





REFERENCE ARCHITECTURE

Virtualizing Business Critical Applications on SmartStack[™]

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Preface About This Reference Architecture Guide

This document will highlight design best practices for virtualizing business-critical applications on SmartStack, and showcase what was validated jointly by VMware, Cisco, and Nimble Storage. If you want to learn more about Nimble SmartStack, please contact your sales rep or visit this website for links to more resources:

http://www.nimblestorage.com/resources/SmartStack.php

Chapter 1 Availability

When you virtualize business critical applications, you want to ensure the entire infrastructure has no single point of failure, for both hardware and software, across all layers (compute, network, storage, VM and applications). Here is a list of design considerations:



- 1. UCS
 - Cisco UCS blade chassis has redundancy for all components
 - Two UCS blade servers in case one of them fails
 - Dual UCS Fabric Interconnect configured as a cluster
 - UCS fabric NIC failover is used for management and virtual machine traffic



- 2. Storage
 - Nimble Storage CS-series array has redundancy for all components
 - All volumes provisioned use SATP_ALUA & PSP_RR for path failover and load distribution

View: Datastores Devic	es							
Datastores								
Identification 🗠	Status	Device	Drive Type	Capacity	Free	Туре	Last Update	Alarm Actions
bizappsql08db	Normal	NimbleiSCSIDiek	Non-SSD	100 75 CB	07 42 CR	VMESS	7/20/2013 5+14+23	DM Enabled
 bizappsql08logs bizappVMswap DEPOT 	Policy	B Manage Paths						
ExchangeDB	Path Select	tion: Rou	und Robin (VMware)				•	 Change
Exchangelog iboot-esx51-4	Storage Ar	ray Type: VM\	V_SATP_ALUA					
Infrastructure	Paths —							
InternalSSD-14	Runtime Na	ame Target				LUN	Status	Preferred
	vmhba32:0	0:T7:L0 iqn.2007	11.com.nimblesto	rage:exchangedb-	v18609ac9	0	 Active (I/O) 	
 Templates View52-1-cs01 VSI-cs02 	vmhba32:0	1:17:L0 Iqn.2007	11.com.nimblesto	rage: exchanged b-	v 18609ac9	0	Active (I/O)	
Datastore Details								Refresh
ExchangeDB Location: /vmfs/volum Hardware Acceleration:	Name: Runtime Nar	iqn.2013-03. ne: vmhba32:C0:	com.ucs:host:15-00 T7:L0	023d000001,iqn.2	007-11.com.ı	nimblestora	age:exchangedb-v1860	9ac9edd6a7e6.000
Refresh Storage Capabiliti System Storage Capability User-defined Storage Cap	iSCSI Adapter: iSCSI Alia	iqn.2013-03.c	com.ucs:host:15					
Path Selection Round Robin (VM	Target:	iqn, 2007-11.c 172, 18, 127, 1	:om.nimblestorage:e 03:3260	exchangedb-v1860	9ac9edd6a7e	26.000000	0e.†5b63d2†	
Paths Total: 2 F							d	ose <u>H</u> elp
Disabled: 0	Block Dize.	UPID						

3. vSphere

- a. vSphere HA enabled to auto restart VMs in case ESXi server fails
 - i. Host monitoring is enabled to monitor heartbeat of all ESXi hosts in the cluster
 - ii. Admission control is enabled to ensure the cluster has enough resources to accommodate a single host failure
 - iii. N+1 configuration to tolerate for one ESXi host failure

BizApp Settings Cluster Features vSphere HA Virtual Machine Options VM Monitoring Datastore Heartbeating VMware EVC	Host Monitoring Status ESX hosts in this duster exchange network heartbeats. Disable this feature when performing network maintenance that may cause isolation responses.
Swapfile Location	Admission Control The vSphere HA Admission control policy determines the amount of cluster capacity that is reserved for VM failovers. Reserving more failover capacity allows more failures to be tolerated but reduces the number of VMs that can be run. Enable: Disallow VM power on operations that violate availability constraints Disable: Allow VM power on operations that violate availability constraints
	Admission Control Policy Specify the type of policy that admission control should enforce.
	Specify failover hogts: 0 hosts specified. Click to edit. Advanced Options
<u>H</u> elp	OK Cancel

• vSphere Virtual Switch layout (only single vNIC is needed as UCS Fabric failover is enabled for each management and virtual machine traffic vNIC; more on the iSCSI vSwitch later)

Networking



Chapter 2 Performance Optimization



1. UCS

 Dual subnet for directly connecting Nimble to Cisco UCS Fabric Interconnect (without failover of Fabric for the iSCSI vNICs)



2. Storage:

- Storage Volume layout
 - i. Volumes supporting the infrastructure



ii. Volumes supporting the application



• Performance Policy for each storage volume:



• Use PSP_RR to distribute I/O across both paths

🕗 Nimble	iSCSI Disk (e	eui.084f713c34b78c386c9ce9002f3db6f5) Manage Paths				x
Policy -]
Path Se	election:	Round Robin (VMware)			Chan	ae
Storage	Array Type:			-		
	- Andy Type:					
Paths -						
Runtime	e Name	Target	LUN	Status	Preferred	
vmhba3	32:C0:T7:L0	iqn.2007-11.com.nimblestorage:exchangedb-v18609ac9	0	 Active (I/0) 		
vmhba3	32:C1:T7:L0	iqn.2007-11.com.nimblestorage:exchangedb-v18609ac9	0	 Active (I/0) 		
¹						
					Re	fresh
Name:	iqr	n.2013-03.com.ucs:host:15-00023d000001,iqn.2007-11.com.	nimblestorage	e:exchangedb-v1860	9ac9edd6a7e6	.000
Runtime	Name: vm	nhba32:C0:T7:L0		-		
iSCSI						
Adap	ter: iqn	.2013-03.com.ucs:host:15				
iSCSI	Alias:					
Targe	t: iqn	.2007-11.com.nimblestorage:exchangedb-v18609ac9edd6a7	e6.0000000e	.f5b63d2f		
	17	2.18.127.103:3260				
				d	ose	Help

• Change default path IOPS to 0

Set iops=0 for each volume	
Gegodzilla.sedemo.lab - PuTTY	X
~ # esxcli storage nmp psp roundrobin deviceconfig settype=iopsiops=0device=eui.7bc8106d73ab4ad66c9ce9002f3db/ ~ # [esxcli storage nmp device list grep -A 5 Infrastructure]	6f5 ^
All volumes Device Display Name: Infrastructure Storage Array Type: VMN SATP ALUA	
"iops=0" Storage Array Type Device Config: {implicit_support=on;explicit_support=off; explicit_allow=on;alua_followover=on;{	TPG
Path Selection Policy: VMW_PSP_RR	
Path Selection Policy Device Config: {policy=iops(iops=0,)ytes=10485760,useANO=0;lastPathIndex=0; NumIOsPending=0,nu ytesPending=0}	umB
Path Selection Policy Device Custom Config:	

- 3. vSphere:
 - One VMkernel port for each of the iSCSI vNIC

	🕗 iSCSI-B Properties 📃
	General IP Settings Security Traffic Shaping NIC Teaming
	- Policy Exceptions
	Load Balancing:
	Natwork Failover Detection:
	Notify Switches:
	Failback:
	Failover Order:
	Override switch failover order:
	Select active and standby adapters for this port group. In a failover situation, standby adapters activate in the order specified below.
Denvis Denvis	Name Speed Networks Move Up
Standard Switch: iScsiBootvSwitch Remove Properties	Active Adapters
- VMkeriel Port - Physical Adapters	wmic2 10000 Full 172.18.128.1-172.18.128.254
	Standby Adapters
	Unused Adapters
	Vininci 10000 an 172,18,127,1-172,18,127,234
vmk1 + 172 18 127 153	
	🔗 iSCSI-A Properties
	General IP Settings Security Traffic Shaping NIC Teaming
	Load Balanding:
	Network Failover Detection:
	Notify Switches:
	Failback:
	Failover Order:
	Select active and standby adapters for this port group. In a fallover situation, standby adapters activate in the order specified below.
	Name Speed Networks Move Up
	Active Adapters
	wmic1 10000 Full 172.18.127.1-172.18.127.254
	Unused Adapters
	wmnic2 10000 Full 172.18.128.1-172.18.128.254

iSCSI Initiator (vmhba32) I	Properties				iSCSI Initiator (vmhba32) P	roperties			
General Network Configuration Dynamic Discovery Static Discovery General Network Configuration							tatic Discovery		
VMkernel Port Bindings:					VMkernel Port Bindings:				
Port Group	VMkernel Adapter Port Group Poli	cv Patł	Status		Port Group	VMkernel Adapter	Port Group P	olicy Path	Status
iSCSI-A (iScsiBootvS	witc vmk1 📀 Compliant	•	Active		iSCSI-A (iScsiBootvSv	vitc vmk1	📀 Complia	ant 🔶	Active
iSCSI-B (iScsiBootvS	witc vmk2 📀 Compliant	•	Active		iSCSI-B (iScsiBootvSv	vitc vmk2	📀 Complia	ant 🔶	Active
•			Þ		•	m			Þ
		aa (Remove					Add	Remove
VMkorpol Port Pinding Dotails			Centove		VMkorool Port Pinding Dotaile			200	<u>K</u> emove
vinkerner For Containing Details	•				Mikemer Fort binding Details.				
Virtual Network Adapt	er				Virtual Network Adapte	r			
VMkernel:	vmk1				VMkernel:	vmk2			
Switch:	iScsiBootvSwitch				Switch:	iScsiBootvSwitch			
Port Group:	iSCSI-A				Port Group:	iSCSI-B			
Port Group Policy:	📀 Compliant				Port Group Policy:	Compliant			
IP Address:	172.18.127.153				IP Address:	172.18.128.153			
Subnet Mask:	255.255.255.0				Subnet Mask:	255.255.255.0			
Physical Network Adap	ter				Physical Network Adapt	ter			
Name:	vmnic1				Name:	vmnic2			
Device:	Cisco Systems Inc Cisco VIC Ethernet NIC	:			Device:	Cisco Systems Inc Cisc	o VIC Ethernet N	IC	
Link Status:	Connected				Link Status:	Connected			
Configured Speed:	10000 Mbps (Full Duplex)				Configured Speed:	10000 Mbps (Full Dupl	ex)		
		Cla	ce Help					Clas	e Halo

• Software iSCSI initiator binds to two VMkernel ports

- Separate OS, Data, log into its own VMDK, dedicated virtual SCSI adapter, and use vmnxet3 as the virtual adapter
 - i. For Exchange

	🕜 exchange2010 - Virtual Machine Properties							
	Hardware Options Resources Profiles VServices	Virtual Machine Version: 8						
\sim	Show All Devices Add Remove	Number of virtual sockets:						
	Hardware Summary	Number of cores per socket: 8						
HBA for each VMDK	Memory 8192 MB	Total number of cores: 16						
	Video card Video card							
	VMCI device Restricted	Changing the number of virtual CPUs after the guest Os is installed with male your virtual machine						
	SCSI controller 0 LSI Logic SAS	unstable.						
	SCSI controller 1 LSI Logic SAS							
	SCSI controller 2 LSI Logic SAS	The virtual CPU configuration specified on this page might violate the license of the quest OS						
	Hard disk 1 Virtual Disk	hight volde are letting of the guest op.						
\sim	Hard disk 2 Virtual Disk							
Separate VMDK	CD/DVD drive 1 [DEPOT] Software/exc							
for OS, DB, Log	Network adapter 1 VM	- Adapter Type						
	Network adapter 2 DAGReplication	Current adapter: VMXNET 3						
	Floppy drive 1 Client Device							
0								
Separate vmpic for								
MAPI and DAG								
replication traffic								
	1							
	<u>H</u> elp	OK Cancel						

ii. For SQL Server



iii. For SharePoint



- 4. VM Guest OS:
 - If upgraded from Windows 2003, be sure to align the VM (change partition starting offset to be divisible by 4KB)
 - NTFS allocation unit size for data/log partitions should be 64KB

Chapter 3 Data Protection

Infrastructure Protection

 Backup UCSM configuration on a regular basis (service profile templates, service profiles, all environmental configurations for the Fabric Interconnect), especially after changes have been made (for example, modification to service profile, configuration of ports/VLANs in the Fabric Interconnect)



 Backup ESXi sever boot volumes and infrastructure VMs (including Sharepoint Web/App tier) by placing all boot volumes into a single Volume Collection with daily snapshot (NOTE: No snapshot synchronization is needed as crash consistent snapshot is all that's needed)



Application Protection

- Ensure application consistent snapshot can be taken through Nimble and VMware integration
 - Exchange

Mailbox Database 1571673474 Properties	X	ware Snapshot Provider Properl	ies (Local Computer)	×	
General Maintenance Limits Client Settings		ieneral I an On I Bassward Dana	electrical		
derival Noticitation Journal Recipient: Maintenance schedule: Run dally from 1:00 AM to 5:00 AM Image: State	Browse Customize scanning) Volume Collections > E	eneral Log Dn Recovery Deper Service name: vrivss Display name: Vritware Snapchor Description: Vritware Snapchor xchange2010	Provider 4		Status Snapshots Replication
$\langle 1 \rangle$	Edit Take Snapshot C	Collection Delete P	romote Demote Handove	er Validate Volu	umes: 2 Total Usage: 2.09 TB Free: 3.34 TB
~	SYNCHRONIZATION		PROTECTION STATUS		ASSOCIATED VOLUMES
	Туре	VMware vCenter	Last Snapshot Time	07/22 01:01 AM	
	Server		Next Snapshot Time	07/23 01:00 AM	Evolume/Clones
	Application	N/A	Last complete replication	Unknown	ExchangeDo
	Username	nimble\administrator			Exchangelog
	Password	(on file)	V "DAILYEXCHANGE" PROTE	CTION SCHEDULE	
			Snapshot every	1 days	
			Time	1:00 AM	
UK Cancel Ap	REPLICATION PARTNERS		On the following days	Sun, Mon, Tue, Wed, Thu, Fri, Sat	
			Number snapshots to retain	7 (on mktg-cs02)	
	Name Dire	ection Status	VMware vCenter Synchronization	enabled	
	NO REMS	to show.	Replicate to	None	
			Verify backups	N/A	

1. For simplicity, each Exchange mailbox database is configured with circular logging

NOTE: The ability to perform log truncation is provided through add-on products such as <u>Commvault Simpana</u> with Nimble Storage integration or <u>vSphere Data Protection</u>

- 2. VMware VSS integration is used to properly quiesce Exchange database for application consistent snapshot
- VMware vCenter Synchronization is used for the Exchange Volume Collection (the volume collection contains both Exchange database and log datastores)
- o SQL Server

Database Properties - DS2			VMware Snapshot Provider Properties (Local Computer)
elect a page General Files Filegroups Options Change Tracking Permissions Extended Properties Mirroring	Collation:	QL_Latin1_General_CP1_CI_AS	General Log On Recovery Dependencies Service name: vmvss Display name: Of Ware Snapshot Provider Description: VMware Snapshot Provider
Volume Co	Ilections > SQLCollection	Promote Demote Handover Validate	Status Snapshots Replication Volumes: 2 Total Usage: 257.4 GB Free: 3.34 TB
Struct Application Username Password	VMware vCenter N/A nimble\administrator (on file)	PROTECTION STATUS Last Snapshot Time 07/22 12:00 AM Next Snapshot Time 07/23 12:00 AM Last complete replication Unknown " "DAILYDBBACKUP" PROTECTION SCHEDULE	ASSOCIATED VOLUMES
REPLICATI	ON PARTNERS Direction Status No items to show.	Snapshot every 1 days Time 12:00 AM On the following days Sun, Mon, Tu Number snapshots to retain 10 (on mktg- VMware vCenter snabled Synchronization enabled Replicate to None Verify backups N/A	e, Wed, Thu, Fri, Sat cs02)

1. For simplicity, each SQL database is configured with simple recovery mode

NOTE: The ability to perform full recovery is provided through add-on products such as Commvault Simpana with Nimble Storage integration or vSphere Data Protection

- 2. VMware VSS integration is used to properly quiesce SQL database for application consistent snapshot
- 3. VMware vCenter Synchronization is used for the SQL Volume Collection (the volume collection contains both database and log datastores)
- o Sharepoint:

The Sharepoint Web/Application tier VMDK resides in the Infrastructure volume which is backed up daily. Note the Sharepoint database is backed up through SQL Server volume collection

Chapter 4 Operational Management

In this chapter we will highlight tools and integrations that help making deployment and operational management simple and easy.

Server Deployment with Cisco UCS Service Profile

A custom UCS Service Profile template was created for vSphere. It creates a standard for deploying the vSphere environment serving business critical applications, and simplifies scalability expansion down the line. We created two service profiles based on this ESXi template, apply it to each blade, and then modify the boot target for each server. That is it – all subsequent servers that will be added to the environment serving business critical applications will follow the same steps. Here's what the service profile template looks like:

For vNIC

🗍 Cisc	Unified Computing Sy	stem Manager - I	UCS-Fabric					
Fault	ummary	Δ	A	🕒 🏐 🖪 New - 🎴 Options 🛛 🥑	Pending Activities 0 Ext			
	1	8	68	>> 📅 Service Profile Templates 🕴 🛕 roo	🕐 🔥 Sub-Organizations 👌 🛕 TechMitg 🕯	Service Template ESN5_ISCSI_Boot		
Equipm	nt Servers LAN SAN	VM Admin		General Storage Network ISCSI vNICs	Boot Order Policies Events FSM			
iSCSI VNI C fi	Filter: Service Pro	ofile Templa izations mplate ISCSIBoot_Trainations mplate ESV/S mplate	emplate	Actions Change Dynamic WBC Connection F Modify WBC(MBA Placement	Orynamic VNLC Connection Polynamic vNLC / Connection Polynamic vNLC / VHEA Placement Policy VXLC / VHEA Placement Policy Nothing Selected LAN Connectivity Policy LAN Connectivity Policy	nicy s (anot set) • a c(y		
from Nimble		CST vNIC ISCST-Book CST vNIC ISCST-Book	-A	🕰 Filter 🛥 Export 🈸 Print				
WILCO Far with	vHBAs		,	Name	MAC Address	Desired Order	Actual Order	Fabric ID
VINCS FOR VIR	191	BC CLUSTER		- WIC CLUSTER	Derived	4	Unspeched	AB
machine traff	c < 	IIC CorpLAN			Derived	5	Unspecified	4B
		BC VM1		- VNIC VM2	Derived	6	Unspecified	AB
		EC INCSI-A	1	-I vNIC ISCSI-A	Derived	2	Unspecified	A
VNICs for iSC	SI 🔶 🦲 🕷	AC ISCSI-8		- WIC ISCSI-8	Derived	3	Unspecified	В

iSCSI vNICs settings for Boot-from-SAN

	🚁 Set iSCST Boot Parameters
	Set iSCSI Boot Parameters
	Name: ISCSI-Boot-A
 Citrco Unafined Computing System Manager - UCS Fabric EPO Commencements 	Authentication hydrel: <a href="https://www.science.com/sciences/s</th>
	C C New - D Options C America Activities C D A Initiator Address
0 1 0 70 Ersuksment Service Profiles the content of the content	Service Profiles · A, not · A 3:0-Copyruptions · A TechNerg · Service Profile Ext General Strange Tethnick SCSI vide Boot Order Bund Machines PC Zives Publics Serv Motions Motion Motions Motions Motions Motion Motions Motion Motions Motions Motion Motions Motion Motions Motion Motions Motion Motion Motions Motion Motions Motion
B → Service Profiles B ∧ Seb-Organizations B ∧ Litrary C ∧ Seb-Organizations B ∧ C RefeaseQA	Clobal floot Policy Clobal floot Policy Secondary Dets. [0.0.0.0 Clob Instantiation of this initiation address is available. Clob Instantiation of this initiation of this initiation address is available. Clob Instantiation of this initiation of this initiation of this initiation address is available. Clob Instantiation of this initiation of this initiation address is available. Clob Instantiation of this initiation of this initiation of this initiation address is available. Clob Instantiation of this initiation of this ini
Interop-EXX4.10-0FT Interop-EXX4.10-0FT Interop-ReX4.0-0FT Interop-REX1.2 Interop-REX1.2 Interop-WS11.2 Interop-WS11.2 Interop-WS11.2	China MiChARAGESS Name: Yes Construction of DSCI Static Target Interface Construction of DSCI Interface Constructio
Interop-Wi2012 ReleaseQA-wi1240 ReleaseQA-wi1240 ReleaseQA-wi1240 ReleaseQA-wi1240	Dock Grider Ør sett 165 S1 Book Parameters th. □ ■ A Faber i = Coport, (c); PWA Set 18CS1 Boot Parameters Set 18CS1 Boot Parameters Set 18CS1 Boot Parameters
Cabotest3 (ESx51) Cabotest4 (rhel63) Fill generalboot	Authenciation Profile: Knot set > V Create ISC31 Authenciation Profile: Knot set > V Create ISC31 Authenciation Profile Initiator Name
A Sub-Organizations A TechNizg B-20 ESX5.1-2 (Biz Apps-2)	Britister Name Assignment: (LCS_3(24)_Prov(S(462))
(8) (5) ESX5.1-4 (84: Apps2-4) (8) (5) ESX5.1-6 (God200) (8) -√ (God200) (9) -√ (God200)	The Convertient Convertient Convertient Convertient
	I the devaluation (to the lights are explanated areas in the part harder. I raitiator Address
	Initiator IP Address Policy: Static
	IN-MARKENSE IN-MARKENSE Defendt Gatewary: p. 0.0.0. Privary DRS: p. 0.0.0 George DRS: p. 0.0.0 Chris Enge In otherwork If this isolation actives is available. Chris Enge In otherwork If this isolation actives is available. ISO Christian II Peal
	GCSI Static Target Interface © BCSI AUto Target Interface Minimum one instance of ICSI Static Target Interface and maximum two are allowed Name Pointy Post Authenciation Profile SCSI IPVA AGene

- A1: subnet A for iSCSI boot vNIC A
- A2: iSCSI Discovery IP address for Nimble Array
- B1: subnet B for iSCSI boot vNIC B
- B2: iSCSI Discovery IP address for Nimble Array

Storage Management with Nimble Storage vCenter plugin

Don't want to toggle between different UIs to perform storage related tasks? Just stay in vCenter Server. Nimble Storage plugin allows for new datastore provisioning, cloning, resizing, snapshotting, and monitoring performance statistics, space usage, and compression savings:

Nimble San Jose	ummary Virtual	Machines Hosts Datastores and Datastore C	lusters IP Pools Performan	ice Tasks & Eve	nts Alarms Permi	ssions Maps St	corage Vie	ws Nimble m	1ktg-cs02		
General		Datastore	Size Read IOPS*	Write IOPS*	Read MB/sec*	Write MB/sec*	Com	pression Bac	ckup Opt.	Storage Usage	
Total datastores:	11	🔢 ExchangeDB	2.0 TB	0	0	0	0	1.51X	1.89X	1.15 119	
Usage:	3.64 TB	🗑 Exchangelog	2.0 TB	0	0	0	0	1.14X	1.29X	473.57 G8	Y
Free:	3.74 TB	🗑 Infrastructure	1.5 TB	3	29	0	0	1.71X	2.05X	414.39 GB Performar	nce
		🔋 VSI-cs02	1.0 TB	0	1	0	0	1.67X	N/A	132.1 GB (/Space	
Commands		🔋 bizapp\/Mswap	100.0 GB	0	0	0	0	10.44X	N/A	744.25 KB Monitorir	ŋg
New Datastore	\supset	🔋 bizappsql08db	200.0 GB	0	0	0	0	2.82X	N/A	596.18 MB	ト
		i bizappsql08logs	200.0 GB	0	1	0	0	4.63X	N/A	30.42 MB	
		🔋 iSCSI-boot-godzila	100.0 GB	0	0	0	0	1.07X	1.3 4 X	482.57 MB	
		boot-esx51-4	100.0 GB	0	0	0	0	1.1X	1.1 4 X	837.1 MB	
		🔋 sql2012db	800.0 GB	0	5	0	0	1.88X	1.95X	211.66 GB	
		🗊 sql2012log	500.0 GB	0	2	0	0	1.87X	1.91X	91.89 GB	

* Performance measured over a 5 minute period

Operational Management with vCenter Operations Manager

After the environment has been deployed, use vCenter Operations Manager to monitor health, workload and faults in the infrastructure. Good practice is to pay attention to any red icon(s) for Health, Workload and Fault badges, as well as "Alerts":

vmware vCenter Operations	ns Manager	ن
« 🕛 🌛 🗉	🗊 BizApp Actions -	
World Miniple SJ Biz App vCenter	Environment Operations Alerts	
Nimble San Jose Ili BizAnn	Overview Relationships	
bizappesx4.sedemo.lab		
ExchangeDB	Health Workload Faults	
Infrastructure		
Templates	WORLD (1 of 1)	
Visi-cs02 View52-1-cs01	an a	
bizappvniswap bizappsql08db		
iboot-esx51-4	CUSTOM GROUPS (2 of 3)	
sqi2012ab		
Sharepoint2013		
UI VM	DATACENTERS (1 of 1)	
vCenterServer51		
	HOSTS (2 of 2)	
	₩	
	wins (sors)	
		the state

You could also leverage the Group view functionality to look at the current health and workload status of all the VMs by their grouping folder:

NOTE: It is recommended to create a custom group with all Nimble Storage datastores. Doing so allows for quick overview of the health and workload status of the Nimble array volumes. Nimble InfoSight could then be used to look at deeper statistics based on heartbeats sent from the array.

vmware vCenter Operations	: Manager	/			U Configuration	Notifications	Help About	Q SQL2012	
- V 🕹 🛙	Business Apps Actions +								
Department	Environment Operations	Alerts							0
Nimble Array Biz App Volumes	Overview Relationships								
Business Apps	Show All Relationships								
Function	HORALDE								
Security Zone Service Level Objective									
				Business Apps					
	SharepointDBServer		exchangenodeb	exchange2010			Sha	repoint20	13
	Business Apps								
	No of Member(s)	4							
	Туре	Folder							
	Update Membership	Adapter Managed							

vmware vCenter Operations	Manager				
« 🕅 🔂 🗉	Business Apps Actions -				
Department	Environment Operations Alerts				
Nimble Array Biz App Volumes	Details				
Business Apps	🔊 Health (Custom Group : Business Apps)	Population Distribution Over Tim	e		
Function Location Security Zone Service Level Objective	NORMAL: Not calculated yet	00% 0% 6 Hours Ago Now	1 100 %	0%	Time 0 %
	Last 6 Hours	Top Offenders			
		Object Name Type	Health	Workload	Faults
		math display="block-color: block-space; bloc	93	7	• 0
		Sharepoint2013 VM	88		• 0
		SharepointDB VM	89	11	0
		Contangenoted viti	93		U

Deep Data Analytics with Nimble InfoSight

It is a good practice to regularly monitor Nimble InfoSight for storage health, availability, performance, data protection reports based on heartbeats from the array:

Wellness tab shows alerts from the array (both hardware and software), as well as support cases that have been open automatically based on criticality of the alerts:

🗢 nim	blasta	rogo	Inf	oCiabt™			
	Diesic	rage	1111	osigni			wen 🔻
					Company	Nimble Storage TechMktg	
Assets	Wellness	Capacity	Volumes	Performance	Data Protection	Dashboard	ŕ
Vour We	liness ()	<i>i</i> erview			Doily Symmony Emoil	Case Creation Ontions	.+.
Your We	Iness O	/erview 2013 12:49AM k	cal time		Daily Summary Emails	Case Creation Options 🔲 Show hints	⊉
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Capacity tab shows current array space utilization, as well as projection of when the array would run out of capacity:

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Assets	Wellness	Capacity	Volumes	Performance	Data Protection	Dashboard		C

Your Capacity Usage History and Forecast

📄 Show hints 📩



Performance tab shows CPU and cache utilization of the array, as well as average read and write latency based on heartbeat sent by the array:



Data Protection tab shows snapshot/replication configuration for each volume within the Nimble array:

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			MC-clone-031213	0	0							
Z Exchange			MC-test-1001	0	0							
V Hyper-V CSV			MC-test-1003	0	0							
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V IOmeter-8K-AC			MM-VDI-Example	Ō	Õ							
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SCSI-Boot			NS AustinData	18	6							
LogFiles			NG-AustinData	12	12							
V Oracle			NS-AustinLogs	10	2							
oradb AC			NS-Commvault	0	0							
oradb-normal			NS-Commvault-Backups	0	0							
vialogs-8k-nc			NS-DB-Delete-Me	0	0							
vialogs-ok-nc			NS-Exch-A	0	0							
veguential32k			NS-Exch-DB-KrollTest	0	0							
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VMware ESX			NS Filer	10	6							
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Dashboard tab shows summary reports of space savings through compression, data protection level for each volume, snapshot retention duration as well as upgrade recommendations based on workload

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15.54 TIB	350.57 TIB			Nimble Feature	Space Savings	
				Compression	12.29 TiB	
Space used on your Nimble Storage arrays		Space Saving	gs = 96%	Thin Provisioning	335.09 TiB	
minute storage anays				Zero Copy Clone	3.19 TiB	
Equivalent space needed of Data Protection	on traditional arrays	S				
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0 100.0%	96.8	1%	100.0%	_		
00:01:00 00:02:00	00:05:00 01:00):00 1 day	7 days Oth	er		
	Schedule	e Intervals				

Summary

When you virtualize business critical applications such as Microsoft Exchange, SQL and SharePoint, be sure to design the architecture with the four key pillars of requirements in mind: availability, performance, data protection and operational management. This document highlights the key design principles and best practices that address the requirements from all four pillars. Virtualize with confidence using SmartStack, powered by Cisco, VMware and Nimble Storage.

	()	
Vendor	Component Model(Quantity)	Software/OS Version
Cisco	UCS B200 M3 Blade	2.1(1e)
	Server(x2)	
	UCS Fabric Interconnect	
	6248(x2)	
Nimble	CS220G(x1)	1.4.6
VMware	vSphere ESXi (Standard)	5.1
	vSphere vCenter Server	5.1
	(Standard)	
	vCenter Operations Manager	5.7

Appendix A: Build of Materials (B.O.M)

Note:

The B.O.M listed above is a reference design of an environment capable of supporting 500+ users with business critical applications. Customers and partners are welcome to use different models of equipment from Cisco for compute, and Nimble for Storage. For example, Cisco UCS C-series rack mountable servers or other blade models, and a Nimble CS400 series could be used in place of the CS200 series, depending on the workload and capacity needs.

Appendix B: Validation for 500-User Business Critical Applications Environment

High Level Environment Overview:



Exchange 2010:



SQL 2012 and SharePoint 2013:



In case you are wondering how the SmartStack solution performs with real applications, here are the details of the validation:

In short, the physical servers, VMs hosting the applications, and the Nimble CS220G array did not show any signs of resource starvation. The environment could definitely take on additional workload. We leverage vCenter Operations Manager to determine the impact of running all workloads simultaneously, and here are the results:

Summary of observations:

- Mixture of Exchange, SQL and Sharepoint workload shows both random and sequential read and write, with bursts of up to 15000 IOPS
- The SmartStack architecture is well equipped to handle the mixture of workloads without signs of resource starvation for CPU, memory, network or storage (as shown in vCenter Operations charts below)
- Nimble CS220G array shows average latency of under 2 ms for both read and write IO

Details:

Application	Validation Tool	Workload Profile
Microsoft Exchange 2010	LoadGen Version	500 1GB mailboxes (250 in
_	14.01.0180.003	each DAG node with cross
		replication); Outlook 150

		action profile (150 messages/day); total of 10 hour test simulating 8 hour busy work day
Microsoft SQL Server 2012	DVDStore Version 2.1	Large DVDStore database with 1 million customers and 2 million DVD products
Microsoft Sharepoint 2013	Nimble Storage employees	Day-to-day cross functional usage of Sharepoint farms for page creation, modification, file upload and sharing

NOTE: Validation was conducted with all three workloads running simultaneously

Results:

Exchange LoadGen Test Report

Microsoft Excha	ange Load Gene	rator 2010					Windows Ser					
Welcome	View Load Gor	erator 2010 Repo	rt									
Stat a new test	VIEW LOAD GEI	ielator zo io nepo	11									
	Microsoft Exchange Server Load Generator											
ee also		v										
Exchange Load Generator	Test Result Summary											
2010 Help About Exchange Load Generator 2010	Result:		Succeeded									
	Topology Configuration	00	101475 F									
	Total number of use	around:	NUTBLE									
	Total number of use	r groups. rs:	500									
	Total number of dist	ribution lists:	0									
	Total number of dyn	amic distribution lists:	0									
	Total number of con	tacts:	0									
	Total number of ext	ernal recipients:	0									
	Simulation Statistics											
	Simulation started:		7/23/2013 12:1	5:49 AM								
	Scheduled run lengt	h:	00D:10H:00M:0	05								
	Actual run length:		00D:10H:00M:0	05								
	Stress mode:		False									
	Remote:		raise									
	* Note that if the load generation	us or client only runs user aroups with script	ed modules, its task counters are expected to be zero.									
	Туре	Name	Task Exceptions	Task Queue Length	Task Skipped	Tasks Completed	Task Dispatched					
	Master	EXCHANGELOADGEN	0	0	0	113125	113125					
	- UserGroups											
	Name	Succeeded	Client Type	Action Profile	User Count	Tasks per User Day	TasksCompleted					
	⊞ UserGroup1	Succeeded	Outlook 2007 Online	Outlook_150	500	181	113125					
	Generated by Microsoft Exchan	ge.Swordfish (14.01.0180.003)										

Expanding on the Usage tasks completed

View Load Generator 2010 Report

UserGroups							
Name	Succeeded	Client Type	Action Profile	User Count	Tasks per User Day	TasksC	ompleted
UserGroup1	Succeeded	Outlook 2007 Online	Outlook_150	500	181	113125	
E Active User	s Statistics						
Active Use	Active User Count Duration						
500	500 10:00:00						
🖃 Task Execut	Task Execution Statistics						
Task Name	2				Count	Actual Distribution(%)	Configured Distribution(%)
AddPublicD	elegateTask				0	0	0
BrowseAdd	vseAddressBookTask		0	0	0		
BrowseCale	vseCalendarTask			8159	7	7	
BrowseCont	tactsTask				6899	6	6
BrowsePubl	icFolderTask				0	0	0
BrowseTask	∕s⊺ask				581	0	0
CreateCont	actTask				646	0	0
CreateFolde	erTask				0	0	0
CreateTask	Task				630	0	0
DeleteMailT	ask				0	0	0
DownloadO.	abTask				606	0	0
EditRulesTa	sk				0	0	0
EditSmartF	oldersTask				602	0	0
ExportMailT	ask				0	0	0
InitializeMai	ilboxTask				0	0	0
LogoffTask					1898	1	1
LogonTask					0	0	0
MakeAppoir	MakeAppoIntmentTask				655	0	0
ModuleInitT	ask				1	0	0
MoveMailTa	sk				0	0	0
PostFreeBu	syTask				2486	2	2
PublicFolde	PublicFolderPostTask				0	0	0
PublishCerti	PublishCertificatesTask				0	0	0
ReadAndPro	ReadAndProcessMessagesTask					66	66
RequestMe	RequestMeetingTask					1	1
SearchTask	SearchTask				0	0	0
SendMailTa	SendMailTask					11	11
ViewContac	tDetailsTask				0	0	0

DVDStore Results

- Total test run duration: 36018 minutes (~10 hours)
- Total transactions completed: 1892280 orders
- Total new customers added: 378376
- Total number of browse during run: 5677543
- Total number of purchases: 1892280
- Average latency per second to login to DVDStore: 6 millisecond
- Average latency to add new customer: 1 millisecond
- Average latency to browse catalog: 1 millisecond
- Average latency to purchase: 9 millisecond

Final (7/23/2013 10:22:10 AM): et=36018.9 n_overall=1892280 opm=3152 rt_tot_last n_max=220 rt_tot_avg=18 n_login_overall=1513904 n_newcust_overall=378376 n_brows e_overall=5677543 n_purchase_overall=1892280 rt_login_avg_msec=6 rt_newcust_avg_ msec=1 rt_browse_avg_msec=1 rt_purchase_avg_msec=9 rt_tot_sampled=16 n_rollbacks _overall=511 rollback_rate = 0.0%

Thread 0: exiting Controller (7/23/2013 10:22:11 AM): all threads stopped, exiting n_purchase_from_start= 1894362 n_rollbacks_from_start= 511 Run over

Sharepoint Access

Nimble employees across HR, Engineering, QA, Product Management, Marketing, IT and Sales all had access to "MyNimble" (Nimble's intranet backed by Sharepoint 2013 with SQL 2012 back-end). All team members were able to access various intranet pages, upload and edit shared documents, while Exchange Loadgen and DVDStore workloads were running on the SmartStack.



BROWSE PAGE					
s>	Nimble TME Playground				
Libraries Lists Recent Documents Tasks Site Contents	Welcome to the Document Cen Use this site to create, work on, and store documents. This site can be	ter			
	Newest Documents	Modified By Me			
	VDL bootcamp_session_2_3	m bent			
Q1 V0Lbootcamp_session_1		airfare			
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Resource Utilization

ESXi Server1 Resource Utilization:

Vmware vCenter Operations Manager							
 ✓ III ▲ S World 	image: bizappesx4.sedemo.lab Actions → Dashboard Environment Operations						
VCenter Biz App Mimble San Jose Im BizApp	Details Events All Metrics						
 bizappesx4.sedemo.lab godzilla.sedemo.lab ExchangeDB Exchangelog Infrastructure bizappVMswap iSCSI-boot-godzilla sql2012db sql2012log SQL2012 Sharepoint2013 exchangenodeb vCenterServer51 	Workload (Host : bizappesx4.sedemo.lab : Running) $\int \int $						
	CPU 35%						
	MEM 5%						
	DISK I/0 4%						
	NET I/0 12%						

ESXi Server 2 Resource Utilization:



Exchange DAG node 1 Resource Utilization:



Exchange DAG group node 2 Resource Utilization:



SQL DB serving DVDStore and Sharepoint databases Resource Utilization:



Nimble Storage CS220G Array IOPS and Latency chart:





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