

Technical Marketing Solutions Guide

# Nimble Storage SmartStack Getting Started Guide Cisco UCS and VMware ESXi5



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#### OVERVIEW

The Nimble Storage SmartStack is an example of a converged infrastructure for virtualization, building upon the basic components of storage, network, compute and hypervisor. Once the basic environment is assembled, the specific use cases for the virtualized infrastructure are left to the reader.

#### Audience

This Getting Started Guide was developed to help new SmartStack administrators quickly setup a Nimble Storage, Cisco UCS and VMware ESXi5 environment as defined in many of the Nimble Storage SmartStack solutions.

It is not intended to be a complete implementation or customization guide. Where choices are available, we will identify the optimal or chosen methods applicable to the particular area.

If you have further questions, please contact Nimble Storage, Cisco or VMware technical support.

This guide is intended for administrators and architects new to Nimble Storage UCS SmartStack solution configurations. It will cover most of the basic setup steps and considerations for a reference architecture style deployment.

#### **Assumptions**

- General knowledge of Cisco UCS and UCSM this is not a tutorial on how to set up UCS environments.
- Familiarity with Nimble Storage UI and basic setup tasks
- Familiarity with basic setup of VMware ESXi5
- This guide will not address all of the possible configuration options for Cisco UCSM (e. g., pools, and policies). Where the configuration has an impact on the operation of the Nimble Storage solution, details, options and recommendations will be provided.
- This is not a "how to" guide. Step by step setup is not covered, examples of screen shots and settings should be sufficient for the reader to apply the right changes to implement the steps outlined in this guide.

#### 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.

# UCS Topology Review

This guide is based on the SmartStack configuration approach to deploying UCS. There are alternate UCS network topologies possible. Pay particular attention to determining if you need a single iSCSI subnet or if you need dual subnets for network diversity. Nimble Storage can be attached to the Cisco UCS systems in one of two basic methods:

- Directly to the Fabric Interconnect (FI) ports as an Appliance Port storage component, or
- Attached to an access layer switch (e.g., Nexus 5K) as a general purpose iSCSI storage system.

Nimble Storage SmartStack solutions are based on the Fabric Interconnect topology. This getting Started Guide is not intended to cover all of the various scenarios and options for connecting iSCSI storage to a Cisco UCS environment; but is focused on the SmartStack configuration aspects. The next sections will highlight a few of the considerations in the two choices. For more information about general purpose connectivity, please consult with your Cisco UCS solutions team.

UCS operation mode determines how the Fabric Interconnects forward network traffic. Note that in this case we are only interested in the Ethernet operation mode. Ethernet End-host mode is the most common setting, and the general case used for SmartStack setup. To confirm which mode you are currently in, perform the following steps from the UCSM GUI:

- Go to the Equipment tab
- Expand the Fabric Interconnects section
- Select one of the Fabric Interconnects and observe the details in the General section.

You should see something similar to this:



Figure 1 – Equipment Tab FI Operation Mode

### Fabric Interconnect Only Configuration

In this configuration, the Nimble Storage connects directly to unified 10G ports on the Cisco UCS Fabric Interconnect FI (UPN-6248) devices. This solution illustrates the direct attach cabling option and presents the Nimble Storage appliance closest to the UCS servers – blade or rack series. This configuration requires special testing and certification between Cisco and Nimble. You need to ensure that all CASL and Cisco UCS versions are supported; this should be checked before putting the host into production. From the Nimble Storage side, verify that you are running a current GA release which has been certified to work with Cisco UCS and supported for SAN boot.

From the Cisco UCS side, the authoritative place to verify this information is in the Cisco UCS Hardware and Software Interoperability Matrix:

#### http://www.cisco.com/web/techdoc/ucs/interoperability/matrix/matrix.html

In this case Nimble Storage is directly connected to the Cisco Fabric Interconnects (FIs) as Appliance ports. Appliance ports are essentially untagged traffic bound for one specific VLAN in the UCS environment. In the below graphic each Nimble Controller uses one interface to connect to FI-A and the other to FI-B (for example tg1 connections from both controllers to FI-A and tg2 to FI-B). In addition there needs to be two separate VLANs (and associated subnet) for iSCSI connectivity. One VLAN will be specific to FI-A and the other will be specific to FI-B. The VLANs should exist only on a single FI and do not allow failover between the FIs. Each UCS blade server profile will in turn need to have a presence on each iSCSI VLAN. This is accomplished by creating a specific vNIC and assigning it a native VLAN of each of the iSCSI VLANs created previously. The host OS will have an IP presence in these subnets and in turn manage MPIO connectivity via these paths.

The connections can be either 10G twinax or 10G optical as long as the SFP+ connectors and cables are supported by Cisco and Nimble Storage.

With the current UCSM Fabric Interconnect architecture, this will result in a dual data path iSCSI network topology – one subnet through FI-A and one subnet through FI-B.



Figure 2 – SmartStack Basic Network Connectivity

### Nexus Access Layer Switch Configuration (optional)

It is also possible to connect the Nimble Storage appliance to general purpose access layer switches (e.g., Cisco Nexus 5K) which are in turn connected to the UCS FI switches. This method will work when properly configured; however, this is not the typical specified method for SmartStack UCS solutions.

In this setup, the Nimble Storage appears to the UCS environment as a basic iSCSI storage appliance and can be configured pretty much as you would any iSCSI storage to the rest of the UCSM environment. No special certification is required; however, additional access layer switches are introduced and this brings additional cost and switch configuration complexities. These complexities include additional considerations for VLAN tagging, QoS, and MTU settings.

This approach also allows for non-Cisco hosts to be connected to the access layer switches if desired.

For more information about this particular setup, please consult with your Cisco UCS solutions team.

# **Configuring Basic Policies and UCSM Settings**

There are several basic policies and UCSM settings that are best handled up front before configuring the storage, appliance ports or service profiles.

#### Jumbo Frames

For proper use of jumbo frame capabilities, you will need to ensure the values are set consistently throughout the entire configuration. For this SmartStack setup, we are using a common MTU value of 9000 size throughout. This includes:

- Nimble Storage
- QoS System Class
- Service Profile vNIC definitions
- Host / Hypervisor physical and virtual network configuration
- Virtual Machine NIC configuration

### **QoS System Class**

On the LAN tab under LAN Cloud, you will find the QoS System Class. One of these entries should be selected for the iSCSI data traffic. For this configuration, we will focus on just the Nimble Storage iSCSI considerations. The choices you make should be weighed with other factors like FC devices and other types of network traffic through and within the UCS FI network.

Equipment Servers LAN SAN VM Admin	General Events F	General Events FSM							
Filter: All	Priority	Enabled	CoS	Packet Drop	Weight	Weight (%)	мти	Multicast Optimized	
± =	Platinum	<b>V</b>	5		10	71	9000		
	Gold		4	<b>V</b>	9	N/A	normal	-	
E→ Cloud E→ Eabric A	Silver		2	<b>V</b>	8	N/A	normal	<b>-</b>	
Fabric B	Bronze		1	<b>V</b>	7	▼ N/A	normal	<b>-</b>	
QoS System Class	Best Effort	<b>V</b>	Any	<b>V</b>	4	- 28	9000	<b>•</b>	
	Fibre Channel	<b>V</b>	3		none	• 1	fc	▼ N/A	
ULAN Groups ULANs ULANs ULANs ULANs ULANs ULANs									

Figure 3 – LAN QoS System Class

For the selection used – in this case Platinum – make sure Packet Drop is unchecked, MTU is set to 9000 for jumbo frames and the weight is increased (or set appropriately) to support high bandwidth iSCSI traffic. In this case, since there is not any FC, we increase the weighting to a little over 70%. Enable the selected policy.

#### LAN Policies

On the LAN tab under Policies under root level definitions, you will find these key areas to configure: Flow Control, Network Control and QoS.



Figure 4 – LAN Policies

### **Setting Flow Control**

Create a flow control policy to use for the appliance port properties. The example below is called "FlowControlOn" and sets the values for receive and send to On.



Figure 5 – Flow Control Policy

### **Network Control Policy**

Define a network control policy to disable failure of vNICs in the event of losing FI uplink. The example is called "AppModeNCP". Set the Action on Uplink Fail to Warning.

>> 🗊 Policies > 💑 root > 🗊 Network Control Policies > 🗊 AppModeNCP					
General Events					
Actions	Properties				
📅 Delete	Name: AppModeNCP				
Show Policy Usage	Description:				
A Use Global	Owner: Local				
	CDP: O Disabled O Enabled				
	MAC Register Mode: Only Native Vlan O 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 O Deny				

Figure 6 - Service Profile Network Control Policy

### Setting QoS

Define a QoS Policy to use with the vNIC definitions. For this configuration we use "Platinum" from the QoS System Class selections discussed above.

>> ⑤ Policies + 🎄 root + ⑤ QoS Policies + ⑤ QOS Policy Platinum General Events FSM						
Actions Delete Show Policy Usage Use Global	Properties Name: Platinum Owner: Local Egress Priority: Platinum Burst(Bytes): 10240 Rate(Kbps): line-rate Host Control:  None Full					

Figure 7 – QoS Policy

### Appliance Network Control Policy

It's also important to define a Network Control Policy for the Appliance ports to disable failure of vNICs in the event of losing FI uplink. The example is called "AppNCP". Set the Action on Uplink Fail to Warning.

6 19 3 111	>> 🗏 LAN + 🔊 Policies + 🤇	>> 🗐 LAN 🖇 🖉 Policies 🖓 💭 Appliances 👌 🖉 Network Control Policies 🖓 🖉 AppNCP						
Equipment Servers LAN SAN VM Admin	General Events							
Filter: Al	Actions	Properties						
• •	📅 Delete	Name: AppNCP						
	Show Policy Usage	Owner: Local						
Harrian LAN Harrial LAN Harrial LAN Harrian LAN Harr		CDP:      Only Native Vian     All Host Vians						
S Network Control Policies     S Network Control Policies     S AppNCP     G default     C LAN Cloud     G    Cout     G    Pools		Action on Uplink Fail: Link Down  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						
⊕- 2 Traffic Monitoring Sessions		Forge: O Allow O Deny						

Figure 8 – Appliance Network Control Policy

### **Appliance VLANs**

The final configuration to set up on the LAN tab is the VLAN definitions used to separate the iSCSI traffic between the two FIs (A & B). For this configuration we will define VLANs called "iSCSI-A" and "iSCSI-B" and give them unique VLAN IDs to separate traffic on other network configuration definitions in this guide. These can be defined as dual Fabric VLANs or independently defined in each Fabric. For simplicity of this guide, we have defined them at the combined outer level.



Figure 9 – Appliance VLANs

# **Configuring Appliance Ports**

In this section we will configure the Appliance Ports to support the connectivity of the Nimble Storage.

In UCSM, go to Equipment View -> Equipment -> Fabric Interconnects -> Fabric Interconnect A -> Fixed Module or Expansion Module 2 -> Ethernet Ports



Figure 10 – Configure Appliance Port

From here select the port where you will connect the Nimble Storage and choose Port # -> Configure as Appliance Port

Set the following attributes and choices from the configuration defined above:

- Priority = Platinum
- Network Control Policy = <name> (example = AppNCP)
- Flow Control Policy = <name> (example FlowControlOn)
- Admin Speed = 10Gbps
- Port Mode = Trunk
- Select VLAN and choose Native VLAN in this case "iSCSI-A"

From the Show Navigator view you should see something like the following.

- Properties for: Appliance Interface 1/11				- • <b>×</b>
General Faults Events				
Actions	Properties			<b>^</b>
- Sacilla Tatachura	ID: <b>11</b>			
	Slot ID: 1			
Disable Interface	Fabric ID: A			
Add Ethernet Target Endpoint	User Label: mktg-	oaner 1-a-tg1		
	Transport Type: Ether			
Delete Ethernet Target Endpoint	Port: sys/sv	vitch-A/slot-1/switch-ether/port-1	1	
·	Admin Speed(gbps): 🔘 1	Gbps 💿 10 Gbps 🕥 20 Gbps	6 40 Gbps	
	Priority: Platin	um 🔽		
	Pin Group: <not< th=""><th>set&gt;</th><th></th><th></th></not<>	set>		
	Network Control Policy: AppN	CP 🔽		
	Flow Control Policy: FlowC	ControlOn 🔻		
	VLANs			
	Port Mode: O Trunk O	Access		E
	Select	Name	Native VLAN	E
		default	0	
		BCA-VDI	0	
		VM	0	
		XD7	0	
		XD7-XS	0	
		hyperv	0	
		iSCSI-A	0	
		iSCSI-B	0	
		kngo-data	0	
		kngo-data2	0	
		vcmanagement	0	
		vlan-taging-cancun1	0	
				· ·
	+ Create VLAN			
				Cancel Utrt
				Cancel Help

Figure 11 – Show Interface - Appliance Port

# **Configuring UCSM Service Profile**

Once the basic UCSM policies are set up, the Nimble Storage is connected and Appliance Ports defined, you can now work on defining the Service Profile for the ESXi5 host that will be configured. This section will cover the key aspects of connecting the Nimble Storage in the same manner done for the SmartStack solutions. The first step is to create the appropriate Service Profile. We will work from a copy of an existing profile or create a new one. This approach in this guide does not leverage the updating profile capabilities of the UCSM at this time.

#### vNICs

For the SmartStack configuration, we typically define several vNICs in the service profile. These address basic management connectivity to the host, inter-host cluster traffic, VM traffic between and from the hosts and specifically for Nimble Storage, the iSCSI connectivity to the array through the FI. The iSCSI vNICs will be isolated one to each FI Appliance VLAN defined above.

😃 Proper	rties for:	Service Pi	rofile ESXi5-6											
General	Storage	Network	iSCSI vNICs	Boot Order	Virtual Machines	FC Zones	Policies	Server Details	CIMC Sessions	FSM	VIF Paths	Faults I	Events	
Action C	<b>ns</b> Change Dy 10dify vN	ynamic vNI IC/vHBA P	IC Connection Vacement	Policy	Dynamic vNIC Nothing Selecte VNIC/vHBA Pla Specific vNIC	Connection d cement Po /vHBA Plac	Policy licy cement	Policy			]			
					Virtual Slot 1 2 3 4		Selec All All All All	tion Preference						
vNICs-					LAN Connectivit	t <b>y Policy</b> nnectivity Po y Policy Insta Connectivity	blicy: <mark> &lt;</mark> r ince: Policy	not set>	•					
🕰 Filter	👄 Ехро	rt 😹 Prii	nt	_										
Name		MAC	Address	Desired O	Order Actu	ual Order	- Fa	bric ID	Desired Place	ement	Act	tual Placen	nent	
-I VNIC	CorpLAN	00:25	:B5:00:01:FD	1	1		A E	1	Any		1			-
-I vNIC	iSCSI-A	00:25	5:85:00:01:ED				A		Any					
-I VNIC	iSCSI-B	00:25	:85:00:01:DD	3	3		В		Any		1			
-U VNIC	CLUSTER	R 00:25	5:B5:00:00:1D	4	4		A E		Any		1			
-II VNIC	VM1	00:25	:B5:00:01:CD	5	5		A E		Any		1			
-II VNIC	VM2	00:25	5:B5:00:01:BD	6	6		AB		Any		1			

Figure 12 - Service Profile Properties

The details of the specific iSCSI vNIC are shown below. Pay attention to key settings for:

- Fabric ID
- MTU

- Adapter Policy
- QoS Policy
- Network Control Policy

- Properties for: vNIC iSCSI-A	
General VLANs Statistics Faults Events	
Fault Summary	Properties
🛛 V 🛆 🛆	Name: iSCSI-A
0 0 0 0	MAC Address: 00:25:85:00:01:ED
Actions	MAC Pool: default
Change MAC Address	MAC Pool Instance: org-root/mac-pool-default
Modify VLANs	Fabric ID: O Fabric A C Fabric B Enable Failover
	Owner: Logical
Bind to a Template	Type: Ether
Unbind from a Template	Equipment:
X Reset MAC Address	Boot Device: Disabled
	MTU: 9000
	Warning
	Make sure that the MTU has the same value in the <u>QoS System Class</u> corresponding to the Egress priority of the selected QoS Policy.
	Virtualization Preference: NONE
	Template Name:
	States
	Operational Speed: Line Rate
	State: Not Applied
	Policies
	Adapter Policy: VMWare
	Adapter Policy Instance: org-root/eth-profile-VMWare
	QoS Policy Instance: org-root/ep-qos-Platinum
	Network Control Policy: AppModeNCP
	Network Control Policy Instance: org-root/nwctr-AppmodenCP
	Stats Threshold Policy: default
	Inresnoid Policy Instance: org-root/org-TechMktg/thr-policy-default
	Connection Policies
	Dynamic vNIC O usNIC VMQ
	Dynamic vNIC Connection Policy: <not set=""></not>
	Dynamic vNIC Connection Policy Instance:
	Order
	Desired Orders 2
	Actual Order: 2
	Actual Order: Z
	OK Apply Cancel Help
	.:

Figure 13 – vNIC Properties for iSCSI

# Boot From San – iSCSI BFS – Basic Configuration

### **Disk and Boot Policy Definitions**

Before setting up iSCSI boot from Nimble Storage SAN, you should define some of the basic UCSM policies to use in the service profile. These include: iSCSI Adapter, Boot and Local Disk Policy definitions. Examples are provided below.

 P	Ser	vers	
÷	-	Service	Profiles
÷	Ē	Service	Profile Templates
÷	S	Policies	
	÷	ុឆ្នុំ roo	t
		🖻 - 😰	Adapter Policies
		🖻 - 😰	BIOS Defaults
		<u>ت</u>	BIOS Policies
		🖻 - 😰	Boot Policies
		🖻 - 🗊	Host Firmware Packages
		- 5	IPMI Access Profiles
		🖻 - 🗊	Local Disk Config Policies
		🖻 - 🗊	Maintenance Policies
		- 5	Management Firmware Packages
		🖻 🖉	Memory Policy
		🖻 🔊	Power Control Policies
		🖻 🔊 🗐	Scrub Policies
		S	Serial over LAN Policies
		- 5	Server Pool Policies
		<u>∎</u> - <b>S</b>	Server Pool Policy Qualifications
		<u>∎</u> - <b>S</b>	Threshold Policies
		• <b>S</b>	iSCSI Authentication Profiles
		<b>S</b>	vNIC/vHBA Placement Policies
		Ė∵Å	Sub-Organizations
		÷.	្មុឆ្នុំ Library
		÷.	क्रू ReleaseQA
		<u> </u>	🙀 TechMktg
			🖶 🗐 Adapter Policies
			iSCSI Adapter Policy iSCSI-boot
			BIOS Policies
			Boot Policies
			Boot Policy CD
			Boot Policy Local_Disk
			Boot Policy iSCSI_Boot
			Host Firmware Packages
			IPMI Access Profiles
			Event Disk Config Policies
			Local Disk Configuration Policy Local_Disk
			Local Disk Configuration Policy No_local_disk
			Local Disk Configuration Policy SSD-Boot

Figure 14 – Disk and Boot Policies

Adapter Policies Example

S Properties for: iSCSI Adapter Policy iS	CSI-boot	
Actions	Properties Name: iSCSI-boot	
Show Policy Usage	Connection Timeout:         0         [0-255]           LUN Busy Retry Count:         0         [0-60]           DHCP Timeout:         60         [60-300]	
	Enable TCP Timestamp:  HBA Mode:  Boot To Target:	
	Owner: Local	
		OK Apply Cancel Help

Figure 15 – Adapter Policies

Boot Policies Example

Properties for: Boot Policy	iSCSI_Boot							• <b>×</b>
General Events	General Events							
	Propertie	s						
		Name: i	SCSI_Boot					
Actions		Description:	ISCSI Boot from Nimbl	e				
📅 Delete		Owner: I	local					
Show Policy Usage	Reboot o	n Boot Order Change:	✓					
🔒 Use Global	Enforce vN	IC/vHBA/iSCSI Name:	<b>V</b>					
L		Boot Mode:	• Legacy 🔿 Uefi					
Warning	-							
The type (primary/secondary	) does not in	idicate a boot order pre	sence.					
The effective order of boot d	levices within	the same device class	(LAN/Storage/iSCSI) is	s determined by PCIe bus scan order	•			
If it is not selected, the vNIC	s/vHBAs/iSC	SI are selected if they e	xist, otherwise the v	VIC/vHBA/iSCSI with the lowest PCIe	bus scan			
order is used.								
Local Devices	8	Boot Order	_	_	_	_	_	
		🛨 🖃 🕰 Filter 🖬	🕈 Export 😸 Print					
vNICs	۲	Name	Order	VNIC/VHBA/iSCSI VNIC	Туре	Lun ID	WWN	R
			1					<b>^</b>
VHBAs	*	iscsi	2					
ISCST VNTCS	8	iSCSI		iSCSI-Boot-A	Primary			_ 11
	~	ISCSI		ISCS1-0001-0	Secondary			
								-
				🔺 Move Up 🔍 Move	Down 👕 Delete			
							Cancel	Help
								. ICIP
								.:

Figure 16 – Boot Policies

Local Disk Config Policies Example

🔊 Properties for: Local Disk Configu	ration Policy iSCSI_Boot	×
General Events		
Actions	Properties	
📅 Delete	Name: iSCSI_Boot	
Show Policy Usage	Description: iSCSI Boot - no local disk	
Use Global	Owner: Local	
	Mode: Any Configuration	
	Protect Configuration: 🗹	
	If <b>Protect Configuration</b> is set, the local disk configuration is preserved if the service profile is disassociated with the server. In that case, a configuration error will be raised when a new service profile is associated with that server if the local disk configuration in that profile is different. FlexFlash FlexFlash State: O Disable O Enable FlexFlash RAID Reporting State: O Disable O Enable	
	OK Apply Cancel He	:lp
		.::

Figure 17 – Local Disk Configuration Policy

For the SmartStack configuration, we are iSCSI booting from the Nimble Storage system. To do this, we have iSCSI vNICs overlaid onto the regular vNICs as shown below. You will need to set the iSCSI Boot Parameter details from the Boot Order tab on the main Service Profile definition. An example of this is shown below. We will need to come back to this panel as part of connecting the Nimble Storage volumes to the Service Profile.



Figure 18 - iSCSI Boot vNIC Overlay

>> 💐 Service Profiles > 📩 root > 📩 Sub-Organizations > 📩 TechMktg > 💐 Service Profile ESXi5-6 > 📲 iSCSI vNICs > 📲 iSCSI vNIC iSCSI-Boot-A				
General Events				
Actions Change MAC Address Reset MAC Address	Properties         Name:       iSCSI-Boot-A         Overlay vNIC:       iSCSI-A         ISCSI Adapter Policy:       iSCSI-boot         MAC Address:       Derived         MAC Pool:       VLAN:         ISCSI-A (native)       ▼	Adapter Policy		

Figure 19 - iSCSI vNIC Overlay Details

General ctions		s Server Details CI	MC Sessions   FSM	VIF Paths   Fau	ults Eve
tions	Storage	Network	iSCSI vNICs	Boot	Order
📣 Modify Boot Polic	εγ				
lobal Boot Policy					
	Name: iSCSI_Bo	oot			
Boot Polic	y Instance: org-root/	org-TechMktg/boot-policy-iSCSI_	Boot		
[	Description: iSCSI Bo	ot from Nimble			
Reboot on Boot Ord	er Change: Yes				
inforce vNIC/vHBA/is	SCSI Name: Yes				
	Boot Mode: Legacy				
Boot Order					
Boot Order	👄 Export 🔀 Print	_	_	-	
Boot Order	⇔ Export 😸 Print Order	VNIC/VHBA/iSCSI VNIC	Туре	Lun ID	WWN
Boot Order	Export Print	VNIC/VHBA/ISCSI VNIC	Туре	Lun ID	WWN
Boot Order	Export Print Order 1 2	VNIC/VHBA/iSCSI VNIC	Туре	Lun ID	WWN
Boot Order	Crder 2 Print Print Order	VNIC/VHBA/iSCSI VNIC	Type Primary	Lun ID	WWN
Boot Order Filter Name CD/DVD SCSI SCSI SCSI SCSI	Export Print Order 1 2	VNIC/VHBA/iSCSI vNIC	Type Primary Secondary	Lun ID	WW
Boot Order  Filter  CD/DVD  CD/DVD  SCSI  SCSI  SCSI  SCSI  SCSI  SCSI	Export Print Order 1 2	VNIC/VHBA/iSCSI vNIC iSCSI-Boot-A iSCSI-Boot-B	Type Primary Secondary	Lun ID	WWN
Boot Order	Crder 1 2	vNIC/vHBA/iSCSI vNIC iSCSI-Boot-A iSCSI-Boot-B	Type Primary Secondary	Lun ID	WWN
Boot Order  Filter  Name  CD/DVD  SSCSI  ISCSI  ISCSI  ISCSI	Crder	VNIC/VHBA/iSCSI vNIC iSCSI-Boot-A iSCSI-Boot-B	Type Primary Secondary	Lun ID	WWN
Boot Order  Filter  Name  CD/DVD  SCSI  SCSI  SCSI  SCSI  SCSI	Export Crder	VNIC/VHBA/iSCSI vNIC iSCSI-Boot-A iSCSI-Boot-B	Type Primary Secondary	Lun ID	WWN
Boot Order	Export Crder	VNIC/VHBA/iSCSI VNIC iSCSI-Boot-A iSCSI-Boot-B	Type Primary Secondary	Lun ID	WWN

Figure 20 – Boot Order Details

# **Connecting Nimble Storage**

In the SmartStack UCS configuration, the Nimble Storage is connected to the FI switches. The first 10G ports (TG1) from each controller are attached to FI-A and the second 10G ports (TG2) from each controller are attached to FI-B.

In this configuration, the Nimble Storage controller fail-over will always have two paths for MPIO – one through FI-A and one through FI-B. This configuration also covers failure of any networking components (e. g., NIC, cable, or FI) and will not result in data path loss as there will always be at least one active path from the UCS servers to the Nimble Storage.

#### **Network Cabling**

Data Ports – connect the 10G (TG1 and TG2) NIC ports on the Nimble Storage to the FI ports as described above and shown in Figure 2 – SmartStack Basic Network Connectivity.

Management ports – connect the 1GbE (eth1 and eth2) NIC ports on the motherboard to the same management network used by other devices connected to the UCS. Note – these ports could be connected to the FI with appropriate GbE SFP modules but this is not the tested solution.

It may also be possible to run management functionality through the 10G ports used for iSCSI data traffic but this has not been tested and is often not recommended.

#### Jumbo Frames

For this setup, we will assume the use of 10G networking and jumbo frame practices for iSCSI data connections. Set the data ports used for iSCSI traffic to use jumbo frames. For this setup, we will be using MTU=9000 throughout all settings. The key is to consistently set jumbo frame properties throughout the configuration.

To set network interface MTU, open the Nimble Storage management UI and navigate to Administration - > Network Configuration. Then choose the Active Settings and select the Subnets tab. If needed, edit the subnets associated with the iSCSI data networks. In the example below, subnets iSCSI-A and iSCSI-B are configured to use Jumbo MTU of 9000.

Network Configuration	on								
Network Configurations	View							Edit	Save as Draft
Group Subnets	Interfaces	Diagnostics							
Subnet Label	Network Add.	Netmask	Traffic Type	Traffic Assignm	. Discovery IP	IP Address Z	. MTU	Bytes	VLAN ID
iSCSI-A	172.18.127.0	255.255.255.0	Data only	iSCSI + Group	172.18.127.188	Single	Jumbo	9000	
iSCSI-B	172.18.128.0	255.255.255.0	Data only	iSCSI + Group	172.18.128.188	Single	Jumbo	9000	
Management	1///	255.255.255.0	Mgmt only		7777		Standard	1500	

Figure 21 – Setting Jumbo Frames on Nimble Storage

### **Subnet Definitions**

With Nimble Storage 2.1 and later, you can define subnets for the different types of traffic and then associate the NICs with the defined subnets. For our UCS SmartStack setup, we want to define two separate data subnets for the Fabric Interconnects and an additional subnet for the management array UI network. As shown in Figure 21 – Setting Jumbo Frames on Nimble Storage, we have defined two subnets (iSCSI-A and iSCSI-B) to carry Data Only traffic and support the iSCSI and Group traffic. These will correspond to the FI-A and FI-B configuration covered later in this guide. These subnets are set for a Single IP address zone and jumbo MTU. In our example, the subnets are: 172.17.127.0/24 and 172.18.128.0/24

It is important to define an iSCSI Discovery IP address on each of these subnets. This will be used to connect the hosts to the actual Nimble Data ports. The data port IPs are defined on the Interfaces tab as shown below.

ſ	Network Configuration	tion						
	Network Configurations	View						
	Group Subnets	Interfaces	Diagnostics					
	Interface	Array Name	Link Status	Subnet Label	Data IP Addr	Unconfigured	VLAN ID	Tagged
	eth1	mktg-loaner1		Management				
	eth2	mktg-loaner1				Yes		
	tg1	mktg-loaner1	88 88	iSCSI-A	172.18.127.105			
	tg2	mktg-loaner1	88 88	iSCSI-B	172.18.128.105			
1								

Figure 22 – Nimble Storage Interfaces Setup

### Nimble Storage Policies

The following setup steps help define sub policies and configuration options to easier manage the Nimble Storage configuration.

First define a performance policy specifically for the iSCSI boot volumes. We will use the default settings for this configuration. The performance policy gives us another method for identifying distinctions between Nimble volumes within the overall storage setup.

Performance Policies > iSCSI-boot			
Edit Delete			
PERFORMANCE PARAMETERS		ASSOCIATED VOLUMES	
Block size Compress Cache	4096 bytes Yes Yes	Volume/Clones           No associated volumes	
SPACE MANAGEMENT PARAME Quota Exceeded Behavior	TERS Set to Offline		

Figure 23 – iSCSI Boot Performance Policy

Define an Initiator Group to associate with the new Service Profile instance created earlier. Initiator Groups provide us a host access control mechanism. For this definition, we will need the IQNs from the service profile we are attaching to this volume. The UCS Service Profile IQN can be obtained from the

iSCSI Boot Parameters details view as shown below. This is also the place where you will set the host side IP address for the iSCSI network connection. In this case we are using static IP assignments. UCSM policy based methods for IQN and IP assignments are outside the scope of this guide. Please consult with a UCS specialist for more information, guidance and options regarding these other configuration option details. For this setup, simply copy the assigned IQN Initiation Name for the service profile for use in the Nimble Initiator Group definition. Get the IQN Initiator Name for both A and B interfaces as shown in Figure 20 – Boot Order Details.

Set iSCSI Boot Parame	eters			
Set iSCSI Boot Parameters				
Name: iSCST-Boot-A				
Hume, Dest boot A				
Authentication Profile:	<not set=""></not>	tication Profile		
Initiator Name				
Initiator Name Assign	ment: UCS_IQN_Pool(30/100)			
Tatkinkan Nama				
Create ION Suff	2013-03.com.ucs:nost:88 fix Pool			
X Reset Initiator N	Name			
The IQN will be assigned from the selected pool. The available/total IQNs are displayed after the pool name.				
Initiator Address				
Initiator IP Address	Policy: Static	-		
IPv4 Address:	172.18.127.147			
Subnet Mask:	255.255.255.0			
Default Gateway:	0.0.0.0			
Primary DNS:	0.0.0.0			
Secondary DNS:	0.0.0.0			
Click here to deterr	mine if this initiator address is available.			
+ Create IP Pool				

Figure 24 – UCS IQN Boot Parameter Details

Initiator Groups > ES	Xi5-6			
Edit Delete	Add Initiator			ASSOCIATED VOLUMES
Initiator Name	IQN	IP Address		Volume/Clones
ESXi5-6-A	iqn.2013-03.com.ucs:host:88	*	×	iBoot ESVIS 6
ESXi5-6-B	iqn.2013-03.com.ucs:host:98	*	×	

Figure 25 – Nimble Initiator Group Definition

Create the Nimble volume for iSCSI boot. In this example, we are naming the volume "iBoot-ESXi5-6". The volume is 200 GB in size (thin provisioned by default) and assigned to the ESXi5-6 Initiator Group and the iSCSI-Boot Performance Policy created earlier in this section. We have also opted for no protection (snapshot or replication) at this time.

🗲 🛍 🛦 https://mktg-loaned.sedemo.lab/#manage_volume?volumeName=iBoot-ESXi5-68ttab=status 🔍 C 🖁 - Google 🔎 🛧 🖻 🤳	* =
🔄 blogs 🔜 Mike 🦲 Arrays 🔜 lab 🔚 MGR 🔄 Internal 총 bcdemo.sedemo.lab	
Group: <u>mito_ert</u>   <u>Administrator</u> *	*
VolUmes > IBOOL-ESAID-6 © Online Status Snapshot Replication	
Take Snapshot Edd Delete Claim Set Offline	
VOLUME SPACE THROUGHPUT GENERAL	
Size 200.0 GB — Read — Write Performance Policy SCSLboat	
Used 0 B Volume Collection Not Protected	
Reserve 0 B 80 Connected Initiators 0	
Quota 200.0 GB g 60 No Activity Total Connections 0	
Primary Compression N/A m 40	
Primary Space Saved 0 B 20 ACCESS CONTROL	
20 Volume	
SNAPSHOT SPACE ISCSI Initiator Group CHAP Username	
Used 0 B ESXIS-6 Unrestricted Access	
Reserve 0 B 10P5	
Quota Unlimited — Read — Write	
Backup Compression N/A 100 Snapshots	
Number of Snapshots 0 80 ISCSI Initiator Group CHAP Username	
Last Snapshot - 50 ESXI5-6 Unrestricted Access	
IN NO Activity	
20.	
Replication Partner Last Replica 0	
No fems to show,	
	-

Figure 26 – Nimble Volume for iSCSI Boot

# **Boot From SAN Details**

### Settings IQNs and iSCSI Discovery IPs

To get the IQN of the Nimble boot volume, you will need to log into the CLI and perform the following command (Note: the name of the example volume is "iBoot-ESXi5-6"):

volinfo iBoot-ESX	Ki5-6   grep	"iSCSI target"	
iSCSI target: iqn. 2	2007-11. com.	nimblestorage:iboot-esxi5-6-v730bccdab71a8923.	0000039a.
c41145f9			

This IQN obtained above then needs to be pasted into the iSCSI Boot Parameter details for the service profile you are configuring. Paste the IQN from the Nimble into the iSCSI Target Name and the iSCSI Discovery IP into the IPv4 Address fields as shown below.

4	📥 Modify iSCSI Static Target				
I	Modify iSCSI Static Target				
	iSCSI Target Name:	qn.2007-11.com.nimblestorage:iboo			
	Priority:	2			
	Port:	3260			
1	Authentication Profile:	<not set=""></not>			
	IPv4 Address:	172. 18. 127. 104			
	LUN ID:	0			

Figure 27 – UCS Boot Parameter Details from Nimble

The iSCSI Discovery IP needed above can be easily obtained from the Nimble through the UI on the Administration -> Network page.

Network	Configura	tion		
Network C	onfigurations	View		
Group	Subnets	Interfaces	Diagnostics	
Man	agement IP			
Used	l for the Web l ss all "Mgmt or	JI, CLI and replicanly" and "Mgmt +	ation. Resides Data" interfac	on management subnet and floats es on that subnet.
IP Ad	ldress	Network Addre	ss Subnet	Mask
			255.255	.255.0
iscs	SI Host Conne	ection Method		
() M	lanual 🚺			
@ A	utomatic 🚺			
5	🛛 Enable rebalan	cing 🚺		
Disc	overy IP Add	resses		
Subr	net Label Di	scovery IP Ne	tmask	"
Mana	igement 💋	255	.255.255.0	
iSCS	I-A <u>17</u>	2.18.127.104 255	.255.255.0	
iSCS	I-B 17	2.18.128.104 255	.255.255.0	

Figure 28 - Nimble iSCSI Discovery IP

### Booting from Nimble Storage – Basic Steps

Make sure the Nimble is discovered at the UCSM boot configuration iSCSI level. You should see something like this message on the KVM console.



Figure 29 – Nimble Discovered at Boot

The Nimble Storage UI should also indicate that a connected initiator matching one of the Service Profile IQNs is also present as shown below.

Group: <u>mktaer</u>   <u>Administrato</u> Soup: <u>mktaer</u>   <u>Administrato</u> Home Manage Monitor Events Administration Help InfoSight															
/olumes > iBoot-ESXi5-6  Online Status Snapshot Replication															
Take Snapshot	Edit Delet	e	Claim	Set Off	ine										
VOLUME SPACE		т	HROUGHE	тич			GENERAL								
Size	200.0 GB			Read	Write		Performance Policy	iSCSI-boot							
Used	0 B		100				Volume Collection	Not Protected							
Reserve	0 B									80				Connected Initiators	1
Quota	200.0 GB														
Primary Compression	N/A	/se(	Description	Description	ISCSI boot										
Primary Space Saved	0 B	BΒ	40-												
			20-				Volume								
SNAPSHOT SPACE			11:05	AM 11:16AM 11	27AM 11:38AM	11:49AM 12:00PM	iSCSI Initiator Group	CHAP Username							
Used	0 B		11.05			11.1.5.1.1 12.0011	ESXi5-6	Unrestricted Access							

Figure 30 - iSCSI Boot LUN is Connected

Through the UCSM KVM you can attach the appropriate ESXi5 ISO image for installation.

4	Boot Server 🪽	Shutdown Serve	🤤 Reset		
KV	M Console Prop	perties			
	רא 🔓 Virtu	ual Media			
	Client View				-
	Mapped	Read Only	Drive		Exit
	V	V	2 C:\Users\ <b></b> \Desktop\VMware-VM	visor-Installer-5.1.0-799733.x86_64.iso - I	Create Image Add Image Remove Image Details 1

Figure 31 – KVM Attach ESX ISO to Host

On reset, the ESX installer should appear:

	Loading ESXi	installer
Loading /tboot.b00 Loading /b.b00 Loading /useropts.gz Loading /k.b00 Loading /chardevs.b00 Loading /a.b00 Loading /user.b00 Loading /s.v00		

Figure 32 – ESX Installer

Then the Nimble LUN should now be discovered as an option for installation target device as shown below. Select the Nimble Storage device and proceed with the installation.

	Select a Disk to	o Install or Upg	rade				
* Contains a VMFS	* Contains a VMFS partition						
Storage Device			Capacity				
Local: LSI MRSASRoMB-8 Remote: Nimble Server	i (naa.60030130) (eui	f0900000197db0f2 .1386b35020287ec	9c475e09) 92.20 GiB 96c9ce) 200.00 GiB				
(Esc) Cancel	(F1) Details	(F5) Refresh	(Enter) Continue				

Figure 33 - Select Nimble Boot Device

# Host OS Considerations – VMware ESXi5

### ESXi 5.x

The complete setup of the ESXi5 host is beyond the scope of this guide. The main steps we have followed in our SmartStack approach are:

- Install ESXi5 to the Nimble Storage iSCSI boot volume
- Bring the host online and perform basic management network setup steps for your environment. This typically includes setting the management IP and enabling SSH/CLI access.
- Join the host to an existing Virtual Center configuration for subsequent configuration. We exploit
  VMware Host Profiles to assist with much of the standardization steps for consistency. One of the key
  results of this step is to define the networking setup for the two iSCSI networks that leverage the UCS
  FI connection architecture. More detail will be provided on this below.
- Install the Nimble Connection Manager (NCM) to enable optimal MPIO with Nimble Storage. This setup is described in further detail below.
- Verify the basic storage, network and hypervisor host setup.

#### Device Drivers, network settings, MPIO

To set up the Nimble Storage NCM (Nimble Connection Manager) for VMware, first download the appropriate NCM version for connecting to your array. For this configuration, we are using Nimble software version 2.1. Also download the VMware Integration Guide as a useful guide for explaining many other aspects of the VMware support with Nimble Storage.

Once you have the NCM software downloaded from Nimble Storage Infosight, transfer it to the ESXi5 host you just configured. Place it somewhere like /tmp.

To install the software, you will need to put the newly provisioned ESXi5 host into maintenance mode. You can do this through Virtual Center or the CLI with the following command:

# vim-cmd hostsvc/maintenance mode enter

Once this is done, then install the NCM with the following command (change the actual path if you download a different version or place it somewhere other than /tmp):

# esxcli software vib install -d /tmp/ncm\_2-1-0-0\_nimble-ncm-2. 1. 0-500006. zip --no-sig-check

You should see results something like this:

```
Installation Result
Message: Operation finished successfully.
Reboot Required: false
VIBs Installed: Nimble_bootbank_nimble-ncs_2. 1. 0-500006, Nimble_bootbank_nimble-psp_2. 1. 0-
500006
VIBs Removed:
VIBs Skipped:
```

You can check the results of the installation with these commands:

<pre># esxcli software vi</pre>	b list   grep nimble					
nimble-ncs 2013-12-06	2. 0. 4-500110	Nimble	VMwareAccepted			
nimble-psp 2013-12-06	2. 0. 4-500110	Nimble	VMwareAccepted			
# esxcli storage nmp	psp list					
Name	Description					
NIMBLE_PSP_DIRECTED	Nimble Storage Path Selection Plugin					
VMW_PSP_MRU	Most Recently Used Path Selection					
VMW_PSP_RR	Round Robin Path Selection					
VMW_PSP_FIXED	Fixed Path Selection					
# esxcli storage nmp device list						
eui. c93a31e1f3b4edf	76c9ce9002f3db6f5					
Device Display Na	me: Nimble iSCSI Disk (eui. c93a31e1f3b4edf76c9ce	9002f3db6	f5)			
Storage Array Typ	e: VMW_SATP_ALUA					
Storage Array Typ explicit_allow=on;al	e Device Config: {implicit_support=on;explicit_sup ua_followover=on;{TPG_id=0,TPG_state=AO}}	pport=off	;			
Path Selection Po	licy: NIMBLE_PSP_DIRECTED					
Path Selection Po GROUP_MODE=1 MODE_CH lastPathIndex=1 NumI	licy Device Config: {policy=iops iops=0 bytes=0 us ANGED=0 GROUP_ID=0 numIOsForIssueInq=10000 numIOs OsPending=0 numBytesPending=0 }	seANO=0 N SinceLast	UM_OF_MEM_ARRAY=0 Inq=9300			

```
Path Selection Policy Device Custom Config:
Working Paths: vmhba32:C1:T11:L0, vmhba32:C0:T11:L0
Is Local SAS Device: false
Is Boot USB Device: false
```

Finally, remove the host from maintenance mode:

```
# vim-cmd hostsvc/maintenance_mode_exit
```

#### **Network Configuration**

To leverage the UCS FI dual subnets, we configure the two vNICs used for iSCSI traffic into appropriate VMware constructs. The vmnic and vSwitch results will look like the examples below.



Figure 34 – ESX Network Configuration

SCSI Initiator (vmhba32) I	Properties						
neral Network Configurat	ion Dynamic Discovery	Static Discovery					
VMKernel Port Bindings:					_		
Port Group	ort Group 🔼 VMkernel Adapter   Port Group Policy   Path Status   Physical Network Adapter						
ISCSI-A (ISCSIBOOTVS) ISCSI B (ISCSIBOOTVS)	witc vmk1	Compliant	Active	vmnic1 (10000, Full	)		
	SWITC VMKZ	Compliant	Active	Vmnic2 (10000, Full	)		
•					•		
				<u>A</u> dd <u>R</u> emov	e		
/Mkernel Port Binding Details	s:						
Virtual Network Adapt	er						
VMkernel:	vmk2						
Switch:	iScsiBootvSwitch						
Port Group:	iSCSI-B						
Port Group Policy:	Compliant						
IP Address:	172.18.128.147						
Subnet Mask:	255.255.255.0						
Physical Network Adap	oter						
Name:	vmnic2						
Device:	Cisco Systems Inc Ci	sco VIC Ethernet NIC					
Link Status:	ink Status: Connected						
Configured Speed:	10000 Mbps (Full Du	plex)					
				Close	Help		

Figure 35 – ESX iSCSI Initiator Properties

ISCSI-A Properties		×
General IP Settings Security	Traffic Shaping   NIC Teaming	
Port Properties		
Network Label:	iSCSI-A	
VLAN ID (Optional):	None (0)	
vMotion:	Enabled	
Fault Tolerance Logging:	Enabled	
Management Traffic:	Enabled	
iSCSI Port Binding:	✓ Enabled	
-NIC Settings		
MTU:	9000	

Figure 36 – ESX iSCSI General Properties

🕗 iSCSI-A Propertie	s		×
General IP Setting	s Security Traffic	Shaping NIC Teaming	
Policy Exceptions	, <u> </u>		
Load Balancing:		Route based on the originating v	irtual port ID 🔻
Network Failover	Detection:	Link status only	
Notify Switches:			
Failback:			
Tailback.		j j tes	
Failover Order:			
Override swit	ch failover order:		
Select active and adapters activate	standby adapters for in the order specifi	or this port group. In a failover situation	, standby
Name	Speed	Networks	Move Up
Active Adapte	rs		Move Down
Standby Adapt	10000 Full	1/2.18.12/.1-1/2.18.12/.254	
Unused Adapt	ers		
vmnic2	10000 Full	172.18.128.1-172.18.128.254	
J			
Adapter Details			
Name:			
Location:			
Driver:			
		OK Cance	Help
		Cance	

Figure 37 – ESX iSCSI NIC Teaming

Nimble iSCSI Di	sk (eui.1386b35020287ec06c9ce900f94511c4) Manage Paths			<b>—</b> ×
-Policy				
Path Selection:	NIMBLE_PSP_DIRECTED		-	Change
Storage Array T	ype: VMW_SATP_ALUA			
Paths				
Runtime Name	Target	LUN	Status	Preferred
vmhba32:C0:T0	:L0 iqn.2007-11.com.nimblestorage:iboot-esxi5-6-v730bccd	0	<ul> <li>Active (I/0)</li> </ul>	
vmhba32:C1:T0	:L0 iqn.2007-11.com.nimblestorage:iboot-esxi5-6-v730bccd	0	<ul> <li>Active (I/0)</li> </ul>	
,				Refresh
				Keirean
Name:	iqn.2013-03.com.ucs:host:98-00023d000003,iqn.2007-11.com.	nimblestorage	e:iboot-esxi5-6-v730	bccdab71a
Runtime Name:	vmhba32:C0:T0:L0			
iSCSI				
Adapter:	iqn.2013-03.com.ucs:host:98			
Torget	ian 2007 11 com nimblector aquibant equif. 6 y720bccdab71a90	22 000020-	c4114Ef0	
Target:	172 18 128 105-3260	23.00000396	1.04114519	
	1/2/10/120/100/0200			
				_
			Close	Help

Figure 38 – ESX iSCSI Paths and PSP

# Summary

This document provides a high level set of steps that can be followed to help get started with configuring Nimble Storage, Cisco UCS and VMware ESXi5 to form the basis of the Nimble Storage SmartStack integrated infrastructure solution suite. With a little experience in the base products from Nimble Storage, Cisco and VMware, this guide should help you get on the right track to supporting many of the SmartStack solutions built on these technologies.

For more information, contact your local integrator or vendor for more details.

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