

Non-Disruptive Backup of VMware Environments Using Veritas NetBackup



George Winter
Technical Product Manager
Veritas NetBackup



VMWORLD 2006

Agenda

- VMware ESX Architecture Overview
- VMware Backup Challenges
- Traditional Backup Concepts
- Non-Disruptive Backup - VMware Consolidated Backup
- Demo – Consolidated Backup with NetBackup
- Planned Future Integration With NetBackup 6.5
- Final Thoughts
- Q & A



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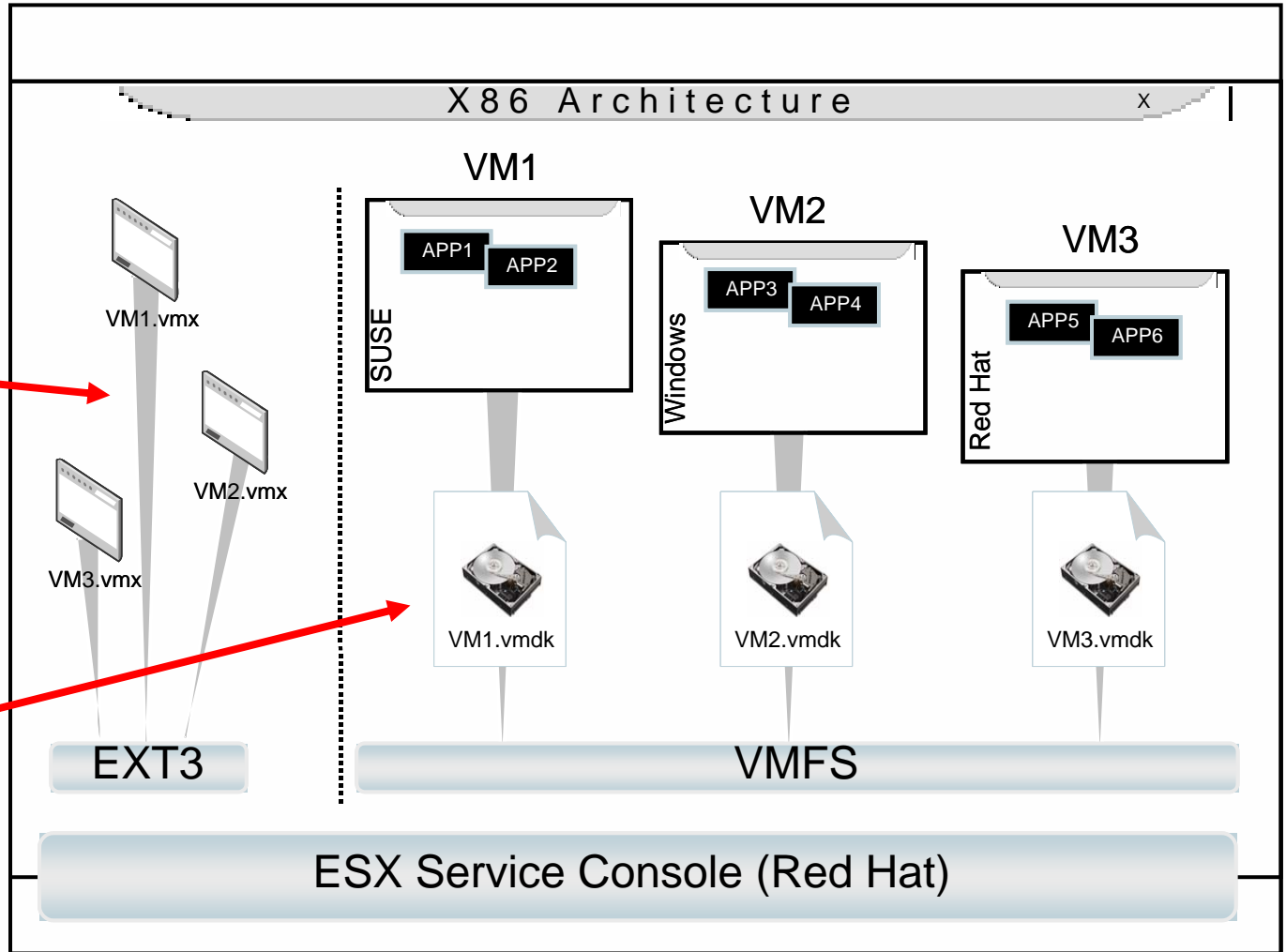
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VMware ESX Architecture – Virtual Machine's

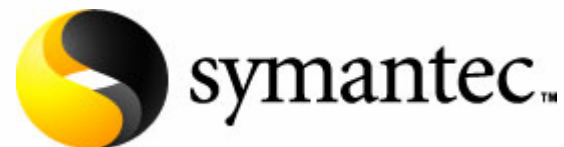
VMX files contain configuration information

VM's are based on VMDK files



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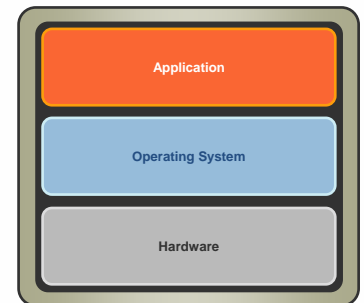
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Virtual Machine Backup Issues

- All VM's share a single physical host
- System resources are efficiently used but finite
- In VM environments, unused system resources are rare
- Backup activities use significant I/O and network resources

- In a nutshell...
 - Minimal system resources are available for backups
 - Backups need to be designed around these realities



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Traditional Backup Technologies

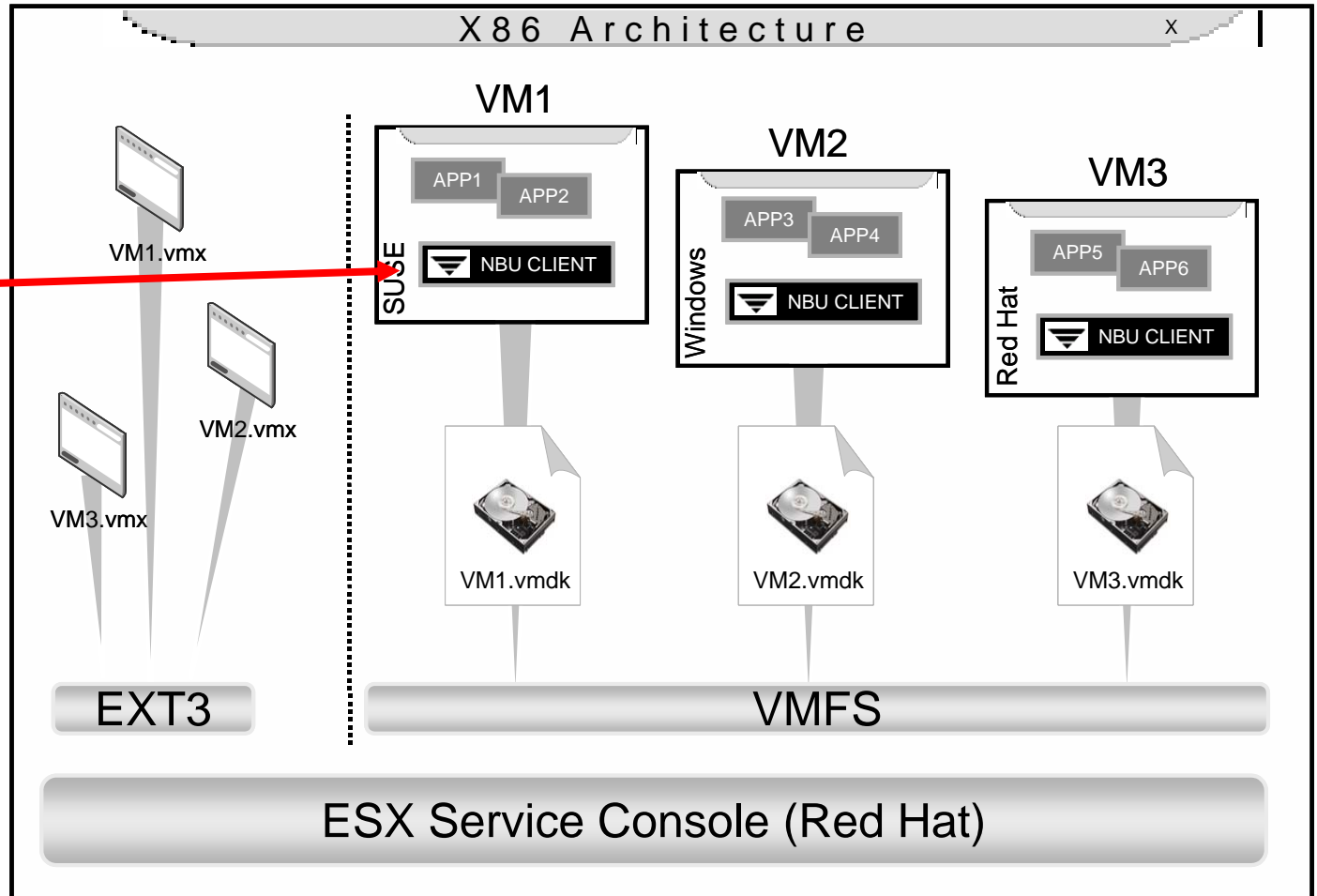
- Backing up Virtual Machines introduces different set of problems
 - Is it best to backup VM as a client?
 - What are advantages of backing up only the VMDK files?
 - How do I backup a DB hosted on a VM?

- Keep the following in mind:
 - Backup processing is very I/O and resource intensive
 - Backup activities on one VM can impact operations on another



Technique 1: Backup the VM as a NBU Client

NBU Client is installed inside VM like any other supported NBU client



Technique 1: Backup the VM as a NBU Client

■ Advantages:

- Essentially same backup config as standard (non-VM) backups
- Restore process is unchanged
- Single file restores are possible
- Full and incremental backups are possible
- Translates to DB's as well

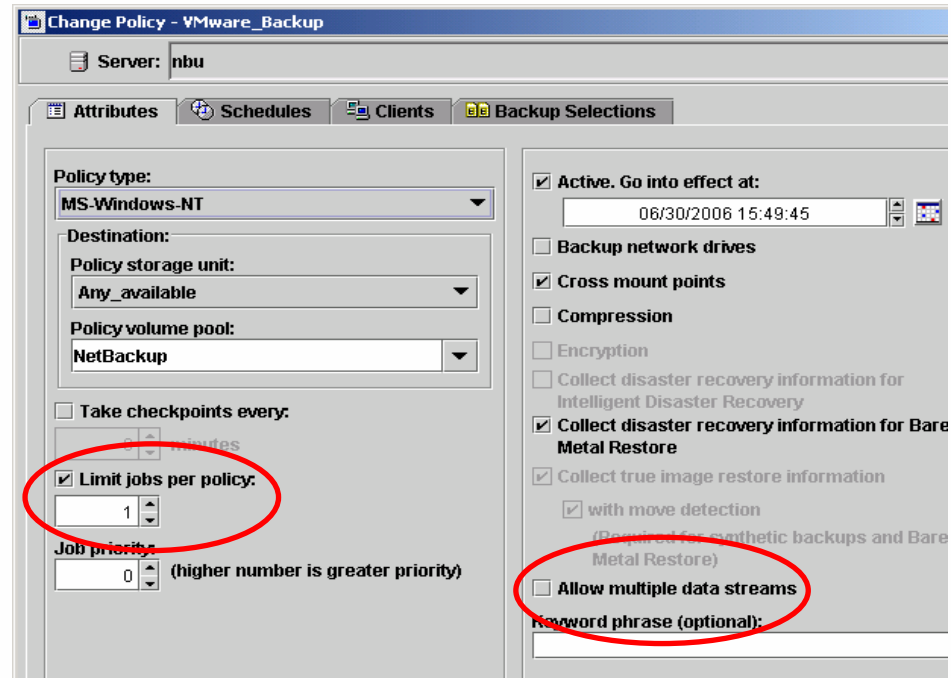
■ Disadvantages

- I/O processing on each VM can significantly impact other VM's
- Entire VM file hierarchy is searched for new or changed files during each backup
- Entire OS restores can be problematic

Technique 1: Backup the VM as a NBU Client

■ Recommendations:

- Backup each VM serially
- Take advantage of "Synthetic Backup" technology
- Only allow a single datastream per VM as data in VM's exist on single files

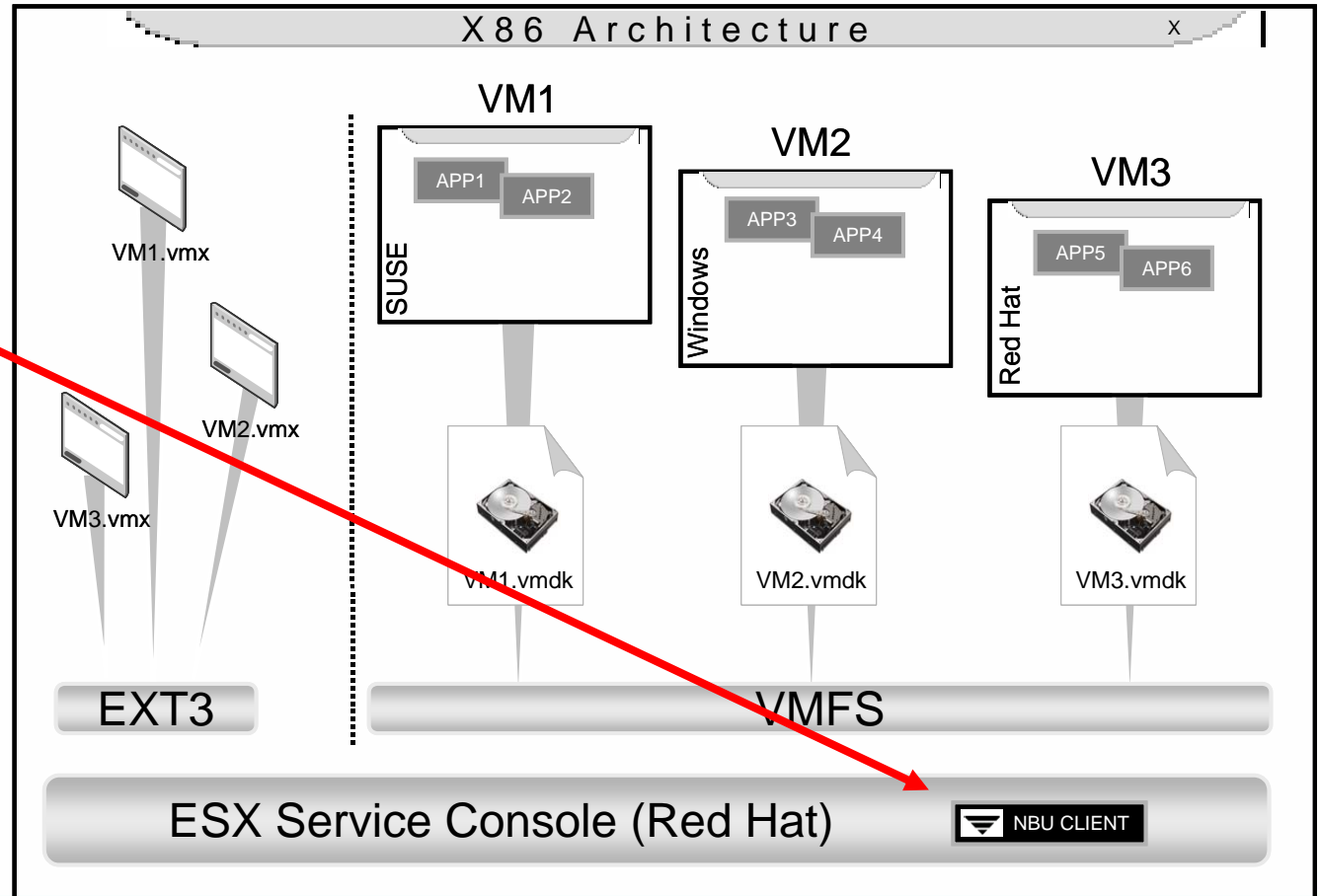


NetBackup Policy Configuration

Technique 2: Backup the VMware Disk (VMDK) Files

NBU Client is installed on the Server Console (RHEL)

Running a client on Service Console is supported



Technique 2: Backup the VMware VMDK (and VMX) Files

Three ways of backing these up:

1) Shutdown VM – backup VMDK files – restart VM

- Most straightforward
- VMDK files are static during backup window
- Unfortunately, VM is down for backup duration
- VMDK files are backed up using NBU RHEL client on Service Console

Technique 2: Backup the VMware VMDK (and VMX) Files

Three ways of backing these up:

2) Shutdown VM – create snapshot – restart VM – backup VMDK files

- Utilized snapshot + redo capability built into ESX 2.x
- Requires some scripting
- VM is unavailable for only a short time
- Reboot is required with this technique
- After reboot, all writes are directed to a VMware Redo Log
- VMDK files are backed up using NBU RHEL client on Service Console

Technique 2: Backup the VMware VMDK (and VMX) Files

Three ways of backing these up:

3) Create snapshot – backup VMDK files

- Creates a "Crash Consistent" version of VMware image (including apps)
- "Crash Consistent" does not sound very good.....
- No guarantee of data integrity
- Not recommended by NetBackup
- Raw Device Mapping (RDM) is "Crash Consistent" as well



Technique 2: Backup the VMware VMDK (and VMX) Files

- Advantages:

- > Disaster Recovery is extremely easy
- > Backup everything by backing up a few files

- Disadvantages

- > No single file restore
- > No incremental backup – must backup entire VMDK file each backup run
- > VM must be rebooted
(assuming you want consistent backups!)

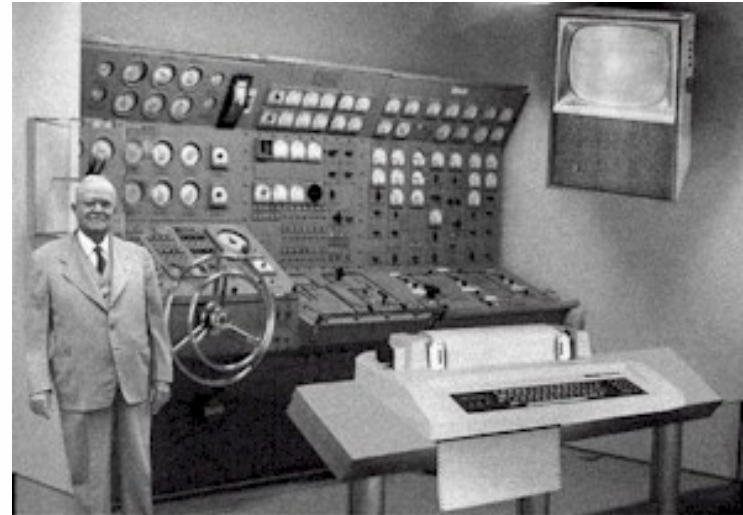
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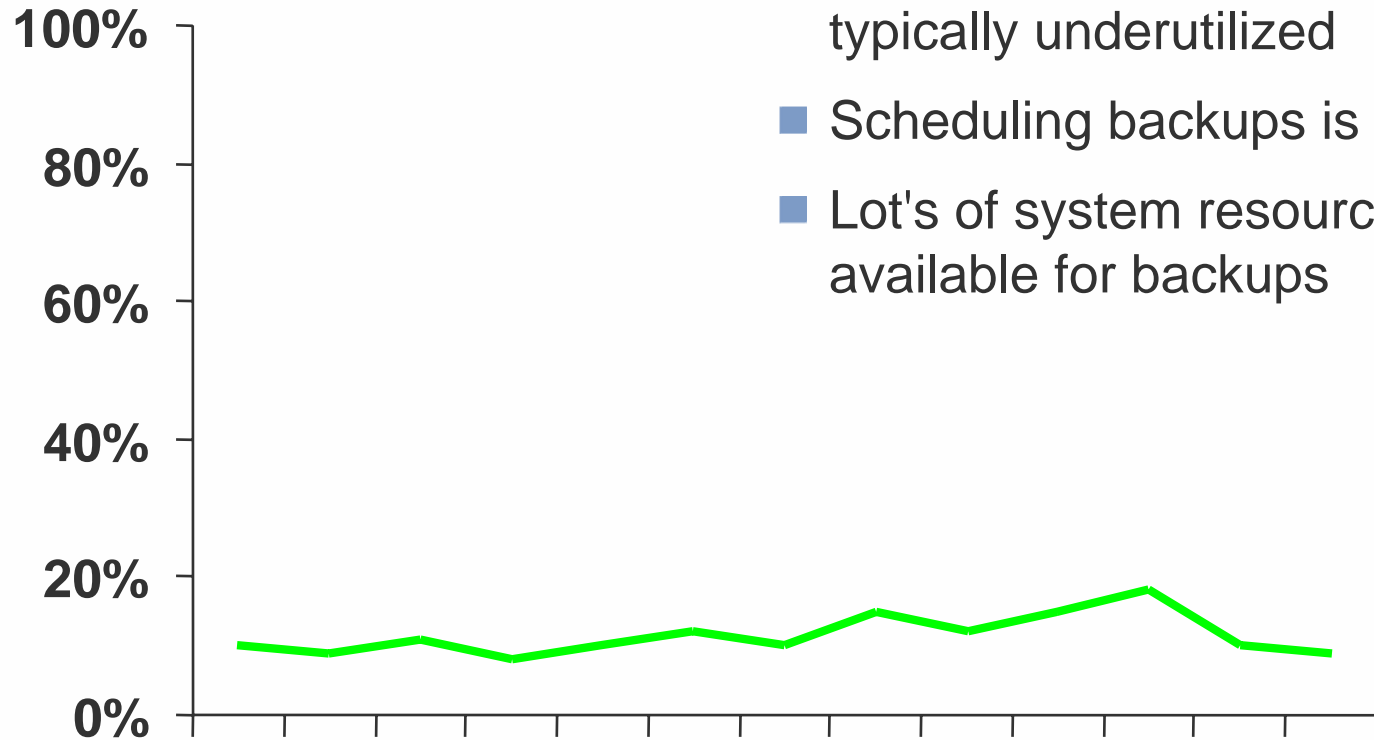


VMware – A Retrospective

- Before we talk about Consolidated Backups, lets take a quick look at the history of virtualization from a resource consumption perspective
- 10 Years ago it was not hard to saturate a 20 MHz CPU
 - No resources available to virtualize
- Then CPU's started to become *much* more powerful
(Moore's law was passed...)



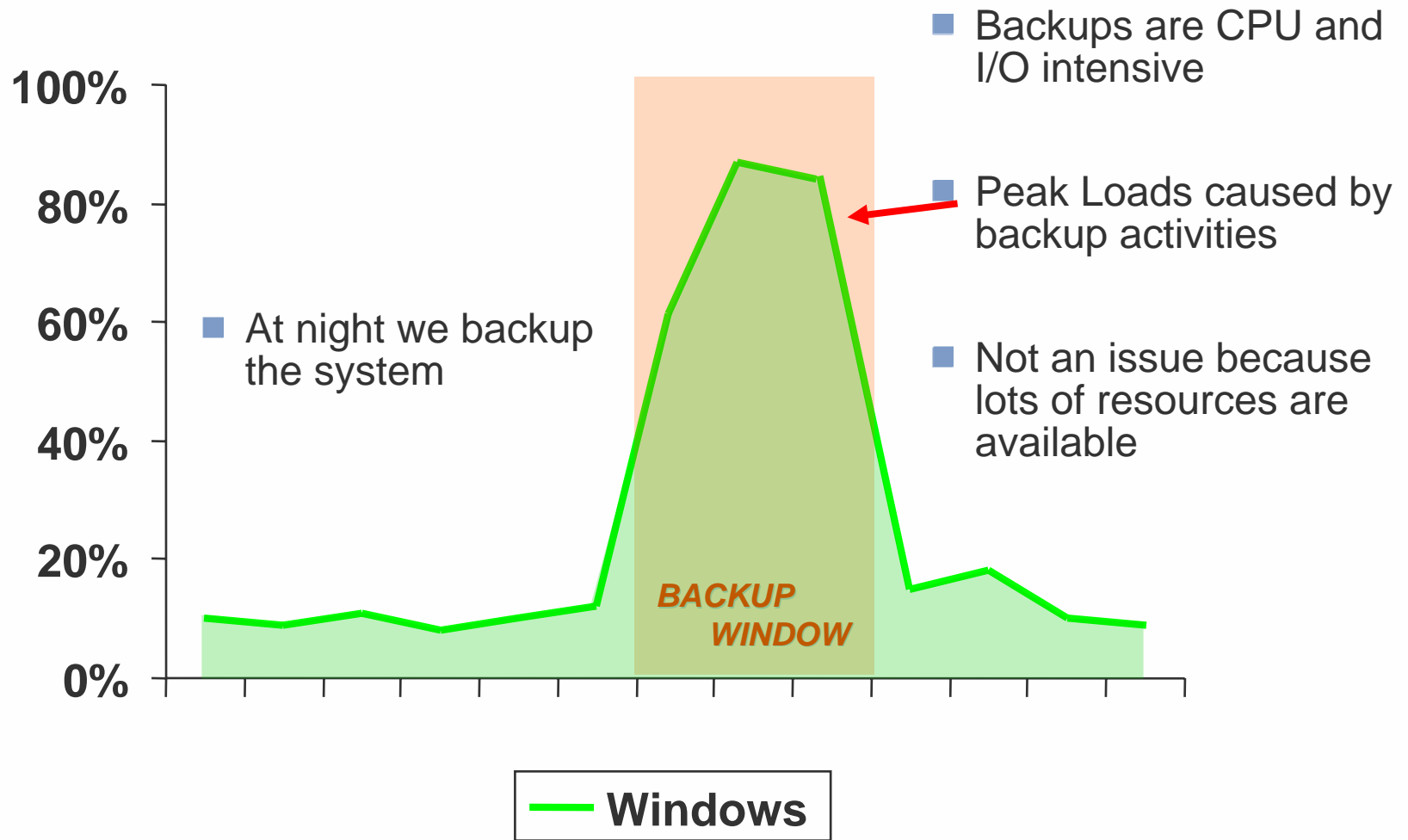
CPU Utilization Before Virtualization



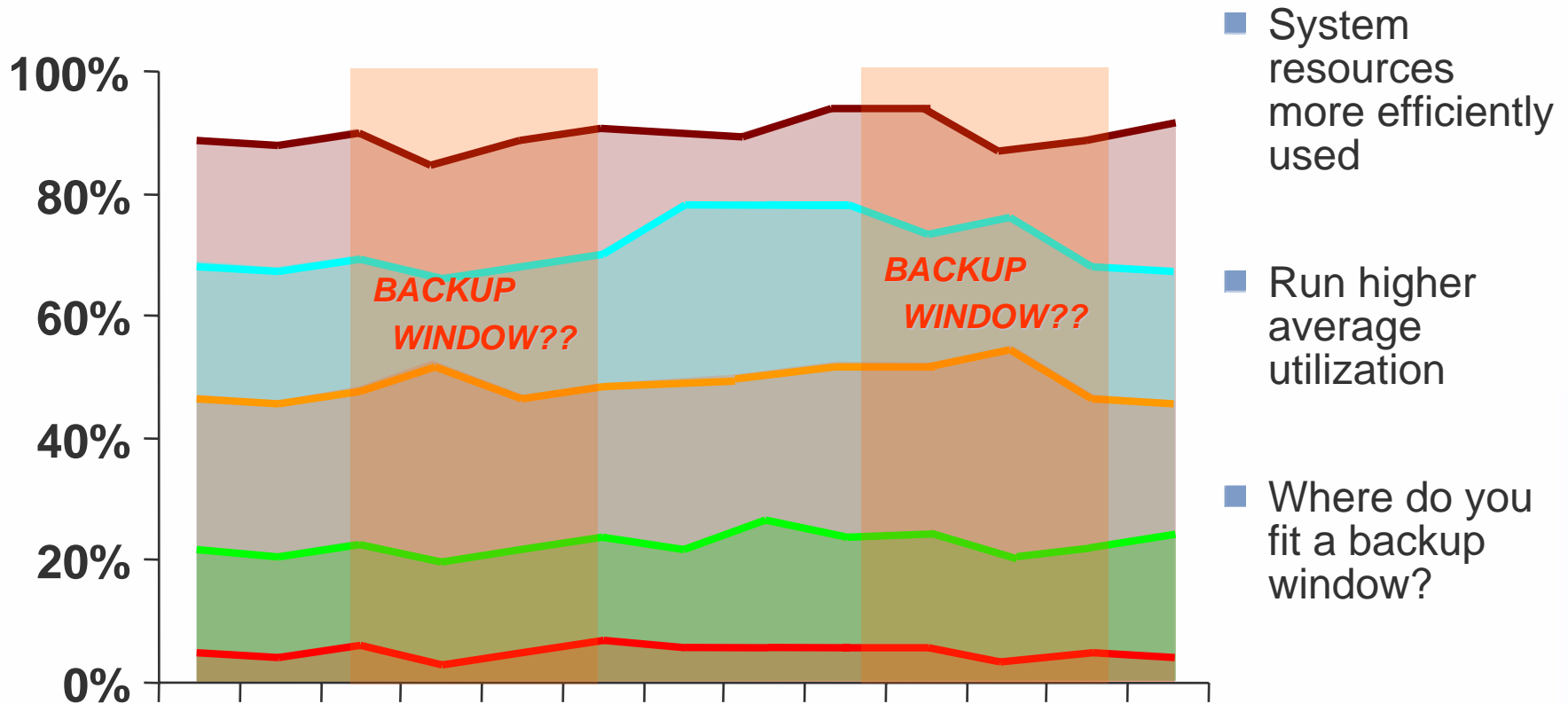
- Majority of system resources are typically underutilized
- Scheduling backups is easy
- Lot's of system resources available for backups

— Windows

CPU Utilization Before Virtualization



CPU Utilization **After** Virtualization



— Serv Cnsl
 — Windows
 — SUSE
 — RHEL
 — Sol x86

Backing Up ESX 3.x

- New technology introduced with ESX 3.x:

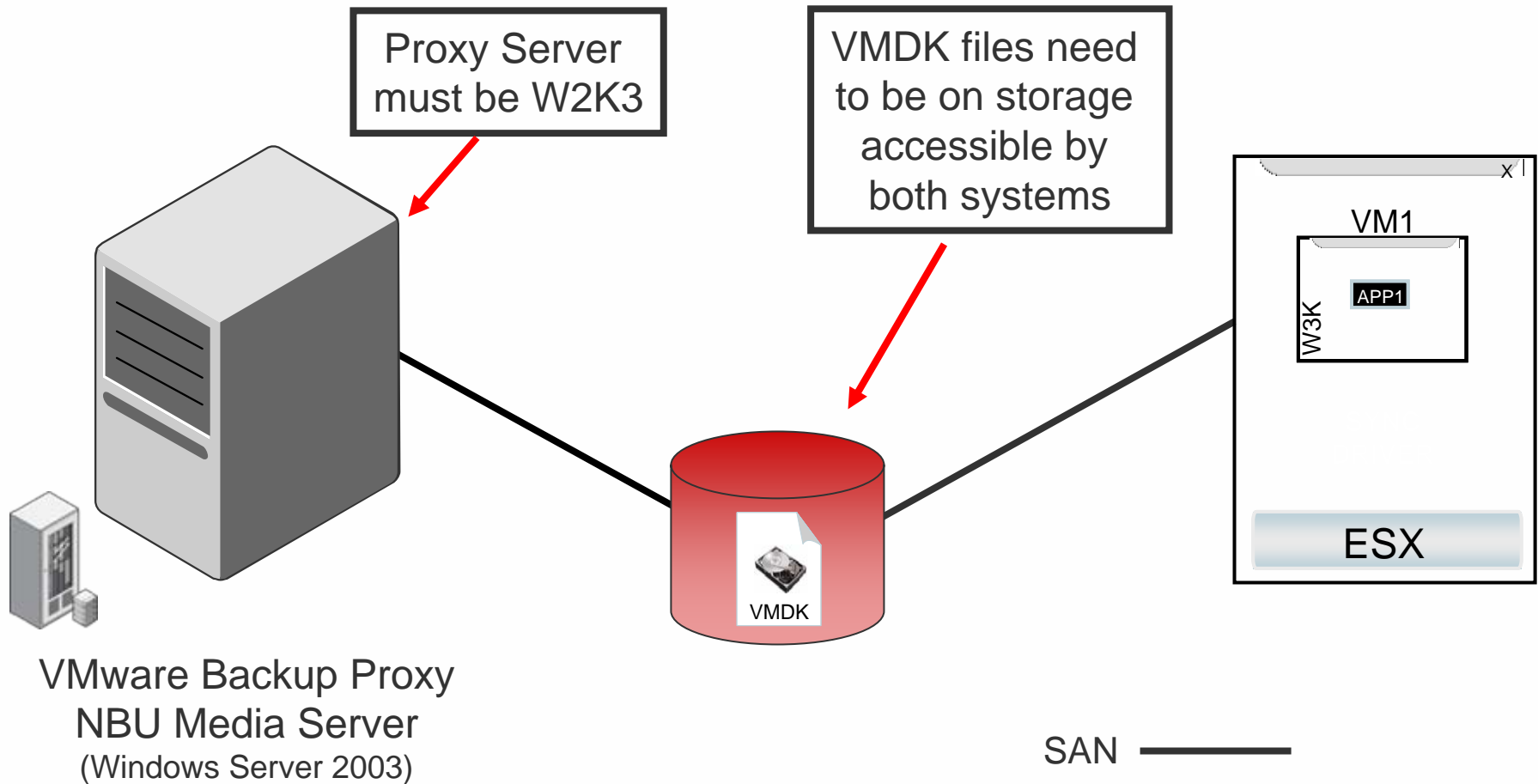
VMware Consolidated Backup (VCB)

- Designed to:
 - Improve file system backup – single file restores are possible
 - OS is properly quiesced for consistent backups & restores
 - OS is 100% available
 - Snapshot & redo creation is quick
 - No reboot is required
 - Reduce backup processing load on ESX Server
 - Simple implementation

VMware Consolidated Backup Components

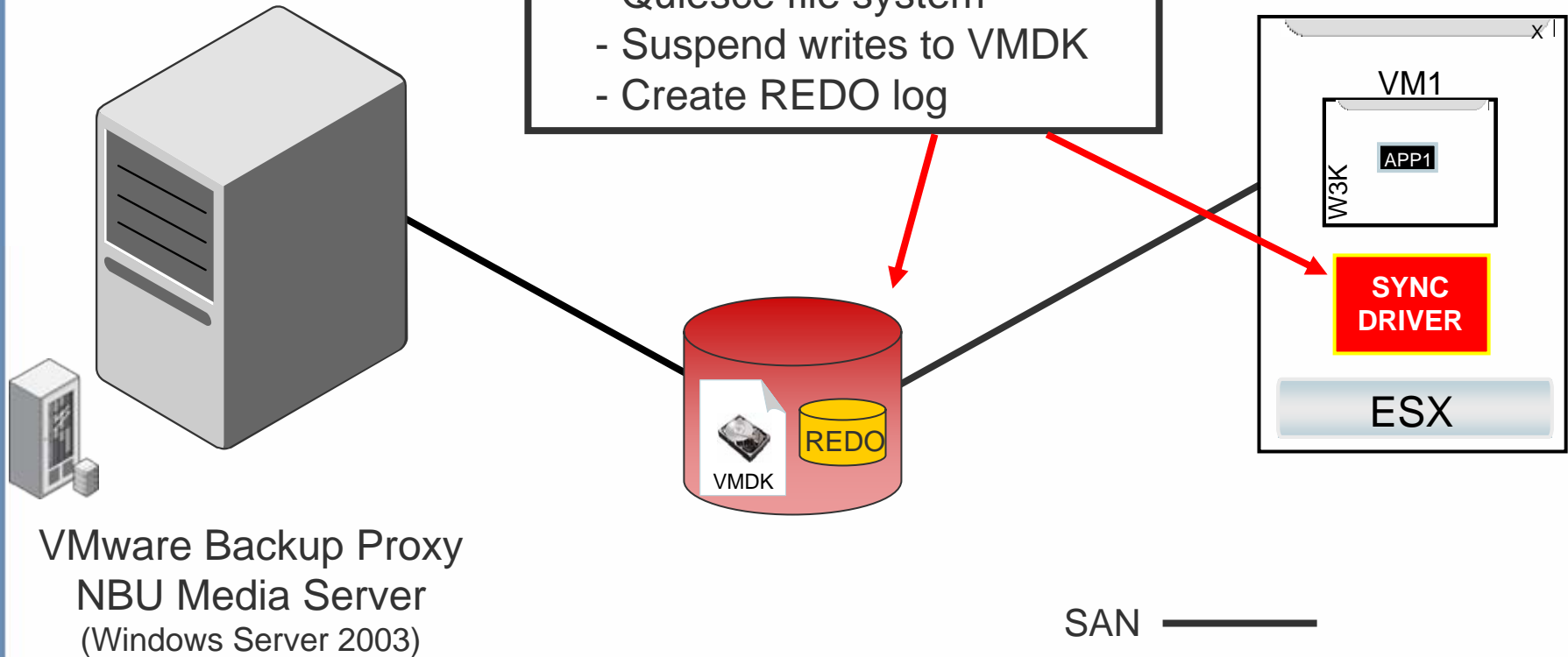
- Backup Proxy Server
 - Similar in concept to NBU off-host Media Server backup
 - Image of VMDK file is mounted on this proxy system
 - This image is backed up by NBU
- Sync Driver
 - Installed via VMware Tools
 - Ensures that OS is synched before snapshot of VMDK file
 - Suspends writes to VMDK file and creates REDO
- vLUN Driver
 - Installed on VCB Backup Proxy Server
 - Provides image of VMDK file
 - Translates VMDK blocks into individual files

VMware Consolidated Backup Configuration



VMware Consolidated Backup Process

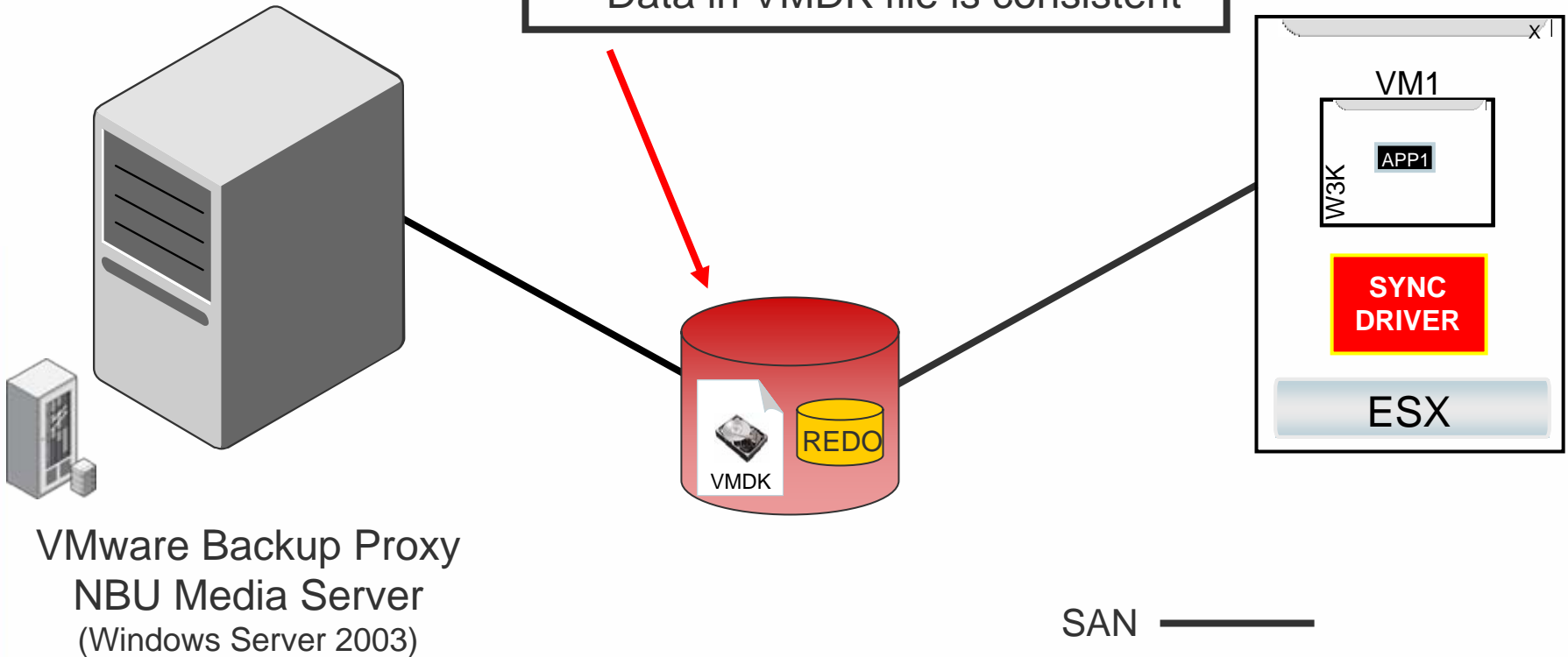
- NBU instructs Sync Driver to:
- Flush disk buffers
 - Quiesce file system
 - Suspend writes to VMDK
 - Create REDO log



VMware Consolidated Backup Process

At this point:

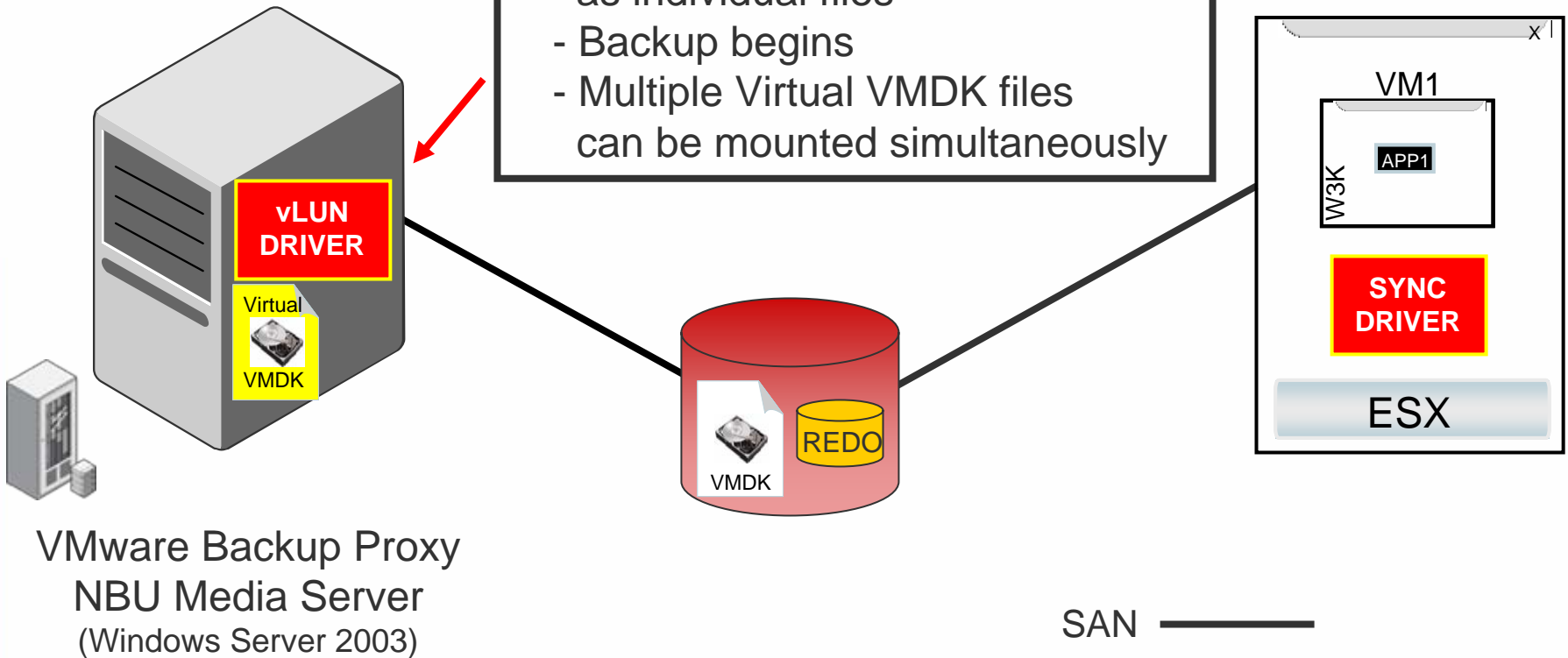
- VMDK file is static
- Data in VMDK file is consistent



VMware Consolidated Backup Process

vLUN driver kicks in:

- Interprets VMDK blocks as individual files
- Backup begins
- Multiple Virtual VMDK files can be mounted simultaneously



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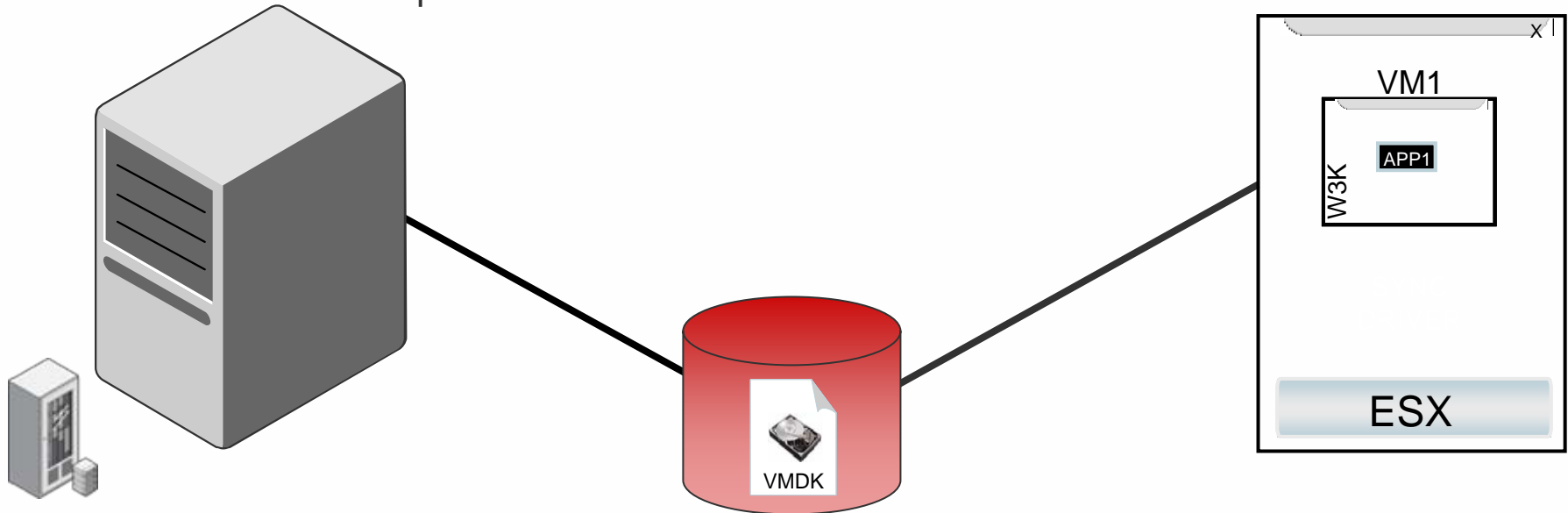
Consolidate Backup Demo Environment

SW Installed on Backup Proxy:

- Consolidated Backup Framework
- NetBackup Media Server
- VMware NBU Integration Module
- Virtual Center Components

SW Installed on Guest OS:

- VMware Tools



VMware Backup Proxy
NBU Media Server
(Windows Server 2003)

SAN —————

DEMO

Some Points To Keep In Mind Regarding VCB

- Advantages of VCB include:
 - OS is 100% available
 - Incremental backups and single file restores are possible
 - Snapshot process is very quick
- VCB can also run pre and post processing within the VM
 - Helpful for DB's or complex data structures
 - If this processing fails, entire backup job fails

Some Points To Keep In Mind Regarding VCB

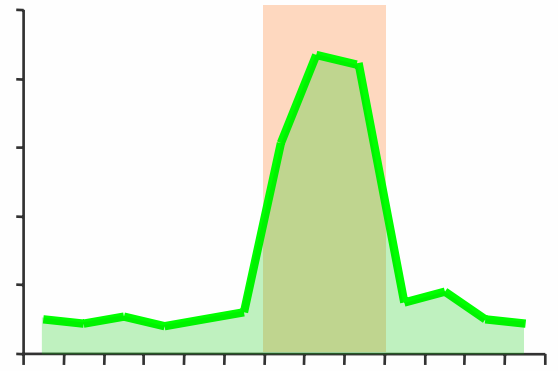
- I/O still occurs against VMDK file on shared storage
 - Plan storage layout and backup scheduling accordingly
- Current VCB OS (sync driver) support is limited
 - Check VMware support site for up-to-date status
- VCB process is currently controlled by NBU pre and post processing scripts
 - Complete integration planned for NBU v6.5 Advanced Client

Other Configurations

Not all possible backup configurations are recommended or supported.....

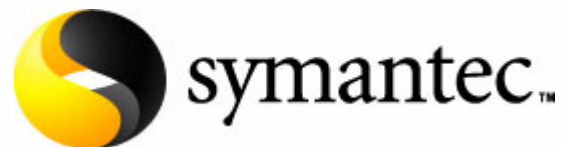
What's Not Supported (And Why!)

- Running a NBU Media Server within a VM
 - Backups are I/O and resource intensive
 - Impact of backups on other VM's would be significant
 - Not recommended by VMware
- Running a NBU Media Server on Service Console (RHEL)
 - Service Console is optimized (non-standard) version of RHEL
 - Never designed to be used as a media server
 - No support for Fibre Tape Drives
 - VMware does not support this



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Future Planned Integration With NetBackup 6.5

VMware Integration

- Quiesce for consistency
- Off-host backup processing
- Intelligent host re-mapping
- Volume-level rollback
- File-level snapshot restore



Advanced Client

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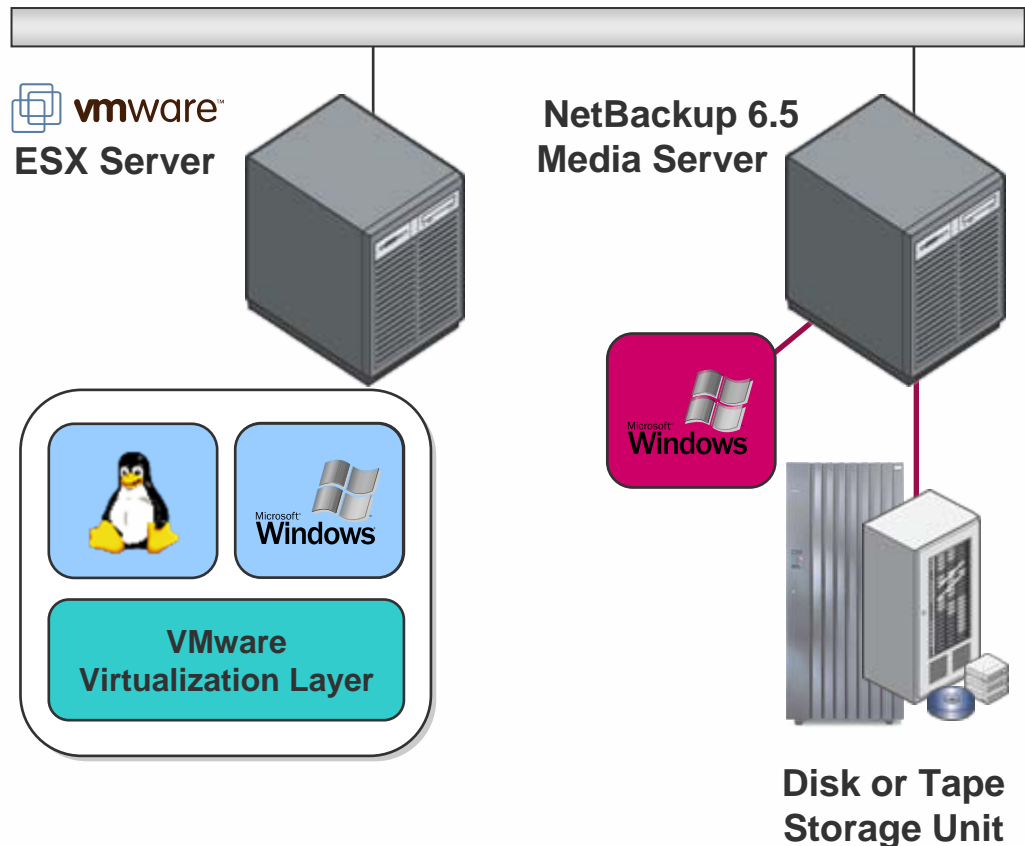


Snapshot Integration

- FREE - Veritas Vol Mgr
- Disk Array API integration
- Snapshot cataloging
- Snapshot rotation
- Snapshot expiration
- Wizard-driven setup

Planned Off-host Backup of VMware ESX 3.0

- Snapshot of a virtual machine is mounted on another host at **volume** level
- Full volume is mounted on other host – not an image
- Uses VMware ESX 3.0 native snapshot capability
- Eliminate impact to ESX host including I/O
- File-level restore capability preserved



Additional Planned Integration With NetBackup 6.5

- Configure NetBackup backup Policies instead of writing, maintaining and troubleshooting homegrown scripts
- Intelligent VMware host remapping
 - All backups properly referenced in catalog to Virtual Machine(s)
 - Greatly simplifies restore process especially in larger environments
- Closer integration with DB or Application backup API's
- One click Virtual Machine Bare Metal Restore
- Integration with FREE Veritas Volume Manager
- And more...

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Some Final Thoughts.....

- Restore requirements tend to influence backup method selection
 - Single file restores not possible with every backup technique
 - Incremental backups not possible with every backup technique
 - DR is straightforward when backing up VMDK files

- Don't forget to backup the ESX Service Console
 - Configuration information is stored there
 - This can be done via NBU client on RHEL
 - Typically does not need to be backed up often

Some Final Thoughts.....

- For more information:
 - > Compatibility matrix is available on our support site
<http://support.veritas.com>
 - > **“Implementing VMware Consolidated Backup with NetBackup 6.0”**
[http:// support.veritas.com](http://support.veritas.com)
 - > **NetBackup 6.0 Advanced Client SAG**
<http:// support.veritas.com>

Thank You!

george_winter@symantec.com



George Winter

Technical Product Manager

Veritas NetBackup



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