





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

Identification 🔷	Status I	Device	Drive Type	Capacity	Free	Туре	Last Update	Alarm	n Actions
bizappsql08db		Nimble iSCSIDiek	Non-SSD	100 75 GB	97 42 CB	VMESS	7/20/2013 5+14+23 0	M Enabl	ed
bizappsql08logs bizappVMswap	C ExchangeDB	Manage Paths					-		2
DEPOT	Policy		_						
ExchangeDB	Path Selectio	n: Rou	nd Robin (VMware)				•	 Char 	nge
Exchangelog iboot-esx51-4	Storage Arra	y Type: VMW	V_SATP_ALUA						
Infrastructure	Paths								
InternalSSD-14	Runtime Nam	ie Target				LUN	Status	Preferred	
I sql2012db I sql2012log	vmhba32:C0	:T7:L0 iqn.2007-	11.com.nimblestor	age:exchangedb-	v18609ac9	0	 Active (I/O) 		
sql2012log Templates View52-1-cs01	vmhba32:C1	:T7:L0 iqn.2007-	11.com.nimblestor	age:exchangedb-	v18609ac9	0	 Active (I/0) 		
VSI-cs02									
VSI-cs02								Re	fresh
VSI-cs02 atastore Details ExchangeDB Location: /vmfs/volur	Name: Runtime Name)23d000001,iqn.2	007-11.com.r	nimblestora	ge:exchangedb-v 18609		
VSI-cs02	n Runtime Name	: vmhba32:C0:)23d000001,iqn.2	007-11.com.r	nimblestora	ge:exchangedb-v18609		
VSI-cs02 Atastore Details ExchangeDB Location: /vmfs/volur Hardware Acceleration: Refresh Storage Capability User-defined Storage Capability	Runtime Name	: vmhba32:C0:	T7:L0 om.ucs:host:15 om.nimblestorage:e				-		
VSI-cs02 Atastore Details ExchangeDB Location: /vmfs/volur Hardware Acceleration: Refresh Storage Capabilit System Storage Capabilit User-defined Storage Cap Path Selection	i Runtime Name i iSCSI Adapter: iSCSI Alias:	: vmhba32:C0: iqn.2013-03.cc iqn.2007-11.cc	T7:L0 om.ucs:host:15 om.nimblestorage:e				e.f5b63d2f		

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 duster 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
Help	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

2 N	Nimble iSCSI Dis	sk (eu	ui.084f713c34b78c386c9ce9002f3db6f5) Manage Paths				x
P	olicy]
	Path Selection:		Round Robin (VMware)			- Char	iae
	Storage Array Ty	/ne:	VMW_SATP_ALUA		-		
		ibe.					
	aths			,			
	Runtime Name		Target	LUN	Status	Preferred	
	vmhba32:C0:T7:I		iqn.2007-11.com.nimblestorage:exchangedb-v18609ac9	0	 Active (I/0) 		
۱ I I I	vmhba32:C1:T7:l	L0	iqn.2007-11.com.nimblestorage:exchangedb-v18609ac9	0	 Active (I/O) 		
11'							
						Re	fresh
	lame:	ign.	.2013-03.com.ucs:host:15-00023d000001,ign.2007-11.com.	nimblestorag	e:exchangedb-v1860	9ac9edd6a7e6	.000
R	untime Name:	vmh	nba32:C0:T7:L0	-	-		
	iSCSI						
	Adapter:	iqn.	2013-03.com.ucs:host:15				
	iSCSI Alias:						
	Target:	iqn.	2007-11.com.nimblestorage:exchangedb-v18609ac9edd6a7e	e6.0000000e	.f5b63d2f		
		172	. 18. 127. 103: 3260				
					d	ose	Help

• Change default path IOPS to 0

Set iops=0 for each volume
godzilla.sedemo.lab - PuTTY
* # esxcli storage nmp psp roundrobin deviceconfig settype=iopsiops=0device=eui.7bc8106d73ab4ad66c9ce9002f3db6f5 * # [esxcli storage nmp device list grep -A 5 Infrastructure]
All volumes should have
"iops=0" Storage Array Type Device Config: {implicit_support=on;explicit_support=off; explicit_allow=on;alua_followover=on;{TPG id=0,TPG state=A0}}
Path Selection Policy: VMW PSP_RR
Path Selection Policy Device Config: {policy=iops(iops=0,)ytes=10485760,useANO=0;lastPathIndex=0: NumIOsPending=0,numB ytesPending=0}
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:
	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.
Denne Denne	Name Speed Networks Move Up
Standard Switch: iScsiBootvSwitch Remove Propertie	Active Adapters
VMkerlel Port Physical Adapters	wmnic2 10000 Full 172.18.128.1-172.18.128.254
□ ISCSI-B vmk2: 172.18.128.153 □ ISCSI-B □ wmnic2 10000 Full □ wmnic1 10000 Full	Stalluby Adapters
	Vinused Adapters
VMkernel Port	Vininci 10000 an 172.18.127.19172.18.127.294
vmk1 : 172.18.127.153	
	🕢 iSCSI-A Properties
	General IP Settings Security Traffic Shaping NIC Teaming Policy Exceptions
	Load Balanding: TRoute based on the originating virtual port ID
	Network Fallover Detection:
	Notify Switches:
	Faibad:
	Failover Order:
	Select active and standard order: select active and standard vadapters for this port group. In a failover situation, standby adapters activate in the order specified below.
	Name Speed Networks Move Up
	Active Adapters Move Down
	vmnic1 10000 Full 1/2.18.127.1-1/2.18.127.254
	Standby Adapters Unused Adapters
	wmic2 10000 Full 172.18.128.1-172.18.128.254

iSCSI Initiator (vmhba32) I	Properties		_ 0 <mark>_ X</mark>		iSCSI Initiator (vmhba32) Pr	roperties			
General Network Configurat	on Dynamic Discovery Static Discovery				General Network Configuration	Dynamic Discovery	tatic Discovery		
VMkernel Port Bindings:					VMkernel Port Bindings:				
Port Group	VMkernel Adapter Port Group Polic	v Path 9	Status		Port Group	VMkernel Adapter	Port Group P	Policy Pat	h Status
iSCSI-A (iScsiBootvS		· .	Active		iSCSI-A (iScsiBootvSw		Compl		Active
iSCSI-B (iScsiBootvS	witc vmk2 📀 Compliant	• •	Active		iSCSI-B (iScsiBootvSw	vitc vmk2	📀 Compl	iant 🔶	Active
•			•		•	m			
	<u>A</u>	id	<u>R</u> emove					<u>A</u> dd	<u>R</u> emove
VMkernel Port Binding Details	:				VMkernel Port Binding Details:				
Virtual Network Adapt	2r				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	er			
Name:	vmnic1				Name:	vmnic2			
Device:	Cisco Systems Inc Cisco VIC Ethernet NIC				Device:	Cisco Systems Inc Cisc	o VIC Ethernet	NIC	
Link Status:	Connected				Link Status:	Connected			
Configured Speed:	10000 Mbps (Full Duplex)				Configured Speed:	10000 Mbps (Full Duple	ex)		
		Close	Help	1					se <u>H</u> elp

• 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:
Separate vSCSI	Hardware Summary	Number of cores per socket: 8
HBA for each VMDK	Memory 8192 MB	Total number of cores: 16
	CPUs 16	
	VMCI device Restricted	Changing the number of virtual CPUs after the guest OS is installed might make 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 guest OS.
	 Hard disk 1 Virtual Disk Hard disk 2 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
	Fioppy drive 1 Client Device	
0		
Separate vmnic 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 Propert	ties (Local Computer)	×	
General Maintenance Limits Client Settings					
Journal Recipient: Maintenance schedule: Run dally from 1:00 AM to 5:00 AM Enable background database an startun Doot mount his database at startun	Browse	eneral Log On Recovery Deper Service name: vmvss Display name: VMware Snapshol Description: VMware Snapshol xchange2010	Provider 2		Status Snapshots Replication
$\langle 1 \rangle$	Edit Take Snapshot C	ollection 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	Volume/Clones ExchangeDB
		N/A	Last complete replication	Unknown	· · · · · · · · · · · · · · · · · · ·
	osernane	nimble\administrator			Exchangelog
	Password	(on file)	V "DAILYEXCHANGE" PROTE	CTION SCHEDULE	
			Snapshot every	1 days	
			Time	1:00 AM	
OK 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 terns	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)
General General Files Filegroups Options Change Tracking Permissions Extended Properties Mirroring	Recovery model: S Compatibility level: S	QL_Latin1_General_CP1_CI_AS	General Log On Recovery Dependencies Service name: vmvss Display name: Mware Snapshot Provider Description: Mware Snapshot Provider
Edit	Ilections > SQLCollection	Promote Demote Handover Validate	Status Snapshots Replication Volumes: 2 Total Usage: 257.4 GB Free: 3.34 TB
SVICEBOART Type Server 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	4 Volume/Clones sq2012 sq2012log
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- VHware vCenter 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

	🗼 Cisco Unified	Computing Sy	stem Manager -	UCS-Fabric							
	Fault Summar	, <u> </u>	Δ		9	🕘 🛚 New - 🛛 😧 Options 🖉 🥹	0 /	Pending Activities			
	8	1	8	68	>>	📅 Service Profile Templates 🕨 🛕 root 🛙	• A Sub	-Organizations 🕴 🛕 TechMitg 🕯	Service Template ESX/5_ISCSI_Boot		
	Equipment Serv	ers LAN SAN	VM Admin		Gene	eral Storage Network ISCSI vNICs I	Boot Orde	r Policies Events PSM			
ISCSI VN	Equipment Bernets UAI SAU (Ve) Advan Filter: Service Profile Templates			Template		ktions	licy	Dynamic VNIE Connection Poi Nothing Selected VVIE/VHBA Placement Policy Nothing Selected LAN Connectivity Policy LAN Connectivity Policy LAN Connectivity Policy Consectivity Policy Consectivity Policy	r ond set> ▼		
booting E	:SXi	G-CSI V	NDCs		vN	ICs					
from Nim	ble <	-0.50	CSI VNIC ISCSI-Bool		4	Filter 👄 Export 😸 Print					
LALC- F		VHBAS				Name		MAC Address	Desired Order	Actual Order	Fabric ID
VNI Cs for	Virtual		IC CLUSTER				Derived		4	Unspecified	AB
machine	traffic (-		IC CorpLAN				Derived Derived		1	Unspecified Unspecified	AB
		J <u>⊕</u> -¶ w					Derived		9 6	Unspecified	AB
			IC VM2 IC ISCSI-A	J			Derived		2	Unspecified	A
vNICs for	iscsi 🤞		IC ISCSI-8				Derived		-	Unspecified	В

iSCSI vNICs settings for Boot-from-SAN

	🚓 Set iSCSI Boot Parameters
	Set iSCSI Boot Parameters
	Name: ISCSI-Boot-A
» Ctrco Unified Computing System Manager - UCS Fabric RNO Environmentation	Authenboation hyofile; <pre>choic set> </pre> Create IDC32 Authenboation hyofile; <pre>Initiator Name</pre> Initiator Name Assignment; UC5_ICR4_PostS740; Initiator Name Name, Name
Fault Summary	Compared Ballow - Decomposition Compared Ballow - Compared Ballow
0 1 0 70 Eaulament (Service) LAN (SAN (VR) Admin Filteer: Service Profiles V deb co.	Service hrules : A root : A Sub-Cogeneones : A roothing : Service hrule Exit General Strange Retrieves, GCE vice Retrieves Product Serv Actions A
Service Profiles A roct A roct A sub-Organizations A sub-Organizations A sub-Organizations A ReleaseQA	Global Boot Policy Global Boot Policy Global Boot Policy Financy (SG) (00.0.0) Security (SG) (00.0.0) Security (SG) (00.0.0) Cick base to determine if this relation address is available. Cick base to determine if
	Explana MECHANADOSCI Name: Yes Torcisi Static Target Interface C Inclusion and the MECHANADOSCI in the State State C Inclusion and the MECHANADOSCI in the State State C Inclusion and In
Interce-W3882-BFT Enterce-W4012 Relnare(0.48973 Relnare(0.48973 Relnare(0.4.4973 Relnare(box Order
Test cabotest1 (w2k0r2) cabotest2 (w2k12)	
cabutest3 (ESX51) cabutest4 (rhel63) fill generalboot	Authentication profile: dcst. bcst.boxt.0 Create Isc.31 Authentication Profile
A Sub-Organizations C A Tech/Matg E SIX5.1-2 (82 Apps-2)	Tratistion Name Accignments: UCS_JCN_Prod(S(40)
(8) (5) (5) (4) (8) (4) (8) (4) (8) (4) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	Totalator Manois Impo 2013 - 00.4 consuccisions12/6 C Crashing Constraints (2015) English Parial The (2014) English The (2014) English The (2014) English Parial The (2014) En
	The available/flotal lights are deplayed after the pool name. Initiator Address
	Initiator IP Address Policys Static
	Privé Addensos (172-10-120-156) Subaros Hana, (176-10-200-0 Conduct Catewory) (0-0.0-0 Primary DRS) (0-0.0-0 Secondary DRS) (0-0.0-0 Chris Enge Teo Hennesse III available.
	GCSI Static Target Interface (* GCSI Auto Target Interface Minimum one instance of ISCSI Static Target Interface and maximum two are allowed None (* None) None (* None) Post (* None) Post (* None) Zet (*

- 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:

eneral		Datastore	Size Read IOPS*	Write IOPS*	Read MB/sec*	Write MB/sec*	Com	npression Bac	ckup Opt.	Storage Usage
otal datastores:	11	🕼 ExchangeDB	2.0 TB	0	0	0	0	1.51X	1.89X	1.151
sage:	3.64 TB	Exchangelog	2.0 TB	0	0	0	0	1.14X	1.29X	473.57 68
ree:	3.74 TB	🗊 Infrastructure	1.5 TB	3	29	0	0	1.71X	2.05X	414.39 GB Performa
		VSI-cs02	1.0 TB	0	1	0	0	1.67X	N/A	
ommands		🕼 bizapp\/Mswap	100.0 GB	0	0	0	0	10.44X	N/A	744.25 KB monitori
New Datastore	\supset	🗊 bizappsql08db	200.0 GB	0	0	0	0	2.82X	N/A	596.18 MB
\sim		izappsq108logs	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	1.34X	482.57 MB
		📵 iboot-esx51-4	100.0 GB	0	0	0	0	1.1X	1.14X	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	Manager
« 🕛 🎿 🗉	1 BizApp Actions -
	Environment Operations Alerts
Nimble San Jose IlizApp	Overview Relationships
bizappesx4.sedemo.lab	
ExchangeDB Exchangelog	Heath Worklad Fauls
Infrastructure	
Templates	WORLD (1 of 1)
View52-1-cs01	-7-
bizappsql08db bizappsql08db	
iboot-esx51-4	CUSTOM GROUPS (2 of 3)
sql2012log Analytics VM	vcenter server systems (1 of 1)
Sharepoint2013 SharepointDBServer	▲ · · · · · · · · · · · · · · · · · · ·
UI VM	DATACENTERS (1011)
vCenterServer51 godzila.sedemo.lab	CLUSTERS (1of 1)
u u	
	HOSTS (2 of 2)
	VMs (9 of 9)

	DATASTORES (13 of 16)

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	s Manager	1			U Configuration	Notifications	Help About	Q SQL2012	
" V 🤣 🛙	Business Apps Actions +								
Department Environment	Environment Operations	Alerts							0
A Nimble Array Biz App Volumes	Overview Relationships								
Business Apps Thrastructure Function	Show All Relationships								
Function	HORAGE								
Security Zone Service Level Objective									
				A					
				Business Apps					
									-
	SharepointDBServer		exchangenodeb	exchange2010			Sha	repoint201	1
	Business Apps								
	No of Member(s)	4							1
	Туре	Folder							
	Update Membership	Adapter Managed							

vmware vCenter Operations	Manager				
« 🕅 🔂 🗉	Business Apps Actions -				
Department	Environment Operations Alerts				
 Nimble Array Biz App Volumes Folder 	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
		mail exchange2010 VM	93	7	• 0
		Sharepoint2013 VM	88		• 0
		SharepointDB VM	89 93	·/···/································	• 0
		Up 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:

🐟 niml	blootor	000	Inf	oCiaht™			
🤝 () ()	blestor	age	11110	oSight [™]			wen 🔻
					Company	Nimble Storage TechMktg	
Assets V	Vellness Ca	pacity N	Volumes	Performance	Data Protection	Dashboard	;
Your Wel	Iness Ove	rview			Daily Summary Emails	s Case Creation Ontions 🔲 Show hints	÷.
	Iness Ove		time		Daily Summary Emails	s Case Creation Options 🔲 Show hints	⊉
	ipdated on: Jul 29 201		time	Ð	Daily Summary Emails	S 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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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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OK Replication Partner			IOMETER ISO-Library jm-Inx-cs59-vol1	000	000							*
Performance Policy V (All) 4K-nc Archive-32k-nc auto1 Default Exchange Hyper-V CSV Ometer-4K-AC Umeter-8K-AC			jm-unx-sol11-vol1 jm-wns-2012-hvc Knopp01-LoadlO-Volu LiveDemoVol MC-clone-031213 MC-test-1001 MC-test-1003 MM-Jump1-Perf MM-VDI-Example	000000000000000000000000000000000000000	0000000000							E
 ✓ IOmeter-32K-AC ✓ ISCSI-Boot ✓ LogFiles ✓ Oracle ✓ oradb-4K-AC ✓ oradb-AC ✓ oralogs-Nc ✓ oralogs-nc ✓ sequential32k ✓ SQL Server 2012 ✓ SQL Server Logs ✓ SQL Server 			newSJProduction NS-AustinData NS-AustinLogs NS-Commvault NS-Commvault-Backups NS-DB-Delete-Me NS-Exch-A NS-Exch-A NS-Exch-DB-KrollTest NS-Exch-DC NS-Exch-Rec-Databas	000000000000	0000000000000							
VMware ESX			NS-Exch-Rec-Logs NS-Files	0	000							

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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Space Savings						
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	
innois storage anafo				Zero Copy Clone Total	3.19 TiB 350.57 TiB	
Data Protection						
	RPO	>			Performance Custom	e Policy Category
6 -		26.4%			Exchang Nimble D Oracle	
− 4 Data (TIB)					SQL VMware	
2 -	_	68.7%				
0 100.0%	96.8		100.0%			
00:01:00 00:02:0			7 days Oth	er		
	Schedul	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 Gen	nerator 2010 Repo	rt							
Stat a new test	VIEW LOad Gen		11							
View a test report										
	Microsoft Excl	hange Server Loa	d Generator							
ee aloo										
Exchange Load Generator	Test Result Summary Result:		0 minuted	Succeeded						
2010 Help About Exchange Load Generator 2010		-	Succeeded							
	Topology Configuration	00	NIMBLE							
	Total number of use	r aroups:	1							
	Total number of use		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 exte	ernal recipients:	0							
	Simulation Statistics									
	Simulation started:		7/23/2013 12:1	5-40 AM						
	Scheduled run lengt	h:	00D:10H:00M:0							
	Actual run length:			002.104.005						
	Stress mode:		False							
	Remote:		False							
	Load Generator Stat									
			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

Name	Succeeded	Client Type	Action Profile	User Count	Tasks per User Day	Task	scompleted
JserGroup1	Succeeded	Outlook 2007 Online	Outlook_150	500	181	1131	
Active Users Sta	tistics						
Active User Co	unt			Duration			
500				10:00:00			
Task Execution 5	Statistics						
Task Name					Count	Actual Distribution(%)	Configured Distribution(
AddPublicDelega	iteTask				0	0	0
BrowseAddressBookTask				0	0	0	
BrowseCalendar	Task				8159	7	7
BrowseContacts	Task				6899	6	6
BrowsePublicFol	derTask				0	0	0
BrowseTasksTas	sk				581	0	0
CreateContactT	ask				646	0	0
CreateFolderTas	sk				0	0	0
CreateTaskTask	(630	0	0
DeleteMailTask					0	0	0
DownloadOabTa	isk				606	0	0
EditRulesTask					0	0	0
EditSmartFolder	sTask				602	0	0
ExportMailTask					0	0	0
InitializeMailbox	Task				0	0	0
LogoffTask					1898	1	1
LogonTask					0	0	0
MakeAppointme	ntTask				655	0	0
ModuleInitTask					1	0	0
MoveMailTask					0	0	0
PostFreeBusyTa	isk				2486	2	2
Public FolderPost					0	0	0
PublishCertificat	esTask				0	0	0
ReadAndProcess	sMessagesTask				74964	66	66
RequestMeeting	Task				1890	1	1
SearchTask					0	0	0
SendMailTask					13108	11	11

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 Cer Use this site to create, work on, and store documents. This site can	TCET become a collaborative repository for authoring documents within a team, or a knowledge base for documents across multiple teams.
	Newest Documents	Modified By Me
	VDL bootcamp, session, 2,3	Si bent
	VDL_boatcamp_session_1	🔛 aintare
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Resource Utilization

ESXi Server1 Resource Utilization:

vmware vCenter Operations I « 🗊 ⋻ 🗉	Manager
▲ ♥ World ▲ ♥ vCenter Biz App ▲ ▶ Nimble San Jose ▲ ♥ BizApp ▶ bizappesx4.sedemo.lab ■ godzilla.sedemo.lab ■ ExchangeDB ■ Exchangelog ■ Infrastructure ■ bizapV/Mswap ■ Sql2012db ■ sql2012log ● Sharepoint2013 ● vCenterServer51	Dashboard Environment Operations Planning Details Events All Metrics Workload (Host : bizappesx4.sedemo.lab : Running) Image: Constraint of the second
	CPU 35%
	MEM 5%
	DISK I/0 4%
	NET I/O 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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