



Reference Architecture Deployment Guide

# SAP HANA Solution on SmartStack



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# **Overview**

The Nimble Storage SmartStack is an example of an integrated infrastructure, building upon the basic components of storage, network, compute and operating system. Once the basic environment is assembled, the platform can then be used for specific solutions such as SAP HANA.

The Best Practices section describes the SAP HANA specific topics for an architecture setup with SmartStack.

The Deployment section describes the SAP HANA specific topics with Nimble Storage using examples and recommendations necessary to meet Tailored Datacenter Integration (TDI) KPI (Key Performance Indicators) requirements.

### Audience

This guide was developed to support customers and systems integrators. The goal is to help them understand the basic setup and recommended configuration of a SAP HANA environment and its features on SmartStack.

### Assumptions

- General knowledge of Cisco UCS and UCSM this is not a tutorial on how to set up UCS environments.
- General knowledge of Nimble Storage CS-series arrays
- General knowledge of network design for both Ethernet and FC
- General knowledge of Unix based operating systems
- General knowledge of SAP HANA

### Limitations and Other Considerations

Since this is not intended as a step by step setup guide, some configuration details may be missing (e. g., changing default choices and simple click through steps). If you find trouble in applying the content of this guide, please contact Nimble Storage or follow the referenced white papers, SAP notes and links.

# Nimble Storage Adaptive Flash Platform

The Nimble Storage Adaptive Flash platform addresses the storage resource needs to meet the growing demands of business-critical applications. It is the first storage solution to eliminate the flash-memory performance and capacity trade-off.

## CASL

Adaptive Flash combines Nimble Storage Cache Accelerated Sequential Layout (CASL) architecture and Nimble Storage InfoSight, the company's innovated data sciences–based approach to the storage lifecycle. Nimble Storage CASL scales performance and capacity transparently and independently. Nimble Storage InfoSight uses the power of deep data analytics to provide customers with precise guidance on the optimal approach to scaling flash memory, CPU, and capacity to meet changing application needs, while helping ensure peak storage health.

Nimble Storage Adaptive Flash offers these main benefits:

- Scale storage performance and capacity independently and non-disruptively.
- Achieve enterprise-class flash storage performance and capacity in a small footprint.
- Protect your IT investment by eliminating the need for major system upgrades.
- Sustain peak health for your storage infrastructure with integrated protection, deep-data analytics, and efficient resiliency.

### **CS-Series** Array

The Nimble Storage CS500 and CS700 storage arrays with Fibre Channel connectivity have been certified for SAP HANA TDI (Tailored Datacenter Integration) infrastructure systems. Refer to SAP HANA Product Availability Matrix (PAM: <u>http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/enterprise-storage.html</u>) for updates.

As part of the Nimble Storage Adaptive Flash platform, the Nimble Storage CS-Series combination pictured below is well suited for the workloads required to support an SAP HANA solution.

	Softw	are version: 2.2.3.0	-152756-opt   Total s	ystem cache: 2.18 TB   Usable Capacity: 22.76 TB   Con	iguration:	; 2 Dual 16	Gb FC
Head She	elf: AF-120	0653 / Model: CS50	0   Online Edit				
Controlle	er A - Activ	ve	Array Name	temp-array1	Controlle	r B - Standl	by Make Active
			Power Supplies	ок			
	00	0 0	Disks	22.76 TB Usable (32.75 TB Raw)		0	0
eth1	fc1	fc5	SSDs	2.18 TB Capacity	eth1	fc1	fc5
	0					0	
eth2	fc2	fc6			eth2	fc2	fc6
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Q:			SSDs	2.91 TB Capacity	0.		
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Temp	Fans	SAS In SAS Out			Temp	Fans	SAS In SAS Out
			SSD SSD SSD SSD S	SD SSD SSD SSD SSD SSD SSD SSD SSD SSD			

Figure 1 – Nimble Storage CS-Series Array

The Nimble Storage CS-Series array offers the following benefits:

- Adaptive performance: Performance adapts to I/O spikes because the flash cache is populated dynamically.
- Cost-effective capacity: Inline compression, high-capacity disk, and zero-copy cloning deliver capacity reductions of up to 75 percent.
- Business continuity: High availability and integrated data protection reduce downtime from local failures and larger site wide disasters.
- Transparent scaling: Easily scale performance and capacity independently and without downtime.

Nimble Storage CS-Series Volume Monitoring

The capability to easily monitor volume activity is crucial to assessing current storage use, compression rates, connectivity, and performance. Nimble Storage allows the administrator many ways to view, modify, and monitor volume performance and use.

The Nimble Storage GUI and command-line interface (CLI) give administrators the tools and views they need to quickly and accurately perform volume tasks. Volume size, maintenance processes, snapshots, compression, and connectivity can all be viewed and controlled by both the GUI and CLI

### **InfoSight**

Nimble Storage InfoSight takes a new approach to the storage lifecycle, using the power of deep-data analytics and cloud-based management to deliver true operational efficiency across all storage activities.

InfoSight, an integral part of the Nimble Storage Adaptive Flash platform, helps ensure the peak health of storage infrastructure by identifying problems and offering solutions in real time. InfoSight provides expert guidance to help organizations deploy the right balance of storage resources—dynamically and intelligently—to meet the changing demands of business-critical applications.

# **Cisco UCS Solution**

The next evolution in IT is happening now, and Cisco's Unified Computing System (UCS) is ready to power your data center in the Internet of Everything. Cisco UCS is a groundbreaking approach to computing, designed for IT innovation and business acceleration. With Cisco UCS, you can tune your environment to support the unique needs of each application while powering all your server workloads on a centrally managed, highly scalable system.

With Cisco UCS, the Cisco Unified Computing System<sup>™</sup> (Cisco UCS) you have a combined compute and network platform designed for the data center. Along with Nimble Storage, this solution delivers servers, storage, and 10 Gigabit networking in an easy-to-deploy, compact form factor. The picture below shows the depth and breadth of the UCS components available.



Figure 2 – UCS Portfolio

The SAP HANA solution includes these components:

• Cisco UCS B260 M4 Blade Server: Delivering performance, versatility, and density without compromise, the Cisco UCS B260 M4 Blade Server addresses a broad set of workloads.

- Cisco UCS 5108 Blade Server Chassis: The chassis can accommodate up to four double-width Cisco UCS B260 M4 Blade Servers.
- Cisco UCS 6200 Fabric Interconnect: The Cisco UCS 6200 provides the unified server and networking capabilities for top-of-rack (ToR) management.
- Cisco UCS Manager: Cisco UCS Manager provides unified, embedded management of all software and hardware components in a Cisco UCS solution.
- Cisco Nexus Switches: Cisco Nexus switches are designed to meet the stringent requirements of the next-generation data center.

### Cisco UCS B260 M4 Blade Server

Delivering performance, versatility, and density without compromise, the Cisco UCS B260 M4 Blade Server addresses a broad set of workloads, from IT and web infrastructure to distributed databases.

View the video data sheet to see how to boost density and performance without compromise using Cisco's new blade server. <u>http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-b260-m4-blade-server/index.html</u>

The enterprise-class Cisco UCS B260 M4 further extends the capabilities of the Cisco UCS portfolio in a double-width blade form factor. The Cisco UCS B260 M4 server harnesses the power of the Intel Xeon processor E7-2800 v2, E7-4800 v2 and E7-8800 v2 product families.

In addition, Cisco UCS has the architectural advantage of not having to power and cool switches in each blade chassis. Having a larger power budget available for blades enables Cisco to design uncompromised expandability and capabilities in its blade servers, as evidenced by the new Cisco UCS B260 M4 and its leading memory and drive capacities, resulting in outstanding performance.

The Cisco UCS 5108 Blade Server Chassis can house up to four Cisco UCS B260 M4 Blade Servers.

### Cisco UCS 6200 Fabric Interconnect

The Cisco UCS 6200 Fabric Interconnect (FI) provides the management, LAN, and storage connectivity for the Cisco UCS 5108 Blade Server Chassis and direct-connect rack-mount servers. It provides the full-featured Cisco UCS management capabilities and XML API as the full-scale Cisco UCS solution in addition to integrating with Cisco UCS Central Software and Cisco UCS Director.

From a networking perspective, the Cisco UCS 6200 Fabric Interconnect uses a cut-through architecture, supporting deterministic, low-latency, line-rate 10 Gigabit Ethernet on all ports, switching capacity of up to 500 Gbps, and 80-Gbps uplink bandwidth for each chassis, independent of packet size and enabled services. The product family supports Cisco® low-latency; lossless 10 Gigabit Ethernet unified network fabric capabilities, which increase the reliability, efficiency, and scalability of Ethernet networks. The Fabric Interconnect supports multiple traffic classes over a lossless Ethernet fabric, from the blade through the fabric interconnect. Significant savings in total cost of ownership (TCO) can be achieved from

the Fibre Channel over Ethernet (FCoE)–optimized server design, in which network interface cards (NICs), host bus adapters (HBAs), cables, and switches can be consolidated.

The Cisco UCS 6200 Fabric Interconnect is built to consolidate LAN and storage traffic onto a single unified fabric, eliminating the capital expenditures (CapEx) and operating expenses (OpEx) associated with multiple parallel networks, different types of adapter cards, switching infrastructure, and cabling within racks. The unified ports allow the fabric interconnect to support direct connections from Cisco UCS to Fibre Channel, FCoE, and Small Computer System Interface over IP (iSCSI) storage devices.

For virtualized environments, the Cisco UCS 6200 Fabric Interconnect supports Cisco virtualizationaware networking and Cisco Data Center Virtual Machine Fabric Extender (VM-FEX) architecture. Cisco Data Center VM-FEX allows the Fabric Interconnects to provide policy-based virtual machine connectivity, with network properties moving with the virtual machine and a consistent operational model for both physical and virtual environments.

The Cisco UCS 6200 Fabric Interconnect is a 10 Gigabit Ethernet, FCoE, and Fibre Channel switch offering up to 500-Gbps throughput and up to four unified ports and one scalability port.

### **Cisco UCS Manager**

The Cisco UCS 6200 Fabric Interconnect hosts and runs Cisco UCS Manager in a highly available configuration, enabling the fabric interconnects to fully manage all Cisco UCS elements. The Cisco UCS 6200 Fabric Interconnects supports out-of-band management through a dedicated 10/100/1000-Mbps Ethernet management port. Cisco UCS Manager typically is deployed in a clustered active-passive configuration on two Cisco UCS 6200 Fabric Interconnects connected through the cluster interconnects built into the chassis.

### **Cisco Nexus Switches**

Unified Fabric is a holistic network architecture comprising switching, security, and services that is designed for physical, virtual, and cloud environments. It uniquely integrates with servers, storage, and orchestration platforms for more efficient operations and greater scalability.

The Cisco Nexus 9000 Series delivers proven high performance and density, low latency, and exceptional power efficiency in a broad range of compact form factors. Operating in Cisco NX-OS Software mode or in Application Centric Infrastructure (ACI) mode, these switches are ideal for traditional or fully automated data center deployments.

Cisco Nexus 7000 Series Switches create the network foundation for your next-generation Unified Fabric data center and campus core. Modular switches, including the Cisco Nexus 7000 and 7700 Series, deliver a comprehensive Cisco NX-OS feature set and open source programmable tools for software-defined network (SDN) deployments. They offer high-density 10, 40, and 100 Gigabit Ethernet with application awareness and performance analytics

Cisco Nexus 5000 Series Switches are designed to deliver high-density top-of-rack (ToR) Layer 2 and Layer 3, 10/40 Gigabit Ethernet with unified ports in compact one-, two-, and four-rack-unit form factors. The Cisco Nexus 5000 Series includes the Cisco Nexus 5500 and 5600 platforms as part of the Cisco Unified Fabric portfolio.

The comprehensive Cisco NX-OS feature set and 10/40 Gigabit Ethernet scalability of the Cisco Nexus 5000 Series deliver high performance, operational efficiency, and design flexibility.

# Best Practices for SAP HANA Tailored Datacenter Integration

With the successful certification of the Nimble Storage for SAP HANA TDI the CS-Series can be combined with any SAP HANA TDI certified server, virtualization software, operating system or network component. Links to the Product Availability Matrix (PAM: <u>http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/appliances.html</u>) and additional notes will be referenced in the following chapters.

This guide is based on the practical experience and resulting recommendations while setting up a reference landscape using the whitepaper "SAP HANA on Cisco UCS Installation Options" (see link <a href="http://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/sap-applications-on-cisco-ucs/whitepaper\_c11-733582.pdf">http://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/sap-applications-on-cisco-ucs/whitepaper\_c11-733582.pdf</a>).

### **Physical Compute Nodes**

The Nimble Storage can be combined with any SAP HANA TDI certified compute nodes following the restrictions on the use of CPU and RAM.

SAP HANA DataMart and BWoH optimized hardware configurations													
SAP HANA scale up sizes	System re • DIMM • Suppo • Storag	System requirements for the listed system sizes: DIMM setting: homogenous symmetric assembly of DIMMs and maximum utilization of all available memory channels Supported CPU's are lvybridge EX 2880, 4880, 8880, or lvybridge EX 2890, 4890, 8890 Storage requirements (the storage media itself needs to be protected from failures): – Log volume ½ of the RAM size for systems ≤ 256 GB RAM and min. ½ TB for systems ≥ 512GB – Data volume 3x RAM											
	128 GB	HANA shar 256 GB	84 GB	512 GB	768 GB	1 TB	1.5 TB	2 TB	3 TB	4 TB	6 TB	8 TB	12 TB
2x lvybridge EX CPU's	x	x	x	x				-				-	
4x Ivybridge EX CPU's	х	х	х	х	х	х							
8x Ivybridge EX CPU's	x	x	x	x	x	x	x	x			-		
SAP HANA scale out sizes													
2x Ivybridge EX CPU's				X*				-					
4x Ivybridge EX CPU's				x		x					-		
8x lvybridge EX CPU's	-			-		x		x	-	-	-	-	-

Figure 3 - SAP HANA DataMart and BWoH

\*\* Source: "SAP HANA Hardware platform based on IvyBridge EX" from SAP AG (July 2014)

SAP HANA SoH optimized hardware configurations													
SAP HANA scale up sizes	System re DIMM Suppo Storag	system requirements for the listed system sizes: DIMM setting: homogenous symmetric assembly of DIMMs and maximum utilization of all available memory channels Supported CPU's are hybridge EX 2880, 4880, 8880, or hybridge EX 2880, 4890, 8890 Storage requirements (the storage media itself needs to be protected from failures): - Log volume ½ of the RAM size for systems ≤ 256 GB RAM and min. ½ TB for systems ≥ 512GB - Data volume 3x RAM - HANA share 1x RAM											
	128 GB	256 GB	384 GB	512 GB	768 GB	1 TB	1.5 TB	2 TB	3 TB	4 TB	6 TB	8 TB	12 TB
2x Ivybridge EX CPU's	x	х	x	x	x	x	x						
4x Ivybridge EX CPU's	х	х	х	х	х	x	х	х	х				
8x Ivybridge EX CPU's	x	х	x	x	x	x	x	х	x	х	x		
16x Ivybridge EX CPU's	х	х	x	х	х	х	x	х	х	х	х	х	х
SAP HANA scale out sizes													
8x Ivybridge EX CPU's	-	-							-		x		
16x Ivybridge EX CPU's * SoH scale out HW configural		 mmended if 6	 TB sizing is e			-	-		-	-			x

Figure 4 – SAP HANA SoH

\*\* Source: "SAP HANA Hardware platform based on IvyBridge EX" from SAP AG (July 2014)

Link to PAM: http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/appliances.html

### Virtual Compute Nodes with VMware

As per SAP Note 1788665 the SAP HANA installation can also be virtualized with VMware. The current limitation for productive use is 1 VM on a physical node for a SAP HANA instance. Please check the SAP or VMware specific sites for updates as there are changes to come in H1/2015 in the meaning of vSphere 6.0, multi VM, large VM (4TB RAM) and 8 socket hardware support.

Capability	Supported in Production	Supported in Test/Dev
HANA Scale up to 1TB of Memory	Yes	Yes
vCloud Suite / vSphere version	5.5	5.1 and 5.5
SAP HANA version	SP 07 and above	SP 05 and above
vSphere vMotion	Yes	Yes
VMware HA	Yes	Yes
VMware DRS	Yes	Yes
Server Hardware	Server Hardware of Certified Appliances (BOM)	Server Hardware of Certified Appliances (BOM)
Storage	Internal storage of Certified Appliances or TDI certifed shared storage	Internal storage of Certified Appliances or TDI certifed shared storage
Scale Out Configuration	No, planned for early H1 / 2015	No, planned for early H1 / 2015
CPU Sockets per server	up to 4	up to 8

Figure 5 – VMware Overview

Source: http://scn.sap.com/docs/DOC-60470

There is a detailed Best Practice Guide from VMware for Scale-up configuration that can be found under this link <a href="http://www.vmware.com/files/pdf/SAP\_HANA\_on\_vmware\_vSphere\_best\_practices\_guide.pdf">http://www.vmware.com/files/pdf/SAP\_HANA\_on\_vmware\_vSphere\_best\_practices\_guide.pdf</a>.

It covers architectural parts as DRS, vMotion, High Availability and host profiles and also more configuration specific topics as the use of VMDK, VMFS, SCSI and PVSCSI.

### Network

The Nimble Storage CS-Series can be combined with any SAP HANA TDI certified compute nodes. The network integration is most likely customer specific but should meet the network requirements. The architecture schema at the beginning shows the use of a NEXUS 5000 but also a NEXUS 7000/9000 model would be fine.

The current Cisco UCS Fabric Interconnects offers an 8GBit/s FC connectivity. The Nimble Storage offers 16GBits/s for FC connections. Note that this is a compatible configuration and that the FC connection bandwidth was not the limiting factor in the SAP HANA TDI storage certification.

### Shared storage /hana/shared

In every SAP HANA Scale-out environment there needs to be a shared storage directory for the SAP HANA instance. To offer this shared storage with the Nimble CS-Series we recommend to use a Linux based HA cluster (e.g. two physical or virtual compute nodes) providing an NFS export.

### **Operating System**

The operating system of the compute nodes is one of the supported platforms for Nimble Storage. All SAP HANA certified operating systems supported by the compute node hardware manufacturer of choice can be used. In case of Cisco this is SLES, SLES for SAP and RHEL.

Please take into account that the standard SLES support most likely is not sufficient for an enterprise application like SAP HANA. It is strongly recommended to use SLES for SAP or RHEL instead.

(http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/appliances.html)

### SAP HANA Storage Connector

The Nimble Storage was certified with the SAP HANA storage connector "hdb\_ha.fcClientLVM". This recommends the use of the Linux Logical Volume Manager (LVM) for LUN, volume group and file system management.

This storage connector comes with SAP HANA SPS 9.

### File System

Any SAP HANA certified file system can be used. As per Cisco SAP HANA TDI whitepaper we recommend to use NFS for /hana/shared and xfs for /hana/data and /hana/log.

(http://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/sap-applications-on-cisco-ucs/whitepaper\_c11-733582.pdf)

(http://global.sap.com/community/ebook/2014-09-02-hana-hardware/enEN/appliances.html)

# Architecture Overview



Figure 6 – Architectural Overview

Product Family	Ultimate Performance Scale-Out Cluster <sup>17</sup>	Extreme Performance Family				Itim ate Extreme High Performance Family formance Performance Family Dut Cluster <sup>17</sup> Performance Family						
Nimble CS-Series Array	4x CS700			CS700					CS500			
Raw Disk Capacity, Base (TB) <sup>2</sup>	1,640	12	24	36	48	72	12	24	36	48	72	
Min. Usable Capacity (TB)4	1,280	8	16	25	33	50	8	16	25	33	50	
Effective Capacity, Base (TB) <sup>2</sup>	1,280-2,560	816	16-32	25-50	33-66	50-100	816	16-32	25-50	33-66	50-100	
Effective Capacity, Maximum (TB)23.5	2,560	556	572	590	606	640	556	572	590	606	640	
Max Number of Disk Expansion Shelves	24	up to 6						up to 6				
Base/Max Flash Capacity per Array (GB)	25,600	3,200 to 6,400				1	,200 to 6,40	0				
Max Rash Capacity with All-Rash Shelf (GB)	166,400	32,000						32,000				
Power Requirement (Watts)	13,000			650			600					

Figure 7 – Nimble CS-Series Specifications

http://info.nimblestorage.com/rs/nimblestorage/images/Nimble\_CS-Series\_Datasheet.pdf

### Scale-out configuration

The tests with the CS-500 have shown the support up to 4 SAP HANA nodes in a Scale-out configuration. When comparing the CS-700 configuration we will use to support SAP HANA with the CS-500 configuration used in certification testing, Nimble's performance engineering and performance QA teams have found the CS-700 to be 50% to 90% faster on random-access workloads, and 50% to 60% faster on sequential access workloads. Based on these results we are confident in our ability to support 6 SAP HANA nodes using the CS-700. The Ultimate Performance Scale-Out Cluster with 4x CS-700 scales linearly. With this cluster we support up to 24 SAP HANA nodes.

Nimble CS-Series	4x CS-700	CS-700	CS-500
Array			
Max. SAP HANA	24	6	4

nodes			
-------	--	--	--

# Deployment

This section is based on the whitepaper "SAP HANA on Cisco UCS Installation Options". <u>http://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/sap-applications-on-cisco-ucs/whitepaper\_c11-733582.pdf</u>

All the examples and screenshots are based on the current published version. Please check for newer versions.

## Customer Switch (Cisco Nexus)

The Cisco Nexus switches are part of the customer network and deliver 10G Ethernet, Management Access and 8G Fiber Channel (Dual-Fabric).



Figure 8 – Customer Network

Both switches are configured as vPC peers using a Peer-Link via Port-Channel 1 and keep-alive-Link via Interface mgmt0. Nexus 2000 FEX is dual-homed to both switches for RJ45 1000/100/10M access.



Figure 9 – Storage Network

Ethernet links between Nexus 5500 Switches (N5k) and Fabric Interconnects (FI) are always configured as a vPC. For UCS IOM high availability we configured two separate vPC's between Nexus and FI.

- Port-Channels 10 and 20 are used as the Customer Network connection to FI's
- Port-Channel 15 and 25 (just 3 VLANs are allowed on that links)

• Management connections from Nimble Storage and FI's are connected to Nexus 2000 (part of customer network)

### **Cisco Nexus Fibre Channel**

A dedicated FC Fabric is not required but used. Connecting Nimble Storage Controllers directly to UCS FI's is possible with minimal adjustments to the UCS configuration.

We use the fabric for a better view on FC Configuration, Traffic and debug capabilities.

### Zoning

We use a standard FC Dual-Fabric with soft zoning (WWN zoning). Each Fabric contains 4x 8G FC links between Controllers/Fabric and Fabric/Fl's.

The details of the vsan configuration are in Appendix A

### UCS Setup – Chassis Links

Each Chassis is connected with 4x 10G per IOM.

### UCS Setup – Power Policy

Power Policy depends on how the blades are configured (hardware) and which settings regarding power saving (CPU C-states and options) are configured. A fully equipped chassis without any configured power saving may requires N+1 for full performance instead of Grid for more availability.

N+1 = three active PSU; one PSU can fail

Grid = two active PSU; two can fail

Depending on the current power usage, it is possible that an N+1 configuration can survive with less than 3 PSU's but without any warranty.

Hain Topol	ogy View 🔤 Fa	bric Interconnects	Servers	🧹 Thermal	Necommis
Global Policies	Autoconfig Polic	ies Server Inheri	tance Policies	Blade Server [	Discovery Policie
Chassis/Fl	X Discovery Po	licy			
Link Groupi	Action: 4	None OPort	Channel		
- Rack Serv	er Discovery P	blicy			
Action	n: • Immediate	O User Acknow	ledged		
Scrub Policy	/: <not set=""></not>	•			
Rack Man	agement Conn	ection Policy			
Action:	Auto Acknowled	ged 🔵 User Ack	nowledged		
Power Poli	cy y: Non Redu	ndant	Grid		
- MAC Addre	ess Table Aging				
Aging Time:	Never	Mode Default 🔵	other		
- Global Pov	ver Allocation F	olicy			
Allocation N	1ethod: OMan	ual Blade Level Caj	o	iven Chassis Gr	oup Cap
Firmware	Auto Sync Serv	er Policy			
Sync State	<ul> <li>Auto Ackno</li> </ul>	wledge 🔵 User i	Acknowledge	No Actions	

Figure 10 – Global Policies

### UCS Setup – Switching Mode

Both FI's run in Ethernet and FC End-Host Mode.

Status	
Overall Status:	1 Operable
Thermal:	1 Ok
Ethernet Mode:	End Host
FC Mode:	End Host

Figure 11 – Switching Mode

**C 1** 

## UCS Setup – Unified Ports

This port configuration is an example.

Onboard ports 1/1 – 26 are configured as Ethernet. Onboard ports 1/27 – 32 are configured as FC.

onfigure Fixed Module Ports	

Figure 12 – Port Configuration - Ethernet / FC

### UCS Setup – VLANs

Not all configured VLANs are required. Only VLANs T01-Client, T01-Storage and T01-Internal are required as a minimal configuration.

The VLAN setup is customer specific.

Name /	I	ID	Туре	Transport	Native	VLAN Sharing
VLAN default (1)	1	L	Lan	Ether	no	None
VLAN T01-Admin (112)	1	12	Lan	Ether	no	None
VLAN T01-AppServer (223)	2	23	Lan	Ether	no	None
VLAN T01-Backup (221)	2	221	Lan	Ether	no	None
VLAN T01-Boot (127)	1	27	Lan	Ether	no	None
VLAN T01-Client (2)	2	2	Lan	Ether	yes	None
VLAN T01-DataSource (224)	2	24	Lan	Ether	no	None
VLAN T01-Internal (220)	2	20	Lan	Ether	no	None
VLAN T01-Replication (225)	2	25	Lan	Ether	no	None
VLAN T01-Storage (110)	1	10	Lan	Ether	no	None

Figure 13 – VLAN Configuration

VLANs are grouped in VLAN-Groups and assigned to a specific uplink interface.

Equipment Servers LAN SAN VM Admin	General VLANs Ethernet Uplink Ports Port Channels Org Permissions Events	
Filter: All	🖧 Filter 👄 Export 😸 Print	
(+) (=)	Name	VLAN ID
	T01-AppServer	223
	T01-Client	2
Fabric A	T01-DataSource	224
LAN Pin Groups		
Threshold Policies		
VLAN Groups		
VLAN Group Admin-zone		
VI AN Group Client-Zone		
VLAN Group Internal-Zone		
VLAN Group Replication-Network		
Filter: All	Image: Tol-AppServer         Tol-AppServer         Tol-Olent         Tol-DataSource	VLAN ID 223 2 224

Figure 14 – Client Zone VLAN

Equipment Servers LAN SAN VM Admin	General VLAN	s Ethernet Uplink	Ports Port Channels
Filter: All	🕰 Filter 🖨 Exp	port 😹 Print	
• •	Name	Fabric ID	ID
	Po10	A	10
	Po20	В	20
Pabric A     QoS System Class     QoS System Class     LAN Pin Groups     VLAN Groups     VLAN Group Admin-Zone     VLAN Group Backup-Network     VLAN Group Internal-Zone     VLAN Group Internal-Zone     VLAN Group Replication-Network			

Figure 15 – Client Zone Port Channel

Equipment Servers LAN SAN VM Admin		G	eneral	VLANs	Ethernet Uplink Ports	Port Channels	Org Permis
Filter: All	1	4	Filter	👄 Expo	rt 😸 Print		
		N	lame		VLAN ID	Poolable DN	
		T01-Boot		127	fabric/lan/net-T	01-Boot	
End LAN Cloud	1	то	)1-Inter	nal	220	fabric/lan/net-T	01-Internal
		то	)1-Stora	ge	110	fabric/lan/net-T	01-Storage
Habric B							
LAN Pin Groups							
Inreshold Policies							
VLAN Group Admin-Zone							
VLAN Group Backup-Network							
VLAN Group Client-Zone							
VLAN Group Internal-Zone							
VLAN Group Replication-Network							

Figure 16 – Internal Zone VLAN

Equipment Servers LAN SAN VM Admin		General V	LANs Ethernet L	Jplink Ports	Port Channels
Filter: All		🔍 Filter 🛋	Export 📚 Prin	t	
• -		Name	Fabric ID	ID	
		Po15	A	15	
		Po25	В	25	
⊕					
LAN Pin Groups					
🗄 🗉 🏂 Threshold Policies					
VLAN Groups					
VLAN Group Admin-Zone					
VLAN Group Backup-Network					
VLAN Group Client-Zone					
VLAN Group Internal-Zone					
VLAN Group Replication-Network					

Figure 17 – Internal Zone Port Channel

## UCS Setup – VSANs

Two VSANs are required, one each Fabric. VSANs are mapped to an internal FCoE VLAN.

CAN UNDER LEVEL	120002							
Equipment Servers LAN SAIN VM Admin	🛨 😑 🕰 Filter 🖨 Export 😓 Print							
Filter: A		1.5						
	Name	ID	Fabric ID	If Type	If Role	Transport	FCoE VLAN ID	
	-							
	VSAN Fabric-A (10)	10	A	Virtual	Network	Fc	1010	
SAN Cloud								
FC Port Channels								
FCoE Port Channels								
H								
VSANs								
WEAN E-bris A (10)								

Figure 18 – VSAN A

E I I I I I I I I I I I I I I I I I I I	VSANs						
Equipment Servers LAN SAN VM Admin	🛨 🖃 🕰 Filter 🖨 Exp	ort 😹 F	Print				
	Name	ID	Fabric ID	If Type	If Role	Transport	FCoE VLAN ID
	VSAN Fabric-B (20)	20	в	Virtual	Network	Fc	1020
SAN Cloud							
E Fabric A							
FCoE Port Channels							
🕀 🗝 Uplink FC Interfaces							
Uplink FCoE Interfaces							
USANs							
VSAN Fabric-A (10)							
E Fabric B							
FC Port Channels							
FCoE Port Channels							
⊕							
Uplink FCoE Interfaces							
USANS							
VSAN Fabric-B (20)							
E CANI Dia Croupa							

Figure 19 – VSAN B

# UCS Setup - Network Control Policy

General Events	
Actions	Properties
📅 Delete	Name: link-up
Show Policy Usage	Description:
A Use Global	Owner: Local
	CDP: O Disabled O Enabled
	MAC Register Mode:  Only Native Vlan  All Host Vlans
	Action on Uplink Fail: O Link Down O Warning
	Warning IMPORTANT: If the Action on Uplink Fail is set to Warning, the fabric will not fail over if uplink connectivity is lost
	MAC Security Forge: Allow Deny

Figure 20 – Network Control Policy

## UCS Setup - MAC Pools

Create a MAC Pool for each VLAN or a single pool for all VLANs.

General MAC Addresses MAC Blocks Faults	s Events
Actions	Properties
📅 Delete	Name: HANA
Create a Block of MAC Addresses	Description:
Show Pool Usage	Size: 256
	Assigned: 16
	Assignment Order: O Default   Sequential

Figure 21 – VLAN MAC Pool

General MAC Addresses	MAC Blocks	Faults	Events			
🛨 🖃 🕰 Filter 🖨 Exp	port 😹 Print	:				
Name				From	То	
	) - 00:25:B5:A	0:00:FF	]	00:25:B5:A0:00:00	00:25	:B5:A0:00:FF

Figure 22 – VLAN MAC Pool Blocks

## UCS Setup - vNIC Templates

We create a vNIC template for every vNIC we use, e.g. T01-Client, T01-Storage, T01-Internal.

General	VLANs	Faults	Events													
Act	ions				Properties	;										
	Modify					Name:	T01-Client	1							_	
f	Delete					Description:			-			Modify \	VLANs			×
	Show F	olicy Usi	aae			Owner:	Local		Ma		le.				6	
8						Fabric ID:	○ Fabric A ● Fabric B 🖌 Enable Failo	over			15					
							Target Adapter Vm		é	VLANs 4 Filter   ⇔ Export	t 😸 Print					
										Select	P.	lame		Native VLAN	F\$	
					Terr	nplate Type:	<ul> <li>Initial Template          <ul> <li>Updating Template</li> </ul> </li> </ul>	e			de	efault		0	^	
						MTU	1500				T	01-Admin		0		
						MIO.	1300				т	01-AppServer		0		
					Policies						т	01-Backup		0		
						MAC Pool:	HANA(240/256)				Т	01-Boot		0		
						QoS Policy:	<not set=""></not>			✓	1	01-Client				
					Network Co	ontrol Policy:	<not set=""></not>				-	01-DataSource		0	_	
						Pin Group:	<not set=""></not>		E E						×	
					Stats Three	shold Policy:	default 🔻		H	Create VLAN						
					Connection	Policies										
					Dynami	ic vNIC 🔾 u	JSNIC OVMQ									
					Dynamic v	/NIC Connect	ion Policy: <not set=""></not>							ОК	Cancel	

Figure 23 – Client vNIC Template

Implete	Actions	Properties					
Modify VLANs     Descriptor:     Owner:     Descriptor:     Template:   Option:   Mac:   Policies   Descriptio:   Policies   Owner:   Descriptio:   Policies   Policies		Namou	T01 Internal				
Userie     Oncer:     Userie     Oncer:     Value     Patric ID:     Peloides     MAC Pool:     Mact Pool: <td< th=""><th>MOLITY VLAINS</th><th>Name:</th><th>101-Internal</th><th></th><th></th><th></th><th></th></td<>	MOLITY VLAINS	Name:	101-Internal				
Show Policy Usage     Police:     Drame:     Initial Template     Upame:     MAC Pool:     Initial Template     Initia	Delete	Description:					
Fabric ID:  Fabric A       Fabric ID: Fabric A Fabric B: <	Show Policy Usage	Owner: I	Local				
Target:       Adapter         MAdapter:       Madapter         Template Type:       Initial Template         MTU:       9000         Policies       Mathematical Select         MAC Podi:       HANA(240/256)         Q65 Policy:       cont et>         Policies       OI:Admin         Policies       OI:Admin         Policies       01:Admin         Policies       01:Diation         Policies       01:Diation         Policies       01:Diation         Policies       01:Diation	🔒 Use Global	Fabric ID:	● Fabric A ○ Fabric B ✔ Enable Failover	<b>A</b>	Modify VI 4	NIS	×
Image: Second Policy			Target	-	mouly to	1110	
Template Type:       Initial Template       Updating Template         MTU:       9000         Policies       MAC Pool:       HANA(240/256) •         Q65 Policy:       crot set> •         Policies       01:4dmin         Policies       01:4dmin         Policies       01:4dmin         Policies       01:4dmin         Pin Group:       crot set> •         Pin Group:       crot set> •         Stats Threshold Policy:       01:4dmin         Optione:       01:4dmin         01:04:000       01:04:000         01:04:000       01:04:000         01:01:06:000       01:04:000         01:01:01:06:0000       01:01:01:01:0000         01:01:01:01:01:01:01:01:01:01:01:01:01:0			Adapter Vm	Modify VL	ANs		0
MTU:     9000       Policies     MAC Pool:     HANA(240/255)       QoS Policy:     cnot set>       QoS Policy:     ink-up       Pin Group:     cnot set>       Stats Threshold Policy:     ink-up       O Dramatic VMIC     usMic       Dynamic VMIC Connection Policy:     cnot set>		Template Type:	Initial Template     O Updating Template	VLANs	port 🕞 Print		
Policies MAC Pool: HANA(240/256) QoS Policy: cnot set> MAC Pool: HAN		MTU:	9000	Salact	Nama	Notivo VI AN	E
MAC Podi: HAVA(240/255)  Qo5 Policy: crot set>  Network: Control Policy: link-up  Pin Group: crot set>  Stats Threshold Policy: default  Outprainic vNIC OutNIC  VMQ Dynamic vNIC Connection Policy: crot set>  Contection Policy: crot set>  Contecti		Policies		Jelect	Hanne de feu de		
QoS Policy:       cnot set>         Network Control Policy:       ini-up         Pin Group:       cnot set>         Stats Threshold Policy:       default         Connection Policy:       rot set>         Dynamic vNIC Connection Policy:       cnot set>         Dynamic vNIC Connection Policy:       cnot set>		MAC Pool:	HANA(240/256) 🔽		T01-Admin		^
Network Control Policy: Ink-up  Pin Group: <not set=""> Stats Threshold Policy: default Connection Policie Dynamic vNIIC Connection Policy: <not set=""></not></not>		QoS Policy:	<not set=""></not>		T01-AppServer	0	
Pin Group: <rol> <li>Fin Group:  Stats Threshold Policy: default Connection Policies Opynamic vNIC Connection Policy:  contection Policy:  Contec</li></rol>		Network Control Policy:	link-up		T01-Backup	0	
Stats Treshold Policy:     default       Connection Policies     T01-Olent       Dynamic vNIC Connection Policy:     vmtext		Pin Group:	(not set)		T01-Boot	Ő	
Statis Interesting Policy:     celault       Connection Policy:     VMQ       Dynamic vNIC Connection Policy:     xnot set>			L C h		T01-Client	Ő	
Conection Policy: cnot set>  Conection Polic		Stats Inreshold Policy:	derault		T01-DataSource	Õ	
Dynamic vNIC Connection Policy: <pre>cnot set&gt; </pre> Create VLAN		Connection Policies			T01-Internal	۲	~
Dynamic vNIC Connection Policy: <pre>cnot set&gt; </pre>		Dynamic vNIC U	ISNIC O VMQ		-		
		Dynamic vNIC Connecti	on Policy: <not set=""></not>	+ Create VLAN			



	Properties					
Modify VLANS	Name:	T01-Storage				
🕆 Delete	Description:					
Show Policy Usage	Owner:	Local				
	Fabric ID:	○ Fabric A ● Fabric B 🗹 Enable Failover				
		Target				
		✓ Adapter	-	Modify VLA	ANs	
				3		
	Template Type:	Initial Template     Opdating Template				
	MTU:	9000	VLANs			
	Policies		🔍 Filter 👄 Export	😸 Print		
	MAC Pool:	HANA(240/256)	Select	Name	Native VLAN	E
	OoS Policy:	<not set=""></not>		default	0	
	Network Central Palian	lak un		T01-Admin	0	
	Network Control Policy:	ink-up		T01-AppServer	0	
	Pin Group:	<not set=""></not>		T01-Backup	0	
	Stats Threshold Policy:	default 👻		T01-Boot	0	
	Connection Policies			T01-Client	0	
	Oprimie vNIC	usNIC 🔘 VMQ		T01-DataSource	0	
	Dumpmic vAIC Connect	tion Bolicy (not not)		101-Internal		<b>`</b>
	Dynamic vivic connec	dont oneys shouses	Create VLAN			
			and the version			

Figure 25 – Storage vNIC Template

# UCS Setup – WWNN Pool

Gener	al WWN Initiator Blocks	Initiators	Faults E	vents
Act	ions	Prop	erties	
f	Delete		Nan	ne: T01-WWNN-Pool
	Create WWN Block		Purpo	se: Node WWN Assignment
	Create WWNN Initiator	·	Descriptio	on:
Ś	Show Pool Usage		Si	ze: 32
2-	-		Assigne	ed: 6
		Assig	gnment Ord	er: ODefault  o Sequential

Figure 26 – WWNN Pool

General WWN Initiator Blocks Initiators Faults Events						
🛨 😑 🕰 Filter 🖨 Export 😓 Print						
Name	From	То				
[20:00:00:25:B5:AA:00:00 - 20:00:00:25:B5:AA:00:1F]	20:00:00:25:B5:AA:00:00	20:00:00:25:B5:AA:00:1F				

Figure 27 – WWN Pool Blocks

# UCS Setup – WWPN Pool Fabric A

This pool configuration is an example.

General	WWN Initiator Blocks	Initiators	Faults	Events	
Actio	ns	Prop	erties		
Ĥ	Delete		١	lame: TO	01-Fabric-A
	Create WWN Block		Pur	pose: Po	ort WWN Assignment
1818	Create WWPN Initiator		Descri	ption:	
S	Show Pool Usage			Size: 12	28
			Assi	gned: 6	
		Assig	nment C	order: (	Default      Sequential

Figure 28 – VSAN A WWPN Pool

General	WWN Initiator Blocks	Initiators	Faults	Events			
•	🕰 Filter 🖨 Export	😓 Print					
Name						From	То
···· 🏭 [2	20:00:00:25:B5:AA:AA:	00 - 20:00:	00:25:B	5:AA:AA	:7F]	20:00:00:25:B5:AA:AA:00	20:00:00:25:B5:AA:AA:7F

Figure 29 – VSAN A WWN Pool Blocks

# UCS Setup – WWPN Pool Fabric B

General WWN Initiator Blocks In	itiators Faults Even	ts
Actions	Properties	
📅 Delete	Name:	T01-Fabric-B
Create WWN Block	Purpose:	Port WWN Assignment
Create WWPN Initiator	Description:	
Show Pool Usage	Size:	128
	Assigned:	6
	Assignment Order:	O Default   Sequential

Figure 30 – VSAN B WWPN Pool

	General WWN Initiator Blocks Initiators Faults Events						
	🛨 🖃 🕰 Filter 🖨 Export 😸 Print						
	Name	From	То				
ш		20.00.00.25.85.88.88.00	20.00.00.25.85.88.88.75				

Figure 31 – VSAN B WWN Pool Blocks

# UCS Setup - vHBA Templates

General vHBA Interfaces Faults Events	
Actions	Properties
🗂 Delete	Name: HANA-vHBA-A
Show Policy Usage	Description:
A Use Global	Owner: Local
	Fabric ID: • A · B
	VSAN: Fabric-A
	Target: Adapter
	Template Type: <ul> <li>Initial Template</li> <li>Updating Template</li> </ul>
	Max Data Field Size: 2048
	Policies
	WWPN Pool: T01-Fabric-A(122/128)
	QoS Policy: <not set=""></not>
	Pin Group: <not set=""></not>
	Stats Threshold Policy: default

Figure 32 – vHBA - Fabric A

General vHBA Interfaces Faults Events		
Actions	Properties	
1 Delete	Name: HANA-vHBA	-В
Show Policy Usage	Description:	
A Use Global	Owner: Local	
	Fabric ID: 🔵 A 💿 B	
	VSAN: Fabric-B	<b>•</b>
	Target: Adapter	
	Template Type: 💿 Initial Ten	nplate 🔵 Updating Template
	Max Data Field Size: 2048	
	Policies	
	WWPN Pool: T01-Fabric-B(	122 🔻
	QoS Policy: <not set=""></not>	-
	Pin Group: <not set=""></not>	-
	Stats Threshold Policy: default	-

Figure 33 – vHBA - Fabric B

## UCS Setup - Ethernet Adapter Policy

These settings are non UCS standards and are documented in the Cisco SAP HANA TDI whitepaper. These settings are necessary to meet the network speed KPIs.

General Events		
Actions	Proj	perties Name: <b>B260M4</b>
Show Policy Usage	Des	cription: Owner: Local
Resources		
Transmit Queues:	1	[1-256]
Ring Size:	256	[64-4096]
Receive Queues:	8	[1-256]
Ring Size:	512	[64-4096]
Completion Queues:	2	[1-512]
Interrupts:	11	[1-514]

Figure 34 – Ethernet Adapter Settings

General Events			
Actions	Properties		
🗂 Delete	Name: <b>B260M4</b>		
Show Policy Usage	Description:		
🔒 Use Global	Owner: Local		
Resources			
Options			
	Transmit Checksum Offload:	O Disabled   Enabled	
	Receive Checksum Offload:	O Disabled   Enabled	
	TCP Segmentation Offload:	O Disabled  Enabled	
	TCP Large Receive Offload:	○ Disabled	
	Receive Side Scaling (RSS):	Disabled      Enabled	
A	Accelerated Receive Flow Steering:	Disabled      Enabled	
Network Virtualization us	ing Generic Routing Encapsulation:	Disabled      Enabled	
	Virtual Extensible LAN:	Disabled O Enabled	
	Failback Timeout (Seconds):	5	[0-600]
	Interrupt Mode:		ĸ
	Interrupt Coalescing Type:	● Min ◯ Idle	
	Interrupt Timer (us):	125	[0-65535]

Figure 35 – Ethernet Adapter Options

# UCS Setup – BIOS Policy

These settings are documented in the Cisco SAP HANA TDI whitepaper and necessary to meet the KPIs.

Main	Advanced	Boot Options	Server Management Events		
	Properties				
			Name:	HANA	
			Description:		
Act	tions		Owner:	Local	
f	Delete		Reboot on BIOS Settings Change:		
S	Show Pol	icy Usage	Quiet Boot:	disabled      enabled      Platform Default	
			Post Error Pause:	◯ disabled ◯ enabled	
			Resume Ac On Power Loss:	◯ stay-off ◯ last-state ◯ reset ● Platform Default	
			Front Panel Lockout:	○ disabled ○ enabled ● Platform Default	

Figure 36 – BIOS Policy



Figure 37 - BIOS Policy - Advanced

Main Advanced Boot Options Server Management Events	
Processor   Intel Directed IO RAS Memory   Serial Port   USB   PCI   QPI   LOM and	PCIe Slots
Memory RAS Config: maximum-performance	
NUMA: Odisabled O enabled O Platform Default	
LV DDR Mode: Opwer-saving-mode Operformance-mode outo	) Platform Default
DRAM Refresh Rate: Platform Default	

Figure 38 – BIOS Policy – RAS

Main Advanced	Boot Options Server Management Events	
Processor Inte	Directed IO RAS Memory Serial Port USB PCI QPI LOM and PCIE Slot	;
Serial Port A:	○ disabled ● enabled ● Platform Default	
-		

Figure 39 – BIOS Policy – Serial

Main Advanced Boot	Options Server Management Events
Assert Nmi On Ser	r: 💽 disabled 🔵 enabled 💿 Platform Default
Assert Nmi On Per	r: 🔵 disabled 🔵 enabled 💿 Platform Default
OS Boot Watchdog Time	r: Odisabled Oenabled OPlatform Default
FRB-2 Time	r: Odisabled Oenabled OPlatform Default
Console Redirectio	n
Console Redirection:	serial-port-a
Flow Control:	○ none ○ rts-cts ④ Platform Default
BAUD Rate:	115200 🔻
Terminal Type:	vt100-plus 🔻
Legacy OS Redirect:	◯ disabled
Putty KeyPad:	Platform Default

Figure 40 - BIOS Policy - Server

# UCS Setup - Boot Policy

Note: The CD will be removed later.



Figure 41 – Boot Policy

Boot Order					
🛨 😑 🔍 Filter 🖨 Export 😓 Print					
Name	Order	vNIC/vHBA/iSCSI vNIC	Туре	Lun ID	WWN
CD/DVD	1				
🗄 🖅 🚍 San	2				
SAN primary		HBA-A	Primary		
SAN Target primary			Primary	0	56:C9:CE:90:F0:8B:97:04
SAN Target secondary			Secondary	0	56:C9:CE:90:F0:8B:97:02
SAN secondary		HBA-B	Secondary		
SAN Target primary			Primary	0	56:C9:CE:90:F0:8B:97:08
SAN Target secondary			Secondary	0	56:C9:CE:90:F0:8B:97:06

Figure 42 – Boot Interface Ordering

## UCS Setup - Default Host Firmware Package

General Events	
Actions	Properties
📋 Delete	Name: default
Show Policy Usage	Description: Default Host Package
Use Global	Owner: Local
Modify Package Versions	Blade Package: 2.2(3c)B

Figure 43 – UCS Host Firmware

# UCS Setup – IPMI User

Set a password for user sapadmin.

General Events	
Actions	Properties
👃 Create User	Name: HANA
📅 Delete	Description:
Show Policy Usage	Owner: Local
use Global	IPMI Over LAN: O Disable  Enable
	IPMI Users
	🛨 🖃 🕰 Filter 🖨 Export 😸 Print
	Name Role
	🔏 sapadm Admin

Figure 44 – IPMI User

## UCS Setup – Maintenance Policy

This configuration is an example.

Main Events	
Actions	Properties
📅 <u>Delete</u>	Name: HANA
Show Policy Usage	Description:
use Global	Owner: Local
	Reboot Policy: O Immediate O User Ack O Timer Automatic

Figure 45 – Maintenance Policy

## UCS Setup – Power Control Policy

General Events	
Actions	Properties
📅 Delete	Name: HANA
Show Policy Usage	Description:
A Use Global	Owner: Local
	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 <b>no-cap</b> , 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.

Figure 46 – Power Control Policy

## UCS Setup - Serial over LAN Policy

This configuration is an example.

General Events		
Actions	Properties	
📅 Delete	Name: SoL-Console	
Show Policy Usage	Description:	
A Use Global	Owner: Local	
	Serial over LAN State: O Disable   Enable	
	Speed: 115200 -	

Figure 47 – LAN Policy

# UCS Setup – UUID Pool

General	UUID Suffixes	UUID Blocks	Faults	Events		
Actio	าร			Properti	25	
Ť	Delete				Name:	T01-HANA
112	Create a Block o	of UUID Suffixe	es	De	scription:	
	Show Pool Lisaa	a.			Prefix:	8A84D76E-6749-11E4
	Show Pool Osag	c			Size:	32
				4	Assigned:	6
				Assignme	nt Order:	🔵 Default 💿 Sequential

Figure 48 – UUID Pool

General UUID Suffixes	UUID Blocks	Faults	Events		
🗈 🖃 🕰 Filter 🖨 Es	xport 😹 Prin	t			
Name				From	То
	001 - 0000-00	A000000	0020]	0000-00A00000001	0000-00A00000020

Figure 49 - UUID Pool Blocks

# UCS Setup - Service Profile Template



Figure 50 - Service Profile Template

ſ	General	Storage	Network	iSCSI vNICs	vMedia Policy	Boot Order	Policies	Events	FSM			
ſ	vHBAs	vHBA Initi	ator Group	s								
	Actions       World Wide Node Name         Change Local Disk Configuration Policy       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name       World Wide Node Name: Pool Derived         World Wide Node Name: Pool Derived       WWNN Pool: T01-WWNN-Pool         Local Disk Configuration Policy       Mode: No Local Storage         Protect Configuration is set, the local disk configuration is preserved if the service profile is associated with       that server in that case, a configuration error will be raised when a new service profile is associated with         What Server if the local disk configuration in that profile is disabled, SD cards will become unavailable immediately.       FlexFlash State: Disable         If FlexFlash RAID Reporting State: Disable       SAN Connectivity Policy: <not set="">          SAN Connectivity Policy       SAN Connectivity Policy&lt;</not>											
	ÐE	🛛 🔍 Filte	er 🖨 Expo	ort 😸 Print								
	Name			WWPN	Desired	Order Fa	abric ID	Actu	ial Order	Desired Placement	Actual Pla	cement
		VHBA HBA	-A If Fabric-A	Derived	3	A		Unsp	ecified	Any	Any	
	<b>60</b>	VHBA HBA	-B If Fabric-B	Derived	4	В		Unsp	ecified	Any	Any	

Figure 51 – Service Profile – Storage



Figure 52 - Service Profile - Create WWNN

General Storage Networ	k iSCSI vNICs vM	edia Policy   Boot Or	der Policies Eve	ents FSM				
Actions Change Dynamic vN Modify vNIC/vHBA	IIC Connection Policy Placement	Dynamic vN Nothing Sele	IC Connection F	olicy				
vNIC/vHBA Placement Policy Specific vNIC/vHBA Placement Policy								
		Virtual Slo	ot	Selection Pr	eference	E.		
		1		All		<u>^</u>		
		2		All				
		3		All				
		4		All				
		LAN Connec	<b>tivity Policy</b> I Connectivity Polic	:y: <not set<="" th=""><th>&gt; 🔻</th><th></th></not>	> 🔻			
		LAN Connect	ivity Policy Instan	ie:				
		🛨 Create L	AN Connectivity P	olicy				
vNICs								
🔍 Filter 🖙 Export 😹 F	Print							
Name	MAC Address	Desired Order	Actual Order	Fabric ID	Desired Placement	Actual Placeme		
-I vNIC T01-Client	Derived	1	Unspecified	B A	1	Any		
VNIC T01-Internal Derived 1 Unspecified A B 2 Any								
- VNIC T01-Storage	Derived	2	Unspecified	BA	2	Anv		

Figure 53 – Service Profile – Network

<u> </u>			Modif	y vNIC/vH	BA Placement			×
Modify N Specify	VNIC/V	<b>/HBA Placeme</b> Cs and vHBAs are plac	e <b>nt</b> eed on physical network adapt	ers				Ø
NIC/vHBA Place n a server hardw Select Placen Virtual Netwo vNICs and v performed es automatically vNIC/vHBA p Please select	ement speci ware configu ment: Spec ork Interfac HBAs are a explicitly by sy plocement o t one Virtua	fies how vNICs and vHBAs aration independent way. offy Manually econnection provides a m ssigned to one of Virtual Ne electing which Virtual Net g <sup>3</sup> any <sup>3</sup> . In physical network interface Network Interface and or	are placed on physical network ada Create Placement Policy echanism of placing WIICs and vHB/ tetwork. Interface connection suech tork interface connection suech pice is controlled by placement prefer- te or more vNIICs or vHBAs	pters (mezzan As on physical Id below. This I VNIC or VHB, ences.	ine) network adapters. assignment can be A or it can be done			
VNICs V	HBAs		Name	Order	Admin Host Port	Selection Preference		
Name	F		-S vCon 1			All		
Inditie			-I vNIC T01-Client	1	ANY			
		>> assign >>	i⊨-∭ vCon 2			All		
		77 doorg 1777	VNIC T01-Internal	1	ANY			
		<< remove <<	-I vNIC T01-Storage	2	ANY			
			🖉 vCon 3			All		
			wCon 4			All		
				🔺 Move L	ip 🔝 Move Down			
							OK Cance	el
	_			_				

Figure 54 – Service Profile – vNIC/vHBA

General Storage Network iSCSI vNICs	vMedia Policy	Boot Order	Policies	Events	FSM
Actions					
Modify vMedia Policy					
No vMedia Policy Selected					

Figure 55 – Service Profile – vMedia

Ger	neral	Storage	Network	iSCSI vNICs	vMedia Policy	Boot Order	Policies	Events	FSM				
Ac	Actions												
T.	Modify Boot Policy												
۲G	lobal	Boot Po	licy										
			١	Name: HANA-	Master								
			Descri	ption:									
	Reboo	ot on Boo	t Order Ch	ange: LBL_SC	ALAR_BOOL	_NO							
E	Inforce	e vNIC/vH	IBA/iSCSI N	Name: LBL_SC	ALAR_BOOL	YES							
			Boot N	Mode: Legacy	/								
		THEE.											
	he tvp	pe (primar	v/seconda	rv) does not in	dicate a boot o	order presence							
1	he eff	ective or	der of boot	t devices within	n the same dev	ice class (LAN,	/Storage/i	SCSI) is	determi	ned by	PCIe bus so	an order.	
I	f Enfo	rce vNI(	C/vHBA/i	SCSI Name is	selected and t	he vNIC/vHBA	/iSCSI do	es not (	exist, a c	onfig er	ror will be r	eported. Jost BCIe hus scap order is us	
1	i itis n	IOT SEIECU	eu, uie vivi	ICS/VIDAS/ISC	SI di e selecteu	in they exist,	ounerwise	uie vi	сулья	VISCOL (	with the low	est PCIE bus scan order is us	:u.
II.	Boot	Order											
	ŧ	I 🔍 Fi	lter 🖨 Exp	port 😸 Print									
	Name				Order	vNIC/vHBA/iS	CSI vNIC	т	ype		Lun ID	WWN	
		CD/DVD			1								
	ġ <b>≣</b>	San			2								
		E SAN	primary		1	HBA-A		Pr	imary				
		- = :	SAN Target	t primary				Pr	imary		0	56:C9:CE:90:F0:8B:97:04	
		=	SAN Target	t secondary				Se	condary	1	0	56:C9:CE:90:F0:8B:97:02	
	ė.	E SAN	secondary		1	HBA-B		Se	condary	1			
		- = 5	SAN Target	t primary				Pr	imary		0	56:C9:CE:90:F0:8B:97:08	
		===	SAN Target	t secondary				Se	condary	r i	0	56:C9:CE:90:F0:8B:97:06	

Figure 56 – Service Profile – Boot Order

General Storage Network iSCSI vNIC	s vMedia Policy Boot Order Policies Events FSM	
Actions	Policies	
S Change Serial over LAN Policy	BIOS Policy	
	BIOS Policy: HANA	
	Firmware Policies	8
	Host Firmware: default	
	IPMI Access Profile Policy         IPMI Access Profile:         HANA         The context of	

Figure 57 – Service Profile – Policies

General	Storage	Network	iSCSI vNICs	vMedia Policy	Boot Order	Policies	Events	FSM					
Action	<b>s</b> nange Seri	al over LA	N Policy	Policies Power Con Power Con	trol Policy trol Policy: d	efault		• 8	Create Power Cont	trol Policy	-	8	^
				Scrub Polic	v /: <not set=""></not>	,	•	Create S	Scrub Policy	-	-	۲	
				Serial over	LAN Policy	SoL-Con	sole	-		-		۲	
				Stats Polic	V		-	+ Crea	ate Threshold Policy	/	-	۲	
				Threshold F	Policy: defau	lt	•					0	
				KVM Manag KVM Manag	gement Poli	: <not se<="" th=""><th>:t&gt;</th><th>•</th><th>+ Create KVM Ma</th><th>inagement Polic</th><th>.y</th><th>*</th><th>~</th></not>	:t>	•	+ Create KVM Ma	inagement Polic	.y	*	~

Figure 58 - Service Profile - Policies (cont)

A	Change Serial over LAN Policy	×
Change Serial or	ver LAN Policy	0
Select the Serial over LAN Polic	y: Use an Existing Serial over LAN P ▼	
Serial over LAN Policy: S	ioL-Console 🔹 💽 Create Serial over LAN Po	licy
	OK Cance	el

Figure 59 – SOL Policy



Figure 60 - Management IP

## UCS Setup - Service Profiles

Create the service profiles and assign the servers.

Service Profiles					
All Failed Active Passive Disa	associated	Pending	Hierarchical	Pending A	Activities
🕰 Filter 🖨 Export 😸 Print					
Name	/ User	Label	Overall Statu	IS	Assoc State
Service Profile hana01			🖡 Unassocia	ated	Unassociated
Service Profile hana02			🖡 Unassocia	ated	Unassociated
Service Profile hana03			🖡 Unassocia	ated	Unassociated
Service Profile hana04			🖡 Unassocia	ated	Unassociated
Service Profile nodenfs01			1 Ok		1 Associated
Service Profile nodenfs02			🖡 Power Of	f	1 Associated

Figure 61 – Service Profile Assignment

### Nimble Storage – Storage Setup

The raid configuration is by default a triple-parity configuration. There is no specific configuration to be done. Details can be found can be found in this technology overview <a href="http://info.nimblestorage.com/rs/nimblestorage/images/nimblestorage\_technology\_overview.pdf">http://info.nimblestorage.com/rs/nimblestorage/images/nimblestorage\_technology\_overview.pdf</a>

### Nimble Storage - Network Configuration

Network Co	onfiguratio	on				
Network Conf	igurations	View				
Group	Subnets	Interfaces	Diagr	nostics		
Manage	ement IP					
Used for across a	r the Web UI, all "Mgmt only	CLI and replica " and "Mgmt +	ition. F Data"	Resides interfac	on managen es on that su	nent subnet and ubnet.
IP Addre	ss	Network		Netmas	sk	
172.22.1.	15	172.22.1.0		255.255	.255.0	
iscsi H	lost Connect	ion Method				
Manu						
Autor	matic 🛄	-				
I Er	nable rebalancin	g				
Routes						
Default (	Gateway	172.22.1.1				
		Network		Netma	sk (	Gateway
Static Ro	outes					

Figure 62 - Nimble Management Network Setup

Group Subnets	Interfaces	Diagnostics				
Subnet Label	Network	Netmask	Traffic Type	мти	Bytes	VLAN ID
Management	172.22.1.0	255.255.255.0	Mgmt only	Standard	1500	

Figure 63 – Management Subnet Assignment

bnets Interfaces	Diagnostics					
Array Name	Link Status	Subnet Label	Data IP Address	Unconfigured	VLAN ID	Tagged
SAP-HANA		Management				
SAP-HANA		Management				
	Array Name SAP-HANA SAP-HANA	Array Name Link Status SAP-HANA SAP-HANA	Array Name     Link Status     Subnet Label       SAP-HANA <ul> <li>Management</li> <li>SAP-HANA</li> <li>Management</li> </ul>	Array Name     Link Status     Subnet Label     Data IP Address       SAP-HANA <ul> <li>Management</li> <li>SAP-HANA</li> <li>Management</li> </ul>	Array Name         Link Status         Subnet Label         Data IP Address         Unconfigured           SAP-HANA <ul> <li>Management</li> <li>SAP-HANA</li> <li>Management</li> </ul>	Array Name     Link Status     Subnet Label     Data IP Address     Unconfigured     VLAN ID       SAP-HANA <ul> <li>Management</li> <li>SAP-HANA</li> <li>Management</li> <li< td=""></li<></ul>

Figure 64 - Management Port Assignment

Group Si	ubnets Int	terfaces	Diagnostics	
Diagnostic IP ad reachable throug	dresses are re Ih the manage	equired fo ement IP	r troubleshooting and N address. These IP addre	imble Storage Support purposes in the event that a controller is not isses must be placed on the Group Management subnet.
Management IP	Network		Netmask	
172.22.1.15	172.22.1.0	D	255.255.255.0	
SAP-HANA				
	IP Address			
Controller A	172.22.1.16			
Controller B	172.22.1.17			

Figure 65 – Nimble Support Interfaces

# Nimble Storage – Initiator Groups and used WWPNs

 	imblestorage	Home	Manage 🗸
	Initiator Groups		
	Create Edit		Delete
	Initiator Group	Iı	nitiators
	hana01		2
	hana02		2
	hana03		2
	hana04		2
	nodenfs01		2
	nodenfs02		2

Figure 66 – Host Initiator Groups

General WWN Initiator Blocks	Initiators	Faults	Event	s
🔍 Filter 🔿 Export 🍃 Print				
Name		Accie	and a	Assisted To
Name		Assig	neu	Assigned to
Initiator 20:00:00:25:B5:AA	:AA:00	yes		org-root/ls-nodenfs01/fc-HBA-A
Initiator 20:00:00:25:B5:AA	:AA:01	yes		org-root/ls-nodenfs02/fc-HBA-A
Initiator 20:00:00:25:B5:AA	:AA:02	yes		org-root/ls-hana01/fc-HBA-A
Initiator 20:00:00:25:B5:AA	:AA:03	yes		org-root/ls-hana02/fc-HBA-A
Initiator 20:00:00:25:B5:AA	:AA:04	yes		org-root/ls-hana03/fc-HBA-A
Initiator 20:00:00:25:B5:AA	:AA:05	yes		org-root/ls-hana04/fc-HBA-A
IIII Toitistor 20,00,00,25,85,44	AA.06	-		

Figure 67 – VSAN A – Nimble WWN Initiators

General WWN Initiator Blocks Initiators Faults Events								
🔍 Filter 🖨 Export 😸 Print								
Name	Assigned	Assigned To						
Initiator 20:00:00:25:85:88:88:00	yes	org-root/ls-nodenfs01/fc-HBA-B						
Initiator 20:00:00:25:85:88:88:01	yes	org-root/ls-nodenfs02/fc-HBA-B						
Initiator 20:00:00:25:B5:BB:BB:02	yes	org-root/ls-hana01/fc-HBA-B						
Initiator 20:00:00:25:85:88:88:03	yes	org-root/ls-hana02/fc-HBA-B						
Initiator 20:00:00:25:85:88:88:04	yes	org-root/ls-hana03/fc-HBA-B						
Initiator 20:00:00:25:85:88:88:05	yes	org-root/ls-hana04/fc-HBA-B						
1111 Toitistor 20:00:00:25:85:88:88:06	00							

Figure 68 - VSAN B - Nimble WWN Initiators

For Failover, HANA- Data and Log LUNs are exported to all HANA Initiators. This means each HANA Node can access all HANA Data and Log LUNs (required for failover). SAN Zoning must not be adjusted. Example for HANA02 Data LUN:

Initiator Group
hana02
<u>hana01</u>
hana03

Figure 69 – Initiator Group – Volume Assignment

### Nimble Storage – Volumes

Please follow the SAP HANA installation guide and the Cisco SAP HANA TDI whitepaper for the Volume sizing and layout. For a 4 Node Scale-out with 256 GB RAM it could look like this:

Volumes						Space	Performance
New Volume View	Volumes + Replicas		Volu	mes: 6 Total U	Isage: <b>34.12 GE</b>	Free:	22.73 TB
Volume	Size	Volume Usage 🚹	Snapshot Usage 👔	1	Total Usage 🚺		
e hana01-boot	100.0 GB	5.69 GB 🧾	0 В	5.	.69 GB		
hana02-boot	100.0 GB	5.69 GB 🥫	0 В	5.	.69 GB		
e hana03-boot	100.0 GB	5.69 GB 🗾	0 B	5.	.69 GB		
e hana04-boot	100.0 GB	5.69 GB 🥫	0 В	5.	.69 GB		
endenfs01-boot	100.0 GB	5.66 GB 🧾	6.84 MB	5.	.67 GB		
endenfs02-boot	100.0 GB	5.69 GB 🗾	0 В	5.	69 GB		

Figure 70 - Nimble Storage Boot Volumes

### **OS** installation

Please follow the Cisco SAP HANA TDI whitepaper instructions.

NOTE: Please make sure to have the boot LUN during the installation presented to the server only as a single LUN without any redundancy and adjust the zoning later.

When the OS is installed from a plain SLES or RHEL installation media please update the OS to the necessary kernel and patch level required by the SAP HANA revision to be installed.

### **OS** configuration

This OS configuration is provided as an example in Appendix B.

Multipathing /etc/multipath.conf

```
defaults {
 user_friendly_names yes
}
blacklist {
devnode "^(ram raw loop fd md dm- sr scd st)[0-9]*"
 devnode "^hd[a-z][[0-9]*]"
 device {
 vendor "*"
 product "*"
 }
}
blacklist_exceptions {
device {
 vendor "Nimble"
 product "Server"
 }
}
devices {
 device {
 vendor "Nimble"
 product "Server"
 no_path_retry 20
 rr_weight priorities
```

```
path_grouping_policy group_by_prio
rr_min_io 20
failback 10
path_selector "round-robin 0"
path_checker "tur"
prio "alua"
}
```

Generate SSH Keys and exchange with all other HANA nodes. This facilitates automation of updates and other management tasks.



Figure 71 – Generate ssh Keys

### **Multipathing**

This configuration shows the four hosts configured for the TDI testing.



Figure 72 - Multipathing Setup

### HANA folders

Create SAP HANA related folders (/hana/data, /hana/log and /hana/backup) with the SuSE Logical Volume Manager (LVM). Create volume groups and format the logical volumes with XFS.

Mount NFS share /hana/shared.



Figure 73 - Mount NFS Share

Add NFS share to /etc/fstab

ピー 172.22.1.43 - PuTTY								
hana04:~ # cat /etc/fstab								
UUID=5ff0ae0f-eb4c-4715-9ece-b2c15ca76fd0	/ ext	3 acl,user_xattr						
proc /proc	proc	defaults						
sysfs /sys	sysfs	noauto						
debugfs /sys/kernel/debug	debugfs	noauto						
usbfs /proc/bus/usb	usbfs	noauto						
devpts /dev/pts	devpts	mode=0620,gid=5						
/swap-001 swap swap defaults	0 0							
nodenfs-st:/srv/nfs-hanashared/hanashared	/hana/shar	ed nfs rsize=1048	576,wsize=1048576 0					
hana04:~ #								
						$\sim$		

Figure 74 - Configure fstab

# Summary

This document provides an overview of the SAP HANA Solution on SmartStack. This guide follows best practices from Nimble Storage, Cisco, and SAP for construction of the compute, network and storage elements needed for a TDI tested solution to support SAP HANA.

Using the setup examples provided in this guide and staying with the vendor defined solutions for SmartStack san SAP HANA TDI configurations, you should be able to construct a similar solution specific to your own environment needs.

This solution guide is not intended to cover every possible configuration setup or detail. For more information, contact your local integrator or vendor for more details.

# Appendix A – VSAN Database Configuration

#### vsan database

```
vsan 10 name "Fabric-A"
```

```
fcdomain fcid database
  vsan 10 wwn 20:1f:54:7f:ee:87:64:c0 fcid 0xe20000 dynamic
  vsan 10 wwn 20:20:54:7f:ee:87:64:c0 fcid 0xe20020 dynamic
  vsan 10 wwn 56:c9:ce:90:f0:8b:97:02 fcid 0xe20040 dynamic
 vsan 10 wwn 56:c9:ce:90:f0:8b:97:04 fcid 0xe20060 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:00 fcid 0xe20001 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:01 fcid 0xe20021 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:02 fcid 0xe20002 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:03 fcid 0xe20022 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:04 fcid 0xe20003 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:05 fcid 0xe20023 dynamic
  vsan 10 wwn 20:00:00:25:b5:aa:aa:06 fcid 0xe20004 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:07 fcid 0xe20005 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:08 fcid 0xe20006 dynamic
  vsan 10 wwn 20:00:00:25:b5:aa:aa:09 fcid 0xe20007 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:0b fcid 0xe20024 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:0c fcid 0xe20008 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:0d fcid 0xe20025 dynamic
 vsan 10 wwn 20:00:00:25:b5:aa:aa:0a fcid 0xe20009 dynamic
 vsan 1 wwn 56:c9:ce:90:f0:8b:97:03 fcid 0x650000 dynamic
 vsan 1 wwn 56:c9:ce:90:f0:8b:97:01 fcid 0x650020 dynamic
[...]
!Full Zone Database Section for vsan 10
fcalias name Nimble_Controller-A_Port1 vsan 10
    member pwwn 56:c9:ce:90:f0:8b:97:04
fcalias name Nimble_Controller-A_Port2 vsan 10
   member pwwn 56:c9:ce:90:f0:8b:97:02
fcalias name nodenfs01 hba-a vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:00
fcalias name nodenfs02_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:01
fcalias name hana01 hba-a vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:02
fcalias name hana02_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:03
fcalias name hana03_hba-a vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:04
fcalias name hana04_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:05
fcalias name drx-test_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:06
fcalias name nodenfs01_hba-c vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:07
fcalias name nodenfs02_hba-c vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:06
fcalias name esxi01_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:08
fcalias name esxi02_hba-a vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:09
fcalias name Nimble_Controller-A_Port3 vsan 10
```

```
member pwwn 56:c9:ce:90:f0:8b:97:03
fcalias name Nimble_Controller-A_Port4 vsan 10
    member pwwn 56:c9:ce:90:f0:8b:97:01
fcalias name hana05_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:0a
fcalias name hana06_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:0b
fcalias name hana07_hba-a vsan 10
    member pwwn 20:00:00:25:b5:aa:aa:0c
fcalias name hana08_hba-a vsan 10
   member pwwn 20:00:00:25:b5:aa:aa:0d
zone name z nodenfs01 vsan 10
   member fcalias Nimble Controller-A Port1
    member fcalias Nimble Controller-A_Port2
    member fcalias nodenfs01_hba-a
    member fcalias nodenfs01 hba-c
zone name z nodenfs02 vsan 10
   member fcalias Nimble_Controller-A_Port1
    member fcalias Nimble Controller-A_Port2
    member fcalias nodenfs02_hba-a
   member fcalias nodenfs02_hba-c
zone name z_hana01_hba-a vsan 10
   member fcalias Nimble_Controller-A_Port1
   member fcalias Nimble_Controller-A_Port2
    member fcalias hana01_hba-a
   member fcalias Nimble_Controller-A_Port3
   member fcalias Nimble Controller-A Port4
zone name z_hana02_hba-a vsan 10
   member fcalias Nimble_Controller-A_Port1
    member fcalias Nimble_Controller-A_Port2
    member fcalias hana02_hba-a
    member fcalias Nimble Controller-A Port3
   member fcalias Nimble_Controller-A_Port4
zone name z_hana03_hba-a vsan 10
    member fcalias Nimble Controller-A Port1
    member fcalias Nimble_Controller-A_Port2
   member fcalias hana03_hba-a
    member fcalias Nimble_Controller-A_Port3
   member fcalias Nimble_Controller-A_Port4
zone name z hana04 hba-a vsan 10
    member fcalias Nimble_Controller-A_Port1
    member fcalias Nimble Controller-A_Port2
    member fcalias hana04_hba-a
    member fcalias Nimble_Controller-A_Port3
    member fcalias Nimble_Controller-A_Port4
zone name z_drx-test_hba-a vsan 10
    member fcalias Nimble_Controller-A_Port1
    member fcalias Nimble_Controller-A_Port2
   member fcalias drx-test_hba-a
zone name esxi01_hba-a vsan 10
    member fcalias Nimble_Controller-A_Port1
    member fcalias Nimble_Controller-A_Port2
   member fcalias esxi01_hba-a
zone name esxi02_hba-a vsan 10
```

```
member fcalias Nimble_Controller-A_Port1
   member fcalias Nimble_Controller-A_Port2
   member fcalias esxi02_hba-a
zone name z_hana05_hba-a vsan 10
   member fcalias Nimble_Controller-A_Port1
   member fcalias Nimble_Controller-A_Port2
   member fcalias Nimble_Controller-A_Port3
   member fcalias Nimble_Controller-A_Port4
   member fcalias hana05_hba-a
zone name z_hana06_hba-a vsan 10
   member fcalias Nimble_Controller-A_Port1
   member fcalias Nimble_Controller-A_Port2
   member fcalias Nimble_Controller-A_Port3
   member fcalias Nimble_Controller-A_Port4
   member fcalias hana06_hba-a
zone name z_hana07_hba-a vsan 10
   member fcalias Nimble_Controller-A_Port1
   member fcalias Nimble_Controller-A_Port2
   member fcalias Nimble_Controller-A_Port3
   member fcalias Nimble_Controller-A_Port4
   member fcalias hana07_hba-a
zone name z_hana08_hba-a vsan 10
   member fcalias Nimble_Controller-A_Port1
   member fcalias Nimble_Controller-A_Port2
   member fcalias Nimble_Controller-A_Port3
   member fcalias Nimble Controller-A Port4
   member fcalias hana08 hba-a
zoneset name zSet_Fabric-A vsan 10
   member z_nodenfs01
   member z_nodenfs02
   member z_hana01_hba-a
   member z hana02 hba-a
   member z_hana03_hba-a
   member z_hana04_hba-a
   member z drx-test hba-a
   member esxi01_hba-a
   member esxi02_hba-a
   member z_hana05_hba-a
   member z_hana06_hba-a
   member z hana07 hba-a
   member z hana08 hba-a
zoneset activate name zSet_Fabric-A vsan 10
```

# Appendix B – OS Configuration

Network configuration for Node hana04 (example) in /etc/sysconfig/network/ifcfg-ethx:

Client Network (eth0):

BOOTPROTO='static' BROADCAST='172.22.1.255' ETHTOOL\_OPTIONS='' IPADDR='172.22.1.43' MTU='1500' NAME='VIC Ethernet NIC' NETWORK='172.22.1.0' REMOTE\_IPADDR='' STARTMODE='auto' USERCONTROL='no' NETMASK='255.255.255.0'

Storage Network (eth1):

BOOTPROTO='static' BROADCAST='172.22.220.255' ETHTOOL\_OPTIONS='' IPADDR='172.22.220.43' MTU='9000' NAME='VIC Ethernet NIC' NETWORK='172.22.220.0' REMOTE\_IPADDR='' STARTMODE='auto' USERCONTROL='no' NETMASK='255.255.255.0'

#### Internal Network (eth2):

```
BOOTPROTO='static'
BROADCAST='172.22.110.255'
ETHTOOL_OPTIONS=''
IPADDR='172.22.110.43'
MTU='9000'
NAME='VIC Ethernet NIC'
NETWORK='172.22.110.0'
REMOTE_IPADDR=''
STARTMODE='auto'
USERCONTROL='no'
NETMASK='255.255.255.0'
```

Default Gateway in /etc/sysconfig/network/routes

default 172.22.1.1 - -

Set Hostname in /etc/HOSTNAME

hana04

/etc/hosts content (distributed to all hana nodes):

```
127.0.0.1
               localhost
172.22.1.40
               hana01
172.22.1.41
               hana02
              hana03
172.22.1.42
172.22.1.43
              hana04
172.22.1.30
              nodenfs01
172.22.1.31
              nodenfs02
172.22.1.10
              ucs6248
172.22.1.15
              nimble-storage
172.22.1.2
              n5k-a
172.22.1.3
              n5k-b
172.22.110.20 nodenfs-st
172.22.110.30 nodenfs01-st
172.22.110.31 nodenfs02-st
172.22.110.40
              hana01-st
172.22.110.41 hana02-st
172.22.110.42 hana03-st
172.22.110.43 hana04-st
172.22.220.40
              hana01-int
172.22.220.41 hana02-int
172.22.220.42 hana03-int
172.22.220.43 hana04-int
192.53.103.108 ptbtime1.ptb.de
# special IPv6 addresses
              host ipv6host ipv6-loopback
::1
fe00::0
              ipv6net
               ipv6-mcastprefix
ff00::0
ff02::1
               ipv6-allnodes
ff02::2
               ipv6-allrouters
ff02::3
               ipv6-allhosts
```



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