HA/DR of Physical and Virtual Environments Using VMware ESX Server and Double-Take for Virtual Systems

Bob Roudebush
Double-Take Software, Inc.
<table>
<thead>
<tr>
<th>Virtualization Use Cases</th>
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<tbody>
<tr>
<td><strong>Server Consolidation and Containment</strong> – Eliminate server sprawl by deploying systems into virtual machines that can run safely and move transparently across shared hardware</td>
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<tr>
<td><strong>Test and Development</strong> – Rapidly provision and re-provision test and development servers; store libraries of pre-configured test machines</td>
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<td><strong>Business Continuity</strong> – Reduce the cost and complexity of business continuity by encapsulating entire systems into single files that can be replicated and restored onto any target server</td>
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<tr>
<td><strong>Enterprise Desktop</strong> – Secure unmanaged PCs without compromising end user autonomy by layering a security policy in software around desktop virtual machines</td>
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Disaster Recovery Challenges

- **Cost**
  - Additional hardware
  - Additional tools and training

- **Complexity**
  - Management and provisioning
  - Lock-step hardware and software upgrades

- **Reliability**
  - Complex solutions are hard to test
  - Requires specialized training for personnel
Virtualization - Benefits

- Hardware independence
- Hardware pooling/oversubscription
- Single Step Recovery
- Faster recovery
- Hardware availability
- Simplified process
Using Virtualization for DR

1. Configure Hardware
2. Rebuild OS
3. Configure OS for New Hardware
4. Install Backup Agent
5. Recover from Tape/Disk
6. Restore VM Configuration
7. Recover from Tape/Disk
Virtualization – Solutions

- VMotion
- VMware HA
- Clustering Solutions

…but that’s why we’re all here, right?
Synchronous Replication

Primary Data Center

Disaster Recovery Site

ESX 1
ESX 2
ESX 3
ESX 4

ESX 1
ESX 2
ESX 3
ESX 4
The Recovery Challenge

- DR2
- DR1
- HA
- FT

COST

RPO/RTO
The Recovery Challenge

FT
HA
DR1
DR2

COST
RPO/RTO

VMWORLD 2006
The Recovery Challenge

- FT
- HA
- DR1
- DR2

COST

RPO/RTO

VMWORLD 2006
The Recovery Challenge

- FT
- HA
- DR1
- DR2
- Under Insured

COST
RPO/RTO

VMWORLD 2006
The Recovery Challenge

VMWORLD 2006
Double-Take Asynchronous Replication

Applications
Operating System
File System
Hardware Layer

Any IP Network

Applications
Operating System
File System
Hardware Layer

Double-Take Replication

VMWORLD 2006
Double-Take Asynchronous Replication

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VMWORLD 2006
What’s Special About Replicating Virtual Machines?
Replicating from the Host

Applications

Operating System

File System

Hardware Layer

VMware Server

NTFS file system containing .vmdk and .vmc files

Win32 Application

FS1

SQL

LINUX
Replicating from the Guest

Virtual Machines
- FS1
- SQL
- FS2
- MAIL

Operating System

File System

Hardware Layer

RePLICATED
Scenario 1: Virtual Machine Protection

- **Who:** Customers who have adopted VMware virtualization technology in production for server consolidation, etc.
- **What:** These customers need to protect their virtual machines – “All The Eggs In One Basket”
- **How:** Leverage real-time replication and failover for virtual machine environments
  - Disaster Recovery for virtual machines
    - Real-time replication of virtual machine data
    - Use DR data to rebuild virtual machines
  - High Availability for virtual machines
    - Real-time replication of virtual machine data
Virtual Machine DR with High Availability
V2V Disaster Recovery Process

Primary Site
- SAN
- Virtual System Disk
- Data Volume

Disaster Recovery Site
- VMFS Volumes
V2V Disaster Recovery Process

1. Using *any* file copy technology, copy the virtual system disks to DR site periodically
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2. Doubletake Software continuously replicates the data between the VMs.
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2. Doubletake Software continuously replicates the data between the VMs
3. When disaster strikes…the DR site takes over as primary: No extra config needed
Disaster Recovery for ESX VMs

Double-Take Replication

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Disaster Recovery for ESX VMs

Double-Take® Replication
Scenario 2: Virtualized Disaster Recovery

- **Who**: Customers who have physical servers and need a cost-effective DR solution
- **What**: These customers need to protect their business-critical systems in a cost-effective but reliable way
- **How**: Replicate data in real-time from physical servers to virtual machines and failover in the event of a disaster
  - Single physical target server
    - Lower costs, easier management
Scenario 2: Virtualized DR

FS1

MAIL

SQL

WWW

FS2

WWW

SQL

MAIL

Double-Take
Replciation

Double-Take
Monitoring/Failover

Double-Take
FOR VIRTUAL SYSTEMS

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Scenario 3: Physical to Migration

- **Who:** Customers who have physical servers and need a way to do real-time migration from physical to virtual machines running on ESX.
- **What:** These customers need a way to migration to virtual machines with minimal downtime.
- **How:** Double-Take for Virtual Systems can replicate data in real-time from physical servers directly into VMDK files on ESX servers.
  - Replicates OS, applications, data.
  - Using P2V Assistant from VMware, requires minimal intervention to modify replicated “image” for use on ESX.
ESX P2V DR / Migration

Double-Take Replication

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DEMONSTRATION:
Physical to Virtual Disaster Recovery
Appendix – Extra Slides
VMotion technology lets you move live, running virtual machines from one host to another while maintaining continuous service availability.
VMware HA enables cost-effective high availability for all applications

- What is it?
  - Automatic restart of virtual machines in case of server failure

- Customer Impact
  - Cost effective high availability for all applications
  - No need for dedicated stand-by hardware
  - None of the cost and complexity of clustering
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VMware Consolidated Backup

Centralized file level backup enables easy, reliable data protection

- **What is it?**
  - Centralized agentless backup for virtual machines
    - Move backup out of the virtual machine
    - Eliminate backup traffic on the local area network
  - Pre-integrated with major 3rd-party backup products

- **Customer Impact**
  - Perform backup in the middle of the day
Evaluating Protection Options

- Recovery Point Objective
  - How much data can you afford to lose?
- Recovery Time Objective
  - How long will it take to recover?
- Protection scenarios
  - Individual server failure
    - Is tape backup good enough?
  - Site-wide disaster
    - Natural disaster, power outage, etc.
    - How do you get your data out of the building?
Data Protection

- Traditional Backup
  - Poor RTO/RPO
  - Complex, error-prone
- Synchronous Replication
  - Typically very expensive
  - Hardware-specific solutions limit flexibility
  - Distance limitations eliminate it as a candidate for Disaster Recovery
- Asynchronous Replication
  - Best balance between cost and RPO/RTO?

“Less than 5% of the data stored in the enterprise requires synchronous protection.”

- Gartner Group
<table>
<thead>
<tr>
<th>Outage Type</th>
<th>VMware Technology Response</th>
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<tbody>
<tr>
<td>1 Unplanned OS/app failure</td>
<td>SDK monitoring and restart of VM</td>
</tr>
<tr>
<td>2 Unplanned server HW or OS/app failure</td>
<td>In-VM cluster support</td>
</tr>
<tr>
<td>3 Planned OS or app</td>
<td>In-VM cluster support</td>
</tr>
<tr>
<td>4 Unplanned NIC failure</td>
<td>NIC teaming</td>
</tr>
<tr>
<td>5 Unplanned storage path failure</td>
<td>Storage multipathing</td>
</tr>
<tr>
<td>6 User deletes critical files</td>
<td>VMware Consolidated Backup (file level)</td>
</tr>
<tr>
<td>7 Unplanned storage</td>
<td>VMware Consolidated Backup (image level)</td>
</tr>
<tr>
<td>8 Unplanned server</td>
<td>VMware HA</td>
</tr>
<tr>
<td>9 Performance Bottleneck</td>
<td>Distributed Resource Scheduler, Resource Groups, Dynamic reallocation of shares, VMotion</td>
</tr>
<tr>
<td>10 Planned server, component or ESX Server OS upgrade</td>
<td>Distributed Resource Scheduler – maintenance mode, VMotion</td>
</tr>
<tr>
<td>11 Unplanned site</td>
<td>Enabled by HW independence, encapsulation and either</td>
</tr>
<tr>
<td></td>
<td>• Third party replication</td>
</tr>
<tr>
<td></td>
<td>• VMware Consolidated Backup (image level)</td>
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