Tivoli Storage Manager
Lunch and Learn
Bare Metal Restore
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Agenda

- Bare Metal Restore Basics
- Windows Automated System Recovery (ASR) with TSM
- ASR Sample Screens
- TSM for System Backup and Recovery (Sysback) Overview
Bare Metal Restore Basics

What is Bare Metal Restore?

- Restore from a catastrophic failure of the client system
  - Boot disk failure
  - Loss of entire client system
- Client operating system functionality is destroyed
- Usually restoring to new hardware
  - Disk replacement
  - Entire client system replacement
- May be considerations for your disaster recovery / business continuance plan
Bare Metal Restore Basics

Performing a bare metal restore

- The basic procedure:
  - Repair or replace the failing hardware
  - Reinstall basic operating system support
  - Reinstall network connectivity to the TSM server
  - Reinstall the TSM client
  - Restore, via TSM, the boot and system partitions
  - Reboot the system
  - Restore, via TSM, any non-system data
- The specific procedure will be different depending on the OS platform
- Some operating systems make the job easier with utilities that help
Bare Metal Restore Basics

Considerations

- Develop a bare metal restore plan for all your client types
  - Need a different plan for each OS platform type
  - Consider different types of clients and their associated data – domain servers, database management systems, mail systems, directory services
  - Know what hardware will be available and plan for any differences
- It’s essential that you practice your bare metal restore plan
  - Uncover any hidden roadblocks
  - Refine the restore plan
  - Test performance
Bare Metal Restore with Automated System Recovery (ASR)

Overview

- New function provided by Microsoft for Windows XP and Windows 2003 Server
  - Provides for restore in the event of a catastrophic system or hardware failure
  - Goal is to return the operating system to the point of last backup – not for restore of application or user data
- Implemented in TSM 5.2 Backup/Archive Client
  - Invokes the new Windows API calls
  - Restores the operating system files and system state data
- This is a “last-ditch” effort to be used after all other recovery options have failed
Bare Metal Restore with Automated System Recovery (ASR)

Hardware Requirements

- The hardware of the target system must be identical to the original system except for hard disks, video cards or network cards
  - Any hardware changes must be manually configured
- The target system must have the same number of disks as the original
  - The size of each disk must be greater than or equal to the original
- All disks must have 512 byte sectors
- All ASR recoverable disks must be accessible
- ASR configuration files must be accessible from a local floppy disk
- The floppy disk and the CD-ROM drives cannot be external PCMCIA connected
- The original system (and target) must be x86 or Itanium machines
- All basic volumes in the original system must be simple
  - Non-simple volumes are not supported – mirrored volumes must be dynamic
Bare Metal Restore with Automated System Recovery (ASR)

Software Requirements

- Windows XP or Windows 2003 Server only
  - No plan to retrofit to Windows 2000
- For Windows XP Service Pack 1 (SP1) you must use an integrated (slipstream) installation CD
  - You cannot recovery SP1 with a base level CD
- The TSM client used in the ASR restore must at the same level or higher than the TSM client used to make the ASR backup
- The TSM client must be a the 5.2.0 or newer level
- For restore of Windows 2003 Server the TSM server must be at the 5.2.0 or newer level
Bare Metal Restore with Automated System Recovery (ASR)

Preparation

- You should complete these steps before the failure occurs:
  - Create the ASR recovery diskette for each client – use the TSM GUI client or the TSM Command Line client
  - Successfully complete TSM incremental backup of the client system – including boot drives
  - Backup of System State (Windows 2003) or System Objects (Windows XP) using TSM
  - Create Windows slipstream installation CD or obtain base level installation CD
  - Create the TSM client installation CD – write the TSM client in packaged-for-the-web (self extracting single file) format onto a CD
Bare Metal Restore with Automated System Recovery (ASR)

**Preparation (cont.)**

- You should complete these steps before the failure occurs:
  - Prepare a network connection to the target system supporting DHCP – DHCP is required for network connection to the TSM Server
  - OR
  - Generate TSM backupsets for local restore (place them on CD’s) of the system and boot drives
  - Obtain the TSM client node name and password
  - (Optional) Enable the Windows Recovery Console security on the client system
    - Allows access to all paths and removable media
    - Can be used to facilitate easier problem determination in the event of recovery errors
    - Permissions must be set before attempting an ASR recovery
Bare Metal Restore with Automated System Recovery (ASR)

Restore Process - Overview

- Insert the Windows installation CD into the CD-ROM drive
- Restart the system and boot from CD
  - You may need to do some BIOS configuration
- Press F2 to enter ASR recovery mode
- Insert the TSM-created ASR diskette (label TSMASR) into the floppy drive
  - Windows will read the diskette and then reformat the boot partition and possibly other partitions
  - Windows will copy installation files to the hard drive
- Insert the TSM client installation package CD (labeled TSMCLI) into the CD-ROM drive
  - The TSM client installation package will copied to the hard disk
- Insert the ASR diskette into the floppy drive (if not already there)
  - Windows copies TSM files from the diskette
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Restore Process – Overview (Cont.)

- Remove the diskette and the system reboots
- Insert the Windows install CD into the CD-ROM drive
- After the Windows setup completes, two command windows are opened
  - One runs the TSM client silent install
  - One is available for diagnostic purposes
- You will be prompted to choose either network connected restore from the TSM server or local backupset restore
- Restore from TSM server requires node name and password
- Restore from backupset requires the path and name of the local backupset – you will be prompted when subsequent volumes are needed
- TSM restores the system state or system objects
- TSM restores the system drive (partition)
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Restore Process – Overview (Cont.)

- Remove the TSMASR diskette and the machine reboots
  - The operating system comes up in fully recovered state
- Restore user data and applications
  - Use traditional TSM restore facilities
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*Use the TSM GUI to Backup the ASR files*
Bare Metal Restore with Automated System Recovery (ASR)

*Use the TSM GUI to Create the ASR Diskette*
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Considerations for Creating the ASR Diskette

- You must perform a backup of the ASR files before you perform the incremental backup of the system and boot drives
  - BACKUP ASR
  - Backup of System Objects or System State will backup ASR files
  - Use QUERY BACKUP C:\WINDOWS\REPAIR\*.ASR to verify that ASR files have been backed up
- The volume label of the ASR diskette must TSMASR
- It is possible to create the ASR diskette after the failure has occurred
  - Go to another Windows system
  - Launch the TSM Client with the virtualnode option and specify the nodename of the failed system
  - Use the GUI or command line to create the ASR diskette
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Performing the Restore

- Boot from install CD
- You can interrupt the process here to install any specialized disk driver(s) that may be required
- You would do this if you have disk that would need drivers not available on the installation CD
Bare Metal Restore with Automated System Recovery (ASR)

Performing the Restore

- F2 here will start the ASR restore process
- You will be prompted to insert the ASR diskette
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Performing the Restore

- Windows formats the boot volume and may reformat other partitions if the layout is different than the original system.
- Windows will also check the system drive.

![Windows XP Professional Setup](image)
Bare Metal Restore with Automated System Recovery (ASR)

Performing the Restore

- Windows copies files from the installation CD
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Performing the Restore

- Insert the TSM Client installation CD when prompted
- You must make this CD
- The CD contains the TSM client in package-for-the-web format
- Single self-extracting installation package available via ftp
- The filename of the package must be TSMCLI.EXE
- The volume label of the CD must be TSMCLI
- The TSM client installation package is copied to a temporary directory on the hard disk
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Performing the Restore

- You will be prompted to insert the TSMASR diskette again.
- The diskette may be still in the drive.
- The ASR files are copied to a temporary directory on the hard disk.
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Performing the Restore

- You will be prompted to remove the diskette before the system reboots
- The text-mode portion of the setup has completed
Bare Metal Restore with Automated System Recovery (ASR)
Performing the Restore

- After reboot, you enter the GUI mode of setup
- You will be prompted to insert the Windows installation CD
- A command window will be opened and the TSM portion of the restore begins
- The TSM client is silently installed
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Performing the Restore

- You are prompted to choose either restore from network connected TSM server or from a local backupset.
- If restoring from the TSM server, you must have a DHCP supported connection and you must know the TSM nodename and password.
- If restoring from a local backupset, you must know the path and name of the backupset files – you will be prompted for each volume.
Bare Metal Restore with Automated System Recovery (ASR)

Performing the Restore

- The TSM client connects to the TSM server and restores the boot and system drives and restores the system objects or system state.
Bare Metal Restore with Automated System Recovery (ASR)  

Performing the Restore

- After the TSM restore completes, the system reboots
Bare Metal Restore with Automated System Recovery (ASR)
Performing the Restore

- The system comes up fully restored at the operating system level
- You can now perform any application level restores using traditional TSM facilities
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*Diagnosing Problems*

- TSMASR.CMD launches secondary command window (minimized) for debugging use
- Do not close the main TSMASR.CMD window. Causes ASR process to exit.
- Use TRACEFLAGS WIN2K and SYSTEMOBJECT
- TSMASR.OPT file on diskette can be modified prior to use to include tracing.
  - Can redirect output to floppy or to a directory accessible from the recovery console
- TSMASR.CMD file on diskette can be modified prior to use to include additional diagnostic commands
- Restore performance can be improved via QUIET option in tsmasr.opt or by minimizing/covering main tsmasr.cmd window.
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Diagnosing Problems – Recovery Console

- If ASR fails and you cannot reboot the system, you can boot the operating system from CD and use recovery console to gather diagnostic data (Specify “R” at setup prompt)
- Note that the administrator password may be blank if TSM restore fails prior to registry commit.
- The recovery console does not grant full access to all directories. That’s why ASR installs TSM in %SystemRoot%\temp\~tsmasr.
- Use MORE and TYPE commands to display file contents to console.
- Copy to removable drives may not work depending on security settings.
Bare Metal Restore with Automated System Recovery (ASR)

Reference Information

- **Tivoli Field Guide**
  - Using Microsoft Windows Automated System Recovery (ASR) to Recover Windows XP and Windows 2003 Systems with the IBM Tivoli Storage Manager Backup-Archive Client for Windows

- **Microsoft Knowledge Base articles**
  - 299044: How to Install Additional Files During Automated System Recovery
  - 314058: Description of the Windows XP Recovery Console

- **Creating Windows XP SP1 slipstream CD**
  - [http://www.windows-help.net/WindowsXP/winxp-sp1-bootcd.html](http://www.windows-help.net/WindowsXP/winxp-sp1-bootcd.html)

- **IBM Redbooks**
  - Disaster Recovery Strategies with Tivoli Storage Management - SG-24-6844
  - Windows NT Backup and Recovery with ADSM – SG-24-2231
  - ADSM Client Disaster Recovery - Bare Metal – SG-24-4880
  - Deploying the Tivoli Storage Manager Client in a Windows 2000 Environment – SG-24-6141
TSM for System Backup and Recovery (Sysback)

Overview

- Provides Full System (Installation Image), Volume Group, File System, Raw Logical Volume, and File / Directory backup & recovery levels for AIX
- Provides complete system recovery / re-installation from bootable backup
- Perform Full or Incremental Backups
- Provides for the installation a Full System (Installation Image) backup on to a different machine of the same or different hardware architecture
- Utility to split AIX mirrors before SysBack backup
- Command line or easy to use SMIT interface
- Network boot - classic SysBack or integrated to AIX NIM
- New in TSM 5.1.5 – backup integration to TSM such that Sysback backup objects are sent directly to the TSM Server
TSM for System Backup and Recovery (Sysback)

Integration to TSM

- This feature will allow SysBack backups to be stored into a TSM server.
- Works with all 5 backup types locally or via remote push or remote pull.
- This functionality provides bare metal restore capabilities to TSM AIX systems.
- Only the Full System (Installation Image) backup provides complete system recovery, aka the /usr/sbin/sysback command.
- Existing SysBack programs interface to the TSM API for backups to TSM.
TSM for System Backup and Recovery (Sysback)

New SysBack Commands

sbttsmdevice

sbttsmdevice [-a|-c|-l|-r|-S] [-n tsmvirdev][-s tsmserver][-p password]
- a → Adds a TSM virtual device (requires the –s and –p flags)
- c → Changes a TSM virtual device
    You can change the TSM server stanza being used or node password
- r → Removes a TSM virtual device
- S → Lists all TSM server stanza entries (taken from the dsm.sys file)
- l → Lists all TSM virtual devices
- n “tsmvirdev” → Specifies the TSM Virtual device (i.e tsm0 tsm1)
- s “tsmserver” → Specifies the TSM Server Stanza (from the dsm.sys file)
- p “password” → Specifies the Client Node password
TSM for System Backup and Recovery (Sysback)

New SysBack Commands

Sbtsmlist

```
sbtsmlist [-l|-r] [-n tsmvirdev][-a|-o][-m][-t S|V|L|F|D][-g id]
- l  → Queries TSM backups.
- r  → Removes a TSM backup by ID
- n “tsmvirdev” → Specifies the TSM virtual device
- a  → Displays all active backups (used with the –l flag)
- o  → Displays all open backups (used with the –l flag)
- t S|V|L|F|D → Displays “S” System “V” Volume group “L”
                  Logical volume “F” Filesystem or “D” File & Directory backups
                  (used with the –l flag)
- g id → Specifies the TSM backup id (Used with either the –l or
                  –r flags)
- m → Displays the management class bindings based on the
dsm.opt settings for the specified TSM virtual device.
```
TSM for System Backup and Recovery (Sysback)
New SysBack Commands

• **sbtsmnetfg**

  sbtsmnetcfg –h “hostname” –r ring –E entif –e entcon –p port –P
  password –d netdev –s srv_ip –g gate_ip –S submask –n node –a
  admin_id

  -h hostname → As defined /tftpboot/hostname.sbinfo host
  -r “ring” → Specifies token-Ring speed (TSM_RINGSPEED)
  -E “entif” → Specifies the ethernet Interface (TSM_ENTIF)
  -e “entcon” → Specifies the ethernet connection type (TSM_ENTCON)
  -p “port” → Specifies the TSM TCPPort, default is 1500 (TSM_PORT)
  -P “password” → Specifies either node or admin_id password
    (TSM_PASSWORD” )
  -d “netdev” → Specifies the network device (ie ent0, ent1, tok0, tok1….)
    (TSM_NETDEV)
  -s “srv_ip” → Specifies ipaddress of the TSM server system (TSM_SRV)
  -g “gate_ip” → Specifies the ipaddress of the client’s gateway (TSM_GATE)
  -S “submask” → Specifies the subnet mask of the client’s (TSM_SUBMASK)
  -n “node” → Specifies the TSM Client’s node name (TSM_NODE)
  -a “admin_id” → Specifies the TSM admin_Id (TSM_ADMIN_ID)
TSM for System Backup and Recovery (Sysback)

**Prerequisites**

- A previously configured TSM server must be at level 5.1.5 or higher
- The 32-bit TSM API client must be installed and at level 5.1.5 or higher
- The TSM node name used for the SysBack backups must be registered on the TSM server and configured to use passwordaccess generate
- Only JFS and JFS2 file systems are supported for all backup types
- The File / Directory backup type may also be used to backup CD-ROM and NFS file systems
- All backup, restore, list, verify, and query operations must be performed as the root user
TSM for System Backup and Recovery (Sysback)

Limitations

- SysBack should not be used to backup TSM HSM file systems.
- LAN Free backups are not supported.
- COMMMethod TCPIP is the only supported TSM communication method.
- Veritas and GPFS file systems are not supported.
- AFS and DFS file system structures can not be recreated from backups. If the root user has the appropriate AFS or DFS permissions, then SysBack can backup the data.
- Set compression options in TSM, not in SysBack.
- Define exclude lists in SysBack, not TSM
TSM for System Backup and Recovery (Sysback)

Sample Screens
TSM for System Backup and Recovery (Sysback)

Sample Screens
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Sample Screens
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Sample Screens
TSM for System Backup and Recovery (Sysback)
Sample Screens

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TSM for System Backup and Recovery (Sysback)

Sample Screens

```
COMMAND: mkdirback -fcmd -v -d 'test backup 1' /home/djdaun
STARTED: Jul 09 14:30:26  ENDED: Jul 09 14:30:38  STATUS: Successful


The total size is 921746 bytes.

Backup ended Wed Jul 9 14:30:36 2003
0 megabytes written to 1 volume.
```
TSM for System Backup and Recovery (Sysback)

Sample Screens
TSM for System Backup and Recovery (Sysback)

Sample Screens

![COMMAND STATUS]

Command: OK  stdout: yes  stderr: no

Before command completion, additional instructions may appear below.

<table>
<thead>
<tr>
<th>Backup ID</th>
<th>Type</th>
<th>Active?</th>
<th>Open?</th>
<th>Management Class</th>
<th>Backup Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10470414</td>
<td>FD</td>
<td>Yes</td>
<td>No</td>
<td>DEFAULT</td>
<td>07/05/2003 14:30:34</td>
</tr>
</tbody>
</table>

F1=Help  F2=Refresh  F3=Cancel  F6=Command
F8=Image  F9=Shell  F10=Exit  /=Find
n=Find Next

VT220  TCP/IP  18:42  11:42
TSM for System Backup and Recovery (Sysback)

Summary

- Expands greatly on basic mksysb function
- Can be used as a standalone backup/restore tool or in conjunction with TSM
- New integration to TSM centralizes backups
- Tivoli Roadmap shows possible migration to other Unix systems