANA: Sizing the SAP HANA database
- SAP Note 1637145: SAP BW on HANA: Sizing the SAP HANA database
- <u>SAP Note 1793345</u>: Sizing for Suite on HANA

Linux notes

- SAP Note 2205917: SAP HANA DB: Recommended OS settings for SLES 12 and SLES for SAP Applications 12
- SAP Note 2235581: SAP HANA: Supported operating systems
- <u>SAP Note 1944799</u>: SAP HANA guidelines for the SLES operating system
- SAP Note 1731000: Nonrecommended configuration changes
- <u>SAP Note 1557506</u>: Linux paging improvements
- SAP Note 1726839: SAP HANA database: Potential crash when using XFS file system
- SAP Note 1740136: SAP HANA: Wrong mount option may lead to corrupt persistency
- SAP Note 1829651: Time-zone settings in SAP HANA scale-out landscapes

Third-party software notes

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

SAP HANA virtualization notes

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

Performing an SAP HANA post-installation checkup

For an SAP HANA system installed with <SID> set to SKL and the system number <nr> set to 00, log in as <sid>adm 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
19.05.2016 11:29:27
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GREEN, Running, 2016 04 13 08:51:49, 866:37:38, 41691
hdbcompileserver, HDB Compileserver, GREEN, Running, 2016 04 13 08:51:56, 866:37:31, 41837
hdbindexserver, HDB Indexserver, GREEN, Running, 2016 04 13 08:52:00, 866:37:27, 41863
hdbnameserver, HDB Nameserver, GREEN, Running, 2016 04 13 08:51:50, 866:37:37, 41711
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2016 04 13 08:51:56, 866:37:31, 41839
hdbwebdispatcher, HDB Web Dispatcher, GREEN, Running, 2016 04 13 08:53:11, 866:36:16, 42431
hdbxsengine, HDB XSEngine, GREEN, Running, 2016 04 13 08:52:00, 866:37:27, 41865
bwladm@cishana01-bwl:/usr/sap/BWL/HDB00>
```

Commands for checking SAP HANA database (HDB) information

bwladm@cisha	na01:/usr/s	ap/BWL/HDB00> HDB	info
USER	PID PPID	%CPU VSZ RSS	COMMAND
bwladm 59	578 59577	0.0 108472 1944	-sh
bwladm 59	663 59578	0.0 114080 2020	_ /bin/sh /usr/sap/BWL/HDB00/HDB info
			_ ps fx -U bwladm -o
user,pid,ppi	d,pcpu,vsz,	rss,args	
		0.0 22188 1640 file/BWL_HDB00_ci	
			8 _ /usr/sap/BWL/HDB00/cishana01- r/sap/BWL/HDB00/cishana01-bwl/daemon.ini
bwladm 41	711 41691	0.3 54292416 205	8900 _ hdbnameserver
bwladm 41	837 41691	0.1 4278472 1243	356 _ hdbcompileserver
bwladm 41	839 41691	0.2 11773976 826	2724 _ hdbpreprocessor
bwladm 41	863 41691	6.2 22143172 181	84604 _ hdbindexserver
bwladm 41	865 41691	0.5 8802064 2446	612 _ hdbxsengine
bwladm 42	431 41691	0.1 4352988 8232	20 _ hdbwebdispatcher
			/usr/sap/BWL/HDB00/exe/sapstartsrv shana01-bwl -D -u bwladm
bwladm@cisha	na01-bwl:/u	sr/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

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 or 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 and kernel

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).
 - Unmount /hana/log and clean /etc/fstab.
- Update the kernel using YaST (or a manual procedure).
- Perform these tasks after updating the kernel:
 - Check the GRUB file and boot sector (menu.lst).
 - Reboot and check /etc/fstab.

The following steps present the tasks in more detail.

- 1. Back up the SAP HANA log area.
 - a. Stop SAP HANA. Then move to the log area and back up the HANA log partition.

```
cishana01 :~ # cd /hana/log
cishana01 :/hana/log # find . -xdev | cpio -oav > /backup/hana.log.cpio
```

- b. If the backup partition has enough room, choose it. Otherwise, choose an appropriate location for the backup.
- 2. Unmount /hana/log.

```
cishana01 :~ #umount /hana/log
```

Updating SUSE and the kernel online

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

Option 1: Using YaST

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

1. 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>"
```

- 2. Start YaST and choose Software > Online Update.
 - a. Select Yes to configure the update repository (Figure 93).

Figure 92. YaST: Online update

YaST2 - online_u	update @ cishana01				
Initializing O	nline Update				
<pre>x Initialize the target system x Refresh software repositories => Check for available updates</pre>					
		configuration workflow now?			
Checking for a	vailable updates	100%			
[Help]	[Back]	[Abort]	[Next]		

b. Log in with the Novel account you used for licensing to register the server (Figure 94). Then click Next.

Figure 93. YaST online update: Registration

YaST2 - online_update	@ cishana01					
Registration		[Network C	Configuration]			
SUSE Linux Enterprise Server for SAP Applications 12 SP1 Please enter a registration or evaluation code for this product and your User Name/E-mail address from the SUSE Customer Center in the fields below. Access to security and general software updates is only possible on						
a registered system	E-mail Addre Registration					
		stration Server] Registration]				
[Help]	[Back]	[Abort]	[Next]			

c. An overview of the available extension and modules is displayed (Figure 95). Click Next.

Figure 94. YaST online update: Extension and Module Selection

YaST2 - online_update @ cish	uana01		
Extension and Module Selecti	lon		
Available Extensions and Mod	iules		
<pre>[] SUSE Enterprise Storage [] SUSE Enterprise Storage [] SUSE Linux Enterprise Hi [] SUSE Linux Enterprise Hi [] SUSE Linux Enterprise Wo [] SUSE Linux Enterprise So [] Advanced Systems Managem [] Certifications Module 12 [] Containers Module 12 x86</pre>	3 x86_6 .gh Availability GEO E .ve Patching 12 x86_6 prkstation Extension 1 oftware Development Ki ment Module 12 x86_6 2 x86_6	Extension 12 S[] Public C L2 SP1 x86_6 [] Toolchain it 12 SP1 x86_	
Details SUSE Linux Enterprise Works Enterprise Server with pack applications (office suite, to combine both products to	ages of SUSE Linux Er email client, graphi	nterprise Desktop, like add ical editor) and libra:	ditional desktop
[Help]	[Back]	[Abort]	[Next]

d. A list of the available patches form the online repository is displayed (Figure 96). Click Accept.

cisco

Figure 95. YaST online update: Patches list

	[Actionsâ]	[Viewâ]	[Dependenciesâ]	
Name		Kind	Summary	
SUSE-SLE	-HA-12-SP1-2016-1010	recommended	Recommended update for libdlm	
SUSE-SLE	-HA-12-SP1-2016-102	recommended	Recommended update for sle-ha-manuals_	
SUSE-SLE	-HA-12-SP1-2016-1049	recommended	Recommended update for crmsh	
SUSE-SLE	-HA-12-SP1-2016-1052	recommended	Recommended update for libdlm	
SUSE-SLE	-HA-12-SP1-2016-1121	recommended	Recommended update for pssh	
SUSE-SLE	-HA-12-SP1-2016-1142	security	Security update for hawk2	
SUSE-SLE	-HA-12-SP1-2016-1158	recommended	Recommended update for resource-agents	
SUSE-SLE	-HA-12-SP1-2016-1204	recommended	Recommended update for crmsh	
SUSE-SLE	-HA-12-SP1-2016-284	recommended	Recommended update for fence-agents	
SUSE-SLE	-HA-12-SP1-2016-312	recommended	Recommended update for yast2-drbd	
SUSE-SLE	-HA-12-SP1-2016-360	recommended	Recommended update for hawk2 and yast2	
SUSE-SLE	-HA-12-SP1-2016-365	recommended	Recommended update for crmsh	
SUSE-SLE	-HA-12-SP1-2016-390	optional	Initial release of aws-vpc-move-ip	
ilter: Online	Update Patches		Total Download Size: 18.5 MB	
Patch: SUSE-SLE-HA-12-SP1-2016-1010 Kind: recommended Version: 1 This update for libdlm to version 4.0.4 includes the following				
This update fo	r libdlm to version 4.0	0.4 includes th		
	r libdlm to version 4.0	0.4 includes th		
This update fo changes:		0.4 includes th		
This update fo changes: - Don't SIGKIL	L dlm_controld			
This update fo changes: - Don't SIGKIL - Make systemd	L dlm_controld stop dlm on corosync i	restart		
This update fo changes: - Don't SIGKIL - Make systemd - dlm_controld	L dlm_controld stop dlm on corosync : don't log error from	restart cpg_dispatch	ne following	
This update fo changes: - Don't SIGKIL - Make systemd - dlm_controld - Fix rejectio	L dlm_controld stop dlm on corosync : don't log error from n of valid connections	restart cpg_dispatch in dlm_contro:	ne following	
This update fo changes: - Don't SIGKIL - Make systemd - dlm_controld - Fix rejectio - Make fail_ti	L dlm_controld stop dlm on corosync : don't log error from	restart cpg_dispatch in dlm_contro pnal	he following Id	
This update fo changes: - Don't SIGKIL - Make systemd - dlm_controld - Fix rejectio - Make fail_ti	L dlm_controld stop dlm on corosync i don't log error from n of valid connections me in dlm_stonith optic tion fault during state	restart cpg_dispatch in dlm_contro pnal	he following Id	
This update fo changes: - Don't SIGKII - Make systemd dlm_controld - Fix rejectio - Make fail_ti - Fix segmenta - Add dlm_ston	L dlm_controld stop dlm on corosync i don't log error from n of valid connections me in dlm_stonith optic tion fault during state	restart cpg_dispatch in dlm_contro: onal is printing in	he following Id libdlmcontrol	

The system will download all available patches (Figures 97 and 98).

Figure 96. YaST online update: Package update

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

	erâ] [Actionsâ]	[Viewâ]	[Dependenciesâ]		
	Name	Kind	Summary		
a+	SUSE-SLE-HA-12-SP1-2016-1010	recommended	Recommended update for libdlm		
a+	SUSE-SLE-HA-12-SP1-2016-1049	recommended	Recommended update for crmsh		
a+	SUSE-SLE-HA-12-SP1-2016-1052	recommended	Recommended update for libdlm		
a+	SUSE-SLE-HA-12-SP1-2016-1158	recommended	Recommended update for resource-agent;		
a+	SUSE-SLE-HA-12-SP1-2016-1204	recommended	Recommended update for crmsh		
a+	SUSE-SLE-HA-12-SP1-2016-284	recommended	Recommended update for fence-agents		
a+	SUSE-SLE-HA-12-SP1-2016-365	recommended	Recommended update for crmsh		
a+	SUSE-SLE-HA-12-SP1-2016-423	recommended	Recommended update for resource-agent		
a+	SUSE-SLE-HA-12-SP1-2016-595	recommended	Recommended update for pacemaker		
a+	SUSE-SLE-HA-12-SP1-2016-681	recommended	Recommended update for sbd		
a+	SUSE-SLE-HA-12-SP1-2016-758	recommended	Recommended update for resource-agent		
a+	SUSE-SLE-HA-12-SP1-2016-799	recommended	Recommended update for crmsh		
a+	SUSE-SLE-HA-12-SP1-2016-954		Recommended update for python-dateuti		
atch	1: SUSE-SLE-HA-12-SP1-2016-1010 H	Kind: recomment	ded Version: 1		
This update for libdlm to version 4.0.4 includes the following changes:					
- Don't SIGKILL dlm controld					
- Don't Sigkill dim_controid - Make systemd stop dlm on corosync restart					
	a controld: don't log error from				
Mal	 - dlm_controld: don't log error from cpg_dispatch - Fix rejection of valid connections in dlm controld 				
Ma) dlr	rejection of valid connections	-			
Ma) dlr Fix	-	-			
Ma) dlr Fix Ma)	e fail_time in dlm_stonith option	onal -	libdlmcontrol		
Ma) dlr Fix Ma) Fix	ce fail_time in dlm_stonith optic c segmentation fault during statu	onal -	libdlmcontrol		
Ma) dlr Fix Ma) Fix Ado	e fail_time in dlm_stonith option	onal us printing in			

e. Some patches may require a reboot after installation. Select Continue (Figure 99).

Figure 98. YaST online update: Package update

[Filter	â] [Actionsâ]	[Viewâ]	[Dependenciesâ]	
	Name	Kind	Summary	
a+	SUSE-SLE-HA-12-SP1-2016-1010	recommended	Recommended update for libdlm	
a+	SUSE-SLE-HA-12-SP1-2016-1049	recommended	Recommended update for crmsh	
a+	SUSE-SLE-HA-12-SP1-2016-1052	recommended	Recommended update for libdlm	
a+	SUSE-SLE-HA-12-SP1-2016-1158	recommended	Recommended update for resource-agents	
a+	SUSE-SLE-HA-12-SP1-2016-1204	recommended	Recommended update for crmsh	
a+	SUSE-SLE-HA-12-SP1-2016-284	recommended	Recommended update for fence-agents	
a+	SUSE-SLE-HA-12-SP1-2016-365	recommended	Recommended update for crmsh	
a+	SUSE-SLE-HA-12-SP1-2016-423	recommended	Recommended update for resource-agents	
a+			r	
a+	These patches will	need rebootin	g after installation	
a+	SUSE-SLE-SERVER-12-SP1-2016		agents	
a+ Kernel teutil SUSE-SLE-SERVER-12-SP1-2016-1004: Security update for the Linux GB Filter: Kernel GB Patch: Kernel GB				
ilter:	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016		ty update for the Linux GB	
filter:	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel		ty update for the Linux GB	
Patch: This u chan - Don'	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel [Contin	5-600: Securit nue] [Back] [S	ty update for the Linux gupdate for the Linux	
Patch: This u chan - Don' - Make	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel [Contin t systemd stop dlm on corosync r	-600: Securit nue] [Back] [S cestart	ty update for the Linux gupdate for the Linux	
Patch: This u chan - Don' - Make - dlm_	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel [Contin t systemd stop dlm on corosync r controld: don't log error from	-600: Securit ue] [Back] [S cestart cpg_dispatch	ty update for the Linux gupdate for the Linux kip All]	
Filter: Patch: This u chan - Don' - Make - dlm_ - Fix	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel [Contin t systemd stop dlm on corosync r controld: don't log error from rejection of valid connections	-600: Securit ue] [Back] [S cestart cpg_dispatch in dlm_contro	ty update for the Linux g update for the Linux kip All]	
ilter: Patch: This u char - Don' - Make - dlm_ - Fix - Make	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel [Contin t systemd stop dlm on corosync r controld: don't log error from rejection of valid connections fail_time in dlm_stonith optic	-600: Securit ue] [Back] [S cestart cpg_dispatch in dlm_contro onal	ty update for the Linux y update for the Linux kip All]	
Filter: Patch: This u chan - Don' - Make - dlm_ - Fix - Make - Fix	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel t systemd stop dlm on corosync r controld: don't log error from rejection of valid connections fail_time in dlm_stonith optic segmentation fault during statu	-600: Securit ue] [Back] [S cestart cpg_dispatch in dlm_contro onal	ty update for the Linux y update for the Linux kip All]	
Filter: Patch: This u char - Don' - Make - dlm - Fix - Make - Fix - Add	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel t systemd stop dlm on corosync r controld: don't log error from rejection of valid connections fail_time in dlm_stonith optic segmentation fault during statu dlm_stonith man page	estart [Back] [Back] [S estart cpg_dispatch in dlm_contro onal is printing in	ty update for the Linux y update for the Linux kip All] ld libdlmcontrol	
Patch: This u chan - Don' - Make - dlm - Fix - Fix - Fix - Add - Outp	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel controld: don't log error from rejection of valid connections fail_time in dlm_stonith optic segmentation fault during statu dlm_stonith man page out of dlm_tool ls should distin	estart [Back] [Back] [S estart cpg_dispatch in dlm_contro onal is printing in	ty update for the Linux y update for the Linux kip All] ld libdlmcontrol	
Patch: This u chan - Don' - Make - dlm - Fix - Fix - Fix - Add - Outp	SUSE-SLE-SERVER-12-SP1-2016 Kernel SUSE-SLE-SERVER-12-SP1-2016 Kernel t systemd stop dlm on corosync r controld: don't log error from rejection of valid connections fail_time in dlm_stonith optic segmentation fault during statu dlm_stonith man page	estart [Back] [Back] [S estart cpg_dispatch in dlm_contro onal is printing in	ty update for the Linux y update for the Linux kip All] ld libdlmcontrol	

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

Figure 99. YaST online update: Package update progress

YaST2 - online update @ cishana01		
Patch Download and Installation		
FProgress Log		
Retrieving python-dateutilOK		
Retrieving crmsh-scriptsOK		
Retrieving glibcOK		
Retrieving glibc-i18ndataOK		
Retrieving insserv-compatOK		
Retrieving kernel-macrosOK		
Retrieving man-pagesOK		
Retrieving nfs-docOK		
Retrieving python-enum34OK		
Retrieving python-requestsOK		
Retrieving release-notes-slesOK		
Retrieving sles-admin_en-pdfOK		
Retrieving sles-deployment_en-pdfOK		
Retrieving sles-installquick_en-pdf(OK	
Retrieving sles-manuals_en		
Package Download Progress		
	65%	
Total Progress		
	1%	
C Deck 1	[2]	(Risish)
[Help] [Back]	[Abort]	[Finish]

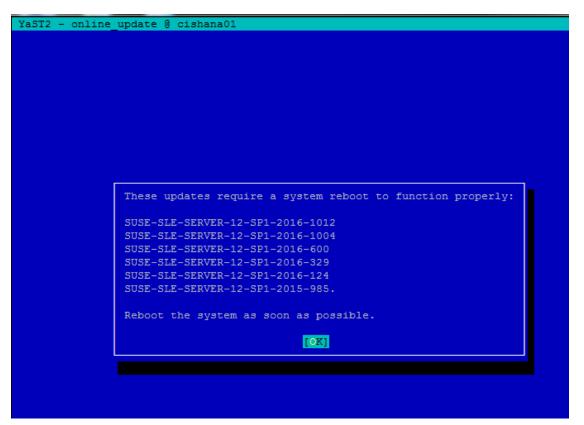
f. When the packages have been updated, the release notes are displayed (Figure 101). Select Close.

Figure 100. YaST online update: Release Notes

YaST2 - online_update @ cishana01			
Release Notes			
Language			
English (US) ² a			
Release Notes			
12.1.20160801			
Abstract			
This document provides guidance and an overview to high level general features and updates for SUSE Linux Enterprise Server 12 SP1. Besides architecture or product-specific information, it also describes the capabilities and limitations of SLES 12 SP1. General documentation may be found at: http:// www.suse.com/documentation/sles-12/.			
Table of Contents			
1. SUSE Linux Enterprise Server			
 1.1. What's New? 1.2. Documentation and Other Information 1.3. How to Obtain Source Code 1.4. Support Statement for SUSE Linux Enterprise Server 1.5. Derived and Related Products 1.6. Security, Standards, and Certification 			
2. Installation and Upgrade			
[Help] [Back] [Abort] [Close			

g. Click OK to acknowledge the reboot prompt (Figure 102).





h. Quit YaST.

i. Reboot the system to make the patch installation 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
19.07.2016 14:54:45
GetProcessList
OK
name, description, dispstatus, textstatus, starttime, elapsedtime, pid
hdbdaemon, HDB Daemon, GREEN, Running, 2016 07 15 11:57:45, 98:57:00, 8545
hdbnameserver, HDB Nameserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11579
hdbpreprocessor, HDB Preprocessor, GREEN, Running, 2013 08 15 12:05:27, 98:49:18, 11580
hdbindexserver, HDB Indexserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11581
hdbstatisticsserver, HDB Statisticsserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11582
hdbxsengine, HDB XSEngine, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11583
sapwebdisp_hdb, SAP WebDispatcher, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11584
hdbcompileserver, HDB Compileserver, GREEN, Running, 2016 07 15 12:05:27, 98:49:18, 11584
```

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
19.07.2016 15:03:12
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus
cishana01, 0, 50013, 0, 0.3, HDB, GREEN
```

HDB info

Another important tool is the **HDB** command, which needs to be issued by the <SID>adm user: the OS user who owns the 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
                                 RSS COMMAND
         PID PPID %CPU
                           VSZ
USER
        61208 61207 1.6 13840 2696 -sh
hanadm
hanadm
       61293 61208 0.0 11484 1632 \_ /bin/sh /usr/sap/HAN/HDB00/HDB info
hanadm 61316 61293 0.0 4904
                                 872
                                      \ ps fx -U hanadm -o
user,pid,ppid,pcpu,vsz,rss,args
hanadm
       8532
                  1 0.0 20048 1468 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
hanadm 11580 8545 1.5 5675392 371984
                                            \ hdbpreprocessor
hanadm
       11581 8545 10.9 18908436 6632128
                                              \ hdbindexserver
       11582 8545 8.7 17928872 3833184
                                              \ hdbstatisticsserver
hanadm
hanadm 11583 8545 7.4 17946280 1872380
                                              \ hdbxsengine
       11584 8545 0.0 203396 16000
                                          \ sapwebdisp hdb
hanadm
pf=/usr/sap/HAN/HDB00/cishana01/wdisp/sapwebdisp.pfl -f /usr/sap/H
                                            \ hdbcompileserver
hanadm 11585 8545 1.5 15941688 475708
hanadm
         8368
                  1 0.0 216268 75072 /usr/sap/HAN/HDB00/exe/sapstartsrv
pf=/hana/shared/HAN/profile/HAN HDB00 cishana01 -D -u
```

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

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
19.07.2016 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
19.07.2016 15:05:58
GetSystemInstanceList
OK
hostname, instanceNr, httpPort, httpsPort, startPriority, features, dispstatus
cishana01, 0, 50013, 0, 0.3, HDB, YELLOW
Wait for the status to be GRAY.
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList
19.07.2016 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
19.07.2016 15:08:48
StartSystem
OK
```

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

```
cishana01:~ # /usr/sap/hostctrl/exe/sapcontrol -nr 00 -function GetSystemInstanceList
19.07.2016 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 19.07.2016 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
19.07.2016 19:11:20
Start
OK
```

Downloading revisions

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

Refer to http://help.sap.com/hana/SAP_HANA_Master_Update_Guide_en.pdf for update procedures for SAP HANA.

For more information

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

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

Appendix: Solution variables used in this document

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

Table 14. Solution variables used in this documen

Variable	Description	Value used in the lab for this document
< <var_cimc_ip_address>></var_cimc_ip_address>	Cisco UCS C480 M5 server's IMC IP address	173.36.215.117
< <var_cimc_ip_netmask>></var_cimc_ip_netmask>	Cisco UCS C480 M5 server's IMC network netmask	255.255.255.0
< <var_cimc_gateway_ip>></var_cimc_gateway_ip>	Cisco UCS C480 M5 server's IMC network gateway IP address	173.36.215.1
< <var_raid50_vd_name>></var_raid50_vd_name>	Name for virtual drive VD0 during RAID configuration	ucs_hana
< <var_hostname.domain>></var_hostname.domain>	SAP HANA node FQDN	cishana01.custdom.local
< <var_sys_root-pw>></var_sys_root-pw>	SAP HANA node's root password	Saphana1!
< <var_lvm_vg_name>></var_lvm_vg_name>	SAP HANA node's OS LVM volume group name	hanavg
< <var_mgmt_ip_address>></var_mgmt_ip_address>	SAP HANA node's management and administration IP address	173.36.215.118
< <var_mgmt_nw_netmask>></var_mgmt_nw_netmask>	SAP HANA node's management network netmask	255.255.255.0
< <var_mgmt_gateway_ip>></var_mgmt_gateway_ip>	Cisco UCS C480 M5 server's management and administration network gateway IP address	173.36.215.1
< <var_mgmt_netmask_prefix>></var_mgmt_netmask_prefix>	Netmask prefix in CIDR notation	24

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