BCT 4540:
VMware Consolidated Backup Best Practices, Tips and Tricks

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VMWORLD 2006

Overview

- Best Practices
  - > On COS and Proxy
  - > Snapshots
  - > Proxy Performance/Setup Recommendations
  - > Security: Create vcbuser
- Tips and Tricks
  - > VCB on COS and Proxy
  - > Command Line Utilities
  - > VCB DIY - Fun with VCB
    - Project #1: Image level backup/single file restore
    - Project #2: Back up single disk of a VM

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The Two Identities of VCB

- On the Backup Proxy (VCB on Windows)
  - Offloaded direct-off-SAN backup for VMs
  - File level Backups (Windows guests)
  - Full VM Backups
  - Integration with 3rd party backup applications
- On the Service Console (COS)
  - Full VM Backups/Restores
  - Back up Any VM on any ESX box in a Farm (3.0.1)
  - Replacing vmsnap.pl & friends
- Some best practices apply to both cases!

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Best Practices - Generic

- ESX Snapshots and Storage
  - While snapshot exists, writes are absorbed in redo log (COW file)
  - Redo log is not a continuous log, but keeps only one copy of touched block => size bounded by size of base disk
  - Redo log grows dynamically (16MB increments)
  - Usually much smaller than base disk, depending on workload in VM ("working set") and time required for backup
  - Redo logs improved significantly in VI3

Best Practices - Generic

- ESX Snapshots and Storage
  - When a redo log grows, VMFS metadata change requires acquisition of VMFS lock
  - Lock contention comes from multiple ESX hosts trying to grow redo logs on the same VMFS file system
  - Don't kick hundreds of VMs into snapshot mode at once...
  - If you back up multiple VMs simultaneously, pick VMs on different VMFSes or keep them clustered on small number of ESX machines (DRS affinity rules)

Best Practices - Generic

- Proxy accesses virtual disks using metadata provided by ESX server
- Metadata describes location of virtual disk blocks on physical medium
- Very compact for base disk only
- Pre-existing snapshot for VM with random IO pattern can cause list to become huge
  - Might degrade VM performance
  - Increased resource consumption on proxy

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Best Practices - Proxy Performance

- Workload on proxy usually I/O bound, not CPU bound
- Know your bottleneck:
  - # of spare IOPs for backing up VMFS LUN
  - Fiber Channel throughput to proxy
  - for full VM: throughput to holding space
  - # of IOPs your backup SW can push to backup target

Best Practices - Proxy Performance

- vLUN throughput should be close to native file system access for SAN LUN => Consult backup vendor sizing guide
- Full VM backup requires intermediate copy step
  - If using 3rd party SW to write to tape, try using multiple jobs in parallel (if your backup SW permits...)
  - Low number of parallel jobs should be OK

Best Practices - Proxy Performance

- If performing full VM backup or if target is disk, consider
  - putting target volume on SAN rather than local disk (one spindle on destination vs. many on source)
  - dedicating different HBAs for reading data (VMFS) and for writing data (holding space)

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Best Practices - Create VCB User

- Avoid hardcoding the Administrator's username and password on the proxy
- Create user "vcbuser" for backup
- Add a Custom Role "VCB" in VirtualCenter and assign minimum set of privileges for backup:
  - `VirtualMachine/Provisioning/Allow Virtual Machine Download`
  - `VirtualMachine/State/CreateSnapshot`
  - `VirtualMachine/State/RemoveSnapshot`
  - `VirtualMachine/Configuration/DiskLease`
- Use this user on backup proxy instead of Administrator

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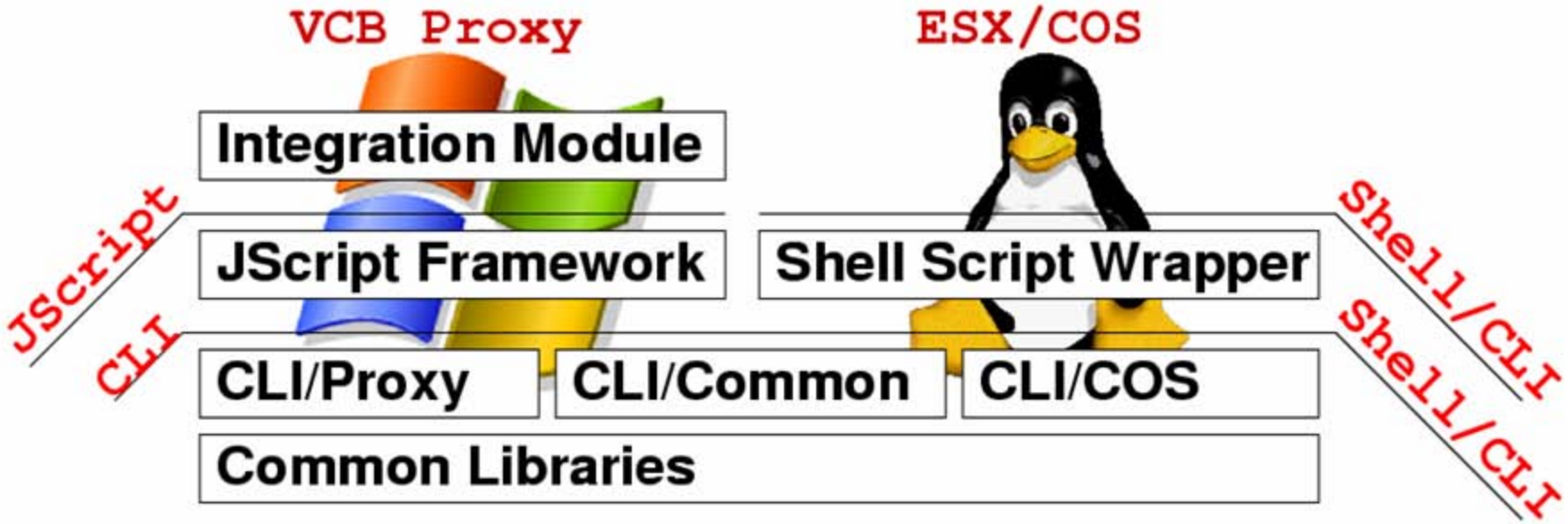
VCB Overview



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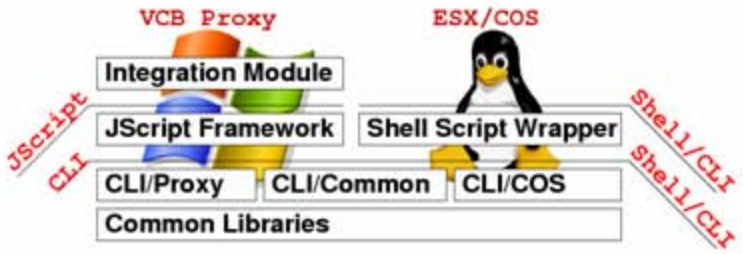
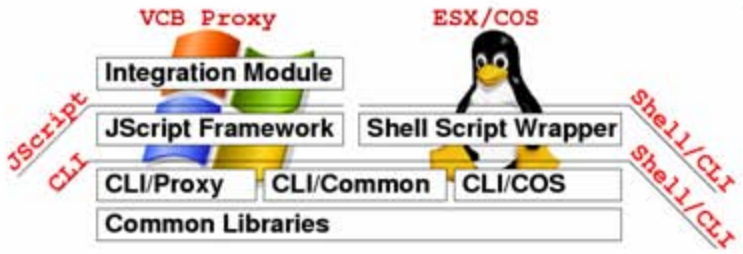
VCB: CLI/Common

- Platform-independent Command Line Utilities Available on Proxy/COS
  - `vcbVmName`
    - Search for VMs and obtain some basic configuration info.
  - `vcbSnapshot`
    - Create/Delete/Find/Get Properties for VM snapshots
  - `vcbMounter`
    - Get access to VM data to be backed up (the swiss army knife)
  - `vcbExport`
    - Export a disk from a VM snapshot



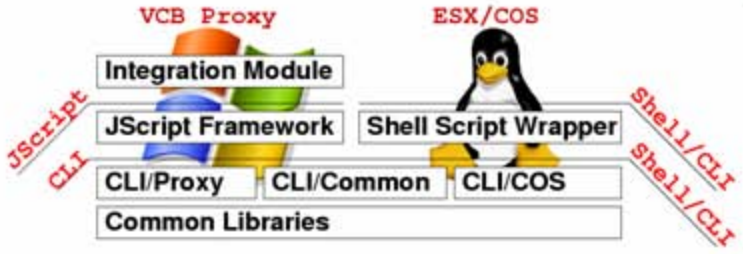
VCB: CLI/Proxy

- Command line utilities only available on the VCB proxy
  - > `mountvm`
    - Manually mount a VM's disk(s) ("loopback mount for VMDKs on Windows")



VCB: CLI/COS

- Command Line Utilities only available on ESX/COS
  - > `vcbRestore`
    - Restore a virtual machine backed up by VCB or on ESX 2.5.x
  - > `vcbUtil`
    - Query some info from VC required for restoring a VM to a different Resource Pool or a different location



Using VCB Command Line Utilities

- Allows you to do “non-standard things”
- Interface similar on Proxy and ESX/COS
- Not all commands available on both (CLI/COS, CLI/Proxy)
  - mountvm only on Proxy
  - vcbRestore, vcbUtil only on ESX/COS
  - On ESX/COS, vcbMounter can only do full VM backups

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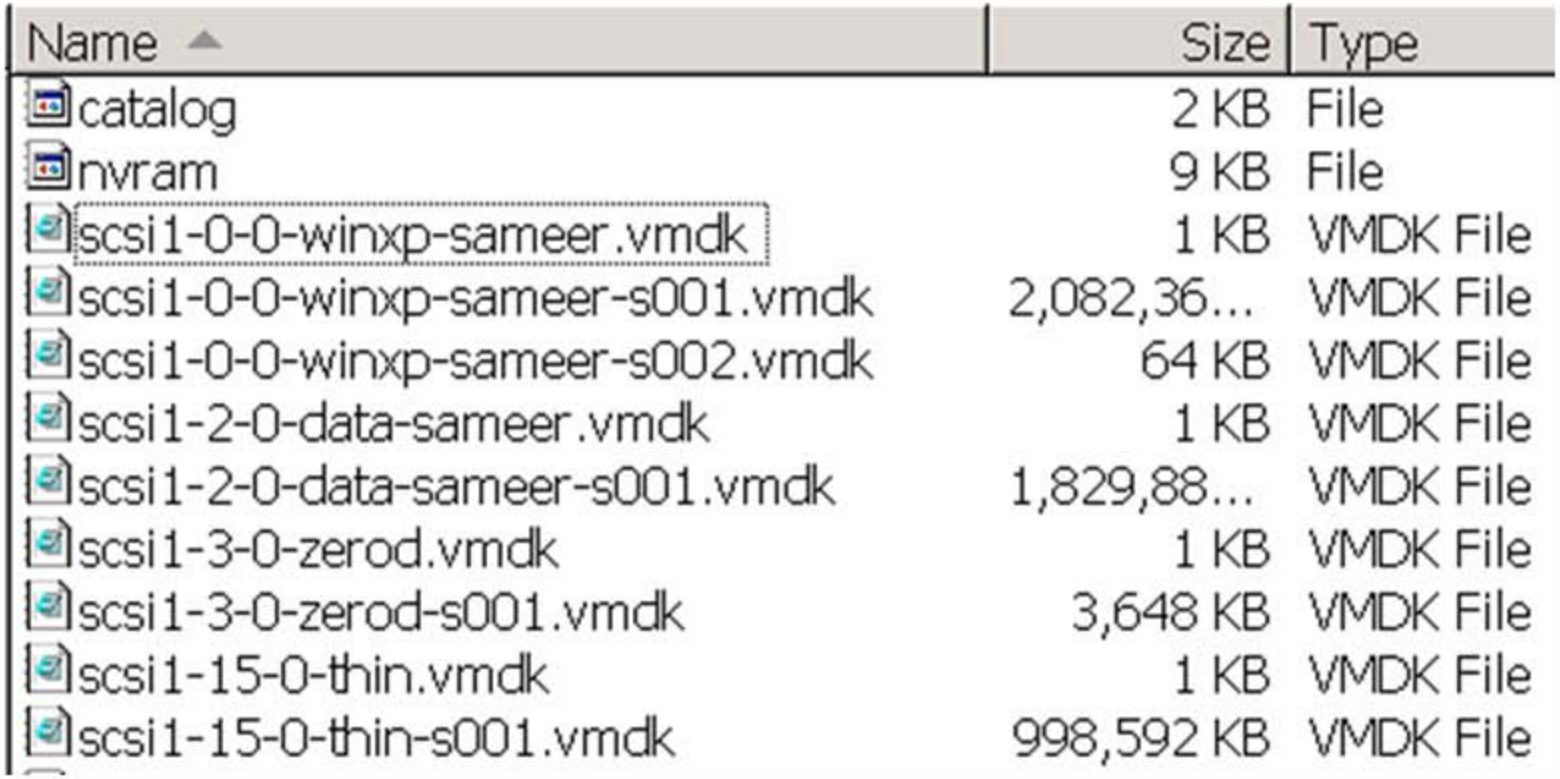
Project #1: Single File Restore

- Q: Can I get to individual files from a full VM backup?
- A: Yes, (for Windows). -- You can use VCB's "mountvm" utility to mount the file system(s) inside your .vmdk files

Project #1: Single File Restore

- Let's have a look at a full VM Backup:



Name	Size	Type
catalog	2 KB	File
nvram	9 KB	File
scsi1-0-0-winxp-sameer.vmdk	1 KB	VMDK File
scsi1-0-0-winxp-sameer-s001.vmdk	2,082,36...	VMDK File
scsi1-0-0-winxp-sameer-s002.vmdk	64 KB	VMDK File
scsi1-2-0-data-sameer.vmdk	1 KB	VMDK File
scsi1-2-0-data-sameer-s001.vmdk	1,829,88...	VMDK File
scsi1-3-0-zerod.vmdk	1 KB	VMDK File
scsi1-3-0-zerod-s001.vmdk	3,648 KB	VMDK File
scsi1-15-0-thin.vmdk	1 KB	VMDK File
scsi1-15-0-thin-s001.vmdk	998,592 KB	VMDK File

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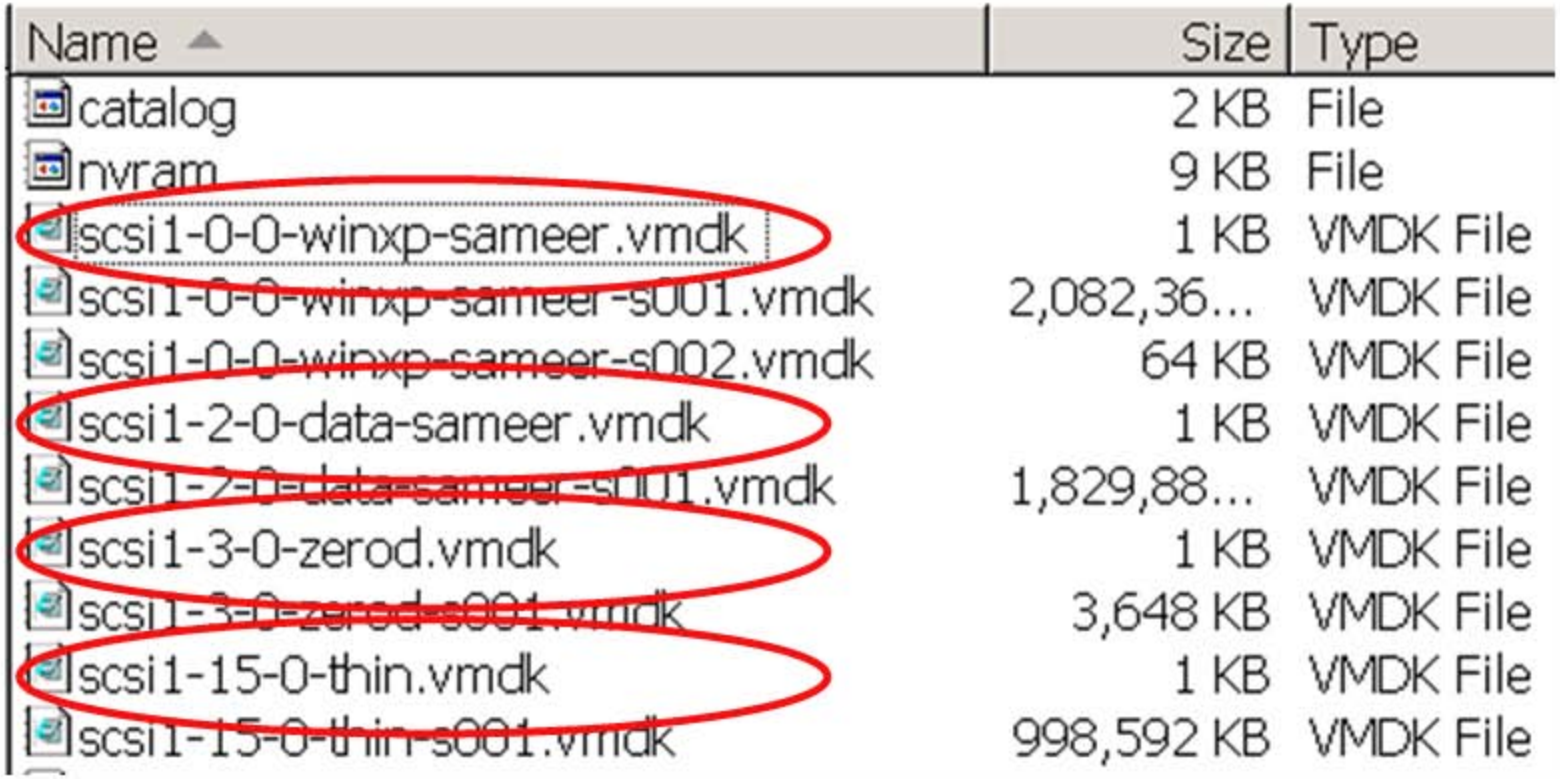

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Project #1: Single File Restore

- Let's mount the disks:

```
mountvm
   -d e:\mnt\newtest\scsi1-0-0-winxp-sameer.vmdk
   -d e:\mnt\newtest\scsi1-2-0-data-sameer.vmdk
   -d e:\mnt\newtest\scsi1-3-0-zerod.vmdk
   -d e:\mnt\newtest\scsi1-15-0-thin.vmdk
   -cycleId e:\mnt\vm37
```

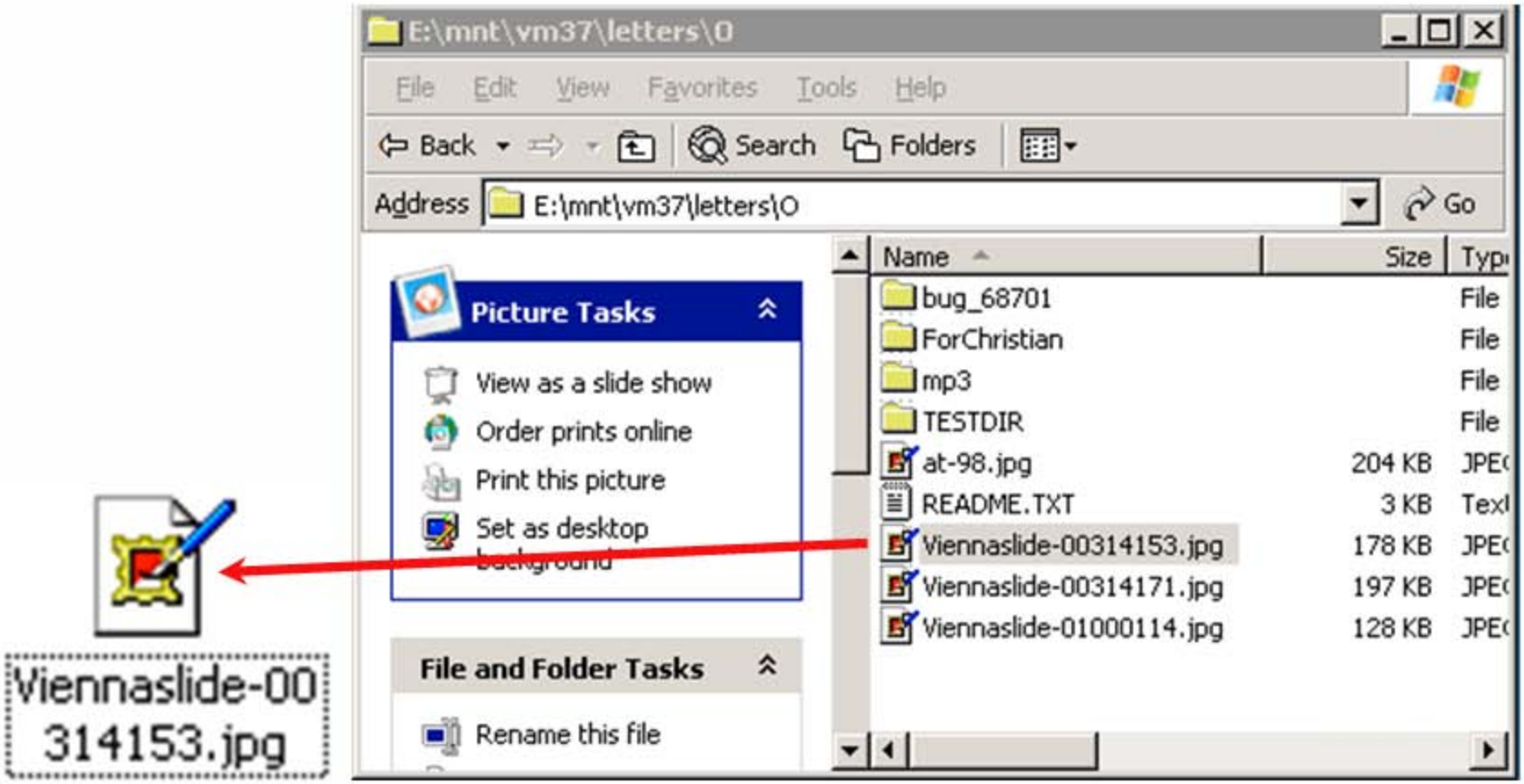
- Must use absolute path to disk!
- If you have multiple bootable volumes: Specify actual boot drive first
- cycleID: Override GUIDs on disks (cloned VMs)
- Specify mount point

Project #1: Single File Restore

- What you get:
- ```
  Opened disk: e:\mnt\newtest\scsi1-0-0-winxp-sameer.vmdk
  Opened disk: e:\mnt\newtest\scsi1-2-0-data-sameer.vmdk
  Opened disk: e:\mnt\newtest\scsi1-3-0-zerod.vmdk
  Opened disk: e:\mnt\newtest\scsi1-15-0-thin.vmdk
  Proceeding to analyze volumes
  Done mounting
  Volume 1 mounted at e:\mnt\vm37\digits\1 (mbSize=2039
  fsType=NTFS )
  Volume 2 mounted at e:\mnt\vm37\digits\2 (mbSize=1997
  fsType=NTFS )
  Volume 3 mounted at e:\mnt\vm37\digits\3 (mbSize=98
  fsType=NTFS )
  Volume 4 mounted at e:\mnt\vm37\digits\4 (mbSize=1021
  fsType=NTFS )
  Volume 1 also mounted on e:\mnt\vm37\letters\C
  Volume 2 also mounted on e:\mnt\vm37\letters\O
  Volume 3 also mounted on e:\mnt\vm37\letters\E
  Volume 4 also mounted on e:\mnt\vm37\letters\Z
  ```
  ```

Project #1: Single File Restore

- Now Copy Files:



Project #1: Single File Restore

- Finally Unmount:
- ```
  mountvm -u e:\mnt\vm37
  Unmounted e:\mnt\vm37\digits\1\ (formatted)
  Unmounted e:\mnt\vm37\digits\2\ (formatted)
  Unmounted e:\mnt\vm37\digits\3\ (formatted)
  Unmounted e:\mnt\vm37\digits\4\ (formatted)
  Deleted directory e:\mnt\vm37\digits\1\
  Deleted directory e:\mnt\vm37\digits\2\
  Deleted directory e:\mnt\vm37\digits\3\
  Deleted directory e:\mnt\vm37\digits\4\
  Deleted directory e:\mnt\vm37\digits\
  Deleted directory e:\mnt\vm37\letters\C\
  Deleted directory e:\mnt\vm37\letters\E\
  Deleted directory e:\mnt\vm37\letters\O\
  Deleted directory e:\mnt\vm37\letters\Z\
  Deleted directory e:\mnt\vm37\letters\
  Deleted directory e:\mnt\vm37
  ```
  ```

Project #1: Single File Restore

- Now let's automate this:
  - A simple shell script can be used to automate this:
    `fullmount e:/mnt/newtest e:/mnt/vm37`
  - Mounts a VCB backed up full VM
    You specify: Directory containing VM
    Mount point (will be created)
  - Script (cygwin bash) is ~30LOC

Project #1: Single File Restore

```
#!/bin/bash

#Where to find "mountvm"
VCB_PATH="c:/Program Files/VMware/VMware Consolidated Backup"

# At first, find the full path to the base dir
BASEDIR="$1"
MOUNTPOINT="$2"
if [ "$BASEDIR" == "" -o "$MOUNTPOINT" == "" ] ; then
    echo "Usage: fullmount <dir> <mountpoint>" >&2
    echo "       <mountpoint> and <dir> must be an absolute path" >&2
    exit 1
fi

ls "$BASEDIR"/*.vmdk | grep -v -- -s[0-9][0-9]\*.vmdk\$ | \
(while read item
 do
     DISKS=$DISKS"-d "$item" "
 done
 "$VCB_PATH"/mountvm $DISKS -cycleId "$MOUNTPOINT"
)
rv=$?
if [ "$rv" != "0" ] ; then
    echo "Could not mount any .vmdk files from $BASEDIR" >&2
fi
exit $rv
```

Project #1: Single File Restore

- This is powerful stuff, let your imagination go wild!
  - Automatically mount/retrieve specified set of files/unmount
  - Run virus checker on exported disks (mountvm -rw -persistent options)
  - …

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Sample Project: Back up Individual Disks

- Q: I want an image backup of my bootdisk only using VCB, but a full VM backup always exports all the disks. How can I do this with VCB?
- A: Yes. But you have to do a little (more) scripting:
  - Use vcbVmName to get VM's ID
  - Use vcbSnapshot to create snapshot
  - Use vcbSnapshot to get list of disks in snapshot
  - Use vcbExport to export desired disks
  - Use vcbSnapshot to remove snapshot

Sample Project: Back up Individual Disks

- Script (bash/cygwin) is ~100LOC
- Runs on both the COS and the VCB proxy!
- Example:

```
export_disk vcserver.company.com
   vcbuser vcbPasswd name:Sameer
   scsi1.0 bootdisk.vmdk
```

- Example exports disk that is mapped to SCSI adapter #1, target #0 in the guest
- Disk is exported to "bootdisk.vmdk"
- Done by using VCB command line utilities and parsing their output

Sample Project: Back up Individual Disks

```
#!/bin/bash

export HOST="$1"
export USER="$2"
export PASSWD="$3"
VM_ID="$4"
DISK_ID="$5"
export DEST_NAME="$6"

export VCB_PATH="c:/ceci/vcb"
VM_CACHEFILE="$VCB_PATH"/vmName.cache
SNAPSHOT_NAME="_VCB-DEMO_"

function export_disk
{
    source="$1"
    dest="$2"

    echo exporting $1 to $2
    if [ `uname` == Linux ] ; then
        # running on the COS
        path=`echo ${source#*]}`
        datastore=`echo ${source%]*} | sed s@[@@`
        source="/vmfs/volumes/${datastore}/${path}"
    else
        # running on Proxy
        source="blklst://${SSID}${source}@${HOST}?${USER}/${PASSWD}"
    fi
    "$VCB_PATH/vcbExport" -d "$dest" -s "$source"
}

# Get VM's MoRef
echo "Searching for VM..."
VM_MOREF=`"$VCB_PATH"/vcbVmName -h "$HOST" -u "$USER" -p "$PASSWD" \
          -c "$VM_CACHEFILE" -s "$VM_ID" | grep "^moref:" | tr -d \\\r`
if [ "$VM_MOREF" == "" ] ; then
    echo "Cannot find VM specified by $VM_ID" >&2
    exit 1
fi
echo Found VM: $VM_MOREF
```

```
# Create VM snapshot for backup
echo Creating Snapshot
SSID=`"$VCB_PATH"/vcbSnapshot -h "$HOST" -u "$USER" -p "$PASSWD" \
      -c $VM_MOREF "$SNAPSHOT_NAME" "VCB Demo" | grep -i "^ssid:" | \
      tr -d \\\r`
# remove prepended "ssid:"
SSID=${SSID#*:}
if [ "SSID" == "" ] ; then
    echo "Cannot create VM snapshot" >&2
    exit 2
fi
export SSID
echo Snapshot created

echo "Starting disk export"
# get list of disks
"$VCB_PATH"/vcbSnapshot -h "$HOST" -u "$USER" -p "$PASSWD" \
      -l $VM_MOREF ssid:$SSID | grep "^scsi" | tr -d \\\r | \
(
 while read item
 do
    if [ "${item%%:*}" == "${DISK_ID}" ] ; then
        # We found the disk to export
        export_disk "${item#*:}" "${DEST_NAME}"
    fi
 done
)

if [ ! -f "${DEST_NAME}" ] ; then
    echo Disk Export failed >&2
    result=5
else
    result=0
fi

echo "Removing Snapshot"
#Remove snapshot
"$VCB_PATH"/vcbSnapshot -h "$HOST" -u "$USER" -p "$PASSWD" \
      -d $VM_MOREF ssid:$SSID
rv=$?
if [ "$rv" != "0" ] ; then
    echo "Could not remove snapshot" >&2
    result=3
else
    echo "Snapshot removed"
fi
exit $result
```

Q&A

Presentation Download

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/

Enter the following to download (case-sensitive):

Username: cbv_rep
Password: cbvfor9v9r

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