VMware ESX Server and Storage Architecture Best Practices for Performance, Backup, and Disaster Recovery

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VMworld 2006
Agenda

- Overview of the Complete Solution
  - Description
  - What is our Approach
  - How do we break it down
- Storage Requirements
  - Design Best Practices
- Backup
- Disaster Recovery
- Network Requirements
- Missing Pieces
Nirvana / Utopia

- Optimally Performing Virtual Machines
  - Storage and Networking are designed by Best Practices
  - Standardization helps to maintain levels of Performance
- Complete Backup of VMDK Files
- File level backup of Windows VMDKs
- Full Site Replication of Virtual Machines
- DR for Physical Servers as VMs

**BUT storage is the central focal point!!!!**
Case Study Overview

- During the presentation we will reference the following generalized case study
- The case study is conglomeration of environments I have architected
- The hardware and software that are utilized can be substituted for other vendors
- Customer Requirements
  - RPO of servers is between 10 mins and 24 hours (depending on application)
  - RTO of servers is between 4 hours and 2 weeks (depending on application and tier)
  - Consolidate backups with SAN based backup
    - Low I/O Servers via File Level and All VMDK Files
  - Meet performance requirements of Exchange, SQL and Kronos
<table>
<thead>
<tr>
<th>Service</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial SQL Server</td>
<td>ICI-FINSQL</td>
</tr>
<tr>
<td>Domain / DHCP / DNS</td>
<td>ICI-DC01</td>
</tr>
<tr>
<td>Exchange 2003</td>
<td>ICI-EXCH01</td>
</tr>
<tr>
<td>SAS Servers</td>
<td>ICI-SAS01 thru ICI-SAS04</td>
</tr>
<tr>
<td>Blackberry</td>
<td>ICI-BB</td>
</tr>
<tr>
<td>Citrix</td>
<td>ICI-CITRIX01</td>
</tr>
<tr>
<td>Kronos Server</td>
<td>ICI-KRONOS</td>
</tr>
<tr>
<td>Web Servers</td>
<td>ICI-WEB01 thru ICI-WEB03</td>
</tr>
<tr>
<td>All Development Machines</td>
<td>ICIDEV-Test01 thru ICIDEV-Test06</td>
</tr>
<tr>
<td>Image Server</td>
<td>ICI-PSPIN</td>
</tr>
</tbody>
</table>
The Approach

- Architect for the present and the future
- Create the complete solution and break into phases
  - Phases are based on requirements, prerequisites and budget
- Tier the environment
  - Servers / VMs / Applications
  - Storage
- Architectural Considerations
  - Performance
  - Backup
  - Disaster Recovery
Architectural Considerations

- Performance
  - Most Virtual Machines will have different performance characteristics
  - Create heterogeneous environment
  - The disk layout should reflect the performance needs
    - What Raid Type
    - What Spindles
    - VMFS vs. RDM / SAN Pass-through
  - How much CPU and memory will be needed per VM
  - How much overhead should be reserved for HA
  - These considerations should also be applied to the DR Site
  - Sizing enough servers, storage/spindles, bandwidth on networks
Architectural Considerations (cont’d)

- Backup and Recovery
  - Host Based, VMDK / VCB, Imaging
  - How will each virtual machine be backed up?
  - Does the backup need to be done at the file level or only VMDK level?

- Disaster Recovery
  - Tiering of Servers, P2V for Physical Servers, Replication Solutions
  - How important is each virtual machine?
  - How will it be replicated?
  - When does it need to be recovered?
  - To what point does it need to be recovered?
Now What?

- Understand the infrastructure
  - Storage
    - SAN
    - NAS
    - Switches
  - Backup
    - Standard Host Backup Agents
    - VCB
  - Disaster Recovery
    - Storage Layout
    - Replication Methods
  - Networking
    - Bandwidth
  - Missing Links
    - PlateSpin PowerConvert
    - High IO Servers
    - How to Recover
Underlying Infrastructure:

Storage
Case Study: The Storage Area Network

- EMC Storage Arrays
  - CLARiiON CX3-40
  - Celerra NS40
- Cisco MDS SAN Switches
  - MDS 9216i
EMC CLARiiON CX3-40

- Why EMC CX3-40?
- Multiple Disk Types
  - 73, 146, 300, 500
  - 7,200, 10,000 and 15,000 RPM
  - 2 GB and 4 GB Speeds
- San and iSCSI Connectivity in Single Array
- N+1 Redundancy
- Multiple Raid Types
- Very High Performance
- Supports All Major Operating Systems for Heterogeneous Environment
- Multiple Replication Methods
  - Snapview
  - Mirrorview /A and /S
  - SanCopy
EMC Celerra NS40

- Why NS40
- NFS, CIFS and iSCSI
- Utilizes CLARiiON or Symmetrix for Storage
- Native Replication
- Integrates into Active Directory or NIS
- Simple File Storage
- Consolidate File Servers
- Easy Backup via NDMP
- Simple Web Based GUI
CISCO MDS 92xx and 95xx Series

- Why Cisco?
  - Blade Chassis Architecture
  - Combines iSCSI, Fibre, and FCiP connectivity
  - From 14 Fibre to 526 Fibre Ports
  - From 2 to > 24 iSCSI / FCiP Ports
- This is the SAN Replication Enabler
- Allows multiple SANs to connect via Ethernet Based Connectivity while combining Fibre connectivity in one solution
Storage Design Best Practices

- These Best Practices are derived from many years of storage implementations and VMware Consulting
- Take Advantage of Different Raid Types
- Keep in Mind –
  - Replication Methods
  - Tiers of Servers
  - Backup Methods
  - Performance Impact
CLARiiON Raid Group Layout

- The CX3 can do
  - Raid 5, Raid 3, Raid 1, Raid 1/0, 2 Disk Raid 1/0, Raid 0, Single Disk and Hot Spare
- Do NOT use Raid 0 !!!!!!!!!!
- Use Raid 3 on ATA Drives
- Raid 5 can be anything from a 2+1 to 15+1
  - Sweet spot is anywhere from 4+1 to 8+1
  - BUT 4+1 or 8+1 creates a nice layout and helps to maximize the storage used while maintaining good parity to disk ratio
Storage Design Best Practices (continued)

- Create Multiple Types of VMFS Volumes
  - VMFS_OS_01
    - For all Operating System Drives and Swap Files
    - i.e. C:\ or / (root)
  - VMFS_PAGE_01
    - For all Page Files or Swap Files
  - VMFS_DATA_01
    - All Data drives < 50 GB or 150 GB
    - Not High Performance Drives or Cluster Drives
  - VMFS_OTHER_01
    - Templates, Images, General Storage

- Increment the number when adding a new drive
  - i.e. VMFS_OS_01 already exists, so add VMFS00S02
VMFS_OS_01 Both Versions

- 20 GB OS Drive
  - 10 VMs per VMFS so
    - 20 GB x 10VMs = 200 GBs
  - Assume 2 GB Virtual Memory per VM so adding Swap space
    - 200 GB + (10 VM * 2 GB) = 220 GB
  - Last but not least Snap Space approx 20 % of total space
    - .20 x 220 GB = 44 GB + 220 GB = 264 GB
    - 264 is uneven, lets make it either 250 or 275

- 15 GB OS Drive
  - 10 VMs per VMFS so
    - 15 GB x 10VMs = 150 GBs
  - Assume 2 GB Virtual Memory per VM so adding Swap space
    - 150 GB + (10 VM * 2 GB) = 170 GB
  - Last but not least Snap Space approx 20 % of total space
    - .20 x 170 GB = 34 GB + 170 GB = 204 GB
    - 204 is uneven, lets make it 200
The page LUN is paired with the VMFS_OS LUN

Make the Page File P:\ and move it there

So if there are 10 VMs on the VMFS_OS_01 then
  > 10 VM x 2 GB of Virtual Memory = 20 GB
  > 20 GB + 10 GB for Page File = 30 GB

The Page File is the item on the C:\ that fills up the snap space and does not need to be replicated
Between 300 GB and 400 GB
Also for meta files of Raw Disk Mappings aka Mapped SAN LUNs
For VMDKs larger than ~150 GB, sometimes 50 GB if Very High I/O

MetaLUNs
- Should be used ONLY with Extents or RDMs
- Concatenate not Stripe if expanding with extents
- Striping can be used with RDMs
- Different Raid Groups

LUN Migrate Utility
For Templates, ISOs and any other type of files
Can be NAS, iSCSI, or ATA
Fibre channel might be a waste if the storage environment is tiered
Ok so now what?

- How does the Tiering work with our Storage Best Practices?

- Create each VMFS on a different type of disk for different characteristics

- San Pass Thru LUN / RDM
Ok so now what?

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- San Pass Thru LUN / RDM

  Exchange DB 1 50 GB
  Exchange Log 1 10 GB
  SQL DB 1 100 GB
  Exchange DB 2 50 GB
  Exchange Log 2 10 GB
  SQL Log 2 50 GB
  Kronos Data 1 200 GB
Ok so now what?

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  - Exchange DB 1 50 GB
  - Exchange Log 1 10 GB
  - SQL DB 1 100 GB
  - Exchange DB 2 50 GB
  - Exchange Log 2 10 GB
  - SQL Log 2 50 GB
  - Kronos Data 1 200 GB

534 GB Free
534 GB Free
267 GB Free
690 GB Free
750 GB Free
268 GB Free
238 GB Free

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**Ok so now what?**

- How does the Tiering work with our Storage Best Practices?

  > Create each VMFS on a different type of disk for different characteristics

<table>
<thead>
<tr>
<th>VMFSOS01</th>
<th>VMFSPAGE01</th>
<th>VMFSDATA01</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 GB</td>
<td>30 GB</td>
<td>300 GB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VMFSOS02</th>
<th>VMFSPAGE02</th>
<th>VMFSO/SHEL01</th>
</tr>
</thead>
<tbody>
<tr>
<td>250 GB</td>
<td>30 GB</td>
<td>200 GB</td>
</tr>
</tbody>
</table>

- San Pass Thru LUN / RDM

<table>
<thead>
<tr>
<th>Exchange DB 1</th>
<th>Exchange Log 1</th>
<th>SQL DB 1</th>
<th>SQL Log 2</th>
<th>Kronos Data 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 GB</td>
<td>10 GB</td>
<td>100 GB</td>
<td>50 GB</td>
<td>200 GB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exchange DB 2</th>
<th>Exchange Log 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 GB</td>
<td>10 GB</td>
</tr>
</tbody>
</table>

- Storage mirror:

<table>
<thead>
<tr>
<th>LUN</th>
<th>Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUN6</td>
<td>690 GB</td>
</tr>
<tr>
<td>LUN1</td>
<td>750 GB</td>
</tr>
<tr>
<td>LUN2</td>
<td>238 GB</td>
</tr>
<tr>
<td>LUN3</td>
<td>238 GB</td>
</tr>
</tbody>
</table>

- Disk details:

| 534 GB Free |
| 267 GB Free |

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Ok so now what?

- How does the Tiering work with our Storage Best Practices?

  > Create each VMFS on a different type of disk for different characteristics

  ![Disk Configuration Diagram]

  - VMFSOS01 250 GB
  - VMFSOS02 250 GB
  - VMFSPAGE01 30 GB
  - VMFSPAGE02 30 GB
  - VMFSDATA01 300 GB
  - VMFSO/THA01 200 GB

  > San Pass Thru LUN / RDM

  ![LUN and RDM Configuration Diagram]

  - Exchange DB 1 50 GB
  - Exchange Log 1 10 GB
  - Exchange DB 2 50 GB
  - Exchange Log 2 10 GB
  - SQL DB 1 100 GB
  - SQL Log 2 50 GB
  - Kronos Data 1 200 GB

  - LUN 6 390 GB Free
  - LUN 1 750 GB Free
  - LUN 2 238 GB Free
  - LUN 3 238 GB Free
  - LUN 4 267 GB Free
  - LUN 5 534 GB Free
  - LUN 6 534 GB Free
Ok so now what?

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  > Create each VMFS on a different type of disk for different characteristics

  ![VMFS Configuration](image)

  - VMFSOS01 250 GB
  - VMFSOS02 250 GB
  - VMFSPAGE01 30 GB
  - VMFSPAGE02 30 GB
  - VMFSDATA01 300 GB
  - VMFSTHREED01 200 GB

  ![SAN LUN Configuration](image)

  - Exchange DB 1 50 GB
  - Exchange Log 1 10 GB
  - Exchange DB 2 50 GB
  - Exchange Log 2 10 GB
  - SQL DB 1 100 GB
  - SQL Log 2 50 GB
  - Kronos Data 1 200 GB

  - LUN 1: 534 GB Free
  - LUN 2: 534 GB Free
  - LUN 3: 267 GB Free
  - LUN 4: 390 GB Free
  - LUN 5: 550 GB Free
  - LUN 6: 238 GB Free
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  - Create each VMFS on a different type of disk for different characteristics

- San Pass Thru LUN / RDM

- VMFSOS01 250 GB
- VMFSPAGE01 30 GB
- VMFSOS02 250 GB
- VMFSPAGE02 30 GB
- VMFSDATA01 300 GB
- VMFS(SQL/EMAIL)01 200 GB

- Exchange DB 1 50 GB
- Exchange Log 1 10 GB
- Exchange DB 2 50 GB
- Exchange Log 2 10 GB
- SQL DB 1 100 GB
- SQL Log 2 50 GB
- Kronos Data 1 200 GB

- 434 GB Free
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- How does the Tiering work with our Storage Best Practices?

  > Create each VMFS on a different type of disk for different characteristics

  VMFSOS01  250 GB
  VMFSOS02  250 GB
  VMFSPAGE01 30 GB
  VMFSPAGE02 30 GB
  VMFSDATA01 300 GB
  VMFSERVER01 200 GB

  > San Pass Thru LUN / RDM

  Exchange DB 1  50 GB
  Exchange DB 2  50 GB
  Exchange Log 1 10 GB
  Exchange Log 2 10 GB
  SQL DB 1  100 GB
  SQL Log 2  100 GB
  Kronos Data 1  200 GB

  234 GB Free
  434 GB Free
  257 GB Free
  390 GB Free
  550 GB Free
  238 GB Free
  238 GB Free
Ok so now what?

- How does the Tiering work with our Storage Best Practices?

  > Create each VMFS on a different type of disk for different characteristics

  ![Diagram showing storage allocation]

  - VMFSOS01 250 GB
  - VMFSPAGE01 30 GB
  - VMFSDATA01 300 GB
  - VMFSOS02 250 GB
  - VMFSPAGE02 30 GB
  - VMFSOTHER01 200 GB

  - San Pass Thru LUN / RDM

  - Exchange DB 1 50 GB
  - Exchange Log 1 10 GB
  - SQL DB 1 100 GB
  - Exchange DB 2 50 GB
  - Exchange Log 2 10 GB
  - SQL Log 2 50 GB
  - Kronos Data 1 200 GB

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  **VMFSOS01** 250 GB  
  **VMFSOS02** 250 GB  
  **VMFSPAGE01** 30 GB  
  **VMFSPAGE02** 30 GB  
  **VMFSDATA01** 300 GB  
  **VMFSOTH01** 200 GB

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  **Exchange DB 1** 50 GB  
  **Exchange DB 2** 50 GB  
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  **Exchange Log 2** 10 GB  
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  **SQL Log 2** 50 GB  
  **Kronos Data 1** 200 GB

---

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Ok so now what?

- How does the Tiering work with our Storage Best Practices?

  > Create each VMFS on a different type of disk for different characteristics

  - VMFSOS01 250 GB
  - VMFSPAGE01 30 GB
  - VMFSDATA01 300 GB
  - VMFSOS02 250 GB
  - VMFSPAGE02 30 GB
  - VMFS0THE01 200 GB

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  - Exchange DB 1 50 GB
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Decisions, Decisions, Decisions

- How do we decide what VMDK goes where?
  - Conform to performance requirements
  - DO NOT be scared of multiple VMFS volumes
    - VI3 makes management VERY simple
  - Always Reserve space for ESX snapshot functionality
- Only use MetaLUNs in extreme cases
- Windows Offset via Diskpart !!!
  - 128k or 64k
Underlying Infrastructure:

Backups
Backup Considerations

- What Backup Software is best?
  > Any on the VMware support matrix
- Full vs. Incremental Backups?
  > A mix of full and incremental is ideal
- How often do we do VMDK backups?
  > Depends on the VM
  > Weekly at a minimum
- What's the retention on each VMDK?
  > Based on company policy
- How does VMware Consolidated Backup fit into the backup scheme?
  > VCB will help to perform a SAN backup of the VMDKs
- When do we use VCBs file level backup?
  > If there is a low rate of change of data on the server i.e. Web Servers
Standard Network Backups

- Install Host Based Agent in each VM
- Utilize the network to backup the VM
- Perfect for Databases and high I/O applications
  - Use the application specific agents for packages such as SQL, Oracle, Exchange, etc...
- Backup to Virtual Tape Library (i.e. CLARiiON Disk Library) increases backup and restore performance
- DO NOT attach tape drives via Fibre to VMs NOT SUPPORTED
- Restore Process – SIMPLE
  - Standard restore via Backup Agent
  - Good for data restore not VM restore
VMware Consolidated Backup

- Offloads the backups to the SAN
- Mounts VMDK files on a physical Windows server
  - Utilizes Snapshots to quiesce the server
- Mounts File Structure of VMDK files of Windows Servers on the physical Windows server
  - Allow for Full and Incremental backups
  - To perform Incremental, perform backups by modify date not archive bit
- IMPORTANT: Do Not Present VMFS Volumes Before Installing VCB Agent and Disabling Automount in Windows
- Restore Process – NOT SIMPLE:
  - If small file is to be restored, restore to backup server and perform network copy
  - If whole application restore is needed, install backup agent and restore application
  - If VMDK restore is needed, use vcbRestore to do image based restore
Underlying Infrastructure:

Disaster Recovery
SnapView and SanCopy

- Provides up to eight replicas per source
  - Clones—Full-image copies of source LUN
  - Snapshots—Logical point-in-time views of source LUN
- Useful for
  - Backup and Restore
  - Testing
  - Upgrade Protection
  - Disaster Recovery
- Instant Restore

Bi-Directional Copy Capabilities via “Pull” and “Push” Feature

- CLARiiON arrays capable of hosting SAN Copy:
  - CX3-80, CX3-40, CX3-20, CX700, CX500, CX600, and CX400
- Full or incremental copies of data residing on a SAN Copy-hosted array can be “pushed”
  - To any EMC or supported third-party array
- Full copies of data residing on any supported array can be “pulled” to a SAN Copy-hosted array
CLARiiON MirrorView

MirrorView/Synchronous

- RPO: Zero seconds
- Both images identical
- Limited distance
- High network bandwidth

MirrorView/Asynchronous

- RPO: 30 minutes to hours
- Target updated periodically
- Unlimited distance
- Restartable copy on secondary if session fails
- Optimized for low network bandwidth (consumes 100 Mb/s maximum)
Disaster Recovery Considerations

- VMware ESX and Virtual Center are key components in optimizing a DR Strategy
- Quicker Recovery Time Objective
- Simplify the DR plan
  > You do not know who might need to implement the DR Plan

Planning for DR, consider:
- Service Level Agreements
  - With vendors, customers, internal departments
- Document the Recovery Process for the DR Site
- Document the Process for returning to the Production Site
- Perform regular DR Tests
- Creating DR Tiers based on RTO
Disaster Recovery Tiering

While Tiering the environment, there are usually 4 tiers:

1. aka Oh @#!%, WE ARE DOWN!!!!!
   - 4 Hour Recovery
   - Email, Blackberry, Point of Sale System, Oracle, etc...
   - Obviously Domain, DHCP, DNS

2. aka Just 20 hours to go....
   - 24 Hour Recovery
   - Web Servers, ERP, CRM, SQL

3. aka Hey Charlie, is there a problem?
   - 48 Hour – 1 Week Recovery
   - IT Software( Cisco Works, ECC, OpenView, etc...)

4. aka Do we really need these applications?!?!?!
   - > 2 Weeks Recovery
   - Test Environment, Lab Servers
Sample Tiering

- **Tier 1**
  - Domain / DHCP / DNS
  - Exchange 2003
  - Blackberry
  - Citrix
  - Image Server
  - ICI-DC01
  - ICI-EXCH01
  - ICI-BB
  - ICI-CITRIX01
  - ICI-PSPIN

- **Tier 2**
  - Financial SQL Server
  - Kronos Server
  - SAS Servers
  - ICI-FINSQL
  - ICI-KRONOS
  - ICI-SAS01 thru ICI-SAS04

- **Tier 3**
  - Web Servers
  - ICI-WEB01 thru ICI-WEB03

- **Tier 4**
  - All Development Machines
  - ICIDEV-Test01 thru ICIDEV-Test06
DR’s Affect on Storage Layout

- How does our replication scheme effect this layout?
  - Group the VMDKs by replication Tier and schedule
  - Smaller VMFS partitions allows a more granular replication and recovery
  - In Case of a failure, lesser number of VMs are affected

- Create source and target LUNs from same type spindles
  - Fibre for Fibre and ATA for ATA

- When mirroring with MirrorView type software:
  - Remember the ability to fracture the mirror
  - Consistency groups are great for RDM of the same server

- When replicating with SanCopy type software:
  - SanCopy sessions can be performed from Clones for the production volume
  - Incremental sessions can save a significant amount of time
  - These sessions can be scripted with the navicli from within a VM
The Recovery Process via SAN Replication

- Power Up DR ESX Servers
- Place Mirrored LUNs in Storage Groups
- Rescan San for LUNs
- Now the tricky part
  - Option 1: Open the VMFS_OS_01 and register the VMX for each VM
  - Option 2: Create a script that will traverse the directory and register the VMs for you
- The environment is running 😊
Underlying Infrastructure:

Network
Bandwidth for Backup

- Without VCB
  - Create multi-NIC vSwitches
  - Ensure a Gigabit Network is available
  - Create a separate Port Group for Backups (if possible)
- With VCB
  - Bandwidth is not a factor, SAN does all the work
Bandwidth for Replication

- How much data is replicated?
- How often is the data replicated?
- Is the replication data sharing bandwidth?
  > If so is the replication and production data on the same schedule or differing?
- SO
  Sync Rate = 2 Hours
  Rate of Change = 1 Gigabyte per Hour
  Every 2 Hours we need to transfer 2 GBs of data
  2 Gigabytes = 2048 Megabytes = 16384 Megabits
  \[ T1 = \frac{16384 \text{ Mb}}{1.54 \text{ Mbps}} = \frac{10638 \text{ seconds}}{3600 \text{ sph}} = \approx 2 \text{ h 57 min} \]
  \[ T3 = \frac{16384 \text{ Mb}}{44.736 \text{ Mbps}} = \frac{366.24 \text{ seconds}}{3600 \text{ sph}} = \approx 6 \text{ min} \]
  Dual T1s = 2 h 57 min / 2 = 1 h 27 min ← Sufficient
Almost There...

- So far we have taken care of a general replication of all the C:\ VMDKs and most of the data volumes, BUT
  - What about all of those Physical servers in production?
  - What about those high I/O servers?
- To simplify our recovery in DR we will want to look towards using ESX as much as possible
  - How about P2V the physical servers for DR so we can recover them in ESX
- And those high I/O servers that have issues with quiescing their I/O
  - Use a host based replication restart solution
PlateSpin PowerConvert solves the physical server issue for Disaster Recovery.

Any physical server that is deemed suitable can be captured nightly to an image or virtual machine.

- These images or VMDKs can then be stored on a LUN on the CLARiiON.
- These LUNs will be Sancopied or Mirrored over to DR on a regular basis.

Using this method we can setup a recovery scenario that looks like this.
Physical Servers – PlateSpin PowerConvert

Primary

Secondary

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PowerConvert P2V for Recovery

- Images are great, but ...
  - Image deployment increase RTO

- So why not ...
  - Schedule whole system backups directly into a VM

- PlateSpin PowerConvert 6.5 with Live Incremental P2V
  - Easily test the recovery process
  - Use the same recovery process for physical and virtual
  - V2P is available to restore back to replacement physical hardware
Physical Servers – PlateSpin PowerConvert

Backup
Replicate
Test
Failure
Recover

Primary

Secondary

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The Recovery Process via SAN and PlateSpin

- Power UP DR ESX Servers
- Place Mirrored LUNs in Storage Groups
- Rescan San for LUNs
- Now the tricky part
  - Option 1: Replicate SQL VC Database
  - Option 2: Open the VMFS_OS_01 and register the VMX for each VM
  - Option 3: Create a script that will traverse the directory and register the VMs for you
- The environment is running 😊
High I/O Quiescable Servers

- Now, last and definitely NOT least... the High I/O quiescable servers
- These solutions can be used to make Exchange, SQL or other applications geographically clusterable
- Enhances our DR process by alleviating the concern for the quiesce issue with databases
- Fills the gap with the VMs that are affected by a small amount of data loss during failover

Solutions
- EMC Replistor
- NSI DoubleTake
- NeverFail
The Recovery Process via SAN, Replistor and PlateSpin

- Power UP DR ESX Servers
- Place Mirrored LUNs in Storage Groups
- Rescan San for LUNs
- Now the tricky part
  > Option 1: Replicate SQL VC Database
  > Option 2: Open the VMFS_OS_01 and register the VMX for each VM
  > Option 3: Create a script that will traverse the directory and register the VMs for you
- Replistor failover requires an existing Windows domain infrastructure to be running
- The environment is running 😊
For a more comprehensive discussion on PlateSpin PowerConvert please visit the PlateSpin Booth
Questions

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Please remember to complete your session evaluation form and return it to the room monitors as you exit the session.

The presentation for this session can be downloaded at http://www.vmware.com/vmtn/vmworld/sessions/

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