Cisco HyperFlex Node - HCI Solution for SAP HANA

January 2019
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Solution overview

This section defines a high-level view of the certified Hyperconverged Infrastructure for SAP HANA using the Cisco HyperFlex™ solution.

SAP landscapes frequently are deployed in virtualization environments. In recent years, SAP has been encouraging its customers to migrate to SAP’s own database platform of the future: SAP HANA. In the past, SAP HANA databases were deployable on virtual servers or on physical machines, and now they are allowed and certified to run under a hyperconverged infrastructure.

With the launch of the Cisco HyperFlex system, Cisco offers a low-cost, easy-to-deploy, high-performance hyperconverged virtual server platform that is an excellent solution for both SAP HANA databases and SAP landscapes. You can use this Cisco HyperFlex solution to deploy SAP application servers, fully virtualized SAP HANA servers, and other non-HANA virtual servers on the same hyperconverged infrastructure.

Document purpose

This document describes deployment of a single Production SAP HANA virtual machine on a single node of the Cisco HyperFlex 3.x all-flash cluster with SuSE Linux Enterprise Server for SAP 12 SP3 as the operating system. This document uses a 4 node Hyperflex cluster as an example and so the cluster can have 4 Production SAP HANA virtual machines.

Red hat Enterprise Linux for SAP Applications also can be installed but not covered in this document.

This document does not cover the installation and configuration of the Cisco HyperFlex Data Platform; it is covered in the section “Installing Cisco HyperFlex”. The sections about the Cisco HyperFlex node are for informational purposes only.

Solution benefits

The Cisco HyperFlex for SAP HANA solution offers you the following benefits:

- **Single hardware platform:** The Cisco Unified Computing System™ (Cisco UCS®) is the base platform for Cisco HyperFlex systems, which provide a fully contained hyperconverged environment, combining networking, storage, and virtualization resources in a single system. You can deploy additional Cisco UCS servers alongside the Cisco HyperFlex solution in the same Cisco UCS domain to service other workloads.

- **Simplified management:** A single administrator can manage all aspects of Cisco UCS and the Cisco HyperFlex system through Cisco UCS Manager and the VMware vCenter Web Client, making tasks much easier and faster to complete.

- **Rapid deployment:** The programmability and ease of use of Cisco UCS Manager allow you to deploy Cisco HyperFlex systems quickly. These features also allow you to rapidly provision additional Cisco UCS servers for other workload requirements.

Customers who have already invested in Cisco products and technologies have the opportunity to mitigate their risk further by deploying familiar and tested Cisco UCS technology.

Audience

The target audience for this document includes, but is not limited to, storage administrators, data center architects, database administrators, field consultants, IT managers, SAP solution architects, and customers who want to implement SAP HANA on the Cisco HyperFlex Hyperconverged Infrastructure solution. A working knowledge of SAP HANA Database, Linux, server, storage, and networks is assumed.
Infrastructure overview
SAP has defined hardware and software requirements to run SAP HANA on a hyperconverged infrastructure.

CPU
Though SAP allows the Skylake CPU models (which are greater than or equal to 8 cores) listed in the TDI Phase V model that can be used in a Hyperconverged Infrastructure for SAP HANA, not all the CPU models are supported in the Cisco Hyperflex configuration. The supported CPU models in Hyperflex configuration must be validated before proceeding with the installation.

There is also an important SAP’s limitation to the socket usage to be considered. The socket that the storage controller virtual machine uses cannot be shared to run the HANA virtual machine. That is, the HANA virtual machine cannot share a socket with non-SAP workloads.

Memory
SAP HANA is supported in the following memory configurations:

- SAP HANA 2.0 Memory per socket up to 768 GB for SAP NetWeaver Business Warehouse (BW) with all TDI supported processor models and up to 1.5TB with only Intel Xeon Platinum ‘M’ (8xxxM) CPUs
- SAP HANA 2.0 Memory per socket up to 1.5TB for SAP Business Suite on SAP HANA (SoH) (With the Intel Xeon Platinum ‘M’ processors)

Cisco HyperFlex HXAF240c M5 for SAP HANA
Cisco used All Flash HX server for SAP HANA in HCI. The HXAF240c M5 All Flash Node is excellent for high-performance, high-capacity clusters.

Physically, the system is installed as a cluster of three or more Cisco HyperFlex HXAF240c M5 Nodes that are integrated into a single system by a pair of Cisco UCS 6300 Series Fabric Interconnects.

Cisco HyperFlex solution design
The Cisco HyperFlex system provides a fully contained virtual server platform with compute and memory resources, integrated networking connectivity, a distributed high-performance log-based file system for virtual machine storage, and the hypervisor software for running the virtualized servers, all within a single Cisco UCS management domain (Figure 1).
Following are the components of a Cisco HyperFlex system for the SAP HANA on HCI:

- One pair of Cisco UCS Fabric Interconnects:
  - Cisco UCS 6332 Fabric Interconnect
- Three to 32 Cisco HyperFlex HX-Series Rack-Mount Servers (minimum 4 nodes recommended)
  - Cisco HyperFlex HXAF240c-M5SX All-Flash Rack-Mount Servers
- Cisco HyperFlex Data Platform Software
- VMware vSphere ESXi Hypervisor
- VMware vCenter Server (end-user supplied)
- VMware vCenter Plugin
- Cisco Hyperflex HX connect
- Cisco Intersight

**Cisco HyperFlex solution design**

**Requirements**

The following sections detail the physical hardware, software revisions, and firmware versions required to install a four-node cluster of the Cisco HyperFlex system for SAP HANA on HCI.
Physical Components

Table 1 lists the physical components for the solution.

**Table 1. HyperFlex system components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Hardware required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric Interconnects</td>
<td>2 Cisco UCS 6332-16U Fabric Interconnects</td>
</tr>
<tr>
<td>Servers</td>
<td>4 HyperFlex HXAF240c-M5SX All-Flash Rack-Mount Servers</td>
</tr>
</tbody>
</table>

For complete server specifications and more information, please refer to the following link:

HyperFlex™ HXAF240c-M5SX specification sheet:


Table 2 lists the hardware component options for one HyperFlex HXAF240c-M5SX server model used as an example:

**Table 2. HXAF240c-M5SX Server configuration**

<table>
<thead>
<tr>
<th>HyperFlex HXAF240c-M5SX options</th>
<th>Hardware required</th>
</tr>
</thead>
</table>
| Processors                       | Intel Xeon CPU  
(All models certified for SAP HANA TDI with greater than or equal to 8 cores and listed in the Cisco Hyperflex compatibility list are supported.) |
| Memory                           | 24 x 32-GB (768-GB) double-data-rate 4 (DDR4) 2666-MHz 1.2V modules               |
| Disk controller                  | Cisco 12-Gbps Modular SAS Host Bus Adapter (HBA)                                  |
| Hard drives                       |  
- One 240-GB 2.5-inch Cisco UCS Enterprise Value 6-Gbps SATA SSD  
- One 375-GB 2.5-inch Optane Extreme Performance SSD  
- 18 x 960-GB 2.5-inch Enterprise Value 6-Gbps SATA SSDs |
| Network                           | Cisco UCS VIC1387 VIC MLOM                                                          |
| Boot device                       | One 240-GB M.2 form-factor SATA SSD                                                |
| Optional                          | Cisco QSA module to convert 40 Gigabit Ethernet Quad Small Form-Factor Pluggable Plus (QSFP+) to 10 Gigabit Ethernet SFP+ |

Software components

Table 3 lists the software components and the versions required for the Cisco HyperFlex system.

**Table 3. Software components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Software required</th>
</tr>
</thead>
</table>
| Hypervisor            | VMware ESXi, 6.5.0 U2 - 8294253  
(Cisco Custom Image for ESXi 6.5 to be downloaded from Cisco.com downloads portal) |
| Management server     | VMware vCenter Server for Windows or vCenter Server Appliance 6.5 or later        |
| Cisco HyperFlex Data Platform | Cisco HyperFlex HX Data Platform Software 3.0 or later                           |
| Cisco UCS Firmware    | Cisco UCS Infrastructure Software, B-Series and C-Series bundles, revision 3.2(3g) or later |
| SAP HANA              | SAP HANA 2.0 revision 31 or later                                                |
**Licensing**
Cisco HyperFlex systems must be properly licensed using Cisco Smart Licensing, which is a cloud-based software licensing management solution used to automate many manual, time-consuming and error-prone licensing tasks.

Beginning with Cisco HyperFlex 3.0, licensing of the system requires one license per node from one of three different licensing editions: Edge licenses, Standard licenses, or Enterprise licenses. Depending on the type of cluster you install and the features you desire to activate and use in the system, you need to purchase licenses from the appropriate licensing tier.

For more information about the Cisco Smart Software Manager satellite server, visit this website: https://www.cisco.com/c/en/us/buy/smart-accounts/software-manager-satellite.html.

**Physical topology**
The Cisco HyperFlex system is composed of a pair of Cisco UCS Fabric Interconnects along with up to 32 HX-Series rack-mount servers per cluster. You can install up to eight separate HX clusters under a single pair of fabric interconnects. The two fabric interconnects both connect to every HX-Series rack-mount server. Upstream network connections, also referred to as “northbound” network connections, are made from the fabric interconnects to the customer data center network at the time of installation (Figure 3).

*Figure 2. Cisco HyperFlex standard cluster topology*
Cabling

The Fabric interconnects, HX-series rack-mount servers need to be cabled properly before you begin the installation activities.

Table 2 provides an example cabling map for installation of a Cisco HyperFlex system, with four HyperFlex converged servers.

Table 4. Example fabric interconnect cabling Map

<table>
<thead>
<tr>
<th>Device</th>
<th>Port</th>
<th>Connected To</th>
<th>Port</th>
<th>Type</th>
<th>Length</th>
<th>Note</th>
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<td>UCS6332-B</td>
<td>L1</td>
<td>CAT5</td>
<td>1FT</td>
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<td>UCS6332-B</td>
<td>L2</td>
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<td>UCS6332-A</td>
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<tr>
<td>UCS6332-B</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>UCS6332-B</td>
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<tr>
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<tr>
<td>UCS6332-B</td>
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</tr>
<tr>
<td>UCS6332-B</td>
<td>1/25</td>
<td>Customer LAN</td>
<td></td>
<td></td>
<td></td>
<td>uplink</td>
</tr>
<tr>
<td>UCS6332-B</td>
<td>1/26</td>
<td>Customer LAN</td>
<td></td>
<td></td>
<td></td>
<td>uplink</td>
</tr>
<tr>
<td>UCS6332-B</td>
<td>1/27</td>
<td></td>
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<td></td>
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<tr>
<td>UCS6332-B</td>
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<tr>
<td>UCS6332-B</td>
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<tr>
<td>UCS6332-B</td>
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<td>UCS6332-B</td>
<td>1/31</td>
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<td></td>
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<tr>
<td>UCS6332-B</td>
<td>1/32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IP Addressing

IP addresses that are used in the Cisco HyperFlex system fall into the following groups:

- **Cisco UCS Manager**: Cisco UCS Manager assigns and uses these addresses. Cisco UCS Manager uses three IP addresses: one address is assigned to each Cisco UCS Fabric Interconnect, and the third IP address is a roaming address for management of the Cisco UCS cluster. In addition, at least one IP address per Cisco UCS blade or HX-Series rack-mount server is required for the hx-ext-mgmt IP address pool, these addresses are assigned to the Cisco Integrated Management Controller (IMC) interface of the physical servers. Because these management addresses are assigned from a pool, they need to be provided in a contiguous block of addresses. These addresses must all be in the same subnet.

- **HyperFlex and ESXi management**: These addresses are used to manage the ESXi hypervisor hosts, and the HyperFlex Storage Platform Controller virtual machines. Two IP addresses per node in the HyperFlex cluster are required from the same subnet, and a single additional IP address is needed as the roaming HyperFlex cluster management interface. These addresses can be from the same subnet as the Cisco UCS Manager addresses, or they can be separate.

- **HyperFlex replication**: The HyperFlex Storage Platform Controller virtual machines use these addresses for clusters that are configured to replicate virtual machines to one another. One IP address per HX node is required, plus one additional IP address as a roaming clustered replication interface. These addresses are assigned to a pool as part of a postinstallation activity described later in this document, and are not needed to complete the initial installation of a HyperFlex cluster. These addresses can be from the same subnet as the HyperFlex and ESXi management addresses, but we recommend that the VLAN IDs and subnets be unique.

- **HyperFlex storage**: The HyperFlex Storage Platform Controller virtual machines use these addresses, and they use them as VMkernel interfaces on the ESXi hypervisor hosts to send and receive data to/from the HyperFlex HX Distributed Data Platform file system. Two IP addresses per node in the HyperFlex cluster are required from the same subnet, and a single additional IP address is needed as the roaming HyperFlex cluster storage interface. We recommend that you provision a subnet that is not used in the network for other purposes; you also could use nonroutable IP address ranges for these interfaces. Finally, if the Cisco UCS domain will contain multiple HyperFlex clusters, we recommend that you use a different subnet and VLAN ID for the HyperFlex storage traffic for each cluster. This method is safer because it helps ensure that storage traffic from multiple clusters cannot intermix.

- **VMotion**: The ESXi hypervisor hosts use these IP addresses as VMkernel interfaces to enable vMotion capabilities. One or more IP addresses per node in the HyperFlex cluster are required from the same subnet. You can use multiple addresses and VMkernel interfaces if you wish to enable multi-nic vMotion, although this configuration would require additional manual steps.

**Considerations for SAP HANA on Cisco HyperFlex solutions**

**Scale**

Cisco HyperFlex standard clusters for a SAP HANA production environment can currently scale from a minimum of 3 to a maximum of 32 nodes.

Though Cisco HyperFlex can support as few as 3 nodes, we highly recommend starting with a 4-node cluster for the SAP HANA on HCI solution.

**SAP Limitations**

Because the current certified solution of Cisco HyperFlex for SAP HANA on HCI doesn’t allow sharing the physical socket between a HANA virtual machine and the storage controller virtual machine, you can use only one socket of the node to host a production SAP HANA virtual machine.

Also, because one full socket has to be dedicated for the SAP HANA virtual machine, only one HANA virtual machine per HX node is allowed to run.
To summarize:

- The storage controller virtual machine uses 8 vCPUs or 4 cores, which also can be shared to run nonproduction SAP HANA virtual machines or other SAP workloads only. You must consider this workload when choosing frequency of the CPU.
- One socket must be dedicated for the HANA virtual machine (Figure 4).

**Figure 3.** CPU placement for the virtual machines

---

**Installing Cisco HyperFlex node**

Installing the HyperFlex system is done primarily through a deployable HyperFlex installer virtual machine, available for download at cisco.com as an OVA file. The installer virtual machine performs most of the Cisco UCS configuration work, and you can use it to simplify the installation of ESXi on the HyperFlex hosts. The installer virtual machine also performs significant portions of the ESXi configuration. Finally, you can use the installer virtual machine to install the HyperFlex HX Data Platform software and create the HyperFlex cluster.

You can follow the Cisco HyperFlex installation instructions using the Cisco Validated Design link: [Cisco HyperFlex 3.x for Virtual Server Infrastructure with VMware ESXi](https://www.cisco.com/c/en/us/solutions/collateral/uc-collateral.html).

**Note:** When installing the Cisco HyperFlex system, choose Replication Factor 2 to meet the key performance indicators (KPI) for SAP HANA.

**Cisco HyperFlex System - Postinstallation check**

**Cisco HyperFlex Connect HTML 5 management webpage**

After you have installed the Cisco HyperFlex system, you can use a new HTML 5-based web user interface as the primary management tool for Cisco HyperFlex systems (Figure 5). Through this centralized point of control for the cluster, administrators can create volumes, monitor data platform health, and manage resource use. Administrators also can use this data to predict when the cluster needs to be scaled. To use the Cisco HyperFlex Connect user interface, connect using a web browser to the Cisco HyperFlex cluster IP address:

http://<hx controller cluster ip>.
Preparing a SAP HANA virtual machine for OS installation

This section explains the creation of a single virtual machine for production HANA that is ready for the OS installation. As per the current supported certification scenario, you can have one production HANA virtual machine per HX node.

You must repeat the same steps to create additional production HANA virtual machines on the other HX nodes.

Remember that you can have only one HANA production virtual machine per HX node, so please exercise caution when creating the virtual machines.

Steps for creating a virtual machine to use for SAP HANA

This section describes how to create a 512-GB virtual machine of to run a production SAP HANA as an example. Follow the same steps to create additional virtual machines for a production SAP HANA and remember to host only one production HANA virtual machine per HX node.

1. After the HyperFlex system is installed and accessible, log in to the VMware vSphere to access the vCenter of the HyperFlex cluster: https://<vSphere IP address>
2. After logging into the vSphere, from the Home menu on the top click the Hosts & Clusters icon.

3. Hosts & Clusters displays the connected HX ESX nodes and the storage controller virtual machines running on the nodes. These storage controller virtual machine configurations should never be modified because it would void the support for the cluster.
4. Right click on the cluster and choose New Virtual Machine to create the virtual machine.

5. From the screen that appears, select Create New Virtual Machine and click Next at the bottom.
6. In the next screen, enter the name of the SAP HANA virtual machine and choose the vCenter data center that was created; click Next at the bottom.

7. From the next screen, choose the compute resource or HX node where the SAP HANA virtual machine has to be placed and click Next.

Note: Based on the current certified solution for Cisco HyperFlex for SAP HANA on HCI, only one production SAP HANA virtual machine can be run per HX node.
8. After you have selected the HX node for the SAP HANA virtual machine placement, select the datastore for the virtual machine that was created with the HyperFlex installation. Click Next.

9. Choose the compatibility option as “ESXi 6.5 and later” and click Next.
10. Choose the OS family as “Linux” and OS version as “SUSE Linux Enterprise 12 (64-Bit)”, and then click Next.

11. In this screen you will customize the resources needed to run the production SAP HANA virtual machine. As stated in the previous section, the SAP HANA virtual machine in our current certified solution uses one full socket in the HX node. Depending on the model of the CPU used, the number of virtual CPUs has to be chosen. Also, you need to pin the SAP HANA virtual machine to the second socket of the HX node.

12. This guide uses the Intel Xeon Gold 6140 as an example. This CPU has 18 physical cores and 36 logical threads.

13. For this example, set the CPU resource to 36, which is the maximum number of threads for a full socket CPU that is used in this document for reference. In order to pin the HANA virtual machine to the second socket, set the Scheduling Affinity to 36-71, and then click Next.
14. Enter the Memory value as 512 (GB), which is taken as an example.
15. Enter 100 (GB) for the New Hard disk size; it will be used for the operating system.
16. Select the network as vm-network-325, which is used to allow accessibility of the virtual machine in the network.
17. Select Datastore ISO File and choose the SUSE Linux Enterprise server ISO from the drop-down menu.
18. Click the Connect checkbox.

19. The next step is to add the disks for the data, log, and shared file system for SAP HANA.
In our example, for a 512-GB memory HANA virtual machine, the disk size of 1536 GB (1.5 TB) is used for the data file system.

21. Repeat these steps to add two more 512-GB disks for the log and shared file systems.

22. When the required drives are added, click Next.

23. The final confirmation window shows the customized hardware settings for the HANA file system. Review the settings carefully and make sure no other HANA virtual machine is in the HX node that was chosen to install this virtual machine.

24. Click Finish to create the virtual machine.
25. Now the virtual machine is ready for the OS installation.

Installing the operating system to the SAP HANA virtual machine

To install the SLES 12 for SAP SP3, perform the following steps:

1. Mount the SLES for SAP 12 SP3 ISO from the Datastore.
2. Power ON the virtual machine created in the above steps
3. Select installation from the boot menu
4. On the Language, Keyboard and License Agreement page, select your preferred language and keyboard Layout, agree to the license terms, and select Next.

5. On the Network Settings page, select Next. You will return to the network configuration as part of the postinstallation tasks.

6. On the Registration page, select Skip Registration. You will register later as part of the postinstallation tasks.

7. On the Product Installation Mode page, select the Proceed with standard SLES for SAP Applications installation option.
8. On the Add On Product page, select Next. In this configuration example, there are no additional products to install.


   Suggested partitioning initial proposal: Select Expert Partitioner

10. At the left, choose System View > Linux > Hard Disks > sda.

11. Clear the suggested partitions.
12. Create partitions with sizes based on the memory size of the HANA virtual machine:

<table>
<thead>
<tr>
<th>Disk</th>
<th>Partition</th>
<th>Type</th>
<th>Mount</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>sda</td>
<td>sda1</td>
<td>ext3</td>
<td>/</td>
<td>98G</td>
</tr>
<tr>
<td></td>
<td>sda2</td>
<td>swap</td>
<td>swap</td>
<td>2G</td>
</tr>
<tr>
<td>sdb</td>
<td>sdb1</td>
<td>xfs</td>
<td>shared</td>
<td>512G</td>
</tr>
<tr>
<td>sdc</td>
<td>sdc1</td>
<td>xfs</td>
<td>data</td>
<td>1.5 T</td>
</tr>
<tr>
<td>sdd</td>
<td>sdd1</td>
<td>xfs</td>
<td>log</td>
<td>512G</td>
</tr>
</tbody>
</table>

13. After you have created the partitions, the partition information should look like the following screenshot:

Suggested partitioning initial proposal: Select Expert Partitioner

14. Click Accept to return to the Installation Settings page.
15. Review the updated partition information, and then click Next.
16. For Clock and Time Zone, choose the appropriate time zone and select the hardware clock set to UTC.
17. For the password for the system administrator root, enter the appropriate password.
18. On the Installation Settings screen, review the default information.

   Installation Settings: Default proposal

19. Now customize the software selection. Click the Software headline to make changes as follows:
   b. Select C/C++ Compiler and Tools.
   c. Select SAP HANA Server Base.

   Software Selection and System Tasks: Customized settings
20. Click OK.

21. Under the Firewall and SSH headline, disable the firewall. This selection automatically enables Secure Shell (SSH) Protocol service.

Firewall and SSH service customized:

- Firewall will be disabled (enable)
- SSH service will be enabled (disable)
22. Click the Kdump headline and select Disable Kdump.

23. Click OK.

24. Click the Set Default Systemd Target headline and choose Text mode.

25. Click OK.
26. Click the Clone System Configuration headline and click the link: do not write it.

**Clone System Configuration**
- The AutoYaST profile will be written under /root/autoinst.xml (*do not write it*).

You will then see:

**Clone System Configuration**
- The AutoYaST profile will not be saved (*write it*).

27. Leave the Booting and System default selections unchanged.
28. Click Install. Also select Install at subsequent Confirm Installation prompts. The installation starts, and you can monitor the status.
You will see a reboot alert when the installation is complete. Click OK and then Next.

The system will reboot and boot from the disk on startup. Select Boot from Hard Disk.
The system then displays the login prompt:

```
Welcome to SUSE Linux Enterprise Server for SAP Applications 12 SP1 (x86_64) - Kernel 3.12.49-11-default (tty1).

Hint: Menu Lock off
Linux-疣Se login:
```

29. Use the VMware console to log in to the installed system as the user root with the password `<root password>`:

```
Welcome to SUSE Linux Enterprise Server for SAP Applications 12 SP1 (x86_64) - Kernel 3.12.49-11-default (tty1).

Hint: Menu Lock off
Linux-疣Se login: root
Password: ___________
Linux-疣Se: # 
```

30. Configure the host name and disable IPv6.

```
# yast2

YaST Control Center: Network Settings
```

![YaST Control Center: Network Settings](image)

YaST Control Center: Hostname/DNS

32. Enter the **hostname** and enter the Domain Name System (DNS) server address of your network for resolution, if necessary. Then press Alt+O.


Note that changing the IPv6 setting requires a reboot to make the change take effect.

34. Press Alt+O to save the network configuration. Press Alt+Q to quit the YaST Control Center.

35. Reboot the server to make the IPv6 selection and the hostname settings take effect:

```
#reboot
```

36. Use `ifconfig` to list the available virtual machine interface name and go to the network configuration directory and create a configuration. In this example the device name is eth1:

```
#cd /etc/sysconfig/network
#vi ifcfg-eth1

BOOTPROTO='static'
IPADDR='<<access_ip_address>>'
NETMASK='<<access_nw_netmask>>'
NETWORK=''
MTU=''
REMOTE_IPADDR=''
STARTMODE='auto'
USERCONTROL='no'
```
37. Add the default gateway:

```
# cd /etc/sysconfig/network
# vi routes
default <<access_gateway_ip>>
```

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

38. Verify `/etc/hosts`:

```
cishana01:~ $ more /etc/hosts
# hosts  This file describes a number of hostname-to-address
# mappings for the TCP/IP subsystem. It is mostly
# used at boot time, when no name servers are running.
# On small systems, this file can be used instead of a
# "named" name server.
# Syntax:
#
#   IP-Address  Full-Qualified-Hostname  Short-Hostname
#
# 127.0.0.1   localhost
# special IPv6 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
173.36.215.110  cishana01.custdem.local  cishana01
```

```
cishana01:~ $ 
```
39. If required, set up a proxy service so that the appliance can reach the Internet:

   `#yast2

   YaST - menu ~ cishana01

   Software   System
   Network Services
   Security and Users
   Support
   Miscellaneous

   Authentication Client
   Authentication Server
   DHCP Server
   DNS Server
   FTP Server
   HTTP Server
   Hostnames
   Mail Server
   NFS Client
   NFS Server
   NIS Client
   NIS Server
   NTP Configuration
   Network Services (xinetd)
   OpenLDAP MirrorMode
   Proxy
   Remote Administration (UNC)
   Samba Server
   Squid
   TFTP Server
   Wake-on-LAN
   Windows Domain Membership
   iSCSI Initiator
   iSMS Server

40. Enter the proxy server and port as shown in the following sample configuration. Select OK and then quit YaST to save the configuration.
41. 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.
   
   ```bash
   #SUSEConnect -r <<registration_code>> -e <<email_address>>
   ```

42. Update the system with the following command. Again, the system must have access to the Internet to proceed with this step.

   ```bash
   #zypper update
   ```

43. Follow the on-screen instructions to complete the update process. Reboot the server and log in to the system again.

**Post installation VMware and OS configuration**

To optimize the use of the SAP HANA database with SLES 12 or SLES for SAP 12 SP3, apply the settings by referring to this SAP HANA note: 2205917 - SAP HANA DB: Recommended OS settings for SLES 12 / SLES for SAP Applications 12.

Refer the SAP Note: 2161991 - VMware vSphere configuration guidelines for recommended configuration guidelines of VMware vSphere.

**Preparing SAP HANA file systems**

1. Create file systems in the data, log and HANA shared mount:
   ```
   #mkfs.xfs -f /dev/sdb1 (for Shared)
   #mkfs.xfs -f /dev/sdc1 (for Data)
   #mkfs.xfs -f /dev/sdd1 (for Log)
   ```

2. Create mount directories for the data, log, and HANA shared file systems:
   ```
   #mkdir -p /hana/data
   #mkdir -p /hana/log
   #mkdir -p /hana/shared
   ```

3. 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.

   ```
   UUID=fc76372c-6bbe-4269-910d-6f40d23d80f8 swap swap defaults 0 0
   UUID=df8a6b63-ecea-4d6f-86af-ebb7ecd3abd9 / ext3 acl,user_xattr 1 1
   #HANA Disks
   /dev/sdb /hana/shared xfs defaults 1 2
   /dev/sdc /hana/data xfs defaults 1 2
   /dev/sdd /hana/log xfs defaults 1 2
   ```

4. Use the following command to mount the file systems:

   ```
   #mount -a
   ```

5. Use the `df -h` command to check the status of all mounted volumes:

   ```
   hx-sles-01:~ # df -h
   Filesystem  Size  Used Avail Use% Mounted on
   /dev/sda2  57G   6.1G  50G   11% /
   /dev/sdd  512G  41G  471G   32% /hana/log
   /dev/sdc  1.5T  457G  1.1T   39% /hana/data
   /dev/sdb  512G   77G  435G   60% /hana/shared
   ```
6. Change the directory permissions before you install SAP HANA. Use the chown command on each SAP HANA node after the file systems are mounted:

```bash
#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, refer to the [SAP HANA Server Installation Guide](http://service.sap.com/instguides).

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

**Important SAP Notes**

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

The latest SAP notes are available at: [https://service.sap.com/notes](https://service.sap.com/notes).

**SAP HANA IMDB notes**

- [SAP note 1514967](http://service.sap.com/notes): SAP HANA: Central note
- [SAP note 1523337](http://service.sap.com/notes): SAP HANA database: Central note
- [SAP note 2000003](http://service.sap.com/notes): FAQ: SAP HANA
- [SAP note 2380257](http://service.sap.com/notes): SAP HANA 2.0 Release Notes
- [SAP note 1681092](http://service.sap.com/notes): Support for multiple SAP HANA databases on a single SAP HANA appliance
- [SAP note 1514966](http://service.sap.com/notes): SAP HANA: Sizing the SAP HANA database
- [SAP note 1637145](http://service.sap.com/notes): SAP BW on HANA: Sizing the SAP HANA database
- [SAP note 1793345](http://service.sap.com/notes): Sizing for Suite on HANA

**Linux notes**

- [SAP note 2205917](http://service.sap.com/notes): SAP HANA DB: Recommended OS settings for SLES 12 and SLES for SAP Applications 12
- [SAP note 2235581](http://service.sap.com/notes): SAP HANA: Supported operating systems
- [SAP note 1944799](http://service.sap.com/notes): SAP HANA guidelines for the SLES operating system
- [SAP note 1557506](http://service.sap.com/notes): Linux paging improvements
- [SAP note 1740136](http://service.sap.com/notes): SAP HANA: Wrong mount option may lead to corrupt persistency

**Third-party software notes**

- [SAP note 1730928](http://service.sap.com/notes): Using external software in a SAP HANA appliance
- [SAP note 1730929](http://service.sap.com/notes): Using external tools in a SAP HANA appliance
- [SAP note 1730930](http://service.sap.com/notes): Using antivirus software in a SAP HANA appliance
- [SAP note 1730932](http://service.sap.com/notes): Using backup tools with Backint for SAP HANA
SAP HANA virtualization notes

- SAP note 2652670 - SAP HANA VM on VMware vSphere
- SAP note 2161991 - VMware vSphere configuration guidelines
- SAP note 2393917 - SAP HANA on VMware vSphere 6.5 and 6.7 in production
- SAP note 2015392 - VMware recommendations for latency-sensitive SAP applications

Performing SAP HANA postinstallation 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 skladm and run the commands presented here. Commands for checking SAP HANA services follow:

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

Tuning the SAP HANA performance parameters

After SAP HANA is installed, tune the parameters as shown in Table 6 and explained in the following SAP notes.

Table 5. Tuning parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Data file system</th>
<th>Log file system</th>
</tr>
</thead>
<tbody>
<tr>
<td>max_parallel_io_requests</td>
<td>256</td>
<td>Default</td>
</tr>
<tr>
<td>async_read_submit</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>async_write_submit_blocks</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>async_write_submit_active</td>
<td>Auto</td>
<td>On</td>
</tr>
</tbody>
</table>
For SAP HANA 2.0 installations, use either hdbsql or the Structured Query Language (SQL) function in SAP HANA Studio or cockpit and the following SQL commands:

```
ALTER SYSTEM ALTER CONFIGURATION ('global.ini', 'SYSTEM') SET ('fileio', 'fileio.max_parallel_io_requests[Data]') = '256' WITH RECONFIGURE;

ALTER SYSTEM ALTER CONFIGURATION ('global.ini', 'SYSTEM') SET ('fileio', 'fileio.async_write_submit_active [Data]') = 'Auto' WITH RECONFIGURE;
```

For more information, refer to SAP note 2399079: [Elimination of hdbparam in HANA 2](https://support.sap.com/).

**Downloading revisions**

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


**For more information**

- For information about SAP HANA, visit: [https://hana.sap.com/abouthana.html](https://hana.sap.com/abouthana.html).