

Best Practices for Deploying VMware vSphere on Symmetrix

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Agenda



- Why Symmetrix with VMware and vSphere
- Connectivity and Pathing
- Performance and Storage
- Virtual Provisioning and EMC Storage Viewer
- Replication Technologies
- Demo

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Higher Tier Requirements Need Higher-End Storage



Tier 1
mission-critical
applications

infrastructure requirements

- Disaster recovery and restart
- Service level management
- Server/storage management

Tier 2
business-critical
applications

infrastructure requirements

- High availability
- Replication (local/remote)
- Storage resource management

Tier 3
business-support
applications

infrastructure requirements

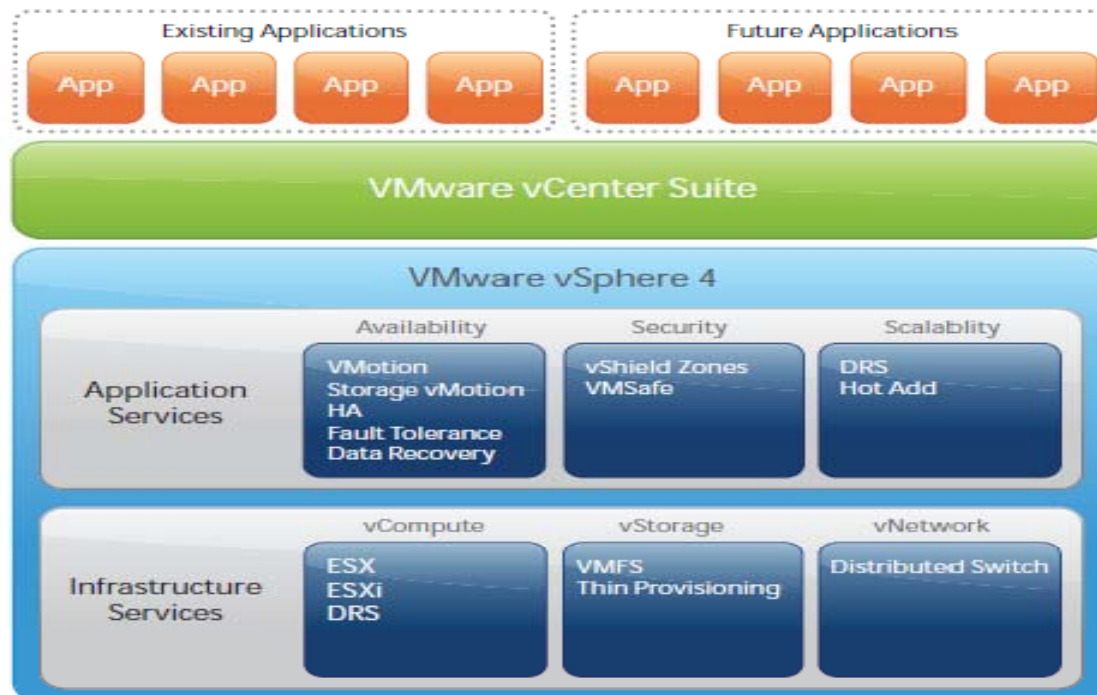
- Basic storage connectivity
- Tape-oriented backup & recovery

VMware vSphere Overview



VMware DRS
Pluggable Storage Architecture
Hot add
Hot plug
Hot extend
VMware vNetwork Distributed Switch

VMware vStorage Thin Provisioning.
VMware VMotion
VMware Storage VMotion
VMware High Availability (HA)
VMware Fault Tolerance (FT)
VMFS Volume Grow



EMC Symmetrix Family



Symmetrix DMX-4 Series



Symmetrix V-Max Series New

Use Case	Full-featured storage with market-leading management and tiering	Storage to support virtual data center requirements
Key Benefits	<p>Enterprise Flash, Fibre Channel, and SATA drives</p> <p>Key management features—Virtual Provisioning, and Virtual LUN</p> <p>Local, remote, and multi-site replication options</p> <p>ControlCenter to automate and simplify physical and virtual infrastructure management</p>	<p>Scale-out architecture for unmatched performance and hyper-consolidation</p> <p>New “ease-of-use” capabilities to provision thousands of virtual and/or physical servers in minutes</p> <p>Up to 2 PB of usable protected capacity with support for Enterprise Flash, Fibre Channel, and SATA</p> <p>Enhanced Virtual LUN Technology for nondisruptive mobility</p>

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Connectivity Considerations

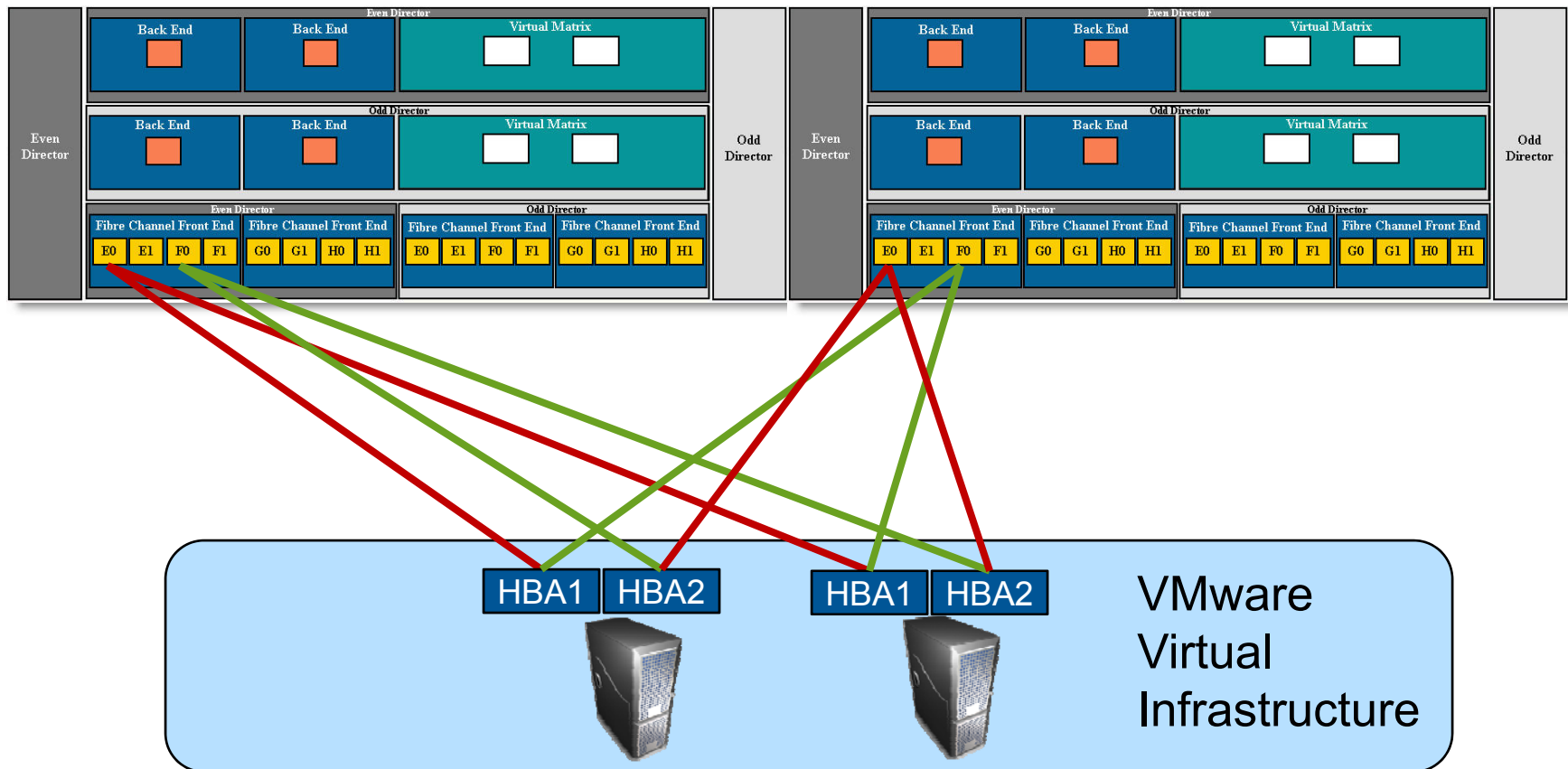


- VMware ESX Servers should have multiple physical HBA
- VMware Servers should be connected to multiple directors
 - Connections to different directors in different engines in multiple engine configuration
- Connect each HBA to a minimum of two ports on different directors

Connectivity Considerations – cont.



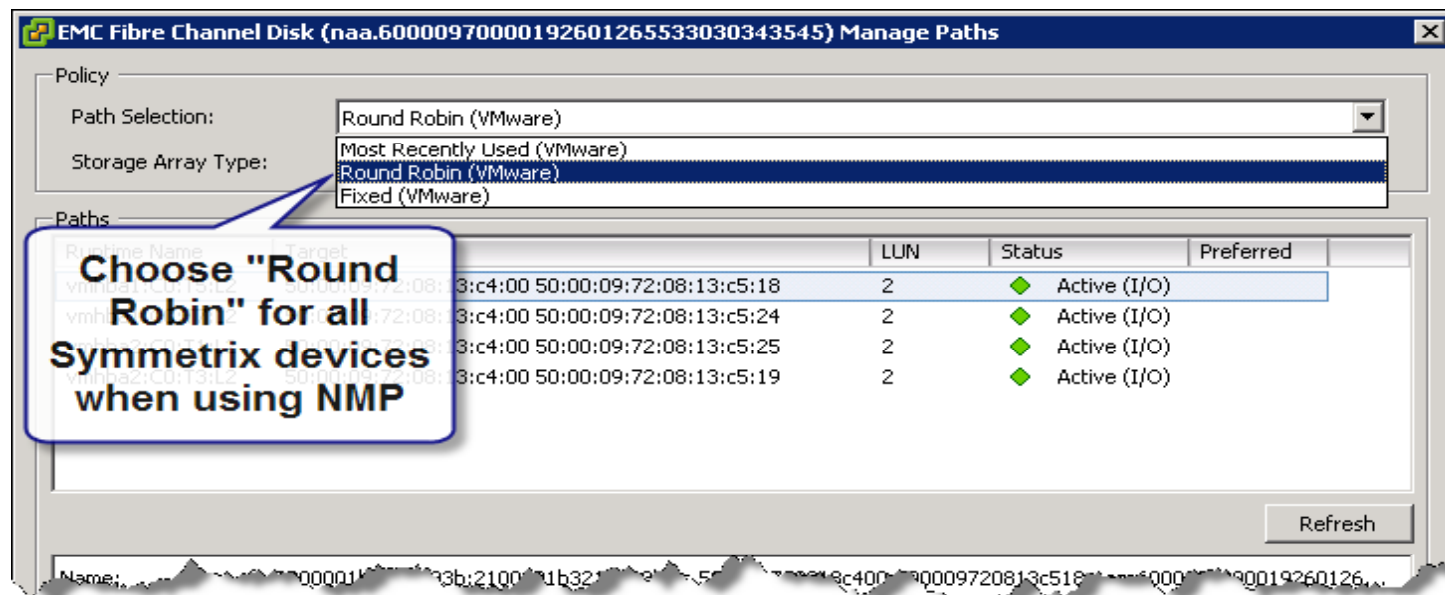
2 V-Max Engines



Path Management



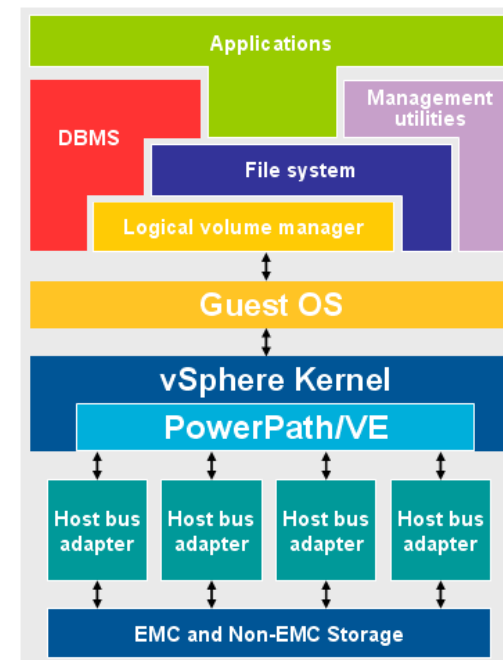
- PowerPath/VE is recommended for vSphere environment
- NMP policy is available with vSphere
 - Use Round Robin policy for Symmetrix arrays



PowerPath/VE - Features



- Dynamic load balancing
- Auto-restore of paths
- Device prioritization
- Automated performance optimization
- Dynamic path failover and path recovery
- Monitor/report I/O statistics
- Automatic path testing



PowerPath/VE - vSphere



```
C:\>rpowershell display host=<IP_Address> dev=emcpower0
```

```
Pseudo name=emcpower0
Symmetrix ID=000192601265
Logical device ID=03A7
Standard UID=naa.60000970000192601265533030334137
state=alive; policy=SymmOpt; priority=0; queued-I/Os=0
```

###	HW Path	Host	I/O Paths	Stor Interf.	I/O Mode	Path State	Stats Q-I/Os	Errors
2	vmhba1		C0:T4:L10	FA 10eB	active	alive	0	0
1	vmhba2		C0:T5:L10	FA 10eA	active	alive	0	0
2	vmhba1		C0:T2:L10	FA 7eB	active	alive	0	0
1	vmhba2		C0:T3:L10	FA 7eA	active	alive	0	0

View: [Datastores](#) [Devices](#)

Devices

[Refresh](#)

Runtime Name	LUN	Type	Transport	Capacity	Owner
vmhba1:C0:T2:L94	94	disk	Fibre Channel	64.00 GB	PowerPath
vmhba1:C0:T1:L82	82	disk	Fibre Channel	64.00 GB	PowerPath
vmhba1:C0:T2:L92	92	disk	Fibre Channel	64.00 GB	PowerPath
vmhba1:C0:T1:L0	0	disk	Fibre Channel	384.01 G	PowerPath
vmhba1:C0:T1:L4	4	disk	Fibre Channel	384.01 G	PowerPath
vmhba0:C1:T0:L0	0	disk	Block Adapter	67.05 GB	NMP

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Performance Considerations



- Physical Disk Size and Protection
- Depends on the IO characteristics of the workload
- LUN Layout
 - Avoid using same set of disks for different applications I/O characteristics

Configuration for I/O intensive application data

- Follow best practices recommendations for a physical server

Storage Layout Considerations

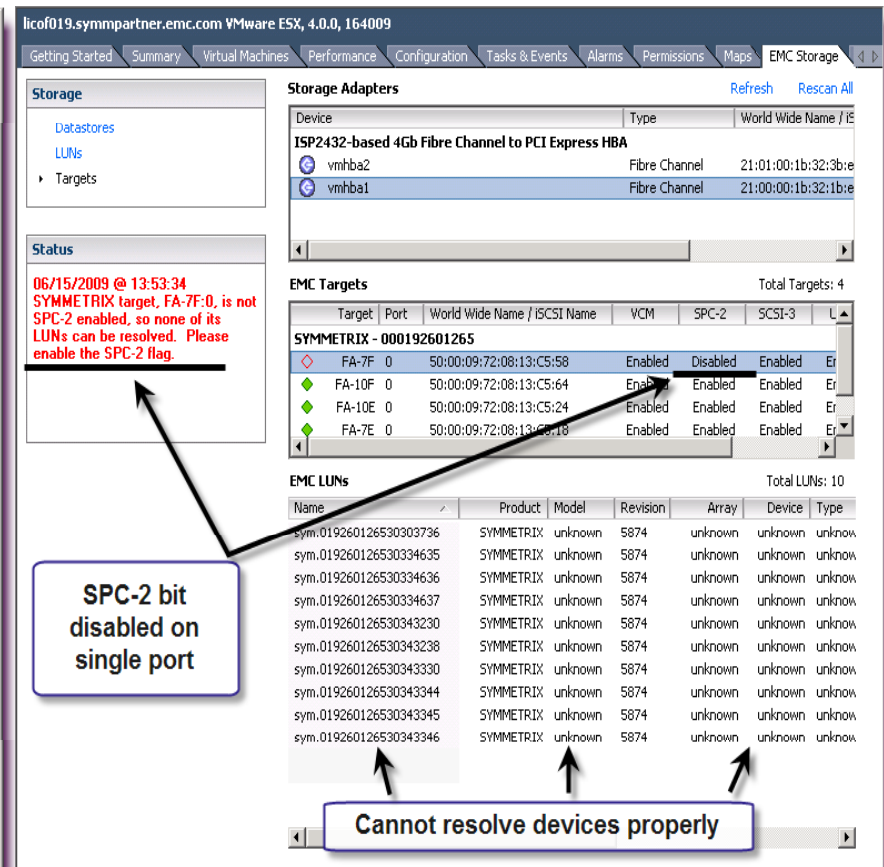
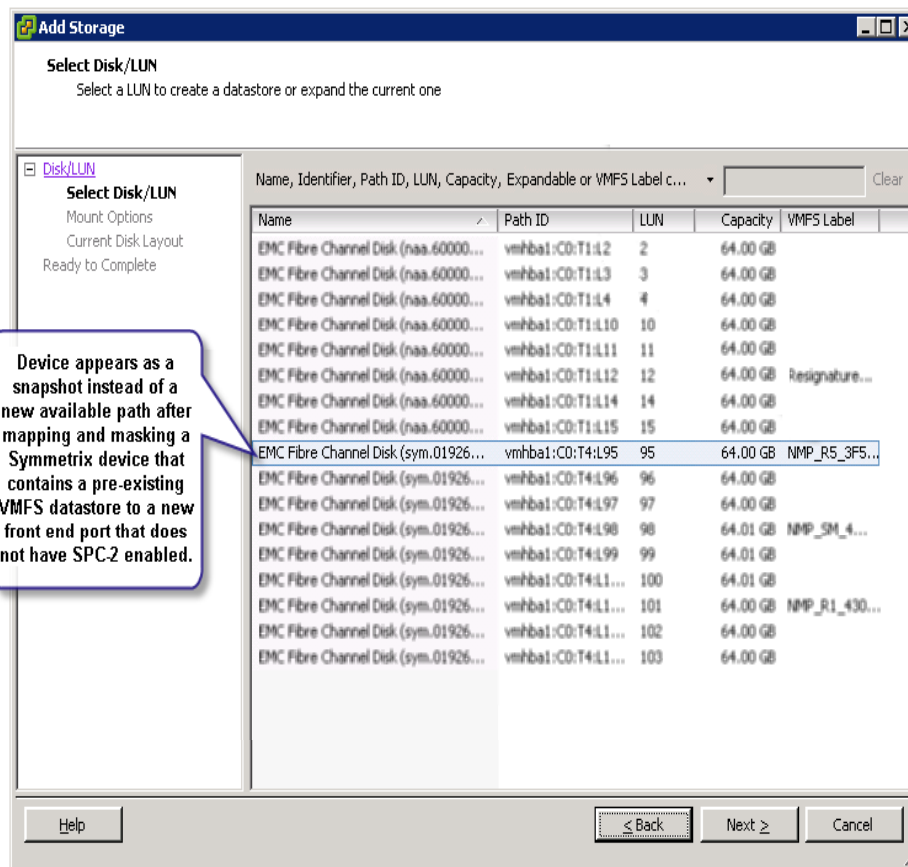


- Do not present SAN storage to ESX server farm as one large SCSI disk
- Metavolumes can be grown non-disruptively with no data loss
- Use of dynamic growth VMFS with dynamic LUN growth mitigates risk

Storage - SPC-2



Turned on per Fibre Channel port or per initiator
Do not activate in a live system if not previously set
Default in 5773 (DMX-4), all V-Maxes have SPC-2 enabled

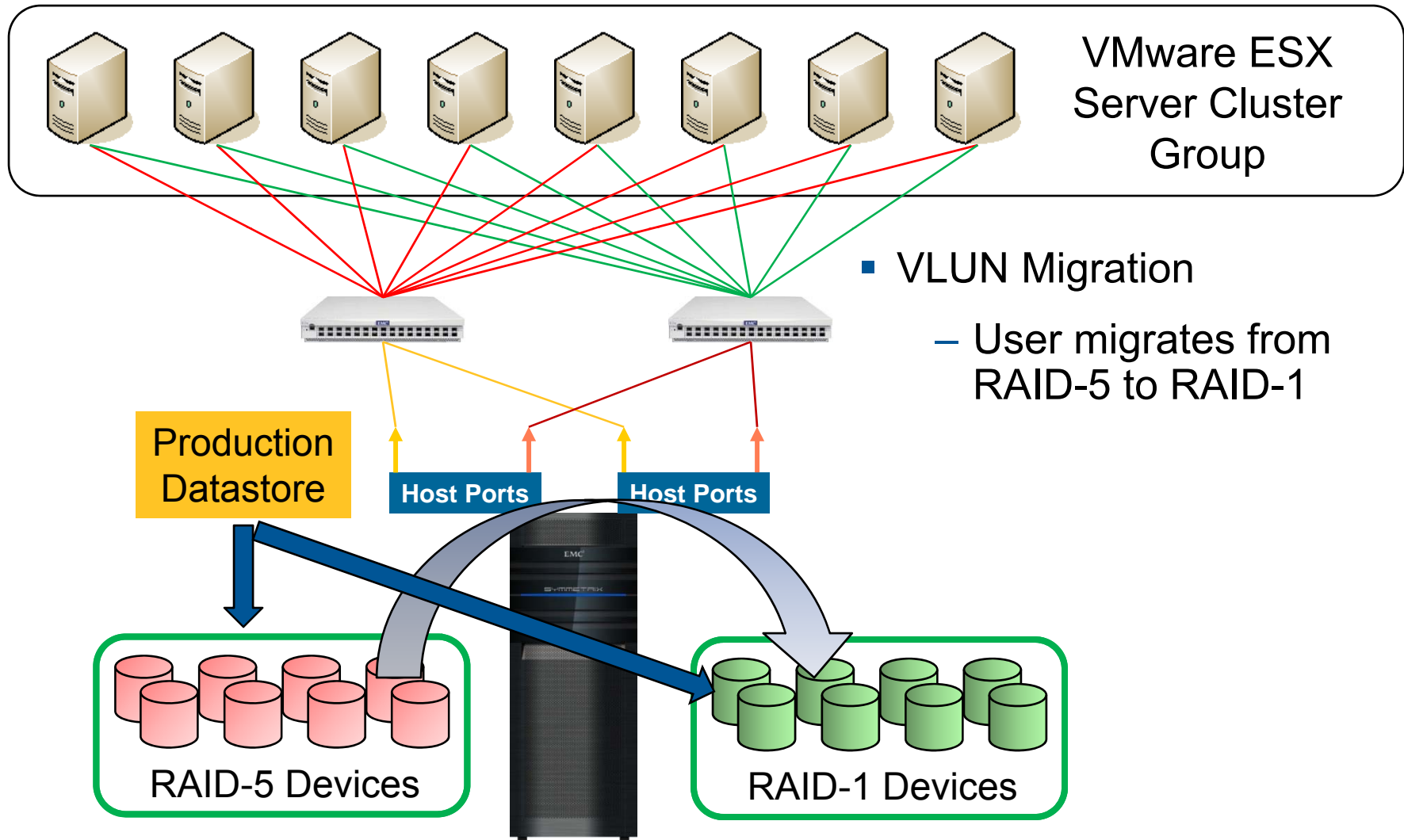


Enhanced Virtual LUN Technology



- Raid Virtual Architecture (RVA)
 - Virtualizes the RAID protection
- Value of business data changes with time
- VMs running applications accessing the data also have life cycle
- VMware clusters allow setting and changing resources for VMs
- Enhanced Virtual LUN Technology transparently migrates data in-array
- Storage vMotion can provide non-disruptive migration
 - Uses host cycles
 - Migration large amount of data can be tedious

Enhanced Virtual LUN Technology – Changing RAID Protection Type



Auto-provisioning Groups



- Symaccess Command
- Simplifies provisioning of storage
 - Very beneficial for large VMware vSphere environment
- Can still accommodate complex configurations
 - Cascaded initiator groups
- Highly scalable

VMFS Datastore Expansion - Dynamic



Can expand the size of a VMFS – Metavolumes

Online

- Concatenated
- Striped – requires use of BCV

```
Meta Configuration      : Concatenated
Meta Device Members (4) :
```

BCV DATA						RDF DATA					
Sym	Cap	Std	Inv	BCV	Inv	Pair	R1	Inv	R2	Inv	Pair
Dev	(MB)	Tracks	Tracks	Tracks	State		Tracks	Tracks	Tracks	State	
--> 044D	65537	-	-	-	N/A		-	-	-	N/A	
044E	65537	-	-	-	N/A		-	-	-	N/A	
044F	65537	-	-	-	N/A		-	-	-	N/A	
0450	65537	-	-	-	N/A		-	-	-	N/A	
262148		-	-	-	-		-	-	-	-	

Metavolume Total Size

```
Meta Configuration      : Concatenated
Meta Device Members (6) :
```

BCV DATA						RDF DATA					
Sym	Cap	Std	Inv	BCV	Inv	Pair	R1	Inv	R2	Inv	Pair
Dev	(MB)	Tracks	Tracks	Tracks	State		Tracks	Tracks	Tracks	State	
--> 044D	65537	-	-	-	N/A		-	-	-	N/A	
044E	65537	-	-	-	N/A		-	-	-	N/A	
044F	65537	-	-	-	N/A		-	-	-	N/A	
0450	65537	-	-	-	N/A		-	-	-	N/A	
0451	65537	-	-	-	N/A		-	-	-	N/A	
0452	65537	-	-	-	N/A		-	-	-	N/A	
393221						-					

Expanded Metavolume

Two added members

Expanded Metavolume
Total Size

Dynamic Expansion of VMFS in vSphere



Locate Datastore

Increase to total available capacity

licof016.symmpartner.emc.com VMware ESX, 4.0.0, 153725

Getting Started Summary Virtual Machines Performance Configuration Tasks & Events Alarms Permissions Maps Storage Views

Hardware

- Processors
- Memory
- Storage
- Networking
- Storage Adapters
- Network Adapters
- Advanced Settings

Software

- Licensed Features
- Time Configuration
- DNS and Routing
- IPMI/iLO Settings
- Virtual Machine Startup/Shutdown
- Virtual Machine Swapfile Location
- Security Profile
- System Resource Allocation
- Advanced Settings

View: Datastores Devices

Datastores

Identification	Capacity	Free	Type
DS_R1_438	63.75 GB	48.51 GB	vmfs3
PP_R5_3F1	63.75 GB	48.20 GB	vmfs3
PP_SM_400	63.75 GB	48.20 GB	vmfs3
PP_R1_439	63.75 GB	47.20 GB	vmfs3
Partner_Templates	235.75 GB	142.53 GB	vmfs3
vSphere_Expand...	255.75 GB	4.84 GB	vmfs3

Notice there is an alert on the datastore, this is due to it being almost full.

Datastore Details

vSphere_Expand_DS

Location: /vmfs/volumes/4a1cf985-f9...

255.75 GB Capacity
250.91 GB Used
4.84 GB Free

Path Selection

Properties

Volume Label: vSphere_Ex...
Datastore Name: vSphere_Ex...

Extents

EMC Fibre Channel Disk (naa.60000970000... 256.00 GB

Paths

Total: 4
Broken: 0
Disabled: 0

Formatting

File System: VMFS 3.33
Block Size: 1 MB

Select Properties

vSphere_Expand_DS Properties

Volume Properties

General

Datastore Name: vSphere_Expand_DS

Total Capacity: 255.75 GB

Rename

Increase...

Format

File System

Maximum

Block Size

Extents

A VMFS file system can span multiple physical disks or extents, to create a single logical volume.

Extent De

The extent disk describ

Select Increase

Extent	Capacity	Device
EMC Fibre Channel Disk (naa.60000970000...	256.00 GB	EMC Fib

Capacity

☒ Maximize capacity

128.00 GB

Agenda

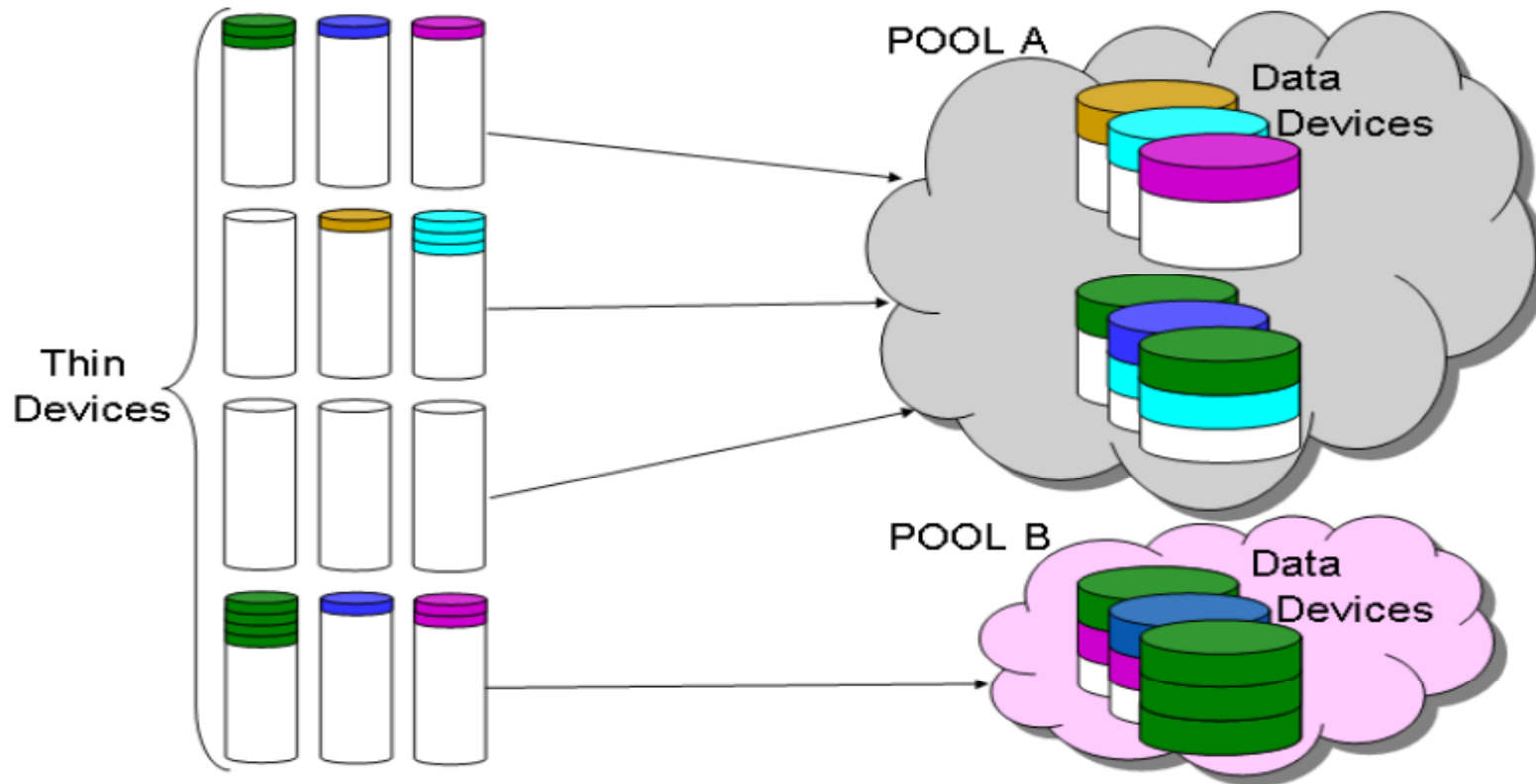


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Virtual Provisioning in Symmetrix



- Data Devices and TDEVs



Virtual Provisioning in vSphere



- Datastore only allocates metadata

The image displays two screenshots from the VMware environment. The top screenshot is from the VMware ESX interface, showing the 'Datastores' tab. A table lists several datastores, including 'ch_VP_VMax_DS', which is highlighted. A callout box points to this entry with the text 'Empty Datastore residing on thin device'. Below the table, the 'Storage Details' section shows the device path 'vmhba1:C0:T1:L5', product 'SYMMETRIX', and model 'VMAX-1'. The bottom screenshot is from the vSphere Client, showing the 'ch_VP_VMax_DS' datastore details. The 'Capacity' section shows a total capacity of 63.75 GB, with 561.00 MB of space used for metadata. A callout box points to this value with the text 'Metadata uses 561MB of storage'.

Identification	Status	Device	Capacity
CH_RAID5_DS	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
ch_VP_VMax_DS	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
DS_R1_438	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
DS_R1_43C	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
DS_RS_3F0	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
DS_RS_3F4	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
DS_RS_3F8	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
DS_SM_418	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 GB
ESX_VC_Datastore	Normal	EMC Fibre Channel Disk (naa.6000097...	235.75 GB
Partn...	Normal	EMC Fibre Channel Disk (naa.6000097...	235.75 GB
Partn...	Normal	EMC Fibre Channel Disk (naa.6000097...	235.75 GB

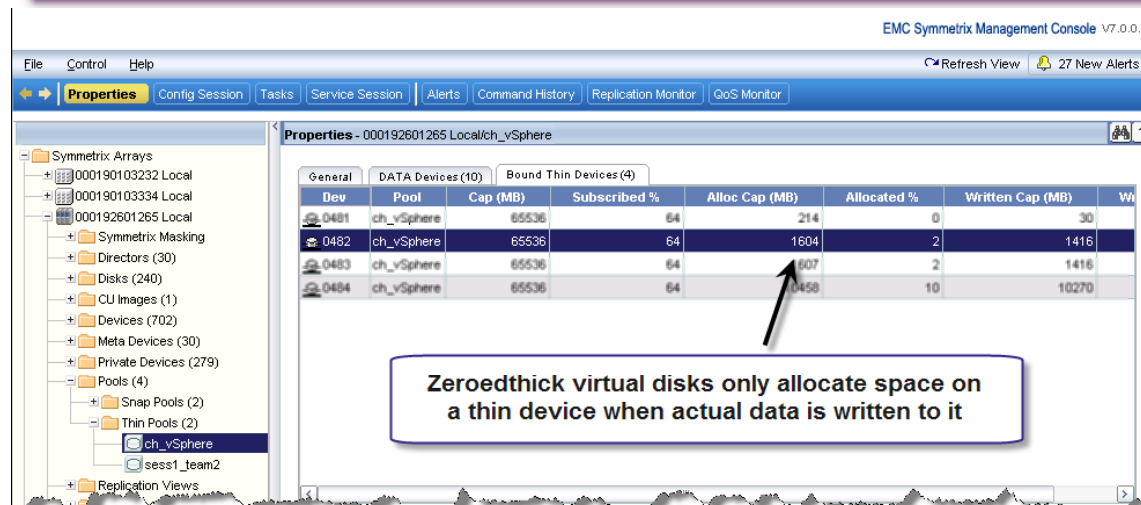
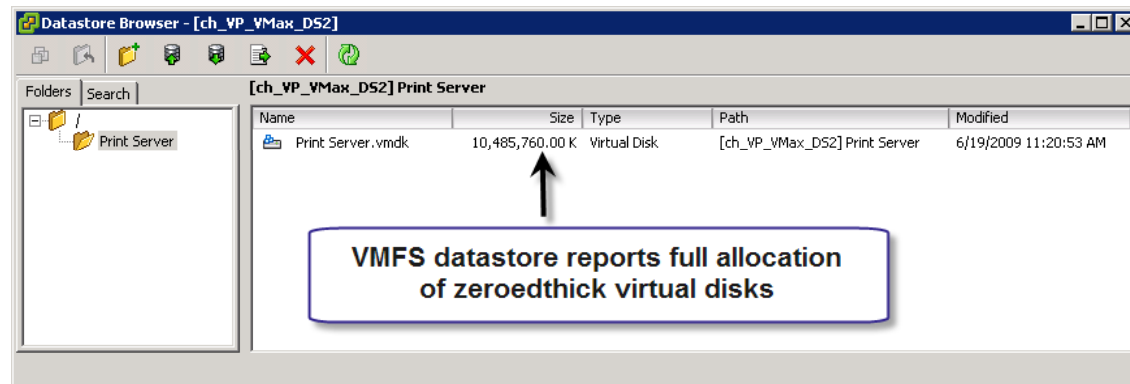
Realtime Name	Product	Model	Revision	Array	Device	Type
vmhba1:C0:T1:L5	SYMMETRIX	VMAX-1	5874	0001926012	00481	TDEV

Location	Capacity	Provisioned Space	Free Space
sanfs://vmfs_uuid:4a3a9925-bc87e76e...	63.75 GB	561.00 MB	63.20 GB

Virtual Provisioning – VMs



- vSphere reports created size but disk space is allocated as needed in thin pool



EMC Storage Viewer



- Solutions Enabler enhancements provide storage admin with CLI tools
- GUI functionality provided through EMC Storage Viewer
- .NET based VC Client side plug in
- Extends storage related information displayed in Virtual Center Client (vCenter)
 - Makes management of storage easier for server administrator
 - Facilitates communication between storage and VMware administrator
- Uses Solutions Enabler and VC

EMC Storage Viewer – ESX Server Information



Select "EMC Storage" tab

Select ESX Server

Select datastore

Details about EMC storage device

Identification	Status	Device	Capacity
PP_LOAD_475	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 G
CH_vSphere_Thin0	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 G
CH_vSphere_Thin3	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 G
vSphere_Expand...	Normal	EMC Fibre Channel Disk (naa.6000097...	383.75 G
Partner_Templates	Normal	EMC Fibre Channel Disk (naa.6006048...	235.75 G
DS_R5_3F0	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 G
DS_SM_3F8	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 G
PP_R5_3F1	Normal	EMC Fibre Channel Disk (naa.6000097...	63.75 G

Realtime Name	Product	Model	Revision	Array	Device	Type
vmhba1:CO:T1:L5	SYMMETRIX	VMAX-1	5874	000192601265	00481	TDEV

Select ESX Server

Select datastore

Details about EMC storage device

Realtime Name	Product	Model	Revision	Array	Device	Type
vmhba1:CO:T0:L1...	SYMMETRIX	DMX4-24	5773	000190103232	00293	RDF1+R
vmhba1:CO:T1:L17	SYMMETRIX	VMAX-1	5874	000192601265	001C0	
vmhba1:CO:T1:L18	SYMMETRIX	VMAX-1	5874	000192601265	001C1	
vmhba1:CO:T1:L19	SYMMETRIX	VMAX-1	5874	000192601265	001C2	
vmhba1:CO:T1:L20	SYMMETRIX	VMAX-1	5874	000192601265	001C3	
vmhba1:CO:T1:L0	SYMMETRIX	VMAX-1	5874	000192601265	0044D	RAID-5
vmhba1:CO:T1:L4	SYMMETRIX	VMAX-1	5874	000192601265	00453	RAID-5
vmhba1:CO:T2:L32	SYMMETRIX	VMAX-1	5874	000192601265	00076	ACLX
vmhba2:CO:T1:L1	SYMMETRIX	DMX4-24	5773	000190103334	001B4	RAID-5
vmhba1:CO:T1:L1	SYMMETRIX	VMAX-1	5874	000192601265	0045E	RAID-5
vmhba1:CO:T1:L3	SYMMETRIX	VMAX-1	5874	000192601265	00460	RAID-5
vmhba1:CO:T1:L2	SYMMETRIX	VMAX-1	5874	000192601265	0045F	RAID-5
vmhba1:CO:T1:L80	SYMMETRIX	VMAX-1	5874	000192601265	003F0	RAID-5
vmhba1:CO:T2:L86	SYMMETRIX	VMAX-1	5874	000192601265	003F1	RAID-5
vmhba1:CO:T2:L87	SYMMETRIX	VMAX-1	5874	000192601265	003F2	RAID-5

EMC Storage Viewer – VM Information



The screenshot shows the vSphere Client interface with the following components and annotations:

- Annotation 1:** A callout box labeled "Select Virtual Machine" points to the "Database Server" VM in the left-hand inventory tree.
- Annotation 2:** A callout box labeled "Select 'EMC Storage'" points to the "EMC Storage" tab in the top navigation bar.
- Annotation 3:** A callout box labeled "Select Virtual Disk" points to the "Hard disk 1" entry in the "Virtual Disks" table.
- Annotation 4:** A callout box labeled "EMC Storage Details about datastore hosting virtual disk" points to the "Storage Details" table.

Virtual Disks Table:

Name	Size	Datastore	Filename
Hard disk 1	8.43 GB	VLUN_Migration_DS	[VLUN_Migration_DS] Database...

Storage Details Table:

Realtime Name	Product	Model	Revision	Array	Device	Type
vmhba1:C0:T1:L16	SYMMETRIX	VMAX-1	5874	000192601265	0048C	2-Wa

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ESX Server with Array Based Replication

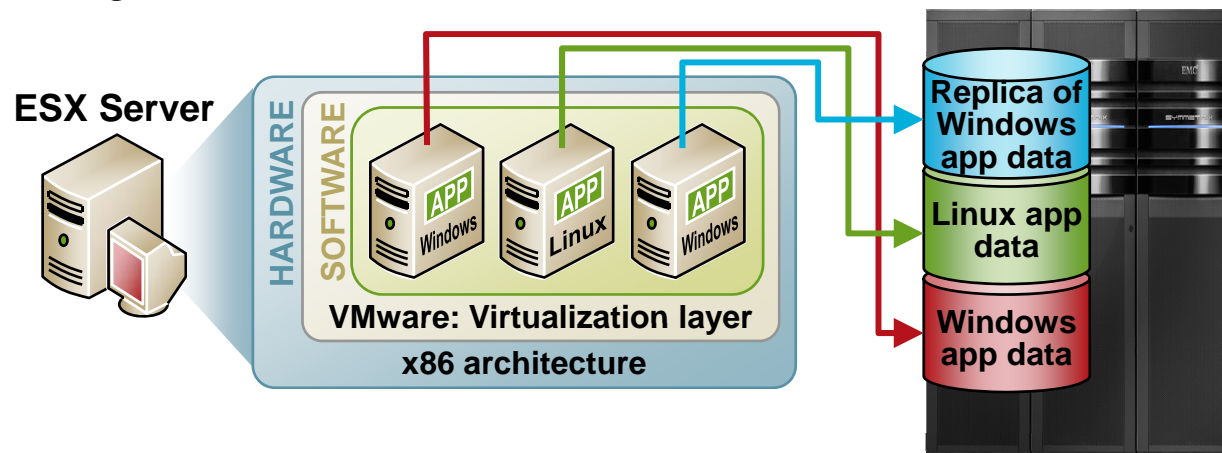


Replication products are supported with RDMs and VMFS volumes: TimeFinder Clone/Mirror/Snap, SRDF/S/A/AR

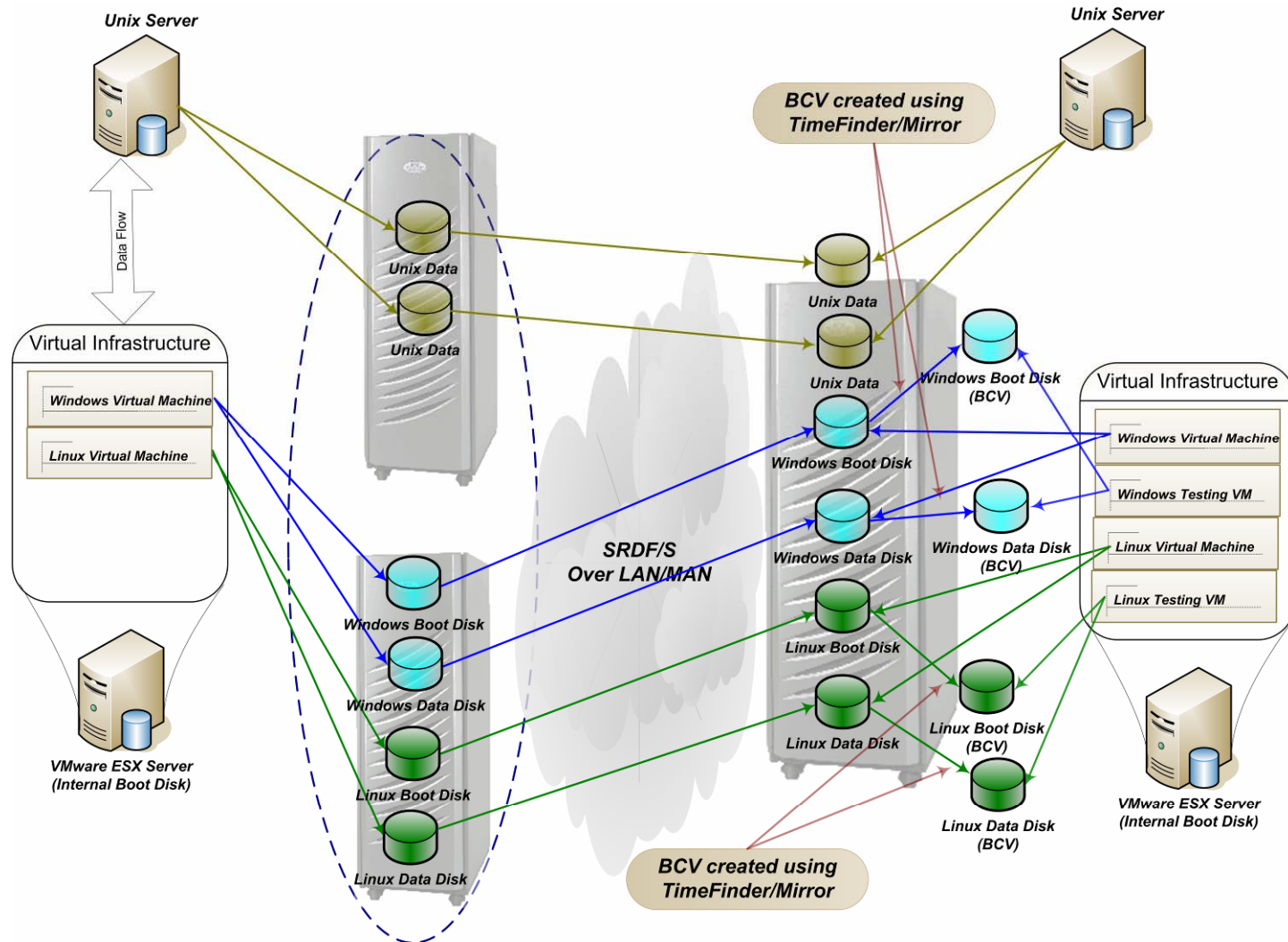
- Advanced replication modes of SRDF fully supported with VMware vSphere environments

Guest operating system images, as well as the application data, can be replicated

- Replication of VM OS images – crash consistent copies for running VMs
- Testing of DR plans that include VMware vSphere data can be performed using TimeFinder



Disaster Restart Protection for Virtual Infrastructure



Considerations for Array-based replication



General Recommendations

- Replica assigned to the same ESX server
- Replica assigned to a different ESX server

Local Incremental Replication - refresh

Remote Incremental Replication- DR

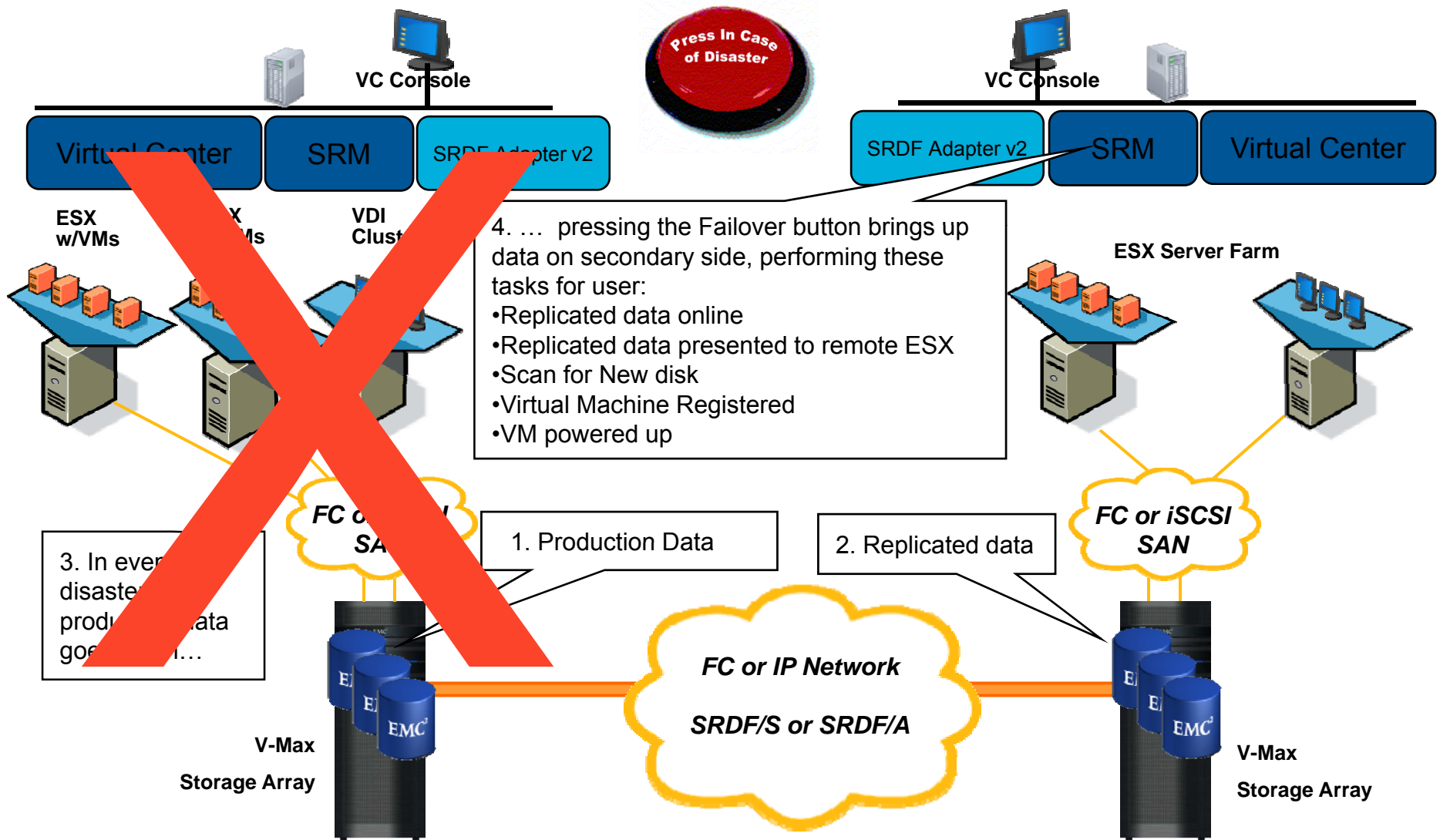
VMFS or RDM – transparent to array-based replication technologies

New Features in SRDF SRA for VMware SRM



- Provides more robust installer
- New SRA simplifies configuration of the adapter
- Performance optimization
- Support for TimeFinder/Snap for testing recovery plans
 - Only supported with SRDF/S. Engineuity operating environment for Symmetrix limitation.
- Support for gold copies during failover
- Capability to disable automatic swap during failover

Symmetrix V-Max and VMware Site Recovery Manager



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Thank You!



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Symmetrix V-Max:

<http://www.emc.com/products/detail/hardware/symmetrix-v-max.htm>

Information Infrastructure for VMware:

<http://www.emc.com/solutions/business-need/virtualizing-information-infrastructure/integrated-infrastructure-vmware.htm>

VMware Family: <http://www.emc.com/products/family/vmware-family.htm>

Questions