

Backup and Recovery of Virtual Servers

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New Age Technologies



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Introduction

- Main Goals:
 - Discuss the Backup and Recovery of Virtual Servers
 - Involving ESX Server and Virtual Center Environments
 - From the Perspective a VMware Authorized Consultant
 - Basic Concepts, Tools, and Technologies
 - How to Select the Best Solution

- Special Focus:
 - VMs are Encapsulated by a Set of Files
 - Providing New Opportunities for Backups and Recovery

Speaker

- John A. Davis
 - Senior Consulting Engineer
 - Microsoft Networking, Development and Training Background
 - VMware Certified Professional and Instructor
 - 50% Consultant and 50% Instructor
 - National and International Exposure
 - Small, Mid-size, and Large Customers
 - Short Term Engagements and Life Cycle Projects

- New Age Technologies
 - IT Solution Provider
 - Louisville, KY
 - Networking, Security, Development, and Virtualization

Audience

- Technical Experience - Beginners to Intermediate
- Engineers, Managers, and Decision Makers
- Other Consultants

Those who are considering how to begin a new backup solution and those wondering if they can improve their backups.

Presentation Outline

- Understanding Backup Types
- Backup and Recovery of ESX Servers
- Backup and Recovery of Virtual Machines
 - File Level
 - System Level
 - Cold Backups
 - Backups of Live Snapshots
 - VMware HA
 - Disaster Backup and Recovery
 - VMware Consolidated Backup
- Recommendations

Understanding Backup Types

- File Level Backups and Recovery
 - Involves Some Files within the ESX Servers
 - Involves Some Files within VMs
- System Level Backups and Recovery
 - Of Entire ESX Servers
 - Of Entire VMs
- Disaster Backup and Recovery
 - Multiple Failures of ESX Servers and VMs

*Ensure the customer clearly understands the types and scope.
Ensure that the design meets all of the customers needs.*

Backup and Recovery of ESX Servers

- Backup Options
 - Using Traditional Backup Software
 - Using Custom Scripts
- Recovery Options
 - File Level
 - System Level

ESX Server Backup Options

- Using Traditional Backup Software
 - Legato Networker
 - Veritas Netbackup
 - Tivoli Storage Manager
 - Symantec Backup Exec
 - ARCserv

Preferably, use software qualified by VMware for ESX Server

Cannot be used, by itself, to backup live VMs

May require more RAM to be allocated to Service Console

ESX Server Backup Options

- Using Custom Scripts
 - To Copy to a Live File Server
 - Consider copying the /etc, /var, and /home folders nightly
 - /etc – contains configuration files
 - /var – contains log files
 - /home - contain VM configuration files on ver 2.5
 - /boot – contains bootable files
 - Consider using Linux, Perl, or VCB commands
 - Schedule with Cron

ESX Server Recovery Options

- File Level Recovery Options
 - Restore from Tape Using Backup Software
 - Copy from Live File Server
- System Level Recovery Steps
 - Rebuild base image options:
 - Use an imaging tool to restore from a known good image
 - Manually perform a base install of ESX Server
 - Perform a scripted installation
 - Optionally, apply latest ESX Server patches and updates
 - Optionally, install the traditional backup software agents
 - Restore modified data options:
 - Restore files from a tape using Traditional backup software
 - Copy specific files from a live file server

VM Backup and Recovery

- File Level
- System Level
 - Cold Backups
 - Backups of Live Snapshots
 - VMware HA
- Disaster Backup and Recovery
- VMware Consolidated Backup

Options for File Level Backup of VMs

- Traditional Backup Software Agents in VMs
*Prefer to use backup software qualified by VMware.
The backup server should be a physical server.*

- VMware Consolidated Backup
Likely to become a favorite choice.

- Other Options
 - Using a VM as a backup server
 - Using Service Console as a backup server*Neither of these are recommended.*

System Level Backups of VMs

- Cold Backups
 - Suspend and backup
 - Scheduled shutdown and clone in VC
 - Scripted shutdown and template creation
 - ESX Server file-based backups
- Backups of Live Snapshots
 - VMsnap
 - VMBK
 - ESX Ranger
 - VMware Consolidated Backup

Recovery may involve restoring using one of the above methods plus a file level recovery of changed files.

Recovery of VMs Following ESX Server Failure

The priority is to recover VMs quickly, not ESX Servers.

- Store vmdk files on public VMFS (version 2.5)
 - Use scripts to backup vmx files to live file server
 - Determine which VMs were running on the server
 - Copy the vmx files to another ESX Host
 - Use: **vmware-cmd -s register *vmx_path*** to register the VM
- Storing all files, including vmx files, in public VMFS volumes (not available in 2.5, due to lack of subfolders). Use DataStore Browser to locate vmx file and Add to Inventory.
- VMware HA

VM System Recovery via VMware HA

Designed to quickly restart VMs on other ESX Servers following an ESX Server Failure.

■ Details

- Requires Virtual Center and HA licenses
- Virtual Center is used during the configuration
- ESX Hosts, not Virtual Center, is involved in the failure detection and VM restarts
- So, HA functions even if Virtual Center has failed
- Legato AAM is a key component (EMC AutoRestart)

VMware HA Details (Continued)

- DRS can assist HA by recommending which host should be used to restart VMs and to load balance, via VMotion, after the VM has been restarted.
- Users will detect that VMs have failed. From the users perspective, the VMs were simply restarted quickly.
- HA is only intended to restart VMs following an ESX Server crash, not individual VM crash.
- When ESX Servers fail, the VM files are in a crash consistent state. Do not use for VMs where concern exists that the guest OS and application may not recover nicely from a crash.

VMware HA Details (Continued)

- HA uses the Service Console network to monitor other ESX Servers and detect failures.
- Use redundant Service Console Nics, so an IP failure is not mistaken for a server crash.
- HA requires the use of fully qualified hostnames that resolve correctly.
- Priorities can be configured on VMs, to ensure that higher priority VMs are restarted more first.
- Constraints can be configured or ignored, when HA restarts VMs.

VMware HA Details (Continued)

- A host that loses contact with other hosts, will ping its SC IP address by default, to determine if it is actually isolated from the network (loss IP connectivity to SC).
- As an option, another address can be provided to determine isolation (das.isolationaddress)
- If a host determines it is isolated, it will start powering down its VMs, by default, after 12 seconds.
- After 15 seconds, other hosts will begin powering on the VMs of the isolated host.
- ESX hosts can be configured not to power down VMs due to isolation.

Disaster Recovery of VMs

- Basic DR principles
 - DR versus system recovery versus high availability
 - Defining DR requirements per application
 - Dependencies such as involved servers and databases
 - Recovery time objectives
 - Recovery point objectives
- Common DR approaches
 - Same approach as with physical servers
 - Making use of snapshots
 - SAN based replication
 - Data based replication

Common Obstacles for DR

- Network Bandwidth requirements for replicating data or copying snapshots off-site.
- Solution for storing backup tapes off-site and delivering to disaster site.
- Verifying the recoverability of the solution periodically

Sample DR Forms

Application Discovery and Service Level Agreements

Application Name:

Provide the common name of the application.

Brief Application Description:

Provide a very brief description of the application

Support Point of Contact:

Provide name and contact information for the key support

Normal Hours of Availability:

Provide the days and hours when the application

- 24 X 7
- 8 am - 5 pm, Mon - Fri

Minimum Required Percentage Uptime:

Provide the minimum percentage up-time, during example:

- 95% per month
- 90% per week

Maximum Continuous Downtime:

Provide the maximum length of acceptable continuous downtime. Downtime during normal hours define the maximum disruption during normal hours. Downtime on Sat-Sun should not be included. In the event of a disaster occurring on Sat that gets resolved on Sun, the downtime should not be included.

Application Configuration Data Sheet

Application Name:

Provide the common name of the application.

Brief Application Description:

Provide a very brief description of the application.

Support Point of Contact:

Provide name and contact information for the key support

Server(s) Configuration

Provide configuration information about each network, file

Server Name	Server Type <i>Examples:</i>
	<ul style="list-style-type: none"> • File S • Netw • Web • E-ma

Data Configuration

Provide location and configuration information about the

Data Store Name	Data Type	Data Location	Data Size
<i>Provide the name of the database or data file</i>	<i>Provide a brief indication of the type of data. For example:</i> <ul style="list-style-type: none"> • Text file • SQL Database 	<i>Provide the location of the data, such as a folder and file path or the name of a SQL Server.</i>	<i>Provide the current size and max size of the data Example: 2G current (4G max)</i>

Application Downtime Cost Sheet

Economic Justification, Risk Assessment

Application Name	Formula(s) Used	Cost per hour
<i>Provide the common name of the application.</i>	<i>Provide the formula(s) used to calculate the cost. For example:</i> <i>Complete Users Down:</i> $Number\ of\ Users * Avg\ Pay\ Rate\ per\ lost\ hour$ <i>Increased workload:</i> $Number\ of\ users * Avg\ Pay\ Rate * number\ of\ extra\ hours\ per\ lost\ hour$	<i>Provide the calculated cost hour.</i>

VMware Consolidated Backup

■ Benefits

- ▶ A Single Solution –
 - File Level (Windows VMs Only)
 - System Level (live backup of VM files)
- ▶ Integrates with Traditional Backup Software
- ▶ Reduced Number Agents (only proxy server requires an agent)
- ▶ LAN Free Backup (uses Fiber Channel)

VMware Consolidated Backup Details

- Requires a proxy server, which must be a physical Windows 2003 server
- Requires a Fiber Channel SAN, where the VM's virtual disk must be stored.
- The proxy server must be connected to the fiber channel SAN and must be configured to see the LUNs, where the VMs are stored.
- Requires the use of a supported, traditional backup software and Integration Package.
- The VCB Framework, traditional backup software, and appropriate integration package must be installed and configured on the proxy server.

More VCB Details

- Typically, a tape drive is attached to the proxy server.
- VCB does provide a command based interface
- Create and schedule backups using the traditional backup software interfaces.
- Backup Job Sequence:
 - Proxy Server communicates with the ESX Host
 - ESX Host creates a stable snapshot of the VM's virtual disk
 - Proxy server connects via the Fiber Channel to the virtual disk.
 - It can backup the entire vmdk or reach inside the vmdk and backup the files in its file system (Windows VMs only)
- Naturally, the snapshots are committed back to a single vmdk file after the backup completes

More VCB Details

- Restoration of VMs must be planned.
- Choices
 - Centralized Restore – restore via single proxy server
Restore to Proxy, then copy to VM
 - VM Based Restore – restore directly to each VM
Requires agents in each VM
 - Per Group Restore – designate one VM per group
Restore to a VM, then copy to other VMs
- Trade off is number of agents versus steps and time to restore.

VCB Compatible Software

- Tivoli Storage Manger
- Symantec Backup Exec
- Veitas Netbackup
- EMC Networker

Recommendations

■ ESX Servers

- Typically, the main concern is not the restoration of lost ESX Servers
- However, some customers still require the ability to restore files on ESX Servers.
- The solution is driven by specific customer needs.
- At one extreme, some customers are only concerned about ESX Server files that directly affects VMs.
 - For example, prior to version 3.0, using scripts to backup the /home folder to a live server typically sufficed.
- At the other extreme, some customers require the ability to restore all files.
 - For example, some external regulations may require the backup and recovery of log files. A typical tape backup software solution may be the best fit.

Recommendations

- Disaster Recovery of VMs:
 - Recovery of VMs following single ESX Server failures or Disasters is critical.
 - The number, hardware type, and configuration of the ESX Servers at the DR Site does not have to match the Production Site.
 - Application criticalness, funding, and DR requirements often dictate the approach.
 - Each approach has several challenges, such as:
 - how to obtain off-site tape storage and delivery
 - how to fund a build a large enough network for off-site replication
 - The selected approach can involve VCB, data replication, SAN based replication, etc.

Recommendations

- System Recovery of VMs:
 - VMs stored in shared volumes, do not require file restorations following ESX Server failures.
 - VMware HA is typically the best choice for VM recovery following ESX Server failure.
 - Configure VMware HA according to best practices.
 - VMware HA may not fit well with all application servers.
 - Solutions other than VMware HA are required for VM system recovery, following complete VMs failures.
 - VCB and third party tools, such as ESX Ranger, may be the best fit, because of scalability.

Recommendations

- File Level Recovery of VMs
 - File level backups are still needed, even if VMDK files are backed up.
 - VCB offers a single solution for providing both system level and file level backups and recoveries of Windows VMs.
 - Strongly consider using VCB in Windows environments, where VCB compatible software is already in use.
 - For live, snapshot based backups, such as VCB and ESX Ranger, ensure that pre-freeze scripts and queiscing are well utilized.
 - Remember VCB only performs file-level backup for Windows, not Linux VMs.
- Test ... Prove each component of the backup and recovery solution.

Questions?

For electronic copy of the associated handout or for answers to questions that arise after the presentation, simply e-mail:

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