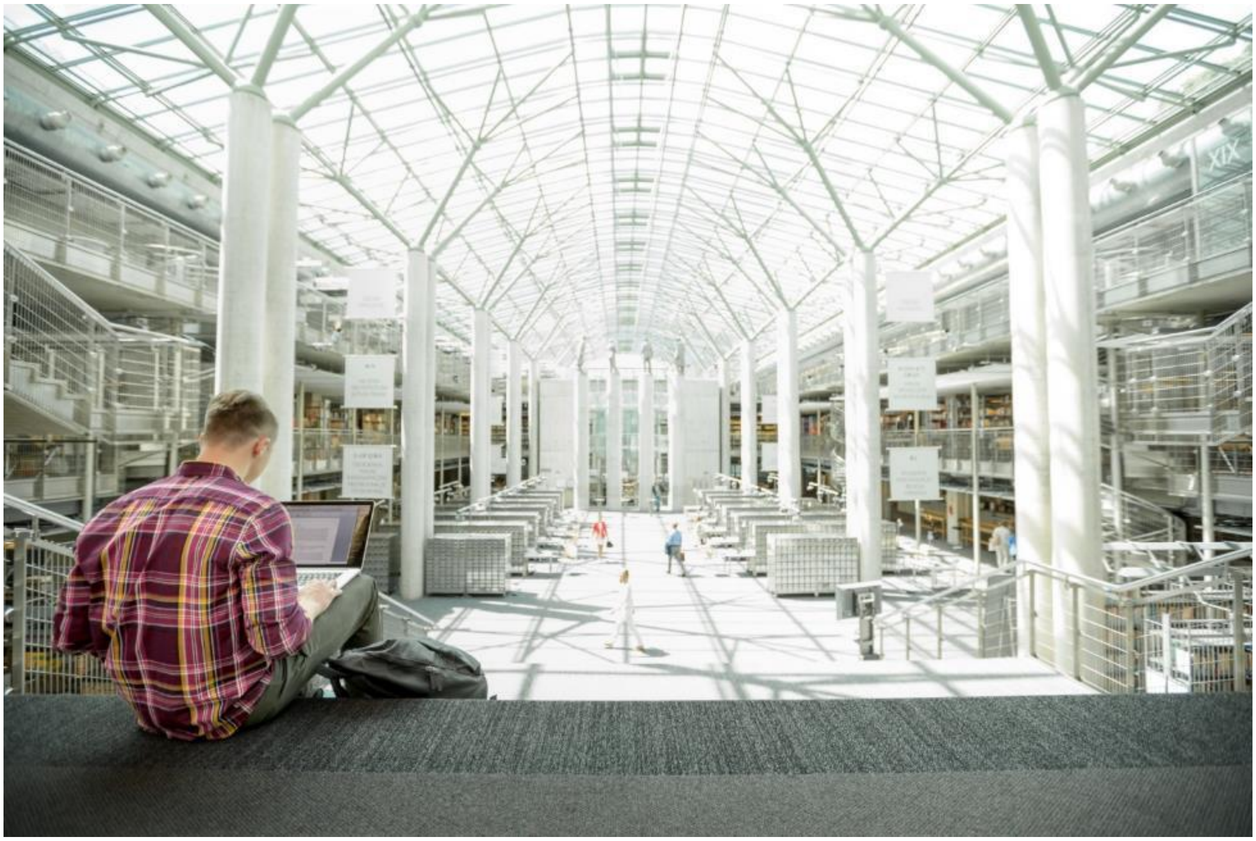

Cisco and Hitachi Adaptive Solutions for SAP HANA TDI

Deployment Guide for Cisco and Hitachi Converged Infrastructure with Cisco UCS Blade Servers, Cisco Nexus 9336C-FX2 Switches, Cisco MDS 9706 Fabric Switches, and Hitachi VSP G370 Storage Systems with SUSE Linux Enterprise Server for SAP Applications 12 SP4 and Red Hat Enterprise Linux 7.5

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About the Cisco Validated Design Program

The Cisco Validated Design (CVD) program consists of systems and solutions designed, tested, and documented to facilitate faster, more reliable, and more predictable customer deployments. For more information, go to:

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Executive Summary

Cisco Validated Designs consist of systems and solutions that are designed, tested, and documented to facilitate and improve customer deployments. These designs incorporate a wide range of technologies and products into a portfolio of solutions that have been developed to address the business needs of our customers.

Cisco and Hitachi are working together to deliver a converged infrastructure solution that helps enterprise businesses meet the challenges of today and position themselves for the future. Leveraging decades of industry expertise and superior technology, this Cisco CVD offers a resilient, agile, and flexible foundation for today's businesses. In addition, the Cisco and Hitachi partnership extends beyond a single solution, enabling businesses to benefit from their ambitious roadmap of evolving technologies such as advanced analytics, IoT, cloud, and edge capabilities. With Cisco and Hitachi, organizations can confidently take the next step in their modernization journey and prepare themselves to take advantage of new business opportunities enabled by innovative technology.

This document explains the deployment of the Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration, as it was described in Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration Design Guide. The recommended solution architecture is built on Cisco Unified Computing System (Cisco UCS) using the unified software release to support the Cisco UCS hardware platforms for Cisco UCS B-Series blade servers, Cisco UCS 6300 Fabric Interconnects, Cisco Nexus 9000 Series switches, Cisco MDS Fiber channel switches, and Hitachi VSP controllers. This architecture supports Red Hat Enterprise Linux and SUSE Linux Enterprise Server for SAP Applications.

Solution Overview

Introduction

Enterprise data centers have a need for scalable and reliable infrastructure that can be implemented in an intelligent, policy driven manner. This implementation needs to be easy to use, and deliver application agility, so IT teams can provision applications quickly and resources can be scaled up (or down) in minutes.

Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration provides a best practice datacenter architecture built on the collaboration of Hitachi Vantara and Cisco to meet the needs of enterprise customers. The solution provides Orchestrate efficiency across the data path with an intelligent system that helps anticipate and navigate challenges as you grow. The architecture builds a self-optimizing data center that automatically spreads workloads across devices to ensure consistent utilization and performance. The solution helps organization to effectively plan infrastructure growth and eliminate the budgeting guesswork with predictive risk profiles that identify historical trends.

Organizations experience a 5-year ROI of 528% with Cisco UCS Integrated Infrastructure solutions, Businesses experience 48% lower IT infrastructure costs with Cisco UCS Integrated Infrastructure solutions. Organizations can realize a 5-year total business benefit of $20.4M per organization with Cisco UCS Integrated Infrastructure solutions. The break-even period with Cisco UCS Integrated Infrastructure solutions is nine months. Businesses experience 67% lower ongoing administrative and management costs with Cisco UCS Manager (UCSM). For more information please refer to IDC #US41084916 2016

This architecture is composed of the Hitachi Virtual Storage Platform (VSP) connecting through the Cisco MDS multilayer switches to Cisco Unified Computing System (Cisco UCS), and further enabled with the Cisco Nexus family of switches.

Audience

The audience for this document includes, but is not limited to; sales engineers, field consultants, professional services, IT managers, partner engineers, and customers who want to modernize their infrastructure to meet SLAs and the business needs at any scale.

Purpose of this Document

This document provides a step by step configuration and implementation guide for the Cisco and Hitachi Adaptive Solutions for Converged Infrastructure solution. This solution features a validated reference architecture composed of:

- Cisco UCS Compute
- Cisco Nexus Switches
- Cisco Multilayer SAN Switches
- Hitachi Virtual Storage Platform
- SUSE Enterprise Linux and Red Hat Enterprise Linux Operating System
- SAP HANA

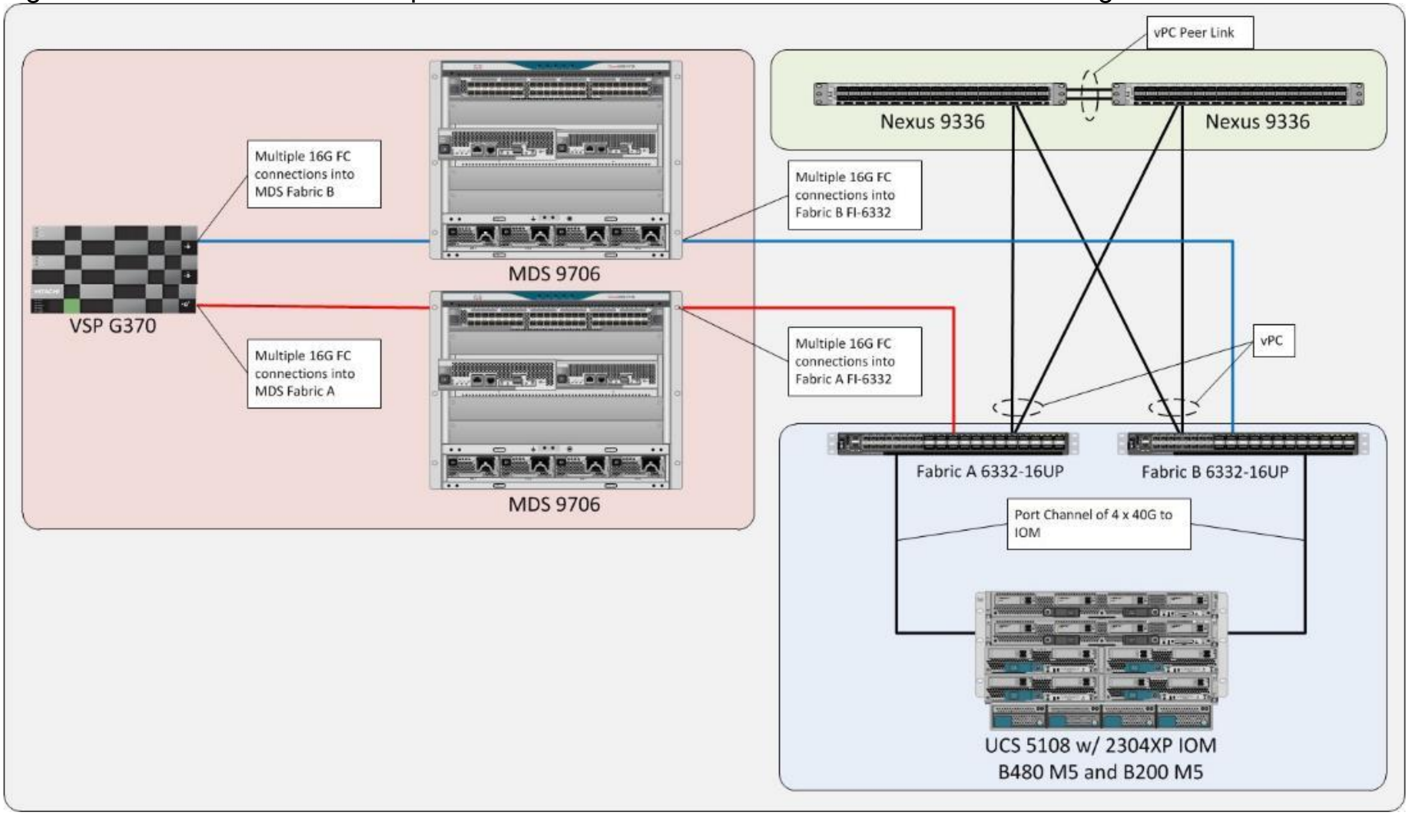
For the design decisions and technology discussion of the solution, please refer to the Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration Design Guide.

Solution Design

Architecture

Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration provides an end-to-end architecture with Cisco Compute, Networking and Hitachi Storage that demonstrate support for multiple SAP HANA workloads with high availability and secure multi-tenancy. The architecture is built around the Cisco Unified Computing System(UCS) and the Hitachi Virtual Storage Platform(VSP) connected together by Cisco MDS Multilayer SAN Switches, and further enabled with Cisco Nexus Switches. These components come together to form a powerful and scalable design, built on the best practices of Cisco and Hitachi to create an ideal platform for running a variety of enterprise workloads with confidence. Figure 1 illustrates the physical topology of the Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration.

Figure 1 Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration Architecture


vPC Peer Link
Nexus 9336
Nexus 9336
Multiple 16G FC connections into MDS Fabric B
MDS 9706
Multiple 16G FC connections into Fabric B FI-6332
VSP G370
Multiple 16G FC connections into MDS Fabric A
MDS 9706
Multiple 16G FC connections into Fabric A FI-6332
vPC
Fabric A 6332-16UP
Fabric B 6332-16UP
Port Channel of 4 x 40G to IOM
UCS 5108 w/ 2304XP IOM
B480 M5 and B200 M5

The components of this integrated architecture shown in Figure 1 are:

- Cisco Nexus 9336C-FX2 – 100Gb capable, LAN connectivity to the Cisco UCS compute resources.
- Cisco UCS 6332-16UP Fabric Interconnect – Unified management of Cisco UCS compute, and the compute's access to storage and networks.
- Cisco UCS B200 M5 – High powered, versatile blade server with two CPU for SAP HANA
- Cisco UCS B480 M5 – High powered, versatile blade server with four CPU for SAP HANA

- Cisco MDS 9706 – 16Gbps Fiber Channel connectivity within the architecture, as well as interfacing to resources present in an existing data center.
- Hitachi VSP G370 – Mid-range, high performance storage subsystem with optional all-flash configuration
- Cisco UCS Manager – Management delivered through the Fabric Interconnect, providing stateless compute, and policy driven implementation of the servers managed by it.

Deployment Hardware and Software

Hardware and Software Versions

Table 1 lists the validated hardware and software versions used for this solution. Configuration specifics are given in this deployment guide for the devices and versions listed in the following tables. Component and software version substitution from what is listed is considered acceptable within this reference architecture, but substitution will need to comply with the hardware and software compatibility matrices from both Cisco and Hitachi, please refer to the following documentation:

Cisco UCS Hardware Compatibility Matrix:

https://ucshcltool.cloudapps.cisco.com/public/

Cisco Nexus and MDS Interoperability Matrix:

https://www.cisco.com/c/en/us/td/docs/switches/datacenter/mds9000/interoperability/matrix/intmatrx/Matrix1.html

Cisco Nexus Recommended Releases for Nexus 9K:

https://www.cisco.com/c/en/us/td/docs/switches/datacenter/nexus9000/sw/recommended_release/b_Minimum_and_Recommended_Cisco_NX-OS_Releases_for_Cisco_Nexus_9000_Series_Switches.html

Cisco MDS Recommended Releases:

https://www.cisco.com/c/en/us/td/docs/switches/datacenter/mds9000/sw/b_MDS_NX-OS_Recommended_Releases.html

Hitachi Vantara Interoperability:

https://support.hitachivantara.com/en_us/interoperability.html

In addition, any substituted hardware or software may have different configurations from what is detailed in this guide and will require a thorough evaluation of the substituted product reference documents.

Table 1 Validated Hardware and Software

Component		Software Version/Firmware Version
Network	Cisco Nexus 9336C-FX2	7.0(3)I7(5a)
Compute	Cisco UCS Fabric Interconnect 6332	4.0(1c)
	Cisco UCS 2304 IOM	4.0(1c)
	Cisco UCS B480 M5 Blade Server	4.0(1c)
	Cisco UCS B200 M5 Blade Server	4.0(1c)
	SUSE Linux Enterprise Server for SAP Applications	SLES for SAP 12 SP4

Component		Software Version/Firmware Version
	Red Hat Enterprise Linux for SAP Solutions	RHEL 7.5
Storage	Hitachi VSP G370	88-02-03-60/00
	Cisco MDS 9706 (DS-X97-SF1-K9 & DS-X9648-1536K9)	8.3(1)

Configuration Guidelines

This information in 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 2 lists the configuration variables that are used throughout this document. This table can be completed based on the specific site variables and used in implementing the document configuration steps.

The Cisco UCS Fabric Interconnects are similarly configured. Additionally, this document details the steps for provisioning multiple Cisco UCS hosts, and these are identified sequentially: HANA-Server01, HANA-Server02, and so on. Finally, to indicate that you should include information pertinent to your environment in a given step, <text> appears as part of the command structure. Review the following example for the `network port vlan create` command:

Usage:

```
network port vlan create ?
   [-node] <nodename>                    Node
   { [-vlan-name] {<netport>|<ifgrp>}  VLAN Name
   |  -port {<netport>|<ifgrp>}        Associated Network Port
[-vlan-id] <integer> }                Network Switch VLAN Identifier
```

Example:

```
network port vlan –node <node01> -vlan-name i0a-<vlan id>
```

Table 2 Configuration Variables

Variable	Description	Customer Implementation Value
`<<var_nexus_A_hostname>>`	Cisco Nexus 9336C-FX2-A host name	
`<<var_nexus_A_mgmt0_ip>>`	Out-of-band Cisco Nexus 9336C-FX2-A management IP address	
`<<var_nexus_B_hostname>>`	Cisco Nexus 9336C-FX2-B host name	
`<<var_nexus_B_mgmt0_ip>>`	Out-of-band Cisco Nexus 9336C-FX2-B management IP address	
`<<var_mgmt_mask>>`	Out-of-band management network netmask	

Variable	Description	Customer Implementation Value
<<var_mgmt_gateway>>	Out-of-band management network default gateway	
<<var_ucs_clustername>>	Cisco UCS Manager cluster host name	
<<var_ucsa_mgmt_ip>>	Cisco UCS 6332-16UP-A out-of-band management IP address	
<<var_ucsb_mgmt_ip>>	Cisco UCS 6332-16UP-B out-of-band management IP address	
<<var_ucs_cluster_ip>>	Cisco UCS Manager cluster IP address	
<<var_hitachi_svp_ip>>	Out-of-band management IP for Hitachi storage management network	
<<var_hitachi_controller-1_mgmt_ip>>	Out-of-band management IP for Hitachi storage Controller 1	
<<var_hitachi_controller-2_mgmt_ip>>	Out-of-band management IP for Hitachi storage Controller 2	
<<var_dns_domain_name>>	DNS domain name	
<<var_nameserver_ip>>	DNS server IP(s)	
<<var_global_ntp_server_ip>>	NTP server IP address	
<<var_mds-a_name>>	Cisco MDS 9706 A hostname	
<<var_mds-a_ip>>	Cisco MDS 9706 A Management IP Address	
<<var_mds-b_name>>	Cisco MDS 9706 B hostname	
<<var_mds-b_ip>>	Cisco MDS 9706 B Management IP Address	
<<var_nexus_vpc_domain_id>>	Unique Cisco Nexus switch VPC domain ID for Cisco Nexus 9336C-FX2 Switch pair	
<<var_mgmt_vlan_id>>	Management Network VLAN	
<<var_backup_vlan_id>>	Backup Network for HANA VLAN ID	
<<var_client_vlan_id>>	Client Network for HANA VLAN ID	
<<var_appserver_vlan_id>>	Application Server Network for HANA VLAN ID	
<<var_datasource_vlan_id>>	Data source Network for HANA VLAN ID	
<<var_replication_vlan_id>>	Replication Network for HANA VLAN ID	

Variable	Description	Customer Implementation Value
`<<var_fc-pc_a_id>>`	Fiber Channel - Port Channel ID for MDS A	
`<<var_fc-pc_b_id>>`	Fiber Channel - Port Channel ID for MDS B	
`<<var_san_a_id>>`	VSAN ID for MDS A	
`<<var_san_b_id>>`	VSAN ID for MDS B	

Physical Cabling

This section explains the cabling examples used in the validated environment. To make connectivity clear in this example, the tables include both the local and remote port locations.

This document assumes that out-of-band management ports are plugged into an existing management infrastructure at the deployment site. The upstream network from the Nexus 9336C-FX2 switches is out of scope of this document, with only the assumption that these switches will connect to the upstream switch or switches with a virtual Port Channel (vPC).

Figure 2 shows the cabling configuration used in this validated design.

Figure 2 Cabling Diagram for Cisco and Hitachi Adaptive Solutions for SAP HANA Tailored Data Center Integration

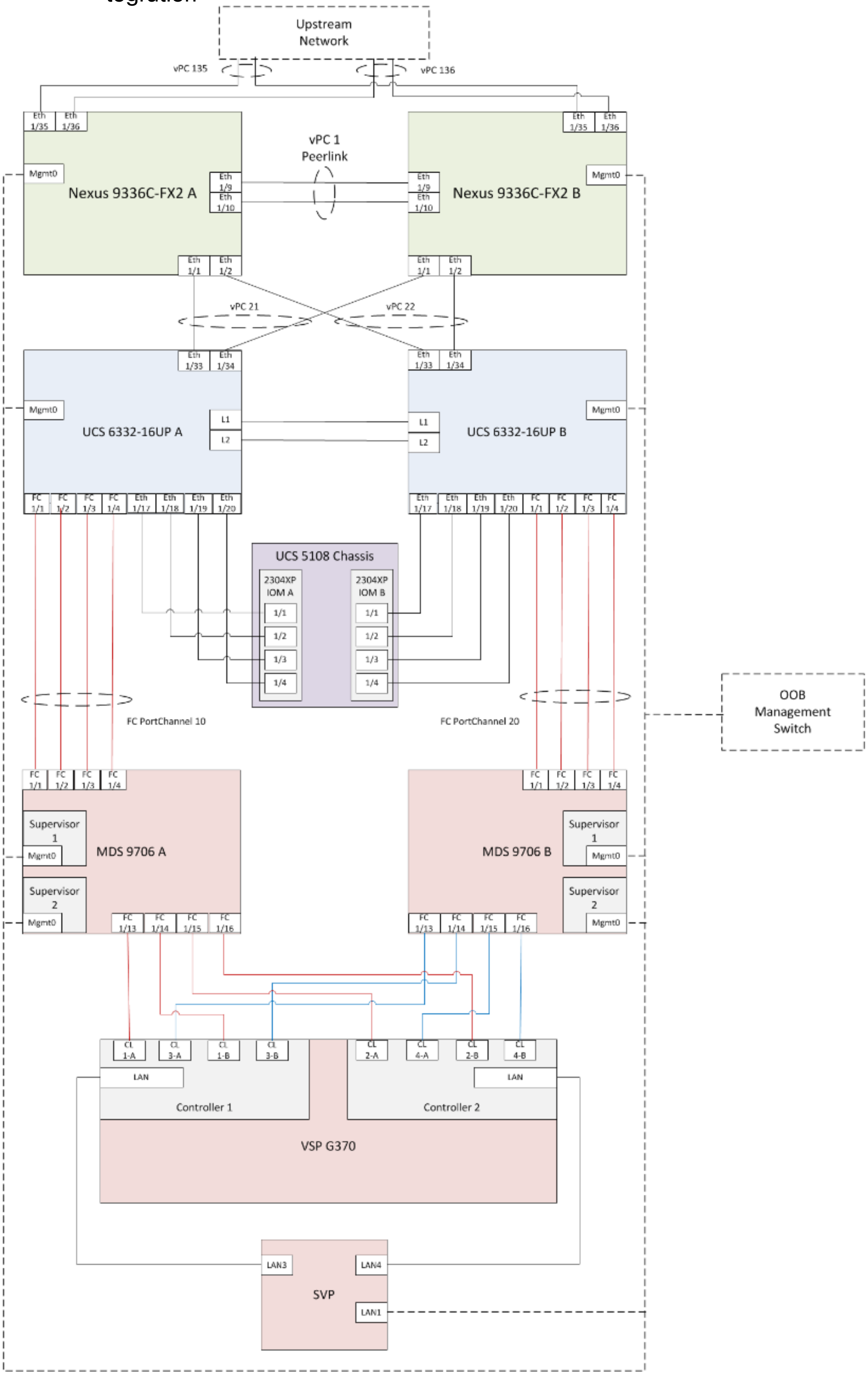


Table 3 through Table 8 provide the details of the specific port connections with the cables used in this deployment guide.

Table 3 Cisco Nexus 9336C-FX2 A Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 9336C-FX2 A	Eth1/1	40GbE	Cisco UCS fabric interconnect A	1/33
	Eth1/2	40GbE	Cisco UCS fabric interconnect B	1/33
	Eth1/9	40GbE	Nx9336C-FX2-B	1/9
	Eth1/10	40GbE	Nx9336C-FX2-B	1/10
	Eth1/31	40GbE	Cisco UCS fabric interconnect A (optional)	1/31
	Eth1/32	40GbE	Cisco UCS fabric interconnect B (optional)	1/31
	Eth1/35	40GbE	Customer Uplink Switch -A	Any
	Eth1/36	40GbE	Customer Uplink Switch -B	Any
	MGMT0	GbE	Customer Management Switch	Any

Table 4 Cisco Nexus 9336C-FX2 A Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 9336C-FX2 B	Eth1/1	40GbE	Cisco UCS fabric interconnect A	1/34
	Eth1/2	40GbE	Cisco UCS fabric interconnect B	1/34
	Eth1/9	40GbE	Nx9336C-FX2-B	1/9
	Eth1/10	40GbE	Nx9336C-FX2-B	1/10
	Eth1/31	40GbE	Cisco UCS fabric interconnect A (optional)	1/32
	Eth1/32	40GbE	Cisco UCS fabric interconnect B (optional)	1/32
	Eth1/35	40GbE	Customer Uplink Switch -A	Any
	Eth1/36	40GbE	Customer Uplink Switch -B	Any
	MGMT0	GbE	Customer Management Switch	Any

Table 5 Cisco UCS 6332-16UP A Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS 6332-	Eth1/1	FC uplink	MDS-A	1/1

Local Device	Local Port	Connection	Remote Device	Remote Port
16UP FI A	Eth1/2	FC uplink	MDS-A	1/2
	Eth1/3	FC uplink	MDS-A	1/3
	Eth1/4	FC uplink	MDS-A	1/4
	Eth1/17	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/1
	Eth1/18	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/2
	Eth1/19	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/3
	Eth1/20	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/4
	Eth1/21	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/1
	Eth1/22	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/2
	Eth1/23	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/3
	Eth1/24	40GbE	Cisco UCS 5108 Chassis 1 – IOM A	1/4
	Eth1/31	40GbE	Nx9336C-FX2-A (optional)	1/31
	Eth1/32	40GbE	Nx9336C-FX2-B (optional)	1/31
	Eth1/33	40GbE	Nx9336C-FX2-A	1/1
	Eth1/34	40GbE	Nx9336C-FX2-B	1/1
	MGMT0	GbE	Customer Management Switch	Any
	L1	GbE	Cisco UCS fabric interconnect B	L1
	L2	GbE	Cisco UCS fabric interconnect B	L2

Table 6 Cisco UCS 6332-16UP B Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS 6332-16UP FI B	Eth1/1	FC uplink	MDS-B	1/1
	Eth1/2	FC uplink	MDS-B	1/2
	Eth1/3	FC uplink	MDS-B	1/3
	Eth1/4	FC uplink	MDS-B	1/4
	Eth1/17	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/1

Local Device	Local Port	Connection	Remote Device	Remote Port
	Eth1/18	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/2
	Eth1/19	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/3
	Eth1/20	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/4
	Eth1/21	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/1
	Eth1/22	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/2
	Eth1/23	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/3
	Eth1/24	40GbE	Cisco UCS 5108 Chassis 1 – IOM B	1/4
	Eth1/31	40GbE	Nx9336C-FX2-A (optional)	1/32
	Eth1/32	40GbE	Nx9336C-FX2-B (optional)	1/32
	Eth1/33	40GbE	Nx9336C-FX2-A	1/2
	Eth1/34	40GbE	Nx9336C-FX2-B	1/2
	MGMT0	GbE	Customer Management Switch	Any
	L1	GbE	Cisco UCS fabric interconnect B	L1
	L2	GbE	Cisco UCS fabric interconnect B	L2

Table 7 Cisco MDS 9706 A Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco MDS 9706 A	Eth1/1	FC uplink	Cisco UCS fabric interconnect A	1/1
	Eth1/2	FC uplink	Cisco UCS fabric interconnect A	1/2
	Eth1/3	FC uplink	Cisco UCS fabric interconnect A	1/3
	Eth1/4	FC uplink	Cisco UCS fabric interconnect A	1/4
	Eth1/13	FC uplink	Hitachi VSP G370 – Controller 1	CL1-A
	Eth1/14	FC uplink	Hitachi VSP G370 – Controller 1	CL1-B
	Eth1/15	FC uplink	Hitachi VSP G370 – Controller 2	CL2-A
	Eth1/16	FC uplink	Hitachi VSP G370 – Controller 2	CL2-B
	MGMT0	GbE	Customer Management Switch	Any

Table 8 Cisco MDS 9706 B Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco MDS 9706 B	Eth1/1	FC uplink	Cisco UCS fabric interconnect B	1/1
	Eth1/2	FC uplink	Cisco UCS fabric interconnect B	1/2
	Eth1/3	FC uplink	Cisco UCS fabric interconnect B	1/3
	Eth1/4	FC uplink	Cisco UCS fabric interconnect B	1/4
	Eth1/13	FC uplink	Hitachi VSP G370 – Controller 1	CL3-A
	Eth1/14	FC uplink	Hitachi VSP G370 – Controller 1	CL3-B
	Eth1/15	FC uplink	Hitachi VSP G370 – Controller 2	CL4-A
	Eth1/16	FC uplink	Hitachi VSP G370 – Controller 2	CL4-B
	MGMT0	GbE	Customer Management Switch	Any

Cisco Nexus 9000 Series Switch Network Configuration

The following section provides a detailed procedure for configuring the Cisco Nexus 9000 Switches for SAP HANA environment. The Nexus switch configuration will explain the basic L2 and L3 functionality for the application environment used in the validation environment hosted by the UCS domains. The application gateways are hosted by the pair of Nexus switches, but primary routing is passed onto an existing router that is upstream of the converged infrastructure. This upstream router will need to be aware of any networks created on the Nexus switches, but configuration of an upstream router is beyond the scope of this deployment guide.

The switch configuration in this section based on cabling plan described in the Physical Cabling section. If the systems connected on different ports, configure the switches accordingly following the guidelines described in this section

The configuration steps detailed in this section provides guidance for configuring the Cisco Nexus 9000 running release 7.0(3)I7(5a) within a multi-VDC environment.

Cisco Nexus 9000 Initial Configuration

Complete this dialogue on each switch, using a serial connection to the console port of the switch, unless Power on Auto Provisioning is being used.

```
Abort Power on Auto Provisioning and continue with normal setup? (yes/no) [n]: yes
         ---- System Admin Account Setup ----


Do you want to enforce secure password standard (yes/no) [y]:

  Enter the password for "admin":
  Confirm the password for "admin":

         ---- Basic System Configuration Dialog VDC: 1 ----

This setup utility will guide you through the basic configuration of
the system. Setup configures only enough connectivity for management
of the system.

Please register Cisco Nexus9000 Family devices promptly with your
supplier. Failure to register may affect response times for initial
service calls. Nexus9000 devices must be registered to receive
entitled support services.

Press Enter at anytime to skip a dialog. Use ctrl-c at anytime
to skip the remaining dialogs.

 Would you like to enter the basic configuration dialog (yes/no): yes


  Create another login account (yes/no) [n]:

  Configure read-only SNMP community string (yes/no) [n]:

  Configure read-write SNMP community string (yes/no) [n]:
```

```
  Enter the switch name : <<var_nexus_A_hostname>>|<<var_nexus_B_hostname>>

  Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]:

    Mgmt0 IPv4 address : << var_nexus_A_mgmt_ip>>|<< var_nexus_B_mgmt_ip>>
    Mgmt0 IPv4 netmask : <<var_oob_mgmt netmask>

  Configure the default gateway? (yes/no) [y]:

    IPv4 address of the default gateway : <<var_oob_gw>>

  Configure advanced IP options? (yes/no) [n]:

  Enable the telnet service? (yes/no) [n]:

  Enable the ssh service? (yes/no) [y]:

    Type of ssh key you would like to generate (dsa/rsa) [rsa]:

    Number of rsa key bits <1024-2048> [1024]:

  Configure the ntp server? (yes/no) [n]: y

  NTP server IPv4 address: <<var_oob_ntp>>

  Configure default interface layer (L3/L2) [L2]:

  Configure default switchport interface state (shut/noshut) [noshut]: shut

  Configure CoPP system profile (strict/moderate/lenient/dense) [strict]:

The following configuration will be applied:
  password strength-check
  switchname <<var_nexus_A_hostname>>|<<var_nexus_B_hostname>>
vrf context management
ip route 0.0.0.0/0 <<var_oob_gw>>
exit
  no feature telnet
  ssh key rsa 1024 force
  feature ssh
  system default switchport
  system default switchport shutdown
  copp profile strict
interface mgmt0
ip address << var_nexus_A_mgmt_ip>>|<< var_nexus_B_mgmt_ip>> <<var_oob_mgmt netmask>
no shutdown

Would you like to edit the configuration? (yes/no) [n]:
Use this configuration and save it? (yes/no) [y]:
```

Enable Appropriate Cisco Nexus 9000 Series Switches Features and Settings

Cisco Nexus 9000 A and Cisco Nexus 9000 B

To enable the IP switching feature and set the default spanning tree behaviors, follow these steps:

1. On each Nexus 9000, enter configuration mode:

```
config terminal
```

2. Use the following commands to enable the necessary features:

```
feature udld
feature lacp
feature vpc
feature interface-vlan
feature lldp
```

3. Configure spanning tree defaults:

```
spanning-tree port type network default
spanning-tree port type edge bpduguard default
spanning-tree port type edge bpdufilter default
```

4. Save the running configuration to start-up:

```
copy run start
```

Create VLANs for SAP HANA Traffic

Cisco Nexus 9000 A and Cisco Nexus 9000 B

To create the necessary VLANs, complete the following step on both switches:

1. From the configuration mode, run the following commands:

```

vlan <<var_mgmt_vlan_id>>
name HANA-Node-Mgmt

vlan <<var_backup_vlan_id>>
name HANA-Node-Backup

vlan <<var_client_vlan_id>>
name HANA-Client

vlan <<var_appserver_vlan_id>>
name HANA-AppServer

vlan <<var_datasource_vlan_id>>
name HANA-DataSource

vlan <<var_replication_vlan_id>>
name HANA-System-Replication
```

Configure Virtual Port-Channel Domain

Cisco Nexus 9000 A

To configure vPCs for switch A, follow these steps:

1. From the global configuration mode, create a new vPC domain:

```
vpc domain <<var_nexus_vpc_domain_id>>
```

2. Make Nexus 9000A the primary vPC peer by defining a low priority value:

```
role priority 10
```

3. Use the management interfaces on the supervisors of the Nexus 9000s to establish a keepalive link:

```
peer-keepalive destination <<var_nexus_B_mgmt0_ip>>  source <<var_nexus_A_mgmt0_ip>>
```

4. Enable following features for this vPC domain:

```
peer-switch
delay restore 150
peer-gateway
auto-recovery
```

Cisco Nexus 9000 B

To configure vPCs for switch B, follow these steps:

1. From the global configuration mode, define the same vPC domain in switch B:

```
vpc domain <<var_nexus_vpc_domain_id>>
```

2. Make Cisco Nexus 9000 B the secondary vPC peer by defining a higher priority value than that of the Nexus 9000 A:

```
role priority 20
```

3. Use the management interfaces on the supervisors of the Cisco Nexus 9000s to establish a keepalive link:

```
peer-keepalive destination <<var_nexus_A_mgmt0_ip>>  source <<var_nexus_B_mgmt0_ip>>
```

4. Enable following features for this vPC domain:

```
peer-switch
delay restore 150
peer-gateway
auto-recovery
```

Configure Network Interfaces for the VPC Peer Links

Cisco Nexus 9000 A

1. Define a port description for the interfaces connecting to VPC Peer <<var_nexus_B_hostname>>.

```
interface Eth1/9
description VPC Peer <<var_nexus_B_hostname>>:1/9

interface Eth1/10
description VPC Peer <<var_nexus_B_hostname>>:1/10
```

2. Apply a port channel to both VPC Peer links and bring up the interfaces.

```
interface Eth1/9-10
channel-group 10 mode active
no shutdown
```

3. Define a description for the port-channel connecting to <<var_nexus_B_hostname>>.

```
interface Po10
description vPC peer-link
```

4. Make the port-channel a switchport, and configure a trunk to allow HANA VLANs

```
switchport
switchport mode trunk
switchport trunk allowed vlan <<var_mgmt_vlan_id>>,<<var_backup_vlan_id>>,
<<var_client_vlan_id>>, <<var_appserver_vlan_id>>, <<var_datasource_vlan_id>>,
<<var_replication_vlan_id>>
```

5. Make this port-channel the VPC peer link and bring it up.

```
spanning-tree port type network
vpc peer-link
no shutdown
```

Cisco Nexus 9000 B

1. Define a port description for the interfaces connecting to VPC peer <<var_nexus_A_hostname>>.

```
interface Eth1/9
description VPC Peer <<var_nexus_A_hostname>>:1/9

interface Eth1/10
description VPC Peer <<var_nexus_A_hostname>>:1/10
```

2. Apply a port channel to both VPC peer links and bring up the interfaces.

```
interface Eth1/35-36
channel-group 10 mode active
no shutdown
```

3. Define a description for the port-channel connecting to <<var_nexus_A_hostname>>.

```
interface Po10
description vPC peer-link
```

4. Make the port-channel a switchport and configure a trunk to allow HANA VLANs.

```
switchport
switchport mode trunk
switchport trunk allowed vlan <<var_mgmt_vlan_id>>,<<var_backup_vlan_id>>,
<<var_client_vlan_id>>, <<var_appserver_vlan_id>>, <<var_datasource_vlan_id>>,
<<var_replication_vlan_id>>
```

5. Make this port-channel the VPC peer link and bring it up.

```
spanning-tree port type network
vpc peer-link
no shutdown
```

Configure vPCs with Cisco UCS Fabric Interconnect

To configure the vPCs for use by the Client zone, Admin zone, and internal zone traffic, follow these steps:

Run on Cisco Nexus 9000 A and Cisco Nexus 9000 B

1. Define a port description for the interfaces connecting to <<var_ucs_clustername>>-A.

```
interface Eth1/1
description <<var_ucs_clustername>>-A:1/33
```

While running this on Switch B, please note the change in remote port in the description command. In the current example, it would be "description <<var_ucs_clustername>>-A:1/33" based on the connectivity details. The same can be verified from command "show cdp neighbours"

2. Apply it to a port channel and bring up the interface.

```
interface eth1/1
channel-group 21 mode active
no shutdown
```

3. Define a description for the port-channel connecting to <<var_ucs_clustername>>-A.

```
interface Po21
description <<var_ucs_clustername>>-A
```

4. Make the port-channel a switchport and configure a trunk to allow all HANA VLANs.

```
switchport
switchport mode trunk
switchport trunk allowed vlan <<var_mgmt_vlan_id>>,<<var_client_vlan_id>>,
<<var_appserver_vlan_id>>, <<var_datasource_vlan_id>>,
<<var_replication_vlan_id>>
```

5. Make the port channel and associated interfaces spanning tree edge ports.

```
spanning-tree port type edge trunk
```

6. Set the MTU to be 9216 to support jumbo frames.

```
mtu 9216
```

7. Make this a VPC port-channel and bring it up.

```
vpc 21
no shutdown
```

8. Define a port description for the interface connecting to <<var_ucs_clustername>>-B.

```
interface Eth1/2
description <<var_ucs_clustername>>-B:1/33
```

While running this on Switch B, please note the change in remote port in the description command. In the current example, it would be "description <<var_ucs_clustername>>-A:1/34" based on the connectivity details. The same can be verified from command "show cdp neighbours"

9. Apply it to a port channel and bring up the interface.

```
interface Eth1/2
channel-group 22 mode active
no shutdown
```

10. Define a description for the port-channel connecting to <<var_ucs_clustername>>-B.

```
interface port-channel22
description <<var_ucs_clustername>>-B
```

11. Make the port-channel a switchport and configure a trunk to allow all HANA VLANs.

```
switchport
switchport mode trunk
switchport trunk allowed vlan <<var_mgmt_vlan_id>>,<<var_client_vlan_id>>,
<<var_appserver_vlan_id>>, <<var_datasource_vlan_id>>,
<<var_replication_vlan_id>>
```

12. Make the port channel and associated interfaces spanning tree edge ports.

```
spanning-tree port type edge trunk
```

13. Set the MTU to be 9216 to support jumbo frames.

```
mtu 9216
```

14. Make this a VPC port-channel and bring it up.

```
vpc 22
no shutdown
```

(Optional) Configure SAP HANA Backup Networks to Use Separate vPCs

Configure additional vPCs to be used exclusively by the Backup Network. The following example configures two ports Ethernet 1/31 and Et/hernet1/32 connected to Eth1/31 and Eth1/32 on the UCS Fabric Interconnects.

Run on Cisco Nexus 9000 A and Cisco Nexus 9000 B

1. Define a port description for the interface connecting to <<var_node01>>.

```
interface Eth1/31
description <<var_ucs_clustername>>-A:1/31
```

While running this on Switch B, please note the change in remote port in the description command. In the current example, it would be "description <<var_ucs_clustername>>-A:1/31" based on the connectivity details. The same can be verified from command "show cdp neighbours"

2. Apply it to a port channel and bring up the interface.

```
interface eth1/31
channel-group 31 mode active
no shutdown
```

3. Define a description for the port-channel connecting to <<var_backup_node01>>.

```
interface Po31
description PC-from-FI-A
```

4. Make the port-channel a switchport and configure a trunk to allow NFS VLAN for DATA.

```
switchport
switchport mode trunk
switchport trunk allowed vlan <<var_backup_vlan_id>>
```

5. Make the port channel and associated interfaces spanning tree edge ports.

```
spanning-tree port type edge trunk
```

6. Set the MTU to be 9216 to support jumbo frames.

```
mtu 9216
```

7. Make this a VPC port-channel and bring it up.

```
vpc 31
no shutdown
```

8. Define a port description for the interface connecting to <<var_node02>>.

```
interface Eth1/32
description <<var_ucs_clustername>>-B:1/31
```

While running this on Switch B, please note the change in remote port in the description command. In the current example, it would be "description <<var_ucs_clustername>>-B:1/31" based on the connectivity details. The same can be verified with the command `show cdp neighbours`.

9. Apply it to a port channel and bring up the interface.

```
channel-group 32 mode active
no shutdown
```

10. Define a description for the port-channel connecting to <<var_node02>>.

```
interface Po32
description PC-from-FI-B
```

11. Make the port-channel a switchport, and configure a trunk to allow NFS VLAN for DATA

```
switchport
switchport mode trunk
switchport trunk allowed vlan <<var_backup_vlan_id>>
```

12. Make the port channel and associated interfaces spanning tree edge ports.

```
spanning-tree port type edge trunk
```

13. Set the MTU to be 9216 to support jumbo frames.

```
mtu 9216
```

14. Make this a VPC port-channel and bring it up.

```
vpc 32
no shutdown
```

Make sure to save the configuration to the startup config using the command `copy running-config startup-config`.

Set Global NTP Configurations

Run the following commands on both switches to set global configurations:

```
ntp server <<var_oob_ntp>> use-vrf management
```

The ntp server should be an accessible NTP server for use by the switches. In this case, point to an out-of-band source.

```
ntp master 3
ntp source <<var_nexus_ib_vip>>
```

Setting the switches as ntp masters to redistribute as an ntp source is optional here, but can be a valuable fix if the tenant networks are not enabled to reach the primary ntp server.

*** Save all configurations to this point on both Nexus Switches ***

```
copy running-config startup-config
```

Configuration of Hitachi Storage

A Hitachi Virtual Storage Platform F/G series specialist must install Hitachi Virtual Storage Platform G370. The initial configuration for VSP G370 is done in the Hitachi Distribution Centers.

If IP addresses of the SVP are not known at build time in the distribution center, they will be set to a default value and need change onsite by the Hitachi storage specialist.

Storage Architecture Overview

Each SAP HANA node needs the following storage layout:

- Operating system (OS) volume
- SAP HANA shared volume
- SAP HANA log volume
- SAP HANA data volume

This SAP HANA TDI setup utilizes the following two dynamic provisioning pools created with Hitachi Dynamic Provisioning for the storage layout. This ensures maximum utilization and optimization at a lower cost than other solutions.

- OS_SH_DT_Pool for the following:
  - OS volume
  - SAP HANA shared volume
  - SAP HANA data volume
- LOG_Pool for the following:
  - SAP HANA log volume

The validated dynamic provisioning pool layout options with minimal disks and storage cache on Hitachi Virtual Storage Platform F350, VSP G350, F370, VSP G370, VSP F700, VSP G700, VSP F900 and VSP G900 storage are listed in Table 9 .

Table 9 Dynamic Provisioning Pools with Disks and Storage Cache

Storage	Cache	Nodes Number	Number of Parity Groups in OS_SH_DT_Pool	Number of Parity Groups in LOG_Pool
			RAID-10 (2D+2D)	RAID-10 (2D+2D)
VSP F350, VSP G350, VSP F370, VSP G370 (with SSD)	VSP F350, VSP G350: 128 GB VSP F370, VSP G370: 256GB	up to 8	1	1
		up to 15	2	2
		up to 16	3	3
VSP F700, VSP G700 (with SSD)	512 GB	up to 11	1	1
		up to 20	2	2

Storage	Cache	Nodes Number	Number of Parity Groups in OS_SH_DT_Pool	Number of Parity Groups in LOG_Pool
			RAID-10 (2D+2D)	RAID-10 (2D+2D)
		up to 28	3	3
		up to 30	4	4
		up to 32	4	5
VSP F900, VSP G900 (with SSD)	1024GB	up to 17	1	1
		up to 23	2	2
		up to 31	3	3
		up to 32	4	3

Additional parity groups of the same type may need to be added. Drive boxes may be needed if the internal drives on storage are not sufficient, depending on the following:

- The various combinations of node sizes
- The number of nodes to meet the capacity requirements

While it is not limited to these systems, this SAP HANA tailored data center integration solution uses the following four active SAP HANA systems, as examples:

- System 1 – 384 GB
- System 2 – 768 GB
- System 3 – 1536 GB
- System 4 – 3072 GB

Provision the storage for the four SAP HANA systems listed above:

- Determine the minimum sizes for operating system, data, log, and HANA shared using these formulas in SAP white pager SAP HANA Storage Requirements as following:
  - Every HANA node requires approximately 100 GB capacity for the operating system.
  - /hana/shared size uses formulas:
    - Single node (scale-up) – Size = MIN (1 × RAM; 1 TB)
    - Multi-node (scale-out) – Size = 1 × RAM of every 4 worker nodes
  - Data size requires at least 1 × RAM of each HANA node
  - Log size uses formulas:
    - Systems with equal or less than 512 GB memory – Size = 1/2 × RAM
    - Systems with greater than 512 GB memory – Size = 512 GB
- Provision the storage:
  - Create two dynamic provisioning pools for the three SAP HANA systems on storage:

- Use OS_SH_DT_Pool to provision the operating system volume, SAP HANA shared volume, and Data volume.
- Use LOG_Pool to provision the Log volume.

– For SSDs, create the parity groups first, as the example shown in Table 10 for Hitachi Virtual Storage Platform G370, using the RAID-10 storage design

Table 10 Dynamic Provisioning Pool with RAID10(2D+2D) for 16 Nodes on VSP F370 and G370 with SSDs

Dynamic Provisioning Pool	Parity Group ID	Parity Group RAID Level and Disks	LDEV ID	LDEV Name	LDEV Size	MPU Assignment
OS_SH_DT_Pool	1	RAID-10 (2D+2D) on 1.9 TB SSD	00:00:01	OS_SH_DT_DPVOL_1	878 GB	MPU-10
			00:00:02	OS_SH_DT_DPVOL_2	878 GB	MPU-20
			00:00:03	OS_SH_DT_DPVOL_3	878 GB	MPU-10
			00:00:04	OS_SH_DT_DPVOL_4	878 GB	MPU-20
	2	RAID-10 (2D+2D) on 1.9 TB SSD	00:00:05	OS_SH_DT_DPVOL_5	878 GB	MPU-10
			00:00:06	OS_SH_DT_DPVOL_6	878 GB	MPU-20
			00:00:07	OS_SH_DT_DPVOL_7	878 GB	MPU-10
			00:00:08	OS_SH_DT_DPVOL_8	878 GB	MPU-20
	3	RAID-10 (2D+2D) on 1.9 TB SSD	00:00:09	OS_SH_DT_DPVOL_9	878 GB	MPU-10
			00:00:10	OS_SH_DT_DPVOL_10	878 GB	MPU-20
			00:00:11	OS_SH_DT_DPVOL_11	878 GB	MPU-10
			00:00:12	OS_SH_DT_DPVOL_12	878 GB	MPU-20
LOG_Pool	4	RAID-10 (2D+2D) on 1.9 TB SSD	00:00:13	LG_DPVOL_1	878 GB	MPU-10
			00:00:14	LG_DPVOL_2	878 GB	MPU-20
			00:00:15	LG_DPVOL_3	878 GB	MPU-10
			00:00:16	LG_DPVOL_4	878 GB	MPU-20
	5	RAID-10 (2D+2D) on 1.9 TB SSD	00:00:17	LG_DPVOL_5	878 GB	MPU-10
			00:00:18	LG_DPVOL_6	878 GB	MPU-20
			00:00:19	LG_DPVOL_7	878 GB	MPU-10
			00:00:20	LG_DPVOL_8	878 GB	MPU-20
	6	RAID-10 (2D+2D) on 1.9 TB SSD	00:00:21	LG_DPVOL_9	878 GB	MPU-10
			00:00:22	LG_DPVOL_10	878 GB	MPU-20
			00:00:23	LG_DPVOL_11	878 GB	MPU-10
			00:00:24	LG_DPVOL_12	878 GB	MPU-20

- Assign all LDEVs to the dedicated pool for VSP G370.

- Create virtual volumes (VVOLs) for the operating system, SAP HANA shared, log, and data volumes. Table 11 shows examples for HANA systems with memory of 384 GB, 768 GB, 1536 GB, and 3072 GB.

Table 11 VVOLs for SAP HANA Nodes for Four Memory Sizes of HANA Systems

Dynamic Provisioning Pool	VVOL ID	VVOL Name	VVOL Size	MPU Assignment	System Memory
OS_SH_DT_Pool	00:01:00	HANA_OS_N1	100 GB	MPU-10	384 GB
	00:02:00	HANA_OS_N2	100 GB	MPU-20	768 GB
	00:03:00	HANA_OS_N3	100 GB	MPU-10	1536 GB
	00:04:00	HANA_OS_N4	100 GB	MPU-20	3072 GB
	00:01:01	HANA_SH_N1	384 GB	MPU-10	384 GB
	00:02:01	HANA_SH_N2	768 GB	MPU-20	768 GB
	00:03:01	HANA_SH_N3	1536 GB	MPU-10	1536 GB
	00:04:01	HANA_SH_N4	3072 GB	MPU-20	3072 GB
	00:01:06	HANA_DATA_N1_1	96 GB	MPU-10	384 GB
	00:01:07	HANA_DATA_N1_2	96 GB	MPU-20	
	00:01:08	HANA_DATA_N1_3	96 GB	MPU-10	
	00:01:09	HANA_DATA_N1_4	96 GB	MPU-20	
	00:02:06	HANA_DATA_N2_1	192 GB	MPU-10	768 GB
	00:02:07	HANA_DATA_N2_2	192 GB	MPU-20	
	00:02:08	HANA_DATA_N2_3	192 GB	MPU-10	
	00:02:09	HANA_DATA_N2_4	192 GB	MPU-20	
	00:03:06	HANA_DATA_N3_1	384 GB	MPU-10	1536 GB
	00:03:07	HANA_DATA_N3_2	384 GB	MPU-20	
	00:03:08	HANA_DATA_N3_3	384 GB	MPU-10	
	00:03:09	HANA_DATA_N3_4	384 GB	MPU-20	
	00:04:06	HANA_DATA_N4_1	768 GB	MPU-10	3072 GB
	00:04:07	HANA_DATA_N4_2	768 GB	MPU-20	
	00:04:08	HANA_DATA_N4_3	768 GB	MPU-10	
	00:04:09	HANA_DATA_N4_4	768 GB	MPU-20	
LOG_Pool	00:01:02	HANA_LOG_N1_1	48 GB	MPU-10	384 GB
	00:01:03	HANA_LOG_N1_2	48 GB	MPU-20	
	00:01:04	HANA_LOG_N1_3	48 GB	MPU-10	

Dynamic Provisioning Pool	VVOL ID	VVOL Name	VVOL Size	MPU Assignment	System Memory
	00:01:05	HANA_LOG_N1_4	48 GB	MPU-20	
	00:02:02	HANA_LOG_N2_1	96 GB	MPU-10	768 GB
	00:02:03	HANA_LOG_N2_2	96 GB	MPU-20	
	00:02:04	HANA_LOG_N2_3	96 GB	MPU-10	
	00:02:05	HANA_LOG_N2_4	96 GB	MPU-20	
	00:03:02	HANA_LOG_N3_1	128 GB	MPU-10	1536 GB
	00:03:03	HANA_LOG_N3_2	128 GB	MPU-20	
	00:03:04	HANA_LOG_N3_3	128 GB	MPU-10	
	00:03:05	HANA_LOG_N3_4	128 GB	MPU-20	
	00:04:02	HANA_LOG_N4_1	128 GB	MPU-10	3072 GB
	00:04:03	HANA_LOG_N4_2	128 GB	MPU-20	
	00:04:04	HANA_LOG_N4_3	128 GB	MPU-10	
	00:04:05	HANA_LOG_N4_4	128 GB	MPU-20	

While mapping the LUN path assignment for each node, add VVOLs in the following order:

1. The operating system volume
2. The SAP HANA shared volume
3. The log volume
4. The data volume

Table 12 lists an example configuration of the LUN path assignment for Node 1. Configure the LUN assignment similarly for all other nodes.

Table 12 Example LUN Path Assignment for the SAP HANA Configuration on Node 1

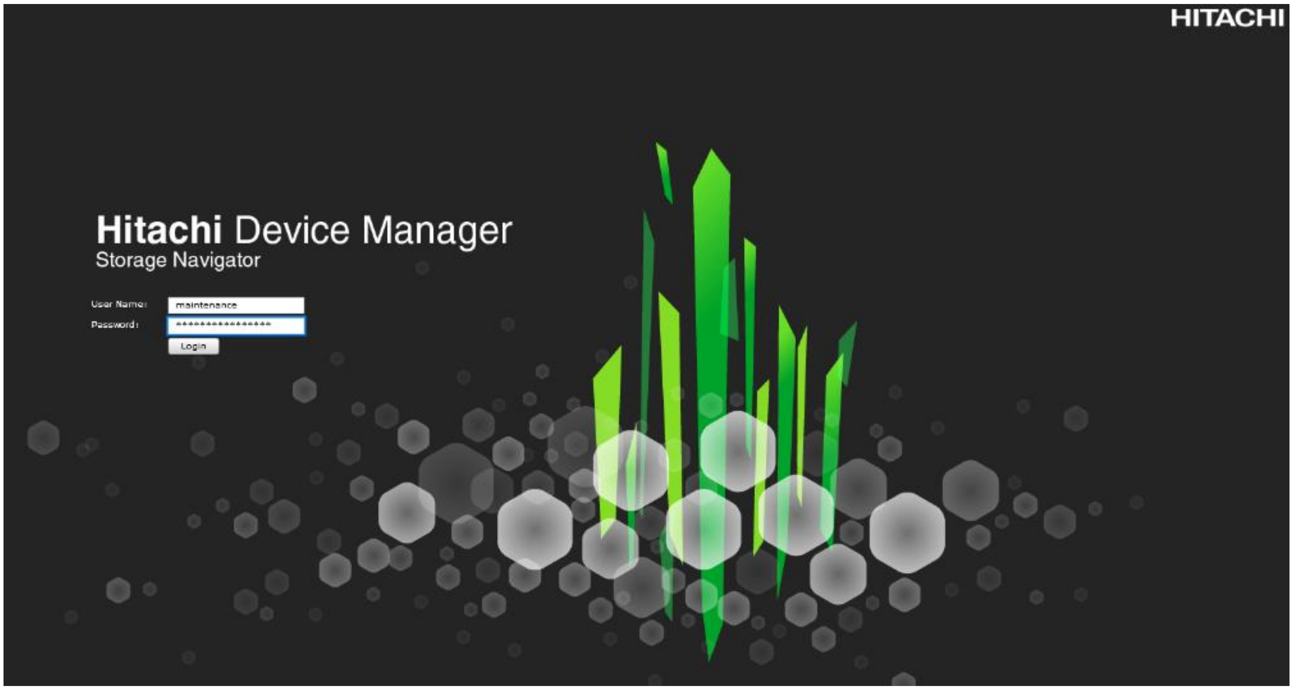
LUN ID	LDEV ID	LDEV Name
0000	00:01:00	HANA_OS_N1
0001	00:01:01	HANA_SH_N1
0002	00:01:02	HANA_LOG_N1_1
0003	00:01:03	HANA_LOG_N1_2
0004	00:01:04	HANA_LOG_N1_3
0005	00:01:05	HANA_LOG_N1_4
0006	00:01:06	HANA_DATA_N1_1
0007	00:01:07	HANA_DATA_N1_2

LUN ID	LDEV ID	LDEV Name
0008	00:01:08	HANA_DATA_N1_3
0009	00:01:09	HANA_DATA_N1_4

Log into Storage Navigator

After installing the VSP G370 onsite and running all necessary cable connections and powering up the VSP G370, open Hitachi Storage Navigator to start the configuration:

1. Access Hitachi Storage Navigator through a web browser.
2. https://<IP of Storage System SVP>/dev/storage/886000<Serial Number of Storage System>/emergency.do – for example, if Storage System SVP IP address is 192.168.50.21 and Serial Number of Storage System is 456789, the URL would be: https://192.168.50.21/dev/storage/836000456789/emergency.do
3. Log into Hitachi Storage Navigator.



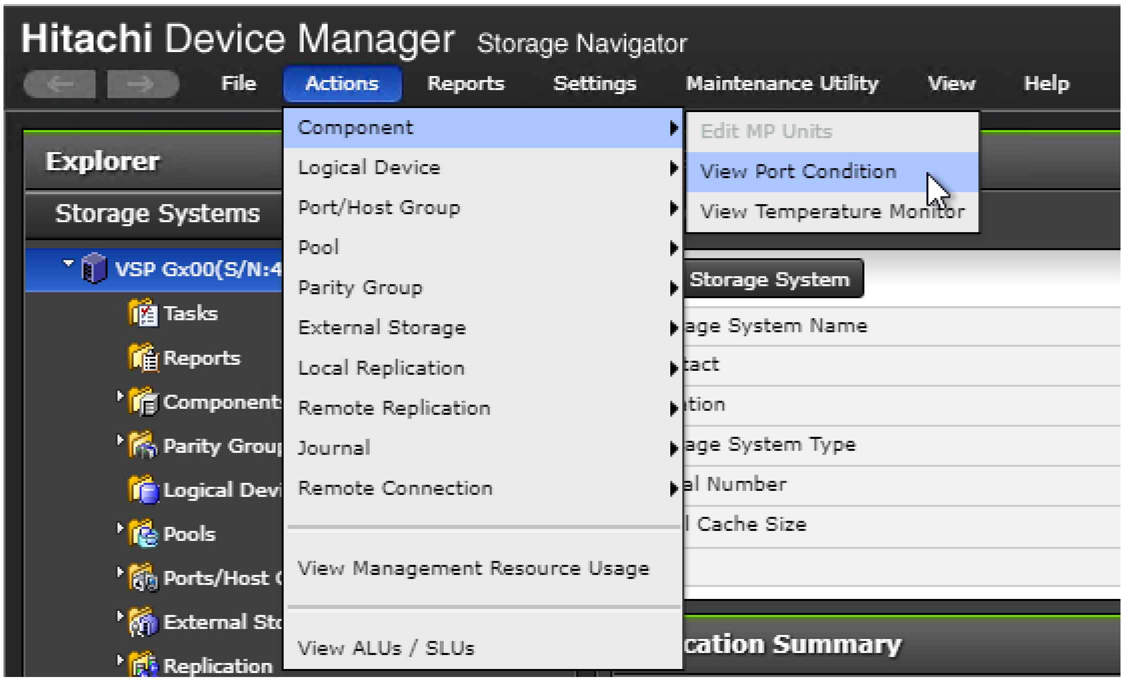
User Name: maintenance
Password: ****************

Check SFP Data Transfer Rate

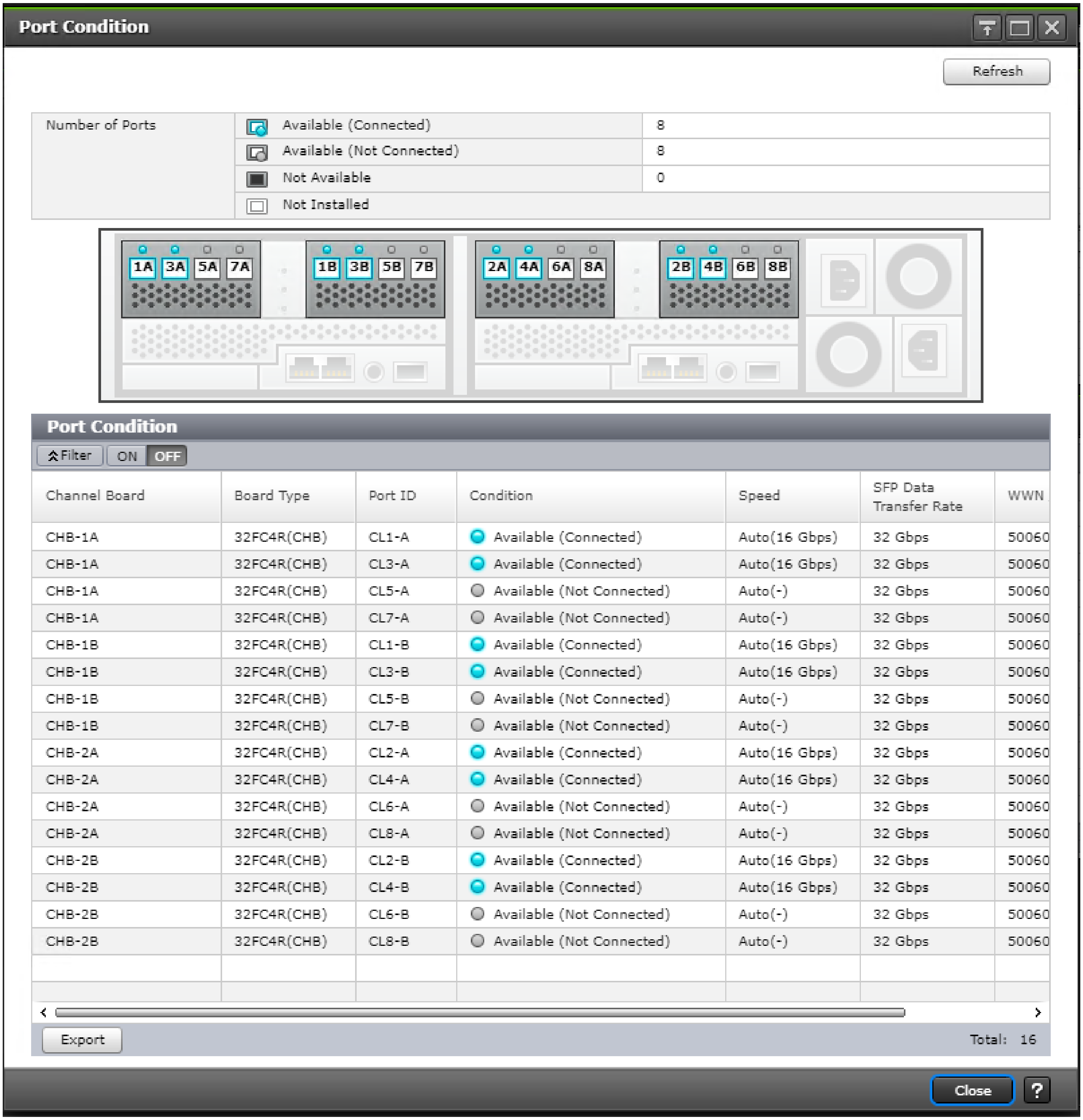
When you first log in prior to starting the configuration of the storage, navigate to Port Condition to check the SFP Data Transfer Rate.

To check the SFP data transfer rate, follow these steps:

1. In the Storage Navigator window click Actions, Components and then View Port Condition.



The Port Condition window opens.



Number of Ports	Available (Connected)	8
	Available (Not Connected)	8
	Not Available	0
	Not Installed	

Channel Board	Board Type	Port ID	Condition	Speed	SFP Data Transfer Rate	WWN
CHB-1A	32FC4R(CHB)	CL1-A	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-1A	32FC4R(CHB)	CL3-A	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-1A	32FC4R(CHB)	CL5-A	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-1A	32FC4R(CHB)	CL7-A	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-1B	32FC4R(CHB)	CL1-B	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-1B	32FC4R(CHB)	CL3-B	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-1B	32FC4R(CHB)	CL5-B	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-1B	32FC4R(CHB)	CL7-B	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-2A	32FC4R(CHB)	CL2-A	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-2A	32FC4R(CHB)	CL4-A	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-2A	32FC4R(CHB)	CL6-A	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-2A	32FC4R(CHB)	CL8-A	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-2B	32FC4R(CHB)	CL2-B	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-2B	32FC4R(CHB)	CL4-B	● Available (Connected)	Auto(16 Gbps)	32 Gbps	50060
CHB-2B	32FC4R(CHB)	CL6-B	○ Available (Not Connected)	Auto(-)	32 Gbps	50060
CHB-2B	32FC4R(CHB)	CL8-B	○ Available (Not Connected)	Auto(-)	32 Gbps	50060

Total: 16

2. Make sure the transfer rate in the SFP Data Transfer Rate matches the speed of the SFPs in the storage controller. The actual Speed can differ, depending on the configuration of the other components.

3. Click Close to close the Port Condition window and start with the storage configuration.

Create Pool Volumes

This procedure creates the Parity Groups and LDEVs using Hitachi Storage Navigator for the following:

- Operating System LUNs
- SAP HANA Shared LUNs
- SAP HANA Log LUNs
- SAP HANA Data LUNs

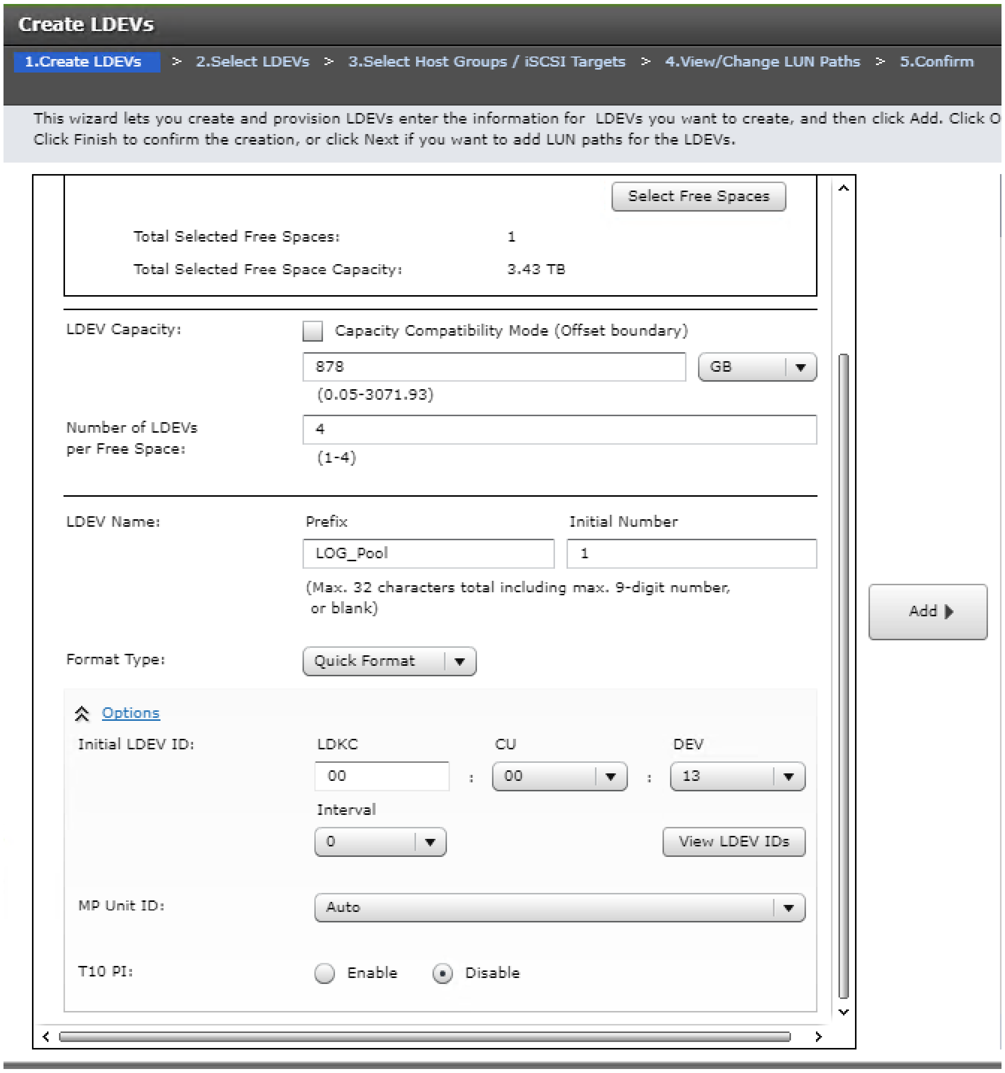
Use the storage navigator session from the previous section. Repeat these steps to create all the required pool volumes.

To create a pool volume, follow these steps:

1. Open the LDEV creation window.
2. In the General Tasks pane, click Create LDEVs. The 1 Create LDEVs dialog box opens.
3. Create Pool Volume LUN:
   a. Create an LDEV.
   b. Enter the values shown in Table 13 into the Create LDEVs dialog box.

Table 13 Pool Volume Creation for LOG_Pool and OS_SH_DT_Pool

For This	Enter This
Provisioning Type	Click Basic
Drive Type/RPM	Click SSD
RAID Level	Click 1 (2D+2P)
Select Free Spaces	Click the option
Parity Group	Select the 1 (2D+2P) Parity Group
LDEV Capacity	Type value 878 GB
Number of LDEVs per Free Space	Type 4 for each RAID group
LDEV Name area	Type the pool name as prefix and the next free number as int number, i.e. 1 for the first RAID group, 5 for the second etc.
Options area	In the LDKC:CU:DEV text box, type the initial as shown in the LDEV ID column of Table 12
	In the MPU assignment text box, select Auto


Create LDEVs
1.Create LDEVs > 2.Select LDEVs > 3.Select Host Groups / iSCSI Targets > 4.View/Change LUN Paths > 5.Confirm
Select Free Spaces
Options
View LDEV IDs
Add

This wizard lets you create and provision LDEVs enter the information for LDEVs you want to create, and then click Add. Click O
Click Finish to confirm the creation, or click Next if you want to add LUN paths for the LDEVs.

Total Selected Free Spaces: 1

Total Selected Free Space Capacity: 3.43 TB

LDEV Capacity: □ Capacity Compatibility Mode (Offset boundary)
878 GB
(0.05-3071.93)

Number of LDEVs per Free Space: 4
(1-4)

LDEV Name: Prefix: LOG_Pool Initial Number: 1
(Max. 32 characters total including max. 9-digit number, or blank)

Format Type: Quick Format

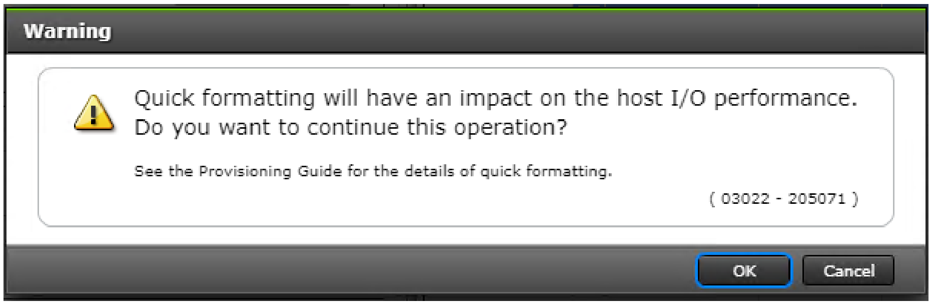
Initial LDEV ID: LDKC: 00 : CU: 00 : DEV: 13
Interval: 0

MP Unit ID: Auto

T10 PI: ○ Enable ● Disable

4. Click Add and then click Finish.

5. Acknowledge the Warning by clicking OK.



Quick formatting will have an impact on the host I/O performance.
Do you want to continue this operation?

See the Provisioning Guide for the details of quick formatting.

(03022 - 205071)

The Confirm window opens.

6. Confirm the selection again, and then click Apply.

7. Record the task name for later reference.

8. Repeat steps 1-7 to create every pool volume required by this installation.

9. Keep the Storage Navigator session open to Create Dynamic Provisioning Pools.

Create Dynamic Provisioning Pools

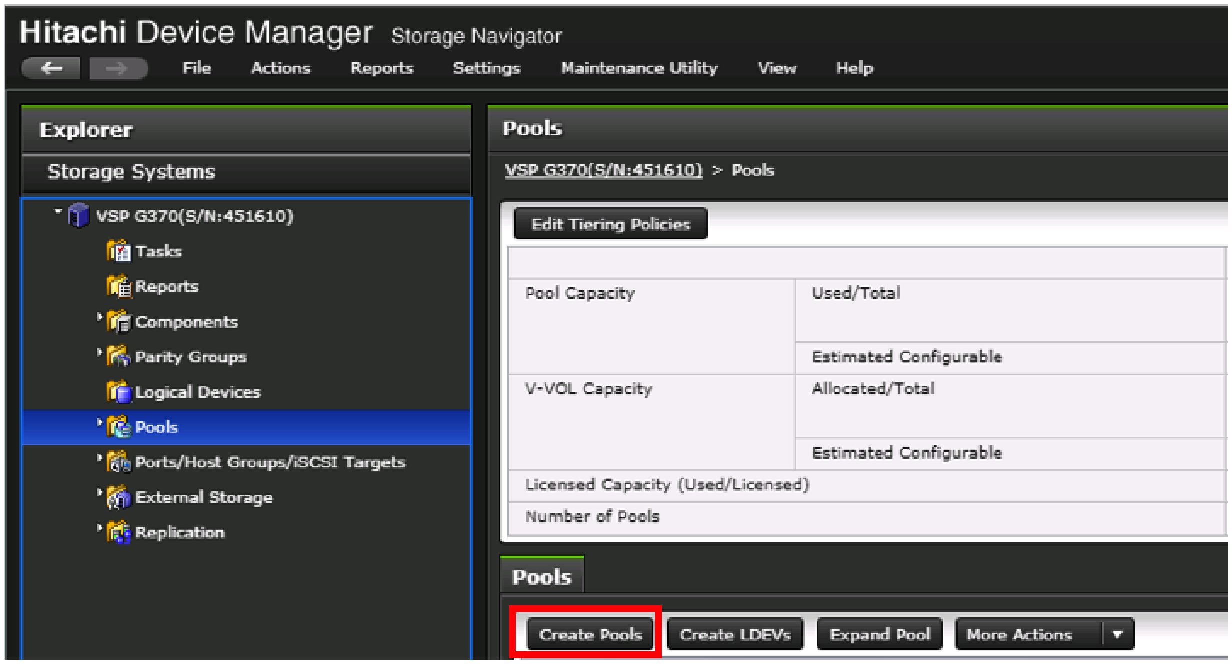
Use the Storage Navigator session from previous procedure to perform this procedure to create dynamic provisioning pools. This solution uses two dynamic provisioning pools:

- LOG_Pool
- OS_SH_DT_Pool

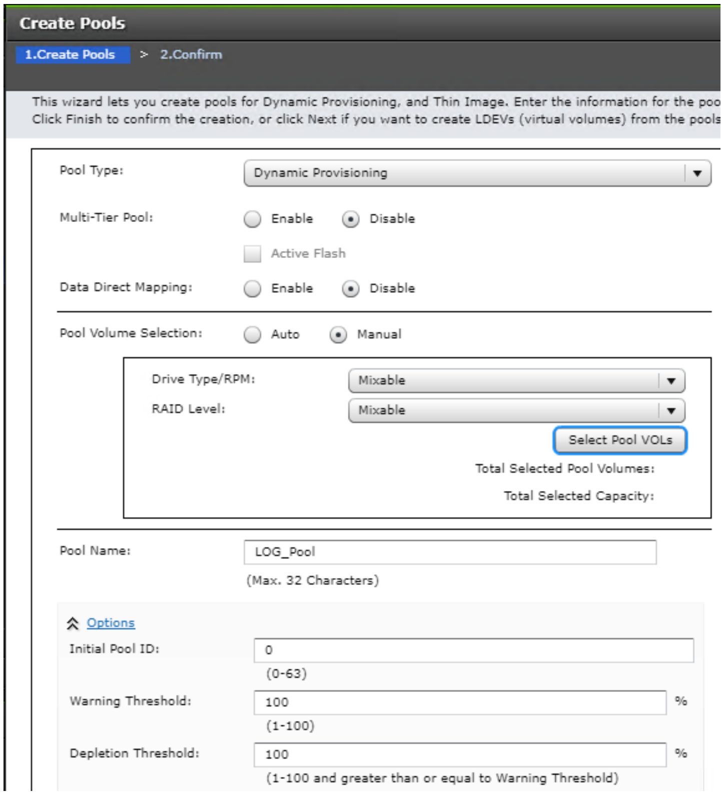
Follow the steps in this section to create the LOG_Pool and repeat these steps to create the OS_SH_DT_Pool.

To create a dynamic provisioning pool, follow these steps:

1. From Pools, click Create Pools to open the 1. Create Pools window.



2. Enter the values shown in Table 6 in the Create Pools dialog box.



Create Pools

1.Create Pools > 2.Confirm

This wizard lets you create pools for Dynamic Provisioning, and Thin Image. Enter the information for the poo
Click Finish to confirm the creation, or click Next if you want to create LDEVs (virtual volumes) from the pools

Pool Type: Dynamic Provisioning

Multi-Tier Pool: ○ Enable ● Disable

□ Active Flash

Data Direct Mapping: ○ Enable ● Disable

Pool Volume Selection: ○ Auto ● Manual

Drive Type/RPM: Mixable

RAID Level: Mixable

Select Pool VOLs

Total Selected Pool Volumes:

Total Selected Capacity:

Pool Name: LOG_Pool

(Max. 32 Characters)

Options

Initial Pool ID: 0

(0-63)

Warning Threshold: 100 %

(1-100)

Depletion Threshold: 100 %

(1-100 and greater than or equal to Warning Threshold)

Table 14 Dynamic Provisioning Pool Creation: LOG_Pool and OS_SH_DT_Pool

For This	Enter This
Pool Type	Select Dynamic Provisioning
Multi-Tier Pool	Disabled
Data Direct Mapping	Disabled
Pool Volume Selection	Click Manual
Pool Name	LOG_Pool or OS_SH_DT_Pool
Initial Pool ID	Type **0** for LOG_Pool or type **1** for OS_SH_DT_Pool
Warning Threshold	100
Deletion Threshold	100

3. Select the pool volumes for the pool.

4. Click Select Pool VOLs.

5. Select the volumes.

   – For LOG_Pool, identify the pool volumes for the pool and select them. Click Add.

   – For OS_SH_DT_Pool, identify the pool volumes for the pool and select them. Click Add.

6. Click OK.

7. Click Add.

8. Click Finish on the 2. Confirm window.

9. Click Apply.

Provision the LUNS (Virtual Volumes)

Follow the storage configuration outlined below for this solution. Do not make any changes to these instructions in the Distribution Center. SAP does not support any changes made to this exact configuration.

This procedure creates the LDEVs using Hitachi Storage Navigator for the following:

- Operating system LUNS
- SAP HANA shared LUNS
- Log LUNs
- Data LUNs

Assign each of the LUNs to specific MPU for optimal performance, map to LUN paths using specific LUN ID in sequence as listed Table 12

Create Virtual Volumes for the Operating System LUNS and Map Ports

Use Hitachi Storage Navigator to create the operating system LDEV and map it to specified Hitachi Virtual Storage Platform Fx00 or Gx00 ports.

To create LDEVs for the operating system boot LUN, follow these steps:

1. From Pools, click OS_SH_DT_Pool.

2. In the Virtual Volumes pane, click Create LDEVs. The 1 Create LDEVs dialog box opens.

3. Create operating system boot LUNS.

4. Create one operating system LUN per HANA node and assign it to the ports following Table 11 . Repeat this step until all operating LUNS are completed.

5. Create an LDEV.

6. Enter the values shown in Table 15 in the Create LDEVs dialog box.

Table 15 LDEV Creation Values for Operating System LUN

For This	Enter This
Provisioning Type	Click Dynamic Provisioning
Drive Type/RPM	Click SSD/-
RAID Level	Click 1 (2D+2P)
Select Pool	OS_SH_DT_Pool

LDEV Capacity	Type 100 GB
Number of LDEVs per Free Space	Type the node number to be added to the name. For example, type: **1**
LDEV Name area	Type the Prefix for the LUN name: HANA_OS_N
	Type the node number to be added to the name. For example, type the following: 1
Full Allocation	Enabled
Options area	Type or click the values for LDKC, CU and DEV according to the VVOL ID column of Table 3 . For example, click the following: 00:01:00
	Select the value Auto for the MPU Unit ID.

7. Click Add and then click Next.

The 2 Select LDEV window displays all configured LDEVs in the right pane.

8. Select the host ports.

9. Click Next on the 2 Select LDEVs window. The 3 Select Host Groups/iSCSI Targets window opens.

10. From the Available Host Groups pane, select the OS LUN ports by referring to Table 11

11. Click Add.

12. The selected ports that were in the Available Hosts Groups pane are now in the Selected Host Groups pane.

13. Click Next.

14. The 4 View/Change LUN Paths window displays.

15. Confirm the selected ports.

The operating system LUN always has a LUN ID of 000.

16. Confirm the selected ports and adjust the LUN ID as listed in Table 4

17. Click Finish.

The 5 Confirm window opens.

18. Confirm the selection again and then click Apply.

19. Record the task name for later reference

20. Keep the Storage Navigator session open for Create Virtual Volumes for HANA Shared File System and Map Ports.

Create Virtual Volumes for HANA Shared File System and Map Ports

Use Hitachi Storage Navigator to create the HANA shared virtual volumes under dynamic provisioning pool OS_SH_DT_Pool and then map them to specified storage ports.

Repeat this procedure until you create all of the virtual volumes.

To create a virtual volume for the HANA-shared file system and map ports, follow these steps:

1. From Pools, click OS_SH_DT_Pool.
2. Enter the values shown in Table 16 in the Create LDEVs dialog box.

Table 16 Virtual Volume Creation for HANA Shared LUNs

For This	Enter This
Provisioning Type	Click Dynamic Provisioning
Drive Type/RPM	Leave at SSD/-
RAID Level	Leave at 1 (2D+2P)
Select Pool	OS_SH_DT_Pool
LDEV Capacity	Type the required volume size for /hana/shared volume in GB. This is equal or greater the memory size of the HANA node.
Number of LDEVs	Type **1**
Full Allocation	Click Enabled
LDEV Name area	For LDEV Name Prefix, type the HANA Shared LUN LDEV name: HANA_SH_N
	Type the node number to be added to the name. For example, type: **1**
Options area	Type or click the values for LDK:CU:DEV according to the VVOL ID column of Table 3 For example, click the following: 00:01:01
	Click Auto for MP Unit ID of the MPU assignment.

3. Keep the Storage Navigator session open for Create Virtual Volumes for Log LUNs and Map Ports.

Create Virtual Volumes for Log LUNs and Map Ports

This procedure creates and maps LDEVs to the specified storage ports for the log LUNs.

Use the Hitachi Storage Navigator session previously started.

To provision the LDEVs for log LUNs, follow the steps from the previous section with the following changes:

1. From Pools, click LOG_Pool.
2. Enter the values shown in Table 17 in the Create LDEVs dialog box.

Table 17 LDEV Creation Values for Log LUN

For This	Enter This
Provisioning Type	Click Dynamic Provisioning
Drive Type/RPM	Click SSD/-
RAID Level	Click 1 (2D+2P)
Select Pool	LOG_Pool
LDEV Capacity	Type the required volume size divided by 4 in GB. For example, if a 512 GB log volume is needed, type 128 GB
Number of LDEVs per Free Space	Type 4
Full Allocation	Click Enabled
LDEV Name area	For LDEV Name Prefix, type the HANA Log LDEV name for this node: For example: HANA_LOG_N1_
	For Initial Number, type the HANA Log LDEV. For example, type the following: 1
Options area	Type or click the values for LDKC, CU and DEV in LDKC:CU:DEV according to the VVOL ID column of Table 3 For example, click the following: 00:01:02
	Click the value for the MPU Unit ID. For example, click the following: MPU10

3. Keep the Storage Navigator session open for Create Virtual Volumes for Data LUNs and Map Ports.

Create Virtual Volumes for Data LUNs and Map Ports

This procedure creates and maps LDEVs to the specified Hitachi Virtual Storage Platform F370/G370 ports for the Data LUNs.

Use the previously-opened Hitachi Storage Navigator session.

To provision the LDEVs for Data LUNs, follow the steps of the previous sections.

To create virtual volumes for data LUNs and map ports, follow these steps:

1. From Pools, click OS_SH_DT_Pool.

2. Enter the values shown in Table 10 in the Create LDEVs dialog box.

Table 18 LDEV Creation Values for Data LUN

For This	Enter This
Provisioning Type	Click Dynamic Provisioning
Drive Type/RPM	Click SSD/-
RAID Level	Click 1 (2D+2P)
Select Pool	OS_SH_DT_Pool

For This	Enter This
LDEV Capacity	Type the required volume size divided by 4 in GB. For example, if a 4096 GB data volume is needed, type 1024 GB.
Number of LDEVs per Free Space	Type 4
Full Allocation	Enabled
LDEV Name area	For LDEV Name Prefix, type the HANA Data LDEV name: HANA_DT_VVOL_N
	For Initial Number, type the HANA node number. For example, type the following: 1
Options area	Type or click the values for LDKC, CU and DEV in LDKC:CU:DEV according to the VVOL ID column of Table 11 . For example, click the following: 00:01:06
	Click the value for the MPU Unit ID. For example, click the following: MPU10

3. Keep the Storage Navigator session open for the Configure the Host Groups procedure.

Storage Port Configuration

The following table lists the configuration and port mapping for Hitachi VSP Fx00 and Gx00 models.

Table 19 Storage Port Mapping for Validated SAP HANA Nodes using SSDs

SAP HANA Node	HBA Port		Fiber Channel Switch Port Name		Virtual Storage Platform Target Port-Host Group				
	Port Name	Port Speed	Host	Storage	VSP F/G370	VSP F/G700	VSP F/G900	Port Speed	Port Security
Node1	Port 0	16 Gb/s	SW-1-P0	SW-1-P32	1A-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P0	SW-2-P32	2A-Host Group 1			32 Gb/s	Enabled
Node2	Port 0	16 Gb/s	SW-1-P1	SW-1-P32	1A-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P1	SW-2-P32	2A-Host Group 2			32 Gb/s	Enabled
Node3	Port 0	16 Gb/s	SW-1-P2	SW-1-P33	3A-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P2	SW-2-P33	4A-Host Group 1			32 Gb/s	Enabled
Node4	Port 0	16 Gb/s	SW-1-P3	SW-1-P33	3A-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P3	SW-2-P33	4A-Host Group 2			32 Gb/s	Enabled
Node5	Port 0	16 Gb/s	SW-1-P4	SW-1-	5A-Host Group 1			32 Gb/s	Enabled

SAP HANA Node	HBA Port		Fiber Channel Switch Port Name		Virtual Storage Platform Target Port-Host Group				
	Port Name	Port Speed	Host	Storage	VSP F/G370	VSP F/G700	VSP F/G900	Port Speed	Port Security
				P34					
	Port 1	16 Gb/s	SW-2-P4	SW-2-P34	6A-Host Group 1			32 Gb/s	Enabled
Node6	Port 0	16 Gb/s	SW-1-P5	SW-1-P34	5A-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P5	SW-2-P34	6A-Host Group 2			32 Gb/s	Enabled
Node7	Port 0	16 Gb/s	SW-1-P6	SW-1-P35	7A-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P6	SW-2-P35	8A-Host Group 1			32 Gb/s	Enabled
Node8	Port 0	16 Gb/s	SW-1-P7	SW-1-P35	7A-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P7	SW-2-P35	8A-Host Group 2			32 Gb/s	Enabled
Node9	Port 0	16 Gb/s	SW-1-P8	SW-1-P36	1B-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P8	SW-2-P36	2B-Host Group 1			32 Gb/s	Enabled
Node10	Port 0	16 Gb/s	SW-1-P9	SW-1-P36	1B-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P9	SW-2-P36	2B-Host Group 2			32 Gb/s	Enabled
Node11	Port 0	16 Gb/s	SW-1-P10	SW-1-P37	3B-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P10	SW-2-P37	4B-Host Group 1			32 Gb/s	Enabled
Node12	Port 0	16 Gb/s	SW-1-P11	SW-1-P37	3B-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P11	SW-2-P37	4B-Host Group 2			32 Gb/s	Enabled
Node13	Port 0	16 Gb/s	SW-1-P12	SW-1-P38	5B-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P12	SW-2-P38	6B-Host Group 1			32 Gb/s	Enabled
Node14	Port 0	16 Gb/s	SW-1-	SW-1-	5B-Host Group 2			32 Gb/s	Enabled

SAP HANA Node	HBA Port		Fiber Channel Switch Port Name		Virtual Storage Platform Target Port-Host Group				
	Port Name	Port Speed	Host	Storage	VSP F/G370	VSP F/G700	VSP F/G900	Port Speed	Port Security
			P13	P38					
	Port 1	16 Gb/s	SW-2-P13	SW-2-P38	6B-Host Group 2			32 Gb/s	Enabled
Node15	Port 0	16 Gb/s	SW-1-P14	SW-1-P39	7B-Host Group 1			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P14	SW-2-P39	8B-Host Group 1			32 Gb/s	Enabled
Node16	Port 0	16 Gb/s	SW-1-P15	SW-1-P39	7B-Host Group 2			32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P15	SW-2-P39	8B-Host Group 2			32 Gb/s	Enabled
Node17	Port 0	16 Gb/s	SW-1-P16	SW-1-P40	N/A	1C-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P16	SW-2-P40	N/A	2C-Host Group 1		32 Gb/s	Enabled
Node18	Port 0	16 Gb/s	SW-1-P17	SW-1-P40	N/A	1C-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P17	SW-2-P40	N/A	2C-Host Group 2		32 Gb/s	Enabled
Node19	Port 0	16 Gb/s	SW-1-P18	SW-1-P41	N/A	3C-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P18	SW-2-P41	N/A	4C-Host Group 1		32 Gb/s	Enabled
Node20	Port 0	16 Gb/s	SW-1-P19	SW-1-P41	N/A	3C-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P19	SW-2-P41	N/A	4C-Host Group 2		32 Gb/s	Enabled
Node21	Port 0	16 Gb/s	SW-1-P20	SW-1-P42	N/A	5C-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P20	SW-2-P42	N/A	6C-Host Group 1		32 Gb/s	Enabled
Node22	Port 0	16 Gb/s	SW-1-P21	SW-1-P42	N/A	5C-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P21	SW-2-P42	N/A	6C-Host Group 2		32 Gb/s	Enabled
Node23	Port 0	16 Gb/s	SW-1-	SW-1-	N/A	7C-Host Group 1		32 Gb/s	Enabled

SAP HANA Node	HBA Port		Fiber Channel Switch Port Name		Virtual Storage Platform Target Port-Host Group				
	Port Name	Port Speed	Host	Storage	VSP F/G370	VSP F/G700	VSP F/G900	Port Speed	Port Security
			P22	P43					
	Port 1	16 Gb/s	SW-2-P22	SW-2-P43	N/A	8C-Host Group 1		32 Gb/s	Enabled
Node24	Port 0	16 Gb/s	SW-1-P23	SW-1-P43	N/A	7C-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P23	SW-2-P43	N/A	8C-Host Group 2		32 Gb/s	Enabled
Node25	Port 0	16 Gb/s	SW-1-P24	SW-1-P44	N/A	1D-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P24	SW-2-P44	N/A	2D-Host Group 1		32 Gb/s	Enabled
Node26	Port 0	16 Gb/s	SW-1-P25	SW-1-P44	N/A	1D-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P25	SW-2-P44	N/A	2D-Host Group 2		32 Gb/s	Enabled
Node27	Port 0	16 Gb/s	SW-1-P26	SW-1-P45	N/A	3D-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P26	SW-2-P45	N/A	4D-Host Group 1		32 Gb/s	Enabled
Node28	Port 0	16 Gb/s	SW-1-P27	SW-1-P45	N/A	3D-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P27	SW-2-P45	N/A	4D-Host Group 2		32 Gb/s	Enabled
Node29	Port 0	16 Gb/s	SW-1-P28	SW-1-P46	N/A	5D-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P28	SW-2-P46	N/A	6D-Host Group 1		32 Gb/s	Enabled
Node30	Port 0	16 Gb/s	SW-1-P29	SW-1-P46	N/A	5D-Host Group 2		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P29	SW-2-P46	N/A	6D-Host Group 2		32 Gb/s	Enabled
Node31	Port 0	16 Gb/s	SW-1-P30	SW-1-P47	N/A	7D-Host Group 1		32 Gb/s	Enabled
	Port 1	16 Gb/s	SW-2-P30	SW-2-P47	N/A	8D-Host Group 1		32 Gb/s	Enabled
Node32	Port 0	16 Gb/s	SW-1-	SW-1-	N/A	7D-Host Group 2		32 Gb/s	Enabled

SAP HANA Node	HBA Port		Fiber Channel Switch Port Name		Virtual Storage Platform Target Port-Host Group				
	Port Name	Port Speed	Host	Storage	VSP F/G370	VSP F/G700	VSP F/G900	Port Speed	Port Security
			P31	P47					
	Port 1	16 Gb/s	SW-2-P31	SW-2-P47	N/A	8D-Host Group 2		32 Gb/s	Enabled

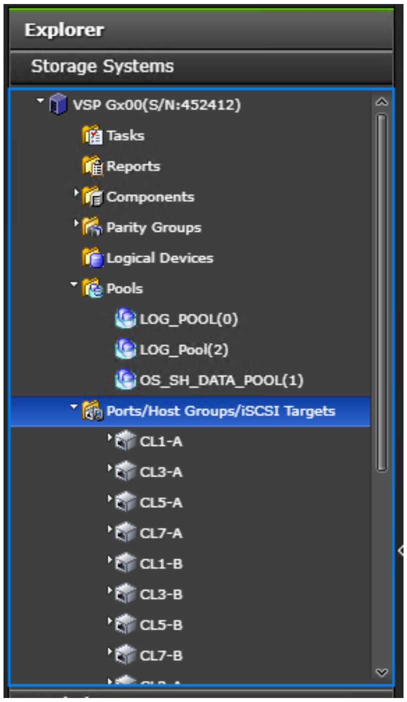
Configure the Host Groups

To configure the host ports, follow these steps:

1. Open the Ports/Host Group/iSCSI Targets window.

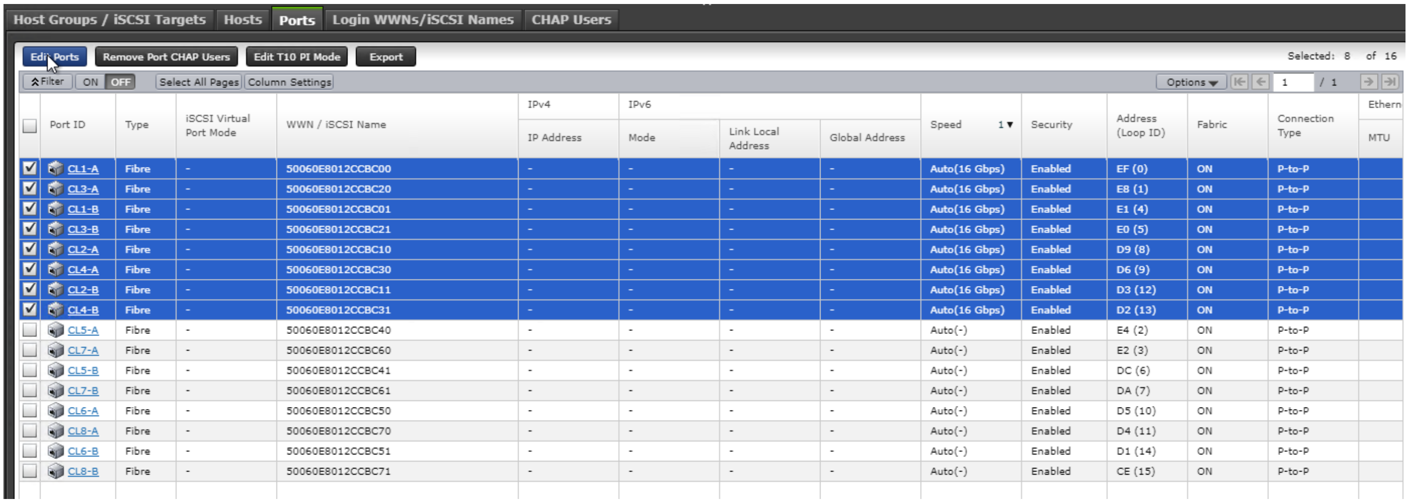
2. In Storage Systems under the Explorer pane, expand the VSP Gx00 tree.

3. Click Ports/Host Groups/iSCSI Targets.



4. In the right pane of the Ports/Host Groups/iSCSI Targets window, click the Ports tab to see the list of ports.

5. Select all required ports and click Edit Ports.



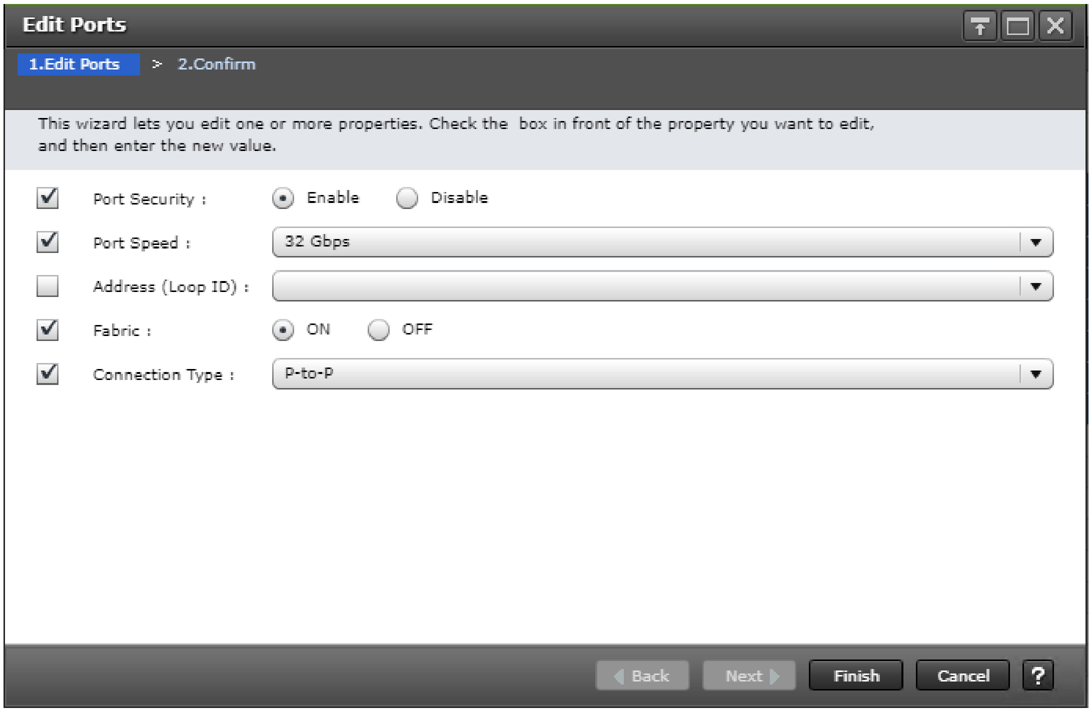
Selected: 8 of 16

☐	Port ID	Type	iSCSI Virtual Port Mode	WWN / iSCSI Name	IPv4	IPv6			Speed 1▼	Security	Address (Loop ID)	Fabric	Connection Type	Ethern
					IP Address	Mode	Link Local Address	Global Address						MTU
☑	CL1-A	Fibre	-	50060E8012CCBC00	-	-	-	-	Auto(16 Gbps)	Enabled	EF (0)	ON	P-to-P	
☑	CL3-A	Fibre	-	50060E8012CCBC20	-	-	-	-	Auto(16 Gbps)	Enabled	E8 (1)	ON	P-to-P	
☑	CL1-B	Fibre	-	50060E8012CCBC01	-	-	-	-	Auto(16 Gbps)	Enabled	E1 (4)	ON	P-to-P	
☑	CL3-B	Fibre	-	50060E8012CCBC21	-	-	-	-	Auto(16 Gbps)	Enabled	E0 (5)	ON	P-to-P	
☑	CL2-A	Fibre	-	50060E8012CCBC10	-	-	-	-	Auto(16 Gbps)	Enabled	D9 (8)	ON	P-to-P	
☑	CL4-A	Fibre	-	50060E8012CCBC30	-	-	-	-	Auto(16 Gbps)	Enabled	D6 (9)	ON	P-to-P	
☑	CL2-B	Fibre	-	50060E8012CCBC11	-	-	-	-	Auto(16 Gbps)	Enabled	D3 (12)	ON	P-to-P	
☑	CL4-B	Fibre	-	50060E8012CCBC31	-	-	-	-	Auto(16 Gbps)	Enabled	D2 (13)	ON	P-to-P	
☐	CL5-A	Fibre	-	50060E8012CCBC40	-	-	-	-	Auto(-)	Enabled	E4 (2)	ON	P-to-P	
☐	CL7-A	Fibre	-	50060E8012CCBC60	-	-	-	-	Auto(-)	Enabled	E2 (3)	ON	P-to-P	
☐	CL5-B	Fibre	-	50060E8012CCBC41	-	-	-	-	Auto(-)	Enabled	DC (6)	ON	P-to-P	
☐	CL7-B	Fibre	-	50060E8012CCBC61	-	-	-	-	Auto(-)	Enabled	DA (7)	ON	P-to-P	
☐	CL6-A	Fibre	-	50060E8012CCBC50	-	-	-	-	Auto(-)	Enabled	D5 (10)	ON	P-to-P	
☐	CL8-A	Fibre	-	50060E8012CCBC70	-	-	-	-	Auto(-)	Enabled	D4 (11)	ON	P-to-P	
☐	CL6-B	Fibre	-	50060E8012CCBC51	-	-	-	-	Auto(-)	Enabled	D1 (14)	ON	P-to-P	
☐	CL8-B	Fibre	-	50060E8012CCBC71	-	-	-	-	Auto(-)	Enabled	CE (15)	ON	P-to-P	

6. Enter the properties in the Edit Ports window, see Table 12

Table 20 Edit Ports Settings

For This	Enter This
Port Security	Select the check box and click the Enabled option.
Port Speed	Select the check box and click the speed matching your connection speed. For example, select 32 Gbps.
Fabric	Select the check box and click ON.
Connection Type	Select the check box and click P-to-P.



This wizard lets you edit one or more properties. Check the box in front of the property you want to edit, and then enter the new value.

☑ Port Security : ● Enable ○ Disable

☑ Port Speed : 32 Gbps ▼

☐ Address (Loop ID) : ▼

☑ Fabric : ● ON ○ OFF

☑ Connection Type : P-to-P ▼

Cisco UCS Configuration Overview

This section describes the specific configurations on Cisco UCS servers to address the SAP HANA requirements.

It is beyond the scope of this document to cover detailed information about the Cisco UCS infrastructure. Detailed configuration guides are at: https://www.cisco.com/c/en/us/support/servers-unified-computing/ucs-manager/products-installation-and-configuration-guides-list.html

Physical Connectivity

Physical cabling should be completed by following the diagram and table references in section Deployment Hardware and Software.

Upgrade Cisco UCS Manager Software to Version 4.0(1c)

This document based on Cisco UCS 4.0(1c). To upgrade the Cisco UCS Manager software and the Cisco UCS Fabric Interconnect software to version 4.0(1c), go to Cisco UCS Manager Install and Upgrade Guides.

Initial Setup of Cisco UCS 6332-16UP Fabric Interconnects

The initial configuration dialogue for the Cisco UCS 6332-16UP Fabric Interconnects will be provide the primary information to the first fabric interconnect, with the second taking on most settings after joining the cluster.

To start on the configuration of the Fabric Interconnect A, connect to the console of the fabric interconnect and step through the Basic System Configuration Dialogue:

```
           ---- Basic System Configuration Dialog ----

  This setup utility will guide you through the basic configuration of
  the system. Only minimal configuration including IP connectivity to
  the Fabric interconnect and its clustering mode is performed through these steps.

  Type Ctrl-C at any time to abort configuration and reboot system.
  To back track or make modifications to already entered values,
  complete input till end of section and answer no when prompted
  to apply configuration.


  Enter the configuration method. (console/gui) ? console

  Enter the setup mode; setup newly or restore from backup. (setup/restore) ? setup

  You have chosen to setup a new Fabric interconnect. Continue? (y/n): y

  Enforce strong password? (y/n) [y]: <enter>

  Enter the password for "admin": <<var_password>>
  Confirm the password for "admin": <<var_password>>


  Is this Fabric interconnect part of a cluster(select 'no' for standalone)?
(yes/no) [n]: yes
```

```
  Enter the switch fabric (A/B) []: A

  Enter the system name:  <<var_ucs_clustername>>

  Physical Switch Mgmt0 IP address : <<var_ucsa_mgmt_ip>>

  Physical Switch Mgmt0 IPv4 netmask : <<var_oob_mgmt_mast>>

  IPv4 address of the default gateway : <<var_oob_gateway>>

  Cluster IPv4 address : <<var_ucs_mgmt_ip>>

  Configure the DNS Server IP address? (yes/no) [n]: y

    DNS IP address : <<var_nameserver_ip>>

  Configure the default domain name? (yes/no) [n]: y

    Default domain name : <<var_dns_domain_name>>

  Join centralized management environment (UCS Central)? (yes/no) [n]: <enter>

  Following configurations will be applied:

    Switch Fabric=A
    System Name=<<var_ucs_clustername>>
    Enforced Strong Password=yes
    Physical Switch Mgmt0 IP Address=<<var_ucsa_mgmt_ip>>
    Physical Switch Mgmt0 IP Netmask=<<var_oob_mgmt_mast>>
    Default Gateway=<<var_oob_gateway>>
    Ipv6 value=0
    DNS Server=<<var_nameserver_ip>>
    Domain Name=<<var_dns_domain_name>>
    Cluster Enabled=yes
    Cluster IP Address=<<var_ucs_mgmt_ip>>
    NOTE: Cluster IP will be configured only after both Fabric Interconnects are
initialized.
          UCSM will be functional only after peer FI is configured in clustering
mode.

  Apply and save the configuration (select 'no' if you want to re-enter)?
(yes/no):yes
```

Wait for the login prompt to make sure that the configuration has been saved.

Cisco UCS 6332-16UP Fabric Interconnect B

Continue the configuration on the console of the Fabric Interconnect B:

```
            ---- Basic System Configuration Dialog ----

  This setup utility will guide you through the basic configuration of
  the system. Only minimal configuration including IP connectivity to
  the Fabric interconnect and its clustering mode is performed through these steps.

  Type Ctrl-C at any time to abort configuration and reboot system.
  To back track or make modifications to already entered values,
  complete input till end of section and answer no when prompted
  to apply configuration.


  Enter the configuration method. (console/gui) ? console

  Installer has detected the presence of a peer Fabric interconnect. This Fabric
interconnect will be added to the cluster. Continue (y/n) ? y

  Enter the admin password of the peer Fabric interconnect:
    Connecting to peer Fabric interconnect... done
    Retrieving config from peer Fabric interconnect... done
    Peer Fabric interconnect Mgmt0 IPv4 Address: <<var_ucsa_mgmt_ip>>
    Peer Fabric interconnect Mgmt0 IPv4 Netmask: <<var_oob_mgmt_mast>>
    Cluster IPv4 address          : <<var_ucs_mgmt_ip>>

    Peer FI is IPv4 Cluster enabled. Please Provide Local Fabric Interconnect Mgmt0
IPv4 Address

  Physical Switch Mgmt0 IP address : <<var_ucsb_mgmt_ip>>


  Apply and save the configuration (select 'no' if you want to re-enter)?
(yes/no):yes
```

Wait for the login prompt to make sure that the configuration has been saved.

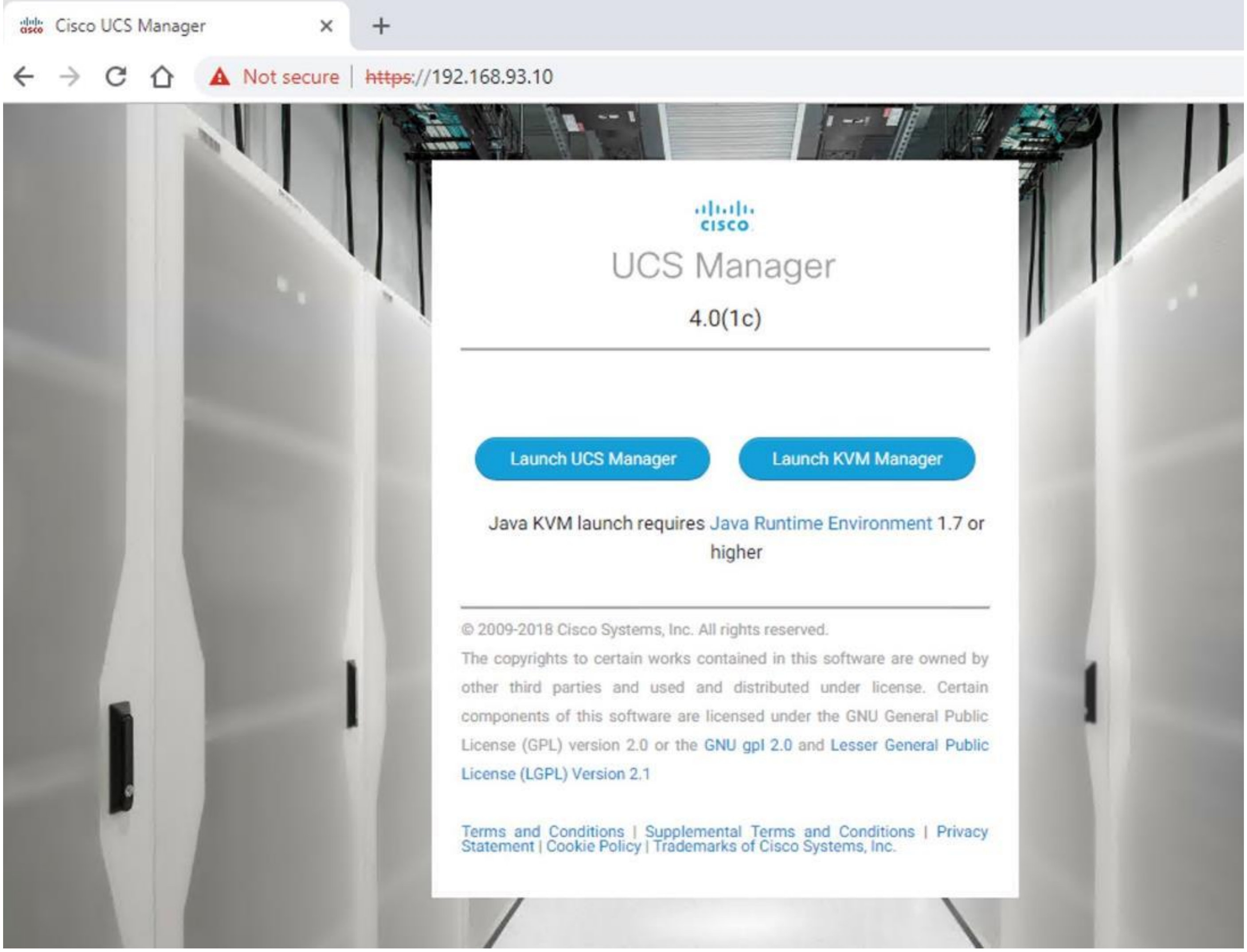
Cisco UCS Manager Setup

Log into Cisco UCS Manager

To log into the Cisco Unified Computing System environment, follow these steps:

1. Open a web browser and navigate to the Cisco UCS 6332 Fabric Interconnect cluster IP address.

Figure 3 Accessing Cisco UCS Manager


Cisco UCS Manager
Not secure
~~https~~://192.168.93.10
cisco
Launch UCS Manager
Launch KVM Manager
Terms and Conditions | Supplemental Terms and Conditions | Privacy Statement | Cookie Policy | Trademarks of Cisco Systems, Inc.

UCS Manager

4.0(1c)

Java KVM launch requires Java Runtime Environment 1.7 or higher

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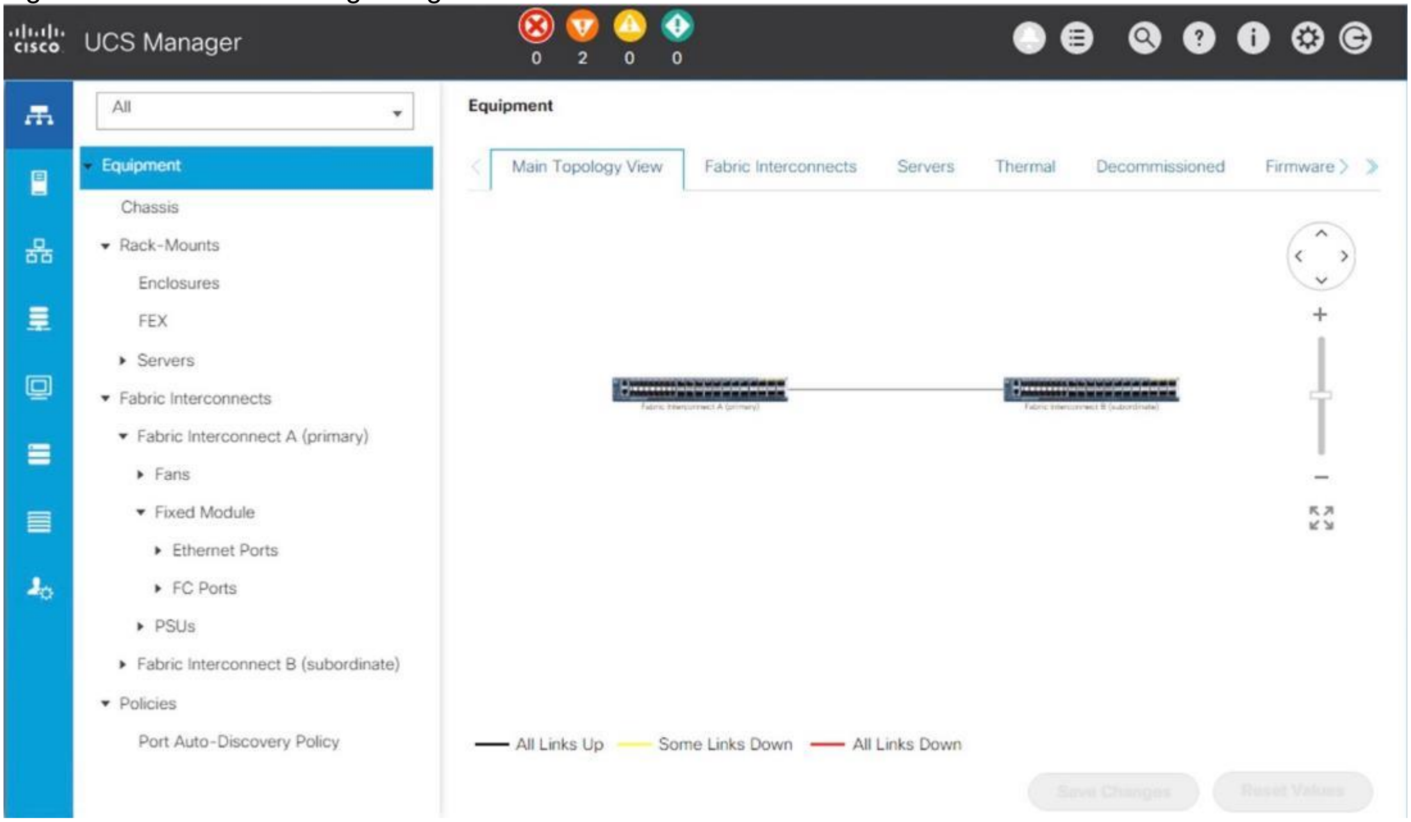
2. Click Launch UCS Manager.
3. If prompted to accept security certificates, accept as necessary.
4. When prompted, enter admin as the user name and enter the administrative password.
5. Click Login to log into the Cisco UCS Manager.

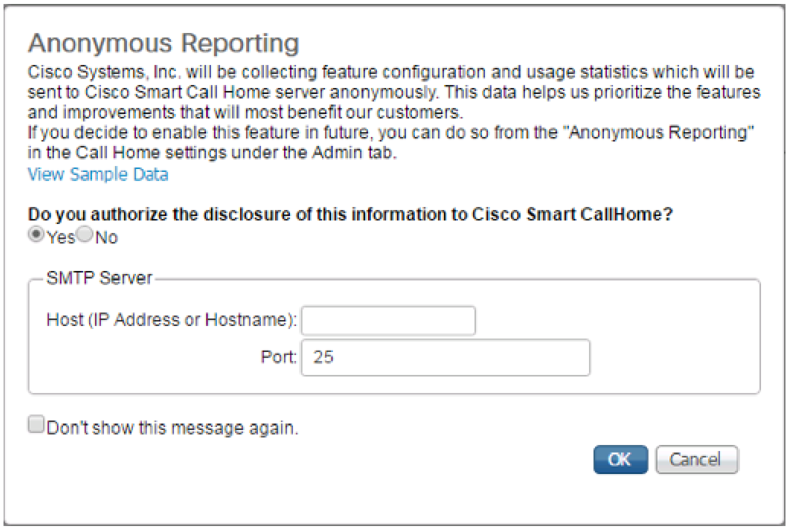
Figure 4   Cisco UCS Manager Page



Anonymous Reporting

During the first connection to the Cisco UCS Manager GUI, a pop-up window will appear to allow for the configuration of Anonymous Reporting to Cisco on use to help with future development. To create anonymous reporting, complete the following step:

1. In the Anonymous Reporting window, select whether to send anonymous data to Cisco for improving future products, and provide the appropriate SMTP server gateway information if configuring:



Anonymous Reporting

Cisco Systems, Inc. will be collecting feature configuration and usage statistics which will be sent to Cisco Smart Call Home server anonymously. This data helps us prioritize the features and improvements that will most benefit our customers.
If you decide to enable this feature in future, you can do so from the "Anonymous Reporting" in the Call Home settings under the Admin tab.
View Sample Data

Do you authorize the disclosure of this information to Cisco Smart CallHome?
● Yes ○ No

SMTP Server

Host (IP Address or Hostname):

Port: 25

□ Don't show this message again.

OK Cancel

If you want to enable or disable Anonymous Reporting at a later date, it can be found within Cisco UCS Manager under: Admin -> Communication Management -> Call Home, which has a tab on the far right for Anonymous Reporting.

Synchronize Cisco UCS to NTP

To synchronize the Cisco UCS environment to the NTP server, follow these steps:

1. In Cisco UCS Manager, click the Admin tab in the navigation pane.
2. Select Timezone Management drop-down list and click Timezone.
3. In the Properties pane, select the appropriate time zone in the Timezone menu.
4. Click Save Changes, and then click OK.
5. Click Add NTP Server.
6. Enter <<var_oob_ntp>> and click OK.
7. Click OK.

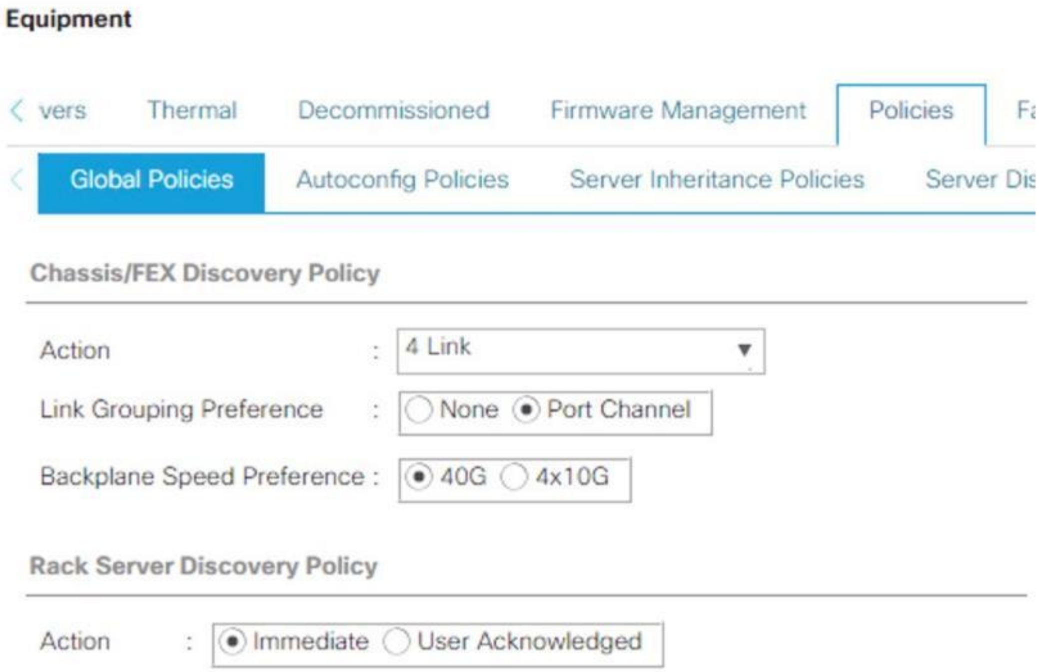
Configure Cisco UCS Servers

Chassis Discovery Policy

Setting the discovery policy simplifies the addition of B-Series Cisco UCS chassis. To modify the chassis discovery policy, follow these steps:

1. In Cisco UCS Manager, click the Equipment tab in the navigation pane and select Equipment in the list on the left.
2. In the right pane, click the Policies tab.
3. Under Global Policies, set the Chassis/FEX Discovery Policy to match the number of uplink ports that are cabled between the chassis or fabric extenders (FEXes) and the fabric interconnects. Set the Link Grouping Preference to Port Channel.
4. Click Save Changes.
5. Click OK.

Figure 5 Chassis/FEX and Rack Server Discovery Policy



Chassis/FEX Discovery Policy

Action : 4 Link ▼

Link Grouping Preference : ○ None ● Port Channel

Backplane Speed Preference : ● 40G ○ 4x10G

Rack Server Discovery Policy

Action : ● Immediate ○ User Acknowledged

Configure Server Ports

To enable server and uplink ports, follow these steps:

1. In Cisco UCS Manager, click the Equipment tab in the navigation pane.

2. Select Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module.

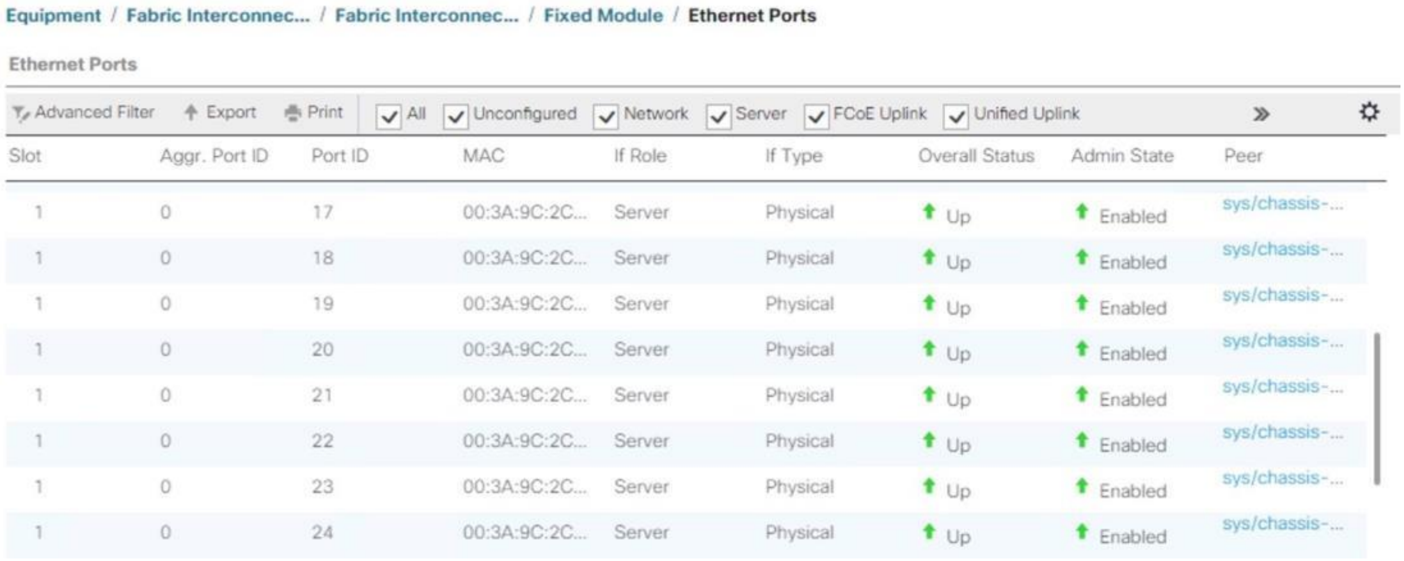
3. Click Ethernet Ports.

4. On the main pane, select the ports that are connected to the chassis and / or to the Cisco C-Series Server (two per FI), right-click them, and select Configure as Server Port.

5. Click Yes to confirm server ports and click OK.

6. Verify that the ports connected to the chassis and / or to the Cisco C-Series Server are now configured as server ports.

Figure 6 Cisco UCS – Server Port Configuration Example



Equipment / Fabric Interconnec... / Fabric Interconnec... / Fixed Module / Ethernet Ports

Ethernet Ports

☑ All ☑ Unconfigured ☑ Network ☑ Server ☑ FCoE Uplink ☑ Unified Uplink

Slot	Aggr. Port ID	Port ID	MAC	If Role	If Type	Overall Status	Admin State	Peer
1	0	17	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	18	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	19	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	20	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	21	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	22	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	23	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...
1	0	24	00:3A:9C:2C...	Server	Physical	Up	Enabled	sys/chassis-...

7. Select Equipment > Fabric Interconnects > Fabric Interconnect B (subordinate) > Fixed Module.

8. Click Ethernet Ports.

9. On the main pane, select the ports that are connected to the chassis or to the Cisco C-Series Server (two per FI), right-click them, and select Configure as Server Port.

10. Click Yes to confirm server ports and click OK.

Configure FC SAN Uplink Ports

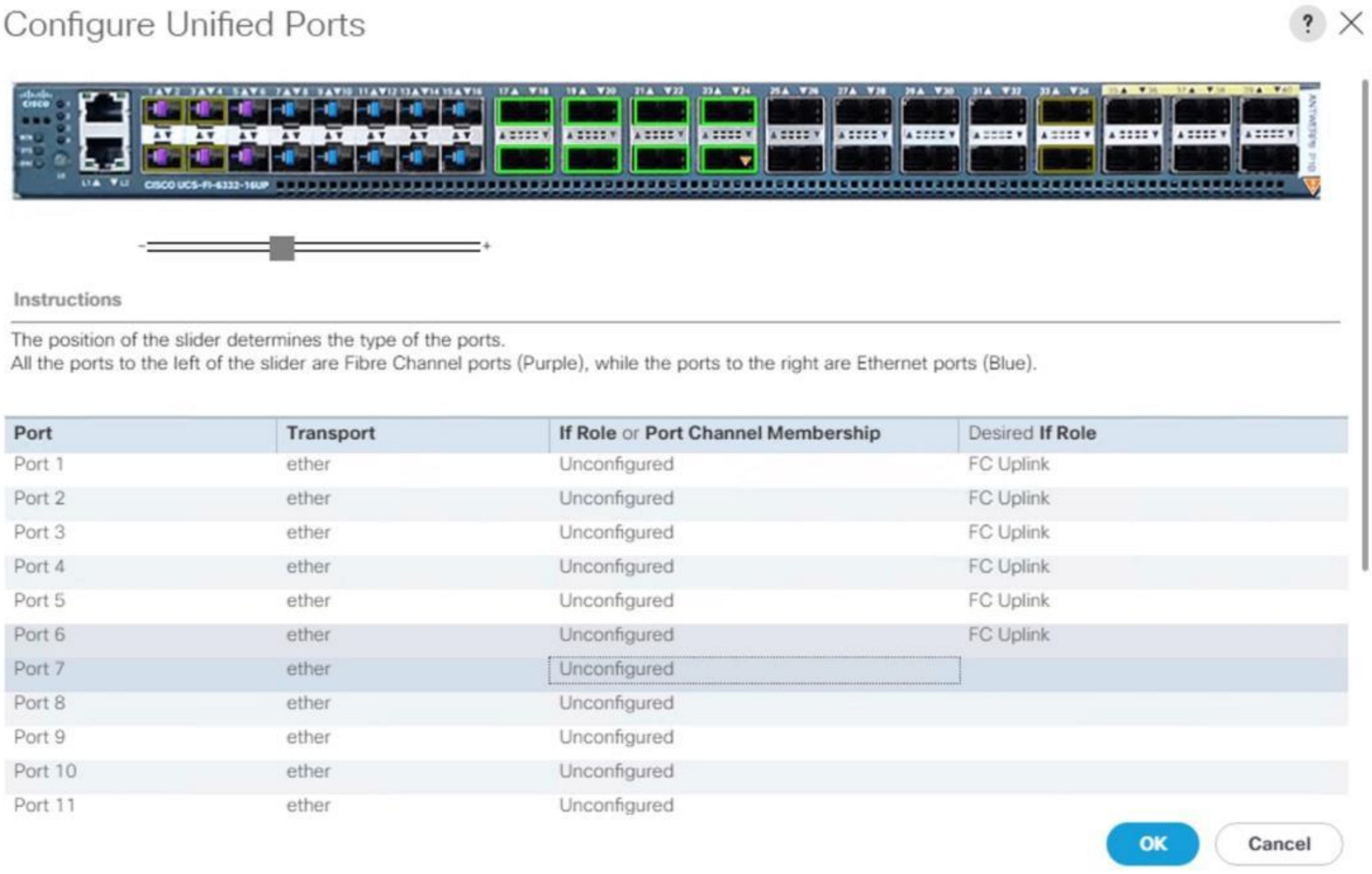
To configure the FC SAN Uplink ports, follow these steps:

1. Configure the ports connected to the MDS as FC SAN Uplink Ports. This step creates the first set of ports from the left for example, ports 1-6 of the Fixed Module for FC uplinks and the rest for Ethernet uplinks to N9Ks.

While configuring the Fixed Module Ports, the slider bar movement enables sets of ports from the left of the module as FC ports. The remainder is available for Ethernet Uplinks. This step used 4 ports for uplink to MDS, it would be enough to configure first set of 6 ports as FC ports.

2. Select Equipment > Fabric Interconnects > Fabric Interconnect A and on the right pane, General > Under Actions > Configure Unified Ports. Choose Yes for the warning pop-up In Cisco UCS Manager, click the Equipment tab in the navigation pane. Move the slider bar to right to enable the first set of 6 ports for FC Uplink Role. Click OK.

Figure 7 Cisco UCS – Configure Fixed Module Ports



Configure Unified Ports

Instructions

The position of the slider determines the type of the ports.
All the ports to the left of the slider are Fibre Channel ports (Purple), while the ports to the right are Ethernet ports (Blue).

Port	Transport	If Role or Port Channel Membership	Desired If Role
Port 1	ether	Unconfigured	FC Uplink
Port 2	ether	Unconfigured	FC Uplink
Port 3	ether	Unconfigured	FC Uplink
Port 4	ether	Unconfigured	FC Uplink
Port 5	ether	Unconfigured	FC Uplink
Port 6	ether	Unconfigured	FC Uplink
Port 7	ether	Unconfigured	
Port 8	ether	Unconfigured	
Port 9	ether	Unconfigured	
Port 10	ether	Unconfigured	
Port 11	ether	Unconfigured	

3. Configuring the unified ports require immediate reboot. Click on Yes on the warning pop-up to reboot the Fabric Interconnect.

4. Select Equipment > Fabric Interconnects > Fabric Interconnect B and on the right pane, General > Under Actions > Configure Unified Ports. Choose Yes for the warning pop-up In Cisco UCS Manager, click the Equipment tab in the navigation pane. Move the slider bar to right to enable the first set of 6 ports for FC Uplink Role. Click OK.

5. Configuring the unified ports require immediate reboot. Click on Yes on the warning pop-up to reboot the Fabric Interconnect.

6. After the FIs are accessible after reboot, re-login to Cisco UCS Manager.

Configure Ethernet Uplink Ports

To configure the ethernet uplink ports, follow these steps:

1. Configure the ports connected to the N9Ks Ethernet Uplink Ports.

Select ports in the range 17-34 for the 40GE Uplink Port connectivity.

2. In Cisco UCS Manager, click the Equipment tab in the navigation pane.

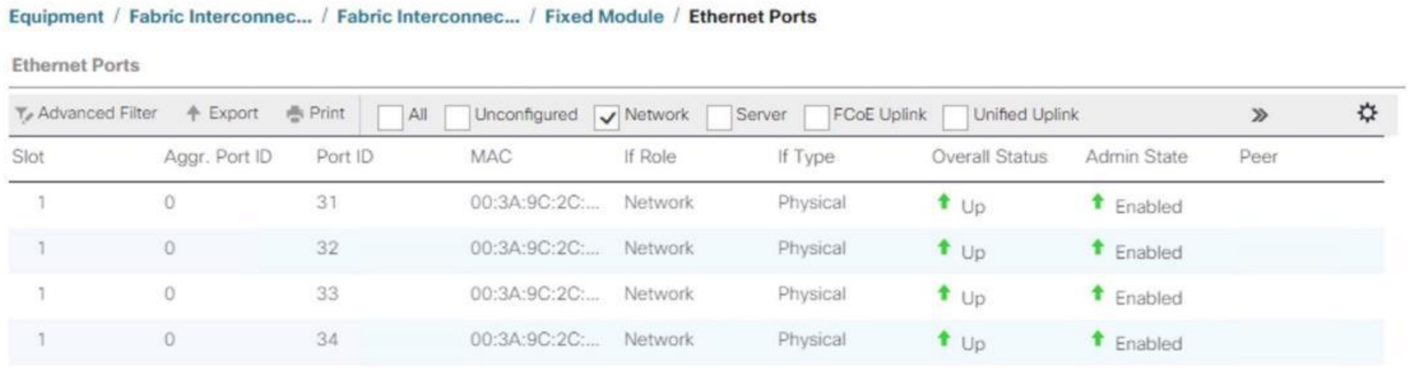
3. Select Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module.

4. Expand Ethernet Ports.

5. Select ports that are connected to the Cisco Nexus switches, right-click them, and select Configure as Uplink Port.

6. Click Yes to confirm uplink ports and click OK.

Figure 8 Cisco UCS – Ethernet Uplink Port FI-A Configuration Example


Equipment / Fabric Interconnec... / Fabric Interconnec... / Fixed Module / Ethernet Ports
Ethernet Ports
Advanced Filter
Export
Print
» ⚙

□ All □ Unconfigured ☑ Network □ Server □ FCoE Uplink □ Unified Uplink

Slot	Aggr. Port ID	Port ID	MAC	If Role	If Type	Overall Status	Admin State	Peer
1	0	31	00:3A:9C:2C:...	Network	Physical	⬆ Up	⬆ Enabled	
1	0	32	00:3A:9C:2C:...	Network	Physical	⬆ Up	⬆ Enabled	
1	0	33	00:3A:9C:2C:...	Network	Physical	⬆ Up	⬆ Enabled	
1	0	34	00:3A:9C:2C:...	Network	Physical	⬆ Up	⬆ Enabled	

7. Select Equipment > Fabric Interconnects > Fabric Interconnect B (subordinate) > Fixed Module.

8. Expand Ethernet Ports.

9. Select ports that are connected to the Cisco Nexus switches, right-click them, and select Configure as Uplink Port.

10. Click Yes to confirm the uplink ports and click OK.

Acknowledge Cisco UCS Chassis

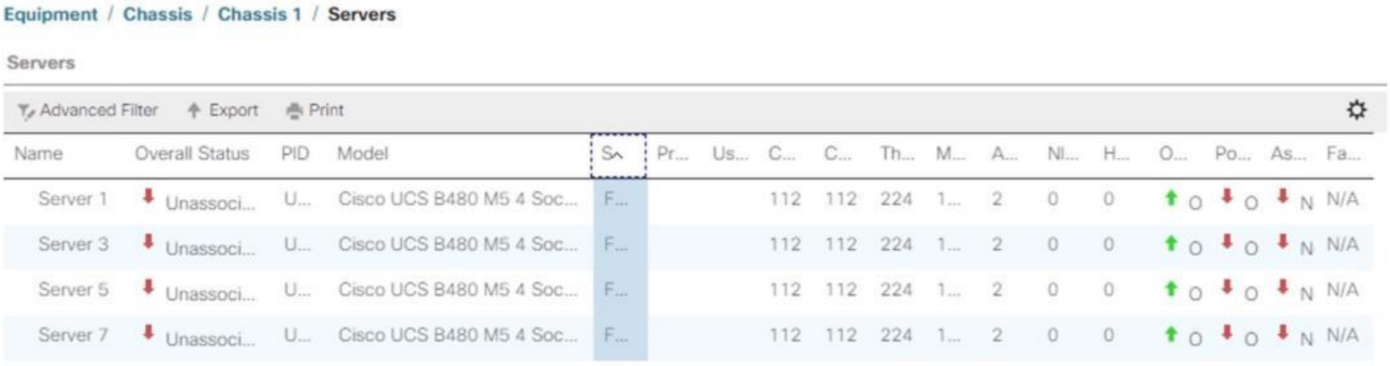
To acknowledge all Cisco UCS chassis, follow these steps:

1. In Cisco UCS Manager, click the Equipment tab in the navigation pane.

2. Expand Chassis and select each chassis that is listed. Right-click each chassis and select Acknowledge Chassis.

3. After a while, ensure the Discovery completes successfully and there are no major or critical faults reported for any of the servers.

Figure 9 Servers Discovery Status Complete



Equipment / Chassis / Chassis 1 / Servers

Servers

Name	Overall Status	PID	Model	S^	Pr...	Us...	C...	C...	Th...	M...	A...	NI...	H...	O...	Po...	As...	Fa...
Server 1	⬇ Unassoci...	U...	Cisco UCS B480 M5 4 Soc...	F...			112	112	224	1...	2	0	0	⬆ O	⬇ O	⬇ N	N/A
Server 3	⬇ Unassoci...	U...	Cisco UCS B480 M5 4 Soc...	F...			112	112	224	1...	2	0	0	⬆ O	⬇ O	⬇ N	N/A
Server 5	⬇ Unassoci...	U...	Cisco UCS B480 M5 4 Soc...	F...			112	112	224	1...	2	0	0	⬆ O	⬇ O	⬇ N	N/A
Server 7	⬇ Unassoci...	U...	Cisco UCS B480 M5 4 Soc...	F...			112	112	224	1...	2	0	0	⬆ O	⬇ O	⬇ N	N/A

Power Policy

To run Cisco UCS with two independent power distribution units, the redundancy must be configured as Grid. Follow these steps:

1. In Cisco UCS Manager, click the Equipment tab in the navigation pane and select Equipment in the list on the left.

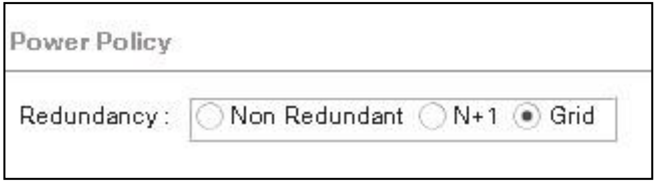
2. In the right pane, click the Policies tab.

3. Under Global Policies, set the Redundancy field in Power Policy to Grid.

4. Click Save Changes.

5. Click OK.

Figure 10 Power Policy



Power Policy

Redundancy : ○ Non Redundant ○ N+1 ● Grid

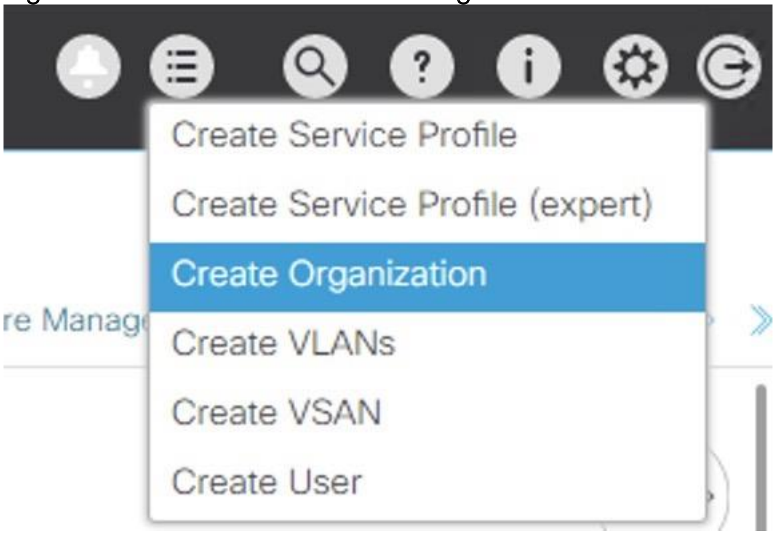
Create New Organization

For secure multi-tenancy within the Cisco UCS domain, a logical entity known as organization is created.

To create an organization unit, follow these steps:

1. In Cisco UCS Manager, on the Tool bar on right pane top click New.

Figure 11 Cisco UCS – Create Organization



2. From the drop-down menu select Create Organization.
3. Enter the Name as T01-HANA
4. (Optional) Enter the Description as Org for T01-HANA.
5. Click OK to create the Organization.

Create Pools

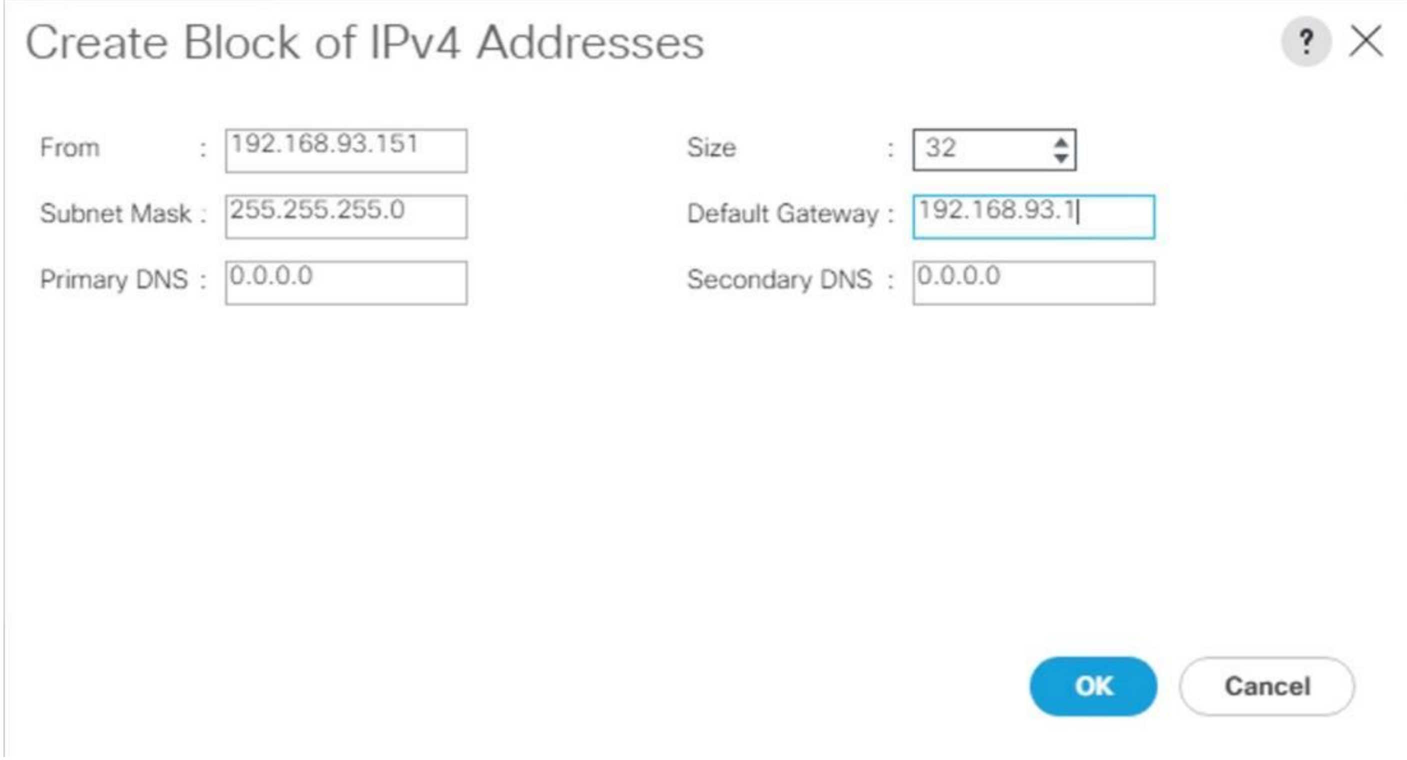
Add Block of IP Addresses for KVM Access

To create a block of IP addresses for server Keyboard, Video, Mouse (KVM) access in the Cisco UCS environment, follow these steps:

This block of IP addresses should be in the same subnet as the management IP addresses for the Cisco UCS Manager.

1. In Cisco UCS Manager, click the LAN tab in the navigation pane.
2. Select Pools > root > IP Pools > IP Pool ext-mgmt.
3. In the Actions pane, select Create Block of IPv4 Addresses.
4. Enter the starting IP address of the block and the number of IP addresses required, and the subnet and gateway information.

Figure 12 Cisco UCS - Create IP Pool



Create Block of IPv4 Addresses

From : 192.168.93.151

Size : 32

Subnet Mask : 255.255.255.0

Default Gateway : 192.168.93.1

Primary DNS : 0.0.0.0

Secondary DNS : 0.0.0.0

5. Click OK to create the IP block.

6. Click OK in the confirmation message.

Create MAC Address Pools

To configure the necessary MAC address pools for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the LAN tab in the navigation pane.

2. Select Pools > root

3. In this procedure, two MAC address pools are created, one for each switching fabric.

4. Right-click MAC Pools under the root

5. Select Create MAC Pool to create the MAC address pool.

6. Enter FI-A as the name of the MAC pool.

7. (Optional) Enter a description for the MAC pool.

8. Choose Assignment Order Sequential.

9. Click Next.

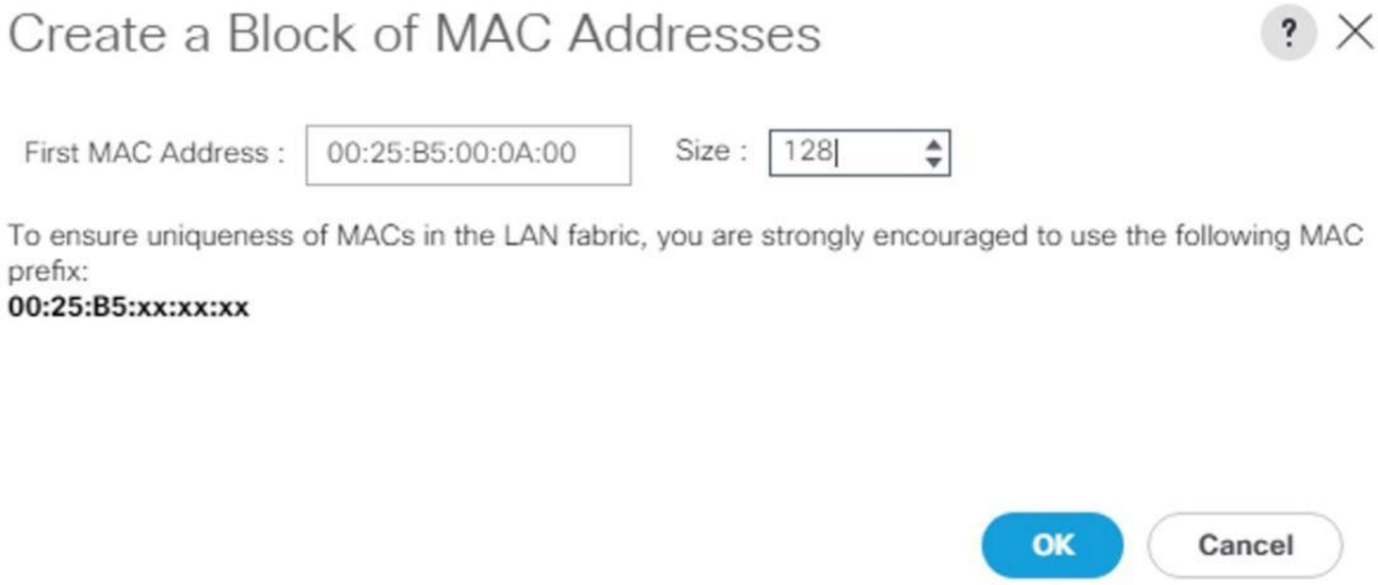
10. Click Add.

11. Specify a starting MAC address.

12. The recommendation is to place 0A in the second-last octet of the starting MAC address to identify all of the MAC addresses as Fabric Interconnect A addresses.

13. Specify a size for the MAC address pool that is sufficient to support the available blade or server resources.

Figure 13 Cisco UCS – Create MAC Pool for Fabric A



Create a Block of MAC Addresses

First MAC Address : 00:25:B5:00:0A:00

Size : 128

To ensure uniqueness of MACs in the LAN fabric, you are strongly encouraged to use the following MAC prefix:
00:25:B5:xx:xx:xx

14. Click OK.

15. Click Finish.

16. In the confirmation message, click OK.

17. Right-click MAC Pools under root

18. Select Create MAC Pool to create the MAC address pool.

19. Enter FI-B as the name of the MAC pool.

20. (Optional) Enter a description for the MAC pool. Select ‘Sequential’ for Assignment order.

21. Click Next.

22. Click Add.

23. Specify a starting MAC address.

The recommendation is to place 0B in the next to last octet of the starting MAC address to identify all the MAC addresses in this pool as fabric B addresses.

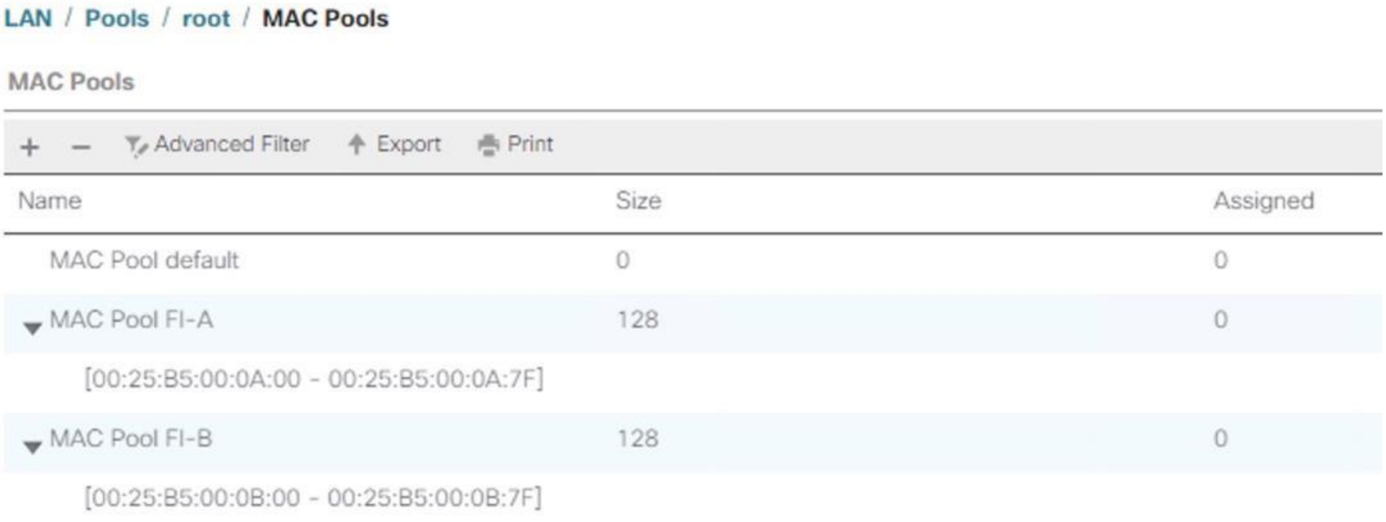
24. Specify a size for the MAC address pool that is sufficient to support the available blade or server resources.

25. Click OK.

26. Click Finish.

27. In the confirmation message, click OK.

Figure 14 Cisco UCS – MAC Pools Summary



LAN / Pools / root / MAC Pools
MAC Pools
+ – Advanced Filter Export Print

Name	Size	Assigned
MAC Pool default	0	0
MAC Pool FI-A	128	0
[00:25:B5:00:0A:00 - 00:25:B5:00:0A:7F]		
MAC Pool FI-B	128	0
[00:25:B5:00:0B:00 - 00:25:B5:00:0B:7F]		

Create WWNN Pool

To configure the necessary WWNN pool for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the SAN tab in the navigation pane.

2. Select Pools > root

3. Right-click WWNN Pools and Select Create WWNN Pool.

4. Enter HANA-Servers as the name of the WWNN pool.

5. (Optional) Enter a description for the WWNN pool.

6. Choose Assignment Order Sequential.

7. Click Next.

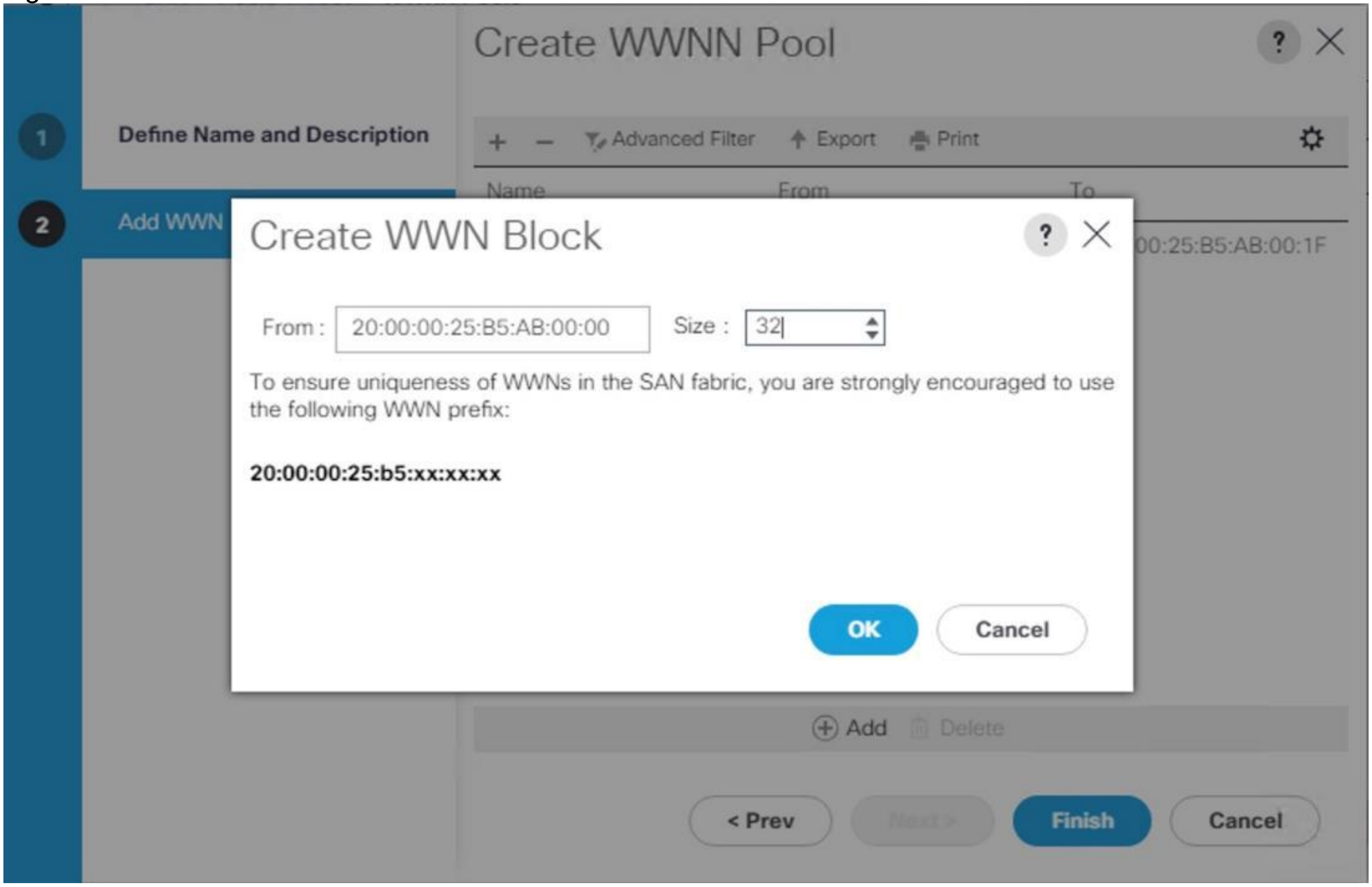
8. Click Add.

9. Specify a starting WWNN address.

10. The recommendation is to place AB in the third-last octet of the starting WWNN address to ensure uniqueness.

11. Specify a size for the WWNN pool that is sufficient to support the available blade or server resources.

Figure 15 Cisco UCS – Create WWNN Pool



Create WWN Block

From : 20:00:00:25:B5:AB:00:00 Size : 32

To ensure uniqueness of WWNs in the SAN fabric, you are strongly encouraged to use the following WWN prefix:

20:00:00:25:b5:xx:xx:xx

12. Click OK.

13. Click Finish.

14. In the confirmation message, click OK.

Create WWPN Pool

To configure the necessary WWPN pool for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the SAN tab in the navigation pane.

2. Select Pools > root

3. In this procedure, two WWPN pools are created, one for each switching fabric.

4. Right-click WWPN Pools and Select Create WWPN Pool

5. Enter FI-A as the name of the WWPN pool.

6. (Optional) Enter a description for the WWPN pool.

7. Choose Assignment Order Sequential.

8. Click Next.

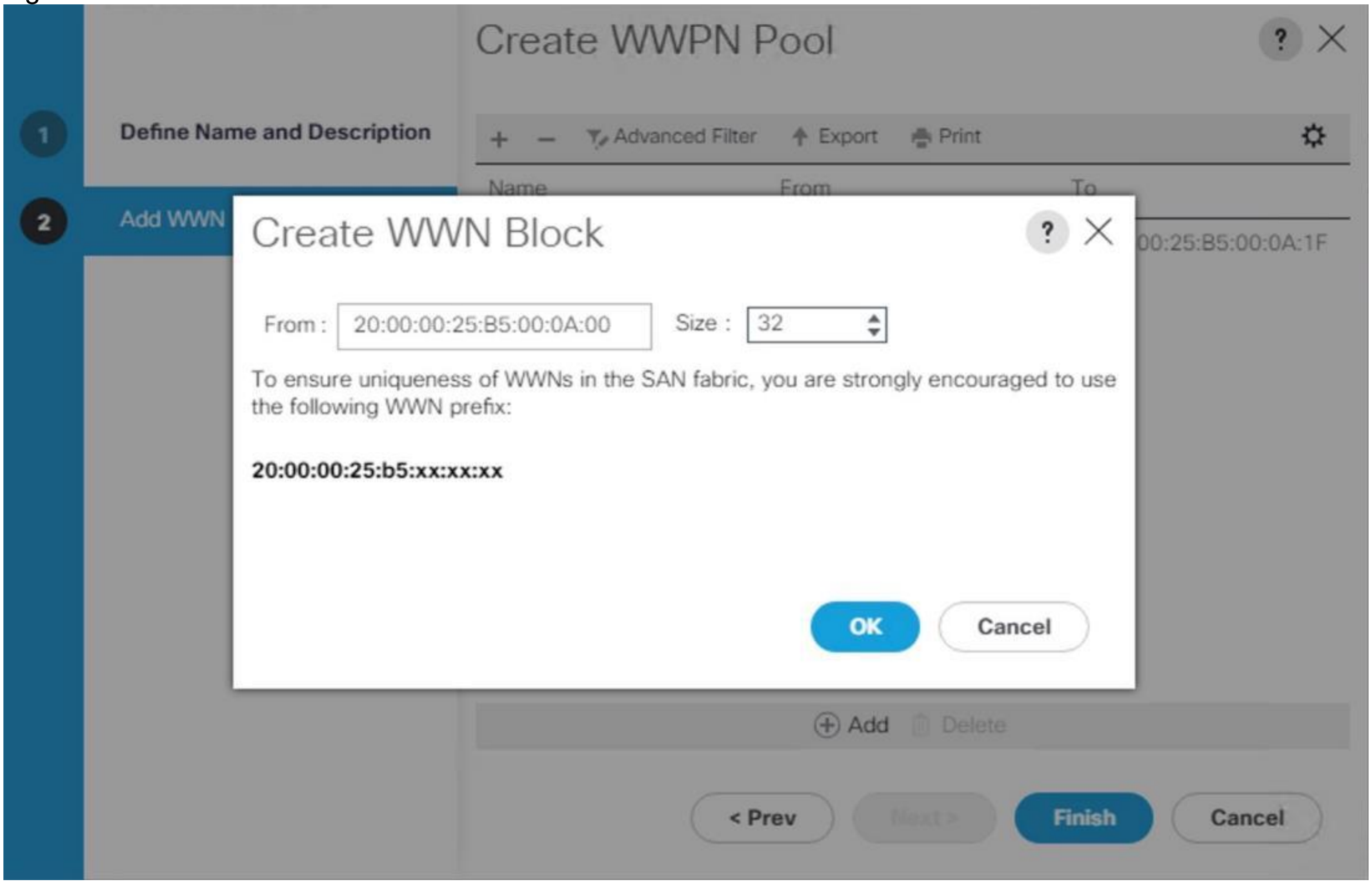
9. Click Add.

10. Specify a starting WWPN address.

11. The recommendation is to place 0A in the last bust one octet of the starting MAC address to identify all of the WWPN addresses as Fabric Interconnect A addresses.

12. Specify a size for the WWPN address pool that is sufficient to support the available blade or server resources.

Figure 16 Cisco UCS – Create WWPN Pool for Fabric A


Create WWPN Pool
1 Define Name and Description
2 Add WWN
+ − Advanced Filter Export Print
Name From To
00:25:B5:00:0A:1F
Add Delete
< Prev Next > Finish Cancel

Create WWN Block

From : 20:00:00:25:B5:00:0A:00 Size : 32

To ensure uniqueness of WWNs in the SAN fabric, you are strongly encouraged to use the following WWN prefix:

20:00:00:25:b5:xx:xx:xx

13. Click OK.

14. Click Finish.

15. In the confirmation message, click OK.

16. Right-click WWPN Pools and Select Create WWPN Pool.

17. Enter FI-B as the name of the WWPN pool.

18. (Optional) Enter a description for the WWPN pool. Select ‘Sequential’ for Assignment order.

19. Click Next.

20. Click Add.

21. Specify a starting WWPN address.

It is recommended to place 0B in the next to third-last octet of the starting WWPN address to identify all the WWPN addresses in this pool as fabric B addresses.

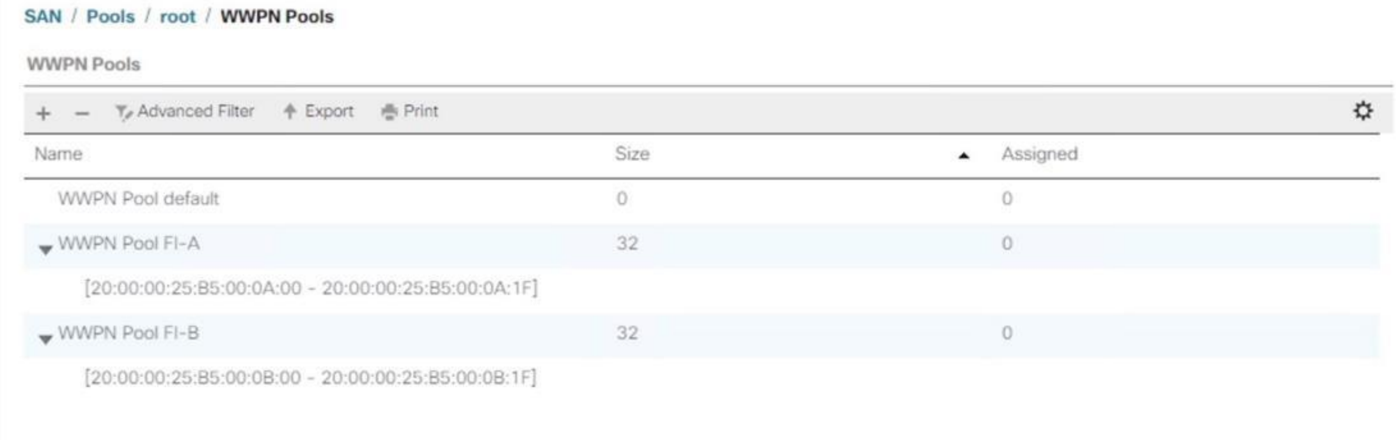
22. Specify a size for the WWPN address pool that is sufficient to support the available blade or server resources.

23. Click OK.

24. Click Finish.

25. In the confirmation message, click OK.

Figure 17 WWPN Pool Summary



Name	Size	Assigned
WWPN Pool default	0	0
WWPN Pool FI-A	32	0
[20:00:00:25:B5:00:0A:00 - 20:00:00:25:B5:00:0A:1F]		
WWPN Pool FI-B	32	0
[20:00:00:25:B5:00:0B:00 - 20:00:00:25:B5:00:0B:1F]		

Create UUID Suffix Pool

To configure the necessary universally unique identifier (UUID) suffix pool for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.

2. Select Pools > root

3. Right-click UUID Suffix Pools.

4. Select Create UUID Suffix Pool.

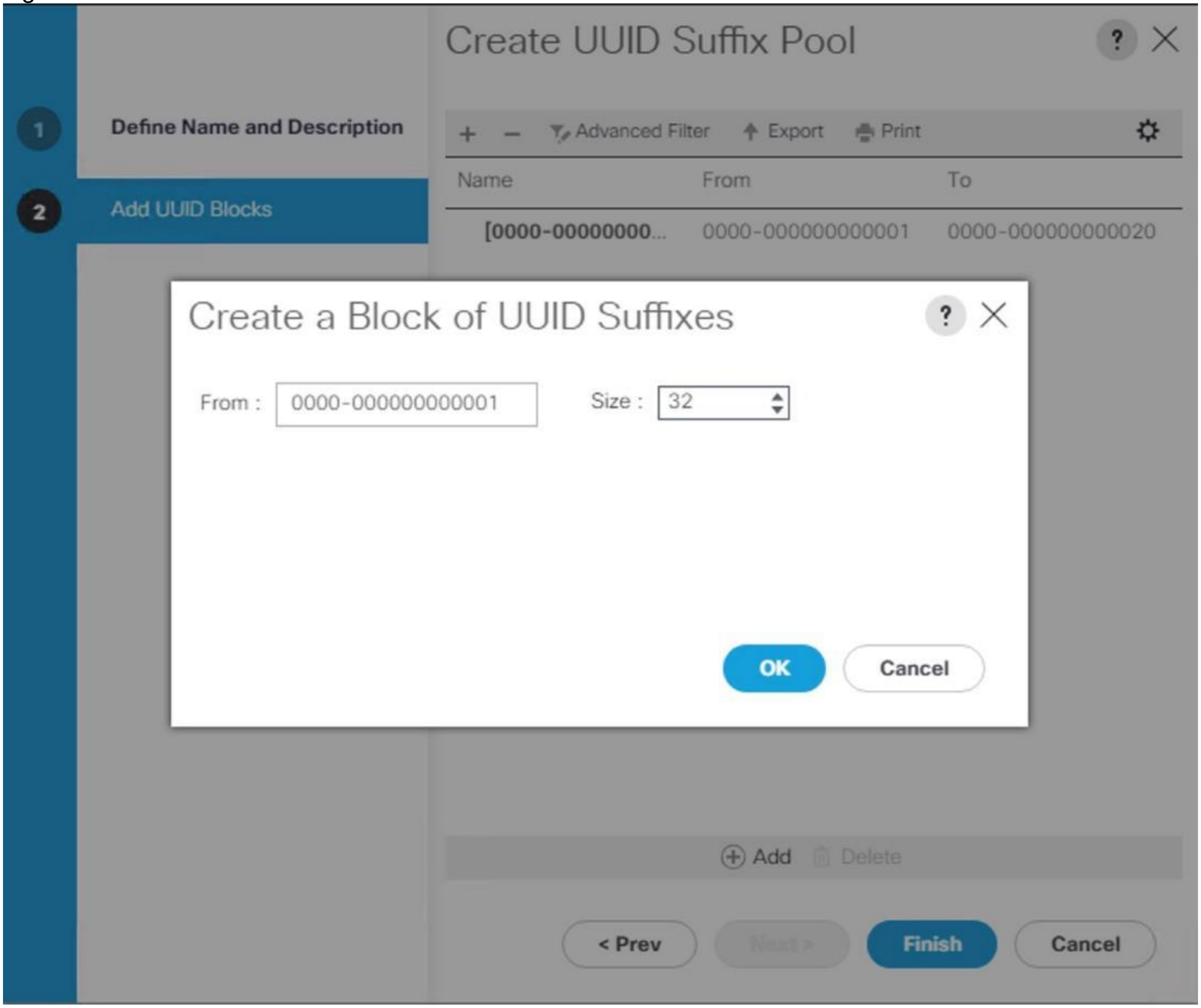
5. Enter HANA-UUID as the name of the UUID suffix pool.

6. (Optional) Enter a description for the UUID suffix pool.

7. Keep the Prefix as the Derived option.

8. Select Sequential for Assignment Order
9. Click Next.
10. Click Add to add a block of UUIDs.
11. Keep the 'From' field at the default setting.
12. Specify a size for the UUID block that is sufficient to support the available blade or server resources.

Figure 18 Cisco UCS – Create UUID Block



Name	From	To
[0000-00000000...	0000-000000000001	0000-000000000020

From : 0000-000000000001

Size : 32

13. Click OK.
14. Click Finish.
15. Click OK.

Set Packages and Policies

Create Host Firmware Package

Firmware management policies allow the administrator to select the corresponding packages for a given server configuration. These policies often include packages for adapter, BIOS, board controller, FC adapters, host bus adapter (HBA) option ROM, and storage controller properties.

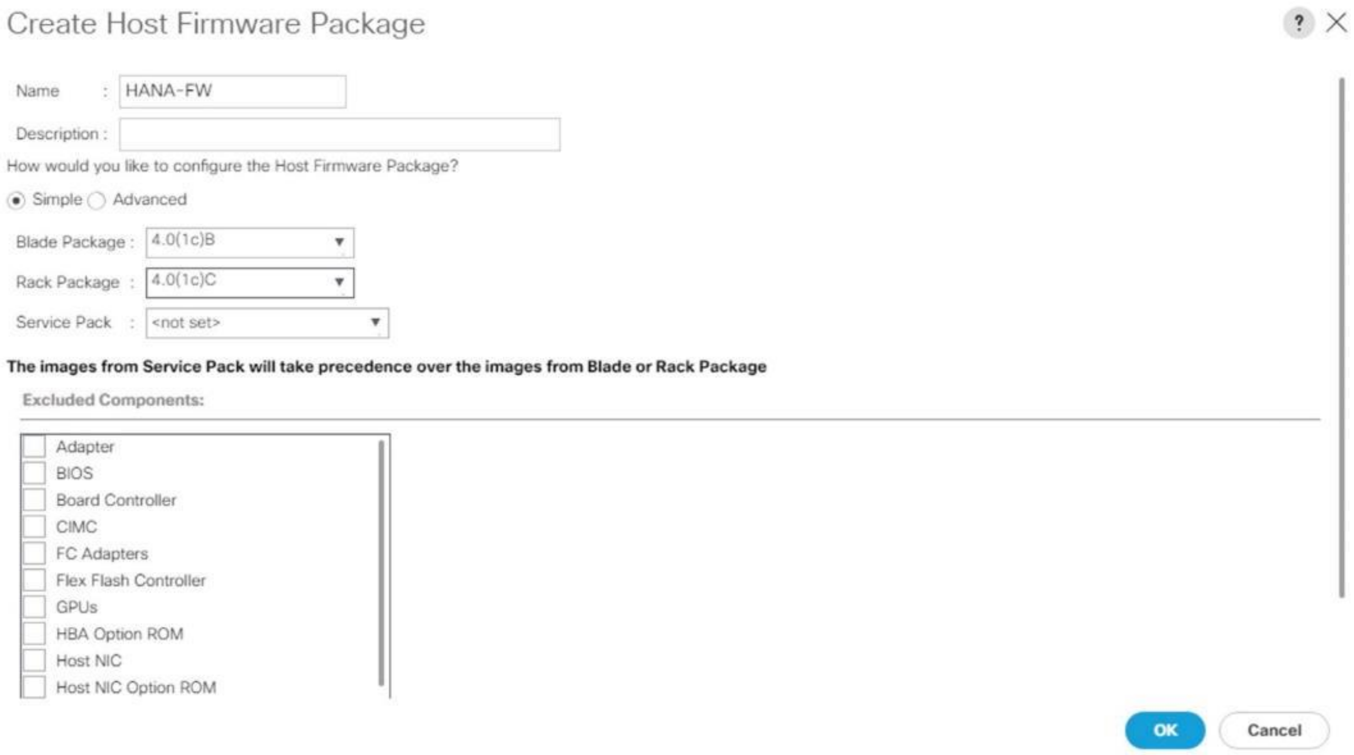
To create a firmware management policy for a given server configuration in the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.
2. Select Policies > root.
3. Right-click Host Firmware Packages.
4. Select Create Host Firmware Package.
5. Enter HANA-FW as the name of the host firmware package.
6. Leave Simple selected.
7. Select the version 4.0(1c)B for the Blade Package and 4.0(1c)C for Rack Packages.

The Firmware Package Version dependent on UCSM version installed

8. Click OK to create the host firmware package.
9. Click OK.

Figure 19 Host Firmware Package



Create Host Firmware Package

Name : HANA-FW

Description :

How would you like to configure the Host Firmware Package?

● Simple ○ Advanced

Blade Package : 4.0(1c)B

Rack Package : 4.0(1c)C

Service Pack : <not set>

The images from Service Pack will take precedence over the images from Blade or Rack Package

Excluded Components:

- □ Adapter
- □ BIOS
- □ Board Controller
- □ CIMC
- □ FC Adapters
- □ Flex Flash Controller
- □ GPUs
- □ HBA Option ROM
- □ Host NIC
- □ Host NIC Option ROM

Create Server BIOS Policy

To get best performance for HANA it is required to configure the Server BIOS accurately. To create a server BIOS policy for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.

2. Select Policies > root

3. Right-click BIOS Policies.

4. Select Create BIOS Policy.

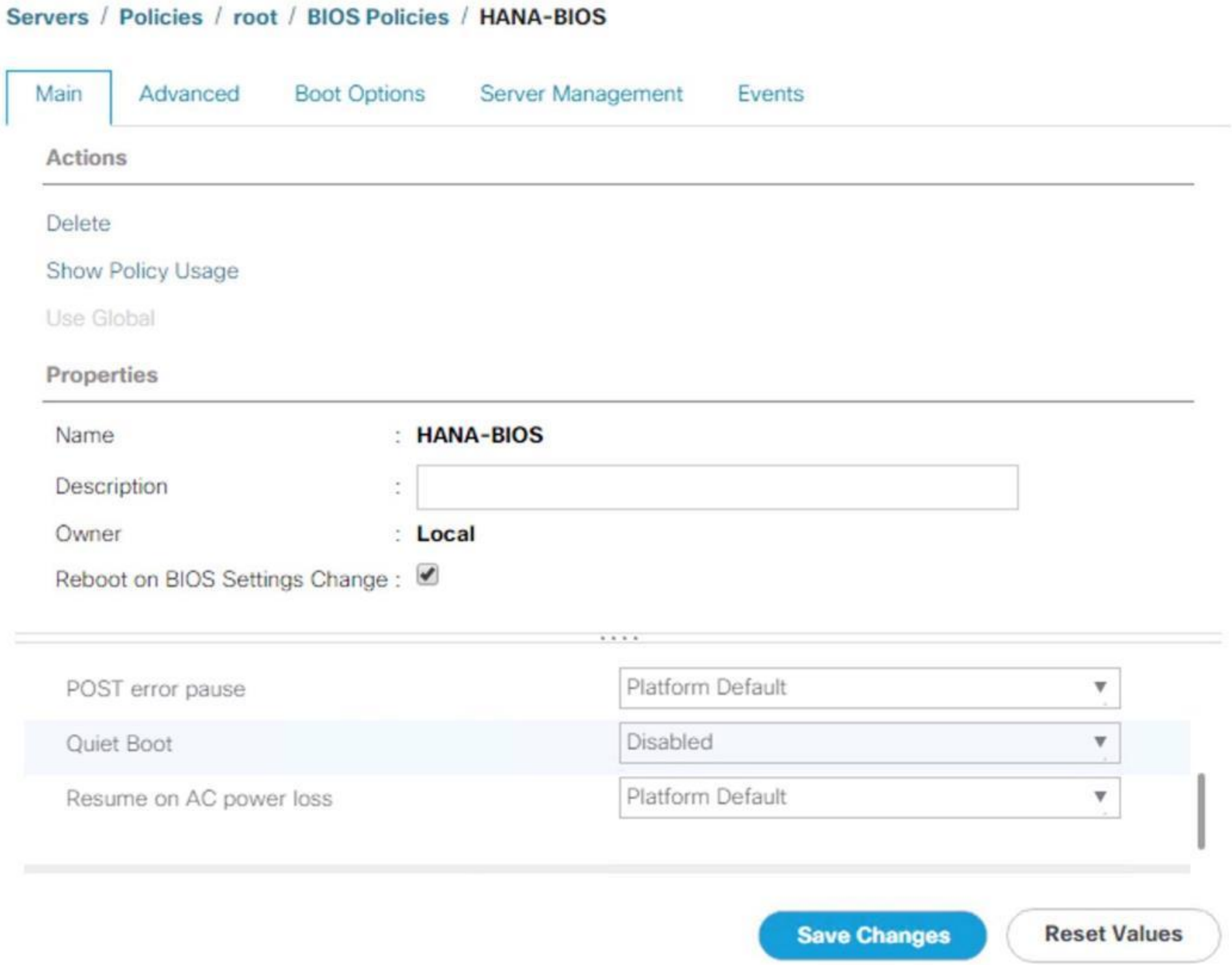
5. Enter HANA-BIOS as the BIOS policy name.

6. Select “Reboot on BIOS Settings Change”. Click OK.

7. Select the BIOS policy selected on the navigation pane.

8. On the ‘Main’ sub-heading, change the Quiet Boot setting to Disabled.

Figure 20 Create Server BIOS Policy



Servers / Policies / root / BIOS Policies / HANA-BIOS

Name : HANA-BIOS

Description :

Owner : Local

Reboot on BIOS Settings Change : ☑

POST error pause	Platform Default ▼
Quiet Boot	Disabled ▼
Resume on AC power loss	Platform Default ▼

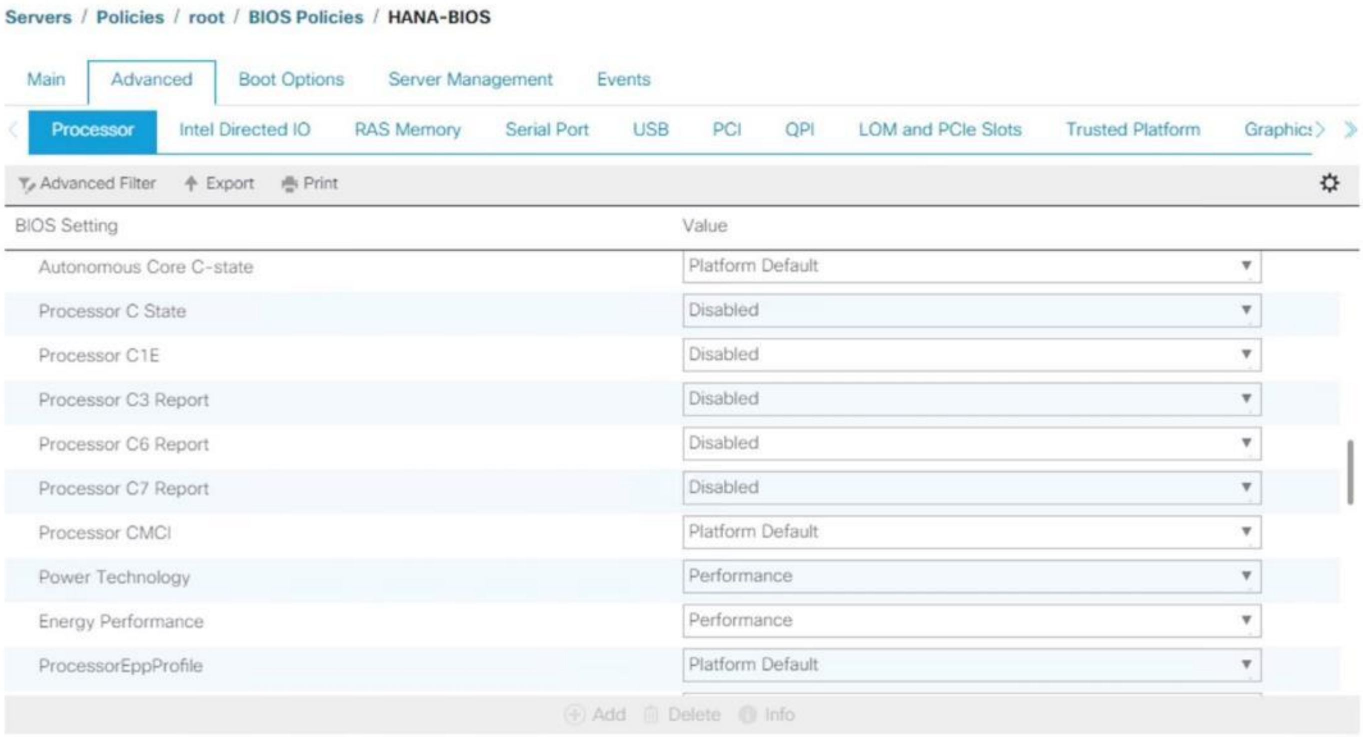
9. Click the Advanced Tab.

10. The recommendation from SAP for SAP HANA is to disable all Processor C States. This will force the CPU to stay on maximum frequency and allow SAP HANA to run with best performance.

11. On the Advanced tab, under Processor sub-tab, make sure Processor C State is disabled.

12. Set HPC for CPU Performance, Performance for Power Technology, Performance for Energy Performance.

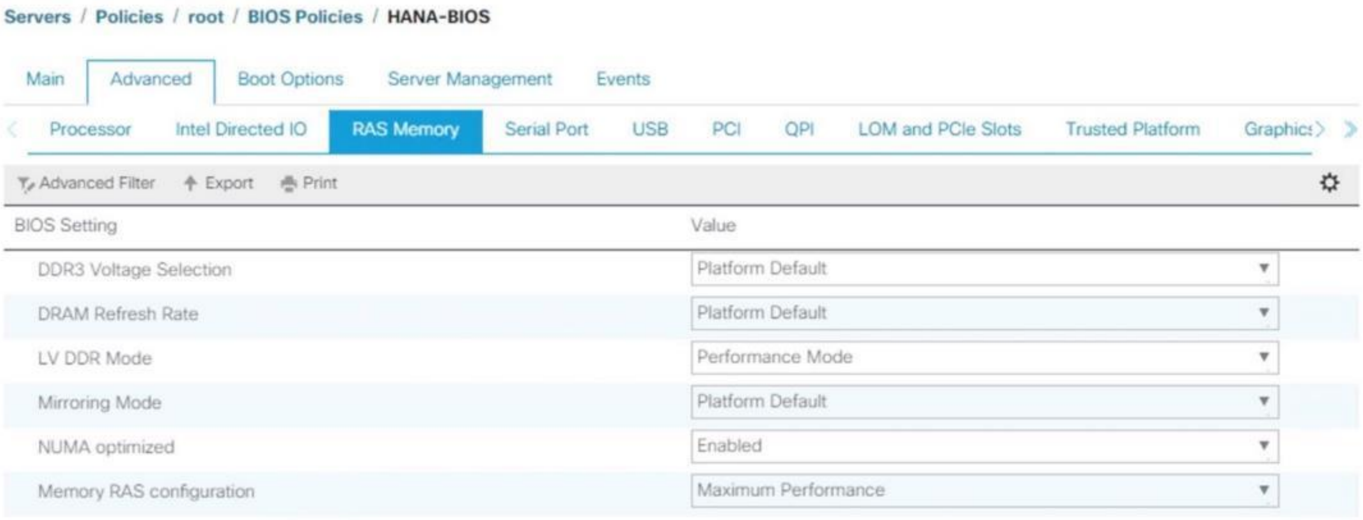
Figure 21 Processor Settings in BIOS Policy



BIOS Setting	Value
Autonomous Core C-state	Platform Default
Processor C State	Disabled
Processor C1E	Disabled
Processor C3 Report	Disabled
Processor C6 Report	Disabled
Processor C7 Report	Disabled
Processor CMCI	Platform Default
Power Technology	Performance
Energy Performance	Performance
ProcessorEppProfile	Platform Default

13. In the RAS Memory tab, select Performance Mode for LV DDR Mode, enabled for NUMA optimized and maximum-performance for Memory RAS configuration

Figure 22 BIOS Policy - Advanced - RAS Memory

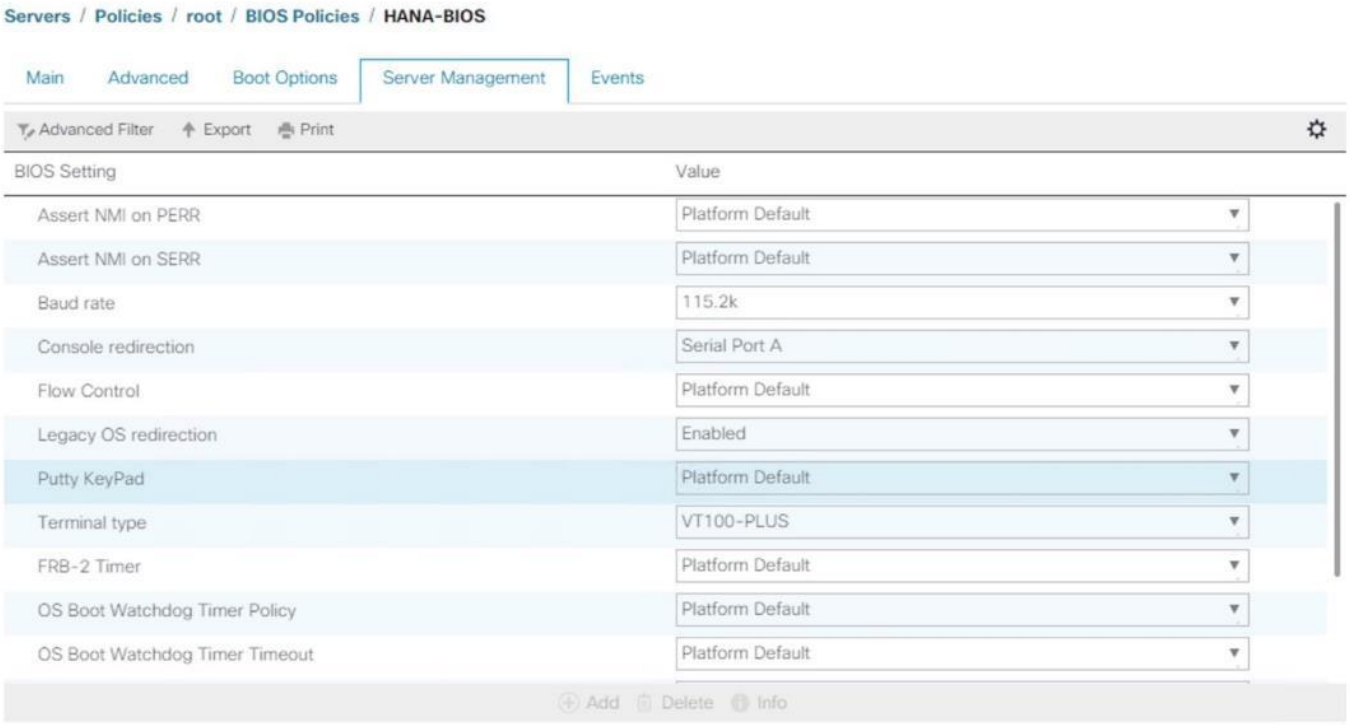


BIOS Setting	Value
DDR3 Voltage Selection	Platform Default
DRAM Refresh Rate	Platform Default
LV DDR Mode	Performance Mode
Mirroring Mode	Platform Default
NUMA optimized	Enabled
Memory RAS configuration	Maximum Performance

14. In the Serial Port sub-tab, the Serial Port A enable must be set to Enabled.

15. On the Server Management tab, select 115.2k for BAUD Rate, Serial Port A for Console redirection, Enabled for Legacy OS redirection, VT100-PLUS for Terminal type. This is used for Serial Console Access over LAN to all SAP HANA servers.

Figure 23 BIOS Policy – Server Management



Servers / Policies / root / BIOS Policies / HANA-BIOS

BIOS Setting	Value
Assert NMI on PERR	Platform Default
Assert NMI on SERR	Platform Default
Baud rate	115.2k
Console redirection	Serial Port A
Flow Control	Platform Default
Legacy OS redirection	Enabled
Putty KeyPad	Platform Default
Terminal type	VT100-PLUS
FRB-2 Timer	Platform Default
OS Boot Watchdog Timer Policy	Platform Default
OS Boot Watchdog Timer Timeout	Platform Default

16. Click Save Change to modify BIOS Policy.

17. Click OK.

Power Control Policy

The Power Capping feature in Cisco UCS is designed to save power with a legacy data center use case. This feature does not contribute much to the high-performance behavior of SAP HANA. By choosing the option “No Cap” for power control policy, the SAP HANA server nodes will not have a restricted power supply. It is recommended to have this power control policy to make sure sufficient power supply for high performance and critical applications like SAP HANA.

To create a power control policy for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.

2. Select Policies > root.

3. Right-click Power Control Policies.

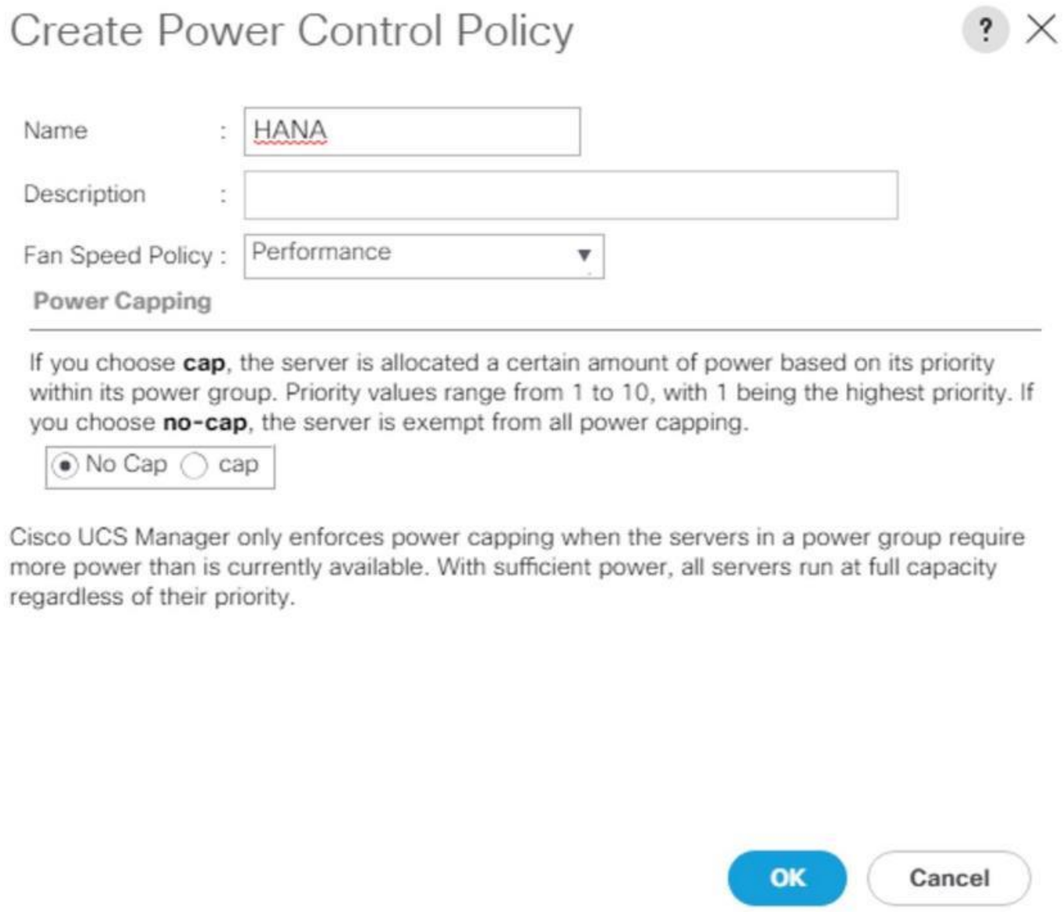
4. Select Create Power Control Policy.

5. Enter HANA as the Power Control Policy name. (Optional) provide description.

6. Set Fan Speed Policy to Performance.

7. Change the Power Capping setting to No Cap.

Figure 24 Power Control Policy for SAP HANA Nodes



Create Power Control Policy

Name : HANA

Description :

Fan Speed Policy : Performance

Power Capping

If you choose **cap**, the server is allocated a certain amount of power based on its priority within its power group. Priority values range from 1 to 10, with 1 being the highest priority. If you choose **no-cap**, the server is exempt from all power capping.

● No Cap ○ cap

Cisco UCS Manager only enforces power capping when the servers in a power group require more power than is currently available. With sufficient power, all servers run at full capacity regardless of their priority.

8. Click OK to create the power control policy.

9. Click OK

Create Serial over LAN Policy

The Serial over LAN policy is required to get console access to all the SAP HANA servers through SSH from the management network. This is used in case of the server hang or a Linux kernel crash, where the dump is required. To configure Create Serial over LAN Policy, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.

2. Select Policies > root

3. Right-click the Serial over LAN Policies.

4. Select Create Serial over LAN Policy.

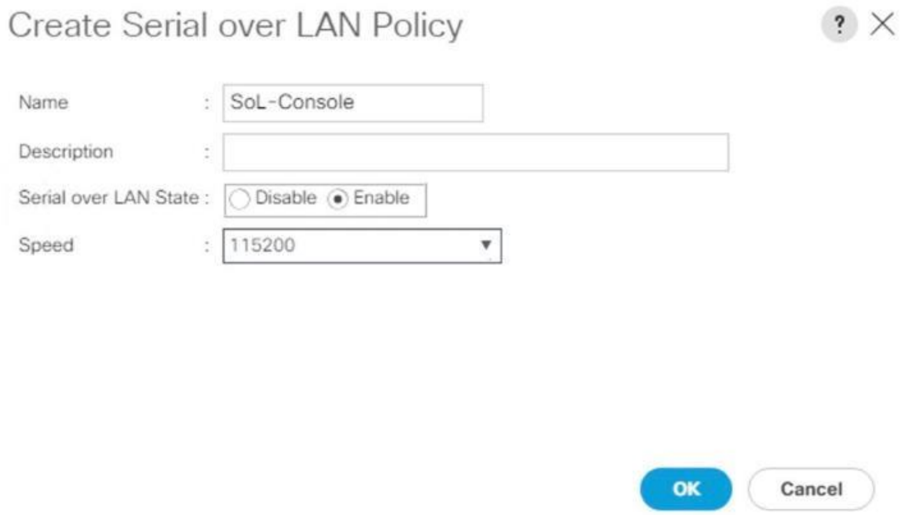
5. Enter SoL-Console as the Policy name.

6. Select Serial over LAN State to Enable.

7. Change the Speed to 115200.

8. Click OK.

Figure 25 Serial Over LAN Policy



Create Serial over LAN Policy

Name : SoL-Console

Description :

Serial over LAN State : ○ Disable ● Enable

Speed : 115200

Update Default Maintenance Policy

It is recommended to update the default Maintenance Policy with the Reboot Policy “User Ack” for the SAP HANA server. This policy will wait for the administrator to acknowledge the server reboot for the configuration changes to take effect.

To update the default Maintenance Policy, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.

2. Select Policies > root.

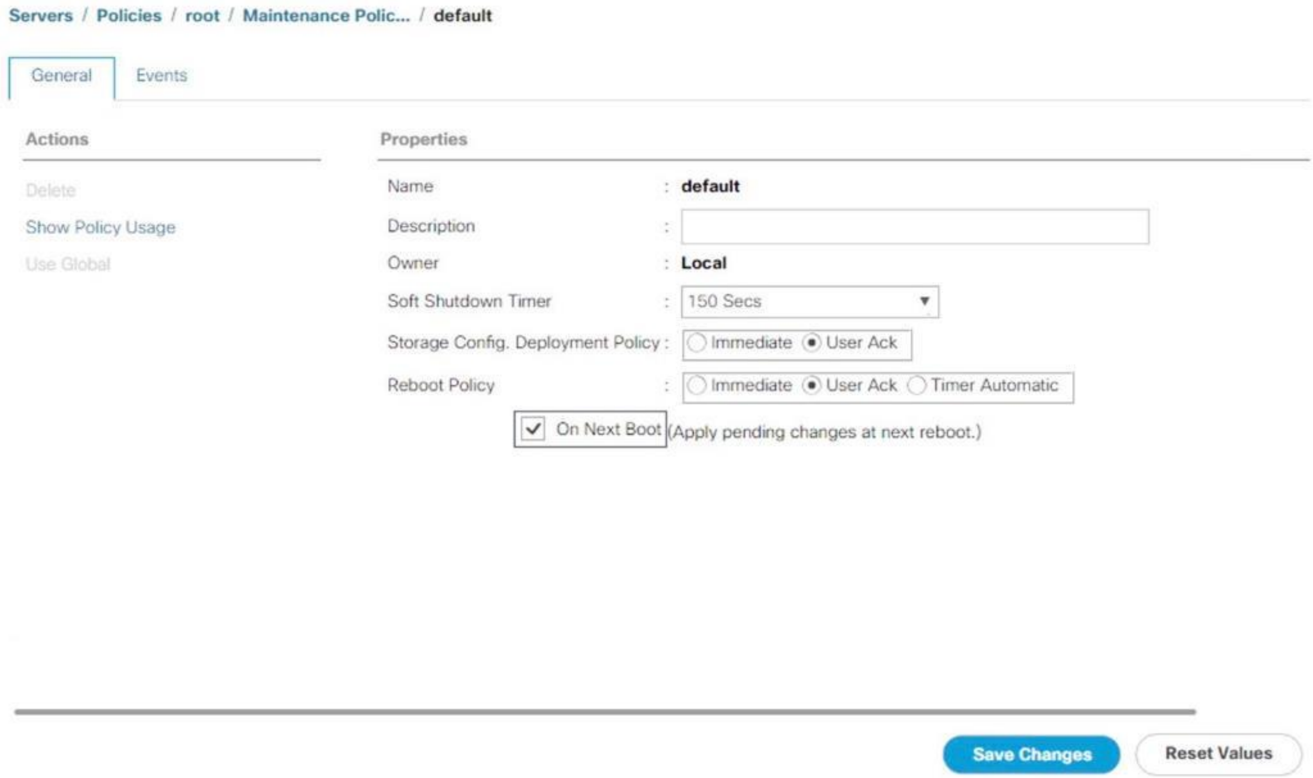
3. Select Maintenance Policies > default.

4. Change the Reboot Policy to User Ack.

5. Click Save Changes.

6. Click OK to accept the change.

Figure 26 Maintenance Policy



Servers / Policies / root / Maintenance Polic... / default

Name : default

Description :

Owner : Local

Soft Shutdown Timer : 150 Secs ▾

Storage Config. Deployment Policy : ○ Immediate ● User Ack

Reboot Policy : ○ Immediate ● User Ack ○ Timer Automatic

☑ On Next Boot (Apply pending changes at next reboot.)

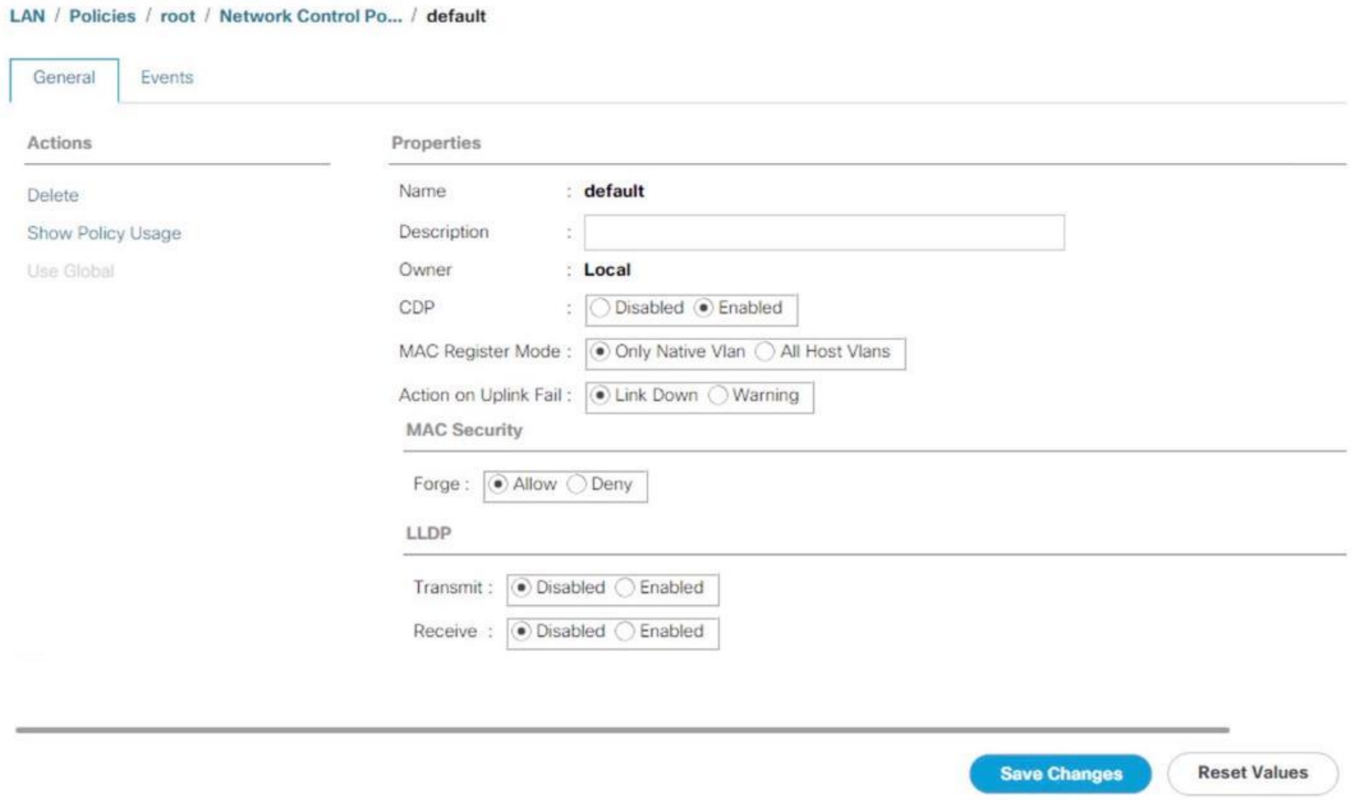
Network Control Policy

Update Default Network Control Policy to Enable CDP

CDP needs to be enabled to learn the MAC address of the End Point. To update default Network Control Policy, follow these steps:

1. In Cisco UCS Manager, click the LAN tab in the navigation pane.
2. Select LAN > Policies > root > Network Control Policies > default.
3. In the right pane, click the General tab.
4. For CDP: select Enabled radio button.
5. Click Save Changes in the bottom of the window.
6. Click OK.

Figure 27 Network Control Policy to Enable CDP



Properties

Name : default

Description :

Owner : Local

CDP : ○ Disabled ● Enabled

MAC Register Mode : ● Only Native Vlan ○ All Host Vlans

Action on Uplink Fail : ● Link Down ○ Warning

MAC Security

Forge : ● Allow ○ Deny

LLDP

Transmit : ● Disabled ○ Enabled

Receive : ● Disabled ○ Enabled

Configure Cisco UCS LAN Connectivity

Set Jumbo Frames in Cisco UCS Fabric

The core network requirements for SAP HANA are covered by Cisco UCS defaults. Cisco UCS is based on 40GbE and provides redundancy through the Dual Fabric concept. The Service Profile is configured to distribute the traffic across Fabric Interconnect A and B.

To configure jumbo frames and enable quality of service in the Cisco UCS fabric, follow these steps:

1. In Cisco UCS Manager, click the LAN tab in the navigation pane.

2. Select LAN > LAN Cloud > QoS System Class.

3. In the right pane, click the General tab.

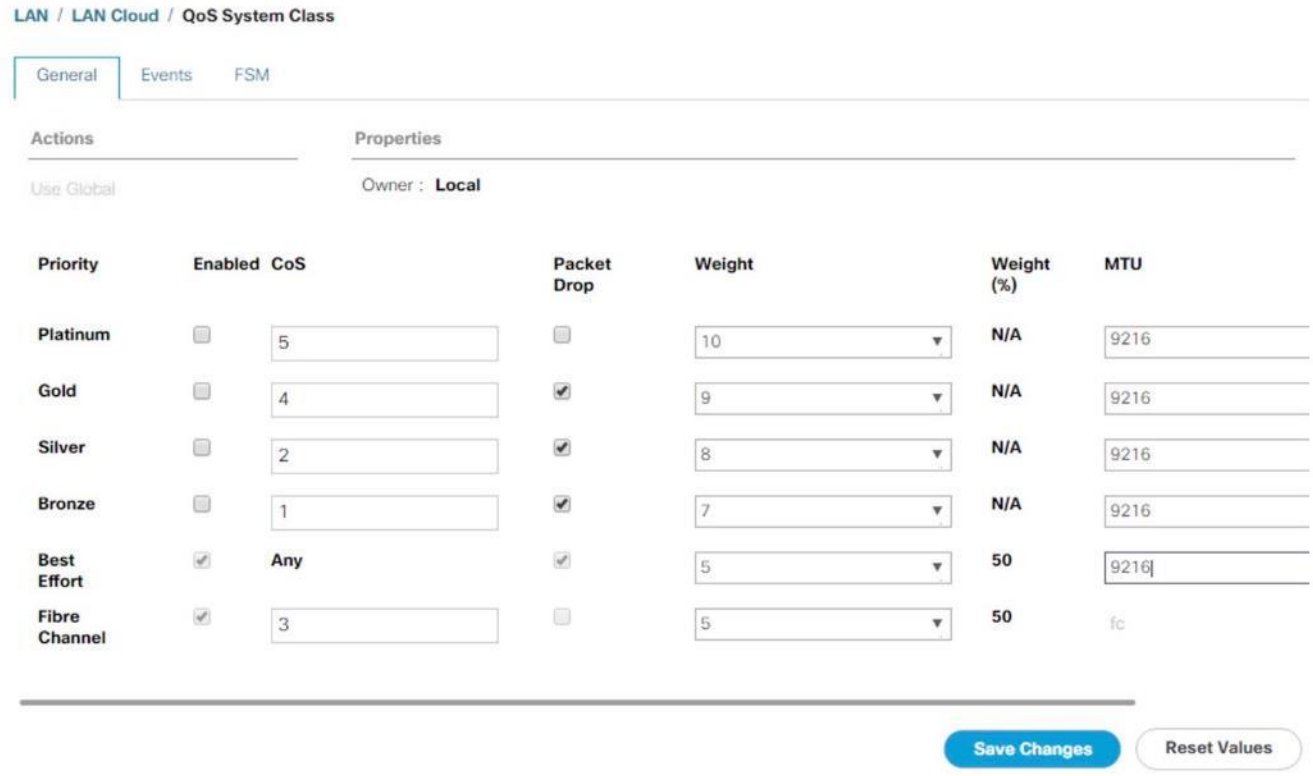
4. On the MTU Column, enter 9216 in the box.

5. Click Save Changes in the bottom of the window.

6. Click Yes to accept the QoS Change Warning

7. Click OK.

Figure 28 Cisco UCS – Setting Jumbo Frames



LAN / LAN Cloud / QoS System Class

Owner : **Local**

Priority	Enabled	CoS	Packet Drop	Weight	Weight (%)	MTU
Platinum	□	5	□	10	N/A	9216
Gold	□	4	☑	9	N/A	9216
Silver	□	2	☑	8	N/A	9216
Bronze	□	1	☑	7	N/A	9216
Best Effort	☑	Any	☑	5	50	9216
Fibre Channel	☑	3	□	5	50	fc

Create LAN Uplink Port Channels

Configure the LAN uplinks from FI-A and FI-B towards northbound Nexus Switches, in port-channel, for use by all of the network zones as prescribed by SAP. For example, we create port-channel 21 on FI-A and port-channel 22 on FI- B. This port channel pair will have corresponding vPCs defined on N9Ks that ensures seamless redundancy and failover for the north-south network traffic

It would suffice to have a port-channel pair on FI with corresponding vPC pair on N9Ks to handle traffic of all network zones provided we have enough ports to account for the desired bandwidth. In the current example, we have used two pairs of 2 x 40GE ports for the FI<->N9K connectivity for port-channels. You could add more based on the need or use-case.

We create port channel pair 21 and 22 with two 40GE ports from FIs to the Nexus switches to cater to SAP HANA's Client, Admin and Internal zones.

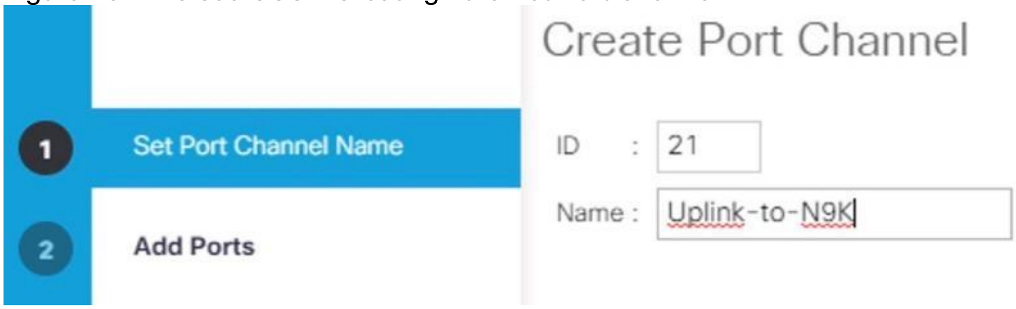
We create another port channel pair 31 and 32 with two 40GE ports from FIs to the Nexus switches that could exclusively handle bandwidth intensive SAP HANA Storage zone traffic comprising of HANA node backup network.

To configure the necessary port channels out of the Cisco UCS environment, follow these steps:

1. In this procedure, two port channels are created: one each from FI-A to and FI-B to uplink Cisco Nexus switches.
2. In Cisco UCS Manager, click the LAN tab in the navigation pane
3. Under LAN > LAN Cloud, expand the Fabric A tree.
4. Right-click Port Channels.

5. Select Create Port Channel.

Figure 29 Cisco UCS – Creating Ethernet Port Channel



Create Port Channel

ID : 21

Name : Uplink-to-N9K

6. Enter 21 as the unique ID of the port channel.

7. Enter Uplink-to-N9K as the name of the port channel.

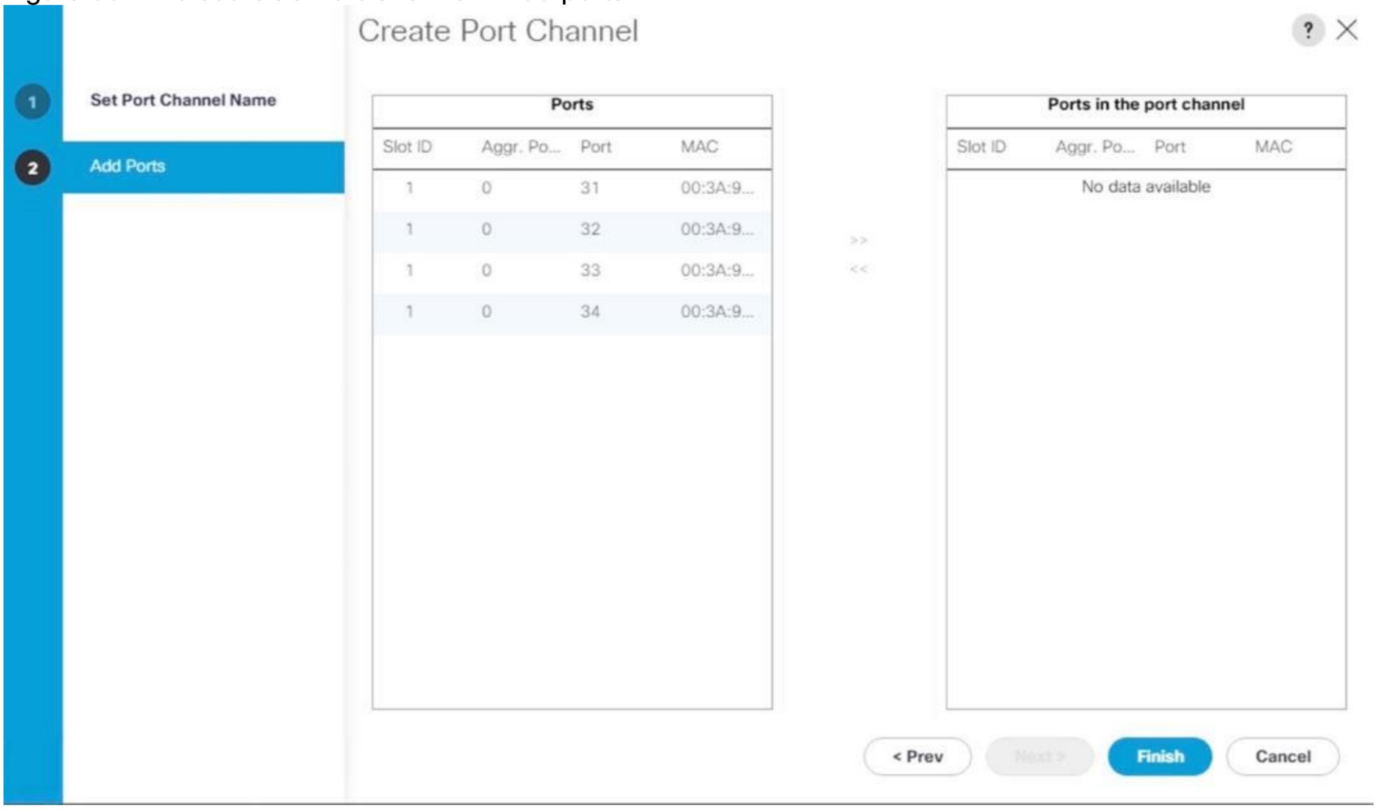
8. Click Next.

9. Select the following ports to be added to the port channel:

   - Slot ID 1 and port 33
   - Slot ID 1 and port 34

The ports are selected based on Uplink Port connectivity and are specific to this sample configuration.

Figure 30 Cisco UCS Port Channel – Add ports



Create Port Channel

Ports

Slot ID	Aggr. Po...	Port	MAC
1	0	31	00:3A:9...
1	0	32	00:3A:9...
1	0	33	00:3A:9...
1	0	34	00:3A:9...

Ports in the port channel

Slot ID	Aggr. Po...	Port	MAC

No data available

10. Click >> to add the ports to the port channel.

11. Click Finish to create the port channel.

12. Click OK.

13. In the navigation pane, under LAN > LAN Cloud, expand the Fabric B tree.

14. Right-click Port Channels.

15. Select Create Port Channel.

16. Enter 22 as the unique ID of the port channel.

17. Enter Uplink-to-N9K as the name of the port channel.

18. Click Next.

19. Select the following ports to be added to the port channel:

    - Slot ID 1 and port 33
    - Slot ID 1 and port 34

20. Click >> to add the ports to the port channel.

21. Click Finish to create the port channel.

22. Click OK.

Configure a second set of port-channels from FI-A and FI-B to the nexus switches. This uplink port-channel could be exclusively used for backup network traffic.

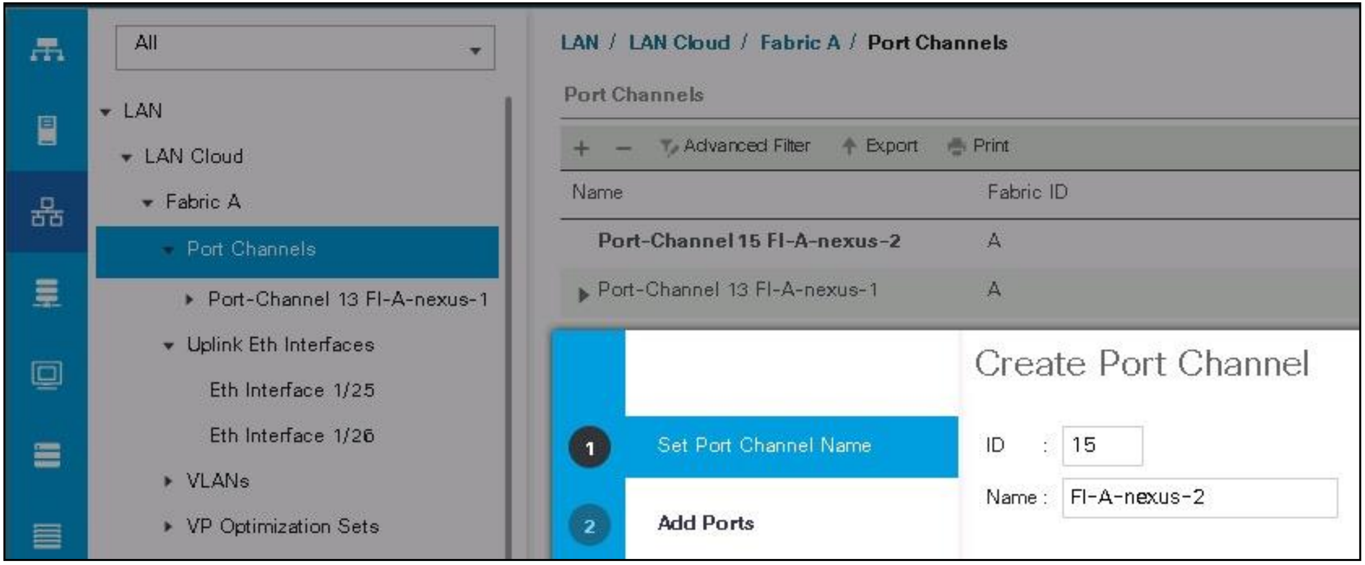
23. In Cisco UCS Manager, click the LAN tab in the navigation pane

24. Under LAN > LAN Cloud, expand the Fabric A tree.

25. Right-click Port Channels.

26. Select Create Port Channel.

Figure 31 Cisco UCS – Creating Ethernet Port Channel



Name	Fabric ID
Port-Channel 15 FI-A-nexus-2	A
Port-Channel 13 FI-A-nexus-1	A

ID : 15

Name : FI-A-nexus-2

27. Enter 31 as the unique ID of the port channel.

28. Enter Uplink-Backup as the name of the port channel.

29. Click Next.

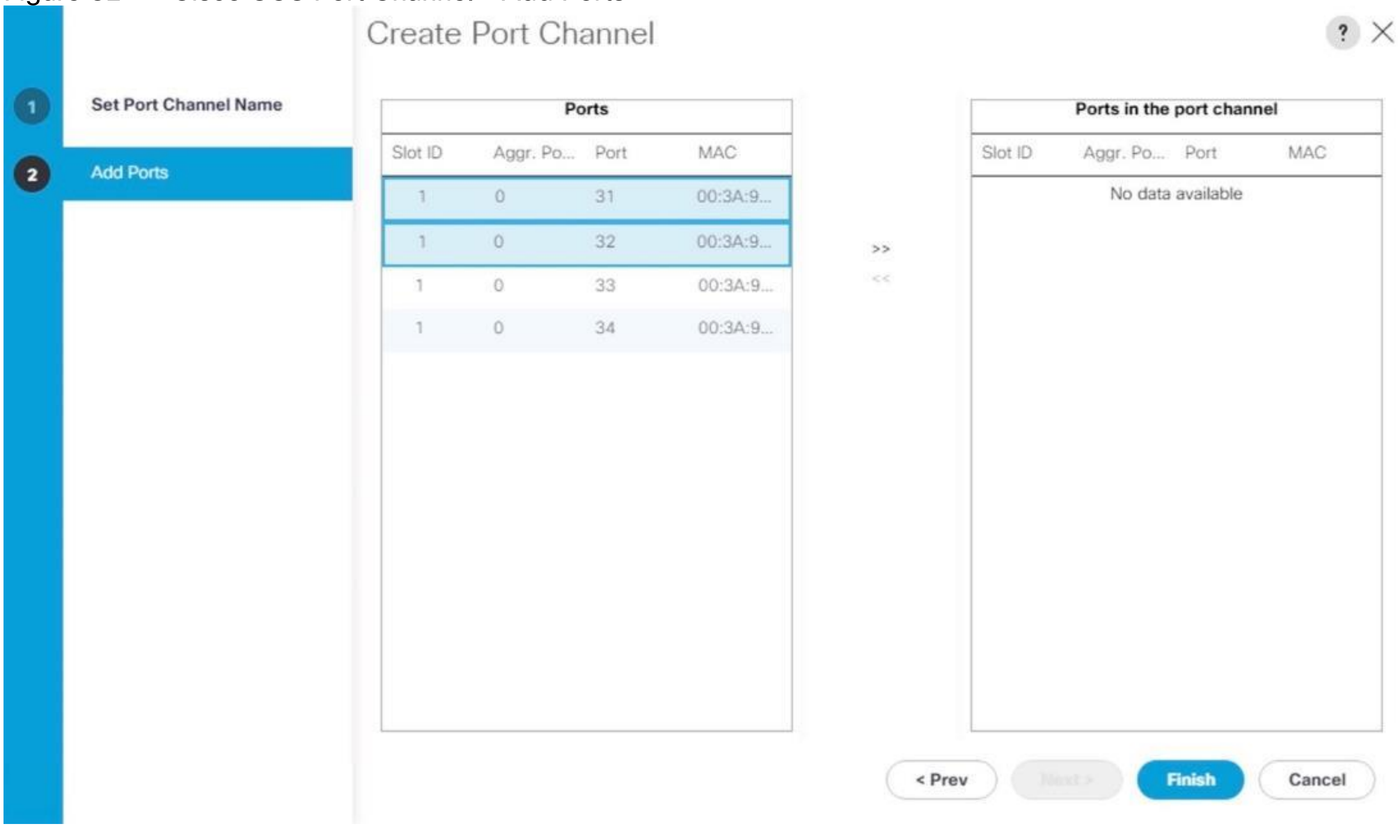
30. Select the following ports to be added to the port channel:

    – Slot ID 1 and port 31

    – Slot ID 1 and port 32

The ports are selected based on Uplink Port connectivity and are specific to this sample configuration.

Figure 32 Cisco UCS Port Channel – Add Ports



Create Port Channel

1 Set Port Channel Name

2 Add Ports

Ports			
Slot ID	Aggr. Po...	Port	MAC
1	0	31	00:3A:9...
1	0	32	00:3A:9...
1	0	33	00:3A:9...
1	0	34	00:3A:9...

Ports in the port channel			
Slot ID	Aggr. Po...	Port	MAC
No data available			

31. Click >> to add the ports to the port channel.

32. Click Finish to create the port channel.

33. Click OK.

34. In the navigation pane, under LAN > LAN Cloud, expand the Fabric B tree.

35. Right-click Port Channels.

36. Select Create Port Channel

37. Enter 31 as the unique ID of the port channel.

38. Enter Uplink-Backup as the name of the port channel.

39. Click Next.

40. Select the following ports to be added to the port channel:

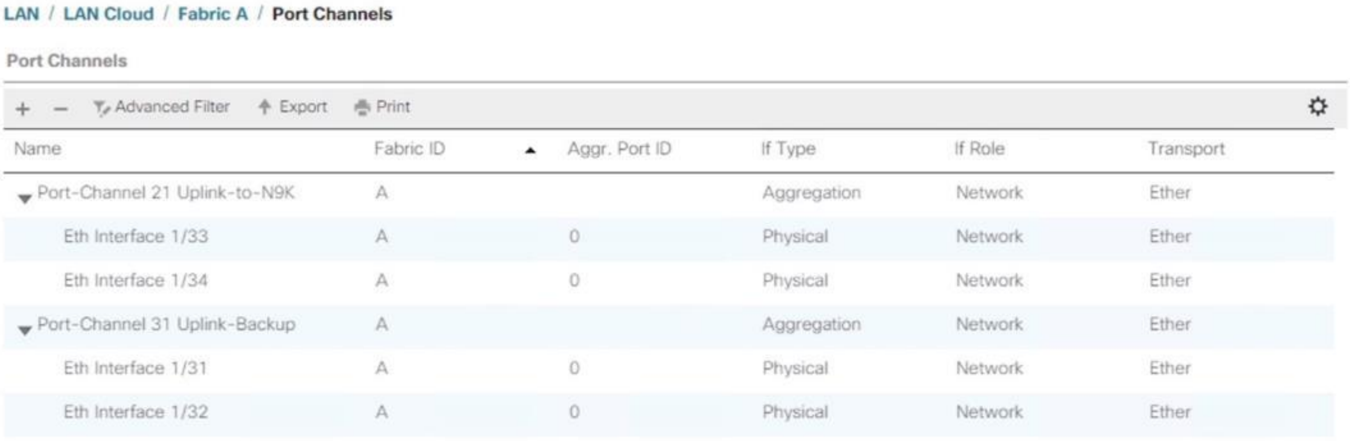
    - Slot ID 1 and port 31
    - Slot ID 1 and port 32

41. Click >> to add the ports to the port channel.

42. Click Finish to create the port channel.

43. Click OK.

Figure 33 Cisco UCS FI-A Port Channel Overview

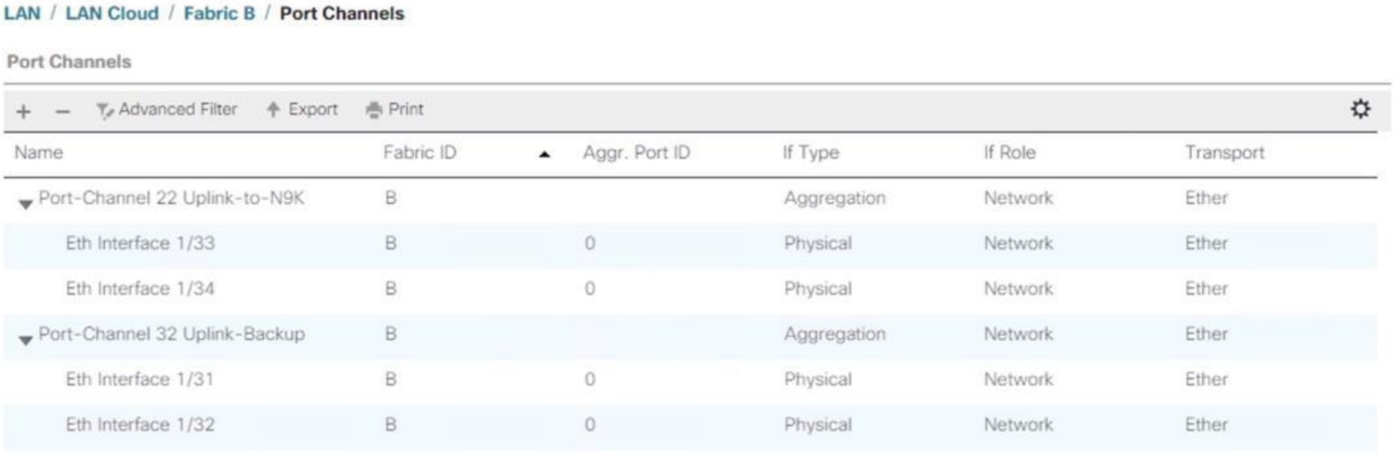


LAN / LAN Cloud / Fabric A / Port Channels

Port Channels

Name	Fabric ID	Aggr. Port ID	If Type	If Role	Transport
Port-Channel 21 Uplink-to-N9K	A		Aggregation	Network	Ether
Eth Interface 1/33	A	0	Physical	Network	Ether
Eth Interface 1/34	A	0	Physical	Network	Ether
Port-Channel 31 Uplink-Backup	A		Aggregation	Network	Ether
Eth Interface 1/31	A	0	Physical	Network	Ether
Eth Interface 1/32	A	0	Physical	Network	Ether

Figure 34 Cisco UCS FI-B Port Channel Overview



LAN / LAN Cloud / Fabric B / Port Channels

Port Channels

Name	Fabric ID	Aggr. Port ID	If Type	If Role	Transport
Port-Channel 22 Uplink-to-N9K	B		Aggregation	Network	Ether
Eth Interface 1/33	B	0	Physical	Network	Ether
Eth Interface 1/34	B	0	Physical	Network	Ether
Port-Channel 32 Uplink-Backup	B		Aggregation	Network	Ether
Eth Interface 1/31	B	0	Physical	Network	Ether
Eth Interface 1/32	B	0	Physical	Network	Ether

VLAN Configurations

Within Cisco UCS, all the network types for an SAP HANA system are manifested by defined VLANs. Even though six VLANs are defined, VLANs for all the networks are not necessary if the solution will not use those networks. For example, if the Replication Network is not used in the solution, then VLAN ID 225 need not be created.

The VLAN IDs can be changed if required to match the VLAN IDs in the customer's network – for example, ID 221 for backup should match the configured VLAN ID at the customer uplink network switches.

Create VLANs

To configure the necessary VLANs for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the LAN tab in the navigation pane.

In this procedure, six VLANs are created.

2. Select LAN > LAN Cloud.

3. Right-click VLANs.

4. Select Create VLANs.

5. Enter HANA-Mgmt as the name of the VLAN to be used for Management network.

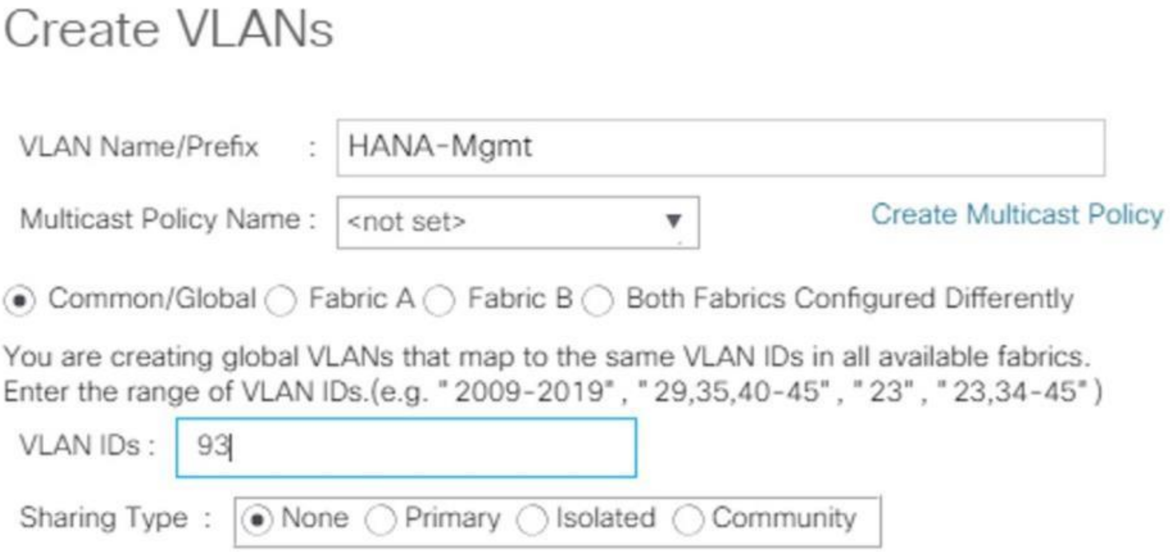
6. Keep the Common/Global option selected for the scope of the VLAN.

7. Enter <<var_mgmt_vlan_id>> as the ID of the Management network.

8. Keep the Sharing Type as None.

9. Click OK, and then click OK again.

Figure 35 Create VLAN for Internode



Create VLANs

VLAN Name/Prefix : HANA-Mgmt

Multicast Policy Name : <not set> ▼

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

You are creating global VLANs that map to the same VLAN IDs in all available fabrics.
Enter the range of VLAN IDs.(e.g. " 2009-2019" , " 29,35,40-45" , " 23" , " 23,34-45")

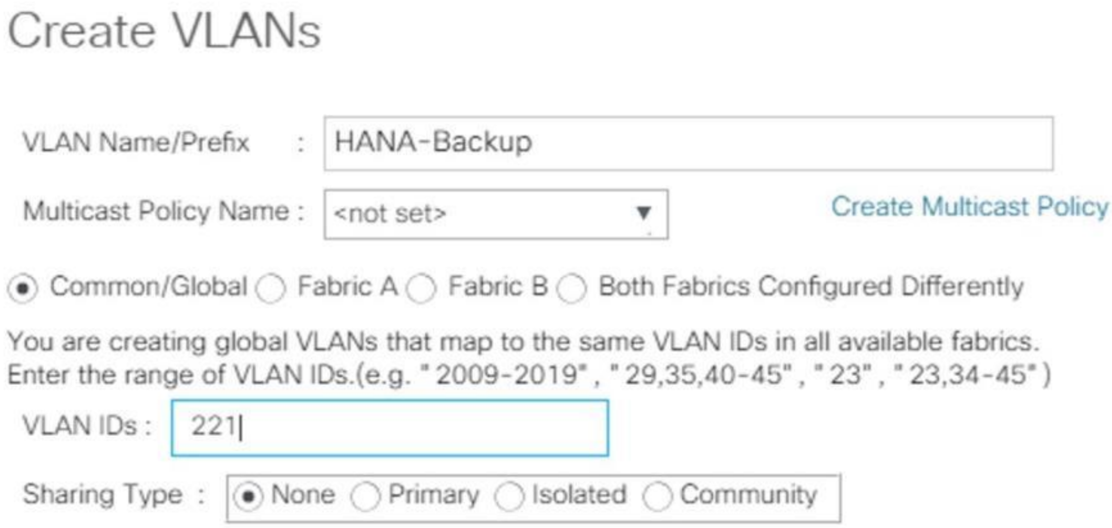
VLAN IDs : 93

Sharing Type : ● None ○ Primary ○ Isolated ○ Community

10. Repeat steps 1-9 above for each VLAN creation.

11. Create VLAN for HANA-Backup

Figure 36 Create VLAN for Backup



Create VLANs

VLAN Name/Prefix : HANA-Backup

Multicast Policy Name : <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

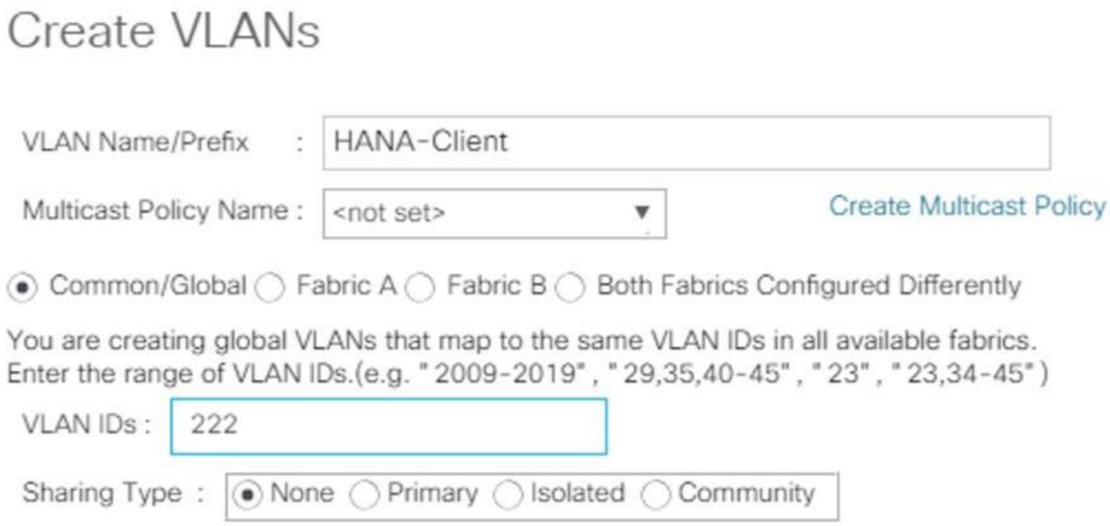
You are creating global VLANs that map to the same VLAN IDs in all available fabrics.
Enter the range of VLAN IDs.(e.g. " 2009-2019" , " 29,35,40-45" , " 23" , " 23,34-45")

VLAN IDs : 221

Sharing Type : ● None ○ Primary ○ Isolated ○ Community

12. Create VLAN for HANA-Client.

Figure 37 Create VLAN for Client Network



Create VLANs

VLAN Name/Prefix : HANA-Client

Multicast Policy Name : <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

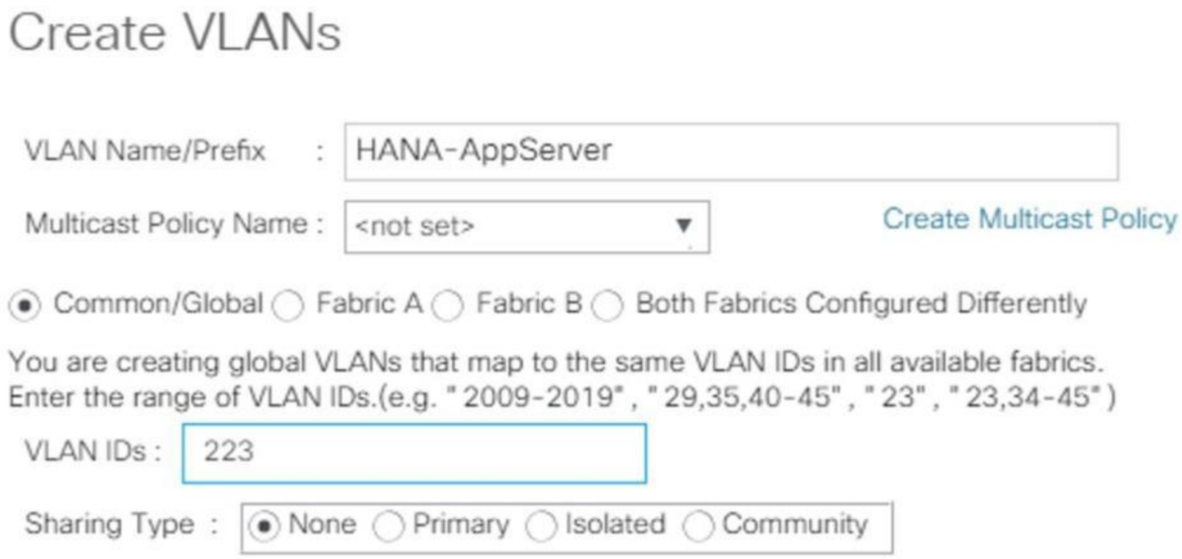
You are creating global VLANs that map to the same VLAN IDs in all available fabrics.
Enter the range of VLAN IDs.(e.g. " 2009-2019" , " 29,35,40-45" , " 23" , " 23,34-45")

VLAN IDs : 222

Sharing Type : ● None ○ Primary ○ Isolated ○ Community

13. Create VLAN for HANA-AppServer.

Figure 38 Create VLAN for Application Server



Create VLANs

VLAN Name/Prefix : HANA-AppServer

Multicast Policy Name : <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

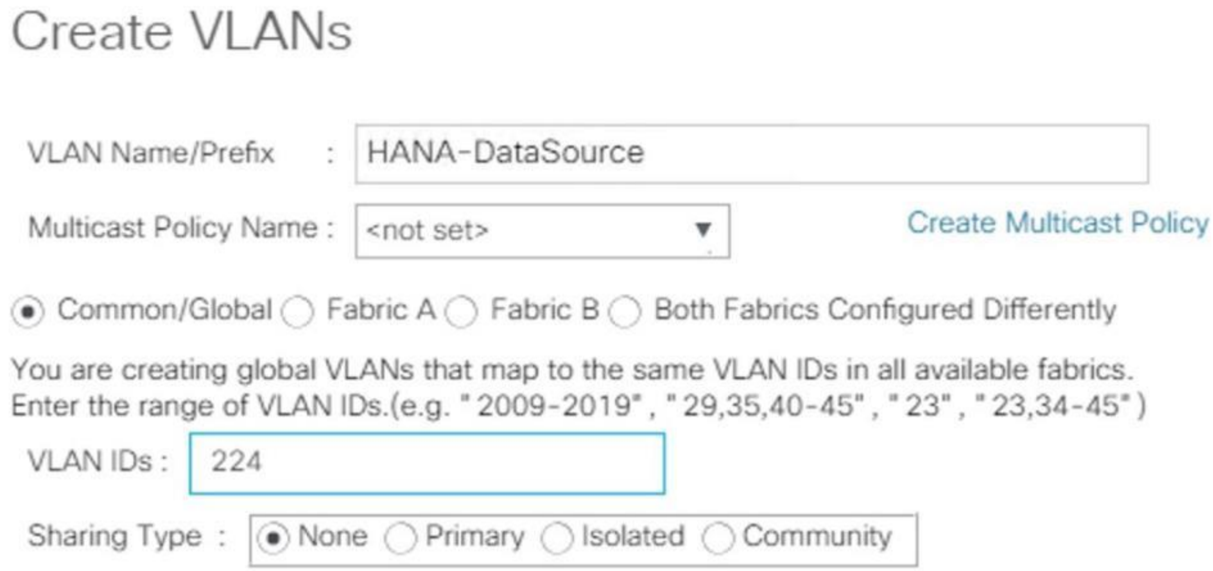
You are creating global VLANs that map to the same VLAN IDs in all available fabrics.
Enter the range of VLAN IDs.(e.g. " 2009-2019" , " 29,35,40-45" , " 23" , " 23,34-45")

VLAN IDs : 223

Sharing Type : ● None ○ Primary ○ Isolated ○ Community

14. Create VLAN for HANA-DataSource.

Figure 39 Create VLAN for Data Source



Create VLANs

VLAN Name/Prefix : HANA-DataSource

Multicast Policy Name : <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

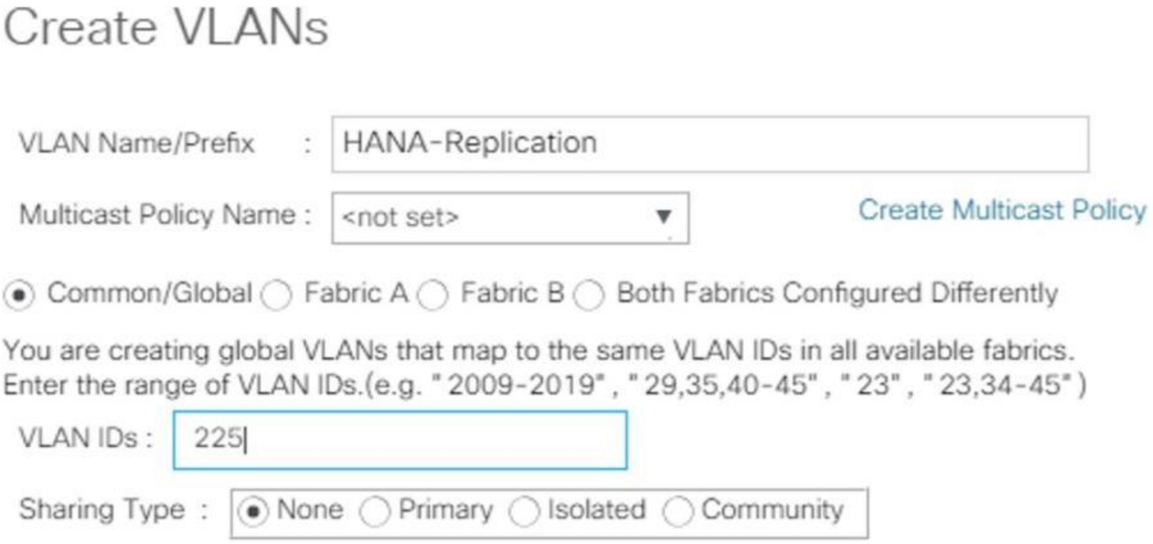
You are creating global VLANs that map to the same VLAN IDs in all available fabrics.
Enter the range of VLAN IDs.(e.g. " 2009-2019" , " 29,35,40-45" , " 23" , " 23,34-45")

VLAN IDs : 224

Sharing Type : ● None ○ Primary ○ Isolated ○ Community

15. Create VLAN for HANA-Replication.

Figure 40 Create VLAN for Replication



Create VLANs

VLAN Name/Prefix : HANA-Replication

Multicast Policy Name : <not set> ▼

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

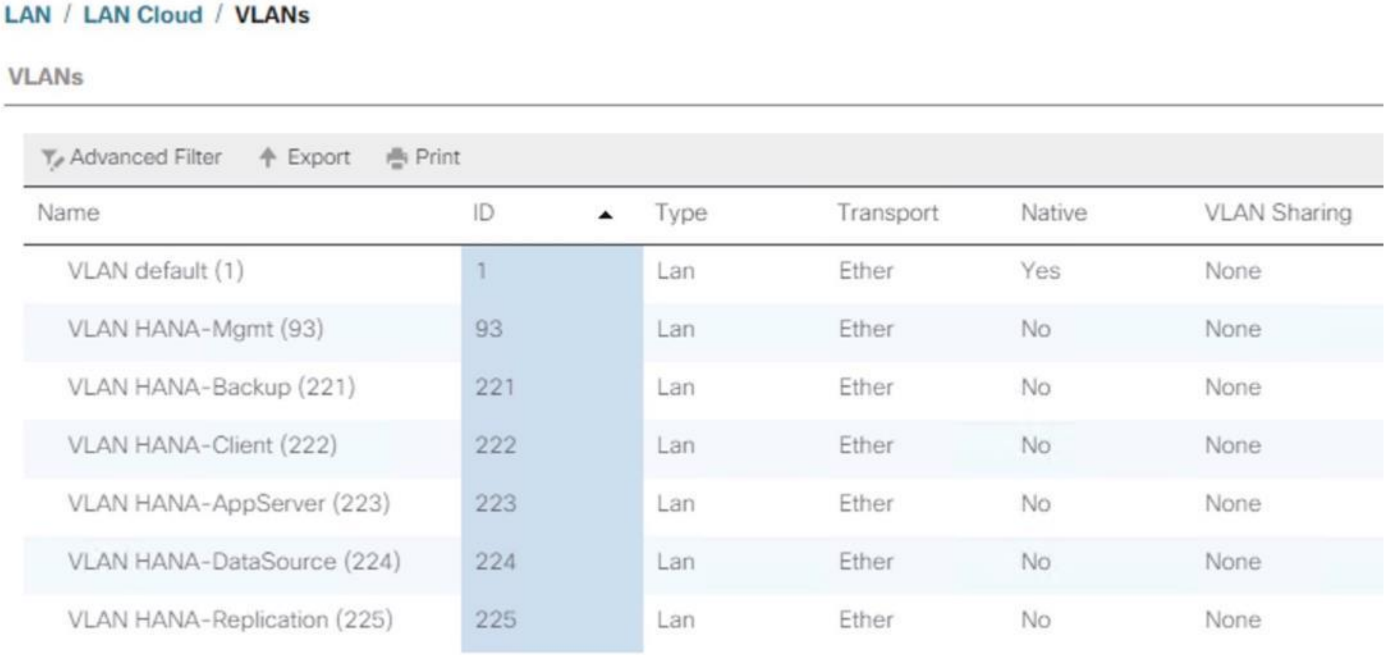
You are creating global VLANs that map to the same VLAN IDs in all available fabrics.
Enter the range of VLAN IDs.(e.g. " 2009-2019" , " 29,35,40-45" , " 23" , " 23,34-45")

VLAN IDs : 225

Sharing Type : ● None ○ Primary ○ Isolated ○ Community

The list of created VLANs is shown below:

Figure 41 VLAN Definition in Cisco UCS



LAN / LAN Cloud / VLANs

VLANs

Name	ID	Type	Transport	Native	VLAN Sharing
VLAN default (1)	1	Lan	Ether	Yes	None
VLAN HANA-Mgmt (93)	93	Lan	Ether	No	None
VLAN HANA-Backup (221)	221	Lan	Ether	No	None
VLAN HANA-Client (222)	222	Lan	Ether	No	None
VLAN HANA-AppServer (223)	223	Lan	Ether	No	None
VLAN HANA-DataSource (224)	224	Lan	Ether	No	None
VLAN HANA-Replication (225)	225	Lan	Ether	No	None

Create VLAN Groups

For easier management and bandwidth allocation to a dedicated uplink on the Fabric Interconnect, VLAN Groups are created within the Cisco UCS. SAP groups the networks needed by HANA system into following zones which could be translated to VLAN groups in Cisco UCS configuration:

- Client Zone – including AppServer, Client and DataSource networks

- Internal Zone – including Inter-node and System Replication networks
- Storage Zone – including Backup and IP storage networks
- And optional Admin zone – including Management, , OS cluster network, if any

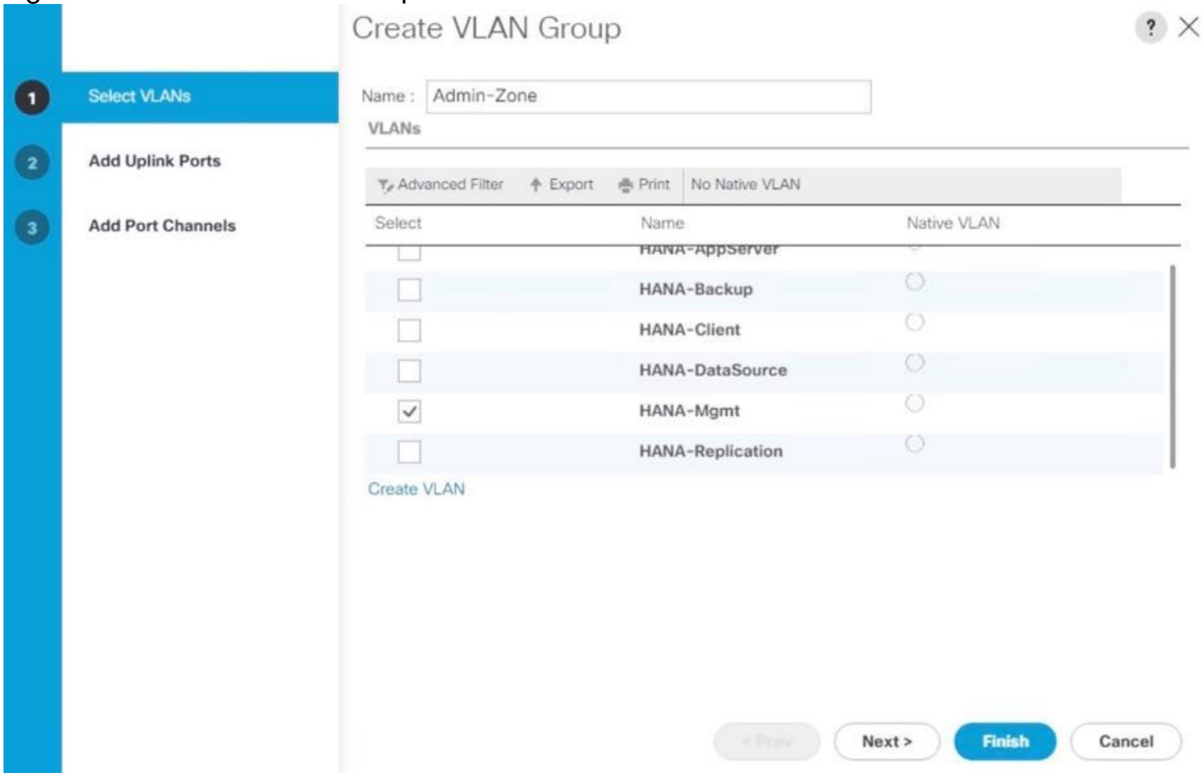
To configure the necessary VLAN Groups for the Cisco UCS environment, follow these steps:

1. In Cisco UCS Manager, click the LAN tab in the navigation pane.

In this procedure, three VLAN Groups are created. Based on the solution requirement create VLAN groups as needed by the implementation scenario.

2. Select LAN > LAN Cloud.
3. Right-click VLAN Groups.
4. Select Create VLAN Groups.
5. Enter Admin-Zone as the name of the VLAN Group used for Infrastructure network.
6. Select HANA-Mgmt.

Figure 42 Create VLAN Group for Admin Zone



Name : Admin-Zone

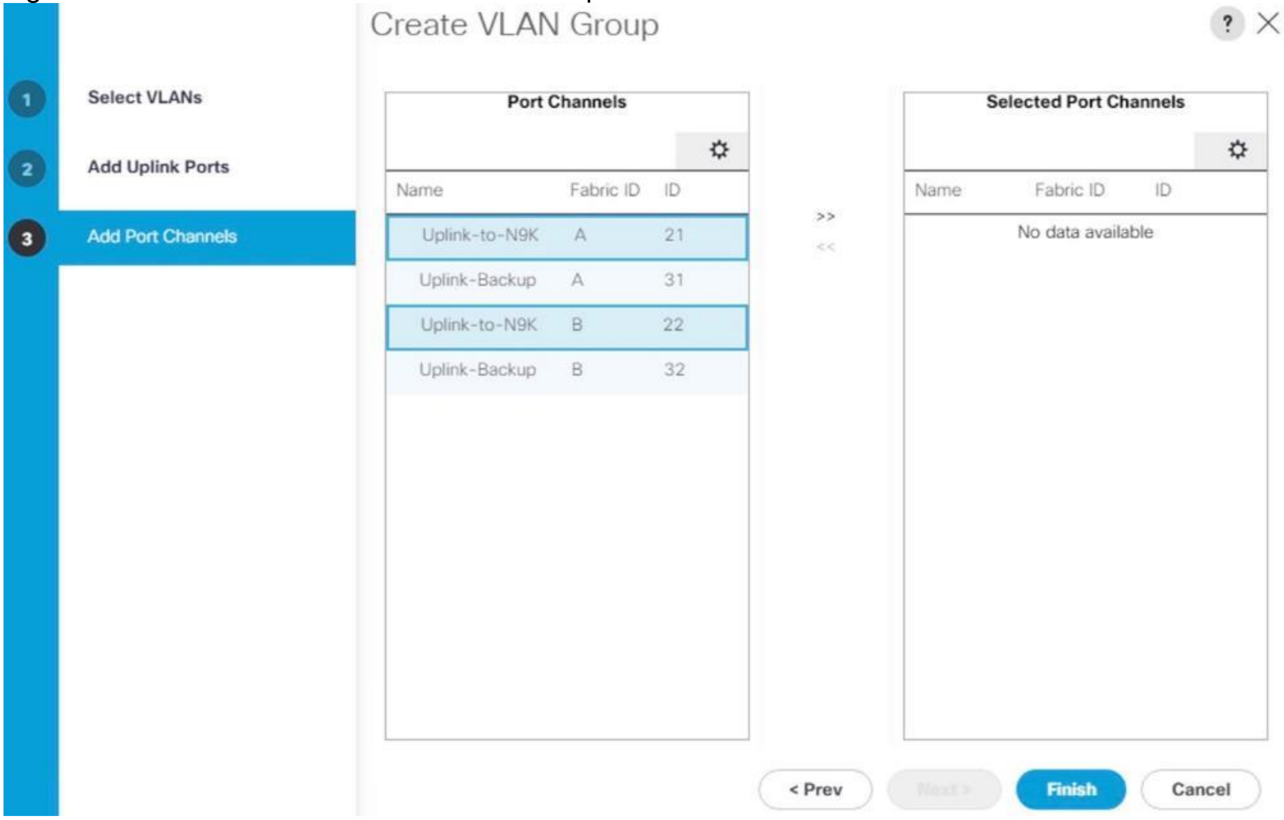
VLANs

Select	Name	Native VLAN
□	HANA-AppServer	○
□	HANA-Backup	○
□	HANA-Client	○
□	HANA-DataSource	○
☑	HANA-Mgmt	○
□	HANA-Replication	○

7. Click Next
8. Click Next on Add Uplink Ports, since you will use port-channel.

9. Choose port-channels created [21 & 22 in this example configuration] for uplink network. Click >>

Figure 43 Add Port-Channel for VLAN Group Admin Zone



Create VLAN Group

Port Channels

Name	Fabric ID	ID
Uplink-to-N9K	A	21
Uplink-Backup	A	31
Uplink-to-N9K	B	22
Uplink-Backup	B	32

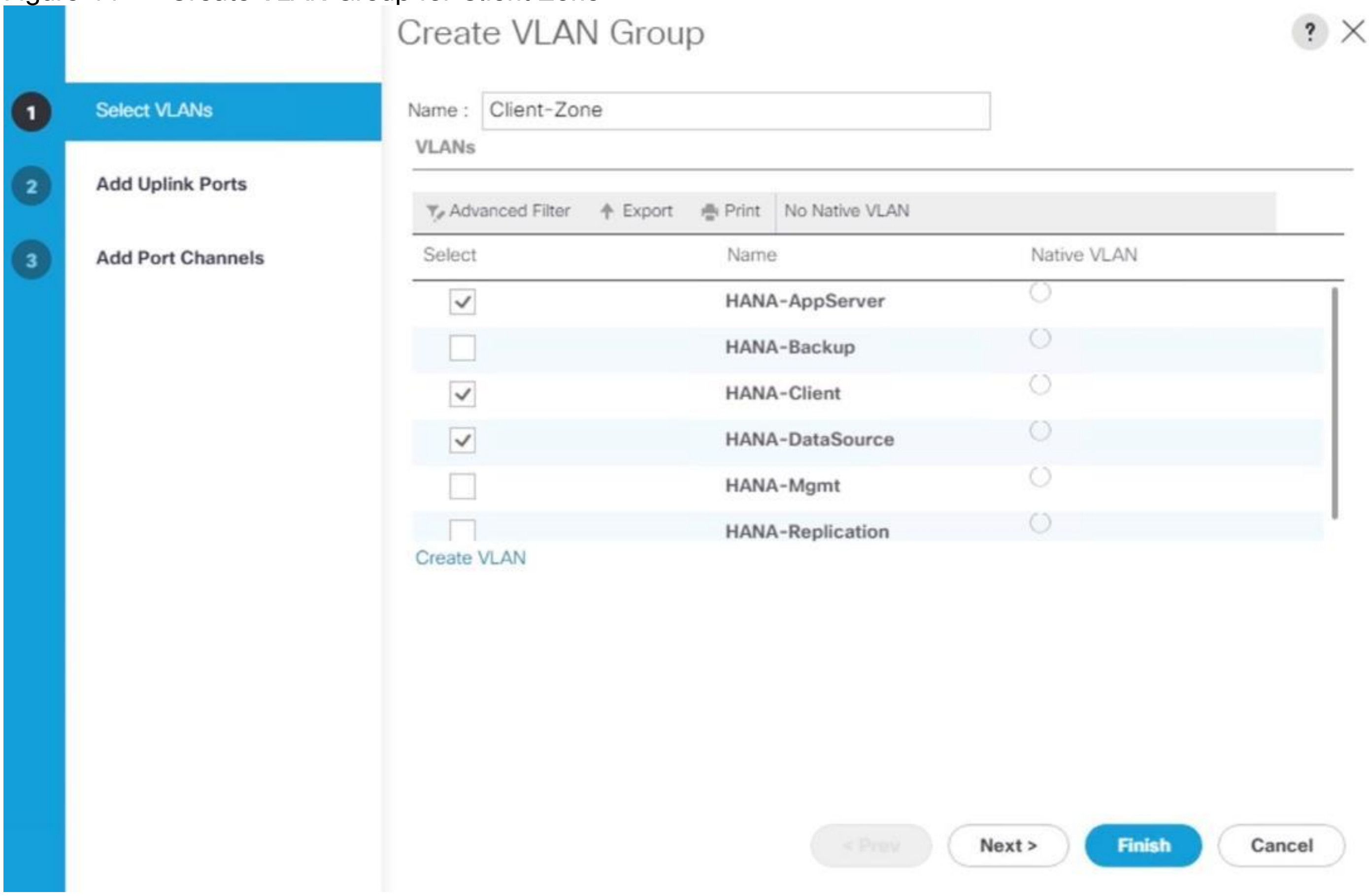
Selected Port Channels

Name	Fabric ID	ID
No data available		

10. Click Finish.

11. Create VLAN Group for Client Zone. Select HANA-AppServer, HANA-Client and HANA-DataSource networks to be part of this VLAN group.

Figure 44 Create VLAN Group for Client Zone



Name : Client-Zone

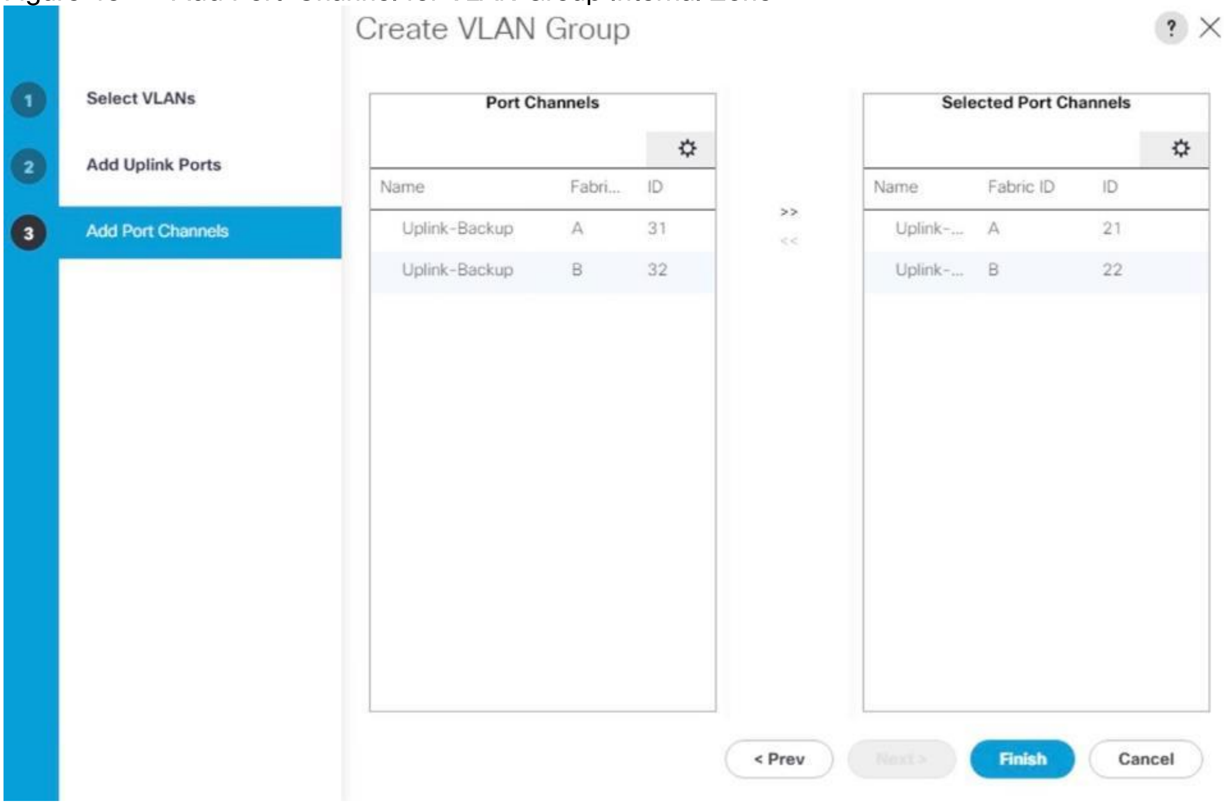
Select	Name	Native VLAN
☑	HANA-AppServer	○
□	HANA-Backup	○
☑	HANA-Client	○
☑	HANA-DataSource	○
□	HANA-Mgmt	○
□	HANA-Replication	○

12. Click Next.

13. Click Next on Add Uplink Ports, since you will use port-channel.

14. Choose port-channels (21 and 22 in this example configuration) created for uplink network. Click >>

Figure 45 Add Port-Channel for VLAN Group Internal Zone



Port Channels

Name	Fabri...	ID
Uplink-Backup	A	31
Uplink-Backup	B	32

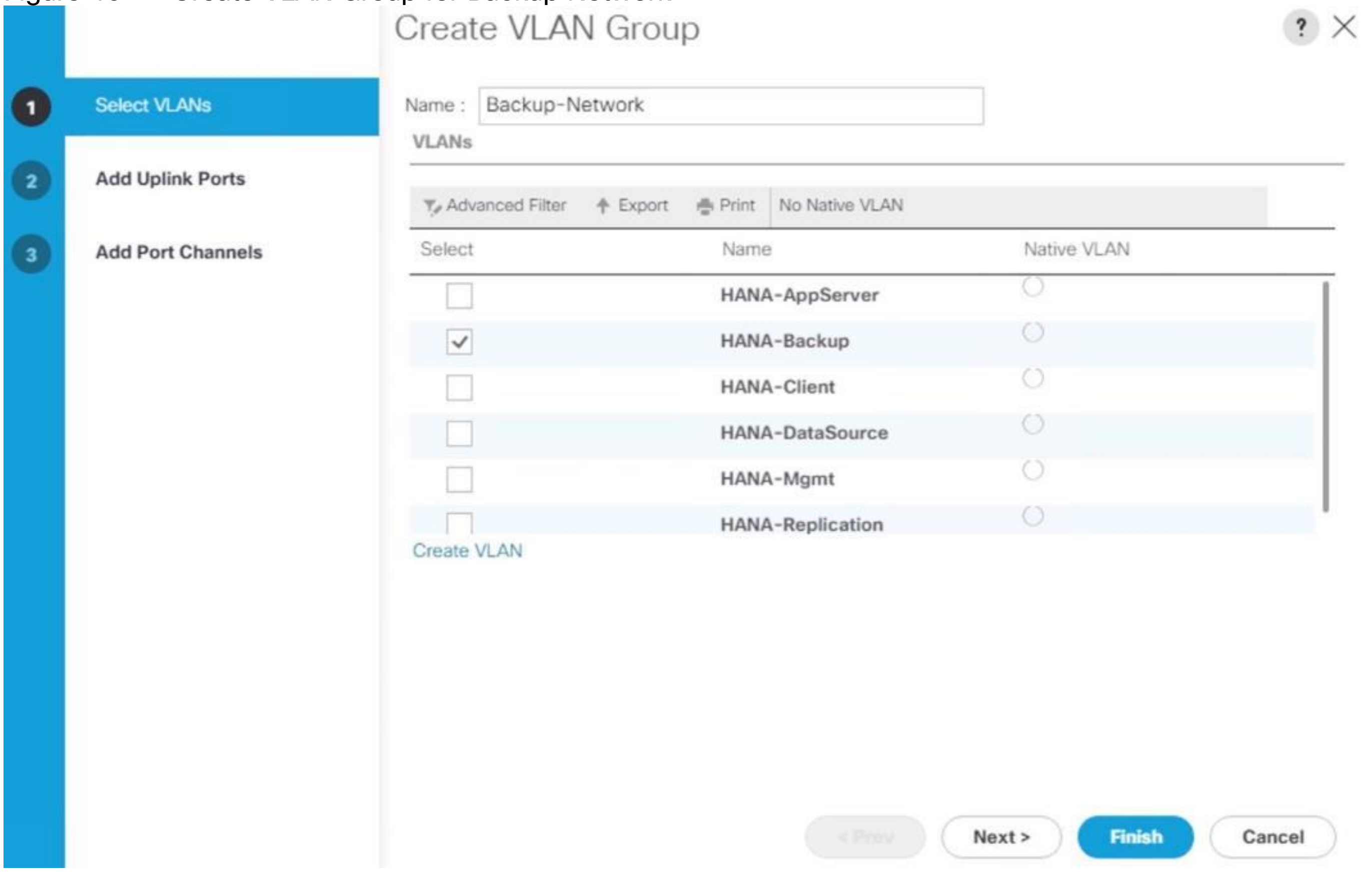
Selected Port Channels

Name	Fabric ID	ID
Uplink-...	A	21
Uplink-...	B	22

15. Click Finish.

16. Create VLAN Group for Backup Network. Select HANA-Backup network.

Figure 46 Create VLAN Group for Backup Network



Name : Backup-Network

VLANs

No Native VLAN

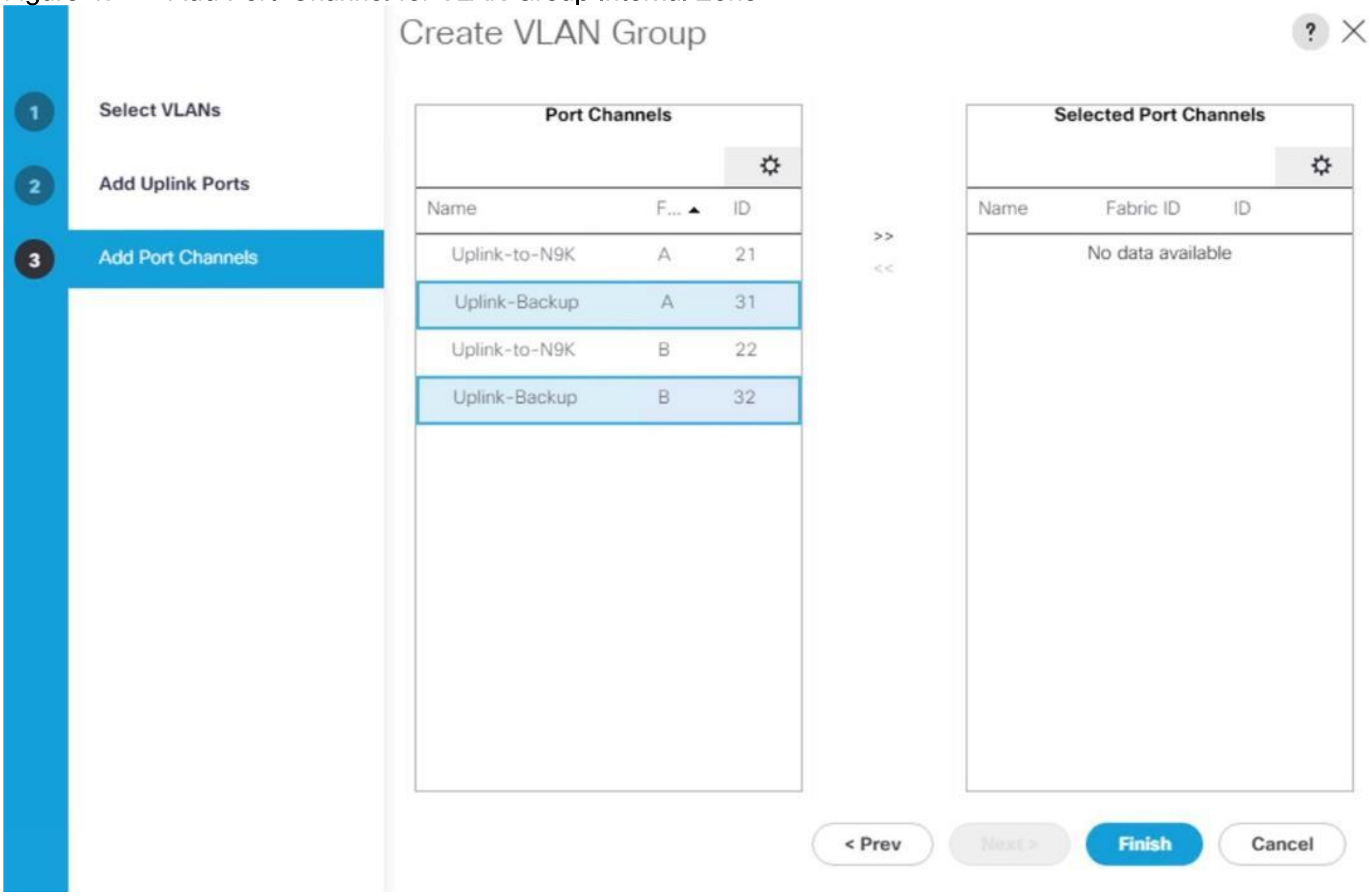
Select	Name	Native VLAN
□	HANA-AppServer	○
☑	HANA-Backup	○
□	HANA-Client	○
□	HANA-DataSource	○
□	HANA-Mgmt	○
□	HANA-Replication	○

17. Click Next.

18. Click Next on Add Uplink Ports, since you will use port-channel.

19. Choose port-channels (31 and 32 in this example configuration) created for uplink network. Click >>

Figure 47 Add Port-Channel for VLAN Group Internal Zone



Port Channels

Name	F... ▲	ID
Uplink-to-N9K	A	21
Uplink-Backup	A	31
Uplink-to-N9K	B	22
Uplink-Backup	B	32

Selected Port Channels

Name	Fabric ID	ID
No data available		

20. Click Finish

21. Create VLAN Group for Internal-Zone. Select HANA-Replication network

22. Click Next.

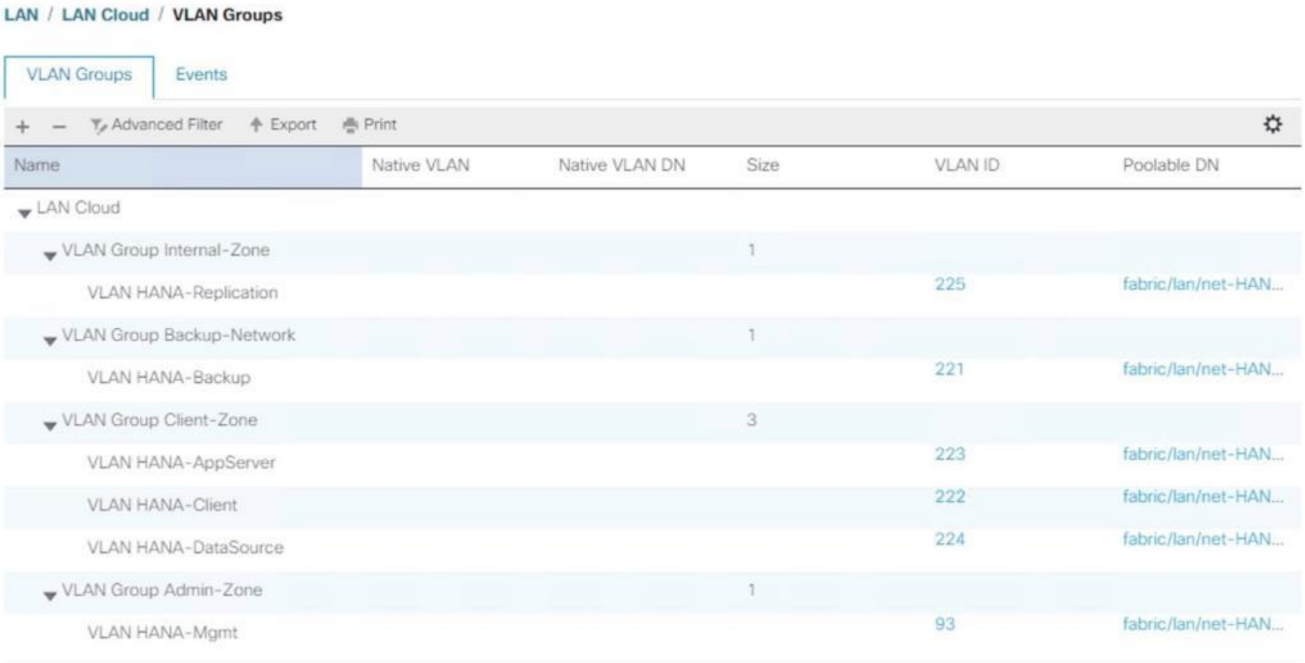
23. Click Next on Add Uplink Ports, since you will use port-channel.

24. Choose port-channels (21 and 22 in this example configuration) created for uplink network. Click >>

25. Click Finish

26. More VLAN groups, if needed could be created following the above steps. VLAN Groups created in the Cisco UCS.

Figure 48 VLAN Groups in Cisco UCS



Name	Native VLAN	Native VLAN DN	Size	VLAN ID	Poolable DN
LAN Cloud					
VLAN Group Internal-Zone			1		
VLAN HANA-Replication				225	fabric/lan/net-HAN...
VLAN Group Backup-Network			1		
VLAN HANA-Backup				221	fabric/lan/net-HAN...
VLAN Group Client-Zone			3		
VLAN HANA-AppServer				223	fabric/lan/net-HAN...
VLAN HANA-Client				222	fabric/lan/net-HAN...
VLAN HANA-DataSource				224	fabric/lan/net-HAN...
VLAN Group Admin-Zone			1		
VLAN HANA-Mgmt				93	fabric/lan/net-HAN...

For each VLAN Group a dedicated Ethernet Uplink Port or Port Channel can be selected, if the use-case demands. Alternatively, a single uplink Port Channel with more ports to enhance the bandwidth could also be used if that suffices.

Create vNIC Template

Each VLAN is mapped to a vNIC template to specify the characteristic of a specific network. The vNIC template configuration settings include MTU size, Failover capabilities and MAC-Address pools.

To create vNIC templates for the Cisco UCS environment, follow these steps:

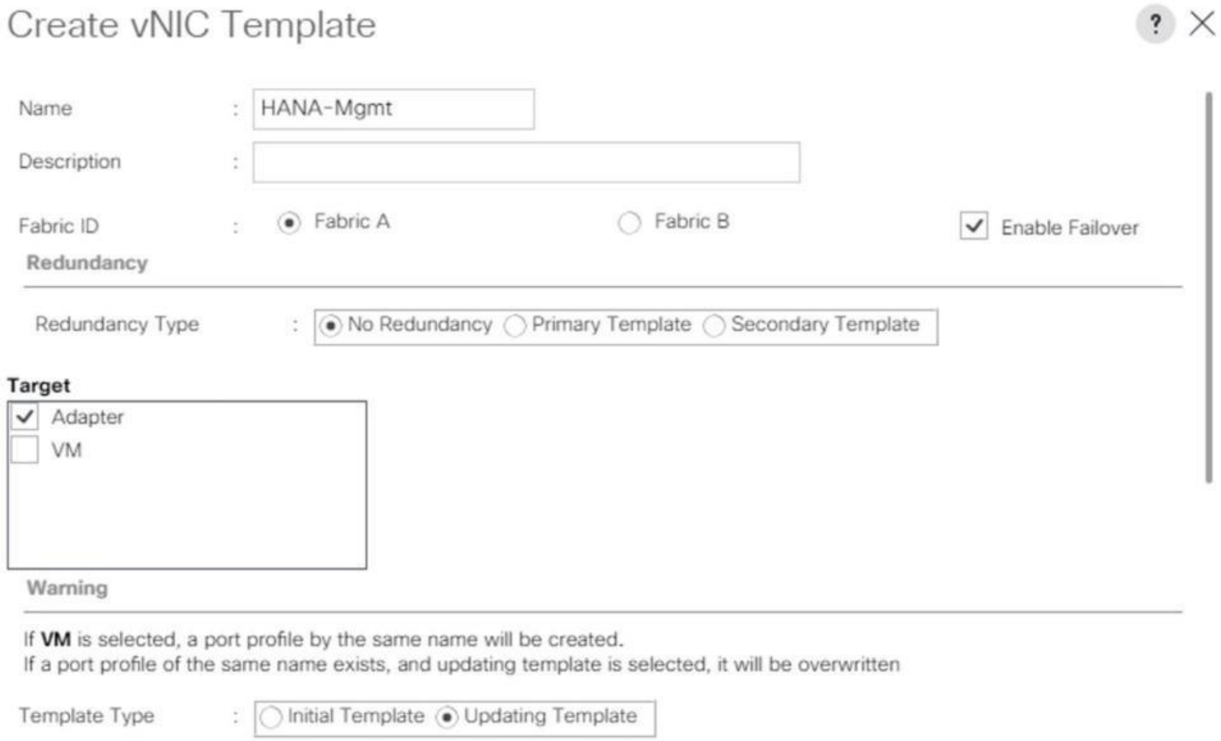
1. In Cisco UCS Manager, click the LAN tab in the navigation pane.
2. Select Policies > root > Sub-Organization > T01-HANA.
3. Right-click vNIC Templates.
4. Select Create vNIC Template.
5. Enter HANA-Mgmt as the vNIC template name.
6. For Fabric ID select Fabric A and Check the Enable Failover checkbox.
7. Under Target, make sure that the VM checkbox is unchecked.
8. Select Updating Template as the Template Type.
9. Under VLANs, check the checkboxes for HANA-Mgmt.
10. Set HANA-Internal as the native VLAN.

11. For MTU, enter 9000.

12. In the MAC Pool list, select FI-A.

13. For Network Control Policy Select default from drop-down list.

Figure 49 Create vNIC Template for HANA-Mgmt



Create vNIC Template

Name : HANA-Mgmt

Description :

Fabric ID : ● Fabric A ○ Fabric B ☑ Enable Failover

Redundancy

Redundancy Type : ● No Redundancy ○ Primary Template ○ Secondary Template

Target

☑ Adapter

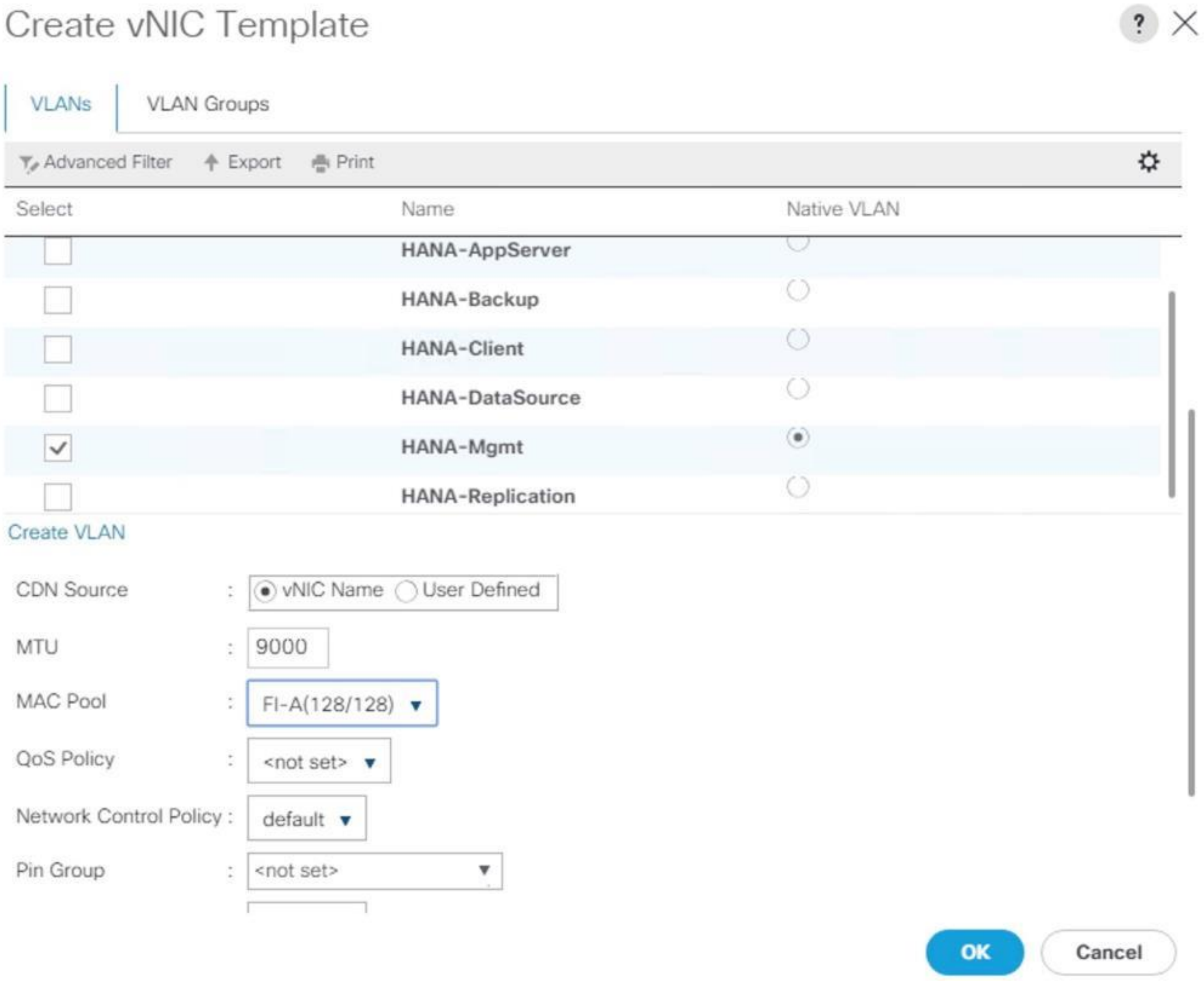
□ VM

Warning

If **VM** is selected, a port profile by the same name will be created.
If a port profile of the same name exists, and updating template is selected, it will be overwritten

Template Type : ○ Initial Template ● Updating Template

Figure 50 Create vNIC Template for HANA-Mgmt



Create vNIC Template

Select	Name	Native VLAN
□	HANA-AppServer	○
□	HANA-Backup	○
□	HANA-Client	○
□	HANA-DataSource	○
☑	HANA-Mgmt	●
□	HANA-Replication	○

CDN Source : ● vNIC Name ○ User Defined

MTU : 9000

MAC Pool : FI-A(128/128)

QoS Policy : <not set>

Network Control Policy : default

Pin Group : <not set>

14. Click OK to create the vNIC template.

15. Click OK.

For most SAP HANA use cases the network traffic is well distributed across the two Fabrics (Fabric A and Fabric B) using the default setup. In special cases, it can be required to rebalance this distribution for better overall performance. This can be done in the vNIC template with the Fabric ID setting. The MTU settings must match the configuration in customer data center. MTU setting of 9000 is recommended for best performance.

16. Create vNIC template for each Network.

Create a vNIC Template for Client Network

To create a vNIC template for the client network, follow these steps:

1. Select Policies > root > Sub-Organization > T01-HANA.

2. Right-click vNIC Templates and select Create vNIC Template.
3. Enter HANA-Client as the vNIC template name.
4. For Fabric ID select Fabric B and Check the Enable Failover checkbox.
5. Under Target, make sure that the VM checkbox is unchecked.
6. Select Updating Template as the Template Type.
7. Under VLANs, check the checkboxes for HANA-Client.
8. Set HANA-Client as the native VLAN.
9. For MTU, enter 9000.
10. In the MAC Pool list, select FI-B
11. For Network Control Policy Select default from drop-down list.
12. Click OK to create the vNIC template.

Create a vNIC Template for Application Server Network

To create a vNIC template for the application server network, follow these steps:

1. Select Policies > root > Sub-Organization > T01-HANA.
2. Right-click vNIC Templates and select Create vNIC Template.
3. Enter HANA-AppServer as the vNIC template name.
4. For Fabric ID select Fabric A and Check the Enable Failover checkbox.
5. Under Target, make sure that the VM checkbox is unchecked.
6. Select Updating Template as the Template Type.
7. Under VLANs, check the checkboxes for HANA-AppServer.
8. Set HANA-AppServer as the native VLAN.
9. For MTU, enter 9000.
10. In the MAC Pool list, select FI-A
11. For Network Control Policy Select default from drop-down list.
12. Click OK to create the vNIC template.

Create a vNIC Template for DataSource Network

To create a vNIC template for the DataSource network, follow these steps:

1. Select Policies > root > Sub-Organization > T01-HANA.
2. Right-click vNIC Templates and select Create vNIC Template.
3. Enter HANA-DataSource as the vNIC template name.
4. For Fabric ID select Fabric A and Check the Enable Failover checkbox.
5. Under Target, make sure that the VM checkbox is unchecked.
6. Select Updating Template as the Template Type.
7. Under VLANs, check the checkboxes for HANA-DataSource.
8. Set HANA-DataSource as the native VLAN.
9. For MTU, enter 9000.
10. In the MAC Pool list, select FI-A
11. For Network Control Policy Select default from drop-down list.
12. Click OK to create the vNIC template

Create a vNIC Template for Replication Network

To create a vNIC template for the replication network, follow these steps:

1. Select Policies > root > Sub-Organization > T01-HANA.
2. Right-click vNIC Templates and select Create vNIC Template.
3. Enter HANA-Replication as the vNIC template name.
4. For Fabric ID select Fabric B and Check the Enable Failover checkbox.
5. Under Target, make sure that the VM checkbox is unchecked.
6. Select Updating Template as the Template Type.
7. Under VLANs, check the checkboxes for HANA-Replication
8. Set HANA-Replication as the native VLAN.
9. For MTU, enter 9000.
10. In the MAC Pool list, select FI-B
11. For Network Control Policy Select default from drop-down list.
12. Click OK to create the vNIC template.

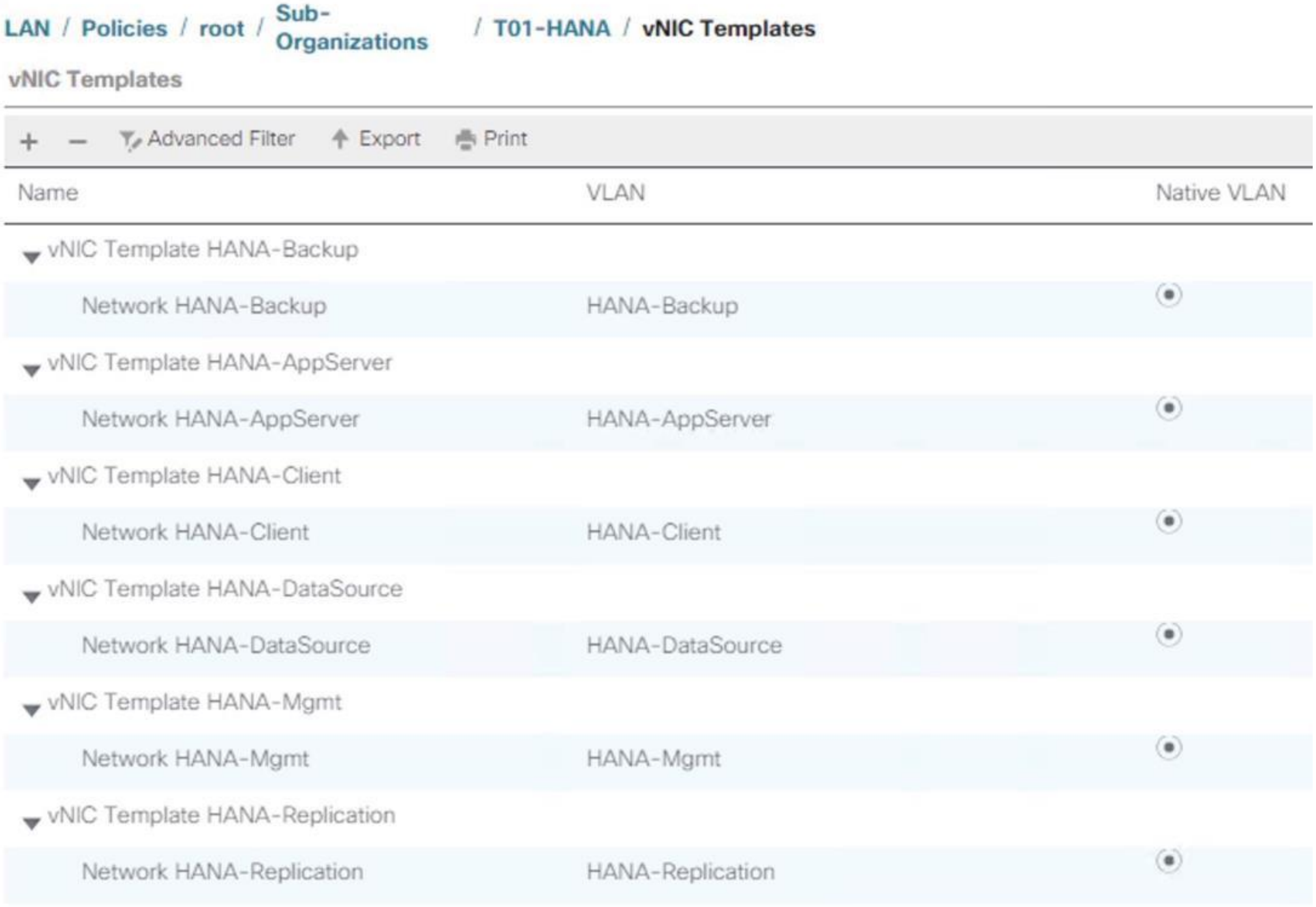
Create a vNIC Template for Backup Network

To create a vNIC template for the backup network, follow these steps:

1. Select Policies > root > Sub-Organization > T01-HANA.
2. Right-click vNIC Templates and select Create vNIC Template.
3. Enter HANA-Backup as the vNIC template name.
4. For Fabric ID select Fabric B and Check the Enable Failover checkbox.
5. Under Target, make sure that the VM checkbox is unchecked.
6. Select Updating Template as the Template Type.
7. Under VLANs, check the checkboxes for HANA-Backup
8. Set HANA-Backup as the native VLAN.
9. For MTU, enter 9000.
10. In the MAC Pool list, select FI-B
11. For Network Control Policy Select default from drop-down list.
12. Click OK to create the vNIC template.

The figure below shows the list of vNIC Templates created for SAP HANA.

Figure 51 vNIC Templates Overview


LAN / Policies / root / Sub-Organizations / T01-HANA / vNIC Templates
vNIC Templates
+
−
Advanced Filter
Export
Print

Name	VLAN	Native VLAN
vNIC Template HANA-Backup		
Network HANA-Backup	HANA-Backup	●
vNIC Template HANA-AppServer		
Network HANA-AppServer	HANA-AppServer	●
vNIC Template HANA-Client		
Network HANA-Client	HANA-Client	●
vNIC Template HANA-DataSource		
Network HANA-DataSource	HANA-DataSource	●
vNIC Template HANA-Mgmt		
Network HANA-Mgmt	HANA-Mgmt	●
vNIC Template HANA-Replication		
Network HANA-Replication	HANA-Replication	●

Configure Cisco UCS SAN Configurations

Create FC Port Channels

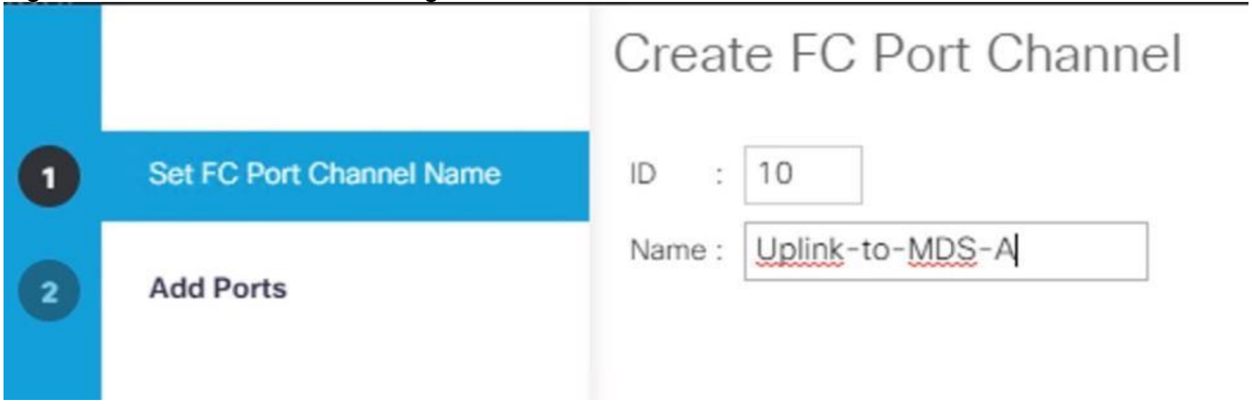
Create a port channel on FIs A and B for the uplink FC interfaces that connect to respective MDS Fabric Switches, for use by all of the specific VSAN traffic we created earlier in MDS. This port channel pair will have corresponding F-port-channel-trunks defined on MDS switches that would allow for the fabric logins from NPV enabled FIs to be virtualized over the port channel. This provides non-disruptive redundancy should individual member links fail.

To configure the necessary port channels out of the Cisco UCS environment, follow these steps:

1. In this procedure, two port channels are created: one from fabric A to both Cisco Nexus switches and one from fabric B to both Cisco Nexus switches.
2. In Cisco UCS Manager, click the SAN tab in the navigation pane.
3. Under SAN > SAN Cloud, expand the Fabric A tree.
4. Right-click FC Port Channels.

5. Select Create FC Port Channel.

Figure 52 Cisco UCS – Creating FC Port Channel



Create FC Port Channel

1 Set FC Port Channel Name

2 Add Ports

ID : 10

Name : Uplink-to-MDS-A

6. Enter 10 as the unique ID of the port channel.

7. Enter Uplink-to-MDS-A as the name of the port channel.

8. Click Next.

9. Set Port Channel Admin Speed to 16gbps. Select the following ports to be added to the port channel:

    – Slot ID 1 and port 1

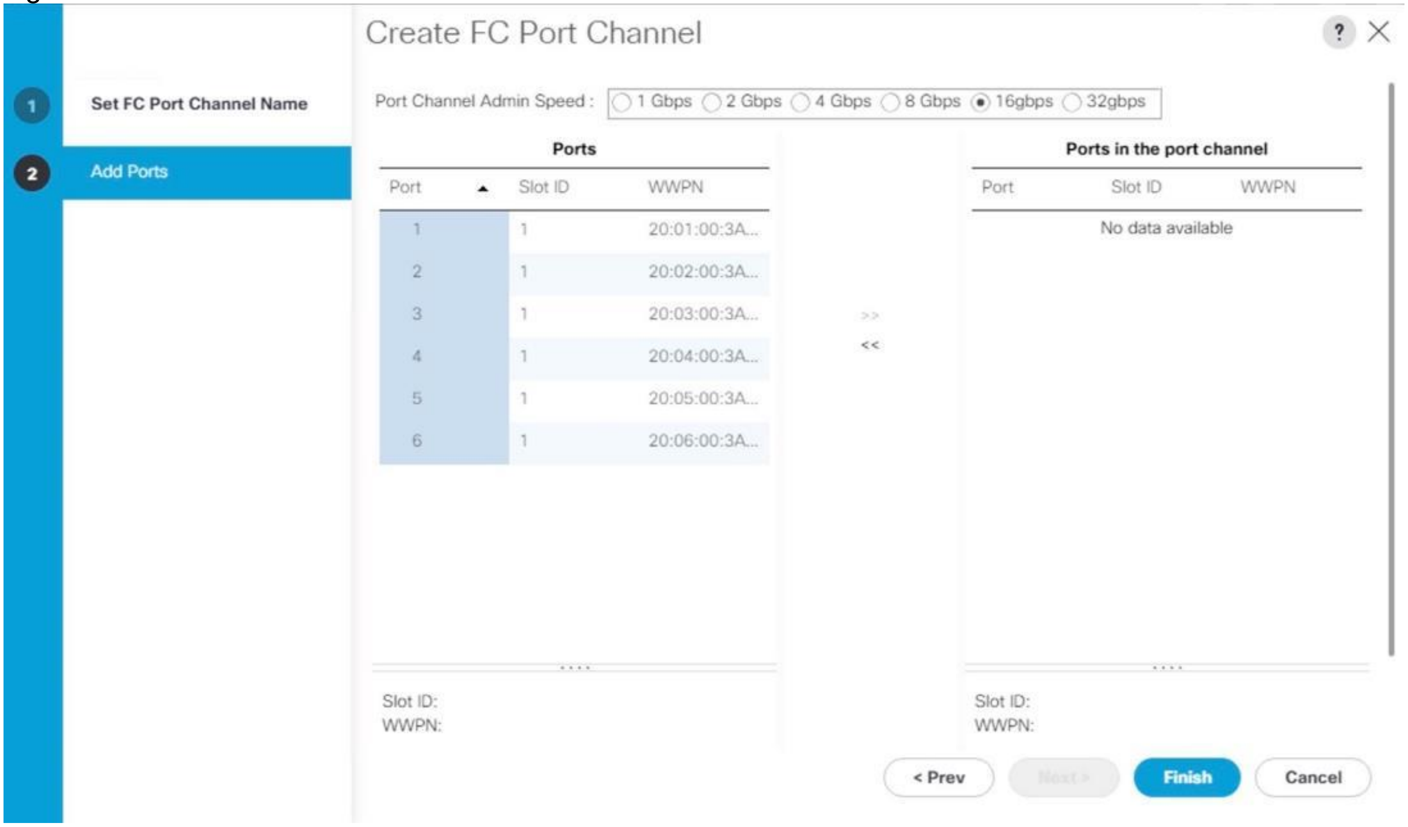
    – Slot ID 1 and port 2

    – Slot ID 1 and port 3

    – Slot ID 1 and port 4

The ports are selected based on Uplink Port connectivity and hence very specific to this sample configuration.

Figure 53 Cisco UCS – Port Channel – Add Ports



Create FC Port Channel

1 Set FC Port Channel Name

2 Add Ports

Port Channel Admin Speed : ○ 1 Gbps ○ 2 Gbps ○ 4 Gbps ○ 8 Gbps ● 16gbps ○ 32gbps

Ports

Port	Slot ID	WWPN
1	1	20:01:00:3A...
2	1	20:02:00:3A...
3	1	20:03:00:3A...
4	1	20:04:00:3A...
5	1	20:05:00:3A...
6	1	20:06:00:3A...

Slot ID:
WWPN:

Ports in the port channel

Port	Slot ID	WWPN
No data available		

Slot ID:
WWPN:

10. Click >> to add the ports to the port channel.

11. Click Finish to create the port channel.

12. Click OK.

13. In the navigation pane, under SAN > SAN Cloud, expand the Fabric B tree.

14. Right-click FC Port Channels.

15. Select Create FC Port Channel.

16. Enter 20 as the unique ID of the port channel.

17. Enter Uplink-to-MDS-B as the name of the port channel.

18. Click Next.

19. Set Port Channel Admin Speed to 16gbps. Select the following ports to be added to the port channel:

   - Slot ID 1 and port 1
   - Slot ID 1 and port 2
   - Slot ID 1 and port 3

- Slot ID 1 and port 4

20. Click >> to add the ports to the port channel.

21. Click Finish to create the port channel.

22. Click OK.

Create VSANs

To configure the necessary VSANs for the Cisco UCS environment, follow these steps:

In this procedure, two VSANs are created. One each for Fabric A and Fabric B.

1. In Cisco UCS Manager, click the SAN tab in the navigation pane.

2. Select SAN > SAN Cloud.

3. Right-click VSANs.

4. Select Create VSAN.

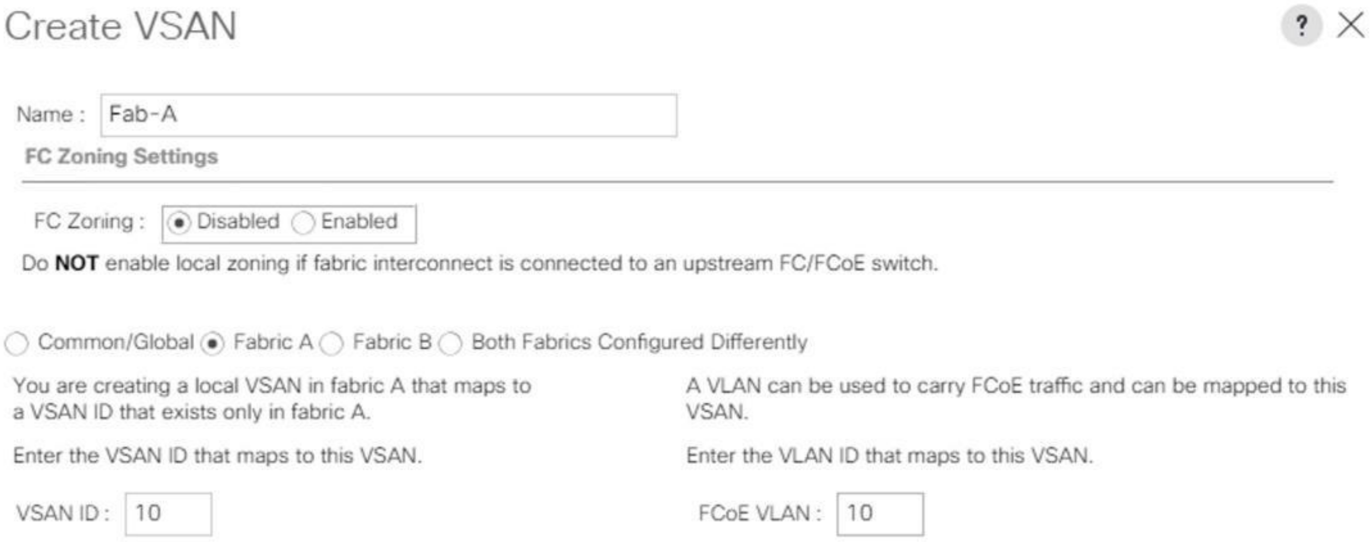
5. Enter Fab-A as the name of the VSAN to be used for Fabric A.

6. Retain 'Disabled' for FC Zoning option and select Fabric A.

7. Enter <<var_fabric-A_vsan_id>> as the ID of the VSAN ID. Use the same value for FCOE VLAN ID.

8. Click OK and then click OK again.

Figure 54 Create VSAN for Fabric A



Create VSAN

Name : Fab-A

FC Zoning Settings

FC Zoning : ● Disabled ○ Enabled

Do **NOT** enable local zoning if fabric interconnect is connected to an upstream FC/FCoE switch.

○ Common/Global ● Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

You are creating a local VSAN in fabric A that maps to a VSAN ID that exists only in fabric A.

Enter the VSAN ID that maps to this VSAN.

VSAN ID : 10

A VLAN can be used to carry FCoE traffic and can be mapped to this VSAN.

Enter the VLAN ID that maps to this VSAN.

FCoE VLAN : 10

9. Select SAN > SAN Cloud.

10. Right-click VSANs.

11. Select Create VSANs.

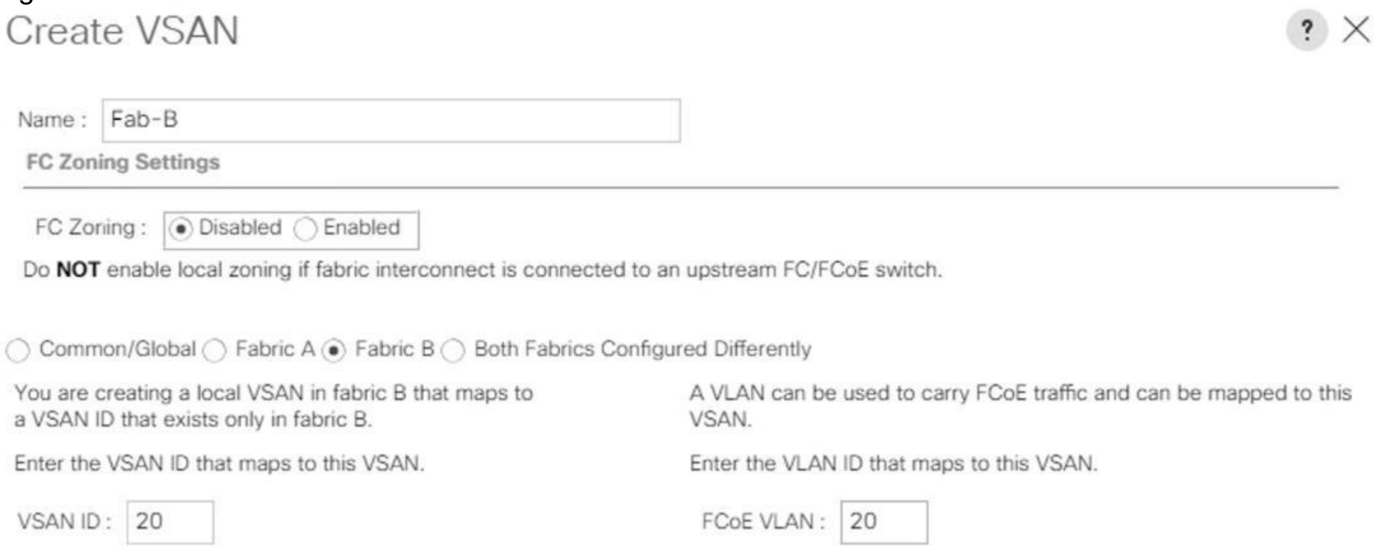
12. Enter Fab-B as the name of the VSAN to be used for Fabric-B.

13. Retain ‘Disabled’ for FC Zoning option and select Fabric B.

14. Enter <<var_fabric-B_vsan_id>> as the ID of the VSAN ID. Use the same value for FCOE VLAN ID.

15. Click OK and then click OK again.

Figure 55 VSANs for Fabrics



Create VSAN

Name : Fab-B

FC Zoning Settings

FC Zoning : ● Disabled ○ Enabled

Do **NOT** enable local zoning if fabric interconnect is connected to an upstream FC/FCoE switch.

○ Common/Global ○ Fabric A ● Fabric B ○ Both Fabrics Configured Differently

You are creating a local VSAN in fabric B that maps to a VSAN ID that exists only in fabric B.

Enter the VSAN ID that maps to this VSAN.

VSAN ID : 20

A VLAN can be used to carry FCoE traffic and can be mapped to this VSAN.

Enter the VLAN ID that maps to this VSAN.

FCoE VLAN : 20

Assign Respective Fabric FC Channels to Created VSAN

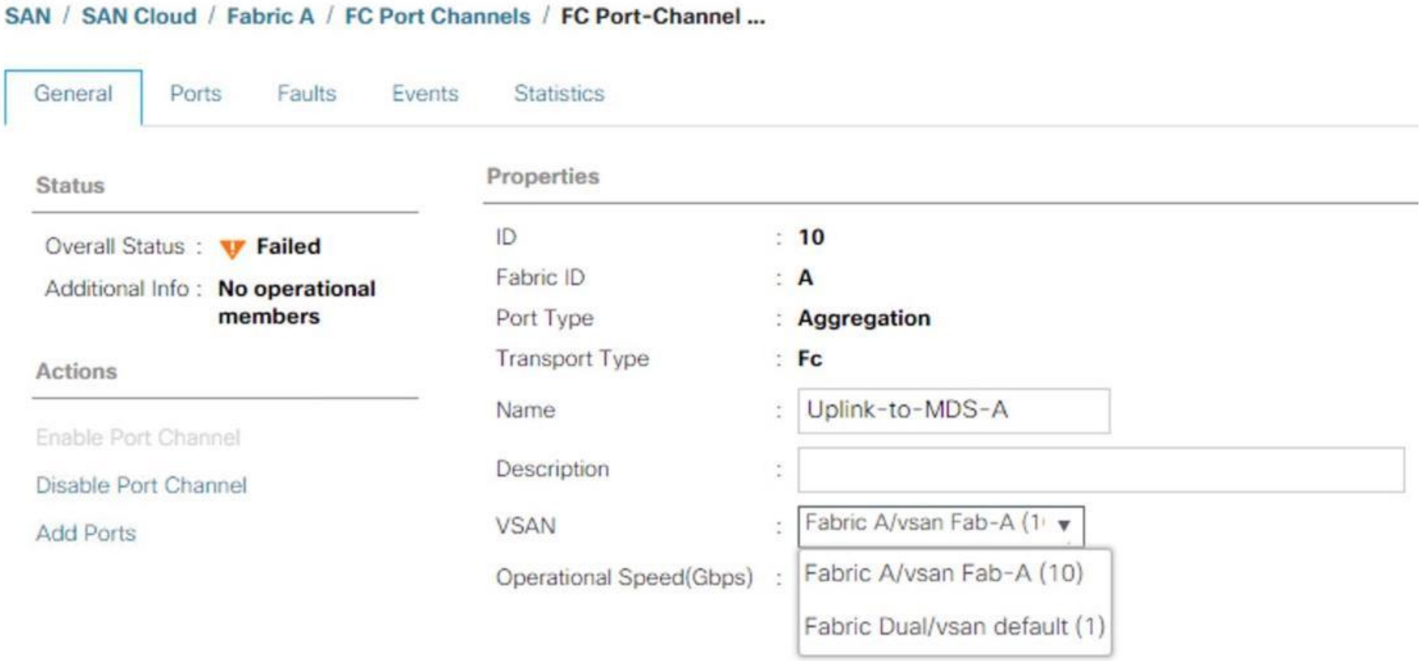
To assign the fc port channels to the fabric VSAN that you just created, follow these steps:

1. In Cisco UCS Manager, click the SAN tab > SAN Cloud > Fabric A> FC Port Channels>

2. Select the configured FC Port Channel.

3. On the right pane, change the VSAN information from default (1) to Fab-A VSAN 10 created for Fabric-A.

Figure 56 VSAN Membership for FI-A FC Uplink Port Channel



Status

Overall Status : Failed

Additional Info : No operational members

Properties

ID : 10

Fabric ID : A

Port Type : Aggregation

Transport Type : Fc

Name : Uplink-to-MDS-A

Description :

VSAN : Fabric A/vsan Fab-A (1

Fabric A/vsan Fab-A (10)

Fabric Dual/vsan default (1)

Operational Speed(Gbps) :

4. Select Save changes. Click OK. After the settings are saved, the Port Channel status changes to Up.

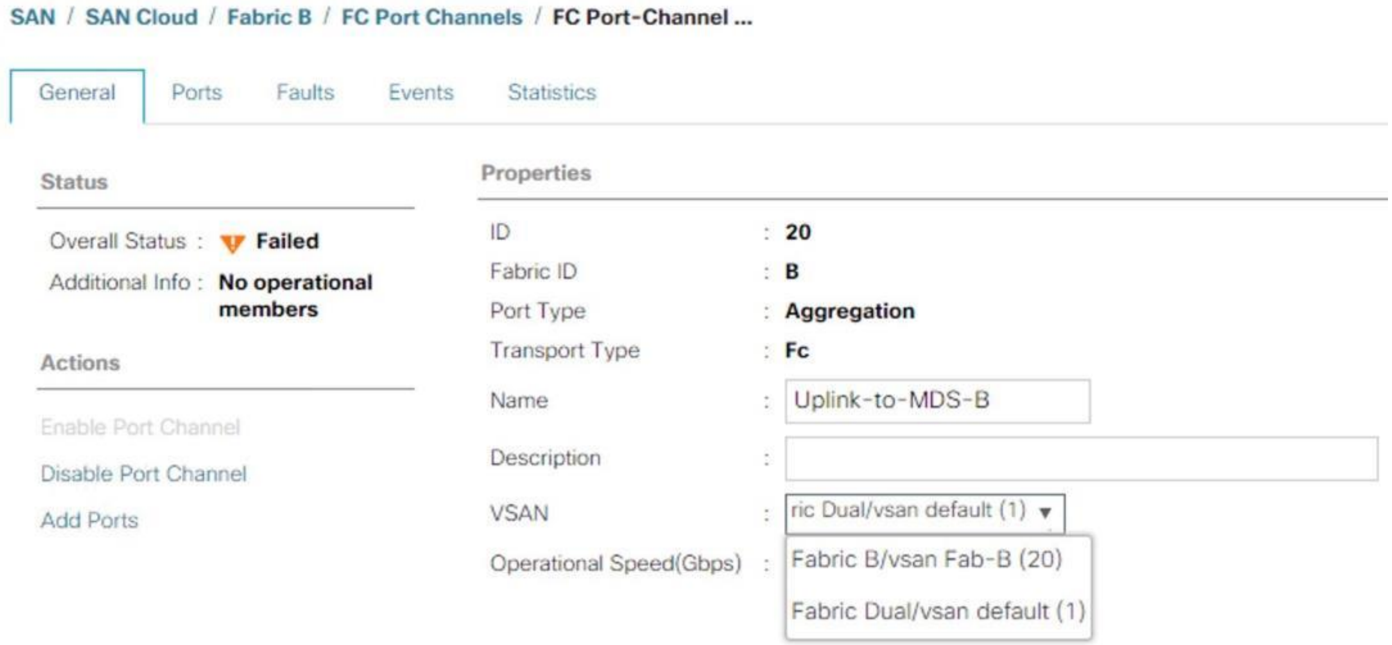
5. Click the SAN tab > SAN Cloud > Fabric B > FC Port Channels >.

6. Select the configured FC Port Channel.

7. On the right pane, change the VSAN information from default (1) to Fab-B VSAN 20 created for Fabric-B.

8. Select Save changes. Click OK.

Figure 57 VSAN Membership Setting for FI-B FC Uplink Port Channel



Status

Overall Status : Failed

Additional Info : No operational members

Properties

ID : 20

Fabric ID : B

Port Type : Aggregation

Transport Type : Fc

Name : Uplink-to-MDS-B

Description :

VSAN : ric Dual/vsan default (1)

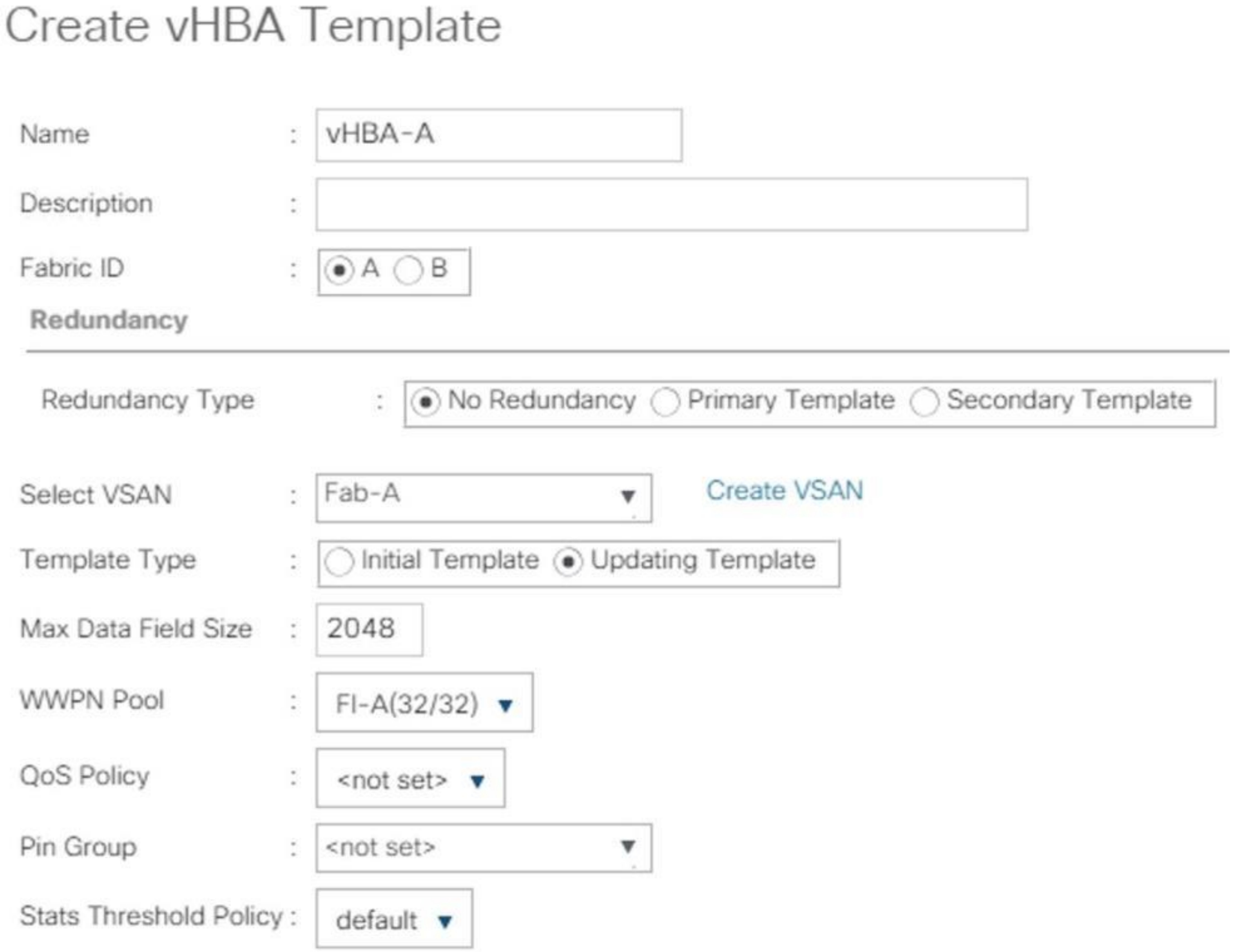
Operational Speed(Gbps) :

Create vHBA Template

In this procedure, two vHBA templates are created. One each for Fabric A and Fabric B.

1. In Cisco UCS Manager, click on tab SAN > Policies > root > Sub-Organizations > T01-HANA.
2. Right-click on vHBA Templates to "Create vHBA Template."
3. First create a template for Fabric A. Choose vHBA-A for name.
4. Optionally provide a description.
5. Select Fabric ID A
6. Select VSAN Fab-A
7. Template Type as Updating template.
8. Select WWPN Pool FI-A.
9. Click Ok and Click OK.

Figure 58 Fabric A - vHBA Template



Create vHBA Template

Name :	vHBA-A
Description :	
Fabric ID :	● A ○ B

Redundancy

Redundancy Type :	● No Redundancy ○ Primary Template ○ Secondary Template
Select VSAN :	Fab-A ▼ Create VSAN
Template Type :	○ Initial Template ● Updating Template
Max Data Field Size :	2048
WWPN Pool :	FI-A(32/32) ▼
QoS Policy :	<not set> ▼
Pin Group :	<not set> ▼
Stats Threshold Policy :	default ▼

10. Create a template for Fabric B. Choose vHBA-B for name.

11. In Cisco UCS Manager, click on tab SAN > Policies > root > Sub-Organizations > HANA.

12. Right-click on vHBA Templates to “Create vHBA Template.”

13. Choose vHBA-B for name.

14. Optionally provide a description.

15. Select Fabric ID B.

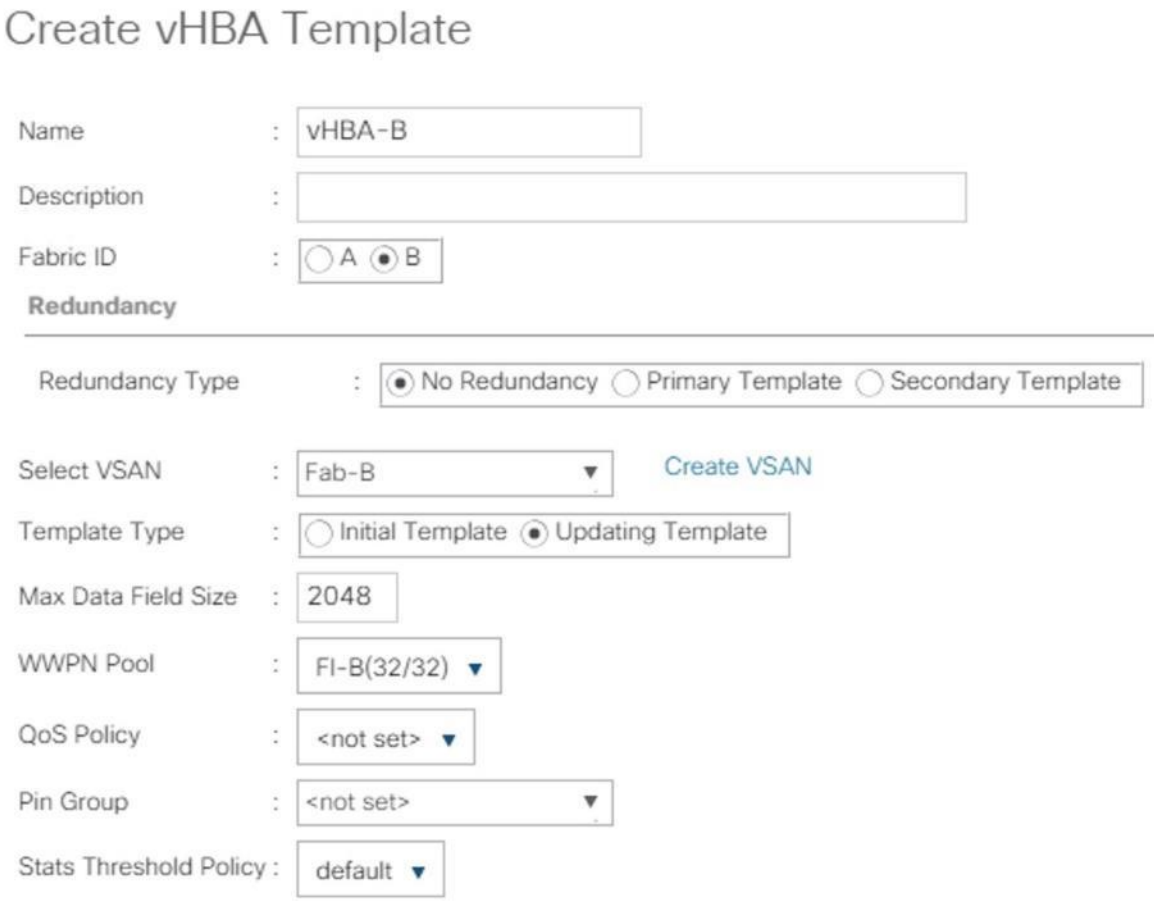
16. Select VSAN Fab-B

17. Template Type as Updating template.

18. Select WWPN Pool as FI-B.

19. Click Ok and Click OK.

Figure 59 Fabric B - vHBA Template



Create vHBA Template

Name : vHBA-B

Description :

Fabric ID : ○ A ● B

Redundancy

Redundancy Type : ● No Redundancy ○ Primary Template ○ Secondary Template

Select VSAN : Fab-B ▼ Create VSAN

Template Type : ○ Initial Template ● Updating Template

Max Data Field Size : 2048

WWPN Pool : FI-B(32/32) ▼

QoS Policy : <not set> ▼

Pin Group : <not set> ▼

Stats Threshold Policy : default ▼

Create SAN Connectivity Policy

When the physical connectivity is established, the following will configure the zoning for the servers and SAN:

- Storage connection policies: This configures the storage connectivity taking into account the WWPN Target numbers for the SAN. Since the Zoning is handled by the MDS switches and that FIs aren't direct attached to the Storage, we do not configure this Storage side connection policy.
- SAN connectivity policies configuration: This configures vHBAs for the servers which will provide WWPN Initiator numbers for the servers. This server-side configuration is needed to prepare the servers for connection to storage.

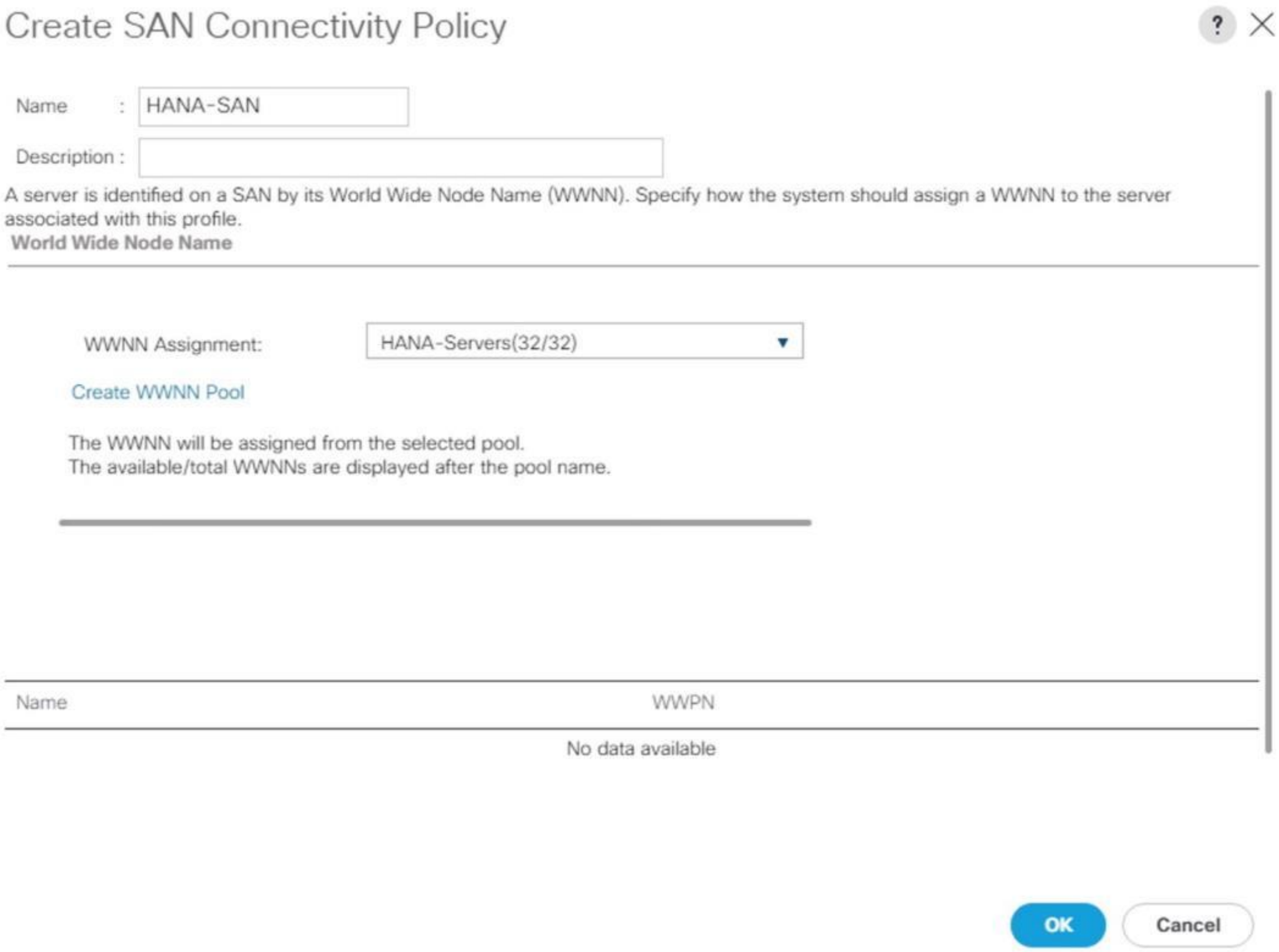
To configure the storage connection policy, follow these steps:

1. Log into UCS Manager.
2. Click the SAN tab in the Navigation pane.
3. SAN tab > Policies > root > Sub-Organizations > HANA > SAN Connectivity Policies.
4. Right-click on SAN Connectivity Policies > Create SAN Connectivity Policy.
5. Provide name as HANA-SAN.

6. Optionally add a Description.

7. Select HANA-Servers for WWNN Assignment

Figure 60 Create SAN Connectivity Policy



Create SAN Connectivity Policy

Name : HANA-SAN

Description :

A server is identified on a SAN by its World Wide Node Name (WWNN). Specify how the system should assign a WWNN to the server associated with this profile.

World Wide Node Name

WWNN Assignment: HANA-Servers(32/32)

Create WWNN Pool

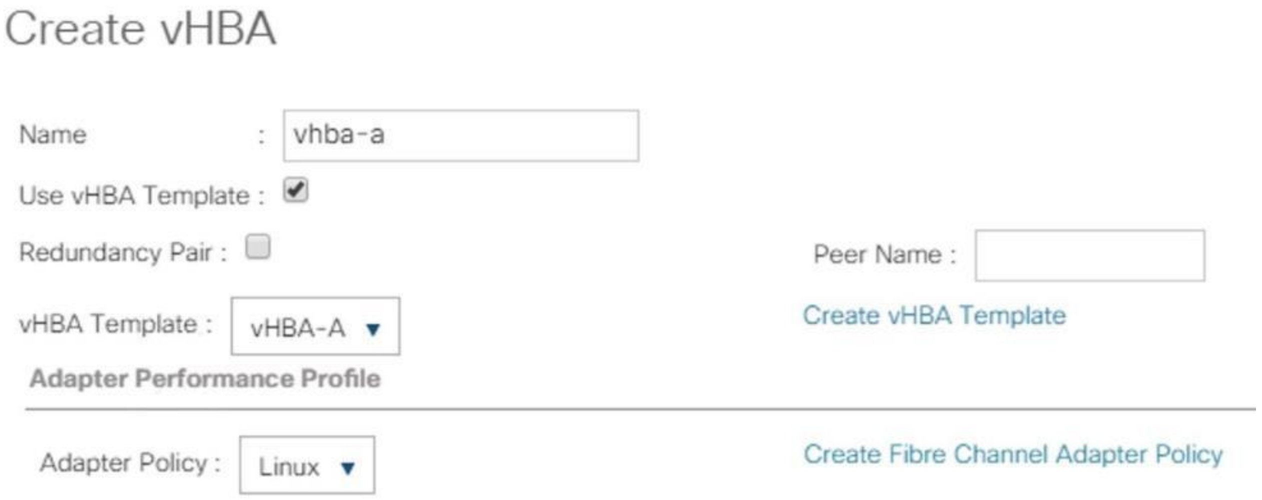
The WWNN will be assigned from the selected pool.
The available/total WWNNs are displayed after the pool name.

Name	WWPN
No data available	

8. Click Add at the bottom for WWPN to add the vHBAs from the vHBA templates previously created.

9. In the Create vHBA window, provide a name as vhba-a and check “Use vHBA Template” option. Select vHBA-A from the vHBA Template drop-down list and Linux for the Adapter Policy. Click OK.

Figure 61 Create vHBA for Fabric A



Create vHBA

Name : vhba-a

Use vHBA Template : ☑

Redundancy Pair : □

Peer Name :

vHBA Template : vHBA-A

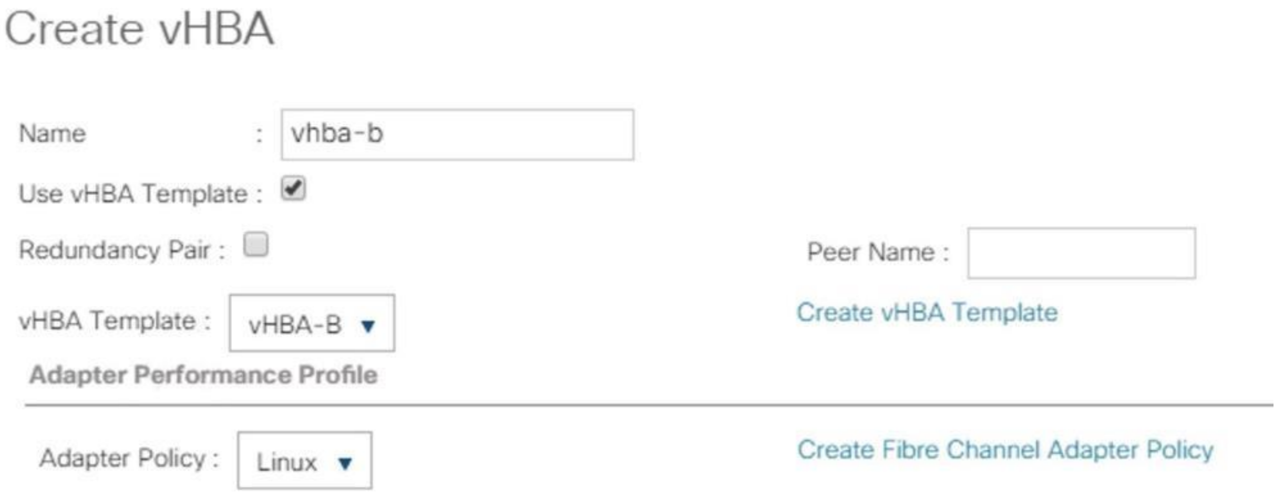
Adapter Performance Profile

Adapter Policy : Linux

10. Click Add at the bottom for WWPN to add the vHBAs to add another vHBA.

11. In the Create vHBA window, provide name as vhba-b and check “Use vHBA Template” option. Select vHBA-B from the vHBA Template drop-down list and Linux for the Adapter Policy.

Figure 62 Create vHBA for Fabric B



Create vHBA

Name : vhba-b

Use vHBA Template : ☑

Redundancy Pair : □

Peer Name :

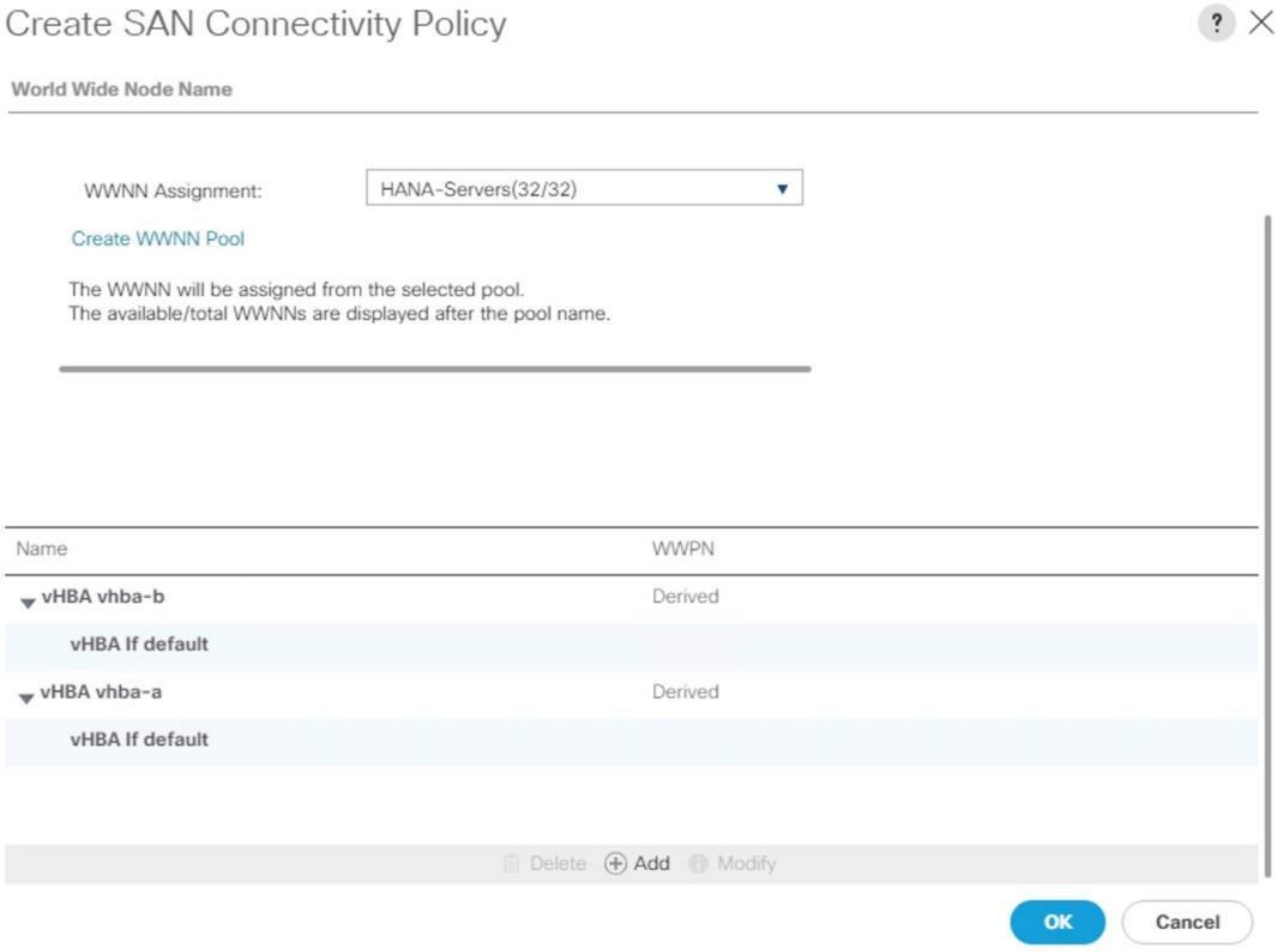
vHBA Template : vHBA-B

Adapter Performance Profile

Adapter Policy : Linux

12. Click OK.

Figure 63 SAN Connectivity Policy (continued)



Create SAN Connectivity Policy

World Wide Node Name

WWNN Assignment: HANA-Servers(32/32)

The WWNN will be assigned from the selected pool.
The available/total WWNNs are displayed after the pool name.

Name	WWPN
vHBA vhba-b	Derived
vHBA If default	
vHBA vhba-a	Derived
vHBA If default	

13. Click OK.

Create Boot Policy for SAN Boot

It is strongly recommended to use “Boot from SAN” to realize full benefits of Cisco UCS stateless computing feature such as service profile mobility. The ports on the storage controllers of Hitachi VSP are cross connected with the MDS switches so that we have alternate paths to the LUNs, in addition to the built-in redundancy and path management features of the storage array itself.

You can determine the WWPN information of these storage array target ports from the Hitachi Device Manager.

Configure the SAN primary's primary-target to be port CL1-A and SAN primary's secondary-target to be port CL2-A of the Hitachi VSP Storage. Similarly, the SAN secondary’s primary-target should be port CL3-A and SAN secondary's secondary-target should be port CL4-A

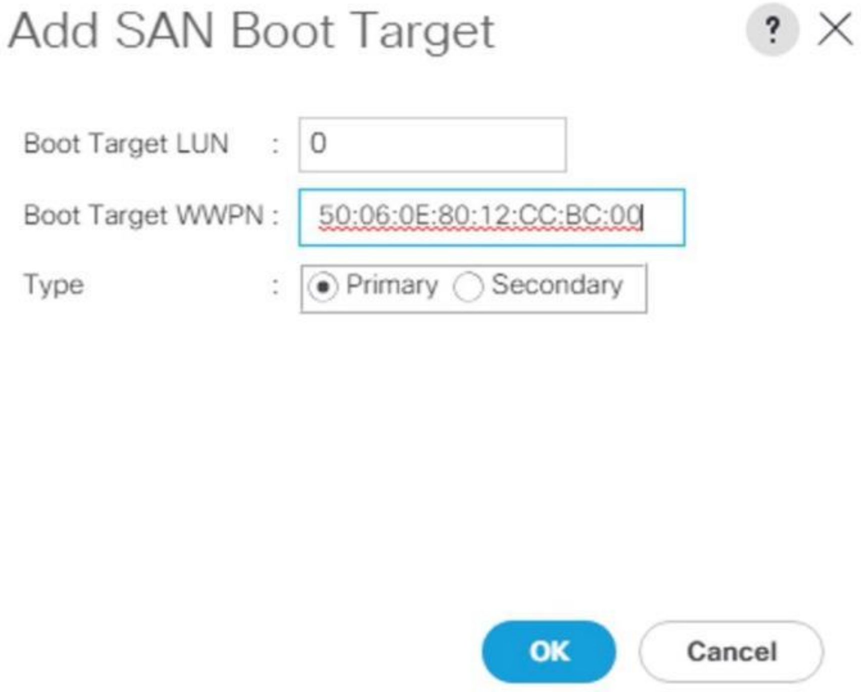
You have to create SAN Boot primary (hba0) and SAN Boot secondary (hba1) in create boot policy by entering WWPN of Hitachi Storage FC Ports.

To create boot policies for the Cisco UCS environments, follow these steps:

1. Go to tab Servers > Policies > root > Sub-Organizations > T01-HANA > Boot Policies.

2. Right-click Boot Policies and select Create Boot Policy
3. Enter HANA-SanBoot as the name of the boot policy
4. Make sure the “Enforce vNIC/vHBA/iSCSI Name” option is unchecked.
5. Expand the Local Devices drop-down menu and Choose Add CD-ROM.
6. Expand the vHBAs drop-down list and Choose Add SAN Boot. In the Add SAN Boot dialog box, select type as ‘Primary’ and enter " hba0" in the vHBA field and Click OK
7. From the vHBAs drop-down list choose “Add SAN Boot Target.”
8. Keep 0 as the value for Boot Target LUN. Enter the WWPN for FC port CL1-A of Hitachi VSP Storage and add click OK.

Figure 64 hba0 Primary Boot Target



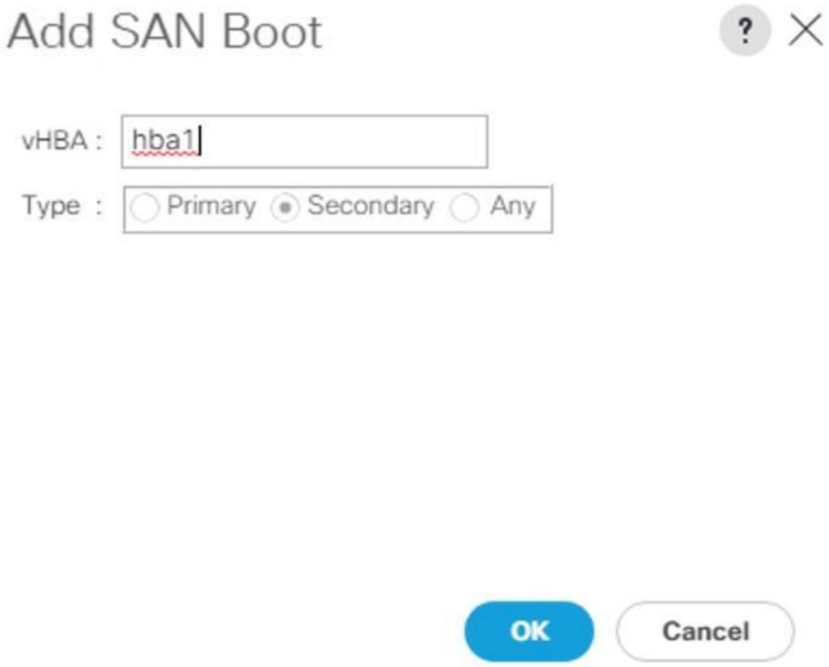
Boot Target LUN : 0

Boot Target WWPN : 50:06:0E:80:12:CC:BC:00

Type : ● Primary ○ Secondary

9. From the vHBAs drop-down menu choose “Add SAN Boot Target” To add a secondary SAN Boot target into hba0
10. Enter boot target LUN as 0 and WWPN for FC port CL2-A of Hitachi VSP Storage. Click OK.
11. From the vHBAs drop-down list and Choose Add SAN Boot. In the Add SAN Boot dialog box, enter " hba1" in the vHBA field. Click OK.

Figure 65 SAN Boot hba1



Add SAN Boot

vHBA : hba1

Type : ○ Primary ● Secondary ○ Any

12. From the vHBAs drop-down list choose “Add SAN Boot Target.”

13. Keep 0 as the value for Boot Target LUN. Enter the WWPN for FC port CL2-A of Hitachi VSP Storage and add click OK.

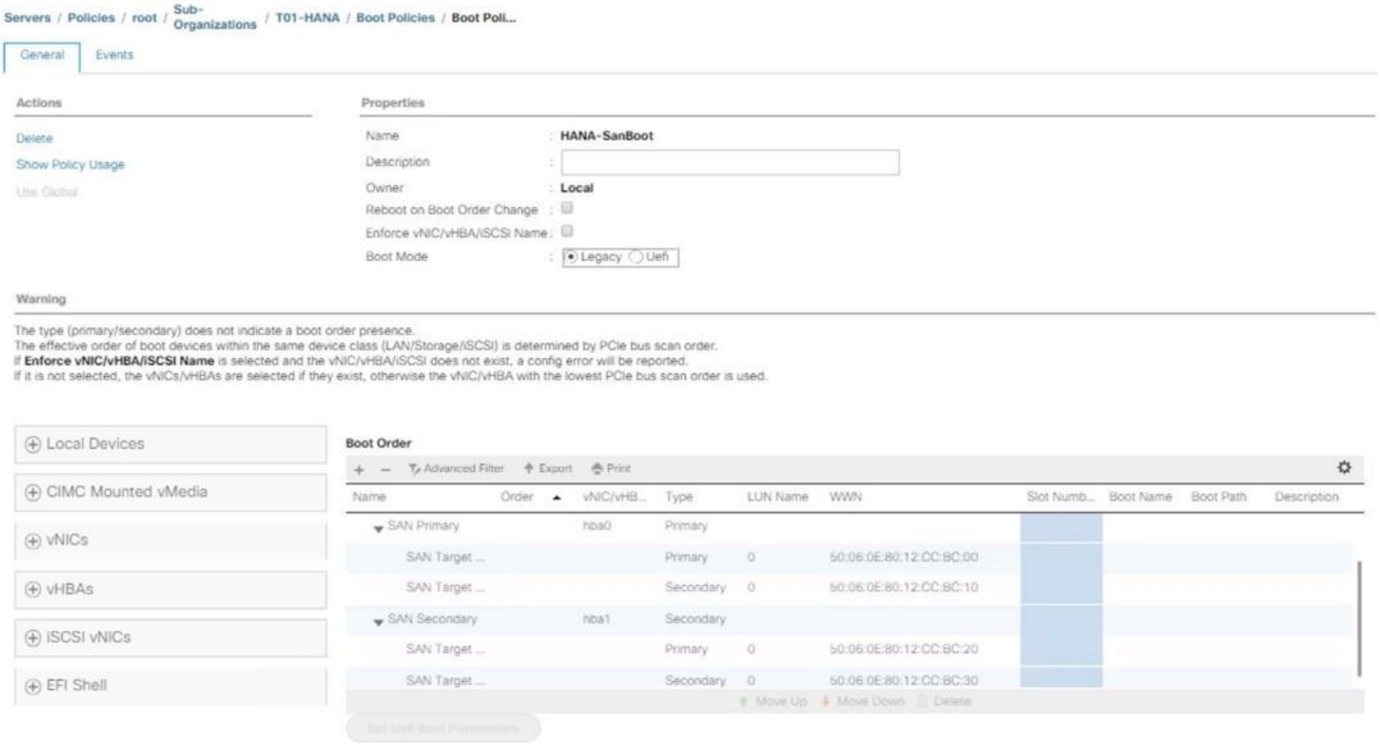
14. From the vHBAs drop-down list choose “Add SAN Boot Target” to add a secondary SAN Boot target into hba1

15. Enter boot target LUN as 0 and WWPN for FC port CL4-A of Hitachi VSP Storage. Click OK.

16. Click OK and click OK for the Create Boot Policy pop-up.

17. After creating the FC boot policies, you can view the boot order in the Cisco UCS Manager GUI. To view the boot order, navigate to Servers > Policies > root > Sub-Organizations > T01-HANA > Boot Policies> HANA-SanBoot to view the boot order in the right pane of the Cisco UCS Manager as shown below.

Figure 66 SAN Boot Policy



Servers / Policies / root / Sub-Organizations / T01-HANA / Boot Policies / Boot Poli...
General
Events
Actions
Delete
Show Policy Usage
Use Global
Properties

Name : HANA-SanBoot

Description :

Owner : Local

Reboot on Boot Order Change : □

Enforce vNIC/vHBA/iSCSI Name : □

Boot Mode : ● Legacy ○ Uefi

Warning

The type (primary/secondary) does not indicate a boot order presence.
The effective order of boot devices within the same device class (LAN/Storage/iSCSI) is determined by PCIe bus scan order.
If **Enforce vNIC/vHBA/iSCSI Name** is selected and the vNIC/vHBA/iSCSI does not exist, a config error will be reported.
If it is not selected, the vNICs/vHBAs are selected if they exist, otherwise the vNIC/vHBA with the lowest PCIe bus scan order is used.

Boot Order

Name	Order	vNIC/vHB...	Type	LUN Name	WWN	Slot Numb...	Boot Name	Boot Path	Description
SAN Primary		hba0	Primary						
SAN Target ...			Primary	0	50:06:0E:80:12:CC:BC:00				
SAN Target ...			Secondary	0	50:06:0E:80:12:CC:BC:10				
SAN Secondary		hba1	Secondary						
SAN Target ...			Primary	0	50:06:0E:80:12:CC:BC:20				
SAN Target ...			Secondary	0	50:06:0E:80:12:CC:BC:30				

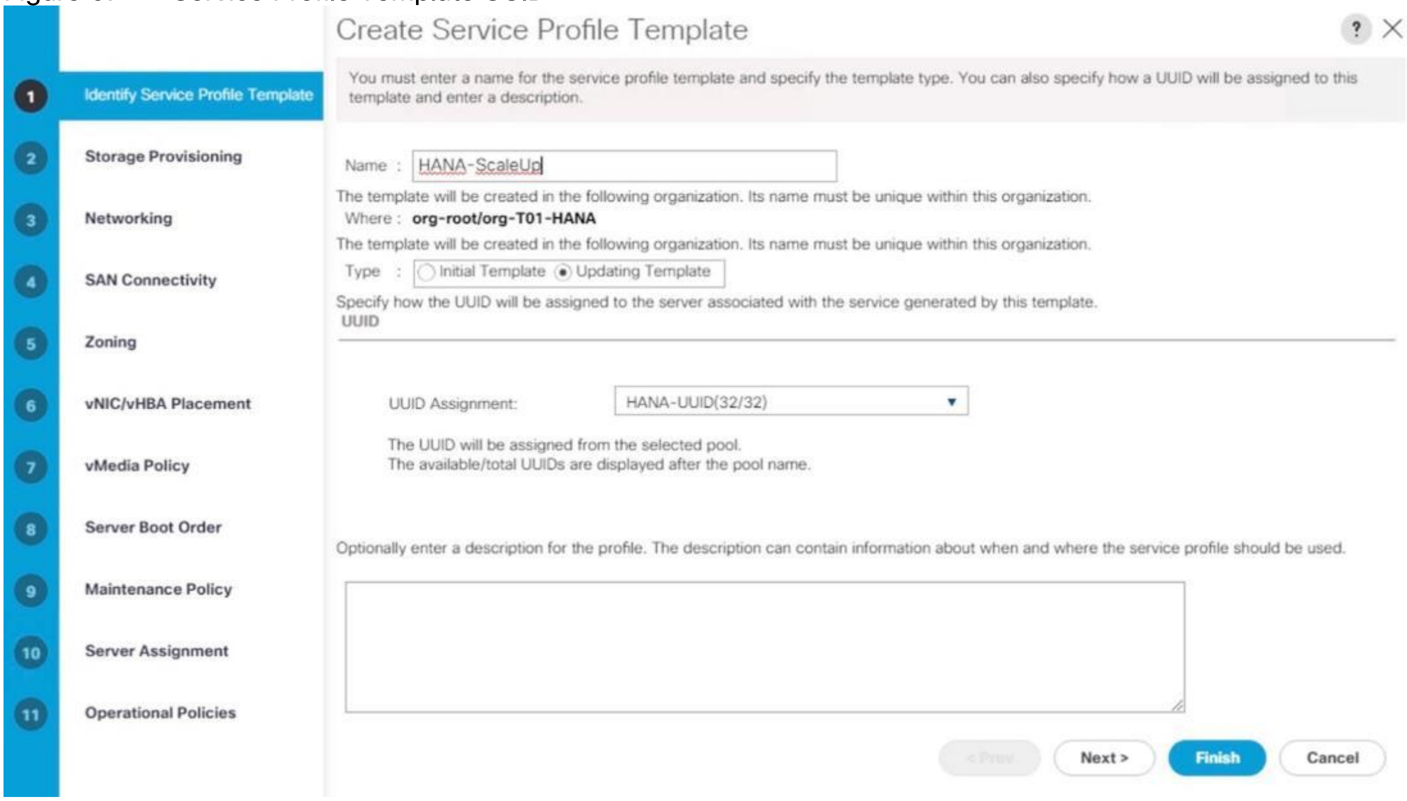
Create Service Profile Templates for SAP HANA Scale Up Servers

The LAN, SAN configurations and relevant SAP HANA policies must be defined prior to creating, a Service Profile Template.

To create the service profile template, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.
2. Select Service Profile Templates > root > Sub-Organization > T01-HANA.
3. Right-click T01-HANA Select Create Service Profile Template
4. This will pop-up Create Service Profile Template wizard
5. Enter HANA-ScaleUp as the name of the service profile template.
6. Select the Updating Template option from the Type
7. Under UUID, select HANA-UUID as the UUID pool. Optionally add a Description.
8. Click Next.

Figure 67 Service Profile Template UUID



Create Service Profile Template

You must enter a name for the service profile template and specify the template type. You can also specify how a UUID will be assigned to this template and enter a description.

Name : HANA-ScaleUp

The template will be created in the following organization. Its name must be unique within this organization.

Where : **org-root/org-T01-HANA**

The template will be created in the following organization. Its name must be unique within this organization.

Type : ○ Initial Template ● Updating Template

Specify how the UUID will be assigned to the server associated with the service generated by this template.

UUID

UUID Assignment: HANA-UUID(32/32)

The UUID will be assigned from the selected pool.
The available/total UUIDs are displayed after the pool name.

Optionally enter a description for the profile. The description can contain information about when and where the service profile should be used.

9. In the Storage Provisioning, nothing needs to be configured

10. Click Next.

11. In the Networking

12. Keep the default settings for Dynamic vNIC Connection Policy.

13. Select the Expert option for ‘How would you like to configure LAN connectivity’ question.

    a. Click Add to add a vNIC to the template.

    b. In the Create vNIC dialog box, enter HANA-AppServer as the name of the vNIC.

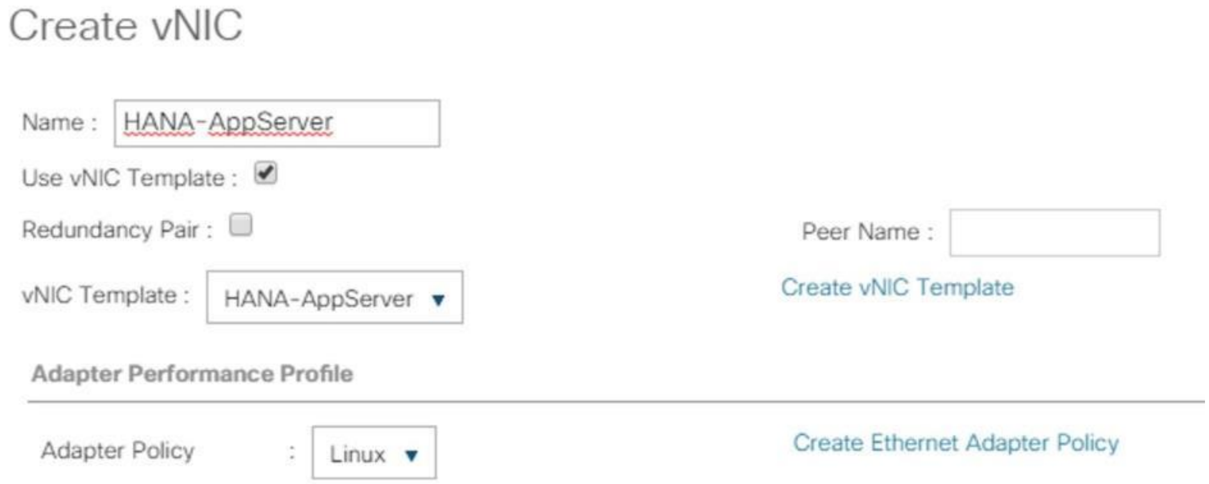
    c. Check the Use vNIC Template checkbox.

    d. In the vNIC Template list, select HANA-AppServer.

    e. In the Adapter Policy list, select Linux.

    f. Click OK to add this vNIC to the template.

Figure 68 Service Profile Template vNIC Internal



Create vNIC

Name : HANA-AppServer

Use vNIC Template : ☑

Redundancy Pair : ☐

Peer Name :

vNIC Template : HANA-AppServer

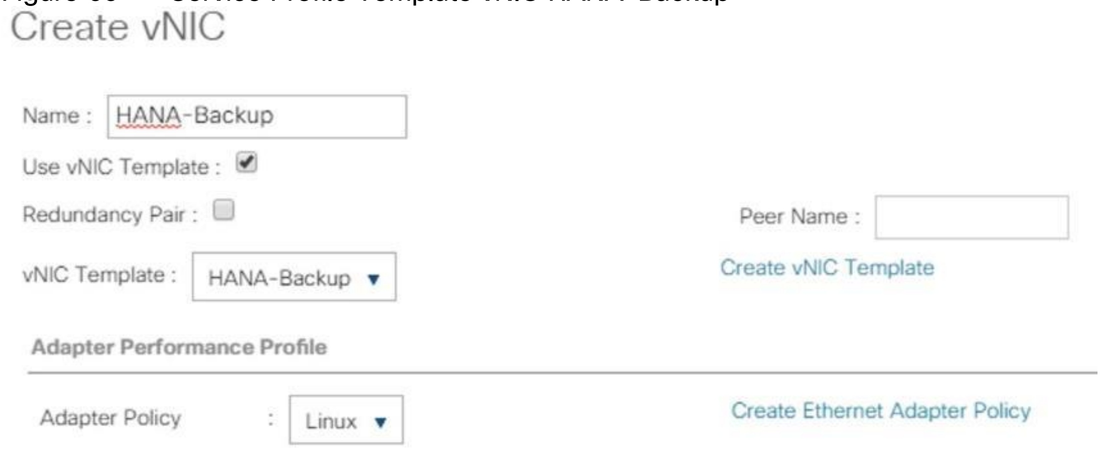
Adapter Performance Profile

Adapter Policy : Linux

14. Repeat step 13 for each vNIC.

15. Add vNIC for HANA-Backup

Figure 69 Service Profile Template vNIC HANA-Backup



Create vNIC

Name : HANA-Backup

Use vNIC Template : ☑

Redundancy Pair : ☐

Peer Name :

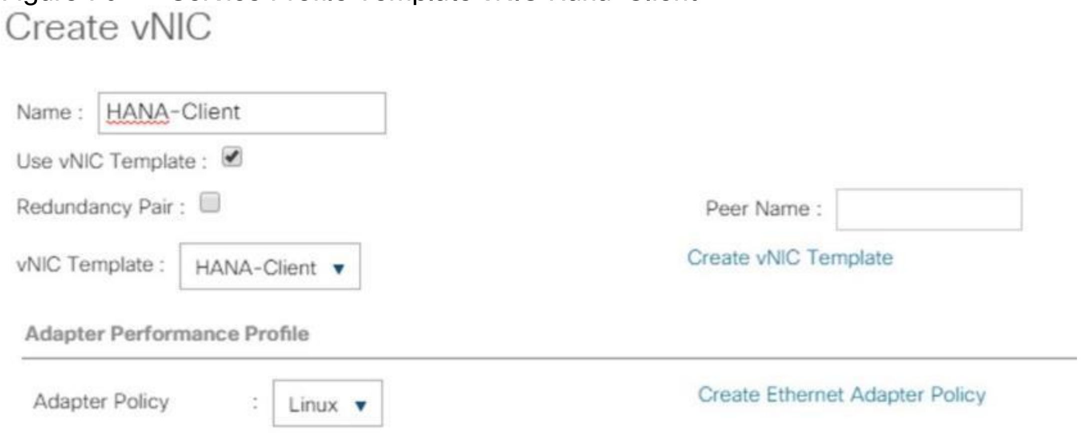
vNIC Template : HANA-Backup

Adapter Performance Profile

Adapter Policy : Linux

16. Add vNIC for HANA-Client.

Figure 70 Service Profile Template vNIC Hana-Client



Create vNIC

Name : HANA-Client

Use vNIC Template : ☑

Redundancy Pair : □

Peer Name :

vNIC Template : HANA-Client ▼

Create vNIC Template

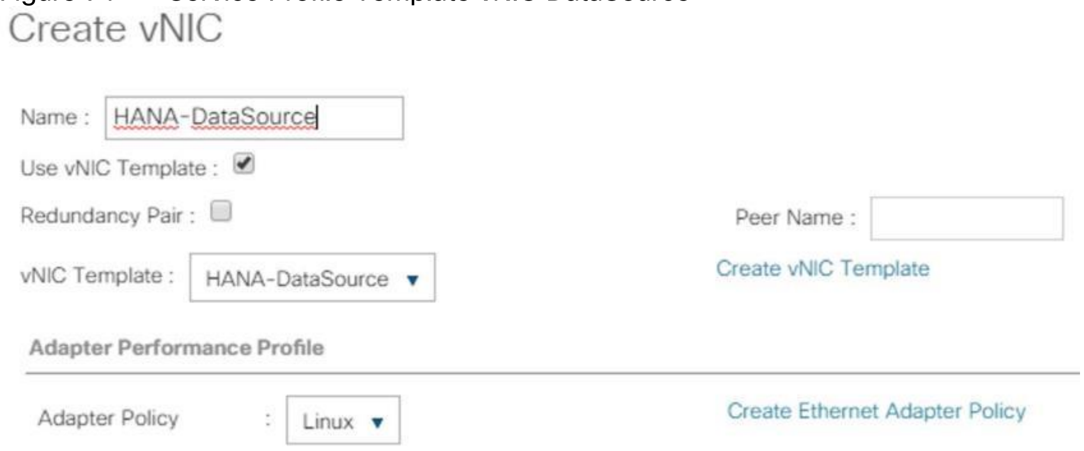
Adapter Performance Profile

Adapter Policy : Linux ▼

Create Ethernet Adapter Policy

17. Add vNIC for HANA-DataSource.

Figure 71 Service Profile Template vNIC DataSource



Create vNIC

Name : HANA-DataSource

Use vNIC Template : ☑

Redundancy Pair : □

Peer Name :

vNIC Template : HANA-DataSource ▼

Create vNIC Template

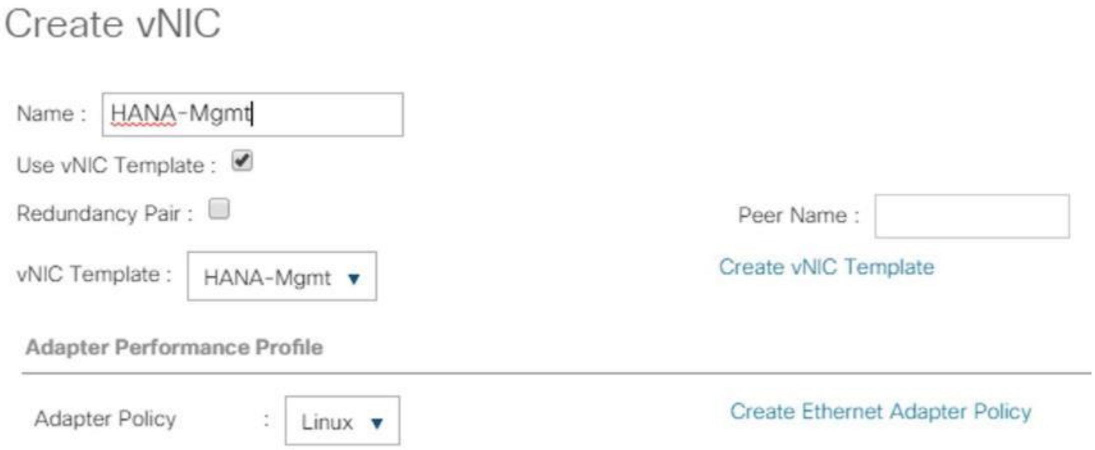
Adapter Performance Profile

Adapter Policy : Linux ▼

Create Ethernet Adapter Policy

18. Add vNIC for Mgmt.

Figure 72 Service Profile Template vNIC Mgmt



Create vNIC

Name : HANA-Mgmt

Use vNIC Template : ☑

Redundancy Pair : □

Peer Name :

vNIC Template : HANA-Mgmt ▼

Create vNIC Template

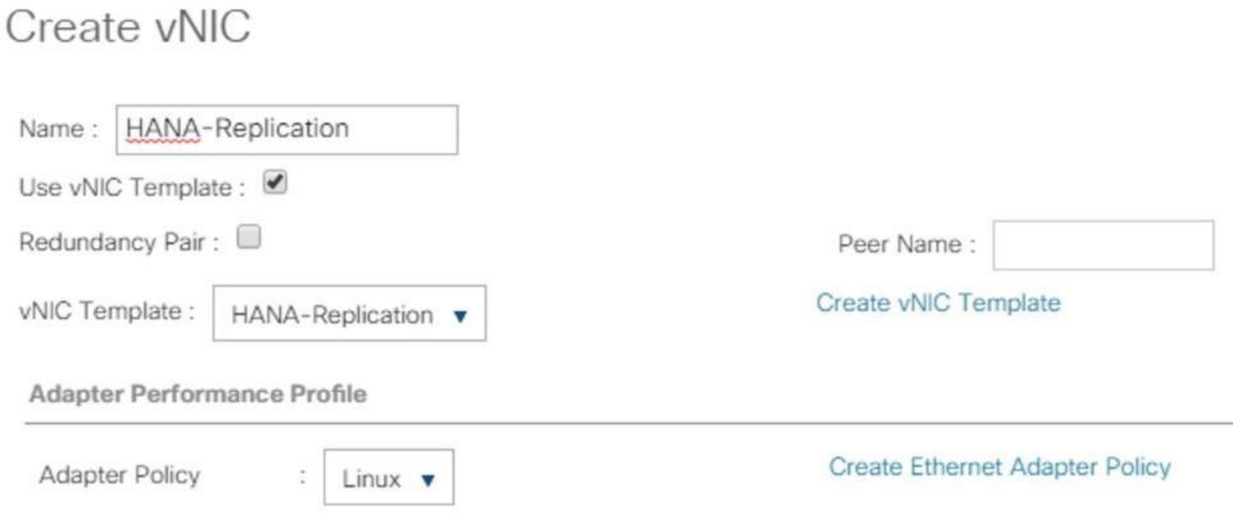
Adapter Performance Profile

Adapter Policy : Linux ▼

Create Ethernet Adapter Policy

19. Add vNIC for HANA-Replication.

Figure 73 Service Profile Template vNIC Replication



Create vNIC

Name : HANA-Replication

Use vNIC Template : ☑

Redundancy Pair : □

Peer Name :

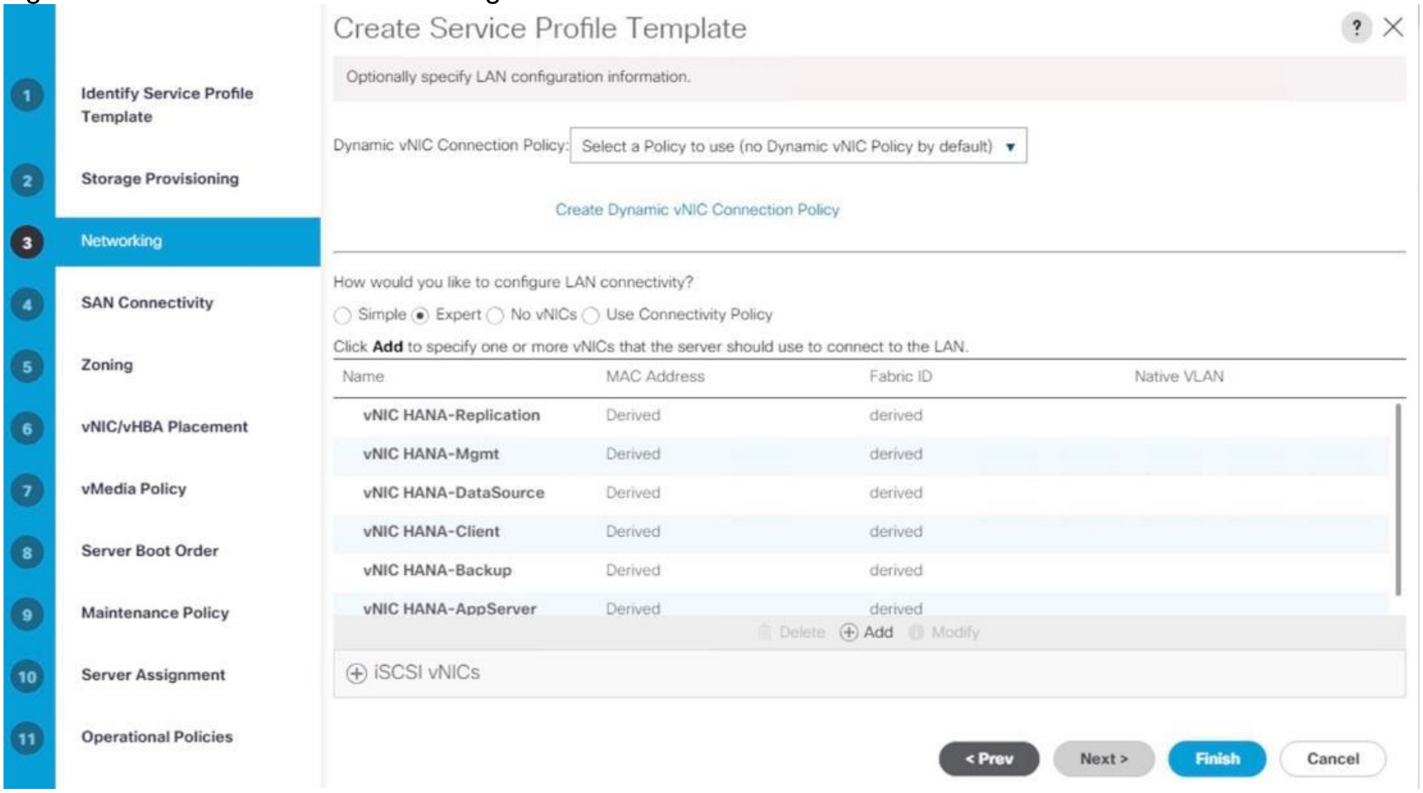
vNIC Template : HANA-Replication

Adapter Performance Profile

Adapter Policy : Linux

20. Review the table in the Networking pane to make sure that all vNICs were created.

Figure 74 Service Profile Networking



Create Service Profile Template

Optionally specify LAN configuration information.

Dynamic vNIC Connection Policy: Select a Policy to use (no Dynamic vNIC Policy by default)

How would you like to configure LAN connectivity?

○ Simple ● Expert ○ No vNICs ○ Use Connectivity Policy

Click **Add** to specify one or more vNICs that the server should use to connect to the LAN.

Name	MAC Address	Fabric ID	Native VLAN
vNIC HANA-Replication	Derived	derived	
vNIC HANA-Mgmt	Derived	derived	
vNIC HANA-DataSource	Derived	derived	
vNIC HANA-Client	Derived	derived	
vNIC HANA-Backup	Derived	derived	
vNIC HANA-AppServer	Derived	derived	

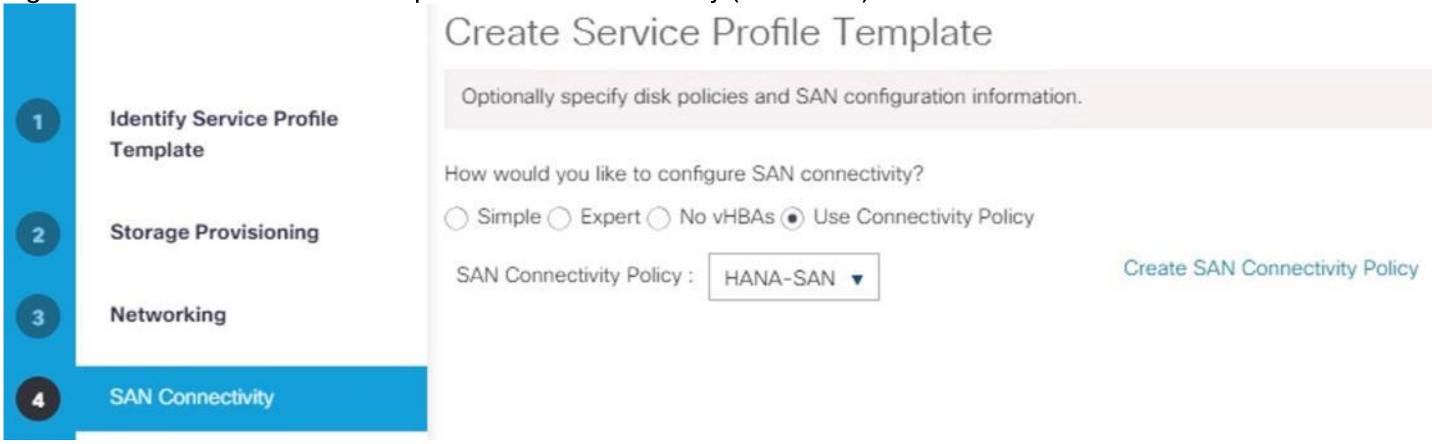
21. Click Next.

22. Configure the SAN Connectivity:

23. Select 'Use Connectivity Policy' option for the "How would you like to configure SAN connectivity?" field.

24. Select HANA-SAN for SAN Connectivity Policy. Click Next.

Figure 75 Service Profile Template - SAN Connectivity (continued)



Create Service Profile Template

Optionally specify disk policies and SAN configuration information.

How would you like to configure SAN connectivity?

○ Simple ○ Expert ○ No vHBAs ● Use Connectivity Policy

SAN Connectivity Policy : HANA-SAN

1 Identify Service Profile Template
2 Storage Provisioning
3 Networking
4 SAN Connectivity
Create SAN Connectivity Policy

25. Zoning – Click Next.

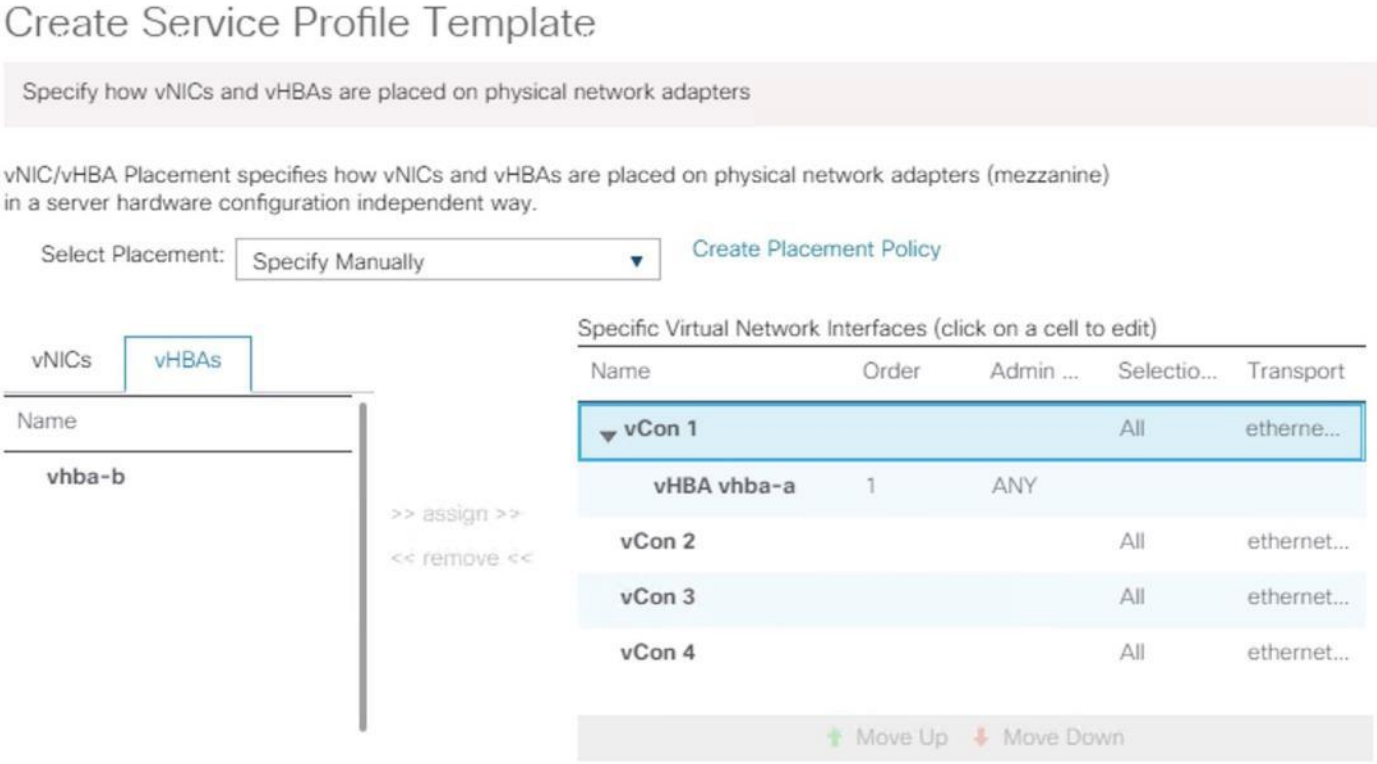
26. vNIC/vHBA Placement for B480-M5:

With the Cisco UCS B480 M5 Blade Server populated with VIC 1340 + Port expander recognized as Adapter1 and VIC 1380 as Adapter 3. Therefore, using vCONs 1 and 3 for the vNIC/vHBA assignment.

a. In the Select Placement list, choose the Specify Manually.

b. From the vHBAs tab, assign vhba-a to vCON1.

Figure 76 Service Profile Template – vNIC/vHBA Placement – vHBA Assignment to vCON1



Create Service Profile Template

Specify how vNICs and vHBAs are placed on physical network adapters

vNIC/vHBA Placement specifies how vNICs and vHBAs are placed on physical network adapters (mezzanine) in a server hardware configuration independent way.

Select Placement: Specify Manually

Name
vhba-b

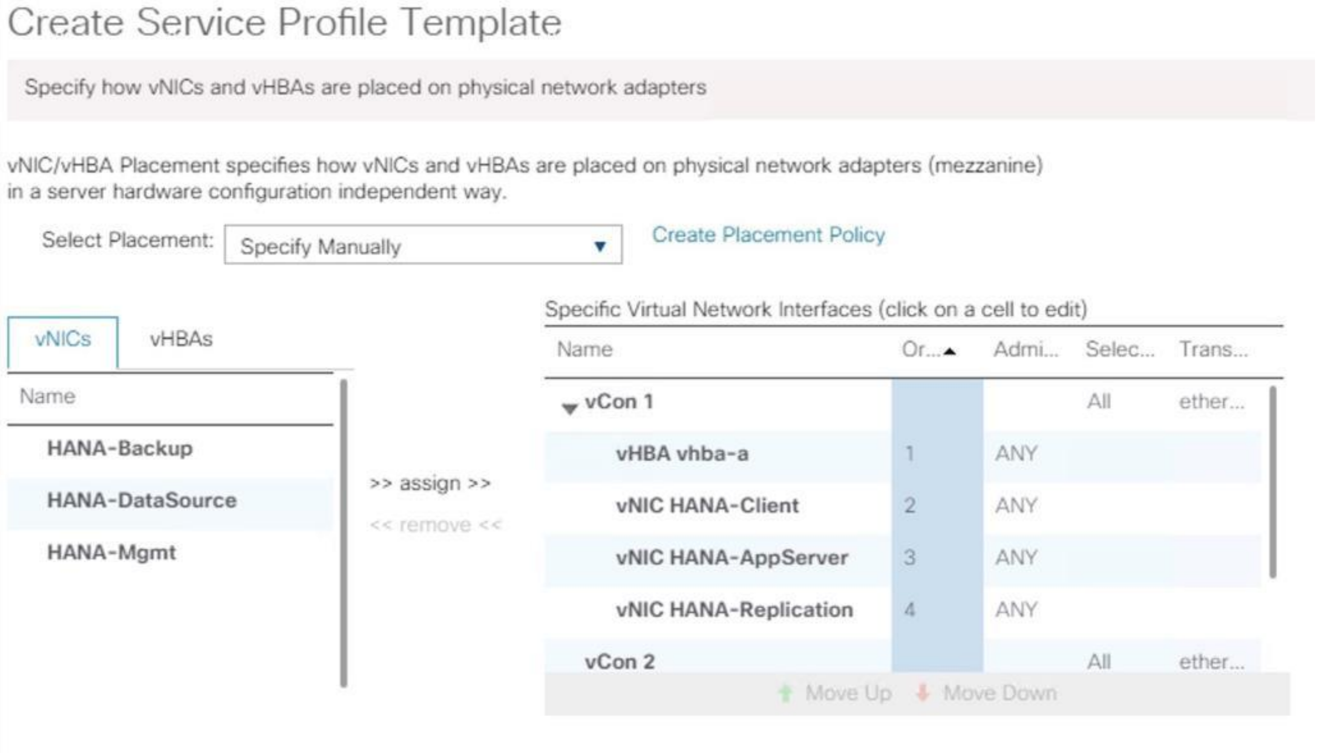
Specific Virtual Network Interfaces (click on a cell to edit)

Name	Order	Admin ...	Selectio...	Transport
vCon 1			All	etherne...
vHBA vhba-a	1	ANY		
vCon 2			All	ethernet...
vCon 3			All	ethernet...
vCon 4			All	ethernet...

c. From the vNICs tab, choose vCon1 and assign the vNICs to the virtual network interfaces policy in the following order:

i. HANA-Client
ii. HANA-AppServer
iii. HANA-Replication

Figure 77 Service Profile Template – vNIC/vHBA Placement – vNIC Assignment to vCON1



Create Service Profile Template

Specify how vNICs and vHBAs are placed on physical network adapters

vNIC/vHBA Placement specifies how vNICs and vHBAs are placed on physical network adapters (mezzanine) in a server hardware configuration independent way.

Select Placement: Specify Manually ▾ Create Placement Policy

Name
HANA-Backup
HANA-DataSource
HANA-Mgmt

Specific Virtual Network Interfaces (click on a cell to edit)

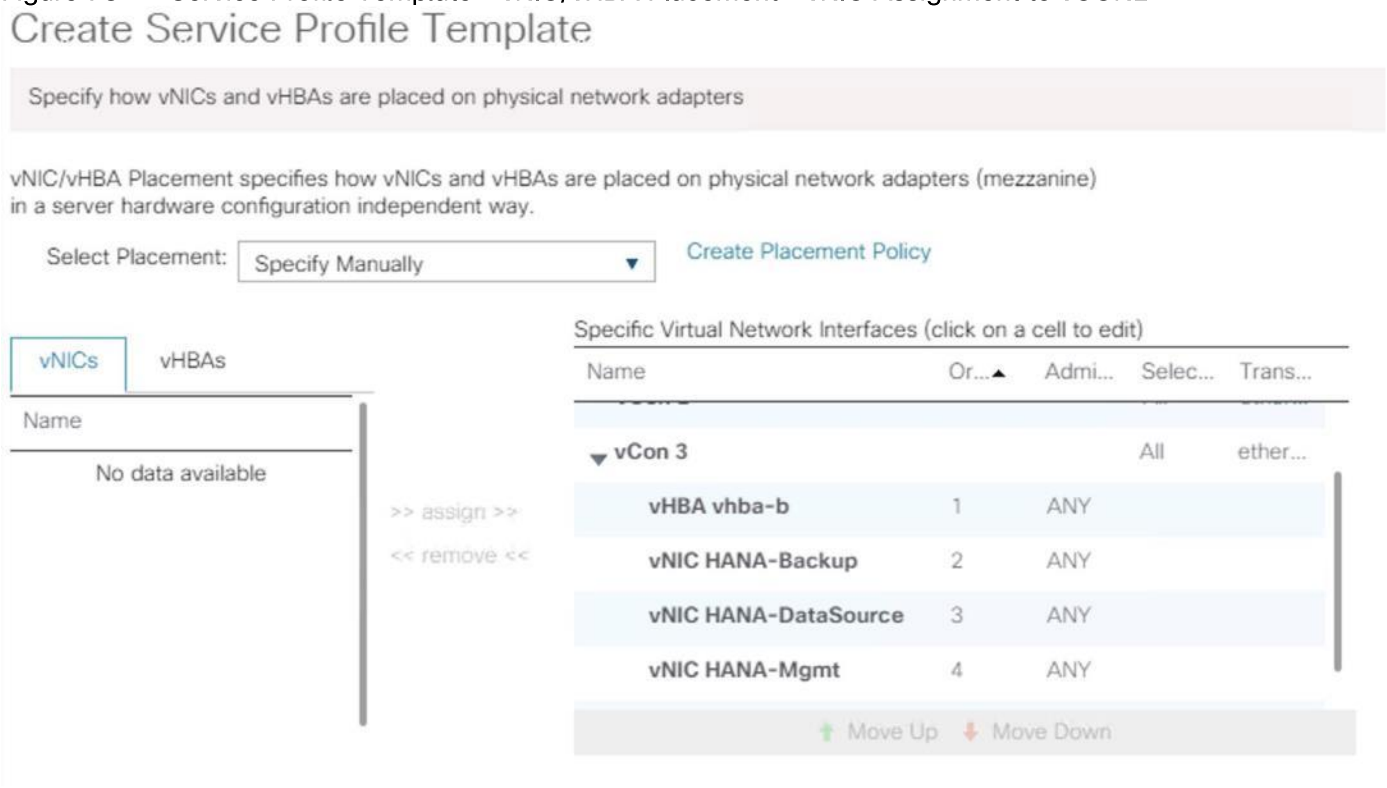
Name	Or...▲	Admi...	Selec...	Trans...
▾ vCon 1			All	ether...
vHBA vhba-a	1	ANY		
vNIC HANA-Client	2	ANY		
vNIC HANA-AppServer	3	ANY		
vNIC HANA-Replication	4	ANY		
vCon 2			All	ether...

d. Select vCON3. From the vHBAs tab, assign vhba-b to vCON3

e. Choose vCon3 and assign the vNICs to the virtual network interfaces policy in the following order:

i. HANA-Backup
ii. HANA-DataSource
iii. HANA-Mgmt

Figure 78 Service Profile Template – vNIC/vHBA Placement – vNIC Assignment to vCON2



Create Service Profile Template

Specify how vNICs and vHBAs are placed on physical network adapters

vNIC/vHBA Placement specifies how vNICs and vHBAs are placed on physical network adapters (mezzanine) in a server hardware configuration independent way.

Select Placement: Specify Manually

Specific Virtual Network Interfaces (click on a cell to edit)

Name	Or...	Admi...	Selec...	Trans...
vCon 3			All	ether...
vHBA vhba-b	1	ANY		
vNIC HANA-Backup	2	ANY		
vNIC HANA-DataSource	3	ANY		
vNIC HANA-Mgmt	4	ANY		

f. Review the table to verify that all vNICs are assigned to the policy in the appropriate order.

g. Click Next.

27. vNIC/vHBA Placement for B200-M5:

With the Cisco UCS B200 M5 Blade Server populated with VIC 1340 + Port expander recognized as Adapter1. Therefore, using vCONs 1 only for the vNIC/vHBA assignment.

a. In the Select Placement list, choose the Specify Manually.

b. From the vHBAs tab, assign vhba-a and vbha-b to vCON1

c. From the vNICs tab, choose vCon1 and assign the vNICs to the virtual network interfaces policy in the following order:

i. HANA-Client
ii. HANA-AppServer
iii. HANA-Replication
iv. HANA-Backup
v. HANA-DataSource
vi. HANA-Mgmt

d. Review the table to verify that all vNICs are assigned to the policy in the appropriate order.

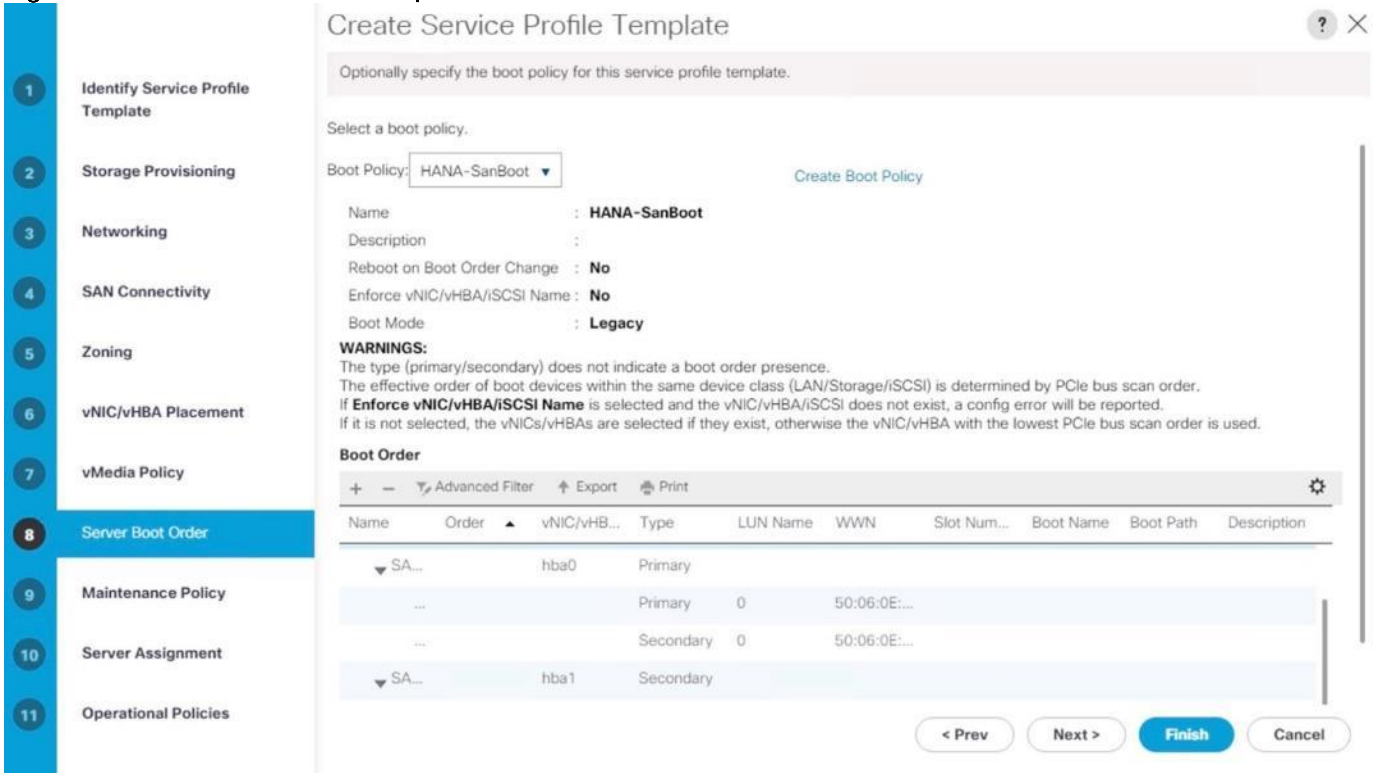
f. Click Next.

28. No Change required on the vMedia Policy, click Next.

29. Set the server boot order:

    a. Select HANA-SanBoot for Boot Policy.

Figure 79 Service Profile Template – Server Boot Order



Optionally specify the boot policy for this service profile template.

Select a boot policy.

Boot Policy: HANA-SanBoot ▾

Name : **HANA-SanBoot**
Description :
Reboot on Boot Order Change : **No**
Enforce vNIC/vHBA/iSCSI Name : **No**
Boot Mode : **Legacy**

WARNINGS:
The type (primary/secondary) does not indicate a boot order presence.
The effective order of boot devices within the same device class (LAN/Storage/iSCSI) is determined by PCIe bus scan order.
If **Enforce vNIC/vHBA/iSCSI Name** is selected and the vNIC/vHBA/iSCSI does not exist, a config error will be reported.
If it is not selected, the vNICs/vHBAs are selected if they exist, otherwise the vNIC/vHBA with the lowest PCIe bus scan order is used.

Boot Order

Name	Order ▲	vNIC/vHB...	Type	LUN Name	WWN	Slot Num...	Boot Name	Boot Path	Description
▾ SA...		hba0	Primary						
...			Primary	0	50:06:0E:...				
...			Secondary	0	50:06:0E:...				
▾ SA...		hba1	Secondary						

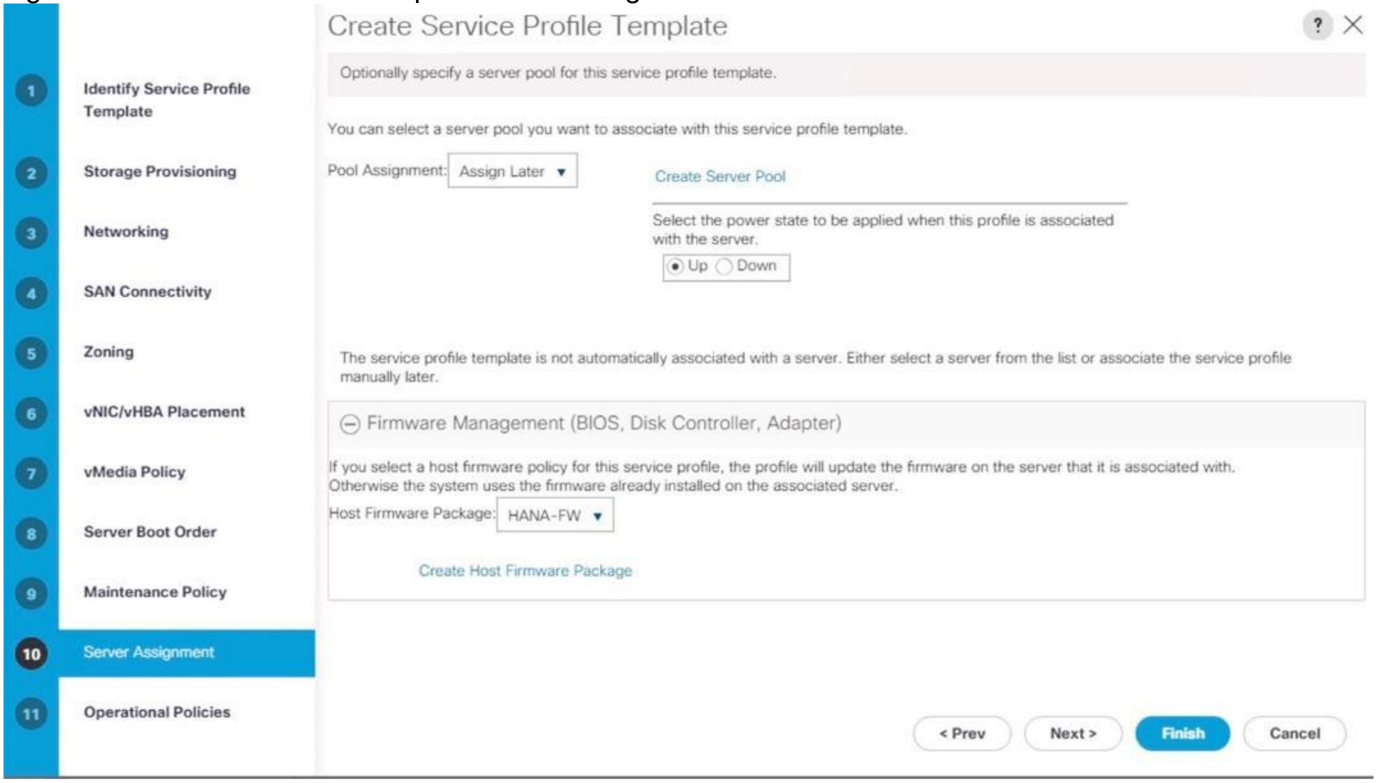
30. Click Next.

31. For Maintenance policy:

    a. Select the ‘default’ Maintenance Policy. Click Next.

32. For Server Assignment: Expand Firmware Management at the bottom of the page and select HANA-FW from the Host Firmware list. Click Next.

Figure 80 Service Profile Template Server Assignment



Create Service Profile Template

Optionally specify a server pool for this service profile template.

You can select a server pool you want to associate with this service profile template.

Pool Assignment: Assign Later

Select the power state to be applied when this profile is associated with the server.

● Up ○ Down

The service profile template is not automatically associated with a server. Either select a server from the list or associate the service profile manually later.

Firmware Management (BIOS, Disk Controller, Adapter)

If you select a host firmware policy for this service profile, the profile will update the firmware on the server that it is associated with. Otherwise the system uses the firmware already installed on the associated server.

Host Firmware Package: HANA-FW

33. For Operational Policies:

    a. BIOS Configuration – In the BIOS Policy list, select HANA-BIOS.

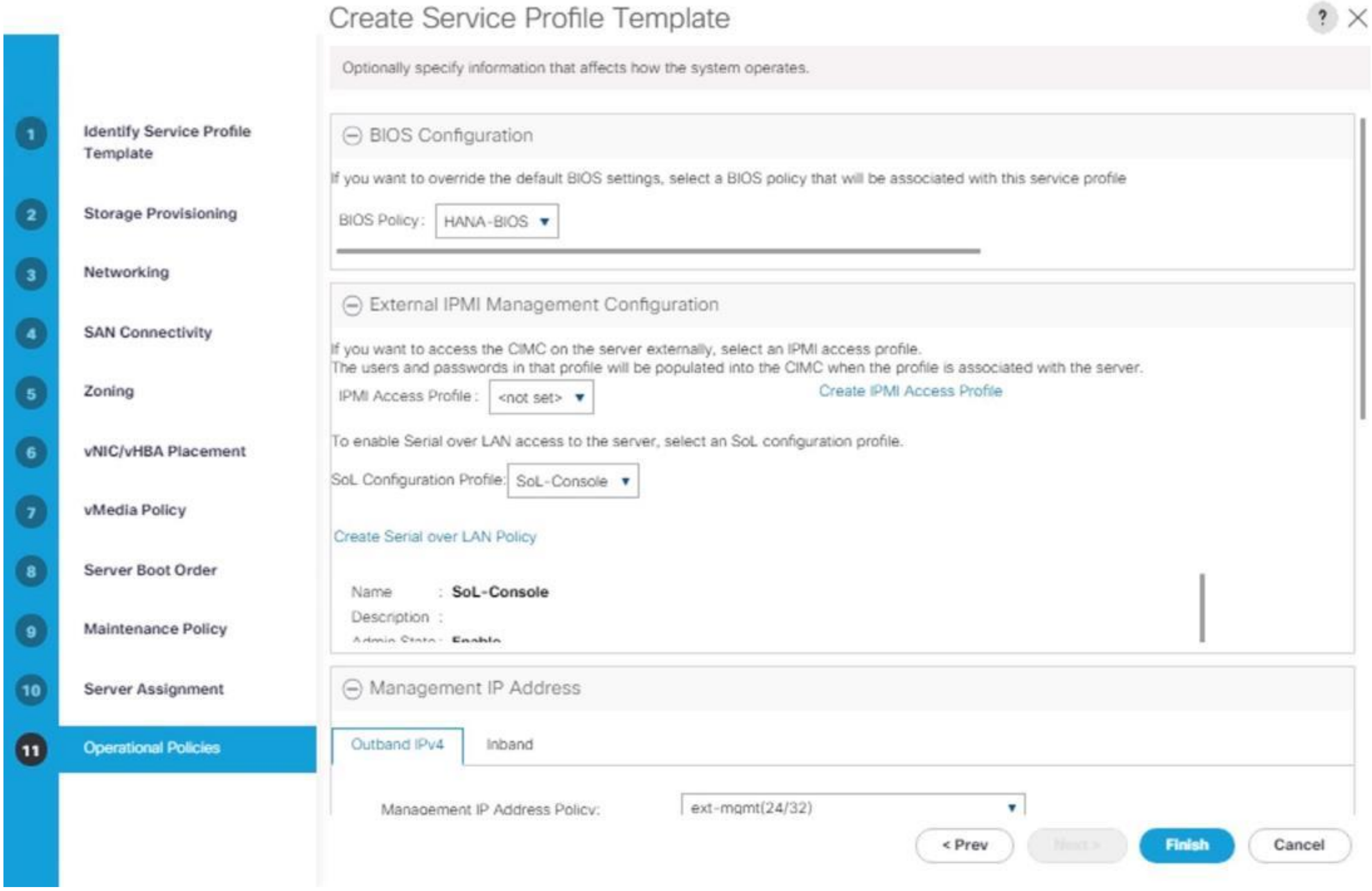
34. External IPMI Management Configuration – Expand the External IPMI Management Configuration. Select SoL-Console in the SoL Configuration Profile.

35. Management IP Address – In the Outband IPv4 tab choose ext-mgmt in the Management IP Address Policy.

36. Power Control Policy Configuration – Select HANA from the drop-down list.

37. Leave the Scrub policy, KVM Management Policy and Graphics Card Policy with default selections.

Figure 81 Service Profile Template Operational Policies



Create Service Profile Template

Optionally specify information that affects how the system operates.

⊖ BIOS Configuration

If you want to override the default BIOS settings, select a BIOS policy that will be associated with this service profile

BIOS Policy : HANA-BIOS ▾

⊖ External IPMI Management Configuration

If you want to access the CIMC on the server externally, select an IPMI access profile.
The users and passwords in that profile will be populated into the CIMC when the profile is associated with the server.

IPMI Access Profile : <not set> ▾ Create IPMI Access Profile

To enable Serial over LAN access to the server, select an SoL configuration profile.

SoL Configuration Profile: SoL-Console ▾

Create Serial over LAN Policy

Name : SoL-Console
Description :
Admin State : Enable

⊖ Management IP Address

Outband IPv4 | Inband

Management IP Address Policy: ext-mgmt(24/32) ▾

38. Click Finish to create the service profile template.

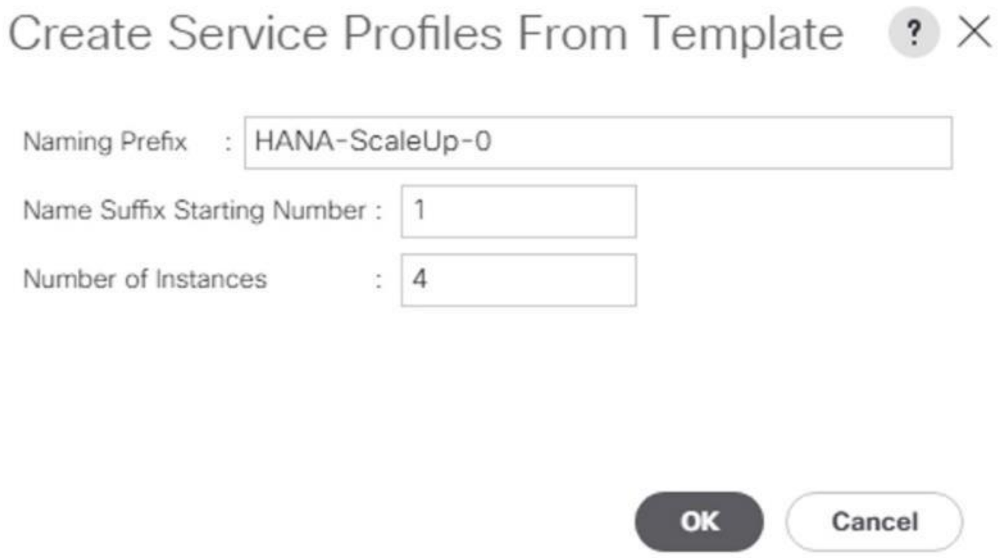
39. Click OK in the confirmation message.

Create Service Profile from the Template

To create service profiles from the service profile template, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.
2. Select Service Profile Templates > root > Sub-Organization > T01-HANA > Service Template HANA-ScaleUp.
3. Right-click Service Template HANA-ScaleUp and select Create Service Profiles from Template
4. Enter HANA-ScaleUp-0 as the service profile prefix.
5. Enter 1 as Name Suffix Starting Number.
6. Enter 4 as the Number of Instances
7. Click OK to create the service profile.

Figure 82 Creating Service Profiles from Template



Create Service Profiles From Template

Naming Prefix : HANA-ScaleUp-0

Name Suffix Starting Number : 1

Number of Instances : 4

Configure Cisco MDS 9706 Switches

The MDS configuration implements a common redundant physical fabric design with fabrics represented as "A" and "B". The validating lab provided a basic MDS fabric supporting VSP Storage Systems that is connected to UCS Fabric Interconnect within the SAN environment. Larger deployments may require a multi-tier core-edge or edge-core-edge design with port channels connecting the differing layers of the topology. Further discussion of these kinds of topologies, as well as considerations in implementing more complex SAN environments can be found in this white paper: https://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9700-series-multilayer-directors/white-paper-c11-729697.pdf

The configuration steps described below are implemented for the Cisco MDS 9706 but are similar to steps required for other Cisco MDS 9000 series switches that may be appropriate for a deployment. When making changes to the design that comply with the compatibility matrices of Cisco and Hitachi, it is required to consult the appropriate configuration documents of the differing equipment to confirm the correct implementation steps.

Physical Connectivity

Physical cabling should be completed by following the diagram and table references section Deployment Hardware and Software.

Cisco MDS Initial Configuration Dialogue

Complete this dialogue on each switch, using a serial connection to the console port of the switch, unless Power on Auto Provisioning is being used.

```
         ---- System Admin Account Setup ----


Do you want to enforce secure password standard (yes/no) [y]:

  Enter the password for "admin": <<var_password>>
  Confirm the password for "admin": <<var_password>>

         ---- Basic System Configuration Dialog ----

This setup utility will guide you through the basic configuration of
the system. Setup configures only enough connectivity for management
of the system.

Please register Cisco MDS 9000 Family devices promptly with your
supplier. Failure to register may affect response times for initial
service calls. MDS devices must be registered to receive entitled
support services.

Press Enter at anytime to skip a dialog. Use ctrl-c at anytime
to skip the remaining dialogs.

Would you like to enter the basic configuration dialog (yes/no): yes



  Create another login account (yes/no) [n]: <enter>
  Configure read-only SNMP community string (yes/no) [n]: <enter>

  Configure read-write SNMP community string (yes/no) [n]: <enter>

  Enter the switch name : <<var_mds_A_hostname>>|<<var_mds_B_hostname>>

  Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]: <enter>

    Mgmt0 IPv4 address : <<var_mds_A_mgmt_ip>>|<<var_mds_B_mgmt_ip>>

    Mgmt0 IPv4 netmask : <<var_oob_netmask>>

  Configure the default gateway? (yes/no) [y]: <enter>

    IPv4 address of the default gateway : <<var_oob_gateway>>

  Configure advanced IP options? (yes/no) [n]: <enter>

  Enable the ssh service? (yes/no) [y]: <enter>

    Type of ssh key you would like to generate (dsa/rsa) [rsa]: <enter>

    Number of rsa key bits <1024-2048> [1024]: 2048

  Enable the telnet service? (yes/no) [n]: y

  Enter the type of drop to configure congestion/no_credit drop? (con/no) [c]:
<enter>

    Enter milliseconds in multiples of 10 for congestion-drop for logical-type edge
    in range (<200-500>/default), where default is 500.  [d]: <enter>

    Congestion-drop for logical-type core must be greater than or equal to
    Congestion-drop for logical-type edge. Hence, Congestion drop for
    logical-type core will be set as default.

  Enable the http-server? (yes/no) [y]: <enter>

 Configure clock? (yes/no) [n]: y

Clock config format [HH:MM:SS Day Mon YYYY] [example: 18:00:00 1 november 2012]:
<enter>

Enter clock config :17:26:00 2 january 2019

 Configure timezone? (yes/no) [n]: y

Enter timezone config [PST/MST/CST/EST] :EST
Enter Hrs offset from UTC [-23:+23] : <enter>
Enter Minutes offset from UTC [0-59] : <enter>

 Configure summertime? (yes/no) [n]: <enter>

  Configure the ntp server? (yes/no) [n]: y

    NTP server IPv4 address : <var_oob_ntp>
  Configure default switchport interface state (shut/noshut) [shut]: noshut

  Configure default switchport trunk mode (on/off/auto) [on]: auto

  Configure default switchport port mode F (yes/no) [n]: y

  Configure default zone policy (permit/deny) [deny]: <enter>

  Enable full zoneset distribution? (yes/no) [n]: <enter>

  Configure default zone mode (basic/enhanced) [basic]: <enter>

The following configuration will be applied:
  password strength-check
  switchname <<var_mds_A_hostname>>|<<var_mds_B_hostname>>
  interface mgmt0
    ip address <<var_mds_A_mgmt_ip>>|<<var_mds_B_mgmt_ip>> <<var_oob_netmask>>
    no shutdown
  ip default-gateway <<var_oob_gateway>>
  ssh key rsa 2048 force
  feature ssh
  feature telnet
  system timeout congestion-drop default logical-type edge
  system timeout congestion-drop default logical-type core
  feature http-server
  clock set 13:51:00 6 january 2019
  clock timezone PST 0 0
  ntp server 192.168.93.16
  no system default switchport shutdown
  system default switchport trunk mode auto
  system default switchport mode F
  no system default zone default-zone permit
  no system default zone distribute full
  no system default zone mode enhanced

Would you like to edit the configuration? (yes/no) [n]: <enter>

Use this configuration and save it? (yes/no) [y]: <enter>

[########################################] 100%
Copy complete.
```

Cisco MDS Switch Configuration

Configure Fibre Channel Ports and Port Channels

To configure the fibre channel ports and port channels, follow these steps:

1. On MDS 9706 A enter the configuration mode and enable the required features as shown below:

```
feature fport-channel-trunk
feature npiv
```

2. Use the following commands to configure the FC Port channel and add all FC ports connected to Cisco UCS Fabric Interconnect A:

```
int port-channel <<var_fc-pc_a_id>>
channel mode active


int fc1/1-4
channel-group <<var_fc-pc_a_id>> force

int port-channel <<var_fc-pc_a_id>>
switchport mode F
switchport trunk mode off
no shut
```

3. On MDS 9706 B enter the configuration mode and enable the required features as shown below:

```
feature fport-channel-trunk
feature npiv
```

4. Use the following commands to configure the FC Port channel and add all FC ports connected to Cisco UCS Fabric Interconnect B:

```
int port channel <<var_fc-pc_b_id>>
channel mode active

int fc1/1-4
channel-group <<var_fc-pc_b_id>> force

int port channel <<var_fc-pc_b_id>>
switchport mode F
switchport trunk mode off
no shut
```

Configure VSANs

To configure VSANs, follow these steps:

1. On MDS 9706 A enter the configuration mode and execute the following commands to configure the VSAN:

```
vsan database
vsan <<var_san_a_id>>
vsan <<var_san_a_id>> interface port-channel <<var_fc-pc_a_id>>
vsan 10 interface fc 1/13
Traffic on fc1/13 may be impacted. Do you want to continue? (y/n) [n] y
vsan 10 interface fc 1/14
Traffic on fc1/14 may be impacted. Do you want to continue? (y/n) [n] y
vsan 10 interface fc 1/15
Traffic on fc1/15 may be impacted. Do you want to continue? (y/n) [n] y
vsan 10 interface fc 1/16
Traffic on fc1/16 may be impacted. Do you want to continue? (y/n) [n] y
```

```
int fc 1/13-16
```

```
switchport trunk mode off
switchport trunk allowed vsan <<var_san_a_id>>
Warning: This command will remove all VSANs currently being trunked and trunk only
the specified VSANs.
Do you want to continue? (y/n) [n] y
no shut
```

2. On MDS 9706 B enter the configuration mode and execute the following commands to configure the VSAN:

```
vsan database
vsan <<var_san_b_id>>
vsan <<var_san_b_id>> interface port-channel <<var_fc-pc_b_id>>
vsan <<var_san_b_id>> interface fc 1/13
Traffic on fc1/13 may be impacted. Do you want to continue? (y/n) [n] y
vsan <<var_san_b_id>> interface fc 1/14
Traffic on fc1/14 may be impacted. Do you want to continue? (y/n) [n] y
vsan <<var_san_b_id>> interface fc 1/15
Traffic on fc1/15 may be impacted. Do you want to continue? (y/n) [n] y
vsan <<var_san_b_id>> interface fc 1/16
Traffic on fc1/16 may be impacted. Do you want to continue? (y/n) [n] y
```

```
int fc 1/13-16
switchport trunk mode off
switchport trunk allowed vsan <<var_san_b_id>>
Warning: This command will remove all VSANs currently being trunked and trunk only
the specified VSANs.
Do you want to continue? (y/n) [n] y
no shut
```

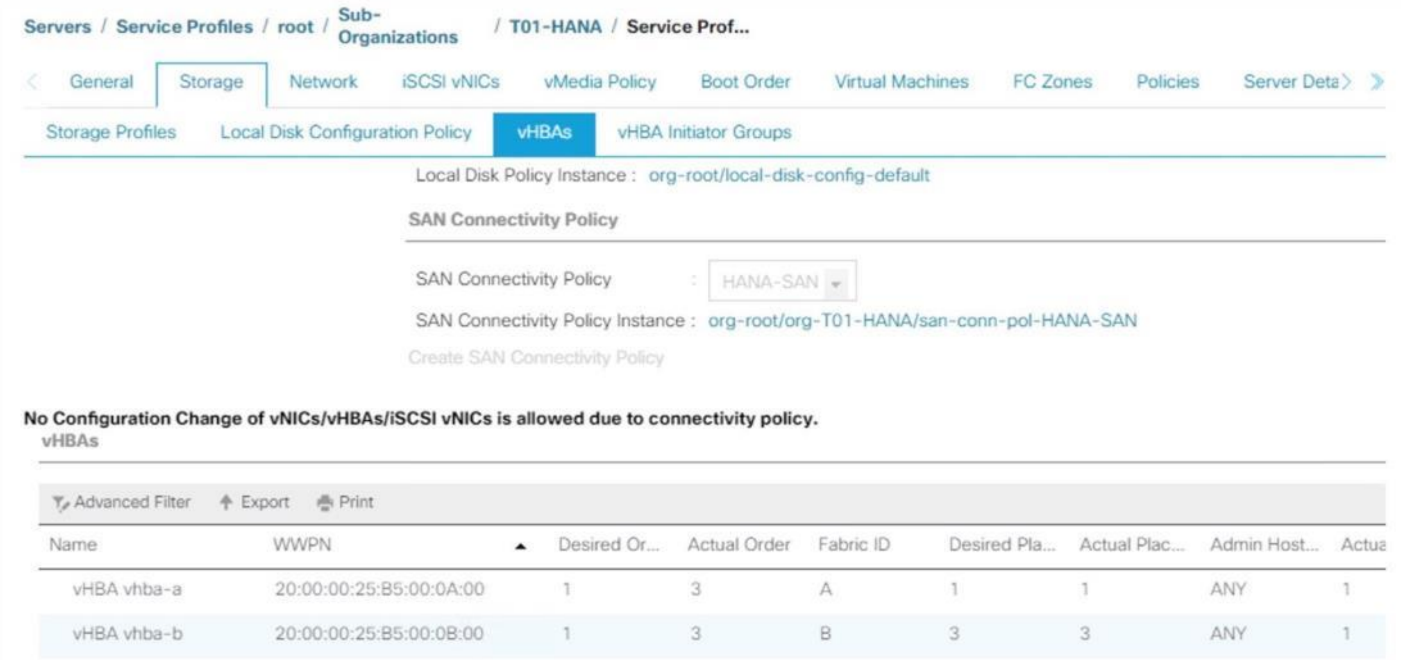
Make sure to save the configuration to the startup config using the command “copy running-config startup-config”

Create and Configure Fiber Channel Zoning

To create the Fiber Channel connections between the Cisco MDS 9706 switches, the Cisco UCS Fabric Interconnects, and the Hitachi Storage, follow these steps:

1. Log into the Cisco UCS Manager > Servers > Service Profiles > root > Sub-Organizations >T01-HANA > Service Profile HANA–ScaleUp-01. On the right-hand pane, click the Storage tab and vHBA's tab to get the WWPN of HBA's as shown in the figure below.

Figure 83 WWPN of a Server Node



Local Disk Policy Instance : org-root/local-disk-config-default

SAN Connectivity Policy

SAN Connectivity Policy : HANA-SAN

SAN Connectivity Policy Instance : org-root/org-T01-HANA/san-conn-pol-HANA-SAN

No Configuration Change of vNICs/vHBAs/iSCSI vNICs is allowed due to connectivity policy.

vHBAs

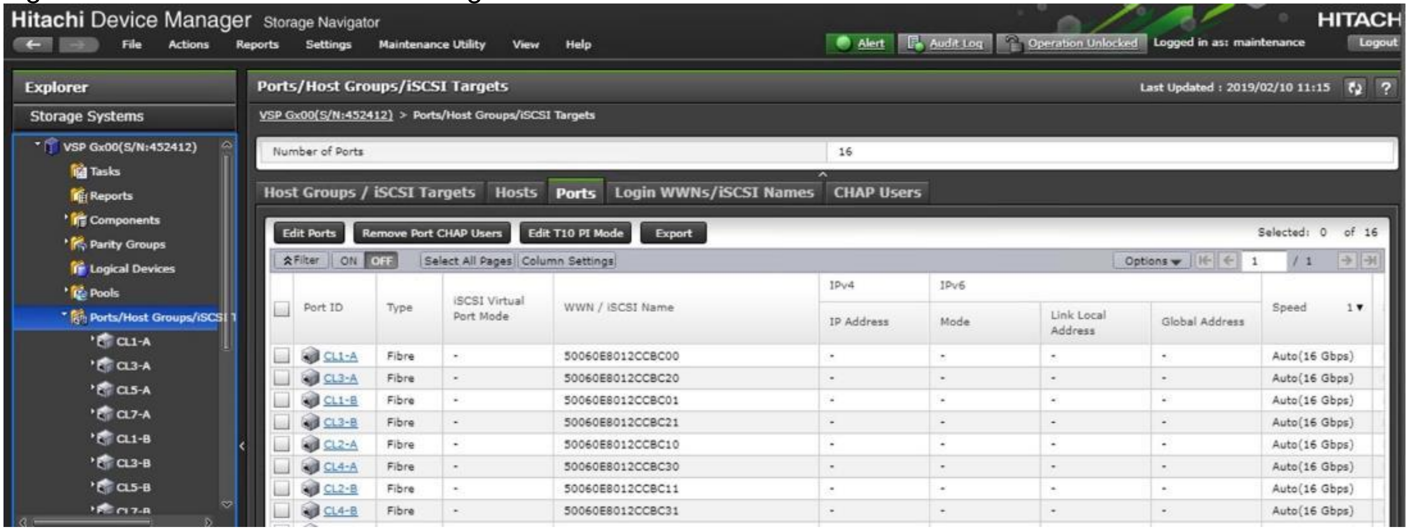
Name	WWPN	Desired Or...	Actual Order	Fabric ID	Desired Pla...	Actual Plac...	Admin Host...	Actua
vHBA vhba-a	20:00:00:25:B5:00:0A:00	1	3	A	1	1	ANY	1
vHBA vhba-b	20:00:00:25:B5:00:0B:00	1	3	B	3	3	ANY	1

2. Note the WWPN of the all the configured Servers from their Service Profiles.

   In the current example configuration, the WWPN numbers of four server nodes configured are 20:00:00:25:B5:0A:00:00 - 20:00:00:25:B5:0A:00:03 for the Fabric A and 20:00:00:25:B5:0B:00:00 - 20:00:00:25:B5:0B:00:03

3. Connect to the Hitachi Storage and extract the WWPN of FC Ports connected to the Cisco MDS Switches. We have connected 8 FC ports from Hitachi Storage to Cisco MDS Switches. FC ports CL1-A, CL1-B, CL2-A, CL2-B are connected to MDS Switch-A and similarly FC ports CL3-A, CL3-B, CL3-A, CL3-B are connected to MDS Switch-B.

Figure 84 WWPN of Hitachi Storage



Ports/Host Groups/iSCSI Targets

Last Updated : 2019/02/10 11:15

VSP Gx00(S/N:452412) > Ports/Host Groups/iSCSI Targets

Number of Ports: 16

Selected: 0 of 16

	Port ID	Type	iSCSI Virtual Port Mode	WWN / iSCSI Name	IPv4	IPv6			Speed
					IP Address	Mode	Link Local Address	Global Address	
□	CL1-A	Fibre	-	50060E8012CCBC00	-	-	-	-	Auto(16 Gbps)
□	CL3-A	Fibre	-	50060E8012CCBC20	-	-	-	-	Auto(16 Gbps)
□	CL1-B	Fibre	-	50060E8012CCBC01	-	-	-	-	Auto(16 Gbps)
□	CL3-B	Fibre	-	50060E8012CCBC21	-	-	-	-	Auto(16 Gbps)
□	CL2-A	Fibre	-	50060E8012CCBC10	-	-	-	-	Auto(16 Gbps)
□	CL4-A	Fibre	-	50060E8012CCBC30	-	-	-	-	Auto(16 Gbps)
□	CL2-B	Fibre	-	50060E8012CCBC11	-	-	-	-	Auto(16 Gbps)
□	CL4-B	Fibre	-	50060E8012CCBC31	-	-	-	-	Auto(16 Gbps)

Create Device Aliases for Fibre Channel Zoning

To configure device aliases and zones for the primary boot paths of MDS switch A, follow this step:

1. Login as admin user and run the following commands.

```
conf t
device-alias database
  device-alias name G370-Cntrl-1-CL1A pwwn 50:06:0e:80:12:cc:bc:00
  device-alias name G370-Cntrl-1-CL1B pwwn 50:06:0e:80:12:cc:bc:01
  device-alias name G370-Cntrl-1-CL2A pwwn 50:06:0e:80:12:cc:bc:10
  device-alias name G370-Cntrl-1-CL2B pwwn 50:06:0e:80:12:cc:bc:11
  device-alias name HANA-Server01-hba-a pwwn 20:00:00:25:b5:00:0a:00
  device-alias name HANA-Server02-hba-a pwwn 20:00:00:25:b5:00:0a:01
  device-alias name HANA-Server03-hba-a pwwn 20:00:00:25:b5:00:0a:02
  device-alias name HANA-Server04-hba-a pwwn 20:00:00:25:b5:00:0a:03
exit
device-alias commit
```

To configure device aliases and zones for the primary boot paths of MDS switch B, follow this step:

1. Login as admin user and run the following commands.

```
conf t
device-alias database
  device-alias name G370-Cntrl-2-CL3A pwwn 50:06:0e:80:12:cc:bc:20
  device-alias name G370-Cntrl-2-CL3B pwwn 50:06:0e:80:12:cc:bc:21
  device-alias name G370-Cntrl-2-CL4A pwwn 50:06:0e:80:12:cc:bc:30
  device-alias name G370-Cntrl-2-CL4B pwwn 50:06:0e:80:12:cc:bc:31
  device-alias name HANA-Server01-hba-b pwwn 20:00:00:25:b5:00:0b:00
  device-alias name HANA-Server02-hba-b pwwn 20:00:00:25:b5:00:0b:01
  device-alias name HANA-Server03-hba-b pwwn 20:00:00:25:b5:00:0b:02
  device-alias name HANA-Server04-hba-b pwwn 20:00:00:25:b5:00:0b:03
exit
device-alias commit
```

Create Zoning

To configure zones for the MDS switch A, follow these steps:

1. Create a zone for each service profile.

2. Login as admin user and run the following commands.

```
conf t
zone name HANA-Server01-A vsan 10
member device-alias G370-Cntrl-1-CL1A
member device-alias G370-Cntrl-1-CL1B
member device-alias G370-Cntrl-1-CL2A
member device-alias G370-Cntrl-1-CL2B
member device-alias HANA-Server01-hba-a
exit

zone name HANA-Server02-A vsan 10
member device-alias G370-Cntrl-1-CL1A
member device-alias G370-Cntrl-1-CL1B
member device-alias G370-Cntrl-1-CL2A
member device-alias G370-Cntrl-1-CL2B
member device-alias HANA-Server02-hba-a
exit

zone name HANA-Server03-A vsan 10
member device-alias G370-Cntrl-1-CL1A
member device-alias G370-Cntrl-1-CL1B
member device-alias G370-Cntrl-1-CL2A
member device-alias G370-Cntrl-1-CL2B
member device-alias HANA-Server03-hba-a
exit

zone name HANA-Server04-A vsan 10
member device-alias G370-Cntrl-1-CL1A
member device-alias G370-Cntrl-1-CL1B
member device-alias G370-Cntrl-1-CL2A
member device-alias G370-Cntrl-1-CL2B
member device-alias HANA-Server04-hba-a
exit
```

3. After the zone for the Cisco UCS service profile has been created, create the zone set and add the necessary members.

```
zoneset name HANA-Servers-A vsan 10
    member HANA-Server01-A
    member HANA-Server02-A
    member HANA-Server03-A
    member HANA-Server04-A
exit
```

4. Activate the zone set by running following commands.

```
zoneset activate name HANA-Servers-A vsan 10
exit
copy run start
```

To configure zones for the MDS switch B, follow these steps:

1. Create a zone for each service profile.

2. Login as admin user and run the following commands.

```
conf t
zone name HANA-Server01-B vsan 20
member device-alias G370-Cntrl-2-CL3A
   member device-alias G370-Cntrl-2-CL3B
   member device-alias G370-Cntrl-2-CL4A
   member device-alias G370-Cntrl-2-CL4B
   member device-alias HANA-Server01-hba-b
exit
zone name HANA-Server02-B vsan 20
member device-alias G370-Cntrl-2-CL3A
   member device-alias G370-Cntrl-2-CL3B
   member device-alias G370-Cntrl-2-CL4A
   member device-alias G370-Cntrl-2-CL4B
   member device-alias HANA-Server02-hba-b
```

```
exit
zone name HANA-Server03-B vsan 20
member device-alias G370-Cntrl-2-CL3A
   member device-alias G370-Cntrl-2-CL3B
   member device-alias G370-Cntrl-2-CL4A
   member device-alias G370-Cntrl-2-CL4B
   member device-alias HANA-Server03-hba-b
exit
zone name HANA-Server04-B vsan 20
member device-alias G370-Cntrl-2-CL3A
   member device-alias G370-Cntrl-2-CL3B
   member device-alias G370-Cntrl-2-CL4A
   member device-alias G370-Cntrl-2-CL4B
   member device-alias HANA-Server04-hba-b
exit
```

3. After the zone for the Cisco UCS service profile has been created, create the zone set and add the necessary members.

```
zoneset name HANA-Servers-B vsan 20
    member HANA-Server01-B
    member HANA-Server02-B
    member HANA-Server03-B
    member HANA-Server04-B
exit
```

4. Activate the zone set by running following commands.

```
zoneset activate name HANA-Servers-B vsan 20
exit
copy run start
```

Operating System Installation

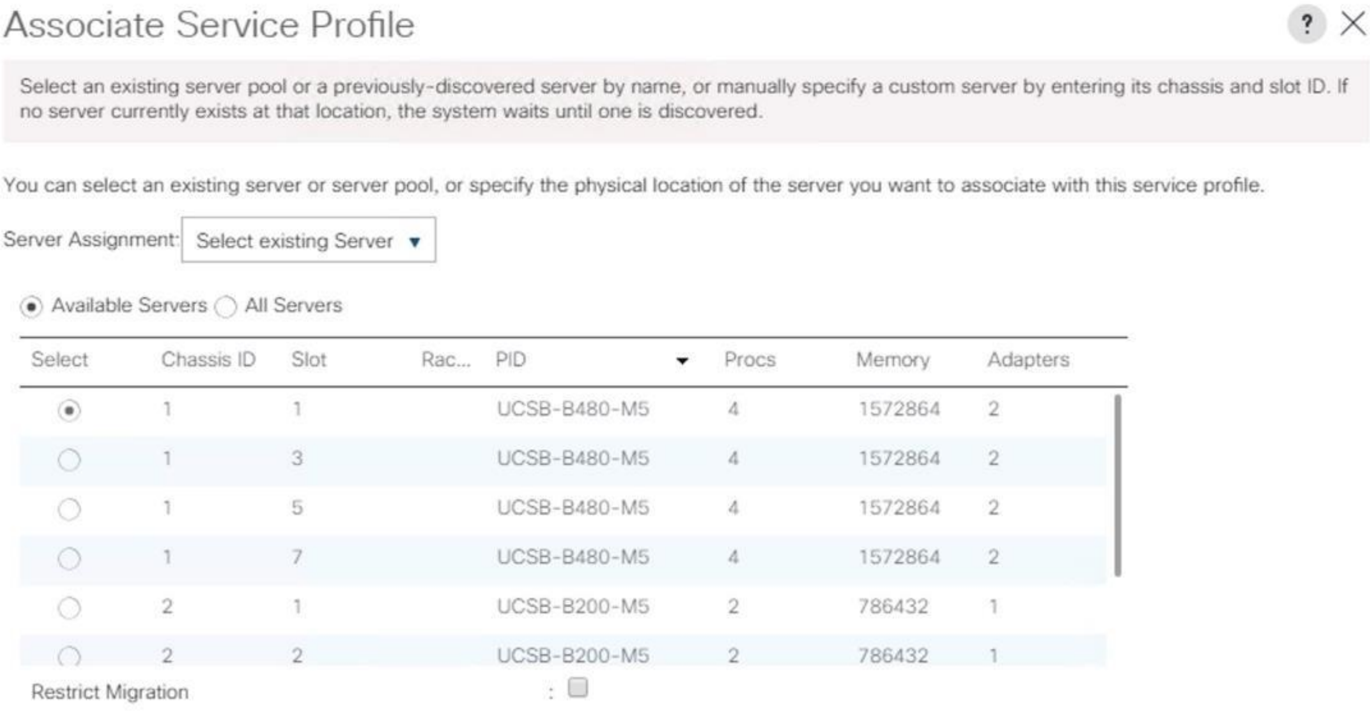
This section provides the procedure for Operating System installation using SAN Boot and operating system customizing for SAP HANA requirement.

Associate Service Profile to Cisco UCS Server

To associate service profile created for a specific server, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.
2. Select Service Profile > `root > Sub-Organization > T01-HANA > HANA-ScaleUp-01`.
3. Right-click `HANA-ScaleUp-01` and select Change Service Profile Association.
4. For Server Assignment, select the existing Server from the drop-down list.
5. Click Available Servers.
6. Select the server, as required. Click OK. Click Yes for the Warning. Click OK.

Figure 85 Creating Service Profiles from Template



Associate Service Profile

Select an existing server pool or a previously-discovered server by name, or manually specify a custom server by entering its chassis and slot ID. If no server currently exists at that location, the system waits until one is discovered.

You can select an existing server or server pool, or specify the physical location of the server you want to associate with this service profile.

Server Assignment: Select existing Server ▾

● Available Servers ○ All Servers

Select	Chassis ID	Slot	Rac...	PID	Procs	Memory	Adapters
●	1	1		UCSB-B480-M5	4	1572864	2
○	1	3		UCSB-B480-M5	4	1572864	2
○	1	5		UCSB-B480-M5	4	1572864	2
○	1	7		UCSB-B480-M5	4	1572864	2
○	2	1		UCSB-B200-M5	2	786432	1
○	2	2		UCSB-B200-M5	2	786432	1

Restrict Migration : □

7. Repeat steps 1-6 to associate each Service Profile with a Server.

SLES for SAP 12 SP4 OS Installation

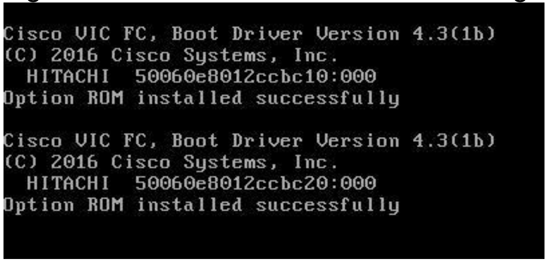
This section provides the procedure for SUSE Linux Enterprise Server for SAP Applications 12 SP 4 Operating System and customizing for SAP HANA requirement.

The following procedure requires SLES for SAP 12 SP 4 installation ISO image.

To install the SLES for SAP 12 SP4, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.
2. Select Service Profile > root > Sub-Organization > T01-HANA > HANA-ScaleUp-01.
3. Click KVM Console.
4. When the KVM Console is launched, click Boot Server.
5. Choose Virtual Media > Activate Virtual Devices.
    a. For Unencrypted Virtual Media Session, select Accept this Session and then click Apply.
6. Click Virtual Media and choose Map CD/DVD.
7. Click Browse to navigate to the ISO media location. Select SLE-12-SP4-SAP-DVD-x86_64-GM-DVD1.ISO Click Open.
8. Click Map Device.
9. At server boot time, during verification of VIC FC boot driver version, it recognizes the Hitachi Storage by its target WWPN numbers. This verifies the server to storage connectivity.

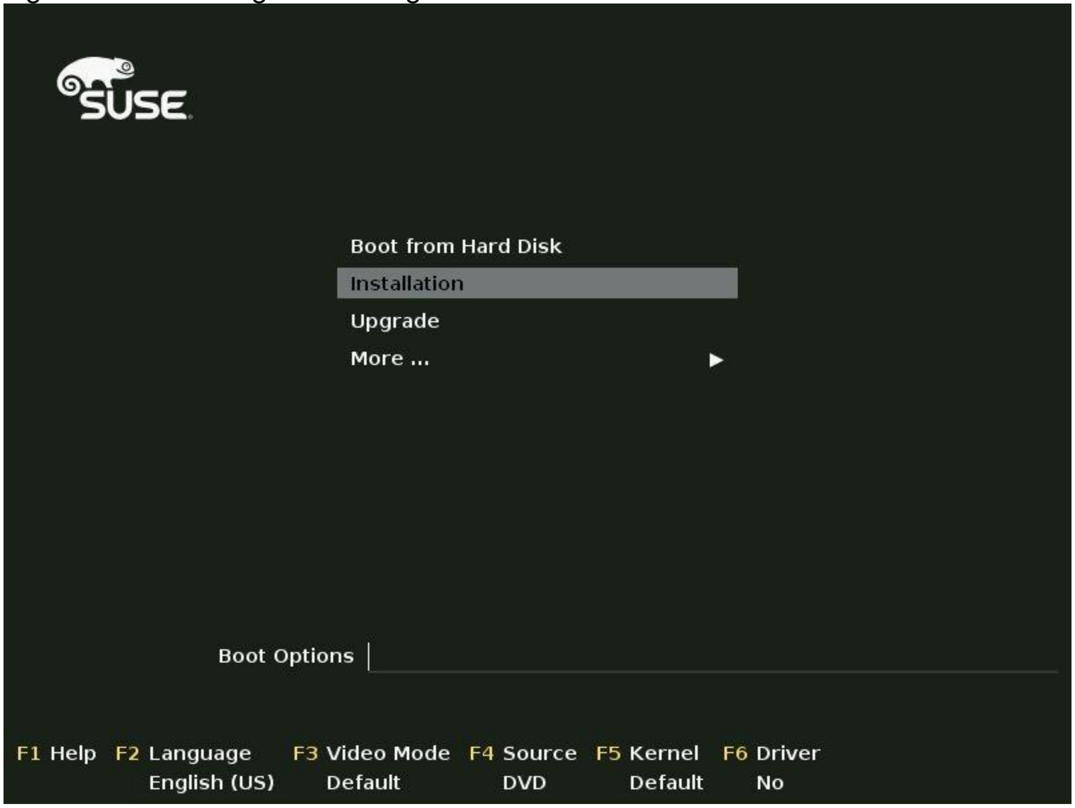
Figure 86 Cisco VIC Boot Driver Recognizes Hitachi Storage



```
Cisco VIC FC, Boot Driver Version 4.3(1b)
(C) 2016 Cisco Systems, Inc.
  HITACHI  50060e8012ccbc10:000
Option ROM installed successfully

Cisco VIC FC, Boot Driver Version 4.3(1b)
(C) 2016 Cisco Systems, Inc.
  HITACHI  50060e8012ccbc20:000
Option ROM installed successfully
```

10. The System will automatically boot from the ISO image. Select the Installation option.

Figure 87 Booting to ISO image



F1 Help F2 Language English (US) F3 Video Mode Default F4 Source DVD F5 Kernel Default F6 Driver No

11. On the first “Language, Keyboard and License Agreement” page, select the Language of choice and Keyboard Layout, “I Agree to license terms” and click Next.

12. On the Network Settings screen Under Overview, click VNIC Ethernet NIC.

    a. To configure the network interface on the OS, it is required to identify the mapping of the Ethernet device on the OS to vNIC interface on the Cisco UCS.

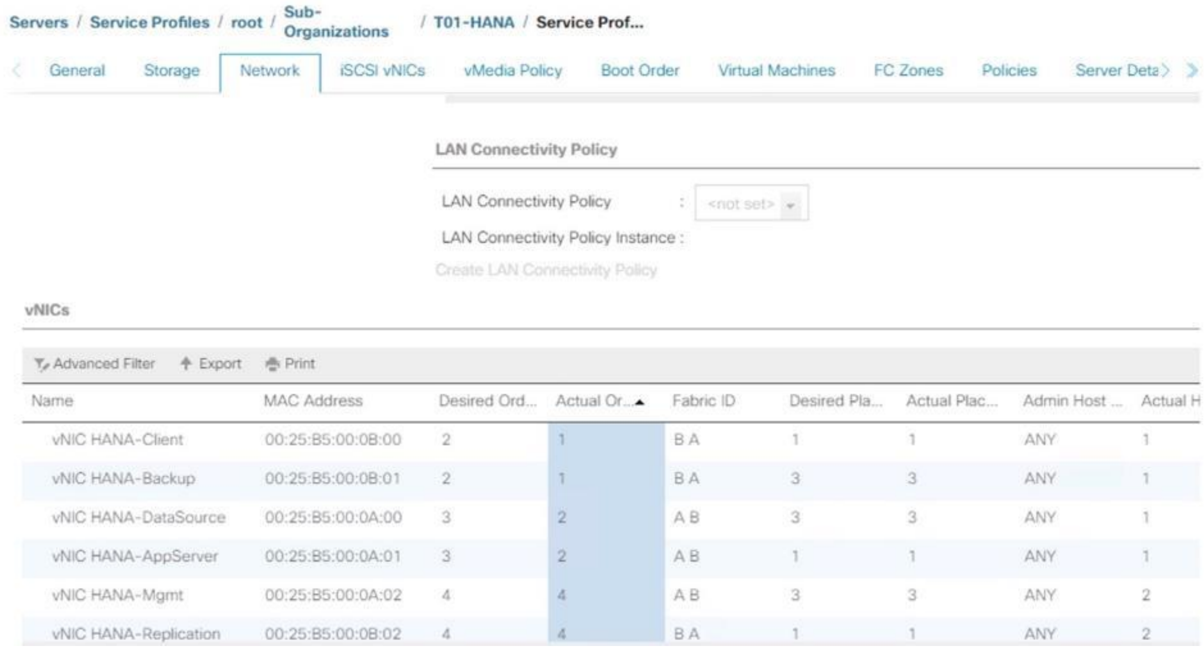
    b. In Cisco UCS Manager, click the Servers tab in the navigation pane.

    c. Select Service Profile > root > Sub-Organization > T01-HANA > HANA-ScaleUp-01.

    d. On the main pane click on Network, list of the vNICs with MAC Address are listed.

    e. Note that the MAC Address of the HANA-Mgmt vNIC is “00:25:B5:00:0A:02”

Figure 88 Cisco UCS vNIC MAC Address



LAN Connectivity Policy

LAN Connectivity Policy : <not set>

LAN Connectivity Policy Instance :

vNICs

Name	MAC Address	Desired Ord...	Actual Or...	Fabric ID	Desired Pla...	Actual Plac...	Admin Host ...	Actual H
vNIC HANA-Client	00:25:B5:00:0B:00	2	1	B A	1	1	ANY	1
vNIC HANA-Backup	00:25:B5:00:0B:01	2	1	B A	3	3	ANY	1
vNIC HANA-DataSource	00:25:B5:00:0A:00	3	2	A B	3	3	ANY	1
vNIC HANA-AppServer	00:25:B5:00:0A:01	3	2	A B	1	1	ANY	1
vNIC HANA-Mgmt	00:25:B5:00:0A:02	4	4	A B	3	3	ANY	2
vNIC HANA-Replication	00:25:B5:00:0B:02	4	4	B A	1	1	ANY	2

f. By comparing MAC Address on the OS and Cisco UCS, eth0 on OS will carry the VLAN for Management.

13. Click Edit, under the Address tab.

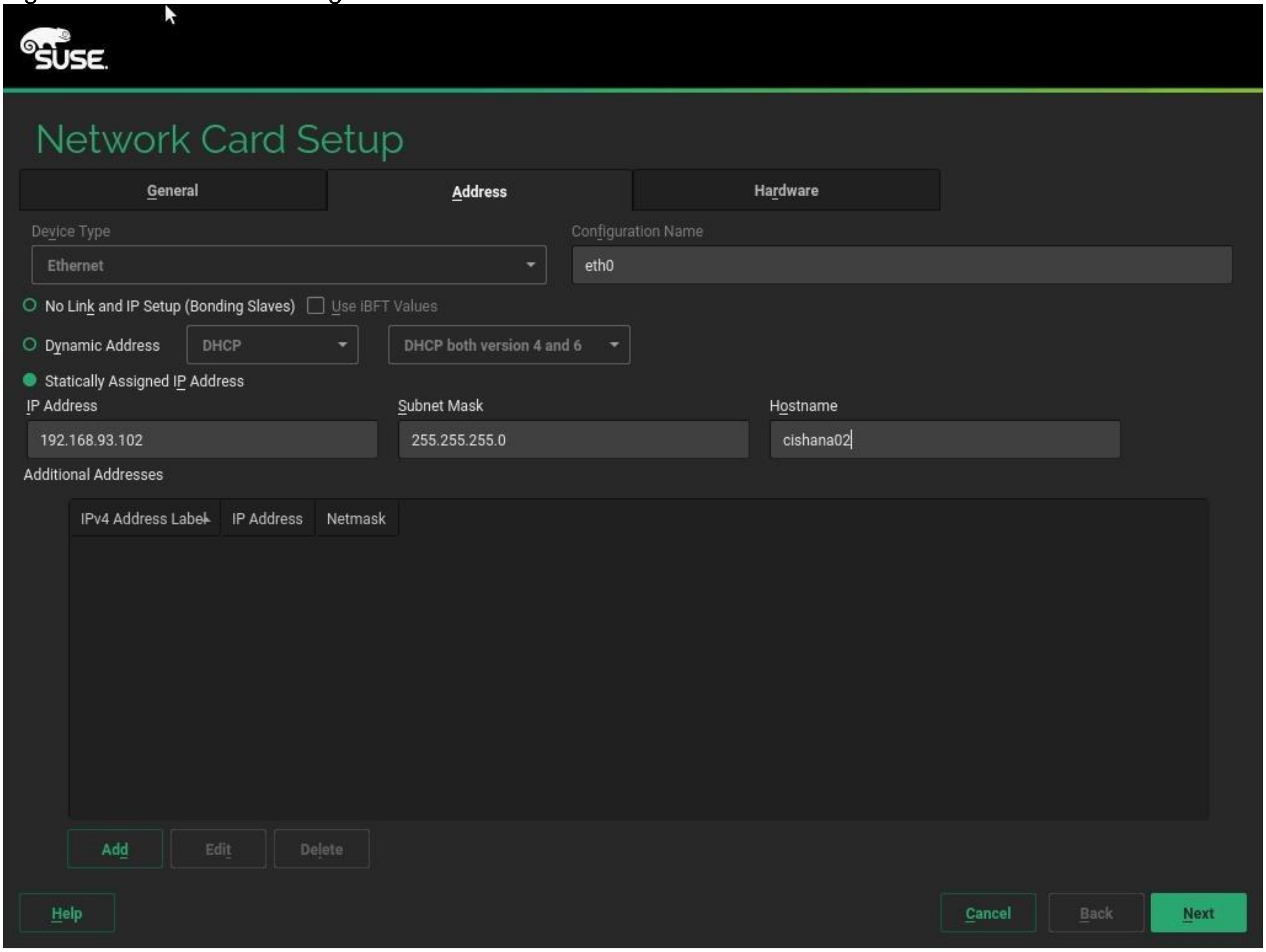
a. Click Statically Assigned IP Address:

b. In the IP Address field enter <<Management IP address>>.

c. In the Subnet Mask field enter <<subnet mask for Management Interface>>.

d. In the Hostname field enter the hostname for Management Interface.

Figure 89 Network Settings



Network Card Setup

Device Type: Ethernet

Configuration Name: eth0

○ No Link and IP Setup (Bonding Slaves) □ Use iBFT Values

○ Dynamic Address DHCP DHCP both version 4 and 6

● Statically Assigned IP Address

IP Address: 192.168.93.102

Subnet Mask: 255.255.255.0

Hostname: cishana02

Additional Addresses

IPv4 Address Label	IP Address	Netmask

14. Repeat steps 12 and 13 for each vNIC. Alternatively, IP address for vNICs can be set post installation, by using ssh to connect to the server on Management IP.

15. On the Network Settings screen Select Hostname/DNS:

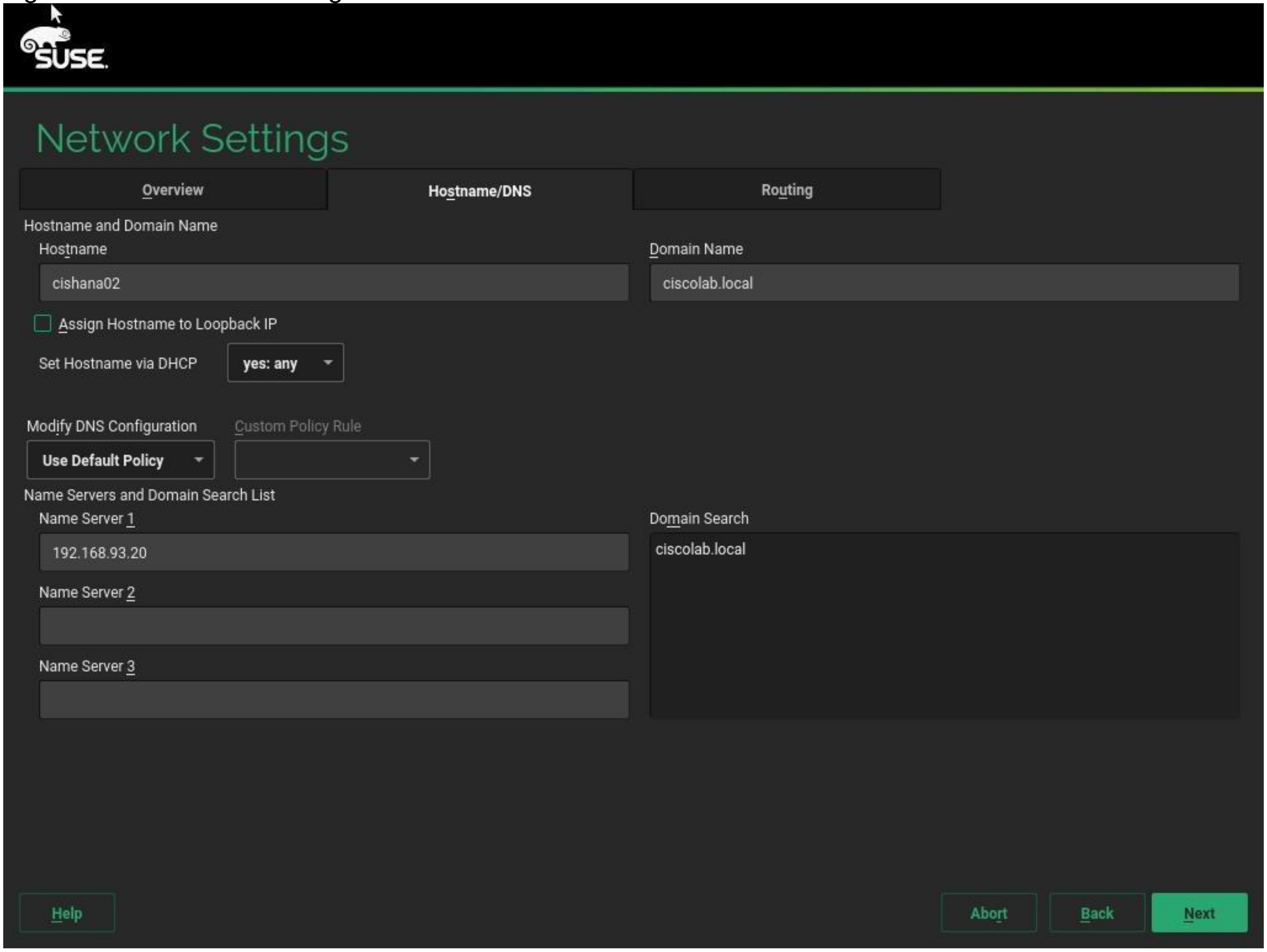
    a. In the Hostname field enter the Hostname.

    b. In the Domain Name Field enter the Domain Name.

    c. In the Name Server 1 field enter <<DNS server1>> and Name Server 2 field enter <<DNS server2>>

    d. In the Search domains field enter <<domain1.com,domain2.com>>.

Figure 90 Network Settings Hostname



Hostname and Domain Name

Hostname: cishana02

Domain Name: ciscolab.local

☐ Assign Hostname to Loopback IP

Set Hostname via DHCP: yes: any

Modify DNS Configuration: Use Default Policy

Custom Policy Rule:

Name Servers and Domain Search List

Name Server 1: 192.168.93.20

Name Server 2:

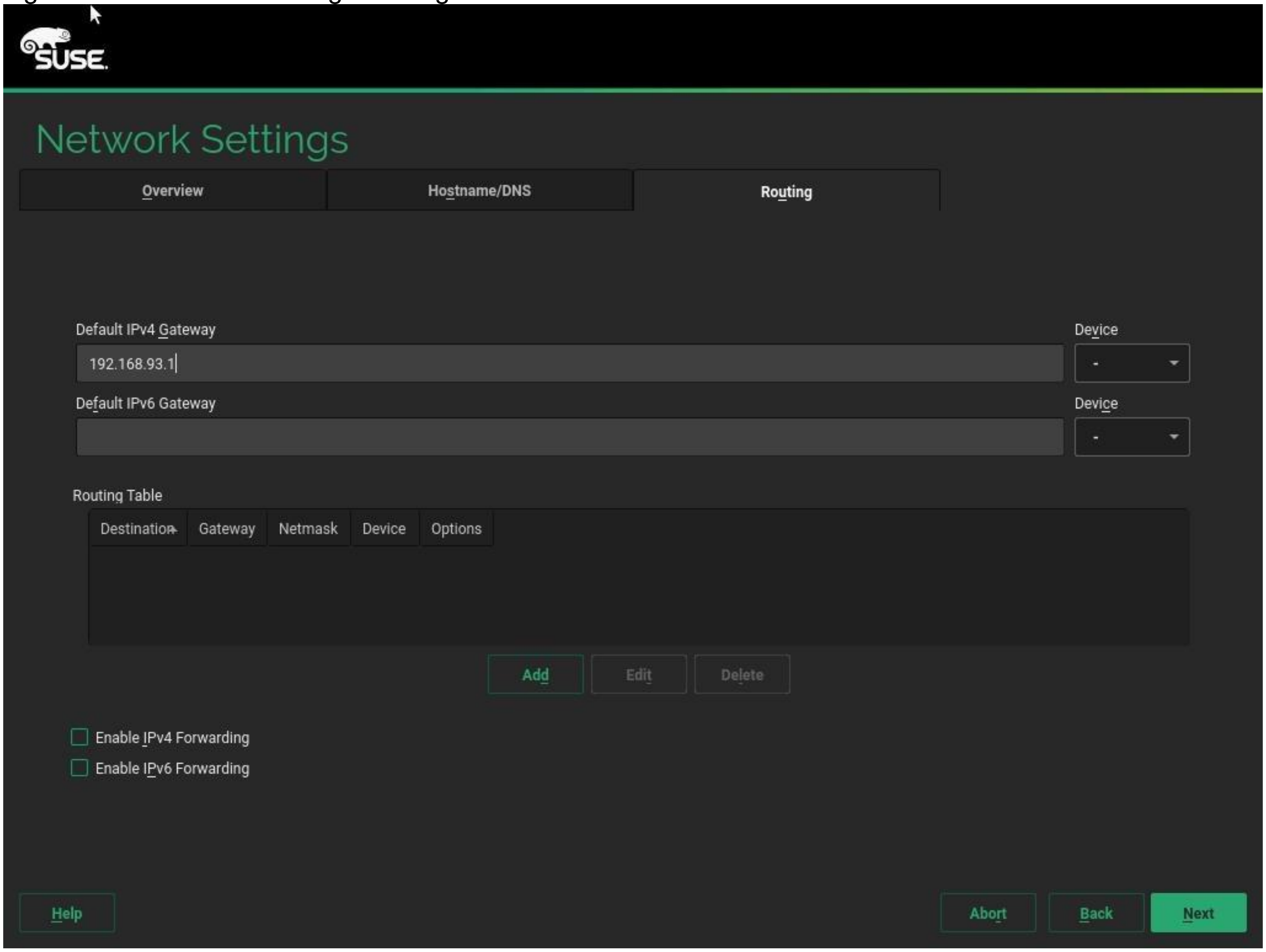
Name Server 3:

Domain Search: ciscolab.local

16. Click Routing.

17. For the Default IPv4 Gateway enter the <<Default Gateway for>>.

Figure 91 Network Settings Routing



Network Settings

Default IPv4 Gateway: 192.168.93.1
Device: -

Default IPv6 Gateway:
Device: -

Routing Table

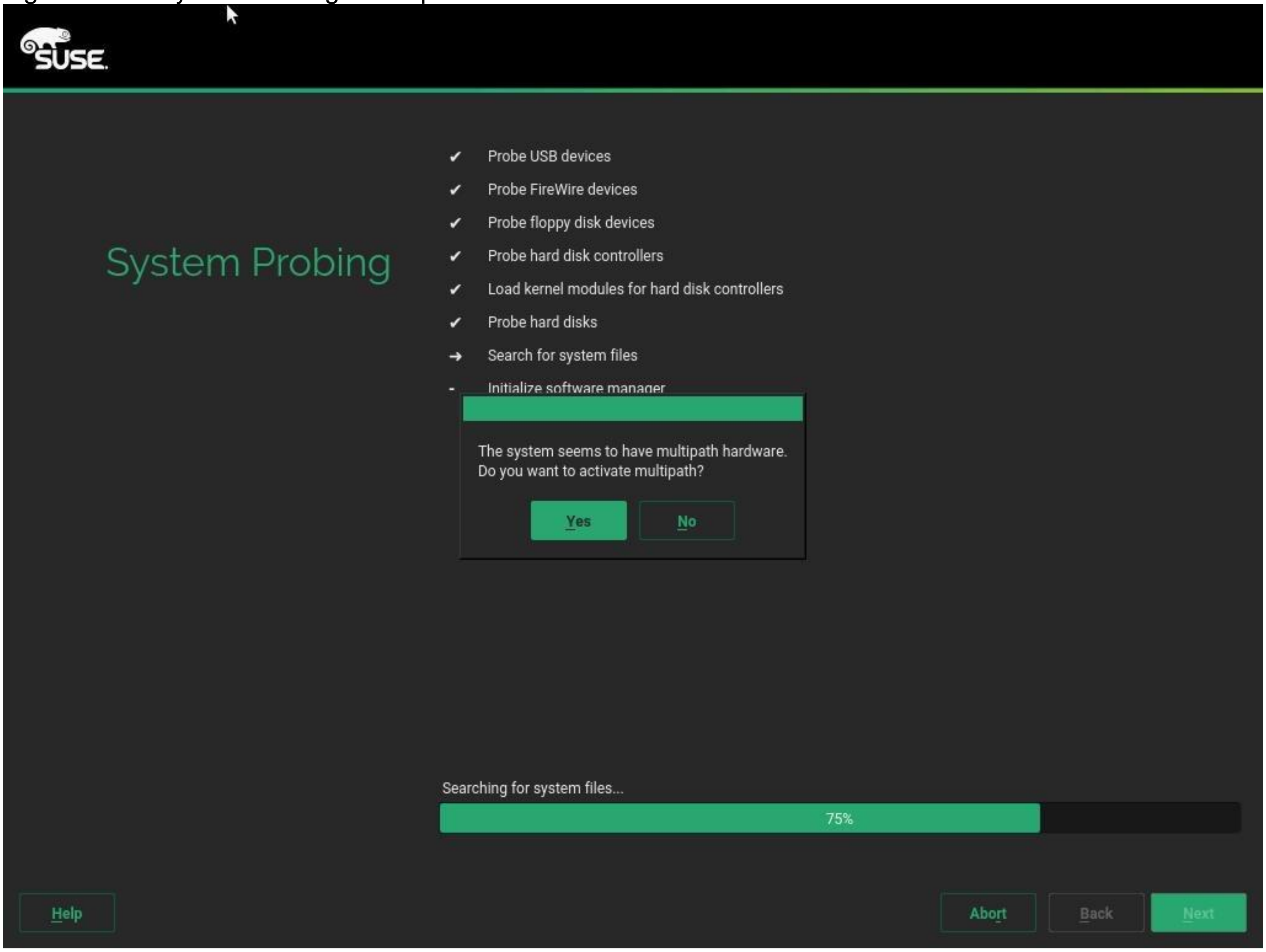
Destination	Gateway	Netmask	Device	Options

□ Enable IPv4 Forwarding
□ Enable IPv6 Forwarding

18. Click Next

19. *System Probing* – Select ‘No’ for the pop-up for Do you want to activate multipath?

Figure 92 System Probing – Multipath Activation Choice



SUSE
System Probing
✔ Probe USB devices
✔ Probe FireWire devices
✔ Probe floppy disk devices
✔ Probe hard disk controllers
✔ Load kernel modules for hard disk controllers
✔ Probe hard disks
➔ Search for system files
- Initialize software manager
Yes
No
75%
Help
Abort
Back
Next

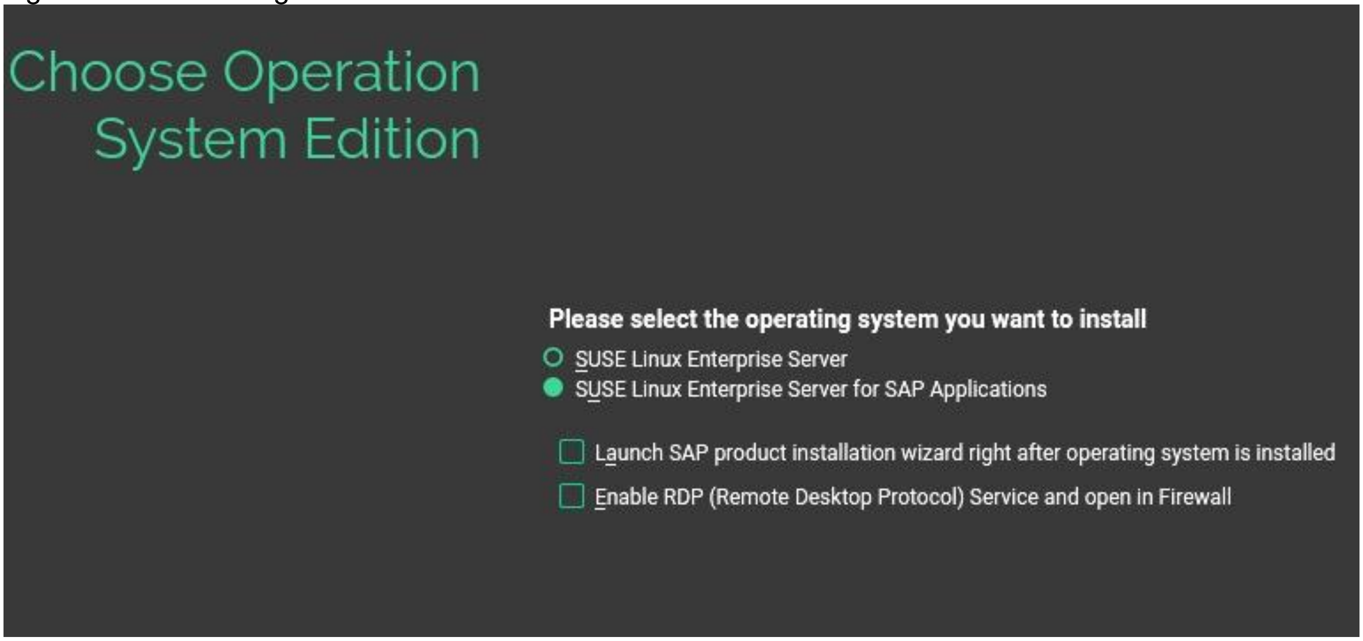
The system seems to have multipath hardware.
Do you want to activate multipath?

Searching for system files...

20. *Registration* – Select Skip Registration. We will do this later as part of post-installation tasks. Click ‘Yes’ for the confirmation warning pop-up to proceed.

21. *Choose Operation System Edition* – Select “SUSE Linux Enterprise Server for SAP Applications” option.

Figure 93 Choosing OS Edition



Choose Operation System Edition

Please select the operating system you want to install

○ SUSE Linux Enterprise Server

● SUSE Linux Enterprise Server for SAP Applications

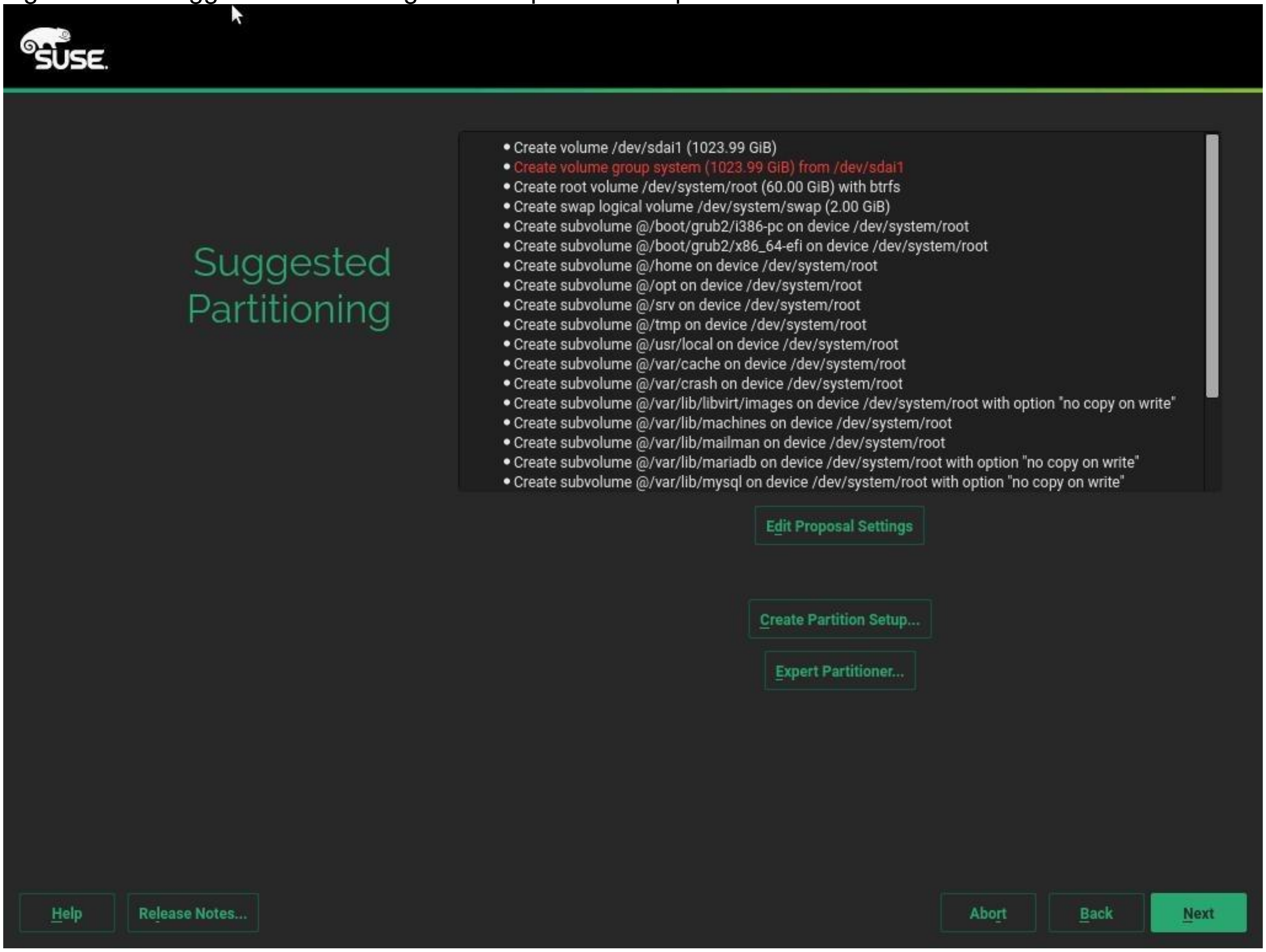
□ Launch SAP product installation wizard right after operating system is installed

□ Enable RDP (Remote Desktop Protocol) Service and open in Firewall

22. Add On Product: Click Next.

23. On Suggested Partitioning select Expert Partitioner.

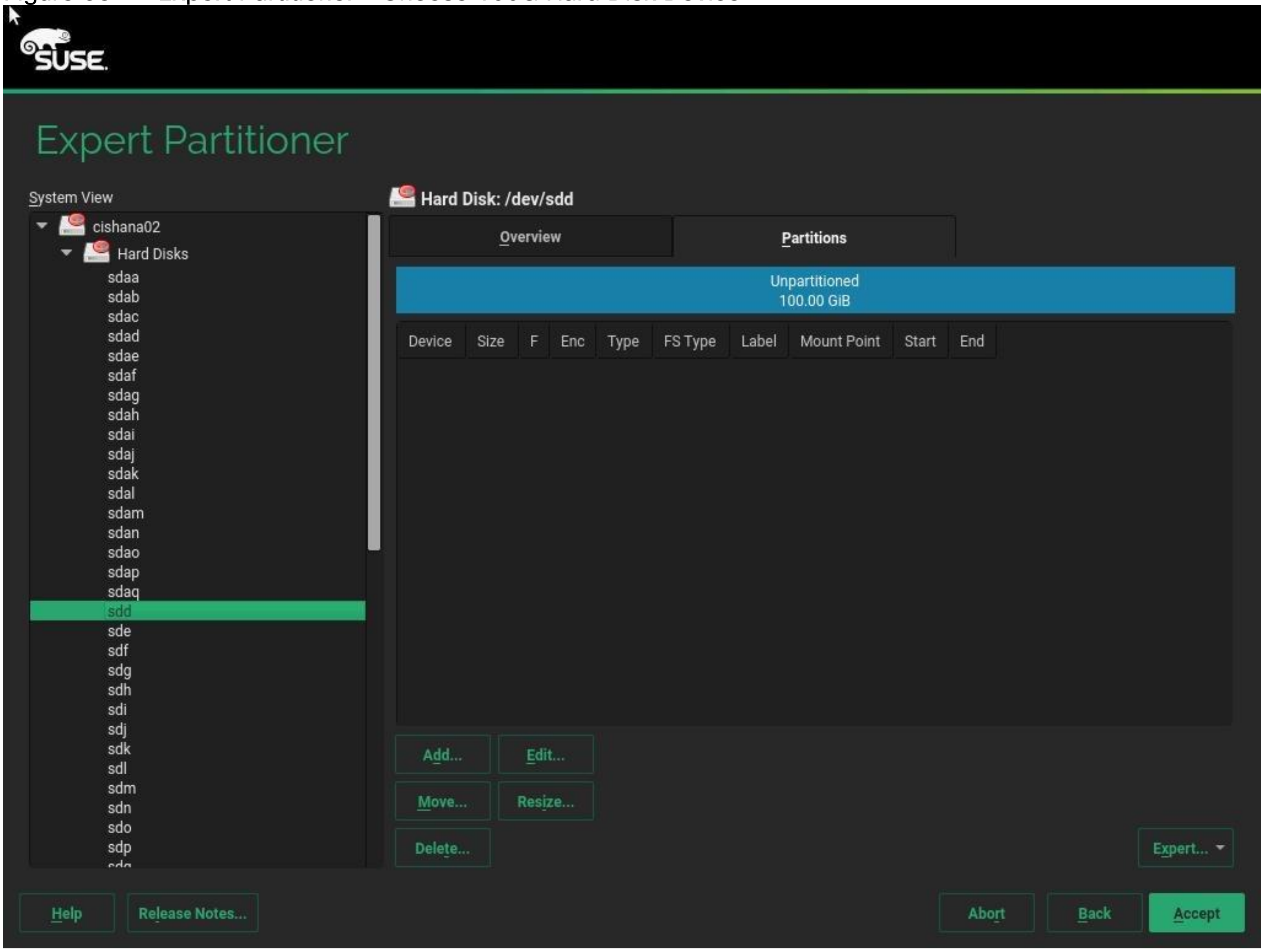
Figure 94 Suggested Partitioning Initial Proposal -Example



- Create volume /dev/sdai1 (1023.99 GiB)
- Create volume group system (1023.99 GiB) from /dev/sdai1
- Create root volume /dev/system/root (60.00 GiB) with btrfs
- Create swap logical volume /dev/system/swap (2.00 GiB)
- Create subvolume @/boot/grub2/i386-pc on device /dev/system/root
- Create subvolume @/boot/grub2/x86_64-efi on device /dev/system/root
- Create subvolume @/home on device /dev/system/root
- Create subvolume @/opt on device /dev/system/root
- Create subvolume @/srv on device /dev/system/root
- Create subvolume @/tmp on device /dev/system/root
- Create subvolume @/usr/local on device /dev/system/root
- Create subvolume @/var/cache on device /dev/system/root
- Create subvolume @/var/crash on device /dev/system/root
- Create subvolume @/var/lib/libvirt/images on device /dev/system/root with option "no copy on write"
- Create subvolume @/var/lib/machines on device /dev/system/root
- Create subvolume @/var/lib/mailman on device /dev/system/root
- Create subvolume @/var/lib/mariadb on device /dev/system/root with option "no copy on write"
- Create subvolume @/var/lib/mysql on device /dev/system/root with option "no copy on write"

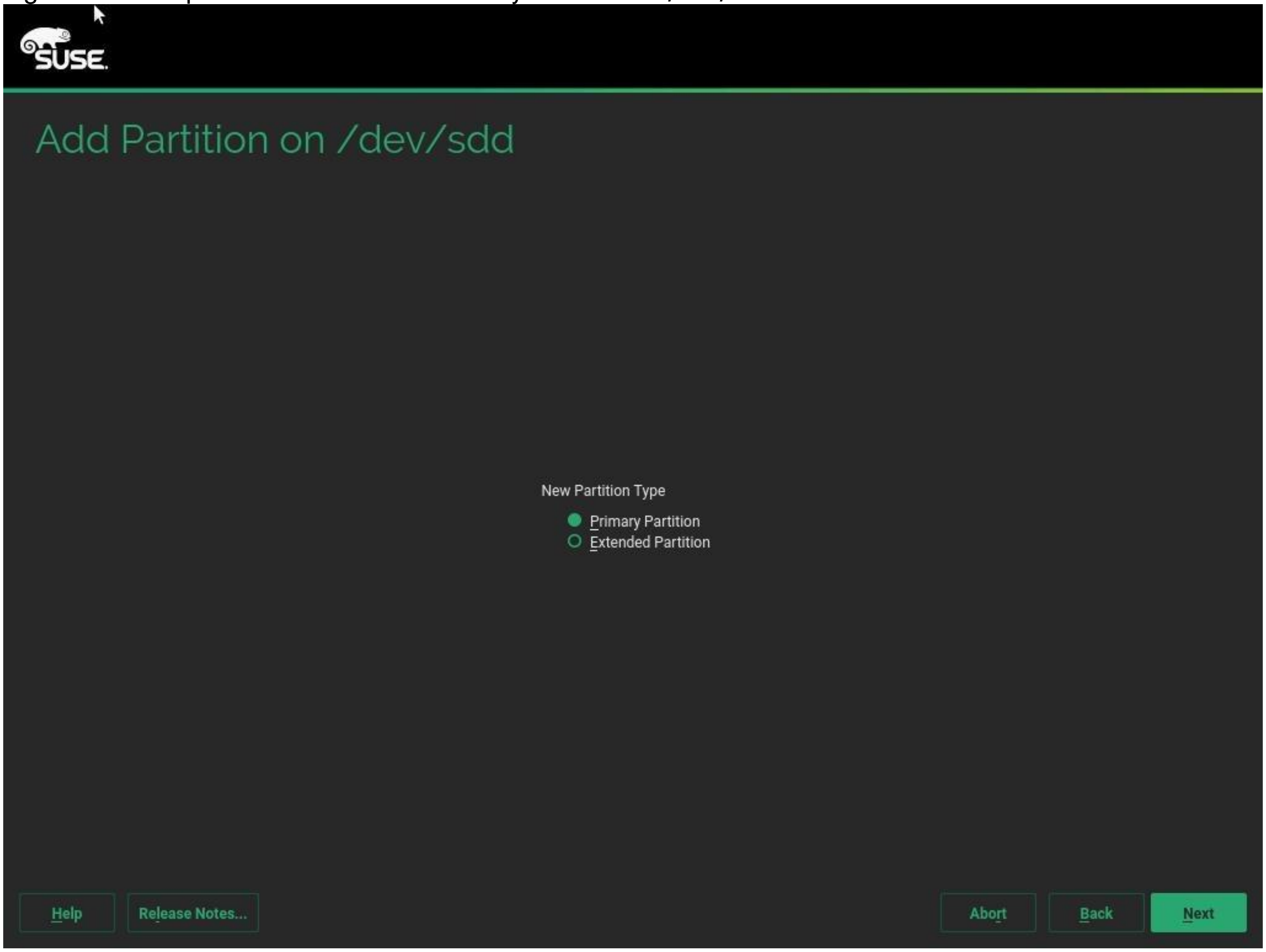
24. On the left 'System View' > <<hostname>> > Hard Disks > Select a device from the list which is 100G. In the navigation pane click Delete if found with the suggested partitions which results in an Unpartitioned disk of 100GB.

Figure 95 Expert Partitioner – Choose 100G Hard Disk Device



25. On the right pane, under Partitions tab, add a new Partition by selecting Add under the Partitions tab for the device. Select Primary Partition for New Partition Type in the next step.

Figure 96 Expert Partitioner – Add Primary Partition on /dev/ device



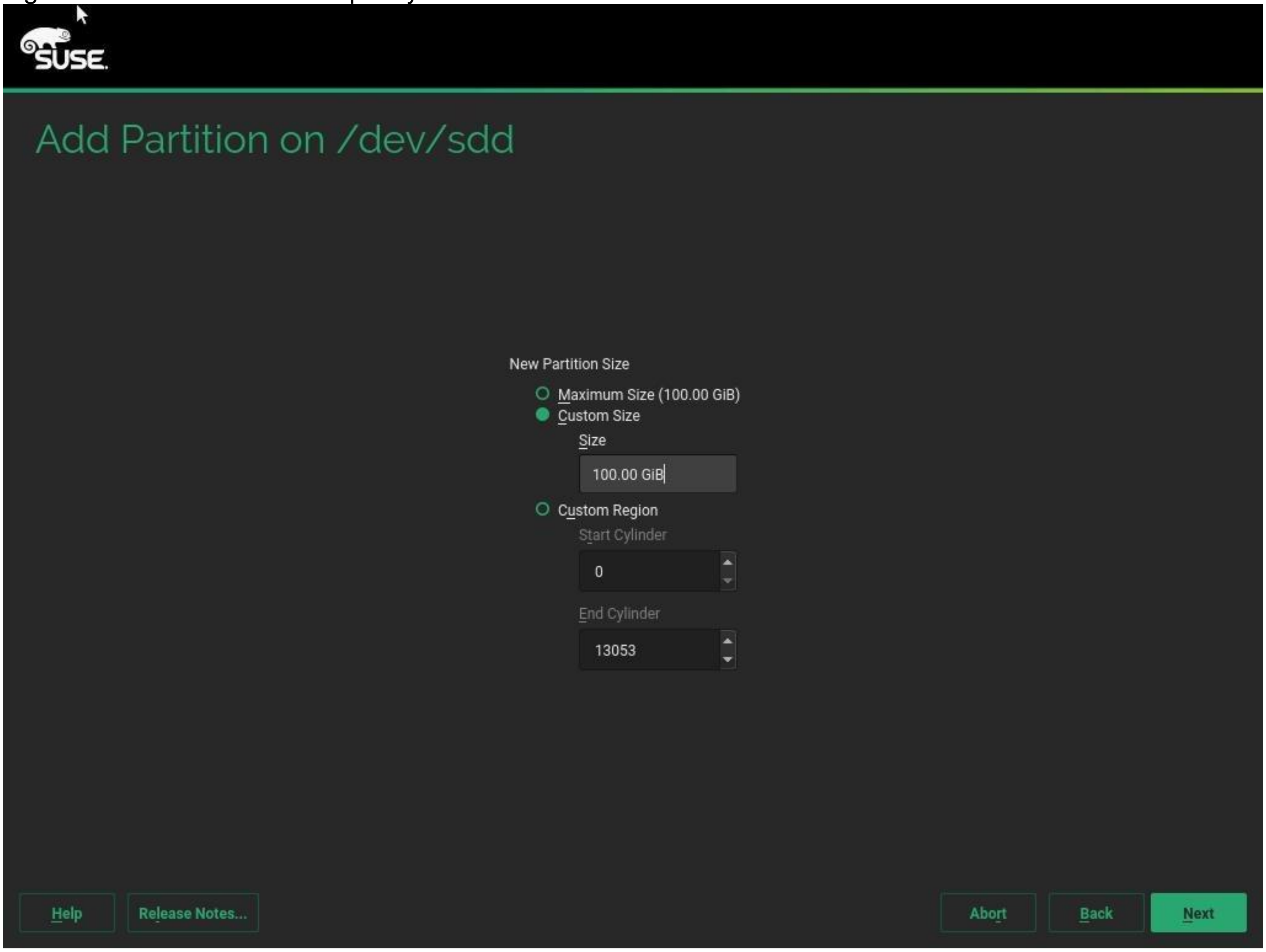
Add Partition on /dev/sdd

New Partition Type

● Primary Partition
○ Extended Partition

26. Select Maximum Size. Click Next.

Figure 97 Add Partition – Specify New Partition Size



Add Partition on /dev/sdd

New Partition Size

○ Maximum Size (100.00 GiB)

● Custom Size

Size: 100.00 GiB

○ Custom Region

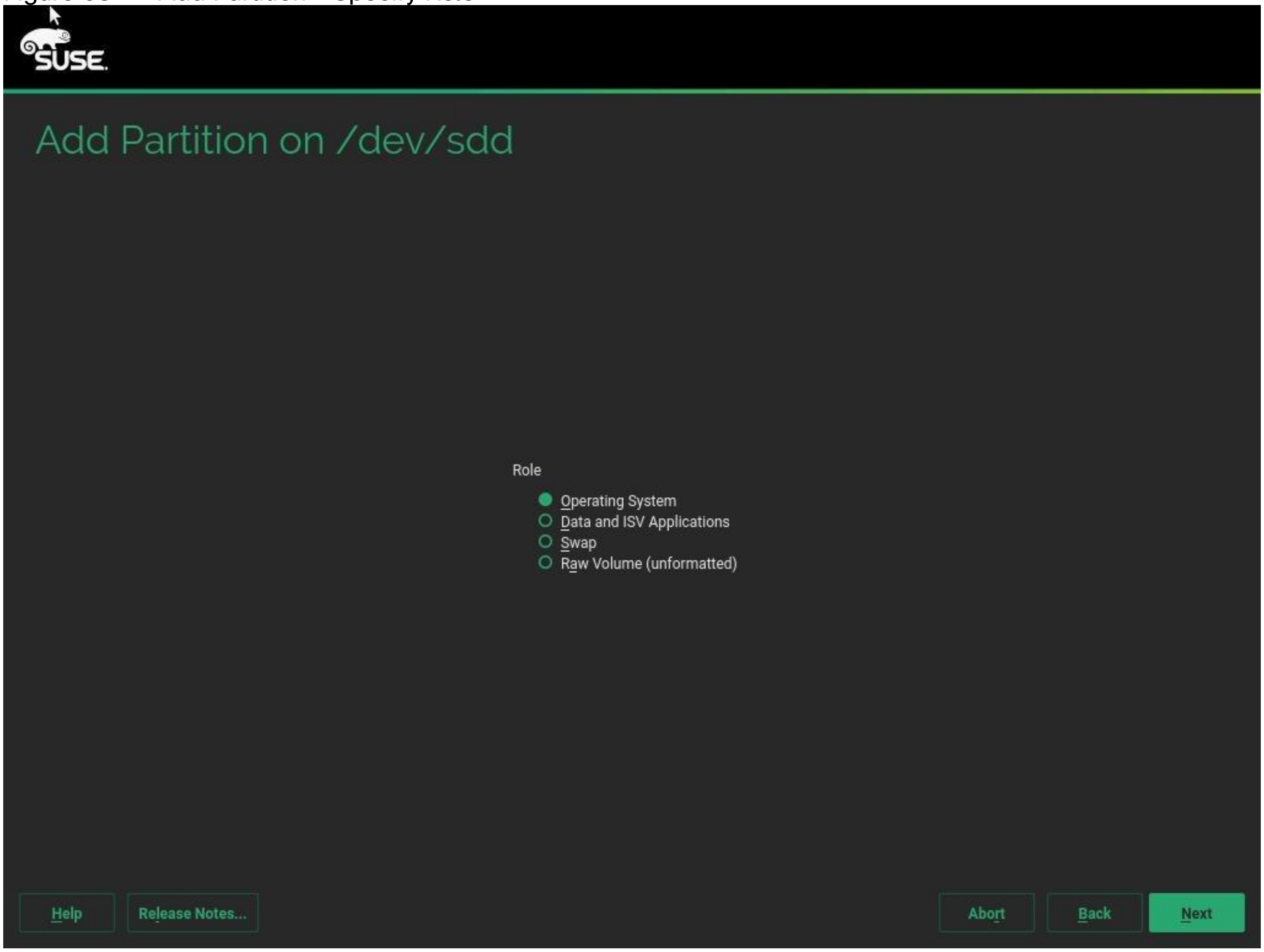
Start Cylinder: 0

End Cylinder: 13053

27. Click Next.

28. Select Operating System Role and click Next.

Figure 98 Add Partition – Specify Role



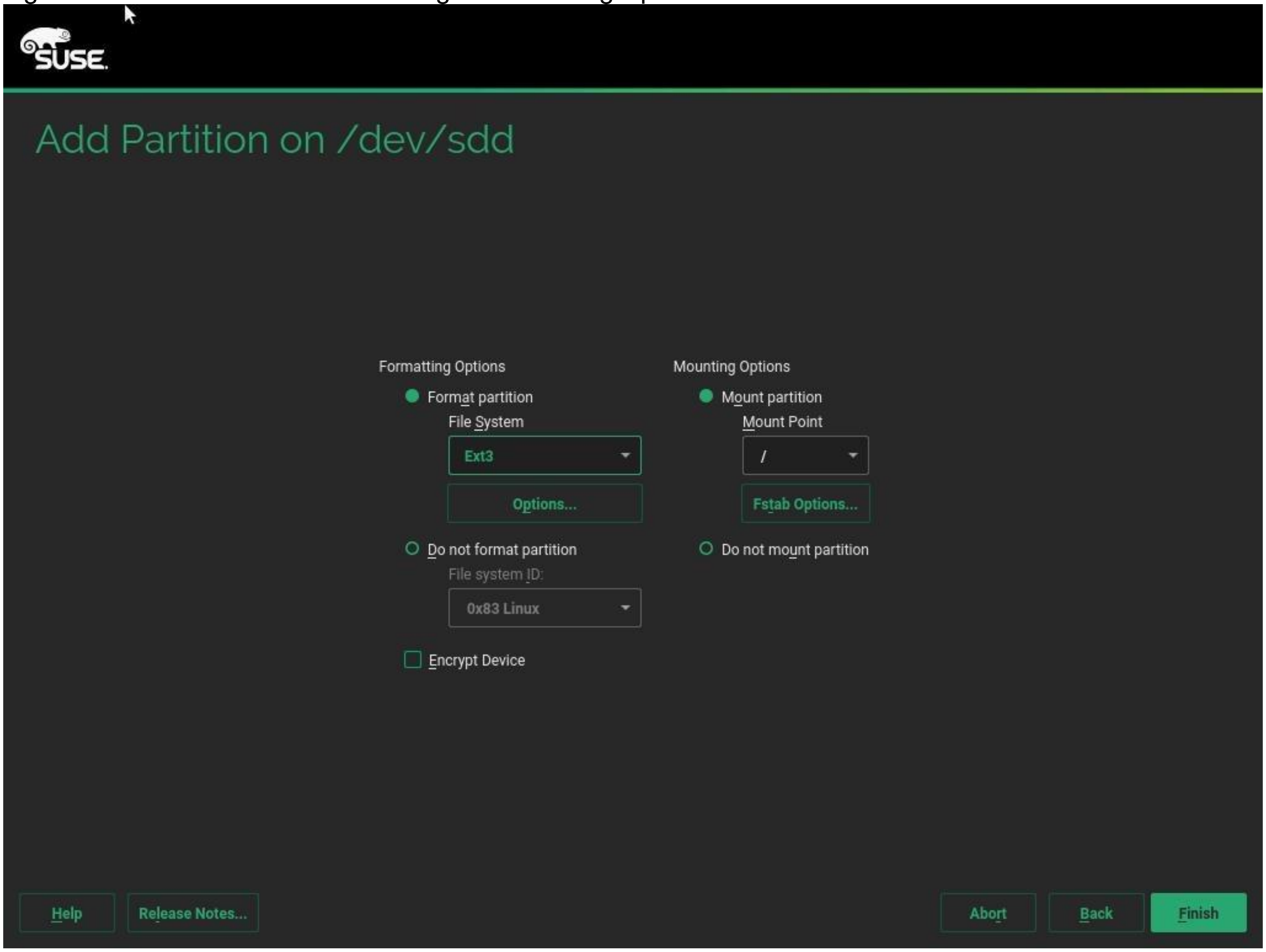
Add Partition on /dev/sdd

Role

● Operating System
○ Data and ISV Applications
○ Swap
○ Raw Volume (unformatted)

29. Select ext3 File system and / or Mount Point. Click Finish.

Figure 99 Add Partition- Formatting and Mounting Options



Add Partition on /dev/sdd

Formatting Options

● Format partition

File System: Ext3

○ Do not format partition

File system ID: 0x83 Linux

□ Encrypt Device

Mounting Options

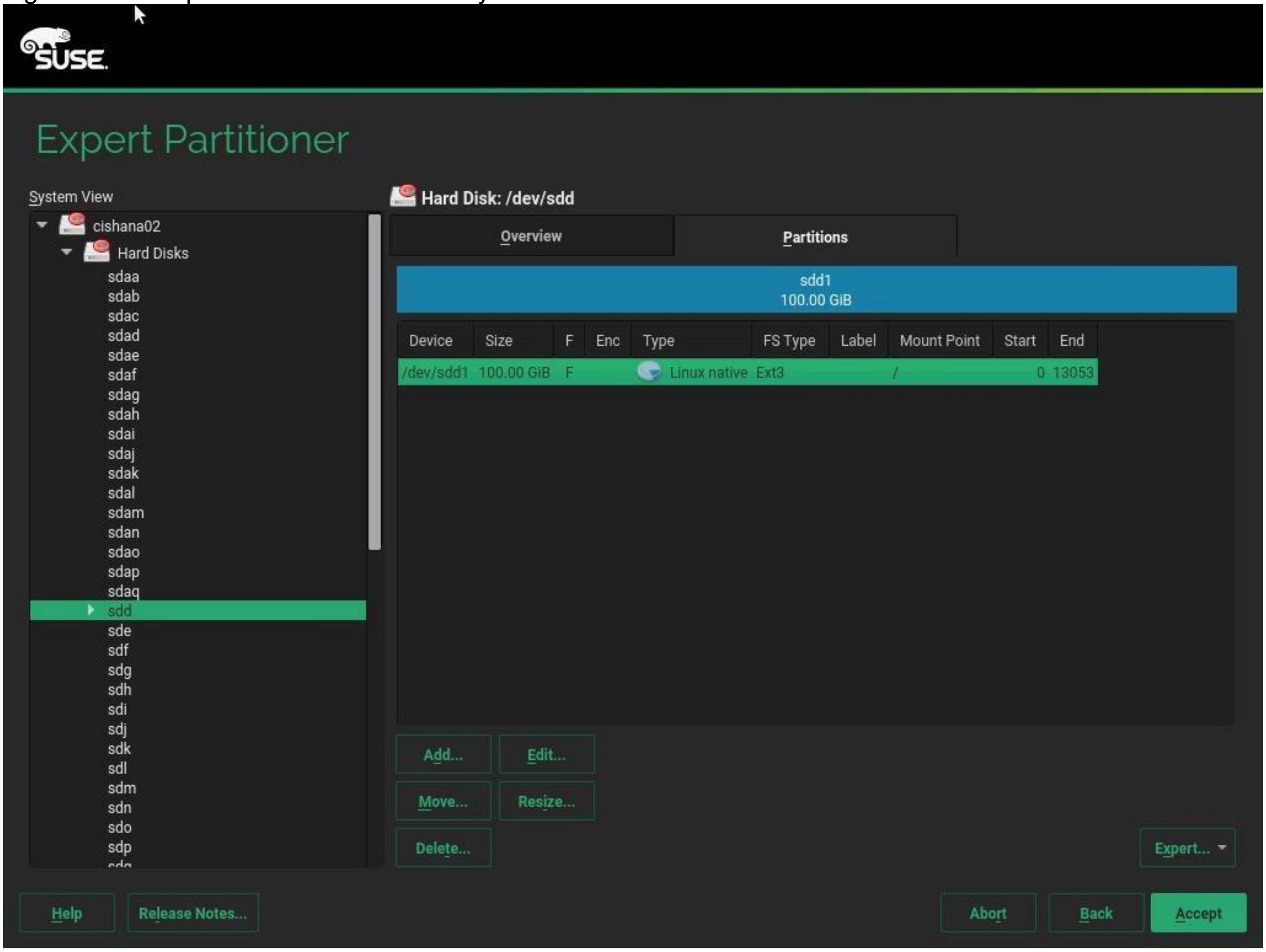
● Mount partition

Mount Point: /

○ Do not mount partition

30. Click Accept to come back to the Installation Settings page.

Figure 100 Expert Partitioner – Summary



Device	Size	F	Enc	Type	FS Type	Label	Mount Point	Start	End
/dev/sdd1	100.00 GiB	F		Linux native	Ext3		/	0	13053

31. Click Yes to continue setup without swap partition. Click Accept.

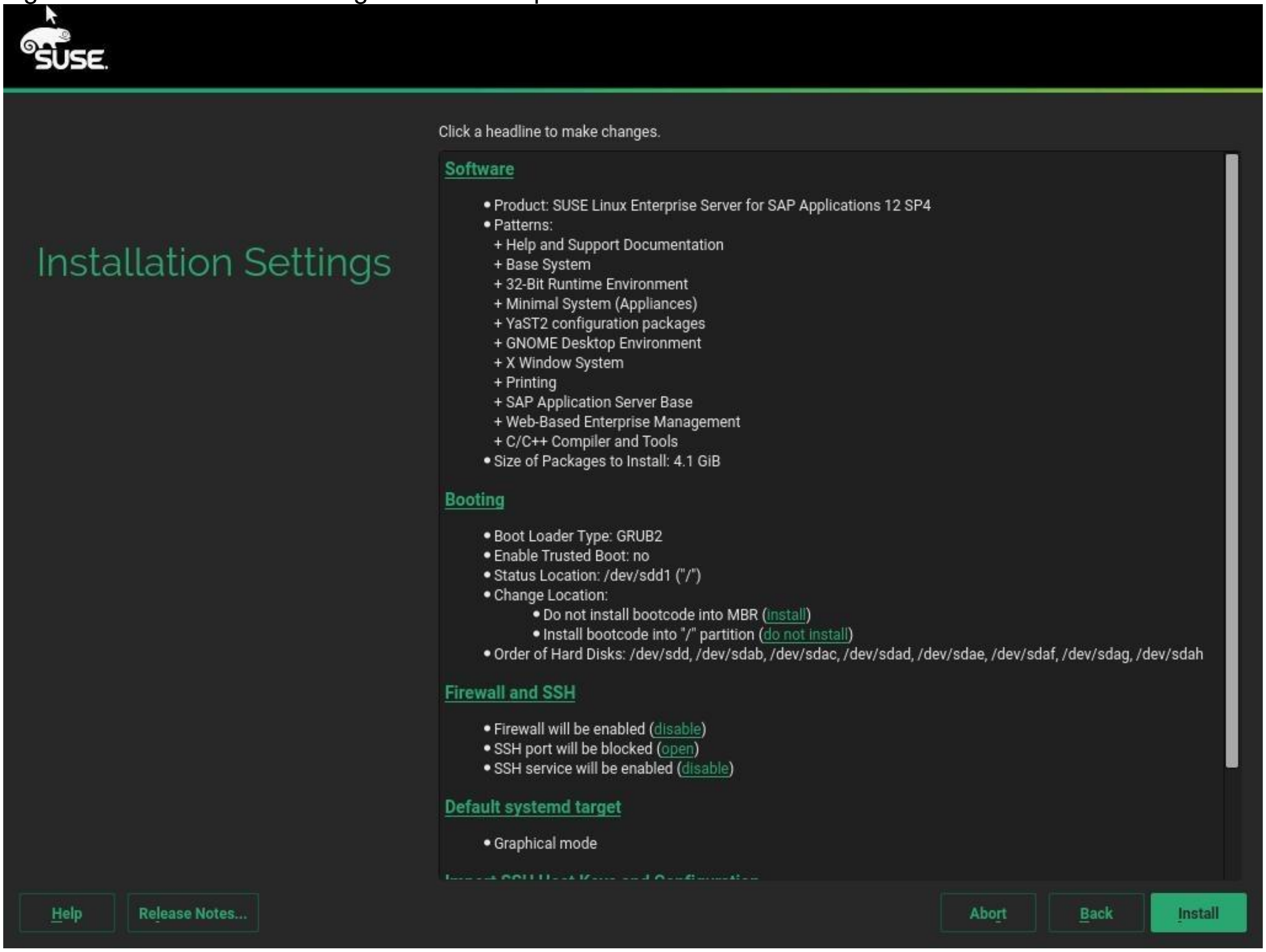
32. Click Next on the final Suggested Partition page.

33. Clock and Time Zone – choose the appropriate time zone and select Hardware clock set to UTC.

34. Password for the System Administrator “root” – Key in appropriate password <<var_sys_root-pw>>

35. On the Installation Settings screen.

Figure 101 Installation Settings – Default Proposal



Installation Settings

Click a headline to make changes.

Software

- Product: SUSE Linux Enterprise Server for SAP Applications 12 SP4
- Patterns:
  - + Help and Support Documentation
  - + Base System
  - + 32-Bit Runtime Environment
  - + Minimal System (Appliances)
  - + YaST2 configuration packages
  - + GNOME Desktop Environment
  - + X Window System
  - + Printing
  - + SAP Application Server Base
  - + Web-Based Enterprise Management
  - + C/C++ Compiler and Tools
- Size of Packages to Install: 4.1 GiB

Booting

- Boot Loader Type: GRUB2
- Enable Trusted Boot: no
- Status Location: /dev/sdd1 ("/")
- Change Location:
  - Do not install bootcode into MBR (install)
  - Install bootcode into "/" partition (do not install)
- Order of Hard Disks: /dev/sdd, /dev/sdab, /dev/sdac, /dev/sdad, /dev/sdae, /dev/sdaf, /dev/sdag, /dev/sdah

Firewall and SSH

- Firewall will be enabled (disable)
- SSH port will be blocked (open)
- SSH service will be enabled (disable)

Default systemd target

- Graphical mode

36. Customize the software selection. Click Software headline to make the following changes:

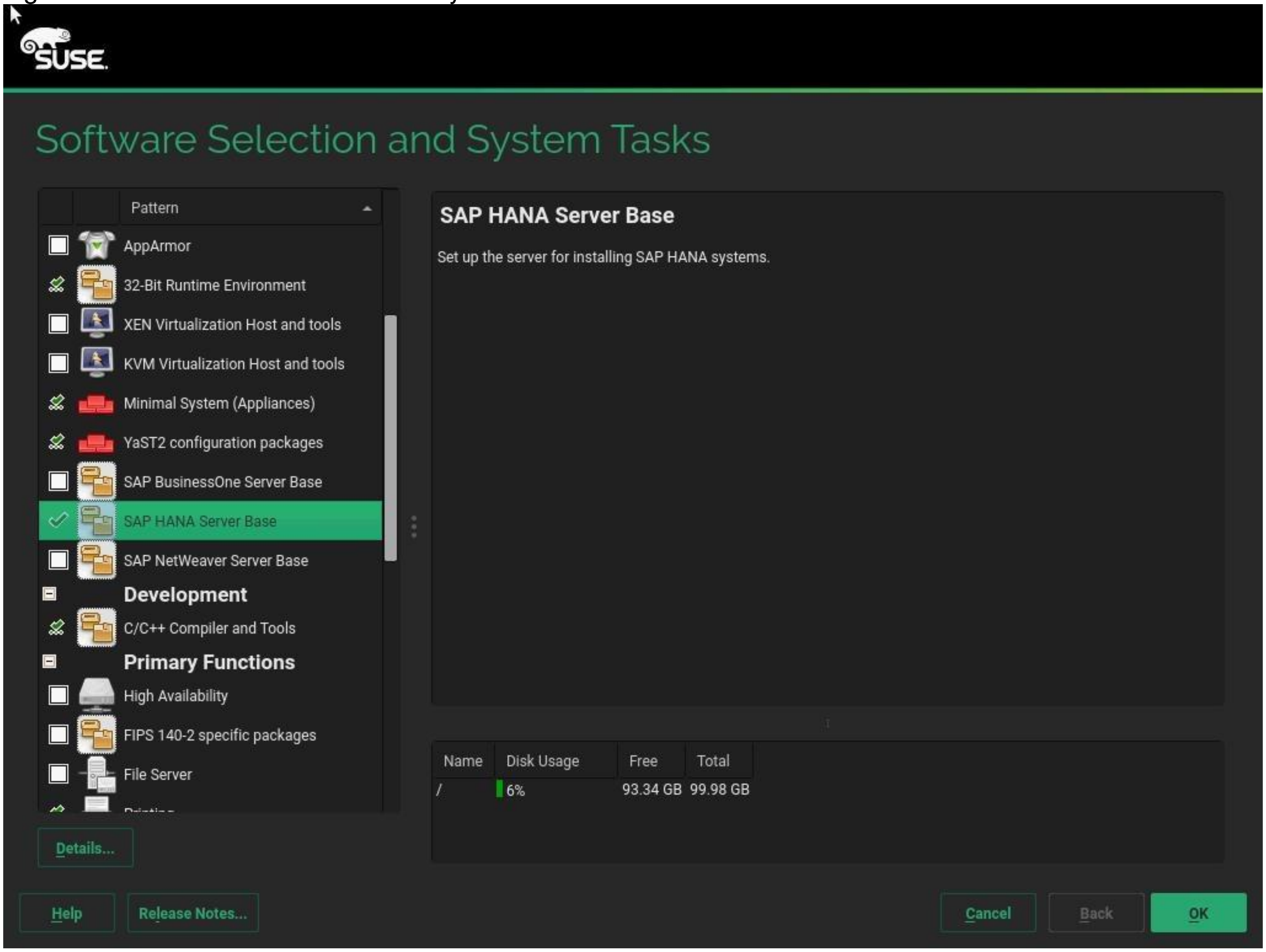
   a. Deselect GNOME DE and X Window System.

   a. Make sure C/C++ Compiler and Tools is selected.

   b. Select SAP HANA Server Base.

   c. Deselect SAP Application Sever Base.

Figure 102 Software Selection and System Tasks - Customized



Software Selection and System Tasks

		Pattern
□		AppArmor
✓		32-Bit Runtime Environment
□		XEN Virtualization Host and tools
□		KVM Virtualization Host and tools
✓		Minimal System (Appliances)
✓		YaST2 configuration packages
□		SAP BusinessOne Server Base
✓		SAP HANA Server Base
□		SAP NetWeaver Server Base
⊟		**Development**
✓		C/C++ Compiler and Tools
⊟		**Primary Functions**
□		High Availability
□		FIPS 140-2 specific packages
□		File Server

SAP HANA Server Base

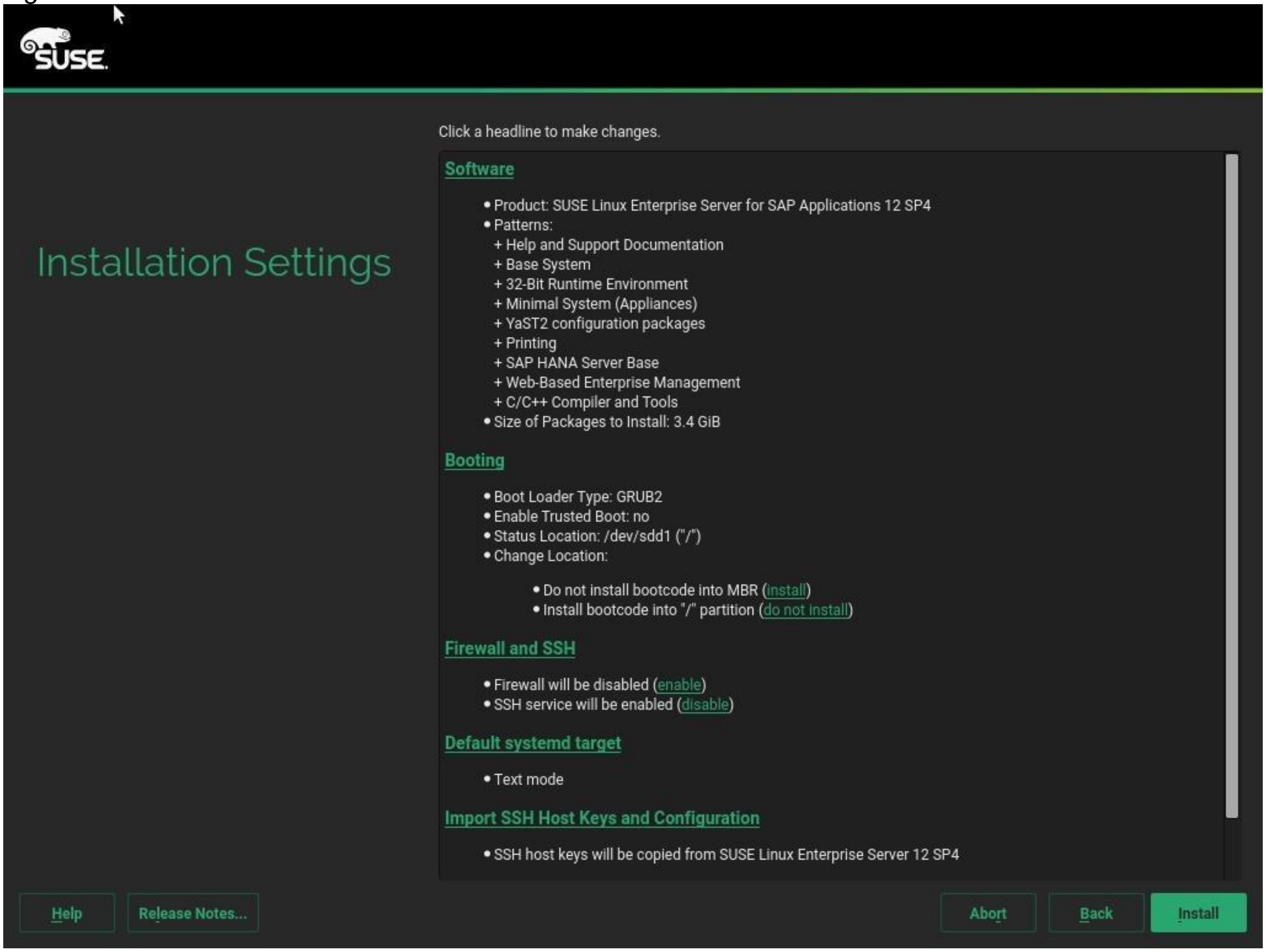
Set up the server for installing SAP HANA systems.

Name	Disk Usage	Free	Total
/	6%	93.34 GB	99.98 GB

37. Click OK.

38. Under the Firewall and SSH headline, click ‘disable’ for Firewall. This will automatically enable SSH service.

Figure 103 Firewall and SSH – Customized



Click a headline to make changes.

Software

- Product: SUSE Linux Enterprise Server for SAP Applications 12 SP4
- Patterns:
  + Help and Support Documentation
  + Base System
  + 32-Bit Runtime Environment
  + Minimal System (Appliances)
  + YaST2 configuration packages
  + Printing
  + SAP HANA Server Base
  + Web-Based Enterprise Management
  + C/C++ Compiler and Tools
- Size of Packages to Install: 3.4 GiB

Booting

- Boot Loader Type: GRUB2
- Enable Trusted Boot: no
- Status Location: /dev/sdd1 ("/")
- Change Location:
  - Do not install bootcode into MBR (install)
  - Install bootcode into "/" partition (do not install)

Firewall and SSH

- Firewall will be disabled (enable)
- SSH service will be enabled (disable)

Default systemd target

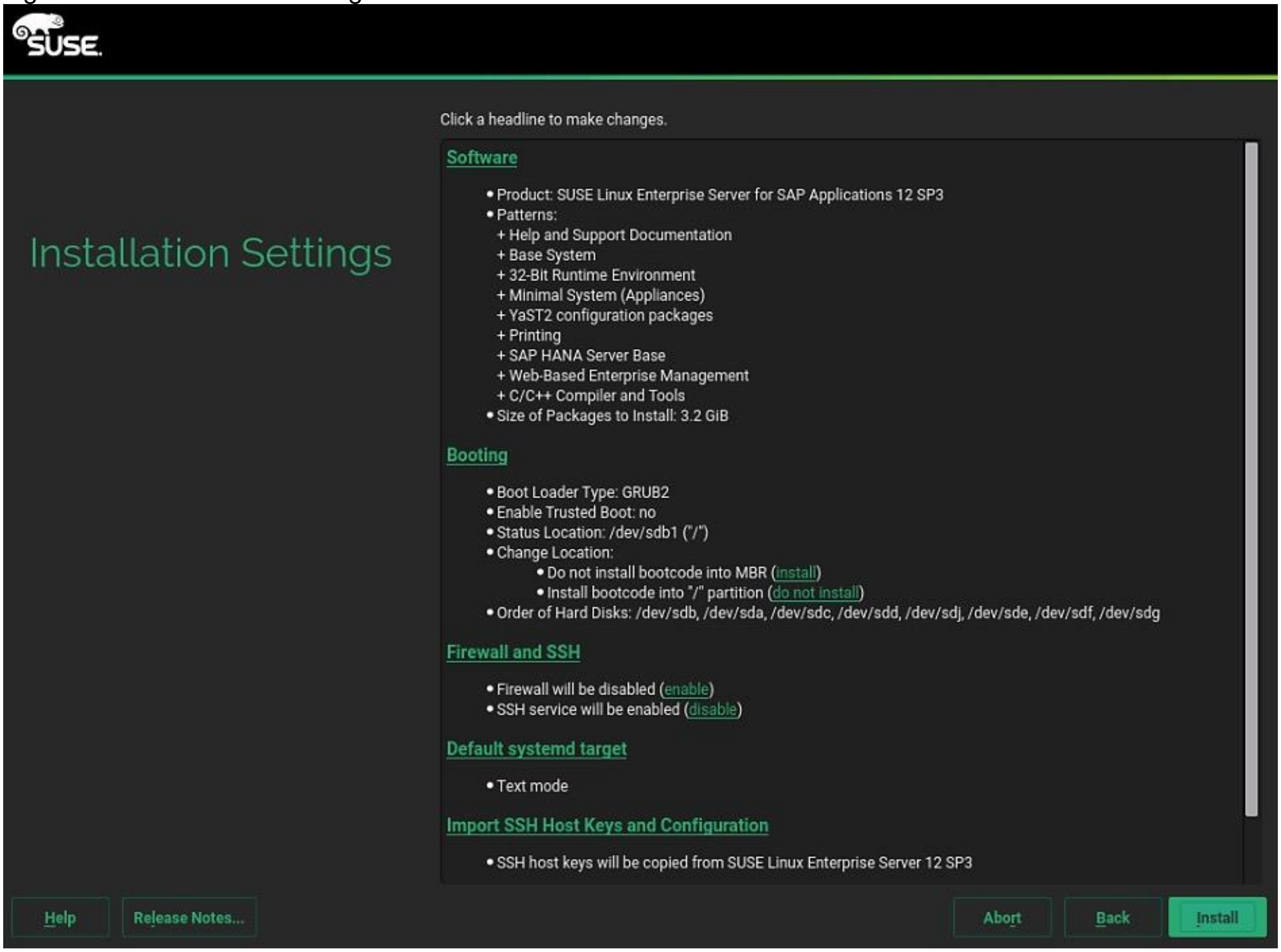
- Text mode

Import SSH Host Keys and Configuration

- SSH host keys will be copied from SUSE Linux Enterprise Server 12 SP4

39. Leave the default selections unchanged.

Figure 104 Installation Settings – Final Selections



Click a headline to make changes.

Software

- Product: SUSE Linux Enterprise Server for SAP Applications 12 SP3
- Patterns:
  + Help and Support Documentation
  + Base System
  + 32-Bit Runtime Environment
  + Minimal System (Appliances)
  + YaST2 configuration packages
  + Printing
  + SAP HANA Server Base
  + Web-Based Enterprise Management
  + C/C++ Compiler and Tools
- Size of Packages to Install: 3.2 GiB

Booting

- Boot Loader Type: GRUB2
- Enable Trusted Boot: no
- Status Location: /dev/sdb1 ("/")
- Change Location:
  - Do not install bootcode into MBR (install)
  - Install bootcode into "/" partition (do not install)
- Order of Hard Disks: /dev/sdb, /dev/sda, /dev/sdc, /dev/sdd, /dev/sdj, /dev/sde, /dev/sdf, /dev/sdg

Firewall and SSH

- Firewall will be disabled (enable)
- SSH service will be enabled (disable)

Default systemd target

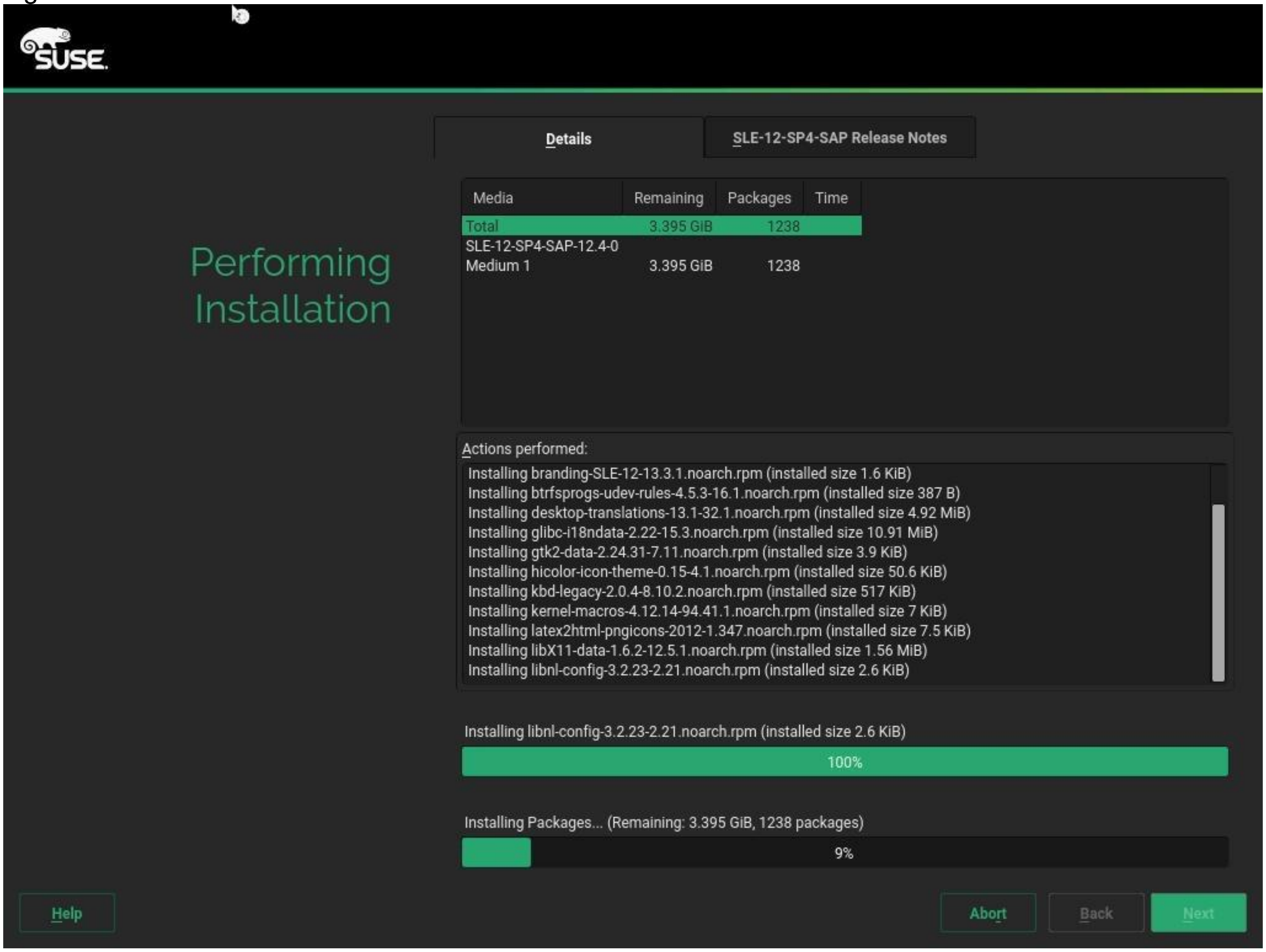
- Text mode

Import SSH Host Keys and Configuration

- SSH host keys will be copied from SUSE Linux Enterprise Server 12 SP3

40. Click Install and select Install again for the subsequent ‘Confirm Installation’ prompt. The installation is started, and you can monitor the status.

Figure 105 Perform Installation



Media	Remaining	Packages	Time
Total	3.395 GiB	1238	
SLE-12-SP4-SAP-12.4-0 Medium 1	3.395 GiB	1238	

Actions performed:

```
Installing branding-SLE-12-13.3.1.noarch.rpm (installed size 1.6 KiB)
Installing btrfsprogs-udev-rules-4.5.3-16.1.noarch.rpm (installed size 387 B)
Installing desktop-translations-13.1-32.1.noarch.rpm (installed size 4.92 MiB)
Installing glibc-i18ndata-2.22-15.3.noarch.rpm (installed size 10.91 MiB)
Installing gtk2-data-2.24.31-7.11.noarch.rpm (installed size 3.9 KiB)
Installing hicolor-icon-theme-0.15-4.1.noarch.rpm (installed size 50.6 KiB)
Installing kbd-legacy-2.0.4-8.10.2.noarch.rpm (installed size 517 KiB)
Installing kernel-macros-4.12.14-94.41.1.noarch.rpm (installed size 7 KiB)
Installing latex2html-pngicons-2012-1.347.noarch.rpm (installed size 7.5 KiB)
Installing libX11-data-1.6.2-12.5.1.noarch.rpm (installed size 1.56 MiB)
Installing libnl-config-3.2.23-2.21.noarch.rpm (installed size 2.6 KiB)
```

Installing libnl-config-3.2.23-2.21.noarch.rpm (installed size 2.6 KiB)

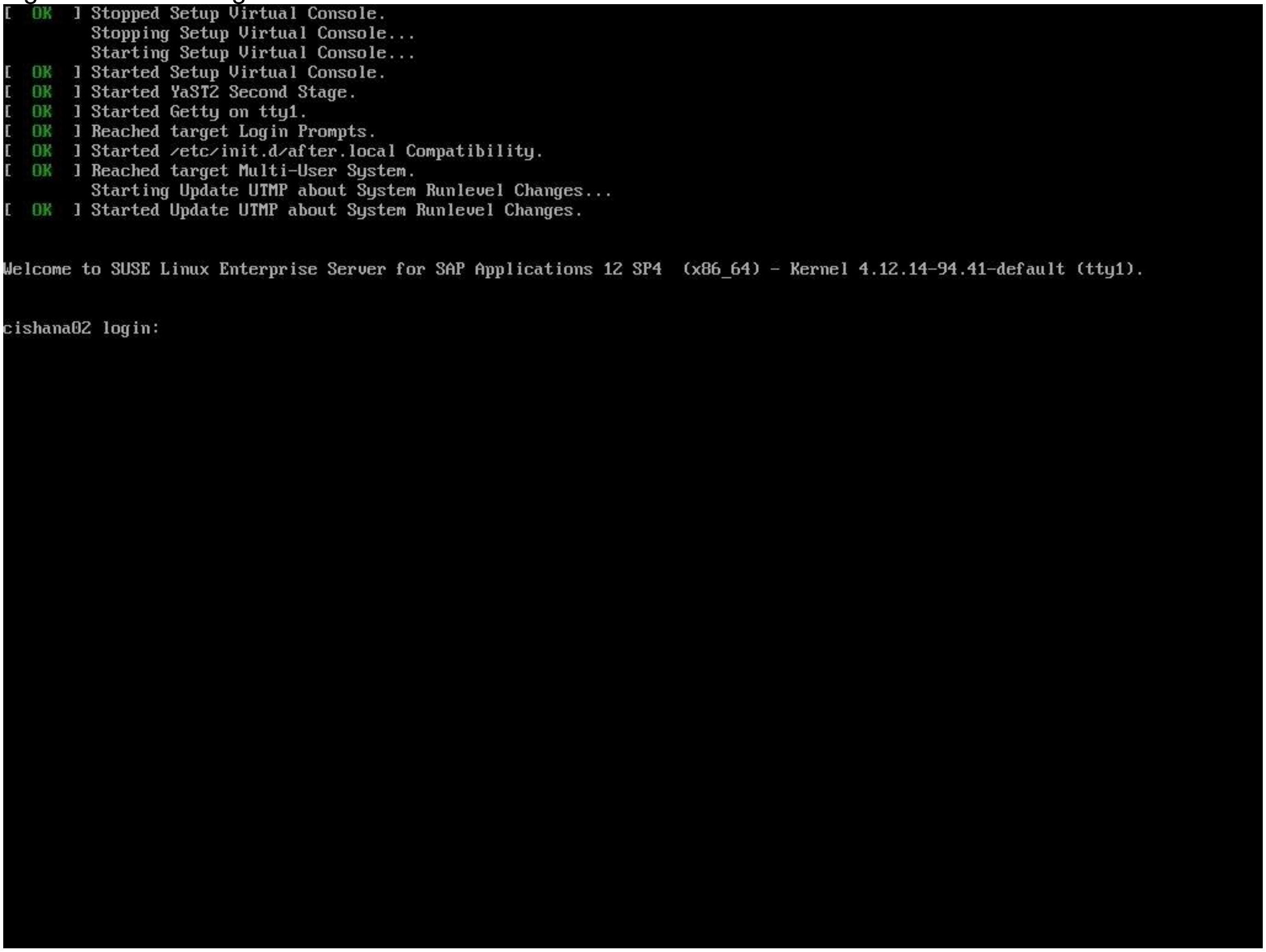
100%

Installing Packages... (Remaining: 3.395 GiB, 1238 packages)

9%

41. After the Operating System is installed the system will reboot.

Figure 106 Booting from Hard Disk



```
[  OK  ] Stopped Setup Virtual Console.
         Stopping Setup Virtual Console...
         Starting Setup Virtual Console...
[  OK  ] Started Setup Virtual Console.
[  OK  ] Started YaST2 Second Stage.
[  OK  ] Started Getty on tty1.
[  OK  ] Reached target Login Prompts.
[  OK  ] Started /etc/init.d/after.local Compatibility.
[  OK  ] Reached target Multi-User System.
         Starting Update UTMP about System Runlevel Changes...
[  OK  ] Started Update UTMP about System Runlevel Changes.


Welcome to SUSE Linux Enterprise Server for SAP Applications 12 SP4  (x86_64) - Kernel 4.12.14-94.41-default (tty1).


cishana02 login:
```

Network Services Configuration

To configure the server with Network services, follow these steps:

Hostnames

The operating system must be configured such a way that the short name of the server is displayed for the command 'hostname' and Full Qualified Host Name is displayed with the command 'hostname –d'.

1. ssh to the Server using Management IP address assigned to the server during installation.

2. Login as root and password.

3. Set the hostname using hostnamectl

```
hostnamectl set-hostname <<hostname>>
```

IP Address

Each SAP HANA Server is configured with 6 vNIC device. Table 21 lists the IP Address information required to configure the IP address on the Operating System.

The IP Address and Subnet Mask provided below are examples only, please configure the IP address for your environment.

Table 21 List the IP Address for SAP HANA Server

vNIC Name	VLAN ID	IP Address Range	Subnet Mask
HANA-AppServer	<<var_appserver_vlan_id>>	192.168.223.101	255.255.255.0
HANA-Backup	<<var_backup_vlan_id>>	192.168.221.101	255.255.255.0
HANA-Client	<<var_client_vlan_id>>	192.168.222.101	255.255.0.0
HANA-DataSource	<<var_datasource_vlan_id>>	192.168.224.101	255.255.255.0
HANA-Replication	<<var_replication_vlan_id>>	192.168.225.101	255.255.255.0
Management	<<var_mgmt_vlan_id>>	192.168.93.101	255.255.0.0

1. To configure the network interface on the OS, it is required to identify the mapping of the ethernet device on the OS to vNIC interface on the Cisco UCS.

2. From the OS execute the below command to get list of Ethernet device with MAC Address.

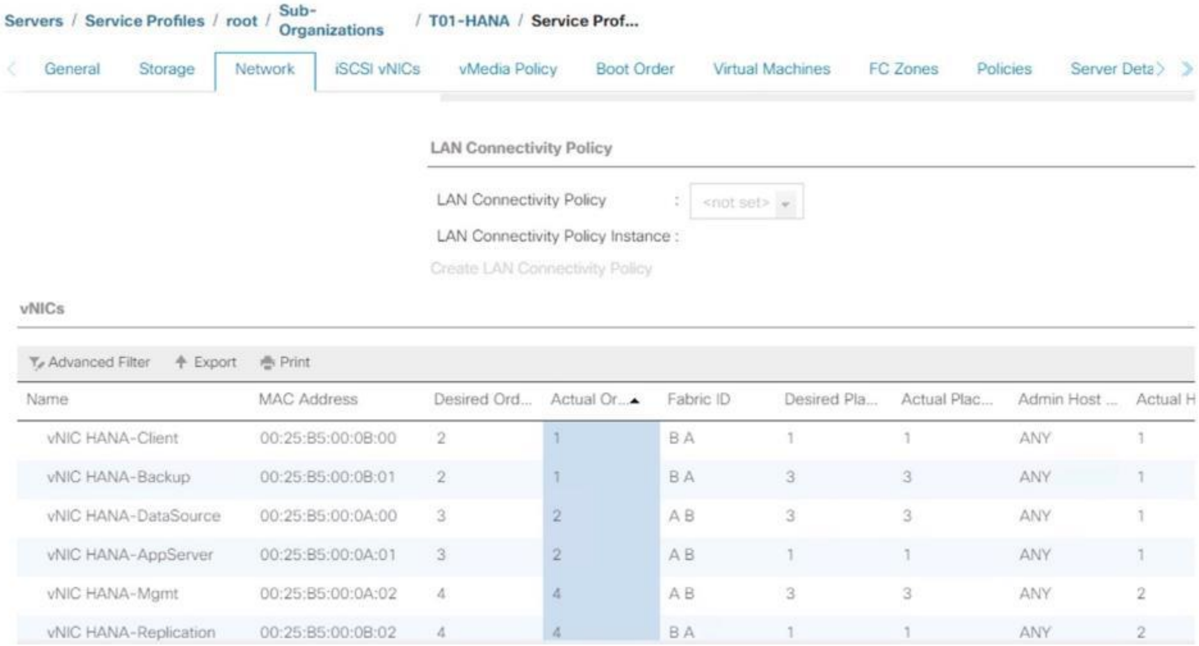
```
ifconfig -a |grep HWaddr
eth0      Link encap:Ethernet  HWaddr 00:25:B5:00:0A:02
eth1      Link encap:Ethernet  HWaddr 00:25:B5:00:0B:01
eth2      Link encap:Ethernet  HWaddr 00:25:B5:00:0A:00
eth3      Link encap:Ethernet  HWaddr 00:25:B5:00:0A:01
eth4      Link encap:Ethernet  HWaddr 00:25:B5:00:0B:02
eth5      Link encap:Ethernet  HWaddr 00:25:B5:00:0B:00
```

3. In Cisco UCS Manager, click the Servers tab in the navigation pane.

4. Select Service Profile > root > Sub-Organization > T01-HANA > HANA-ScaleUp-01.

5. On the main pane, click Network; the list of the vNICs with MAC Address are listed.

Figure 107 Cisco UCS vNIC MAC Address



LAN Connectivity Policy

LAN Connectivity Policy : <not set>

LAN Connectivity Policy Instance :

vNICs

Name	MAC Address	Desired Ord...	Actual Or...	Fabric ID	Desired Pla...	Actual Plac...	Admin Host ...	Actual H
vNIC HANA-Client	00:25:B5:00:0B:00	2	1	B A	1	1	ANY	1
vNIC HANA-Backup	00:25:B5:00:0B:01	2	1	B A	3	3	ANY	1
vNIC HANA-DataSource	00:25:B5:00:0A:00	3	2	A B	3	3	ANY	1
vNIC HANA-AppServer	00:25:B5:00:0A:01	3	2	A B	1	1	ANY	1
vNIC HANA-Mgmt	00:25:B5:00:0A:02	4	4	A B	3	3	ANY	2
vNIC HANA-Replication	00:25:B5:00:0B:02	4	4	B A	1	1	ANY	2

6. Note the MAC Address of the HANA-Client vNIC is “00:25:B5:00:0B:00”.

7. By comparing MAC Address on the OS and Cisco UCS, eth5 on OS will carry the VLAN for HANA-Client.

8. Go to network configuration directory and create a configuration for eth5

```
/etc/sysconfig/network/

vi ifcfg-eth5
BOOTPROTO='static'
BROADCAST=''
ETHTOOL_OPTIONS=''
IPADDR='<<IP subnet for HANA-Client/subnet mask example:192.168.221.101/24>>
MTU='9000'
NAME='VIC Ethernet NIC'
NETWORK=''
REMOTE_IPADDR=''
STARTMODE='auto'
```

9. Repeat the steps 9 to 11 for each vNIC interface.

10. Add default gateway.

```
vi etc/sysconfig/network/routes
default 192.168.93.1 - -
```

DNS

Domain Name Service configuration must be done based on the local requirements.

1. Add DNS Servers entry:

```
vi /etc/resolv.conf

nameserver <<IP of DNS Server1>>
nameserver <<IP of DNS Server2>>
search <<Domain_name>>
```

Hosts file

HANA nodes should be able to resolve internal network IP address, below is an example of Scale Up HANA System host file with the entire network defined in the /etc/hosts file.

```
127.0.0.1      localhost

# special IPv6 addresses
::1             localhost ipv6-localhost ipv6-loopback

192.168.93.101      cishana01m.ciscolab.local     cishana01m
192.168.222.101     cishana01c.ciscolab.local     cishana01c
192.168.223.101     cishana01.ciscolab.local      cishana01
192.168.224.101     cishana01d.ciscolab.local     cishana01d
192.168.225.101     cishana01r.ciscolab.local     cishana01r
192.168.221.101     cishana01b.ciscolab.local     cishana01b
```

Network Time

It is important that the time on all components used for SAP HANA is in sync. The configuration of NTP is important and to be performed on all systems.

1. Configure NTP by adding at least one NTP server to the NTP config file /etc/ntp.conf.

```
vi /etc/ntp.conf
server <<var_oob_ntp>>
fudge <<var_oob_ntp>> stratum 10
keys /etc/ntp.keys
trustedkey 1
```

SLES for SAP 12 SP 4 System Update and OS Customization

To updated and customize the SLES 12 SP 4 System for HANA Servers, follow these steps:

1. Register SUSE Linux Enterprise installations with the SUSE Customer Center:

```
SUSEConnect -r <<Registration Code>> -e <<email address>>
```

If proxy server is required to access the internet, please update the proxy settings at /etc/sysconfig/proxy

2. Execute the below command to update the SLES4SAP 12 SP 4 to latest patch level.

```
zypper update
```

3. Follow the on-screen instruction to complete the update process.

4. Disable transparent hugepages, Configure C-States for lower latency in Linux, Auto NUMA settings. Modify /etc/default/grub search for the line starting with " GRUB_CMDLINE_LINUX_DEFAULT" and append to this line:

```
numa_balancing=disable transparent_hugepage=never intel_idle.max_cstate=1
processor.max_cstate=1
```

5. Save your changes and run:

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

6. Add the following line into /etc/init.d/boot.local, for CPU Frequency, Energy Performance Bias, Kernel samepage merging settings:

```
cpupower set -b 0
cpupower frequency-set -g performance
echo 0 > /sys/kernel/mm/ksm/run
```

7. Activate tuned:

```
saptune daemon start
```

8. Enable tuned profile:

```
saptune solution apply HANA
```

9. Reboot the OS by issuing `reboot` command.

The Operating System Installation and configurations documented in this CVD are from SAP Notes at the time of publication, for latest setting please follow the SAP Notes in the References section

Install Cisco eNIC and fNIC Driver

To download the Cisco UCS Drivers ISO bundle, which contains most of the Cisco UCS Virtual Interface Card drivers, follow these steps:

1. In a web browser, navigate to https://software.cisco.com/download/home/283853163/type/283853158/release/suse

You must be signed in to download Cisco Unified Computing System (UCS) drivers.

2. After the download is complete browse to:

   a. cisco-ucs-drivers-1.1901.1.0-suse.iso\12.4\network\cisco\vic\3.1.142.369 and copy cisco-enic-usnic-kmp-default-3.1.142.369_k4.12.14_94.41-700.19.x86_64.rpm to HANA server

   b. cisco-ucs-drivers-1.1901.1.0-suse.iso\12.4\storage\cisco\vic\1.6.0.47 and copy cisco-fnic-kmp-default-1.6.0.47_k4.12.14_94.37-1.x86_64.rpm to HANA server

3. ssh to the Server as root.

4. Update the enic driver with below command:

```
rpm -Uvh cisco-enic-usnic-kmp-default-3.1.142.369_k4.12.14_94.41-700.19.x86_64.rpm
```

5. Update the fnic driver with below command:

```
rpm -Uvh cisco-fnic-kmp-default-1.6.0.47_k4.12.14_94.37-1.x86_64.rpm
```

Multipath Configuration

This reference architecture uses Device-mapper Multipath, a native component of the Linux operating system. Using Device-mapper Multipath allows the configuration of multiple I/O paths between the server blades and storages.

Each node has two I/O paths connected with the storage. Multipathing aggregates all physical I/O paths into a single logical path. The LUNs are always available unless both paths fail.

Device-mapper Multipath is used for the following I/O paths:

- SAP HANA server boot volume
- SAP HANA data volume
- SAP HANA log volume
- SAP HANA shared volume

1. ssh to the Server as root.

2. Create the following entry in /etc/multipath.conf

```
vi /etc/multipath.conf
blacklist {
    devnode                   "^(ram|raw|loop|fd|md|dm-|sr|scd|st)[0-9]*"
    devnode                   "^hd[a-z]"
    devnode                   "^dcssblk[0-9]*"
}
devices {
   device {
            vendor               "HITACHI"
            product                    ".*"
            user_friendly_names        no
            path_checker         directio
            path_grouping_policy multibus
            path_selector        "queue-length 0"
            uid_attribute              ID_SERIAL
            failback                   immediate
            rr_weight                  uniform
            rr_min_io_rq               128
            features                   0
            no_path_retry              5
}
}
```

3. Start the multipath daemon and enable to start at the boot

```
systemctl start multipathd
systemctl enable multipathd
```

4. Check the status of multipath devices using multipath -ll

```
multipath -ll
360060e8012ccbc005040ccbc00000033 dm-8 HITACHI,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:9 sdad 65:208 active ready running
  |- 0:0:1:9 sdan 66:112 active ready running
  |- 6:0:0:9 sdj  8:144  active ready running
  `- 6:0:1:9 sdt  65:48  active ready running
360060e8012ccbc005040ccbc00000032 dm-7 HITACHI,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:8 sdac 65:192 active ready running
  |- 0:0:1:8 sdam 66:96  active ready running
  |- 6:0:0:8 sdi  8:128  active ready running
  `- 6:0:1:8 sds  65:32  active ready running
360060e8012ccbc005040ccbc00000029 dm-0 HITACHI,OPEN-V
size=1.0T features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:1 sdv  65:80  active ready running
  |- 0:0:1:1 sdaf 65:240 active ready running
  |- 6:0:0:1 sdb  8:16   active ready running
  `- 6:0:1:1 sdl  8:176  active ready running
360060e8012ccbc005040ccbc00000031 dm-6 HITACHI,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:7 sdab 65:176 active ready running
  |- 0:0:1:7 sdal 66:80  active ready running
  |- 6:0:0:7 sdh  8:112  active ready running
  `- 6:0:1:7 sdr  65:16  active ready running
360060e8012ccbc005040ccbc00000030 dm-5 HITACHI,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:6 sdaa 65:160 active ready running
  |- 0:0:1:6 sdak 66:64  active ready running
  |- 6:0:0:6 sdg  8:96   active ready running
  `- 6:0:1:6 sdq  65:0   active ready running
360060e8012ccbc005040ccbc0000001b dm-4 HITACHI,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:5 sdz  65:144 active ready running
  |- 0:0:1:5 sdaj 66:48  active ready running
  |- 6:0:0:5 sdf  8:80   active ready running
  `- 6:0:1:5 sdp  8:240  active ready running
360060e8012ccbc005040ccbc0000001a dm-3 HITACHI,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:4 sdy  65:128 active ready running
  |- 0:0:1:4 sdai 66:32  active ready running
  |- 6:0:0:4 sde  8:64   active ready running
  `- 6:0:1:4 sdo  8:224  active ready running
360060e8012ccbc005040ccbc00000019 dm-2 HITACHI,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
```

```
  |- 0:0:0:3 sdx  65:112 active ready running
  |- 0:0:1:3 sdah 66:16  active ready running
  |- 6:0:0:3 sdd  8:48   active ready running
  `- 6:0:1:3 sdn  8:208  active ready running
360060e8012ccbc005040ccbc00000018 dm-1 HITACHI,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 0:0:0:2 sdw  65:96  active ready running
  |- 0:0:1:2 sdag 66:0   active ready running
  |- 6:0:0:2 sdc  8:32   active ready running
  `- 6:0:1:2 sdm  8:192  active ready running
```

5. Use dracut to include multipath in the initrd image:

```
dracut --force --add multipath
```

Red Hat Enterprise Linux for SAP Solutions 7.5 OS Installation

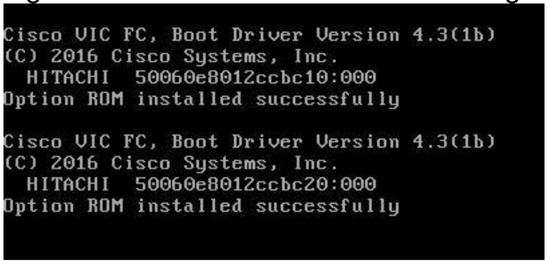
This section provides the procedure for RedHat Enterprise Linux 7.5 Operating System and customizing for SAP HANA requirement.

The following procedure requires RHEL 7.5 installation ISO image.

To install the RHEL 7.5 system, follow these steps:

1. In Cisco UCS Manager, click the Servers tab in the navigation pane.
2. Select Service Profile > root > Sub-Organization > T01-HANA > HANA-ScaleUp-03.
3. Click KVM Console.
4. When the KVM Console is launched, click Boot Server.
5. Choose Virtual Media > Activate Virtual Devices:
   a. For Unencrypted Virtual Media Session, select Accept this Session and then click Apply.
6. Click Virtual Media and choose Map CD/DVD.
7. Click Browse to navigate to the ISO media location. Select rhel-server-7.5-x86_64-dvd.iso Click Open.
8. Click Map Device.
9. At server boot time, during verification of VIC FC boot driver version, it recognizes the Hitachi Storage by its target WWPN numbers. This verifies the server to storage connectivity.

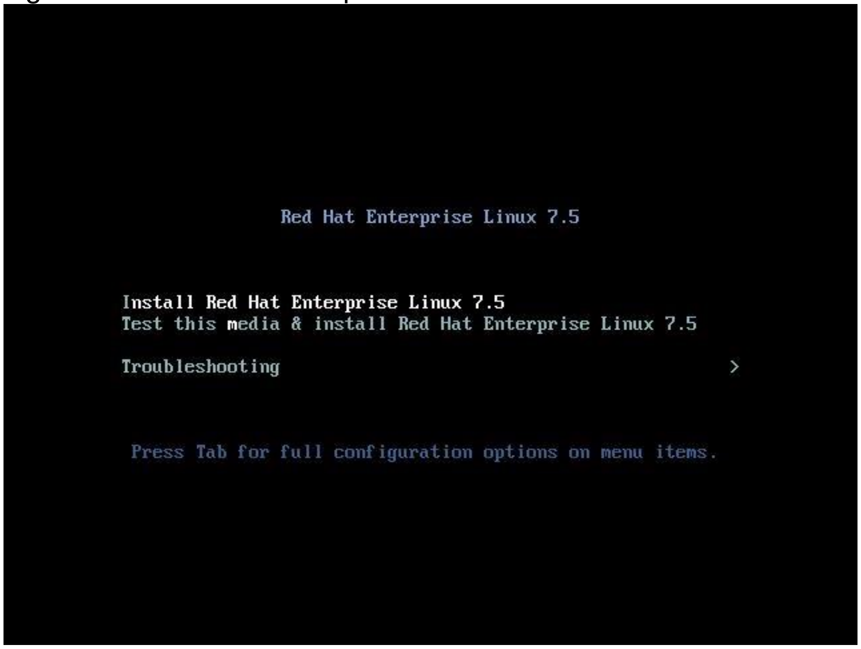
Figure 108 Cisco VIC Boot Driver recognize Hitachi Storage



```
Cisco VIC FC, Boot Driver Version 4.3(1b)
(C) 2016 Cisco Systems, Inc.
  HITACHI  50060e8012ccbc10:000
Option ROM installed successfully

Cisco VIC FC, Boot Driver Version 4.3(1b)
(C) 2016 Cisco Systems, Inc.
  HITACHI  50060e8012ccbc20:000
Option ROM installed successfully
```

10. On the Initial screen choose Install Red Hat Enterprise Linux 7.5 to begin the installation process.

Figure 109 Red Hat Enterprise Linux 7.5 Installation screen

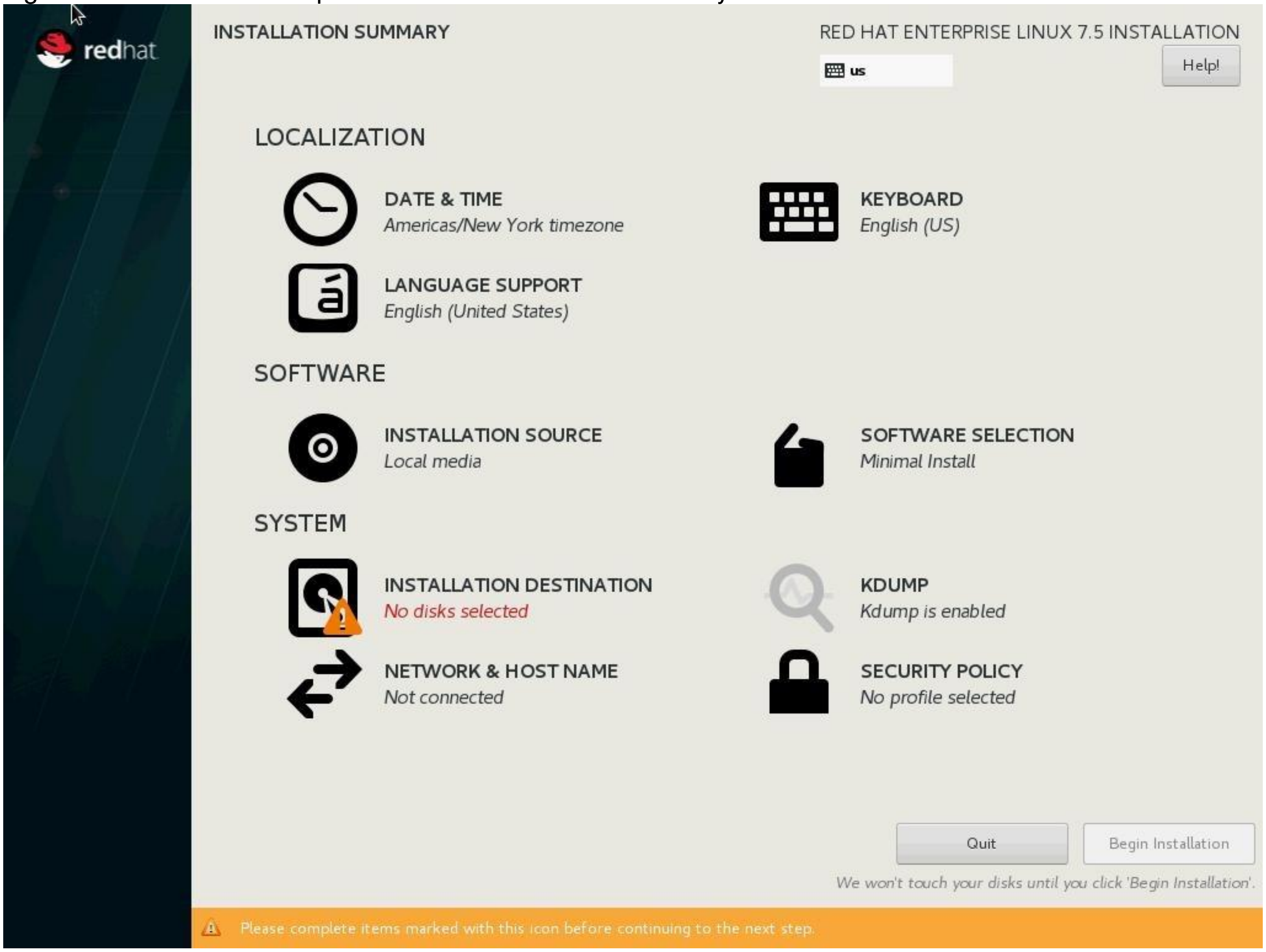


```
                Red Hat Enterprise Linux 7.5


     Install Red Hat Enterprise Linux 7.5
     Test this media & install Red Hat Enterprise Linux 7.5

     Troubleshooting                                          >


      Press Tab for full configuration options on menu items.
```

11. Choose Language and click Continue.

12. The Installation Summary page displays. Click Date & Time; choose the appropriate timezone and click Done.

Figure 110 Red Hat Enterprise Linux 7.5 Installation Summary Screen



INSTALLATION SUMMARY

RED HAT ENTERPRISE LINUX 7.5 INSTALLATION

LOCALIZATION

DATE & TIME
Americas/New York timezone

KEYBOARD
English (US)

LANGUAGE SUPPORT
English (United States)

SOFTWARE

INSTALLATION SOURCE
Local media

SOFTWARE SELECTION
Minimal Install

SYSTEM

INSTALLATION DESTINATION
No disks selected

KDUMP
Kdump is enabled

NETWORK & HOST NAME
Not connected

SECURITY POLICY
No profile selected

We won't touch your disks until you click 'Begin Installation'.

⚠ Please complete items marked with this icon before continuing to the next step.

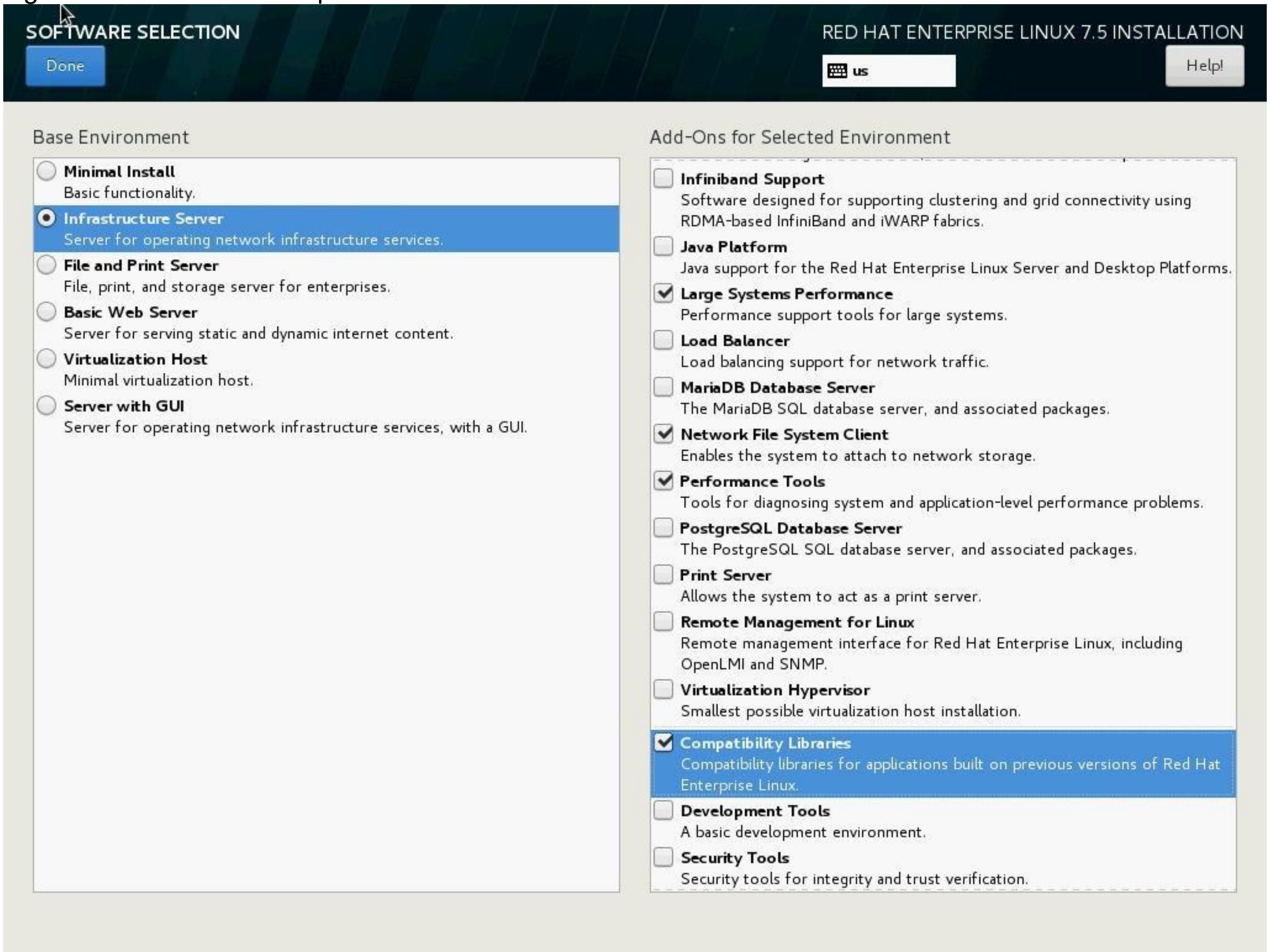
13. Click Keyboard; choose Keyboard layout and click Done.

14. Under Software Menu, click Software selection.

15. In the Base Environment choose Infrastructure Server.

16. For Add-Ons for Selected Environment choose Large Systems Performance, Network File System Client, Performance Tools, Compatibility Libraries and click Done.

Figure 111 Red Hat Enterprise Linux 7.5 Installation Software Selection



Base Environment

○ **Minimal Install**
Basic functionality.

● **Infrastructure Server**
Server for operating network infrastructure services.

○ **File and Print Server**
File, print, and storage server for enterprises.

○ **Basic Web Server**
Server for serving static and dynamic internet content.

○ **Virtualization Host**
Minimal virtualization host.

○ **Server with GUI**
Server for operating network infrastructure services, with a GUI.

Add-Ons for Selected Environment

□ **Infiniband Support**
Software designed for supporting clustering and grid connectivity using RDMA-based InfiniBand and iWARP fabrics.

□ **Java Platform**
Java support for the Red Hat Enterprise Linux Server and Desktop Platforms.

☑ **Large Systems Performance**
Performance support tools for large systems.

□ **Load Balancer**
Load balancing support for network traffic.

□ **MariaDB Database Server**
The MariaDB SQL database server, and associated packages.

☑ **Network File System Client**
Enables the system to attach to network storage.

☑ **Performance Tools**
Tools for diagnosing system and application-level performance problems.

□ **PostgreSQL Database Server**
The PostgreSQL SQL database server, and associated packages.

□ **Print Server**
Allows the system to act as a print server.

□ **Remote Management for Linux**
Remote management interface for Red Hat Enterprise Linux, including OpenLMI and SNMP.

□ **Virtualization Hypervisor**
Smallest possible virtualization host installation.

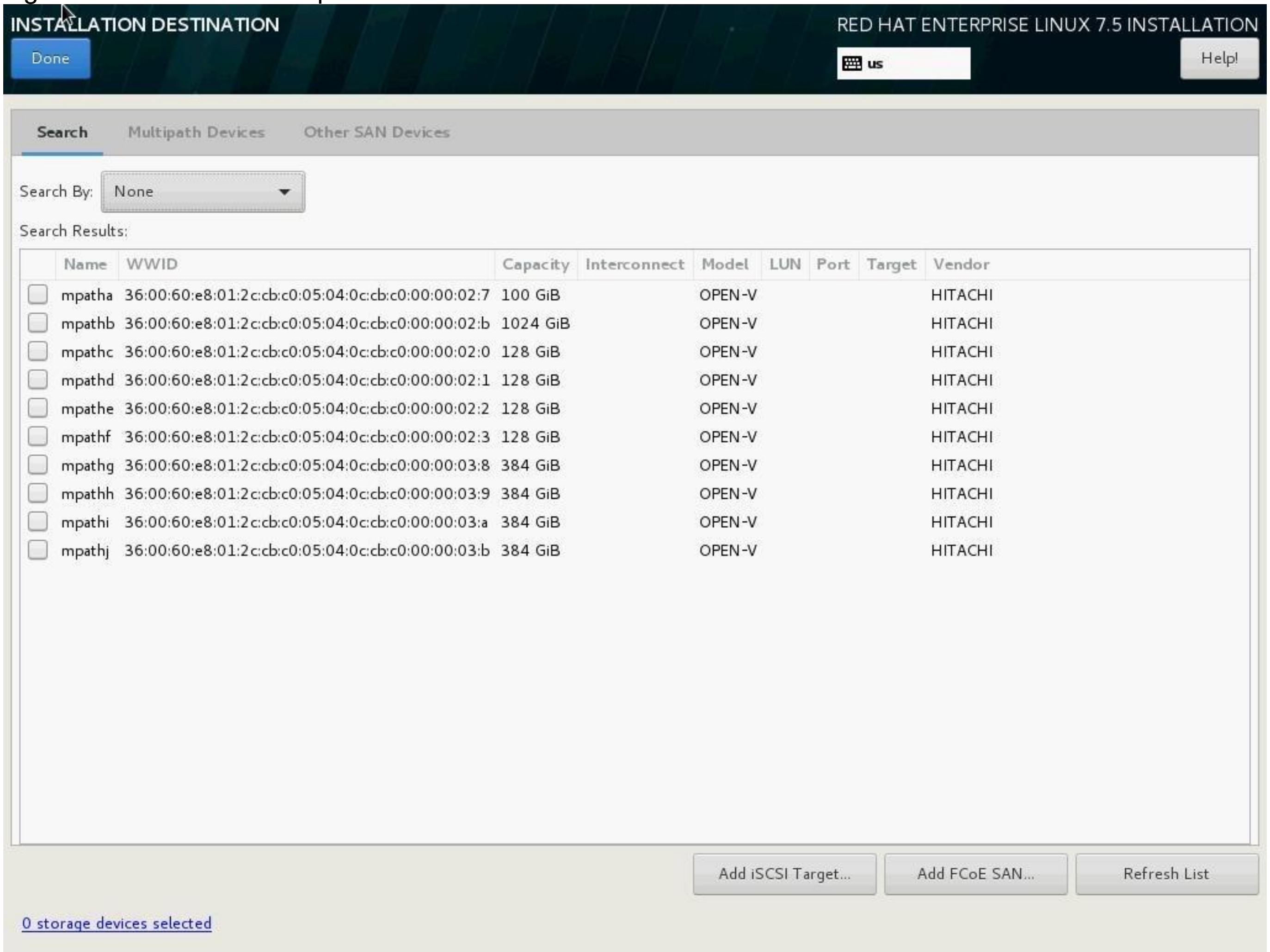
☑ **Compatibility Libraries**
Compatibility libraries for applications built on previous versions of Red Hat Enterprise Linux.

□ **Development Tools**
A basic development environment.

□ **Security Tools**
Security tools for integrity and trust verification.

17. Under System; click Installation destination. Select Specialized & Network Disks's "Add a disk."

Figure 112 Red Hat Enterprise Linux 7.5 Installation Destination Disk



Search By: None

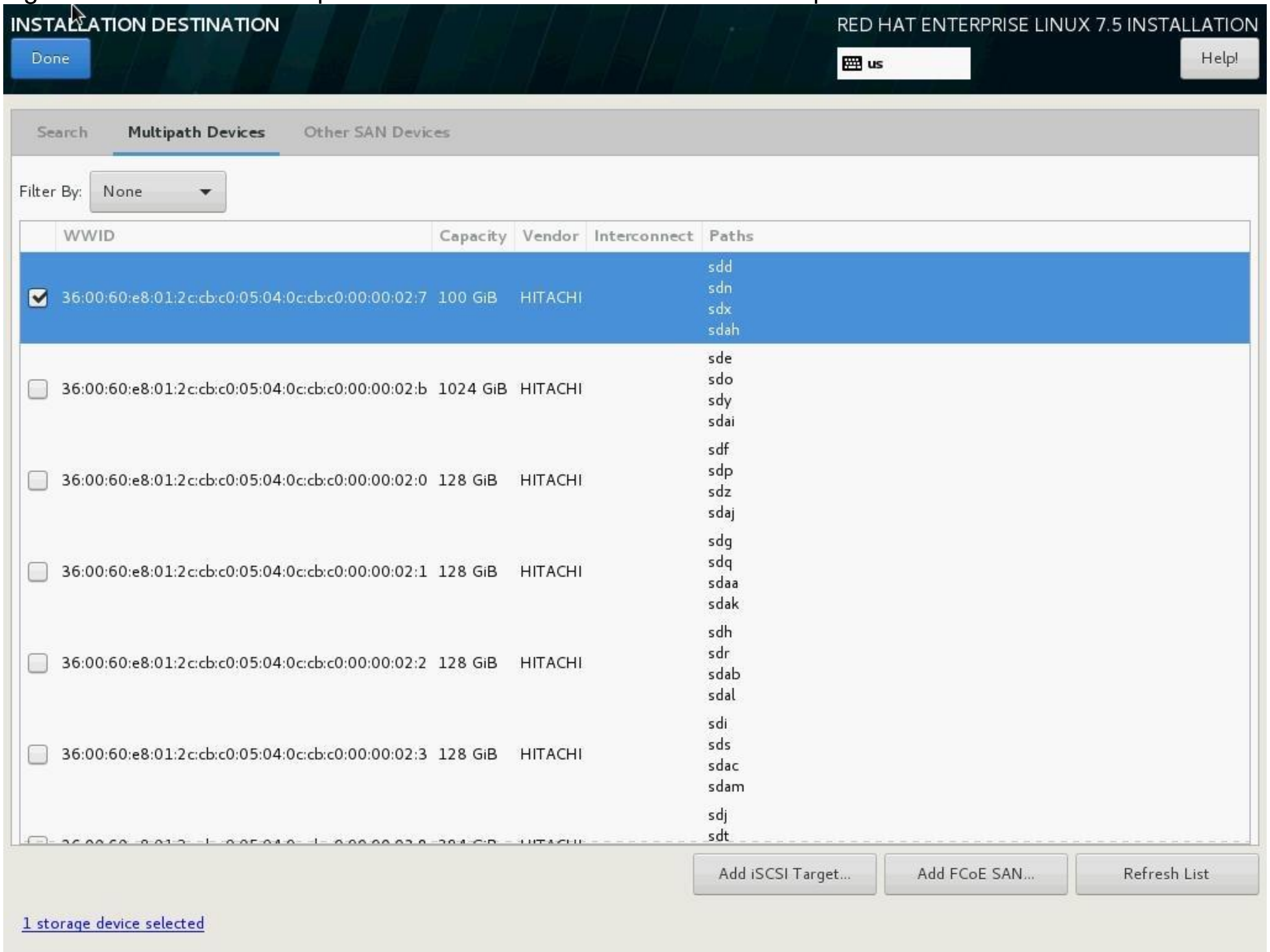
Search Results:

	Name	WWID	Capacity	Interconnect	Model	LUN	Port	Target	Vendor
□	mpatha	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:7	100 GiB		OPEN-V				HITACHI
□	mpathb	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:b	1024 GiB		OPEN-V				HITACHI
□	mpathc	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:0	128 GiB		OPEN-V				HITACHI
□	mpathd	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:1	128 GiB		OPEN-V				HITACHI
□	mpathe	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:2	128 GiB		OPEN-V				HITACHI
□	mpathf	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:3	128 GiB		OPEN-V				HITACHI
□	mpathg	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:03:8	384 GiB		OPEN-V				HITACHI
□	mpathh	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:03:9	384 GiB		OPEN-V				HITACHI
□	mpathi	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:03:a	384 GiB		OPEN-V				HITACHI
□	mpathj	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:03:b	384 GiB		OPEN-V				HITACHI

0 storage devices selected

18. Under Multipath Devices, select the lone 100G device identifies by its WWID. Click Done.

Figure 113 Red Hat Enterprise Linux 7.5 Installation Destination Multipath Device



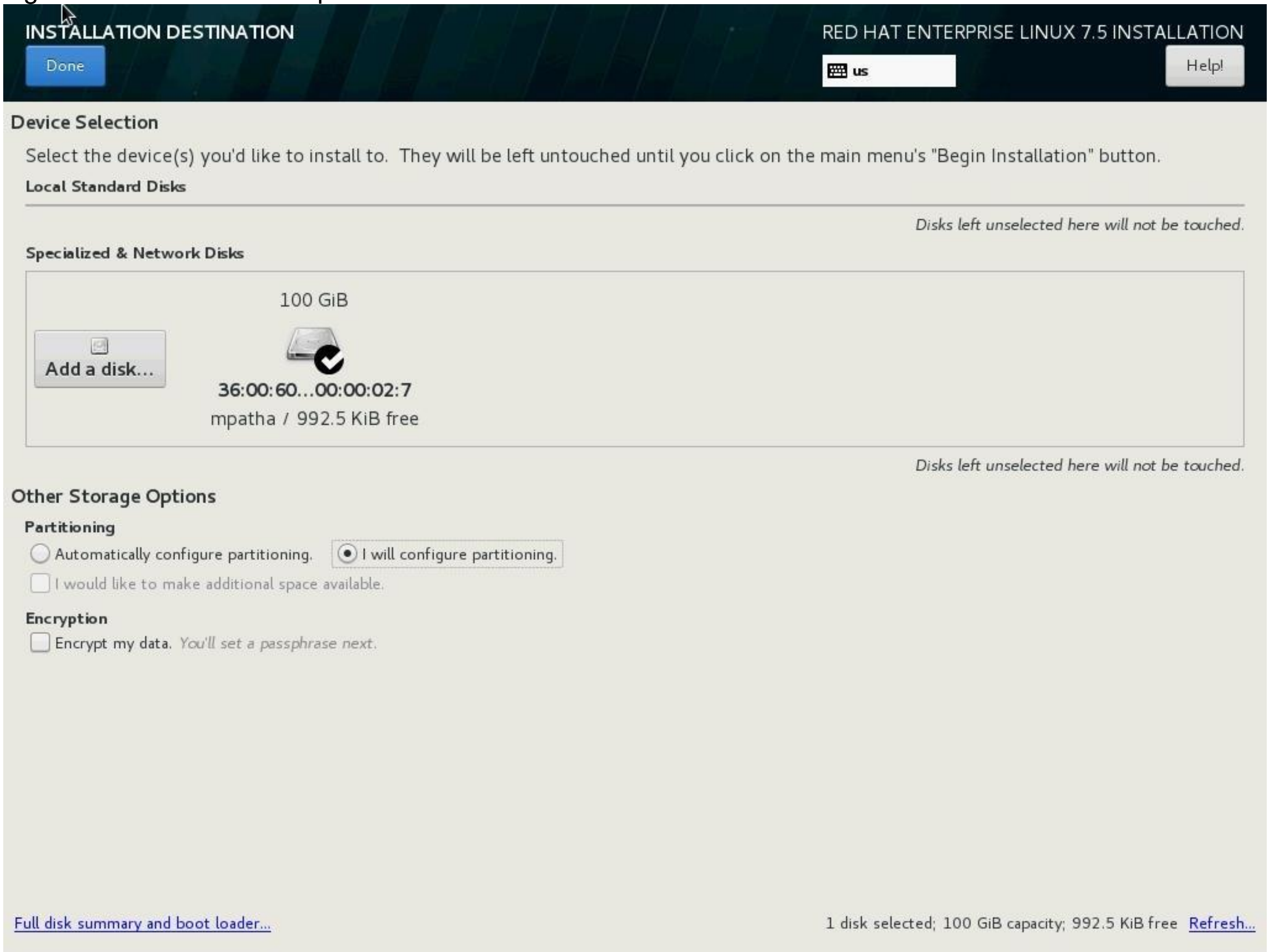
Filter By: None

	WWID	Capacity	Vendor	Interconnect	Paths
☑	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:7	100 GiB	HITACHI		sdd sdn sdx sdah
□	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:b	1024 GiB	HITACHI		sde sdo sdy sdai
□	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:0	128 GiB	HITACHI		sdf sdp sdz sdaj
□	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:1	128 GiB	HITACHI		sdg sdq sdaa sdak
□	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:2	128 GiB	HITACHI		sdh sdr sdab sdal
□	36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:00:00:02:3	128 GiB	HITACHI		sdi sds sdac sdam
□					sdj sdt

1 storage device selected

19. From the Other Storage Options choose ‘I will configure partitioning’ and click Done.

Figure 114 Red Hat Enterprise Linux 7.5 Installation Device Selection



INSTALLATION DESTINATION

RED HAT ENTERPRISE LINUX 7.5 INSTALLATION

Device Selection

Select the device(s) you'd like to install to. They will be left untouched until you click on the main menu's "Begin Installation" button.

Local Standard Disks

Disks left unselected here will not be touched.

Specialized & Network Disks

100 GiB

36:00:60...00:00:02:7

mpatha / 992.5 KiB free

Disks left unselected here will not be touched.

Other Storage Options

Partitioning

○ Automatically configure partitioning. ● I will configure partitioning.

□ I would like to make additional space available.

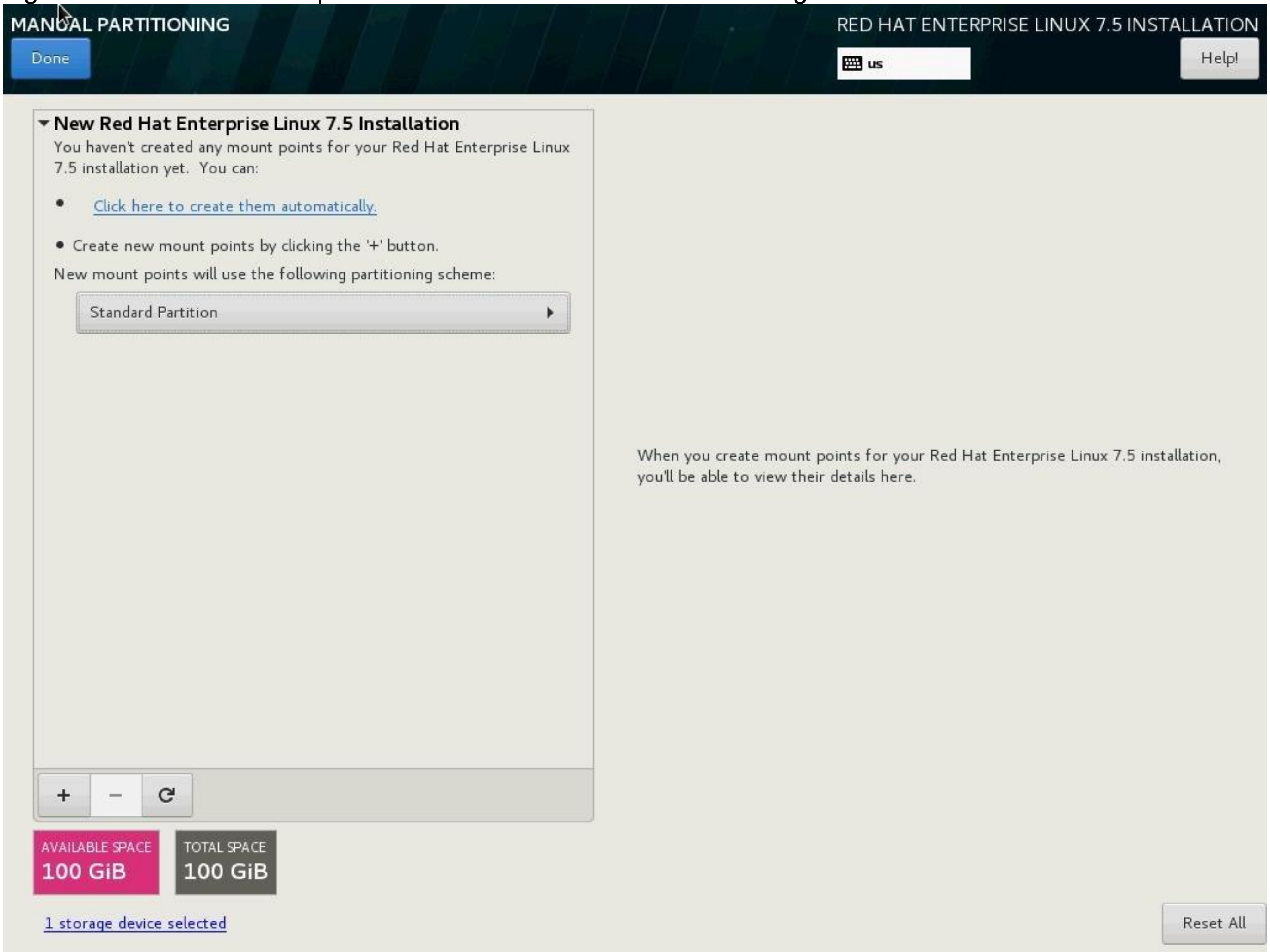
Encryption

□ Encrypt my data. *You'll set a passphrase next.*

1 disk selected; 100 GiB capacity; 992.5 KiB free

20. In the Manual Partitioning Screen, choose Standard Partition for New mount points will use the following partitioning scheme.

Figure 115 Red Hat Enterprise Linux 7.5 Installation Disk Partitioning



New Red Hat Enterprise Linux 7.5 Installation

You haven't created any mount points for your Red Hat Enterprise Linux 7.5 installation yet. You can:

- Click here to create them automatically.
- Create new mount points by clicking the '+' button.

New mount points will use the following partitioning scheme:

Standard Partition

When you create mount points for your Red Hat Enterprise Linux 7.5 installation, you'll be able to view their details here.

AVAILABLE SPACE 100 GiB

TOTAL SPACE 100 GiB

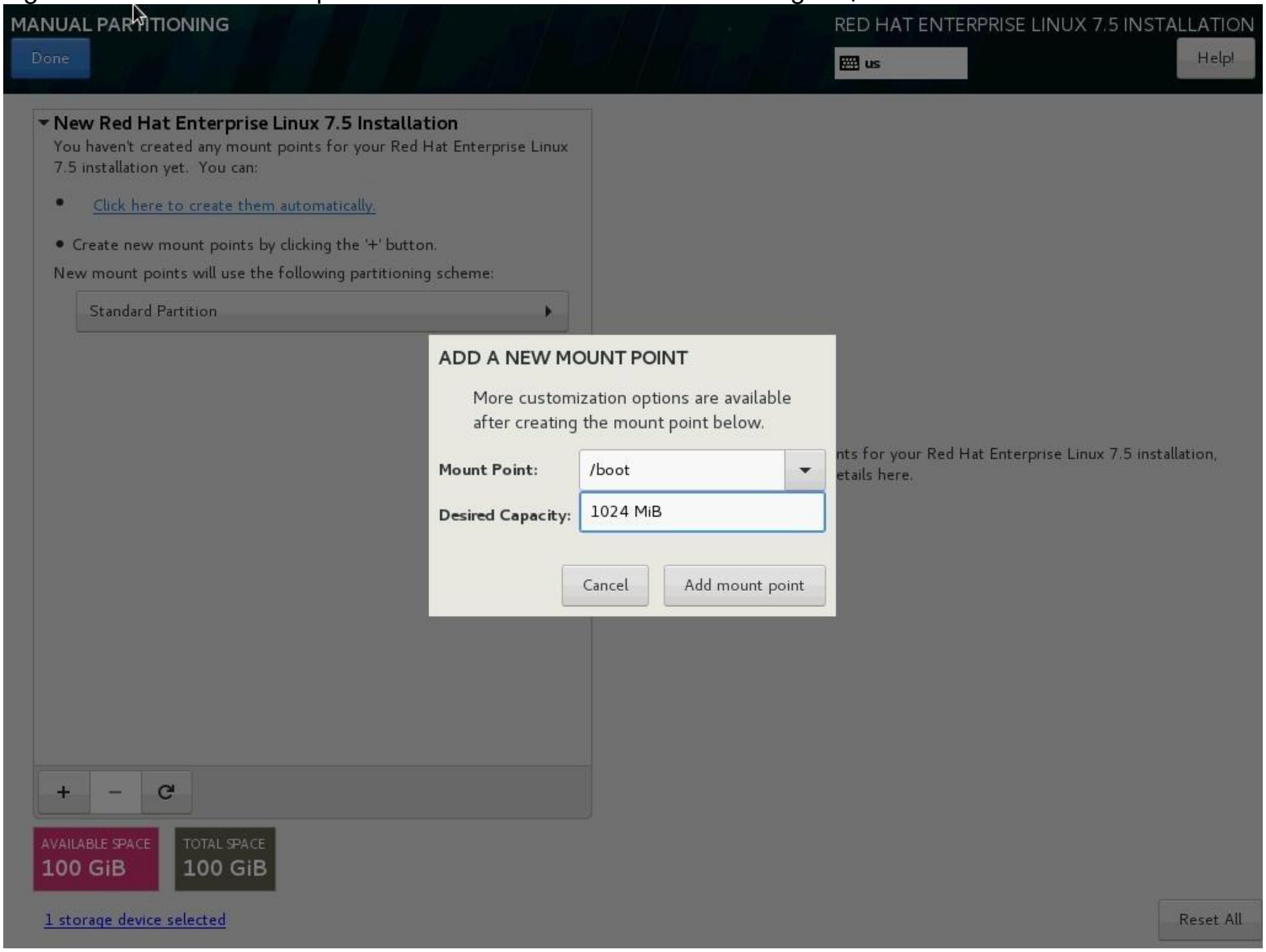
1 storage device selected

21. Click the + symbol to add a new partition.

22. Choose the mount point as '/boot.

23. Enter the Desired capacity as 1024 MiB and click Add Mount Point.

Figure 116 Red Hat Enterprise Linux 7.5 Installation Disk Partitioning for /boot



New Red Hat Enterprise Linux 7.5 Installation

You haven't created any mount points for your Red Hat Enterprise Linux 7.5 installation yet. You can:

- Click here to create them automatically.
- Create new mount points by clicking the '+' button.

New mount points will use the following partitioning scheme:

Standard Partition

ADD A NEW MOUNT POINT

More customization options are available after creating the mount point below.

Mount Point: /boot

Desired Capacity: 1024 MiB

Cancel | Add mount point

nts for your Red Hat Enterprise Linux 7.5 installation, etails here.

AVAILABLE SPACE 100 GiB

TOTAL SPACE 100 GiB

1 storage device selected

24. Choose the filesystem ext3.

25. Click the + symbol to add a new partition.

26. Choose the mount point swap.

27. Enter the Desired capacity 2048 MiB and click Add Mount Point.

28. Choose the filesystem swap.

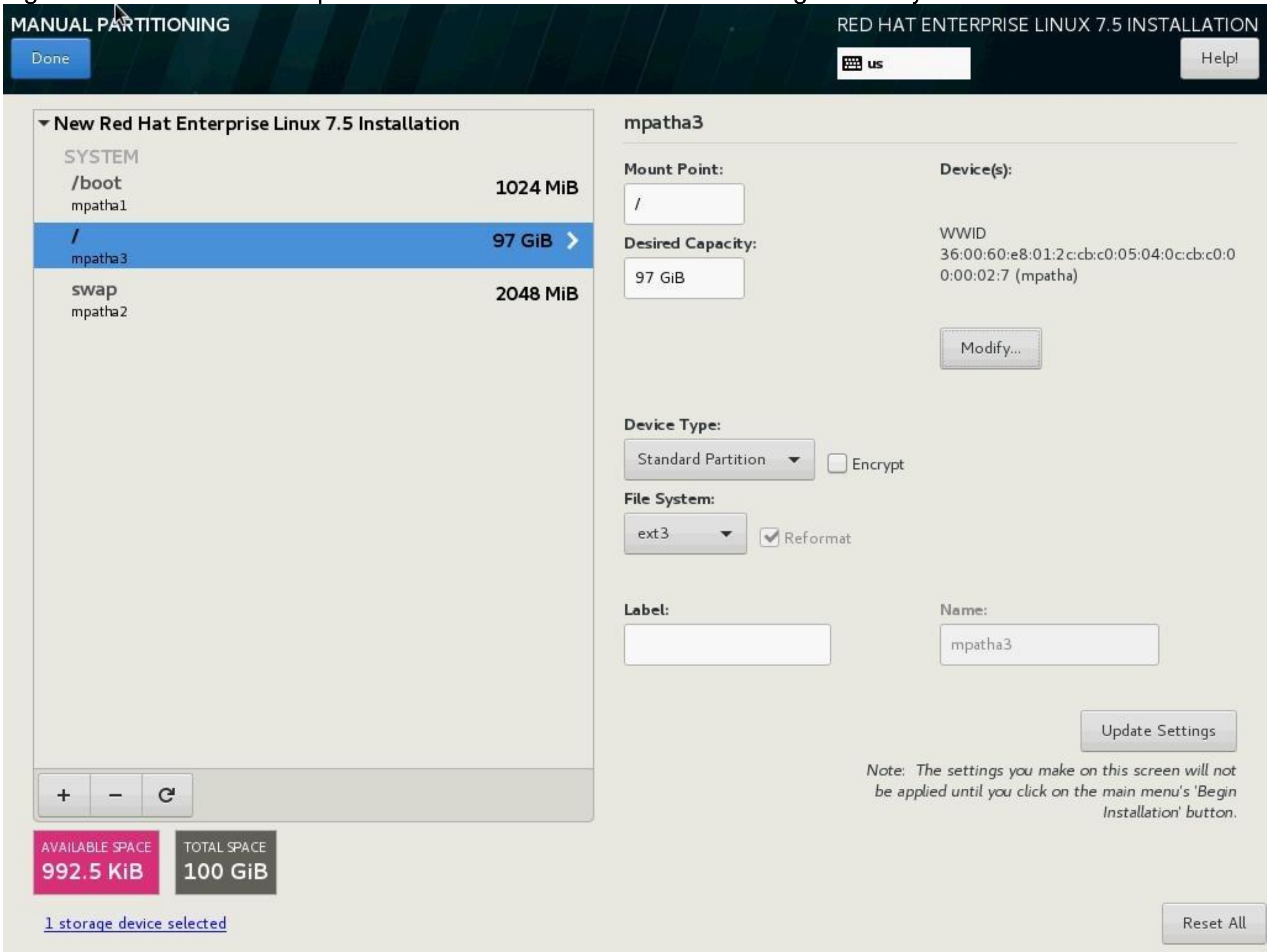
29. Click the + symbol to add / (root) partition.

30. Choose the mount point as /.

31. Enter the Desired capacity blank and click Add Mount Point.

32. Choose the filesystem ext3.

Figure 117 Red Hat Enterprise Linux 7.5 Installation Disk Partitioning Summary


MANUAL PARTITIONING
Done
RED HAT ENTERPRISE LINUX 7.5 INSTALLATION
us
Help!
+
−
⟳
Modify...
Update Settings
Reset All
1 storage device selected

▾ New Red Hat Enterprise Linux 7.5 Installation

SYSTEM

/boot mpatha1	1024 MiB
/ mpatha3	97 GiB ›
swap mpatha2	2048 MiB

AVAILABLE SPACE 992.5 KiB

TOTAL SPACE 100 GiB

mpatha3

Mount Point: /

Desired Capacity: 97 GiB

Device(s):

WWID
36:00:60:e8:01:2c:cb:c0:05:04:0c:cb:c0:0
0:00:02:7 (mpatha)

Device Type: Standard Partition ▾ □ Encrypt

File System: ext3 ▾ ☑ Reformat

Label:

Name: mpatha3

Note: The settings you make on this screen will not be applied until you click on the main menu's 'Begin Installation' button.

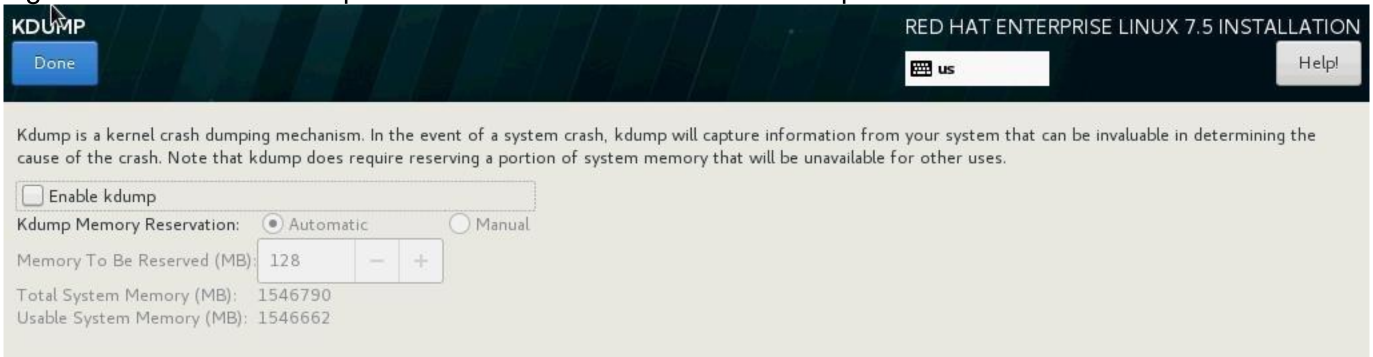
33. Click Done.

34. Review the partition layout and the size.

35. Click Accept Changes to proceed to the next steps.

36. Click KDUMP.

Figure 118 Red Hat Enterprise Linux 7.5 Installation Disable kdump



Kdump is a kernel crash dumping mechanism. In the event of a system crash, kdump will capture information from your system that can be invaluable in determining the cause of the crash. Note that kdump does require reserving a portion of system memory that will be unavailable for other uses.

□ Enable kdump

Kdump Memory Reservation: ● Automatic ○ Manual

Memory To Be Reserved (MB): 128 − +

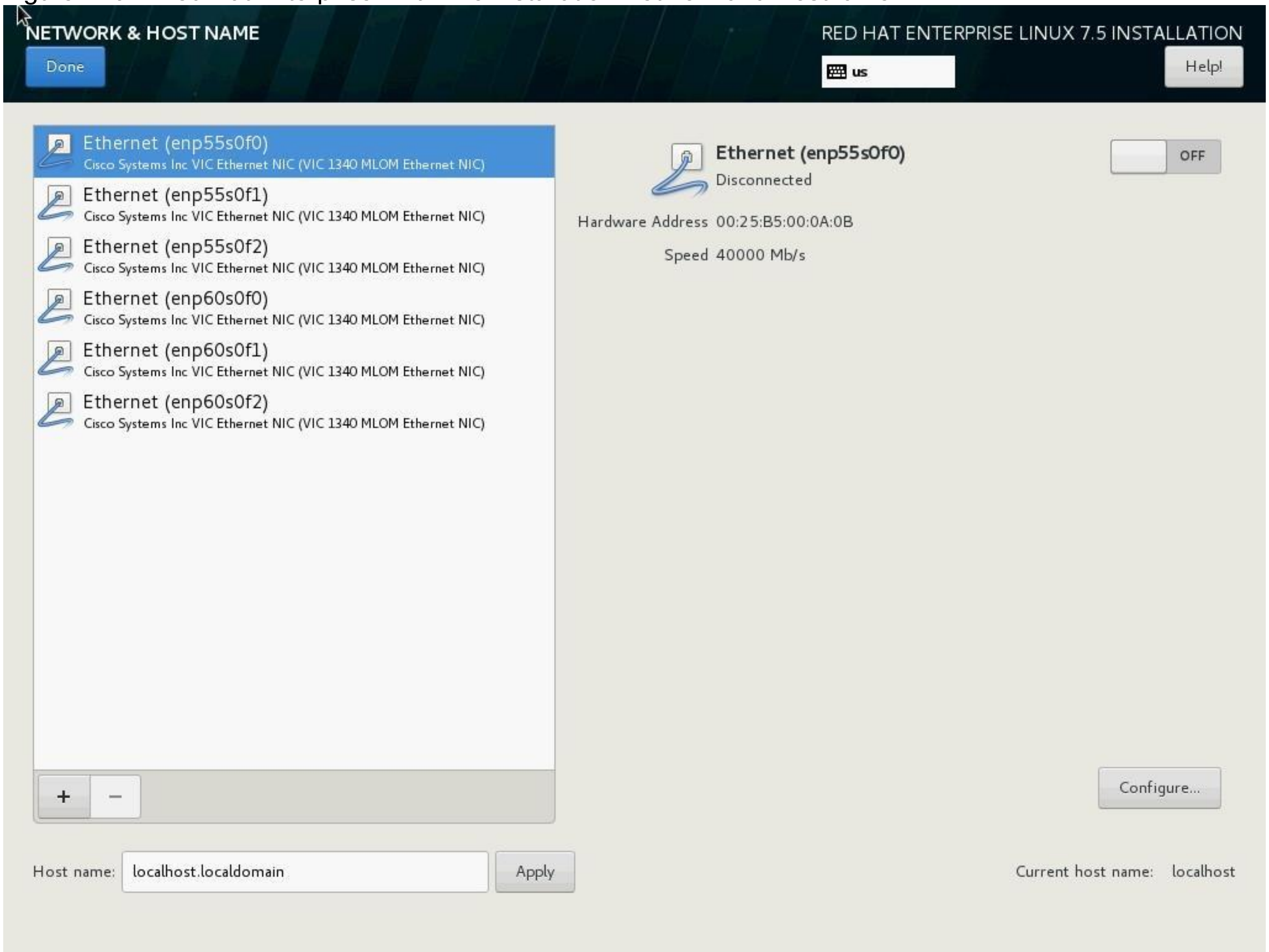
Total System Memory (MB): 1546790

Usable System Memory (MB): 1546662

37. Deselect Enable kdump and click Done

38. Click Network & Hostname.

Figure 119 Red Hat Enterprise Linux 7.5 Installation Network and Hostname



NETWORK & HOST NAME

RED HAT ENTERPRISE LINUX 7.5 INSTALLATION

- Ethernet (enp55s0f0) Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)
- Ethernet (enp55s0f1) Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)
- Ethernet (enp55s0f2) Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)
- Ethernet (enp60s0f0) Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)
- Ethernet (enp60s0f1) Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)
- Ethernet (enp60s0f2) Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f0)
Disconnected

Hardware Address 00:25:B5:00:0A:0B

Speed 40000 Mb/s

Host name: localhost.localdomain

Current host name: localhost

39. Enter the Host name and click Apply.

40. On the NETWORK & HOSTNAME, click Ethernet:

a. To configure the network interface on the OS, it is required to identify the mapping of the Ethernet device on the OS to vNIC interface on the Cisco UCS.

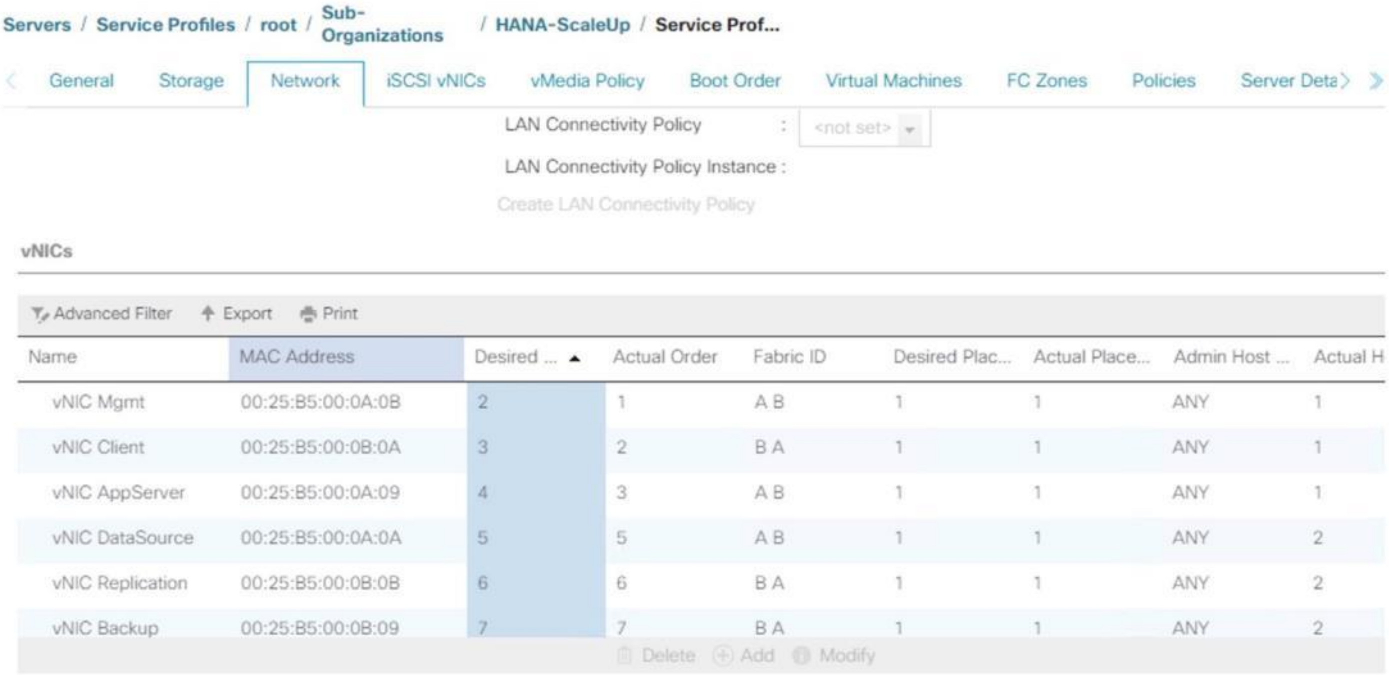
b. In Cisco UCS Manager, click the Servers tab in the navigation pane.

c. Select Service Profile > root > Sub-Organization > T01-HANA > HANA-ScaleUp-03.

d. On the main pane click on Network, list of the vNICs with MAC Address are listed.

e. Note that the MAC Address of the HANA-Mgmt vNIC is “00:25:B5:00:0A:0B”

Figure 120 Cisco UCS vNIC MAC Access



LAN Connectivity Policy : <not set>

LAN Connectivity Policy Instance :

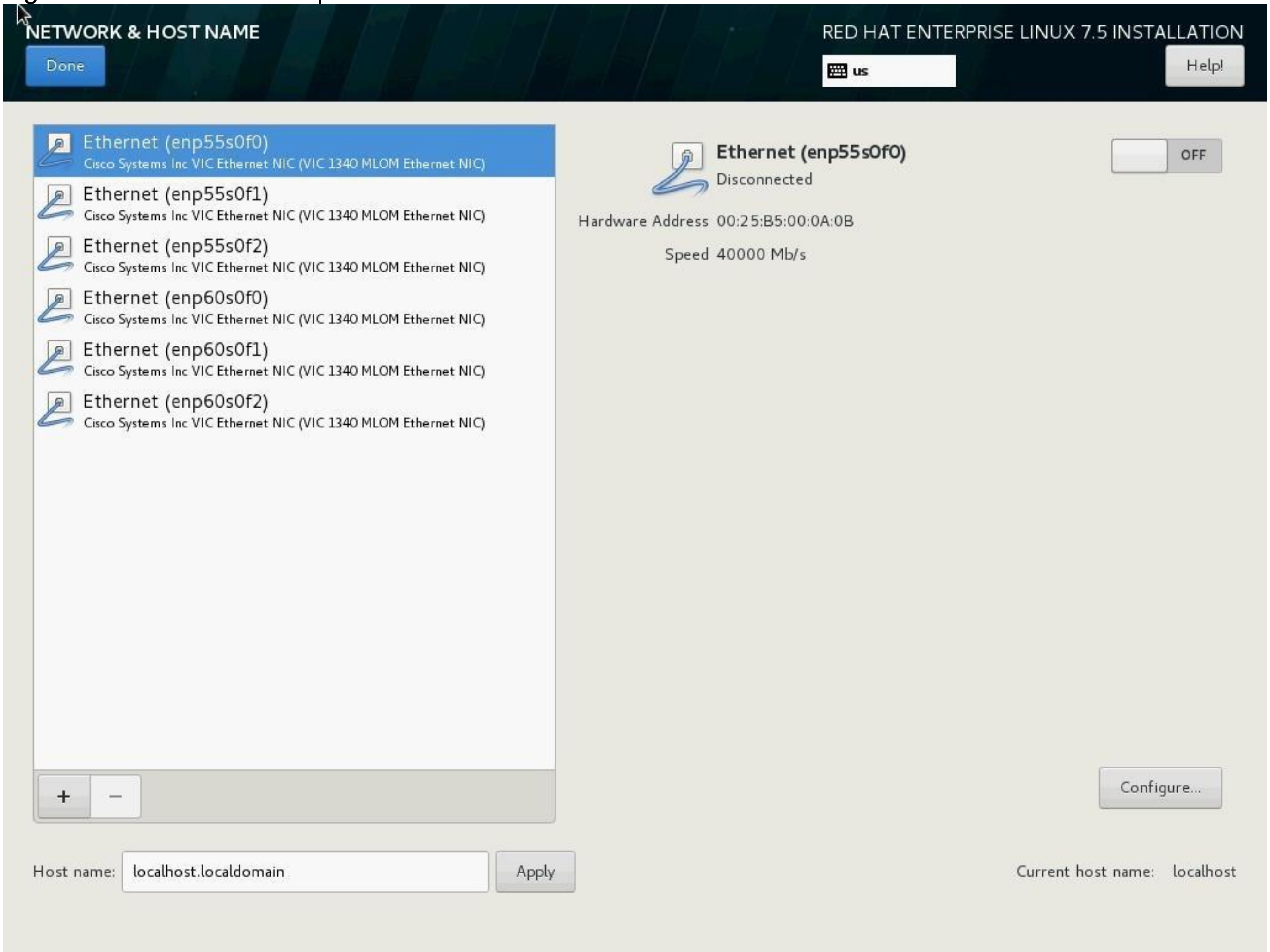
Create LAN Connectivity Policy

vNICs

Name	MAC Address	Desired ... ▲	Actual Order	Fabric ID	Desired Plac...	Actual Place...	Admin Host ...	Actual H
vNIC Mgmt	00:25:B5:00:0A:0B	2	1	A B	1	1	ANY	1
vNIC Client	00:25:B5:00:0B:0A	3	2	B A	1	1	ANY	1
vNIC AppServer	00:25:B5:00:0A:09	4	3	A B	1	1	ANY	1
vNIC DataSource	00:25:B5:00:0A:0A	5	5	A B	1	1	ANY	2
vNIC Replication	00:25:B5:00:0B:0B	6	6	B A	1	1	ANY	2
vNIC Backup	00:25:B5:00:0B:09	7	7	B A	1	1	ANY	2

f. By comparing MAC Address on the OS and Cisco UCS, Ethernet (enp55s0f0) on OS will carry the VLAN for Management.

Figure 121 Red Hat Enterprise Linux 7.5 Installation Network and Hostname



NETWORK & HOST NAME

RED HAT ENTERPRISE LINUX 7.5 INSTALLATION

Ethernet (enp55s0f0)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f1)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f2)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp60s0f0)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp60s0f1)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp60s0f2)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f0)
Disconnected

Hardware Address 00:25:B5:00:0A:0B

Speed 40000 Mb/s

Host name: localhost.localdomain

Current host name: localhost

41. Click Configure:

    a. Click IPv4 Settings, and choose Manual for Method.

    b. Under Addresses Click Add.

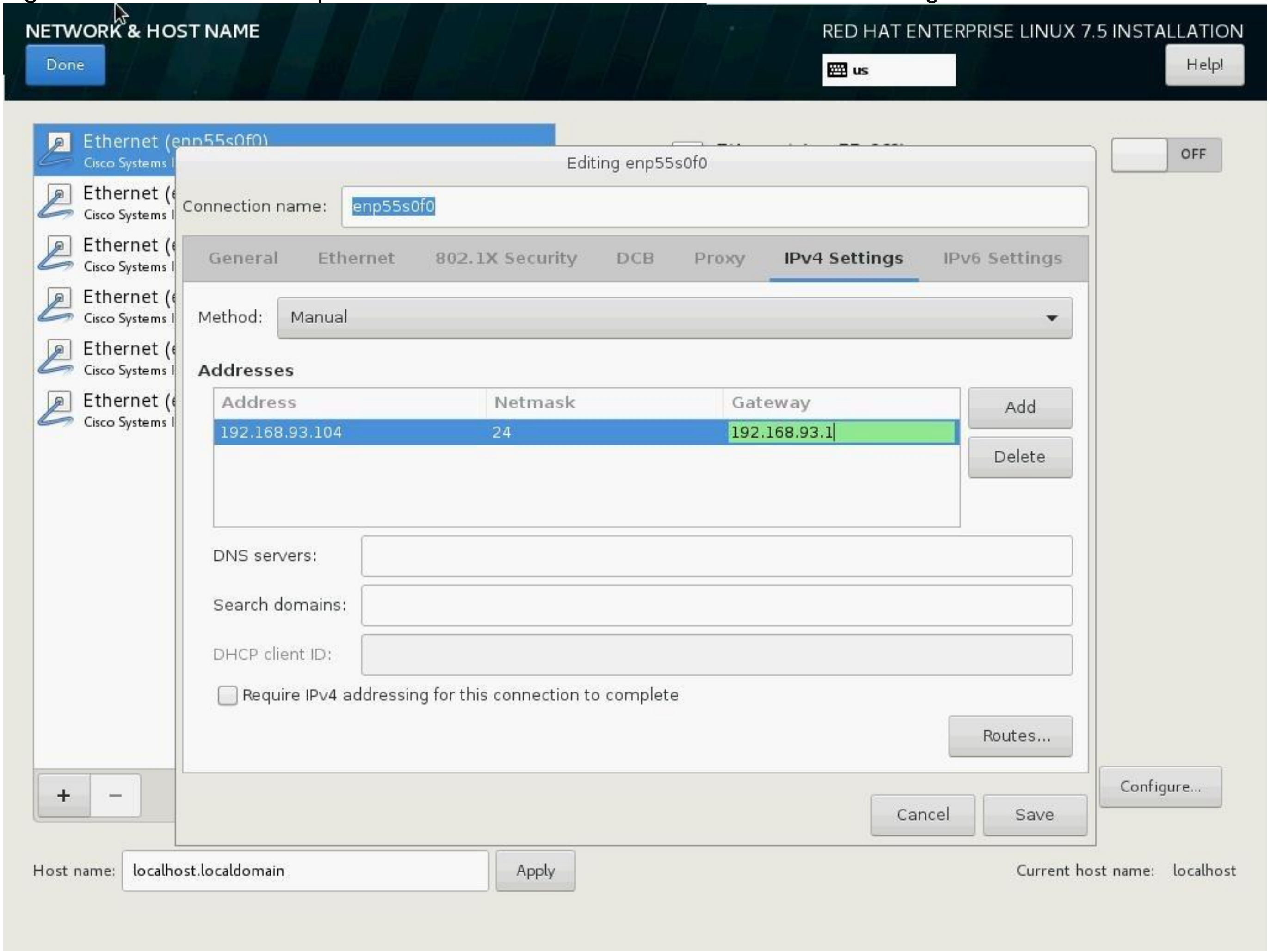
    c. In the Address field enter <<Management IP address>>.

    d. In the Netmask field enter <<subnet mask for Management Interface>>.

    e. In the Gateway field enter <<default gateway for Management Interface>>.

    f. Click Save.

Figure 122 Red Hat Enterprise Linux 7.5 Installation Network IP Address Settings



Connection name: enp55s0f0

Method: Manual

Addresses

Address	Netmask	Gateway
192.168.93.104	24	192.168.93.1

DNS servers:

Search domains:

DHCP client ID:

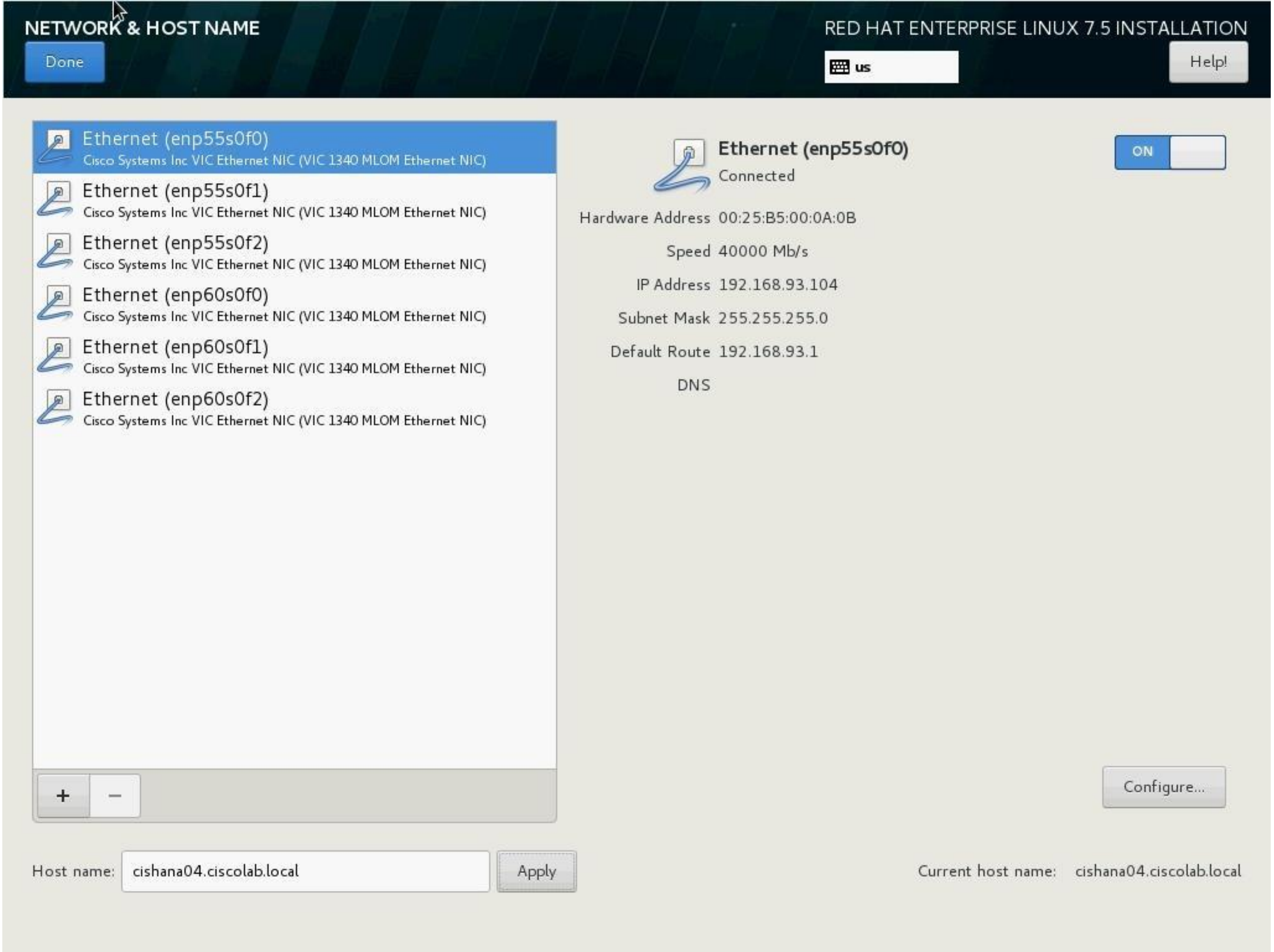
□ Require IPv4 addressing for this connection to complete

Host name: localhost.localdomain

Current host name: localhost

42. Enter the Host name and click Apply.

Figure 123 Red Hat Enterprise Linux 7.5 Installation Hostname Settings



Ethernet (enp55s0f0)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f1)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f2)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp60s0f0)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp60s0f1)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp60s0f2)
Cisco Systems Inc VIC Ethernet NIC (VIC 1340 MLOM Ethernet NIC)

Ethernet (enp55s0f0)
Connected

Hardware Address	00:25:B5:00:0A:0B
Speed	40000 Mb/s
IP Address	192.168.93.104
Subnet Mask	255.255.255.0
Default Route	192.168.93.1
DNS	

Host name: cishana04.ciscolab.local

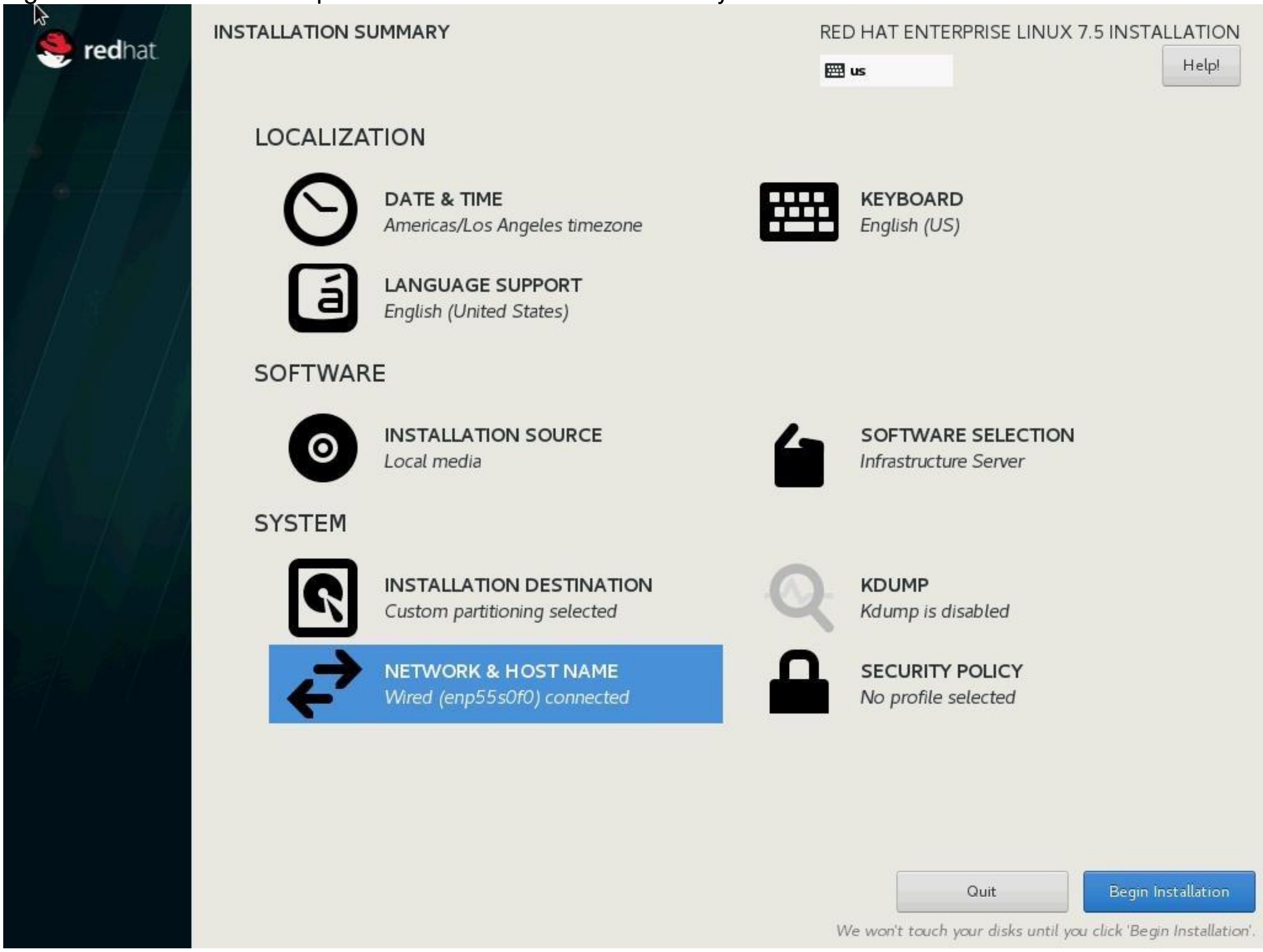
Current host name: cishana04.ciscolab.local

43. Click Done at the top left corner of the screen.

44. IP address for rest of the Ethernet will be set post installation, by using ssh to connect to the server on Management IP.

45. Review the installation summary and click Begin Installation.

Figure 124 Red Hat Enterprise Linux 7.5 Installation Summary



INSTALLATION SUMMARY

RED HAT ENTERPRISE LINUX 7.5 INSTALLATION

LOCALIZATION

DATE & TIME
Americas/Los Angeles timezone

KEYBOARD
English (US)

LANGUAGE SUPPORT
English (United States)

SOFTWARE

INSTALLATION SOURCE
Local media

SOFTWARE SELECTION
Infrastructure Server

SYSTEM

INSTALLATION DESTINATION
Custom partitioning selected

KDUMP
Kdump is disabled

NETWORK & HOST NAME
Wired (enp55s0f0) connected

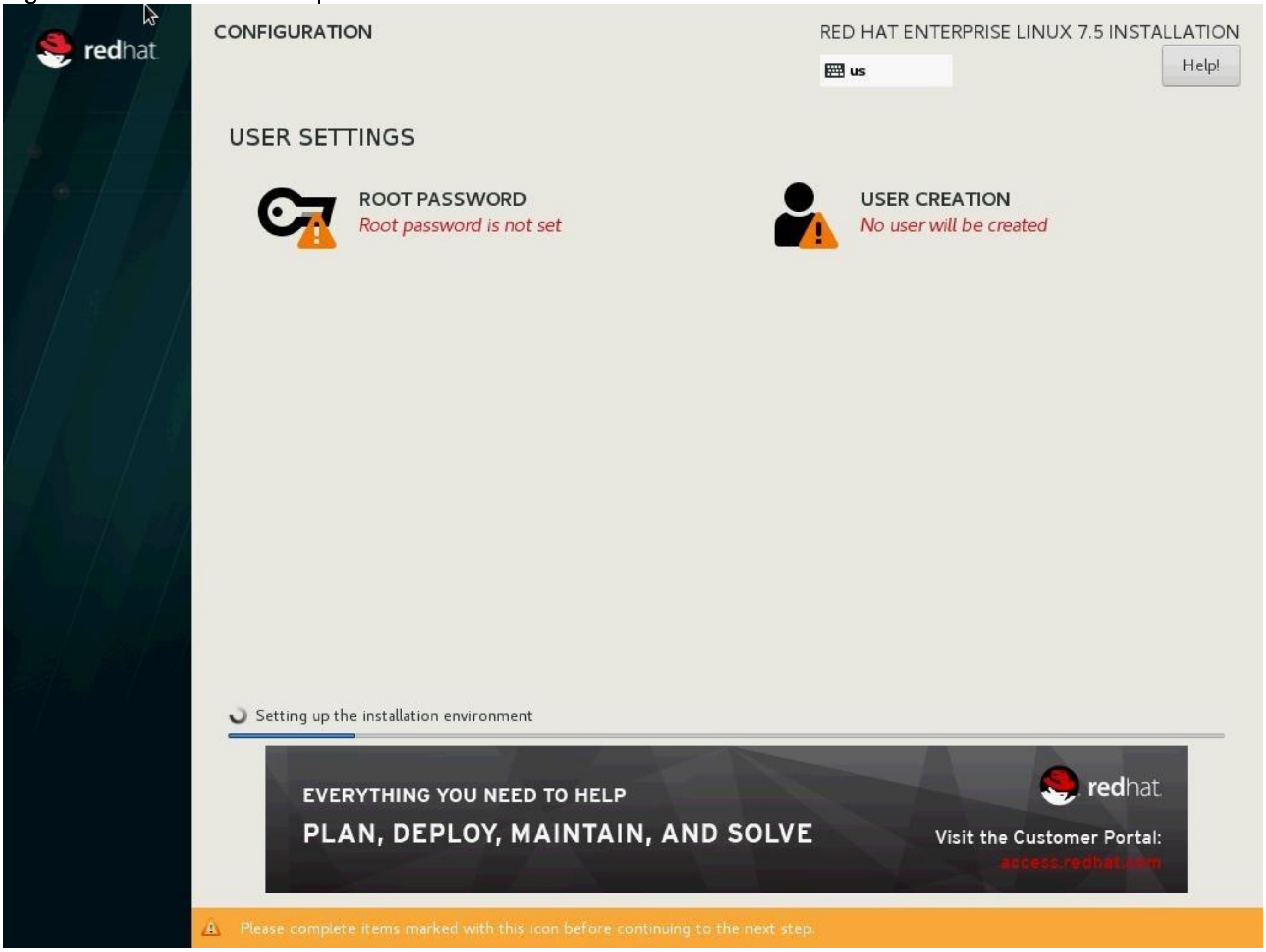
SECURITY POLICY
No profile selected

We won't touch your disks until you click 'Begin Installation'.

46. The next screen will show the start of the OS installation.

47. Click Root Password.

Figure 125 Red Hat Enterprise Linux 7.5 Installation Set Root Password


redhat
CONFIGURATION
RED HAT ENTERPRISE LINUX 7.5 INSTALLATION
us
Help!
EVERYTHING YOU NEED TO HELP
PLAN, DEPLOY, MAINTAIN, AND SOLVE
redhat
Visit the Customer Portal:
access.redhat.com

USER SETTINGS

ROOT PASSWORD
Root password is not set

USER CREATION
No user will be created

Setting up the installation environment

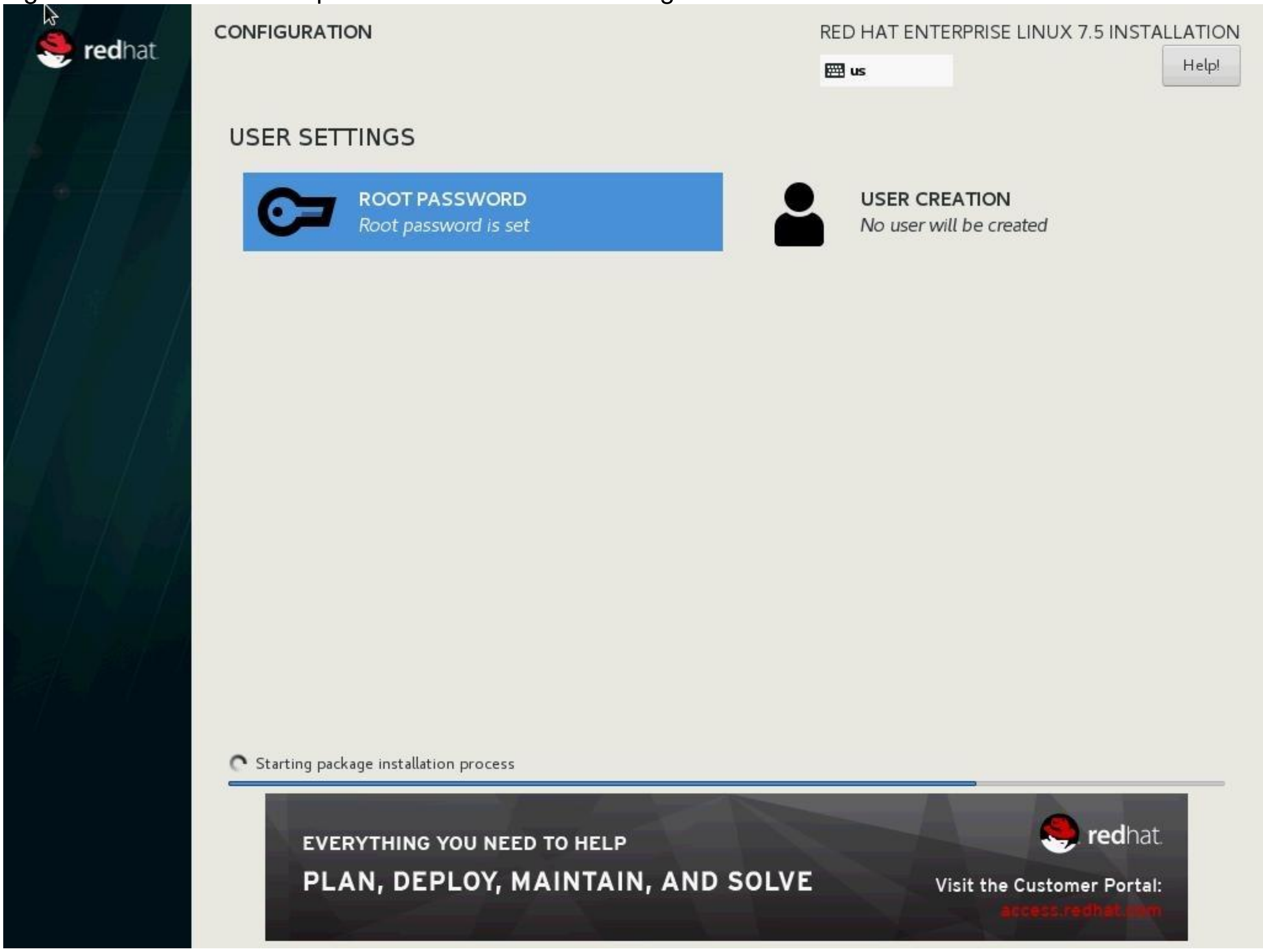
Please complete items marked with this icon before continuing to the next step.

48. Enter the Root Password and Confirm.

49. Click Done.

50. The installation will start and continue.

Figure 126   Red Hat Enterprise Linux 7.5 Installation Progress



redhat
CONFIGURATION
RED HAT ENTERPRISE LINUX 7.5 INSTALLATION
us
Help!
USER SETTINGS
ROOT PASSWORD
Root password is set
USER CREATION
No user will be created
Starting package installation process
EVERYTHING YOU NEED TO HELP
PLAN, DEPLOY, MAINTAIN, AND SOLVE
redhat
Visit the Customer Portal:
access.redhat.com

51. When the installation is complete click Reboot to finish the installation.

Network Services Configuration

To configure the server with Network services, follow these steps:

Hostnames

The operating system must be configured such a way that the short name of the server is displayed for the command ‘hostname’ and Full Qualified Host Name is displayed with the command ‘hostname –d’.

1. Use the KVM console to log in to the installed system as the user root and the password <<var_sys_root-pw>>.

2. Set the hostname using hostnamectl:

```
hostnamectl set-hostname <<hostname>>
```

IP Address

Each SAP HANA Server is configured with 6 vNIC device. Table 22 lists the IP Address information required to configure the IP address on the Operating System.

The IP Address and Subnet Mask provided below are examples only, please configure the IP address for your environment.

Table 22 IP Addresses for SAP HANA Server

vNIC Name	VLAN ID	IP Address Range	Subnet Mask
HANA-AppServer	<<var_appserver_vlan_id>>	192.168.223.103	255.255.255.0
HANA-Backup	<<var_backup_vlan_id>>	192.168.221.103	255.255.255.0
HANA-Client	<<var_client_vlan_id>>	192.168.222.103	255.255.0.0
HANA-DataSource	<<var_datasource_vlan_id>>	192.168.224.103	255.255.255.0
HANA-Replication	<<var_replication_vlan_id>>	192.168.225.103	255.255.255.0
Management	<<var_mgmt_vlan_id>>	192.168.93.103	255.255.0.0

1. To configure the network interface on the OS, it is required to identify the mapping of the ethernet device on the OS to vNIC interface on the Cisco UCS.

2. In RHEL 7, systemd and udev support a number of different naming schemes. By default, fixed names are assigned based on firmware, topology, and location information, like 'enp72s0'. With this naming convention, though names stay fixed even if hardware is added or removed it is often harder to read unlike traditional kernel-native ethX naming "eth0". Another way to name network interfaces, "biosdevnames", is already available with installation.

3. Configure boot parameters "`net.ifnames=0 biosdevname=0`" to disable both, to get the original kernel native network names.

4. Also, IPV6 support could be disabled at this time as we use IPV4 in the solution. This can be done by appending `ipv6.disable=1` to GRUB_CMDLINE_LINUX as shown below:

```
cat /etc/default/grub
GRUB_TIMEOUT=5
GRUB_DISTRIBUTOR="$(sed 's, release .*$,,g' /etc/system-release)"
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="rhgb quiet net.ifnames=0 biosdevname=0 ipv6.disable=1"
GRUB_DISABLE_RECOVERY="true"
```

5. To Run the grub2-mkconfig command to regenerate the grub.cfg file:

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

6. Finally reboot system to effect the changes.

7. To configure the network interface on the OS, it is required to identify the mapping of the ethernet device on the OS to vNIC interface on the Cisco UCS.

8. From the OS, run the following command to get list of Ethernet device with MAC Address:

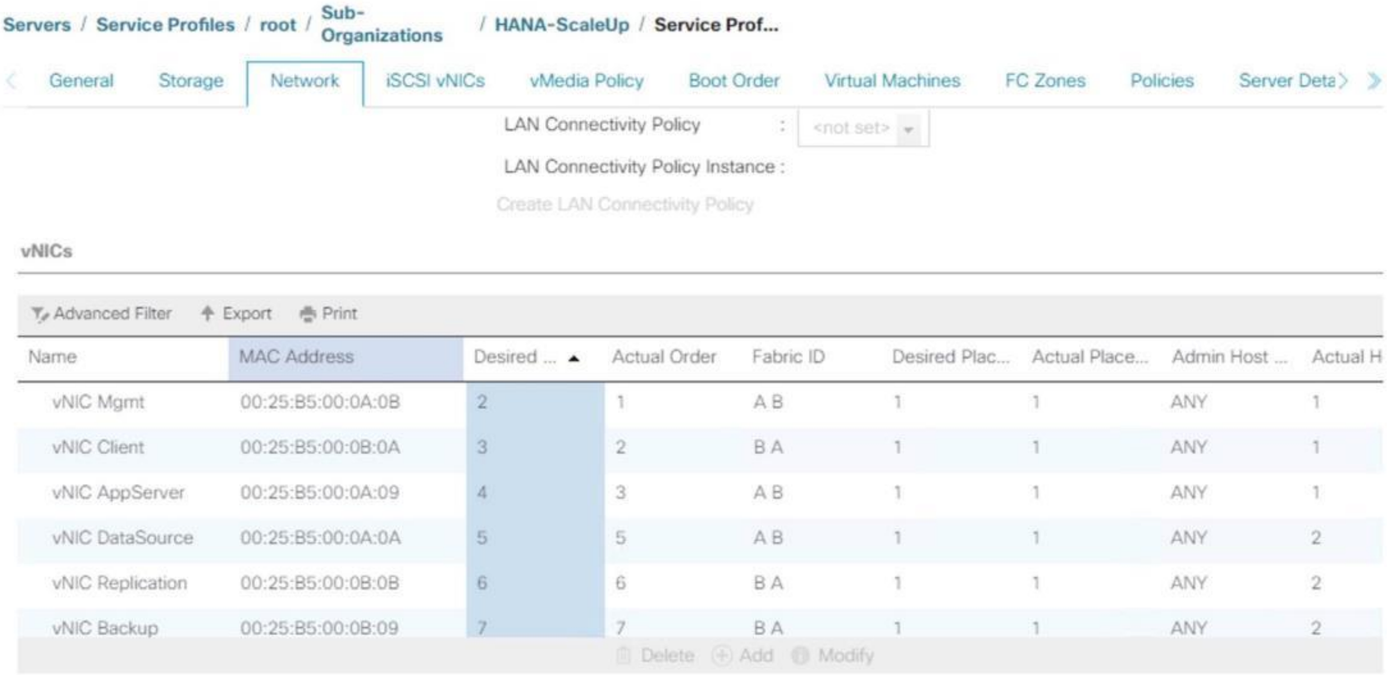
```
[root@cishana03 ~]# ip addr
lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen
1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default
qlen 1000
    link/ether 00:25:b5:00:0b:09 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default
qlen 1000
    link/ether 00:25:b5:00:0a:0a brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default
qlen 1000
    link/ether 00:25:b5:00:0b:0b brd ff:ff:ff:ff:ff:ff
5: eth3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default
qlen 1000
    link/ether 00:25:b5:00:0b:0a brd ff:ff:ff:ff:ff:ff
6: eth4: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default
qlen 1000
    link/ether 00:25:b5:00:0a:09 brd ff:ff:ff:ff:ff:ff
7: eth5: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9000 qdisc mq state UP group default
qlen 1000
    link/ether 00:25:b5:00:0a:0b brd ff:ff:ff:ff:ff:ff
```

9. In Cisco UCS Manager, click the Servers tab in the navigation pane.

10. Select Service Profile > root > Sub-Organization > T01-HANA > HANA-ScaleUp-03

11. On the main pane click Network; the list of the vNICs with MAC Address are listed.

Figure 127 Cisco UCS vNIC MAC Address



LAN Connectivity Policy : <not set>

LAN Connectivity Policy Instance :

vNICs

Name	MAC Address	Desired ...	Actual Order	Fabric ID	Desired Plac...	Actual Place...	Admin Host ...	Actual H
vNIC Mgmt	00:25:B5:00:0A:0B	2	1	A B	1	1	ANY	1
vNIC Client	00:25:B5:00:0B:0A	3	2	B A	1	1	ANY	1
vNIC AppServer	00:25:B5:00:0A:09	4	3	A B	1	1	ANY	1
vNIC DataSource	00:25:B5:00:0A:0A	5	5	A B	1	1	ANY	2
vNIC Replication	00:25:B5:00:0B:0B	6	6	B A	1	1	ANY	2
vNIC Backup	00:25:B5:00:0B:09	7	7	B A	1	1	ANY	2

12. Note the MAC Address of the HANA-Client vNIC is “00:25:B5:00:0B:0A”.

13. By comparing MAC Address on the OS and Cisco UCS, eth5 on OS will carry the VLAN for HANA-Client.

14. Go to network configuration directory and create a configuration for eth3:

```
cd /etc/sysconfig/network-scripts/
vi ifcfg-eth3

DEVICE=eth3
TYPE=Ethernet
ONBOOT=yes
BOOTPROTO=static
IPV6INIT=no
USERCTL=no
NM_CONTROLLED=no
IPADDR=192.168.221.103
IPADDR=<<IP address for HANA-Client network example:192.168.222.103>>
NETMASK=<<subnet mask for HANA-Client network 255.255.255.0>>
```

15. Repeat steps 12 through 18 for each vNIC interface.

16. Add default gateway:

```
vi /etc/sysconfig/network

NETWORKING=yes
HOSTNAME=<<HOSTNAME>>
GATEWAY=<<IP Address of default gateway>>
```

DNS

Domain Name Service configuration must be done based on the local requirements.

Add DNS Servers entry:

```
vi /etc/resolv.conf

nameserver <<IP of DNS Server1>>
nameserver <<IP of DNS Server2>>
search <<Domain_name>>
```

Hosts File

HANA nodes should be able to resolve internal network IP address, below is an example of Scale Up HANA System host file with the entire network defined in the /etc/hosts file.

```
root@cishana03 ~]# cat /etc/hosts
127.0.0.1   localhost localhost.localdomain localhost4 localhost4.localdomain4
::1         localhost localhost.localdomain localhost6 localhost6.localdomain6
192.168.93.103       cishana03m.ciscolab.local     cishana03m
192.168.222.103      cishana03c.ciscolab.local     cishana03c
192.168.223.103      cishana03.ciscolab.local      cishana03
192.168.224.103      cishana03d.ciscolab.local     cishana03d
192.168.225.103      cishana03r.ciscolab.local     cishana03r
192.168.221.103      cishana03b.ciscolab.local     cishana03b
```

RHEL 7.5 System Update and OS Customization for SAP HANA

To update and customize SAP HANA, follow these steps:

1. In order to patch the system, the repository must be updated. Note that the installed system doesn't include any update information. In order to patch the RedHat System, it must be registered and attached to a valid Subscription. The following line will register the installation and update the repository information.

```
subscription-manager register --auto-attach
Username: <<username>>
Password: <<password>>
```

2. If proxy server is required to access the internet, please update the proxy settings using

```
subscription-manager config --server.proxy_hostname=<<proxy_server_IP_address>>
subscription-manager config --server.proxy_port=<<proxy_server_port>>
```

3. Update only the OS kernel and firmware packages to the latest release that appeared in RHEL 7.5. Set the release version to 7.5

```
subscription-manager release –set=7.5
```

4. Add the repos required for SAP HANA.

```
subscription-manager repos --disable "*"
subscription-manager repos --enable rhel-7-server-rpms --enable rhel-sap-hana-for-
rhel-7-server-rpms
```

5. Apply the latest updates for RHEL 7.5 Typically, the kernel is updated as well:

```
yum -y update
```

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

```
yum -y install gtk2 libicu xulrunner sudo tcsh libssh2 expect cairo graphviz iptraf
krb5-workstation libpng12 krb5-libs nfs-utils lm_sensors rsyslog compat-sap-c++-*
openssl098e openssl PackageKit-gtk-module libcanberra-gtk2 libtool-ltdl xorg-x11-
xauth compat-libstdc++-33 numactl libuuid uuidd e2fsprogs icedtea-web xfsprogs net-
tools bind-utils glibc-devel libgomp
```

7. Disable SELinux:

```
sed -i 's/^SELINUX=enforcing/SELINUX=disabled/g' /etc/sysconfig/selinux
sed -i 's/^SELINUX=permissive/SELINUX=disabled/g' /etc/sysconfig/selinux
sed -i 's/^SELINUX=enforcing/SELINUX=disabled/g' /etc/selinux/config
sed -i 's/^SELINUX=permissive/SELINUX=disabled/g' /etc/selinux/config
```

8. For compatibility reasons, four symbolic links are required:

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

9. The Linux kernel shipped with RHEL 7 includes a cpuidle driver for recent Intel CPUs: intel_idle. This driver leads to a different behavior in C-states switching. The normal operating state is C0, when the processor is put to a higher C state, which saves power. But for low latency applications, the additional time needed to stop and start the execution of the code will cause performance degradations. Modify the file /etc/default/grub and append the following parameter to the line starting with GRUB_CMDLINE_LINUX:

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

10. To implement these changes, rebuild the GRUB2 configuration:

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

11. Turn off auto-numa balancing: SAP HANA is a NUMA (non-uniform memory access) aware database. Thus it does not rely on the Linux kernel's features to optimize NUMA usage automatically. Depending on the workload, it can be beneficial to turn off automatically NUMA balancing. For this purpose, add " kernel.numa_balancing = 0" to /etc/sysctl.d/sap_hana.conf (please create this file if it does not already exist) and reconfigure the kernel by running:

```
echo "kernel.numa_balancing = 0" >> /etc/sysctl.d/sap_hana.conf
sysctl -p /etc/sysctl.d/sap_hana.conf
```

12. The " numad" daemon must be disable:

```
systemctl stop numad
systemctl disable numad
```

13. Configure tuned to use profile " sap-hana." The tuned profile " sap-hana" , which is provided by Red Hat as part of RHEL 7 for SAP Solutions, contains many of the configures some additional settings. Therefore the " sap-hana" tuned profile must be activated on all systems running SAP HANA:

```
yum install tuned-profiles-sap-hana
systemctl start tuned
systemctl enable tuned
tuned-adm profile sap-hana
```

14. Disable ABRT, Crash Dump:

```
systemctl disable abrtd
systemctl disable abrt-ccpp
systemctl stop abrtd
systemctl stop abrt-ccpp
```

15. Disable core file creation. To disable core dumps for all users, open /etc/security/limits.conf, and add the line:

```
* soft core 0
* hard core 0
```

16. Enable group " sapsys" to create an unlimited number of processes:

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

17. Disable Firewall:

```
systemctl stop firewalld
systemctl disable firewalld
```

18. Reboot the OS by issuing `reboot` command.

19. Optional: old kernels can be removed after OS update:

```
package-cleanup --oldkernels --count=1 -y
```

The Operating System Installation and configurations documented in this CVD are from SAP Notes at the time of publication, for latest setting please follow the SAP Notes in the References section

Install Cisco eNIC and fNIC Driver

To download the Cisco UCS Drivers ISO bundle, which contains most of the Cisco UCS Virtual Interface Card drivers, follow these steps:

1. In a web browser, navigate to https://software.cisco.com/download/home/283853163/type/283853158/release/redhat

You must be signed in to download Cisco Unified Computing System (UCS) drivers.

2. After the download is complete browse to

   a. cisco-ucs-drivers-1.1901.1.0-redhat.iso\7.5\network\cisco\vic\3.1.137.5 and copy kmod-enic-3.1.137.5-700.16.rhel7u5.x86_64.rpm to HANA server

   b. cisco-ucs-drivers-1.1901.1.0-redhat.iso\7.5\storage\cisco\vic\1.6.0.47 and copy kmod-fnic-1.6.0.47-rhel7u5.el7.x86_64.rpm to HANA server

3. ssh to the Server as root.

4. Update the enic driver with below command

```
rpm -Uvh kmod-enic-3.1.137.5-700.16.rhel7u5.x86_64.rpm
```

5. Update the fnic driver with below command

```
rpm -Uvh kmod-fnic-1.6.0.47-rhel7u5.el7.x86_64.rpm
```

Network Time

The configuration of NTP is important and must be performed on all systems. To configure network time, follow these steps:

1. Install NTP-server with utilities.

```
yum -y install ntp ntpdate
```

2. Configure NTP by adding at least one NTP server to the NTP config file /etc/ntp.conf.

```
vi /etc/ntp.conf
server <<var_oob_ntp>>
```

3. Stop the NTP services and update the NTP Servers.

```
systemctl stop ntpd
ntpdate ntp.example.com
```

4. Start NTP service and configure it to be started automatically.

```
systemctl enable ntpd.service
systemctl start ntpd.service
systemctl restart systemd-timedated.service
```

Multipath Configuration

This reference architecture uses Device-mapper Multipath, a native component of the Linux operating system. Using Device-mapper Multipath allows the configuration of multiple I/O paths between the server blades and storages.

Each node has two I/O paths connected with the storage. Multipathing aggregates all physical I/O paths into a single logical path. The LUNs are always available unless both paths fail.

Device-mapper Multipath is used for the following I/O paths:

- SAP HANA server boot volume

- SAP HANA data volume
- SAP HANA log volume
- SAP HANA shared volume

1. ssh to the Server as root.
2. Create the following entry in /etc/multipath.conf:

```
vi /etc/multipath.conf

defaults {
   find_multipaths yes
   user_friendly_names yes
}
blacklist {
    devnode                   "^(ram|raw|loop|fd|md|dm-|sr|scd|st)[0-9]*"
    devnode                   "^hd[a-z]"
    devnode                   "^dcssblk[0-9]*"
}
devices {
   device {
            vendor               "HITACHI"
            product                    ".*"
            user_friendly_names        no
            path_checker         directio
            path_grouping_policy multibus
            path_selector        "queue-length 0"
            uid_attribute              ID_SERIAL
            failback                   immediate
            rr_weight                  uniform
            rr_min_io_rq               1
            features                   0
            no_path_retry              5
}
}
```

3. Restart the multipath daemon and enable to start at the boot:

```
systemctl stop multipathd
systemctl start multipathd
systemctl enable multipathd
```

4. Check the status of multipath devices using multipath –ll:

```
multipath -ll

360060e8012ccbc005040ccbc00000027 dm-8 HITACHI ,OPEN-V
size=100G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:0 sda  8:0    active ready running
  |- 3:0:1:0 sdk  8:160  active ready running
  |- 6:0:0:0 sdu  65:64  active ready running
  `- 6:0:1:0 sdae 65:224 active ready running
360060e8012ccbc005040ccbc0000003b dm-0 HITACHI ,OPEN-V
```

```
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:9 sdj  8:144  active ready running
  |- 3:0:1:9 sdt  65:48  active ready running
  |- 6:0:0:9 sdad 65:208 active ready running
  `- 6:0:1:9 sdan 66:112 active ready running
360060e8012ccbc005040ccbc0000003a dm-5 HITACHI ,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:8 sdi  8:128  active ready running
  |- 3:0:1:8 sds  65:32  active ready running
  |- 6:0:0:8 sdac 65:192 active ready running
  `- 6:0:1:8 sdam 66:96  active ready running
360060e8012ccbc005040ccbc00000039 dm-1 HITACHI ,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:7 sdh  8:112  active ready running
  |- 3:0:1:7 sdr  65:16  active ready running
  |- 6:0:0:7 sdab 65:176 active ready running
  `- 6:0:1:7 sdal 66:80  active ready running
360060e8012ccbc005040ccbc00000038 dm-4 HITACHI ,OPEN-V
size=384G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:6 sdg  8:96   active ready running
  |- 3:0:1:6 sdq  65:0   active ready running
  |- 6:0:0:6 sdaa 65:160 active ready running
  `- 6:0:1:6 sdak 66:64  active ready running
360060e8012ccbc005040ccbc00000023 dm-6 HITACHI ,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:5 sdf  8:80   active ready running
  |- 3:0:1:5 sdp  8:240  active ready running
  |- 6:0:0:5 sdz  65:144 active ready running
  `- 6:0:1:5 sdaj 66:48  active ready running
360060e8012ccbc005040ccbc00000022 dm-2 HITACHI ,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:4 sde  8:64   active ready running
  |- 3:0:1:4 sdo  8:224  active ready running
  |- 6:0:0:4 sdy  65:128 active ready running
  `- 6:0:1:4 sdai 66:32  active ready running
360060e8012ccbc005040ccbc00000021 dm-7 HITACHI ,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:3 sdd  8:48   active ready running
  |- 3:0:1:3 sdn  8:208  active ready running
  |- 6:0:0:3 sdx  65:112 active ready running
  `- 6:0:1:3 sdah 66:16  active ready running
360060e8012ccbc005040ccbc00000020 dm-3 HITACHI ,OPEN-V
size=128G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:2 sdc  8:32   active ready running
  |- 3:0:1:2 sdm  8:192  active ready running
  |- 6:0:0:2 sdw  65:96  active ready running
  `- 6:0:1:2 sdag 66:0   active ready running
360060e8012ccbc005040ccbc0000002b dm-9 HITACHI ,OPEN-V
size=1.0T features='1 queue_if_no_path' hwhandler='0' wp=rw
```

```
`-+- policy='queue-length 0' prio=1 status=active
  |- 3:0:0:1 sdb  8:16   active ready running
  |- 3:0:1:1 sdl  8:176  active ready running
  |- 6:0:0:1 sdv  65:80  active ready running
  `- 6:0:1:1 sdaf 65:240 active ready running
```

Configure HANA Persistent Storage Volume Configuration

For both operating systems, SUSE Linux Enterprise Server for SAP Applications and Red Hat Enterprise Linux, Hitachi uses an LVM-based storage layout. Once installing the operating system and correctly configuring multipathing, you can see the assigned LUNs in the directories:

```
/dev/mapper
/dev/disk/by-id
```

For example:

```
/dev/mapper/360060e801227fc00504027fc00000101
/dev/disk/by-id/scsi-360060e801227fc00504027fc00000101
```

The last 6 digits of this number indicates the LDEV ID you have used during the LUN assignment. In the example above, 000101 maps to LDEV ID: 00:01:01.

For all the LUNs besides of the one hosting the operating system, you need to initialize the LUNs for use by LVM, running the pvcreate command, which is part of the lvm2 rpm package, for example:

```
pvcreate -ff -y /dev/mapper/360060e801227fc00504027fc00000101
```

After you have prepared all the LUNs, you need to configure the volume groups using the vgcreate command. The names for the volume group differs between scale-up and scale-out installations.

- The volume groups for scale-up use vgdata, vglog, vgshared.

The command to create the volume group takes no specific options. The following example creates the volume group for SAP HANA log in a scale-up scenario using 4 physical disks / LUNs:

```
vgcreate vglog /dev/mapper/360060e801227fc00504027fc0000010[2,3,4,5]
```

For creating other volume groups, use the same syntax, exchanging the volume group name as well as the physical disks or LUNs.

Once creating the volume groups, you need to create a logical volume on top. The general syntax is the following:

```
lvcreate --yes --extents=100%VG --stripes <# luns> --stripesize 1024 --name <lv name> <volume group>
```

Use Table 23 to complete the creation of logical volumes.

Table 23 Details for Creating Logical Volumes

	Number of LUNs	lv Name	vg Name
DATA	4 - following this reference architecture, or the number of assigned LUNs	lvdata	Scale-up: vgdata
LOG	4 - following this reference architecture, or the number of assigned LUNs	lvlog	Scale-up: vglog

	Number of LUNs	lv Name	vg Name
SHARED	1 - following this reference architecture, or the number of assigned LUNs	lvshared	Scale-up: vgshared

If you only use 1 LUN to create the logical volumes for data, log, or shared, the options --stripes and --stripesize are not needed.

Create the file system on top of the logical volume. Hitachi storage arrays use the XFS file system. In Table 24 , find the options to create and mount the file system.

Table 24 File System Create and Mount Options

	System Type	Create Options	Mount Options	Mount Point
DATA	Scale-up	-F	inode64, nobarrier	/hana/data
LOG	Scale-up	-F	inode64, nobarrier	/hana/log
SHARED	Scale-up	-F	inode64, nobarrier	/hana/shared

To create a file system, use the following command:

```
mkfs.xfs <create options> /dev/mapper/<vg name>-<lv name>
```

For example:

```
mkfs.xfs -F /dev/mapper/vglog-lvlog
```

SAP HANA Persistent Storage Volume Configuration for Scale-Up Deployments

For scale-up systems, you need to persist the file systems, including the mount options, in one of the operating system's startup file, /etc/fstab/, to mount the file systems automatically during boot operations.

Add the following entry for each filesystem to /etc/fstab:

```
/dev/mapper/<vg name>-<lv name> <mount point> xfs <mount options> 0 0
```

Refer to Table 22 and Table 22 for volume group and logical volume names as well as the mount options.

Configuration Example on SUSE Linux Enterprise Server for SAP Applications

List of assigned LUNs:

```
cishana02:/dev/mapper # cd /dev/mapper/
cishana02:/dev/mapper # ll
total 0
lrwxrwxrwx 1 root root       8 Mar 26 19:19 360060e8012ccbc005040ccbc00000018 ->
../dm-10
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000019 ->
../dm-5
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc0000001a ->
../dm-0
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc0000001b ->
../dm-1
```

```
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000025 ->
../dm-7
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000025_part1
-> ../dm-9
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000025-part1
-> ../dm-9
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000029 ->
../dm-8
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000030 ->
../dm-3
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000031 ->
../dm-6
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000032 ->
../dm-4
lrwxrwxrwx 1 root root       7 Mar 26 19:19 360060e8012ccbc005040ccbc00000033 ->
../dm-2
crw------- 1 root root 10, 236 Mar 26 19:19 control
```

Initialize the LUNs using pvcreate:

```
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000018
  Physical volume "360060e8012ccbc005040ccbc00000018" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000019
  Physical volume "360060e8012ccbc005040ccbc00000019" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc0000001a
  Physical volume "360060e8012ccbc005040ccbc0000001a" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc0000001b
  Physical volume "360060e8012ccbc005040ccbc0000001b" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000029
  Physical volume "360060e8012ccbc005040ccbc00000029" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000030
  Physical volume "360060e8012ccbc005040ccbc00000030" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000031
  Physical volume "360060e8012ccbc005040ccbc00000031" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000032
  Physical volume "360060e8012ccbc005040ccbc00000032" successfully created.
cishana02:/dev/mapper # pvcreate -ff -y 360060e8012ccbc005040ccbc00000033
  Physical volume "360060e8012ccbc005040ccbc00000033" successfully created.
```

Create volume group for data:

```
cishana02:/dev/mapper # vgcreate vgdata
/dev/mapper/360060e8012ccbc005040ccbc0000003[0,1,2,3]
  Volume group "vgdata" successfully created
```

Create volume group for log:

```
cishana02:/dev/mapper # vgcreate vglog
/dev/mapper/360060e8012ccbc005040ccbc0000001[8,9,a,b]
  Volume group "vglog" successfully created
```

Create volume group for shared:

```
cishana02:/dev/mapper # vgcreate vgshared
/dev/mapper/360060e8012ccbc005040ccbc00000029
  Volume group "vgshared" successfully created
```

Create logical volume for data:

```
cishana02:/dev/mapper # lvcreate --yes --extents=100%VG --stripes 4 --stripesize
1024 --name lvdata vgdata
  Logical volume "lvdata" created.
```

Create logical volume for log:

```
cishana02:/dev/mapper # lvcreate --yes --extents=100%VG --stripes 4 --stripesize
1024 --name lvlog vglog
  Logical volume "lvlog" created.
```

Create logical volume for shared:

```
cishana02:/dev/mapper # lvcreate --yes --extents=100%VG --name lvshared vgshared
  Logical volume "lvshared" created.
```

Create filesystem for data:

```
cishana02:/dev/mapper # mkfs.xfs -f /dev/mapper/vgdata-lvdata
meta-data=/dev/mapper/vgdata-lvdata isize=512    agcount=33, agsize=12582656 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0, rmapbt=0,
reflink=0
data     =                       bsize=4096   blocks=402649088, imaxpct=5
         =                       sunit=256    swidth=1024 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=196608, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

Create filesystem for log:

```
cishana02:/dev/mapper # mkfs.xfs -f /dev/mapper/vglog-lvlog
meta-data=/dev/mapper/vglog-lvlog isize=512    agcount=16, agsize=8388352 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0, rmapbt=0,
reflink=0
data     =                       bsize=4096   blocks=134213632, imaxpct=25
         =                       sunit=256    swidth=1024 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=65536, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

Create filesystem for shared:

```
cishana02:/dev/mapper # mkfs.xfs -f /dev/mapper/vgshared-lvshared
meta-data=/dev/mapper/vgshared-lvshared isize=512    agcount=4, agsize=67108608 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0, rmapbt=0,
reflink=0
data     =                       bsize=4096   blocks=268434432, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=131071, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

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

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

Add the following entry to /etc/fstab:

```
#HANA Volume
/dev/mapper/vgshared-lvshared    /hana/shared      xfs   inode64,nobarrier 0 0
/dev/mapper/vgdata-lvdata        /hana/data        xfs   inode64,nobarrier 0 0
/dev/mapper/vglog-lvlog          /hana/log         xfs   inode64,nobarrier 0 0
```

Use the following command to mount the file systems from /etc/fstab:

```
mount -a
```

Use the df –h command to check the status of all mounted volumes:

```
cishana02:/ # df -h
Filesystem                                         Size  Used Avail Use% Mounted
on
devtmpfs                                           756G     0  756G   0% /dev
tmpfs                                              1.2T     0  1.2T   0% /dev/shm
tmpfs                                              756G   13M  756G   1% /run
tmpfs                                              756G     0  756G   0%
/sys/fs/cgroup
/dev/mapper/360060e8012ccbc005040ccbc00000025-part1  98G  5.3G   92G   6% /
tmpfs                                              152G     0  152G   0%
/run/user/0
/dev/mapper/vgshared-lvshared                      1.0T   33M  1.0T   1%
/hana/shared
/dev/mapper/vgdata-lvdata                          1.5T   34M  1.5T   1%
/hana/data
/dev/mapper/vglog-lvlog                            512G   33M  512G   1% /hana/log
```

Change the directory permissions before installing SAP HANA. Use the chmod command on each volume after the file systems are mounted:

```
chmod -R 777 /hana/data/
chmod -R 777 /hana/log
chmod -R 777 /hana/shared/
```

Configuration Example on Red Hat Enterprise Linux

List of assigned LUNs:

```
[root@cishana04 mapper]# cd /dev/mapper/
[root@cishana04 mapper]# ll
total 0
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000020 ->
../dm-3
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000021 ->
../dm-7
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000022 ->
../dm-2
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000023 ->
../dm-6
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000027 ->
../dm-8
```

```
lrwxrwxrwx 1 root root       8 Mar 26 19:16 360060e8012ccbc005040ccbc00000027p1 ->
../dm-10
lrwxrwxrwx 1 root root       8 Mar 26 19:16 360060e8012ccbc005040ccbc00000027p2 ->
../dm-11
lrwxrwxrwx 1 root root       8 Mar 26 19:16 360060e8012ccbc005040ccbc00000027p3 ->
../dm-12
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc0000002b ->
../dm-9
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000038 ->
../dm-4
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc00000039 ->
../dm-1
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc0000003a ->
../dm-5
lrwxrwxrwx 1 root root       7 Mar 26 19:16 360060e8012ccbc005040ccbc0000003b ->
../dm-0
crw------- 1 root root 10, 236 Mar 22 19:23 control
```

Initialize the LUNs using pvcreate:

```
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc00000020
  Physical volume "360060e8012ccbc005040ccbc00000020" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc00000021
  Physical volume "360060e8012ccbc005040ccbc00000021" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc00000022
  Physical volume "360060e8012ccbc005040ccbc00000022" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc00000023
  Physical volume "360060e8012ccbc005040ccbc00000023" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc0000002b
  Physical volume "360060e8012ccbc005040ccbc0000002b" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc00000038
  Physical volume "360060e8012ccbc005040ccbc00000038" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc00000039
  Physical volume "360060e8012ccbc005040ccbc00000039" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc0000003a
  Physical volume "360060e8012ccbc005040ccbc0000003a" successfully created.
[root@cishana04 mapper]# pvcreate -ff -y 360060e8012ccbc005040ccbc0000003b
  Physical volume "360060e8012ccbc005040ccbc0000003b" successfully created.
```

Create volume group for data:

```
[root@cishana04 mapper]# vgcreate vgdata
/dev/mapper/360060e8012ccbc005040ccbc0000003[8,9,a,b]
  Volume group "vgdata" successfully created
```

Create volume group for log:

```
[root@cishana04 mapper]# vgcreate vglog
/dev/mapper/360060e8012ccbc005040ccbc0000002[0,1,2,3]
  Volume group "vglog" successfully created
```

Create volume group for shared:

```
[root@cishana04 mapper]# vgcreate vgshared
/dev/mapper/360060e8012ccbc005040ccbc0000002b
  Volume group "vgshared" successfully created
```

Create logical volume for data:

```
[root@cishana04 mapper]# lvcreate --yes --extents=100%VG --stripes 4 --stripesize
1024 --name lvdata vgdata
  Logical volume "lvdata" created.
```

Create logical volume for log:

```
[root@cishana04 mapper]# lvcreate --yes --extents=100%VG --stripes 4 --stripesize
1024 --name lvlog vglog
  Logical volume "lvlog" created.
```

Create logical volume for shared:

```
[root@cishana04 mapper]# lvcreate --yes --extents=100%VG --name lvshared vgshared
  Logical volume "lvshared" created.
```

Create filesystem for data:

```
[root@cishana04 mapper]# mkfs.xfs -f /dev/mapper/vgdata-lvdata
meta-data=/dev/mapper/vgdata-lvdata isize=512    agcount=33, agsize=12582656 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0
data     =                       bsize=4096   blocks=402649088, imaxpct=5
         =                       sunit=256    swidth=1024 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=196608, version=2
         =                       sectsz=512   sunit=8 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

Create filesystem for log:

```
[root@cishana04 mapper]# mkfs.xfs -f /dev/mapper/vglog-lvlog
meta-data=/dev/mapper/vglog-lvlog isize=512    agcount=16, agsize=8388352 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0
data     =                       bsize=4096   blocks=134213632, imaxpct=25
         =                       sunit=256    swidth=1024 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=65536, version=2
         =                       sectsz=512   sunit=8 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

Create filesystem for shared:

```
[root@cishana04 mapper]# mkfs.xfs -f /dev/mapper/vgshared-lvshared
meta-data=/dev/mapper/vgshared-lvshared isize=512    agcount=4, agsize=67108608 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0
data     =                       bsize=4096   blocks=268434432, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=131071, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

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

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

Add the following entry to /etc/fstab:

```
#HANA Volume
/dev/mapper/vgshared-lvshared    /hana/shared      xfs   inode64,nobarrier 0 0
/dev/mapper/vgdata-lvdata        /hana/data        xfs   inode64,nobarrier 0 0
/dev/mapper/vglog-lvlog          /hana/log         xfs   inode64,nobarrier 0 0
```

Use the following command to mount the file systems from /etc/fstab:

```
mount -a
```

Use the df –h command to check the status of all mounted volumes:

```
 [root@cishana04 mapper]# df -h
Filesystem                       Size  Used Avail Use% Mounted on
/dev/mapper/mpatha2               96G  2.4G   89G   3% /
devtmpfs                         756G     0  756G   0% /dev
tmpfs                            756G     0  756G   0% /dev/shm
tmpfs                            756G   20M  756G   1% /run
tmpfs                            756G     0  756G   0% /sys/fs/cgroup
/dev/mapper/mpatha1              976M  138M  787M  15% /boot
tmpfs                            152G     0  152G   0% /run/user/0
/dev/mapper/vgshared-lvshared    1.0T   33M  1.0T   1% /hana/shared
/dev/mapper/vgdata-lvdata        1.5T   34M  1.5T   1% /hana/data
/dev/mapper/vglog-lvlog          512G   33M  512G   1% /hana/log
```

Change the directory permissions before installing SAP HANA. Use the chmod command on each volume after the file systems are mounted:

```
chmod -R 777 /hana/data/
chmod -R 777 /hana/log
chmod -R 777 /hana/shared/
```

SAP HANA Installation

Please refer to the official SAP documentation which describes the installation process with and without the SAP unified installer.

Please refer to Important SAP Notes in the References section.

SAP HANA Server Installation Guide

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

HDBPARAM Parameters

The following parameters were set on the HANA system. These parameters change I/O behavior and enhance the database behavior for the Hitachi storage.

For Data and Log Volumes use the following hdbparams:

```
max_parallel_io_requests = 512
max_submit_batch_size = 384
size_kernel_io_queue = 1024
async_read_submit = on
```

```
async_write_submit_blocks = all
min_submit_batch_size = 16
async_write_submit_active = on
```

SAP HANA 1.0

In order to use these parameters in SAP HANA you need to run the following commands in the Linux shell as <sid>adm user:

```
hdbparam --paramset fileio [DATA].max_parallel_io_requests=512
hdbparam --paramset fileio [DATA].max_submit_batch_size=384
hdbparam --paramset fileio [DATA].size_kernel_io_queue=1024
hdbparam --paramset fileio [DATA].async_read_submit=on
hdbparam --paramset fileio [DATA].async_write_submit_blocks=all
hdbparam --paramset fileio [DATA].min_submit_batch_size=16
hdbparam --paramset fileio [DATA].async_write_submit_active=on
hdbparam --paramset fileio [LOG].max_parallel_io_requests=512
hdbparam --paramset fileio [LOG].max_submit_batch_size=384
hdbparam --paramset fileio [LOG].size_kernel_io_queue=1024
hdbparam --paramset fileio [LOG].async_read_submit=on
hdbparam --paramset fileio [LOG].async_write_submit_blocks=all
hdbparam --paramset fileio [LOG].min_submit_batch_size=16
hdbparam --paramset fileio [LOG].async_write_submit_active=on
```

SAP HANA 2.0

With HANA 2.0, global.ini is used to set the parameter vector for optimal storage performance. Add the following parameters in the /hana/shared/<SID>/global/hdb/custom/config/global.ini:

```
max_parallel_io_requests = 512
max_submit_batch_size = 384
size_kernel_io_queue = 1024
async_read_submit = on
async_write_submit_blocks = all
min_submit_batch_size = 16
async_write_submit_active = on
```

Please restart the HANA Database for the configuration to take effect.

References

Certified SAP HANA Hardware Directory

Certified SAP HANA Hardware Directory: Enterprise Storage

SAP HANA TDI Documentation

- SAP HANA TDI: Overview
- SAP HANA TDI: FAQ
- SAP HANA TDI: Storage Requirements
- SAP HANA TDI: Network Requirements

Important SAP Notes

Read the following SAP Notes before you start the HANA 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 here: https://service.sap.com/notes.

SAP HANA IMDB Related Notes

SAP Note 1514967 - SAP HANA: Central Note

SAP Note 1523337 - SAP HANA Database: Central Note

SAP Note 2000003 - FAQ: SAP HANA

SAP Note 1780950 - Connection problems due to host name resolution

SAP Note 1755396 - Released 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

Linux Related Notes

SAP Note 2235581 - SAP HANA: Supported Operating Systems

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

SAP Note 1984787 - SUSE LINUX Enterprise Server 12: Installation notes

SAP Note 1275776 - Linux: Preparing SLES for SAP environments

SAP Note 2382421- Optimizing the Network Configuration on HANA- and OS-Level

SAP Note 2002167 - Red Hat Enterprise Linux 7.x: Installation and Upgrade

SAP Note 2292690 - SAP HANA DB: Recommended OS settings for RHEL 7

SAP Note 2009879 - SAP HANA Guidelines for RedHat Enterprise Linux (RHEL)

SAP Note 1944799 - SAP HANA Guidelines for SLES Operating System

SAP Note 1731000 - Non-recommended configuration changes

SAP Note 1557506 - Linux paging improvements

SAP Note 1829651 - Time zone settings in SAP HANA scale out landscapes

SAP Application Related Notes

SAP Note 1658845 - SAP HANA DB hardware check

SAP Note 1681092 - Support for multiple SAP HANA databases one HANA aka Multi SID

SAP Note 1577128 - Supported clients for SAP HANA

SAP Note 2186744 - FAQ: SAP HANA Parameters

SAP Note 1943937 - Hardware Configuration Check Tool - Central Note

SAP Note 2267798 - Configuration of the SAP HANA Database during Installation Using hdbparam

SAP Note 2156526 - Parameter constraint validation on section indices does not work correctly with hdbparam

SAP Note 2399079 - Elimination of hdbparam in HANA 2

Cisco

MDS Best Practices: https://www.cisco.com/c/en/us/products/collateral/storage-networking/mds-9700-series-multilayer-directors/white-paper-c11-738426.html

Cisco MDS 9000 Series Interfaces Configuration Guide, Release: 8.xhttps://www.cisco.com/c/en/us/td/docs/switches/datacenter/mds9000/sw/8_x/config/interfaces/cisco_mds9000_interfaces_config_guide_8x.html

Nexus vPC Best Practices: https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/sw/design/vpc_design/vpc_best_practices_design_guide.pdf

Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide, Release 7.x: https://www.cisco.com/c/en/us/td/docs/switches/datacenter/nexus9000/sw/7-x/interfaces/configuration/guide/b_Cisco_Nexus_9000_Series_NX-OS_Interfaces_Configuration_Guide_7x.html

Cisco UCS Best Practices: https://www.cisco.com/c/en/us/products/collateral/servers-unified-computing/ucs-manager/whitepaper_c11-697337.html

Cisco UCS Performance and Tuning: https://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/whitepaper_c11-740098.pdf

Cisco UCS 6454 Spec Sheet https://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/ucs-6454-fab-int-specsheet.pdf

Cisco UCS 6300 Spec Sheet https://www.cisco.com/c/dam/en/us/products/collateral/servers-unified-computing/ucs-b-series-blade-servers/6332-specsheet.pdf

Cisco UCS: Design Zone for SAP Applications (technical documentation)

Cisco UCS: Data Center Solutions for SAP (customer references)

Hitachi Storage

Hitachi Virtual Storage Platform F Series:

https://www.hitachivantara.com/en-us/pdf/datasheet/vsp-f-series-all-flash-enterprise-cloud-solutions-datasheet.pdf

Hitachi Virtual Storage Platform G Series:

https://www.hitachivantara.com/en-us/pdf/datasheet/vsp-g-series-hybrid-flash-midrange-cloud-solutions-datasheet.pdf

SAP HANA Tailored Data Center Integration with Hitachi VSP F/G Storage Systems and SVOS RF

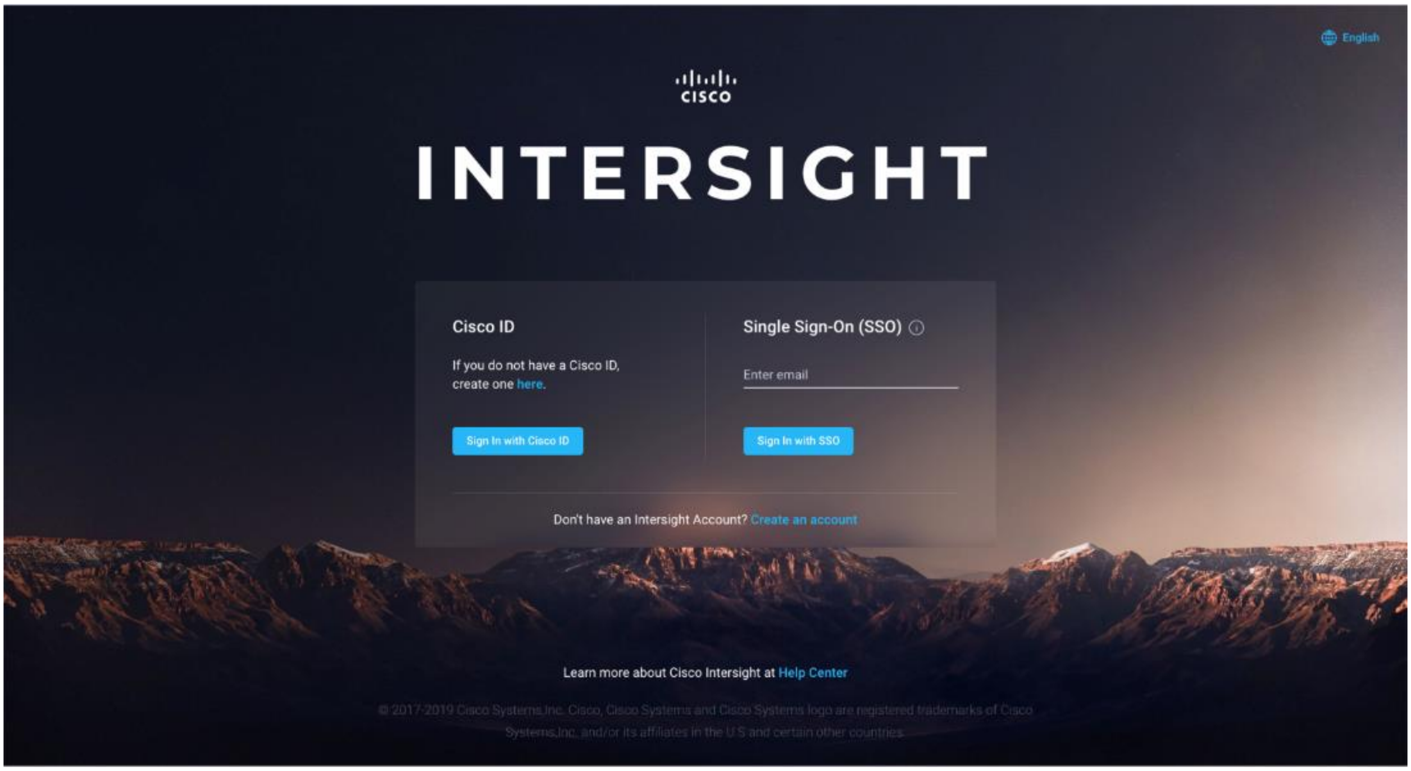
https://www.hitachivantara.com/en-us/pdfd/architecture-guide/sap-hana-tdi-on-vsp-g-series-vsp-f-series-with-svos-reference-architecture-guide.pdf

Cisco Intersight Registration

Cisco Intersight gives manageability and visibility to multiple UCS domains through a common interface, regardless of location. The Base addition is available for UCSM starting at release 3.2(1) at no additional cost.

To add the Cisco UCS Fabric Interconnects into Intersight, follow these steps:

1. Connect to https://www.intersight.com.



If you do not have a Cisco ID, create one here.

Don't have an Intersight Account? Create an account

Learn more about Cisco Intersight at Help Center

Prerequisites

The following prerequisites are necessary to setup access to Cisco Intersight:

1. An account on cisco.com.
2. A valid Cisco Intersight account. This can be created by navigating to https://intersight.com and following the instructions for creating an account. The account creation requires at least one device to be registered in Intersight and requires Device ID and Claim ID information from the device. See Collecting Information From Cisco UCS Domain for an example of how to get Device ID and Claim ID from Cisco UCS Fabric Interconnect devices.
3. Valid License on Cisco Intersight – see Cisco Intersight Licensing section below for more information.
4. Cisco UCS Fabric Interconnects must be able to do a DNS lookup to access Cisco Intersight.
5. Device Connectors on Fabric Interconnects must be able to resolve *svc.ucs-connect.com*.

6. Allow outbound HTTPS connections (port 443) initiated from the Device Connectors on Fabric Interconnects to Cisco Intersight. HTTP Proxy is supported.

Setup Information

To setup access to Cisco Intersight, the following information must be collected from the Cisco UCS Domain. The deployment steps provided below will show how to collect this information.

- Device ID
- Claim Code

Cisco Intersight Licensing

Cisco Intersight is offered in two editions:

- Base license which is free to use, and offers a large variety of monitoring, inventory and reporting features.
- Essentials license, at an added cost but provides advanced monitoring, server policy and profile configuration, firmware management, virtual KVM features, and more. A 90-day trial of the Essentials license is available for use as an evaluation period.

New features and capabilities will be added to the different licensing tiers in future release.

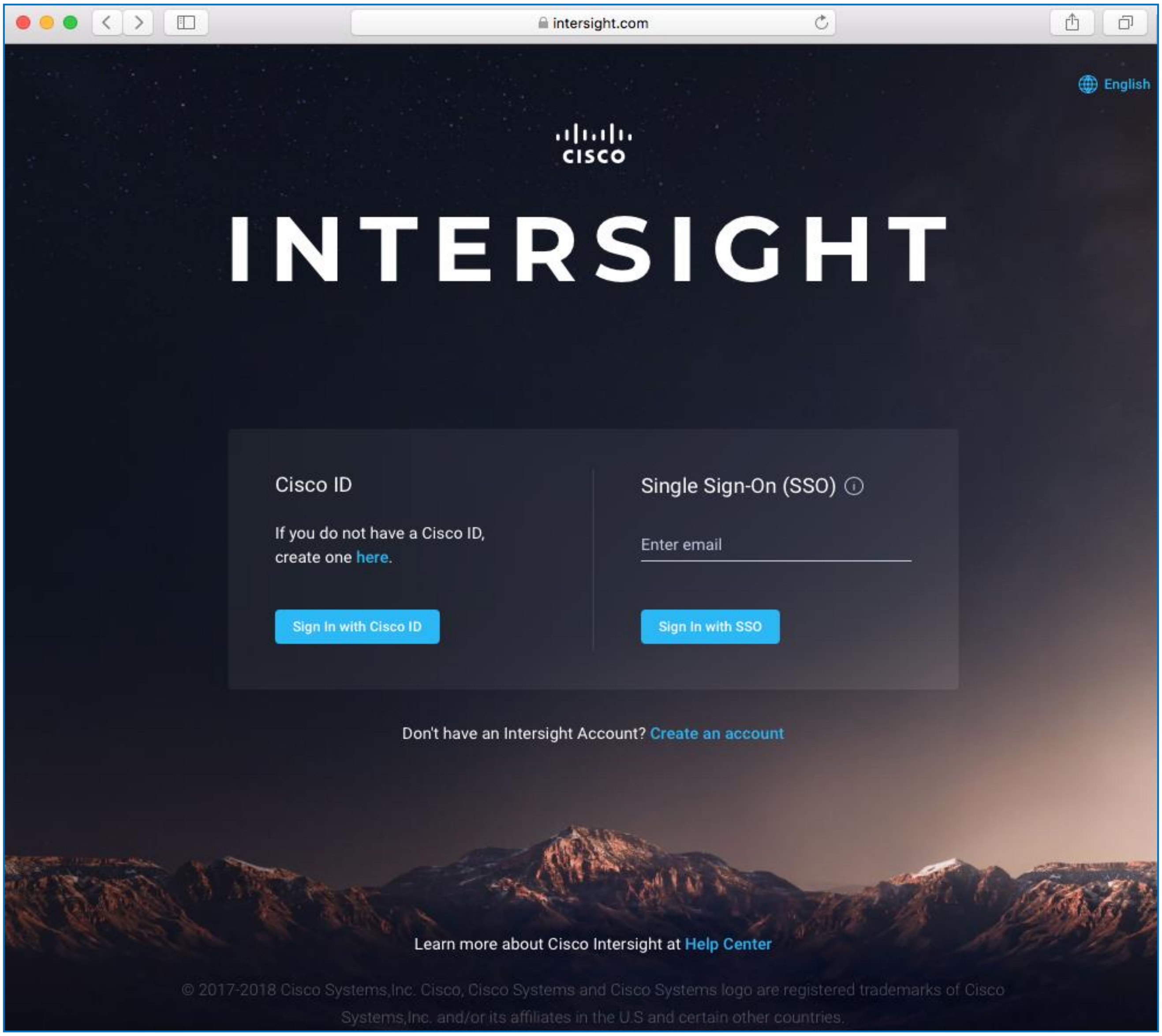
Deployment Steps

To setup access to Cisco Intersight from a Cisco UCS domain, complete the steps outlined in this section.

Connect to Cisco Intersight

To connect and access Cisco Intersight, follow these steps:

1. Use a web browser to navigate to Cisco Intersight at https://intersight.com/.



If you do not have a Cisco ID, create one here.

Don't have an Intersight Account? Create an account

Learn more about Cisco Intersight at Help Center

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2. Login with a valid cisco.com account or single sign-on using your corporate authentication.

Collect Information from UCS Domain

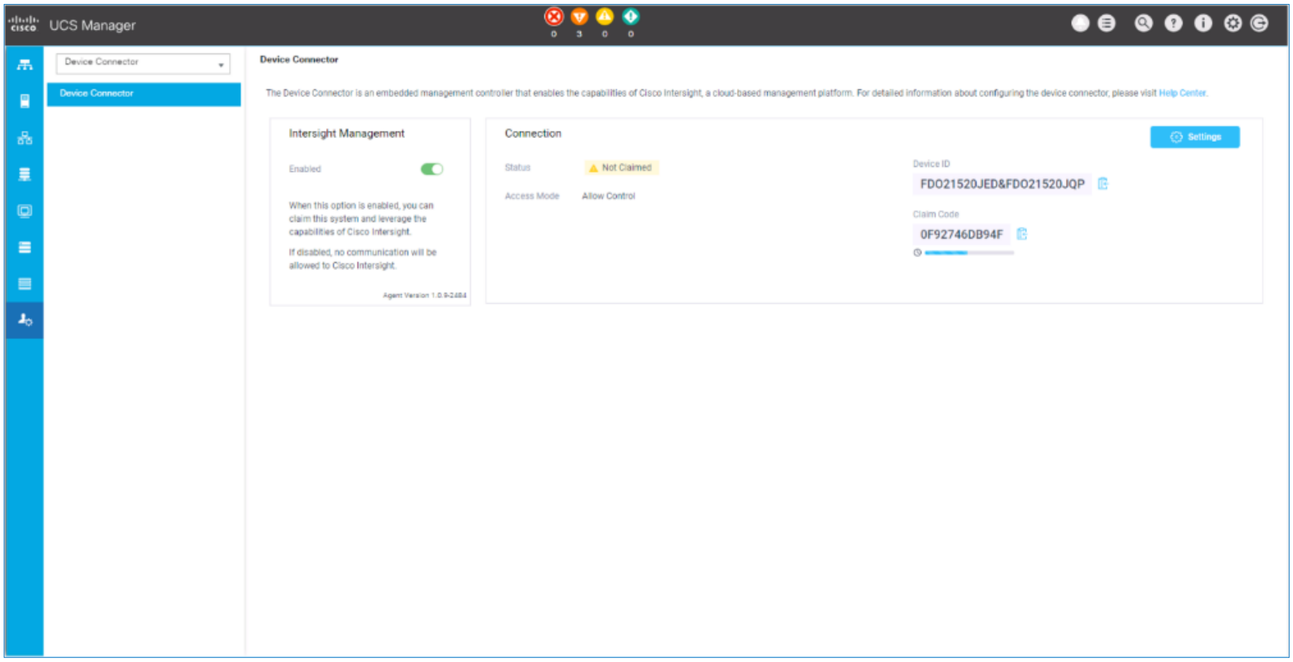
To collect information from Cisco UCS Fabric Interconnects to setup access to Cisco Intersight, follow these steps:

1. Use a web browser to navigate to the UCS Manager GUI. Login using the admin account.

2. From the left navigation menu, select the Admin icon.

3. From the left navigation pane, select All > Device Connector.

4. In the right window pane, for Intersight Management, click Enabled to enable Intersight management.



Device Connector

The Device Connector is an embedded management controller that enables the capabilities of Cisco Intersight, a cloud-based management platform. For detailed information about configuring the device connector, please visit Help Center.

Intersight Management

Enabled

When this option is enabled, you can claim this system and leverage the capabilities of Cisco Intersight.

If disabled, no communication will be allowed to Cisco Intersight.

Agent Version 1.0.9-2484

Connection

Status: Not Claimed

Access Mode: Allow Control

Device ID: FDO21520JED&FDO21520JQP

Claim Code: 0F92746DB94F

5. From the Connection section, copy the Device ID and Claim ID information. This information will be required to add this device to Cisco Intersight.

6. (Optional) Click Settings to change Access Mode and to configure HTTPS Proxy.

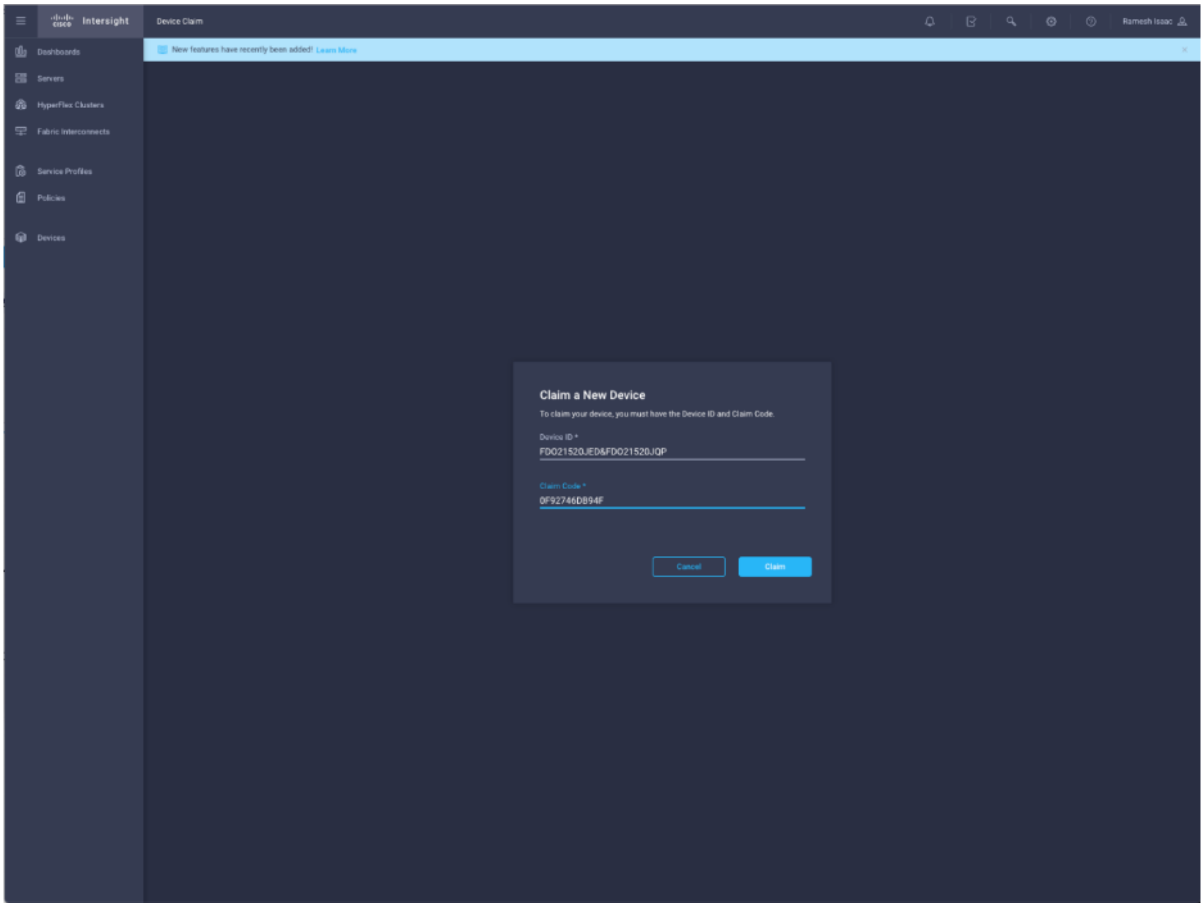
Add Cisco UCS Domain to Cisco Intersight

To add Cisco UCS Fabric Interconnects to Cisco Intersight to manage the UCS domain, follow these steps:

1. From Cisco Intersight, in the left navigation menu, select Devices.

2. Click the Claim a New Device button in the top right-hand corner.

3. In the Claim a New Device pop-up window, paste the Device ID and Claim Code collected in the previous section.



New features have recently been added! Learn More

Claim a New Device

To claim your device, you must have the Device ID and Claim Code.

Device ID *
FDO21520JED&FDO21520JQP

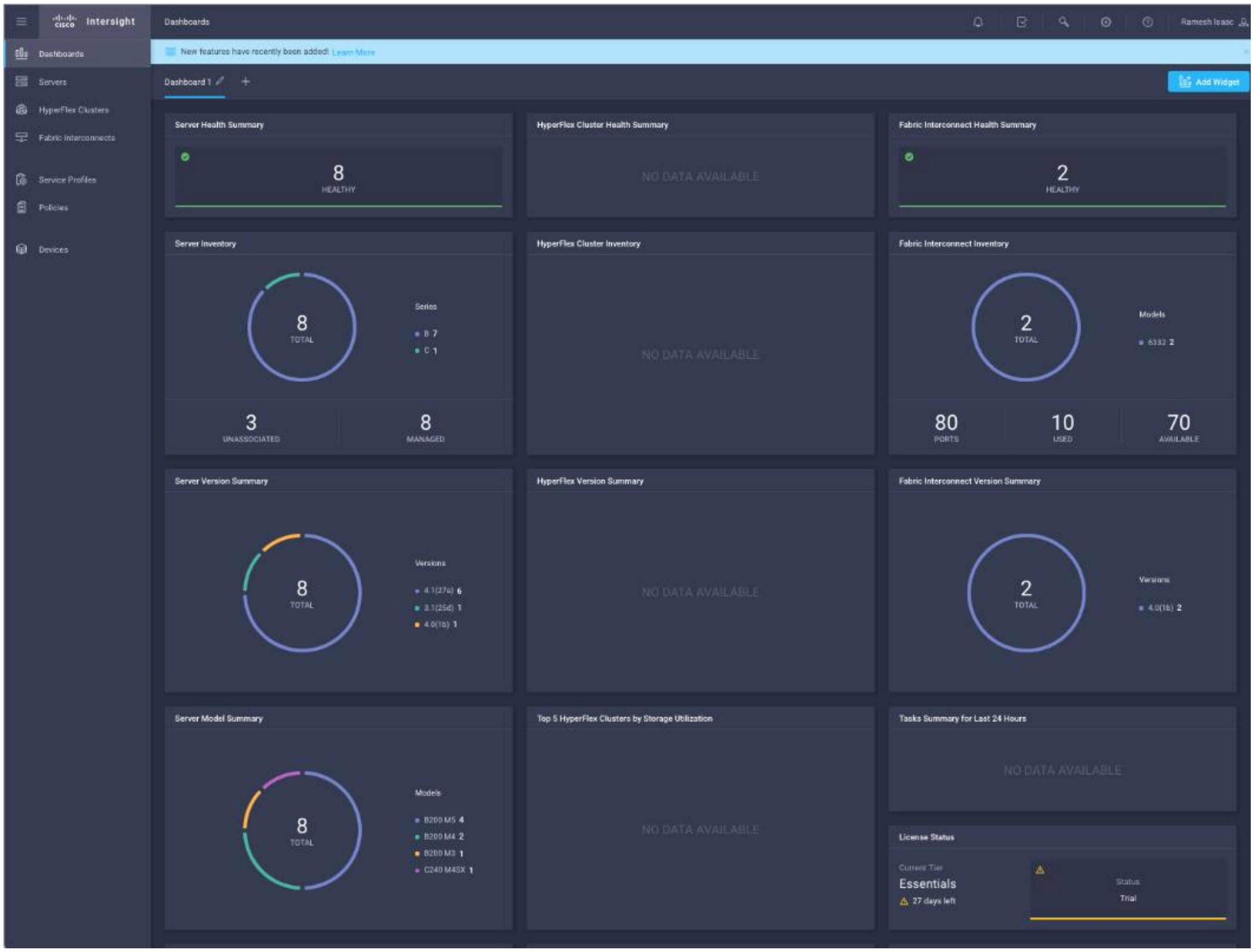
Claim Code *
0F92746DB94F

4. Click Claim.

5. On Cisco Intersight, the newly added UCS domain should now have a Status of Connected.

6. On Cisco UCS Manager, the Device Connector should now have a Status of Claimed.

7. Dashboard will present an overview of the managed UCS domains:


Intersight
Dashboards
Ramesh Isaac
Dashboards
Servers
HyperFlex Clusters
Fabric Interconnects
Service Profiles
Policies
Devices
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Dashboard 1
Add Widget
Server Health Summary
8
HEALTHY
HyperFlex Cluster Health Summary
NO DATA AVAILABLE
Fabric Interconnect Health Summary
2
HEALTHY
Server Inventory
8
TOTAL
Series
B 7
C 1
3
UNASSOCIATED
8
MANAGED
HyperFlex Cluster Inventory
NO DATA AVAILABLE
Fabric Interconnect Inventory
2
TOTAL
Models
6332 2
80
PORTS
10
USED
70
AVAILABLE
Server Version Summary
8
TOTAL
Versions
4.1(27a) 6
3.1(25d) 1
4.0(1b) 1
HyperFlex Version Summary
NO DATA AVAILABLE
Fabric Interconnect Version Summary
2
TOTAL
Versions
4.0(1b) 2
Server Model Summary
8
TOTAL
Models
B200 M5 4
B200 M4 2
B200 M3 1
C240 M4SX 1
Top 5 HyperFlex Clusters by Storage Utilization
NO DATA AVAILABLE
Tasks Summary for Last 24 Hours
NO DATA AVAILABLE
License Status
Current Tier
Essentials
27 days left
Status
Trial

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