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Technical Update for Tivoli Storage Manager v6

Ondřej Bláha
CEE+R Tivoli Storage Team Leader



Additional IBM TSM V6 Resources

- Support Technical Exchanges – technical reviews

http://www-01.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html

- ▶ IBM® Tivoli® Storage Manager (TSM) V6 Announcement Technical Overview (February 26, 2009)
 - ▶ Preparing for TSM V6 (March 19, 2009)
 - ▶ TSM V6 Database Upgrade Process & Strategies part1 (April 28, 2009)
 - ▶ TSM V6 Database Upgrade Process & Strategies part2 (May 1, 2009)
- TSM Version 6 Information Center – documentation downloads
<http://publib.boulder.ibm.com/infocenter/tsminfo/v6/index.jsp>
 - IBM Passport Advantage – product package downloads
<http://www-01.ibm.com/software/howtobuy/passportadvantage/>



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Discovering the Value of the IBM Tivoli Storage Manager v6 Product Family

Preparing for the Database (DB) Upgrade to TSM v6

Ondřej Bláha
CEE+R Tivoli Storage Team Leader



Software, Hardware and Documentation You Will Need to Review and Prepare for the Upgrade

1. READMEs for the DB Upgrade
2. DB Server Upgrade Guide (SC23-9554-00)
3. DB Server-Upgrade Utility Package (from the ftp site)
 - an upgrade utility version that is greater than, or equal to, the level of the TSM server you are upgrading, is required; eg: a TSM 5.5.2 Server requires TSM 5.5.2 Upgrade Utility or higher
 - ▶ <ftp://service.boulder.ibm.com/storage/tivoli-storage-management/maintenance/server-upgrade/>
4. TSM V6.1 Download from Passport Advantage or Product DVD Media
5. Storage Technical Exchange Website:
http://www-01.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html
6. TSM Wiki
<http://www.ibm.com/developerworks/wikis/display/tivolistorage/manager/Home>



Software, Hardware and Documentation You Will Need to Review and Prepare for the Upgrade - continued

7. Study the upgrade method alternatives and select 'best' match to your situation
8. Acquire and prepare any hardware required to support selected upgrade method
9. Backups of the current 5.5 environment
10. Test the Upgrade on Non-Production Systems Multiple Times
11. Create a Fallback Plan and Understand How to Execute It / Much Like Disaster Recovery (DR)
12. Estimate Your Outage and File a Change Request (5-10GB / Hr est.)
13. Upgrade One TSM Server at a Time / Library Manager Server is First
14. Execute an Operational Acceptance Plan to Verify the Upgrade's Success



What You Can and Cannot Do with TSM V6

- You :
 - ▶ **can** run multiple TSM / database instances on same OS image
 - ▶ **can** forget about having to do DB audits and off-line reorgs.
- You :
 - ▶ **CANNOT** use an existing IBM DB2® code install on the system (must use the DB2 that installs with the TSM server)
 - ▶ **CANNOT** use a DB2 from a remote system
 - ▶ **CANNOT** use Raw Logical Volumes (RLV) for the database and Log volumes (you can still use RLV for storage pool volumes)
 - ▶ **CANNOT** run multiple software levels of TSM on the same operating system (OS) instance.



What You Can and Cannot Do with the TSM DB Upgrade

- You **CAN**:

- ▶ run multiple TSM database upgrades at the same time, given you have enough resources
- ▶ use TSM export/import to go from V5.x to V6 to do the upgrade instead of using TSM DB Upgrade utilities (See slides 21+ for considerations)

- You **CANNOT**:

- ▶ change OS platforms with the upgrade (with a few exceptions)
- ▶ merge multiple TSM databases with the upgrade
- ▶ change OS platforms after the upgrade using DB2 export/import. (TSM export/import must still be used for this)



Upgrade Considerations (Library Managers)

- If you have a shared library configuration:
 - ▶ Upgrade the server that is the library manager first
 - ▶ Follow this by upgrading the library clients
 - ▶ Library clients must be at least level 5.5 or above for compatibility with V6 TSM Server.



Upgrade Considerations (Network Interfaces)

- Windows TSM Servers – if the TSM server being upgraded contains multiple Network Interfaces (NIC), it may be necessary to disable all of them except one in order to use the DB Upgrade Wizards. The NICs can be re-enabled after the DB upgrade has completed.



TSM Client/Server Compatibility

If you have a TSM client at this Level:	It is compatible and is supported with these TSM Servers/Storage Agents Levels
Tivoli Storage Manager Version 6	Versions 6, and 5.5
Tivoli Storage Manager Version 5.5	Versions 6, 5.5 and 5.4
Tivoli Storage Manager Version 5.4** <ul data-bbox="280 1178 1709 1263" style="list-style-type: none">**5.4 clients do NOT include the special 5.3.6-level clients (Window 2000, Solaris 8, and Linux x86 RHEL 3)	Versions 6, 5.5 and 5.4



TSM Storage Agent Compatibility

If you have a TSM Server at this level:

It is compatible and is supported with these TSM Storage Agent Levels

Tivoli Storage Manager Version 6

Versions 6, 5.5 and 5.4



Preparation for DB Upgrade Process

- Source system should be at least TSM 5.3 level for testing the DB upgrade.
 - ▶ If TSM is at 5.5.x, then server can be restarted after PREPAREDB is run in case some kind of corrective action is needed.
- Software/Documentation to download:
 - ▶ Database upgrade utility (installed on the source system.)
 - ▶ README for database upgrade
 - ▶ Database Upgrade Guide
- Do you have any event retention data? (see following slide)
- System should meet the requirements for memory, disk, etc. outlined in the READMEs.
- **Might** want to consider doing a TSM DB re-org to improve upgrade time. (optional) Note that an unload/load itself requires downtime.



TSM V6 Install / Upgrade FAQs

- ▶ I am currently running my TSM Server on a 32-bit Windows® platform. Can I move to a 64-bit platform as part of the V6 upgrade?
 - Yes



TSM V6 DB Upgrade FAQ

- ▶ How large will the TSM V6 DB be after the upgrade has completed?
 - During the beta, over 200 customers participated and approximately 80 databases were tested with the upgrade process across multiple platforms. In general, the DB size after the upgrade was completed was roughly the same size. For planning purposes, customers should use a value of 1/3rd larger than the original utilized space value of their database.



TSM V6 DB Upgrade FAQ

- ▶ What do I need to do if I need to restart the upgrade process?
 - The upgrade process is **not** checkpoint restartable. If for any reason the process fails or is cancelled, it needs to be restarted from the beginning.
 - If you are using the extract to media method for upgrade and have completed the extract, you can restart the upgrade from the insertdb step after cleaning up directories and reformatting the DB:
 - db2 start database manager
 - db2 drop db TSMDB1
 - Clean up directories, logs, database backups



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Upgrade Method Options for TSM V6

Ondřej Bláha
CEE+R Tivoli Storage Team Leader



Upgrade Methods

- The following methods can be used to upgrade a TSM 5.x DB to TSM V6:
 1. Upgrade to new system, using external media
 2. Upgrade to new system, using network
 3. Upgrade in place (on same system), using external media
 4. Upgrade in place (on same system) using network
 5. TSM Export/Import from 5.x -> 6.1
 - TSM Export/Import supported from 5.x -> V6 (server-to-server or external media to new system only)
 - Not backward compatible. (V6 -> 5.x export/import is **not** supported)
 - See considerations for use of export/import on slide 26.



Upgrade Methods

- If you are upgrading the DB and not doing TSM Export/Import, you have 2 choices:
 - ▶ Upgrade using command line utilities
 - DB2 utilities
 - Dsmupgrd preparedb, dsmupgrd extractdb, dsmserv insertdb
 - ▶ Upgrade using DB Upgrade Wizards
 - **Highly** recommended to use these
 - Less complex than command line utilities
 - Not only is the DB upgrade done, but the ability to do DB Backups is also mostly configured.
 - Wizard will also create & configure your server/database instance for you prior to doing the upgrade
 - Wizards are supported on all TSM Server platforms



Why use TSM Export/Import instead of the DB Upgrade Utilities?

- You may have applications that require 100% uptime of TSM.
 - ▶ You may need to use TSM Export/Import if:
 - you are using a DP Agent that needs to backup transaction logs before DB insert process has finished.
 - You have a TSM Server that has 24x7 requirements for data restores and backups
 - You want to selectively move just certain nodes to a new V6 system and leave other nodes on a TSM V5 system
 - You are using Tivoli Continuous Data Protection for Files to back up to a TSM Server.
 - You are using Content Management software
 - You are using Space Manager (TSM Hierarchical Storage Manager - HSM)
- TSM Export/Import can be used while TSM 5.x server is still running. (Nodes being moved to new server should be disabled while export/import is running.)
- See Considerations for use on slide 26



Considerations for use of Export/Import for Upgrade to V6

- Consider carefully the case of using Export/Import vs. DB Upgrade.
 - ▶ TSM Export/Import in benchmarks was slower in V6 than in previous releases.
 - ▶ May want to consider instead leaving TSM V5 server as is, and starting over with new V6 server if you have conditions noted on previous slide.



Phases of the Database (DB) Upgrade Process

Phase	Notes
DB Backup (Occurs on Source Server)	
DSMUPGRD PREPAREDB (Occurs on Source Server)	<p>Prepares 5.x DB for upgrade, Does the following:</p> <ol style="list-style-type: none">1. Does an upgrade of DB to 5.5.2. Checks for known Database problems.3. USSFILESPACE conversion status4. Tests for presence of NDMP backups with TOCs, backupsets.5. Backs up devconfig file to configured devconfig files. <p>Should finish in a few minutes</p>

Phases of the DB Upgrade Process

Phase	Notes
DSMUPGRD EXTRACTDB (Occurs on Source Server)	Extracts DB to either media or sends it over the network. If writing to media, this step takes about as long as a DB Backup. If writing to network, it depends on network speed or speed of insertdb process.
DSMSERV LOADFORMAT (Occurs on Target Server)	Creates the instance, Initializes the new DB, and does an initial backup of the new DB. This step takes ~ 5-10 minutes.
DSMSERV INSERTDB (Occurs on Target Server)	Inserts information into DB using the DB2 load utility. Speed is hardware dependent. See performance section. .Expect 5 GB/hr for this part

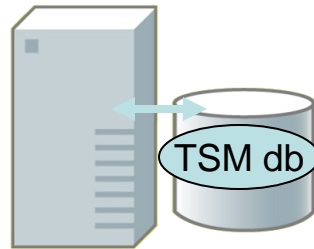


Phases of the DB Upgrade Process

Phase	Notes
DSMSERV INSERTDB Integrity Check (Occurs on Target Server)	Builds the table Indices and verifies the integrity of the tables. This phase may take as long as the previous phase.
DSMSERV INSERTDB Update phase (Occurs on Target Server)	The update phase updates selected records in the TSM 6 database to conform to the requirements of TSM 6. Mostly used to merge information from multiple TSM 5.5 tables into a single TSM 6 table. Again, this phase takes about as long as the previous insertdb phases.

Upgrade to New System External Media

Source Server
TSM Server



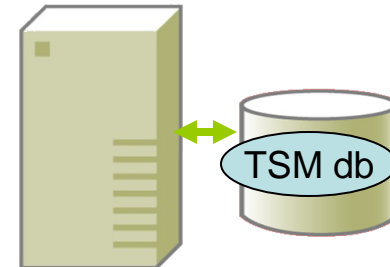
TSM 5.x



or



Target Server
New TSM Server



TSM 6.1.0.0
DB2 V9.5

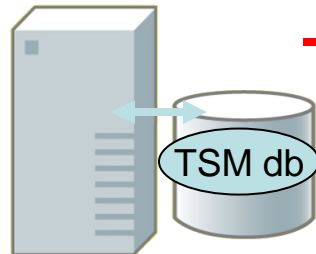
1. Dsmupgrd preparedb
2. dsmupgrd extractdb

3. Install TSM 6.1
4. dsmserv loadformat
5. dsmserv insertdb manifest

Extractdb/dsmserv insertdb

Upgrade to New System Network

Source Server
TSM Server

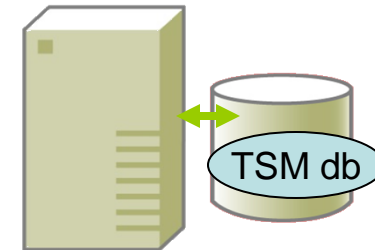


TSM 5.x

1. Dsmupgrd preparedb

4b. dsmupgrd extractdb

Target Server
New TSM Server



TSM 6.x
DB2 V9.7

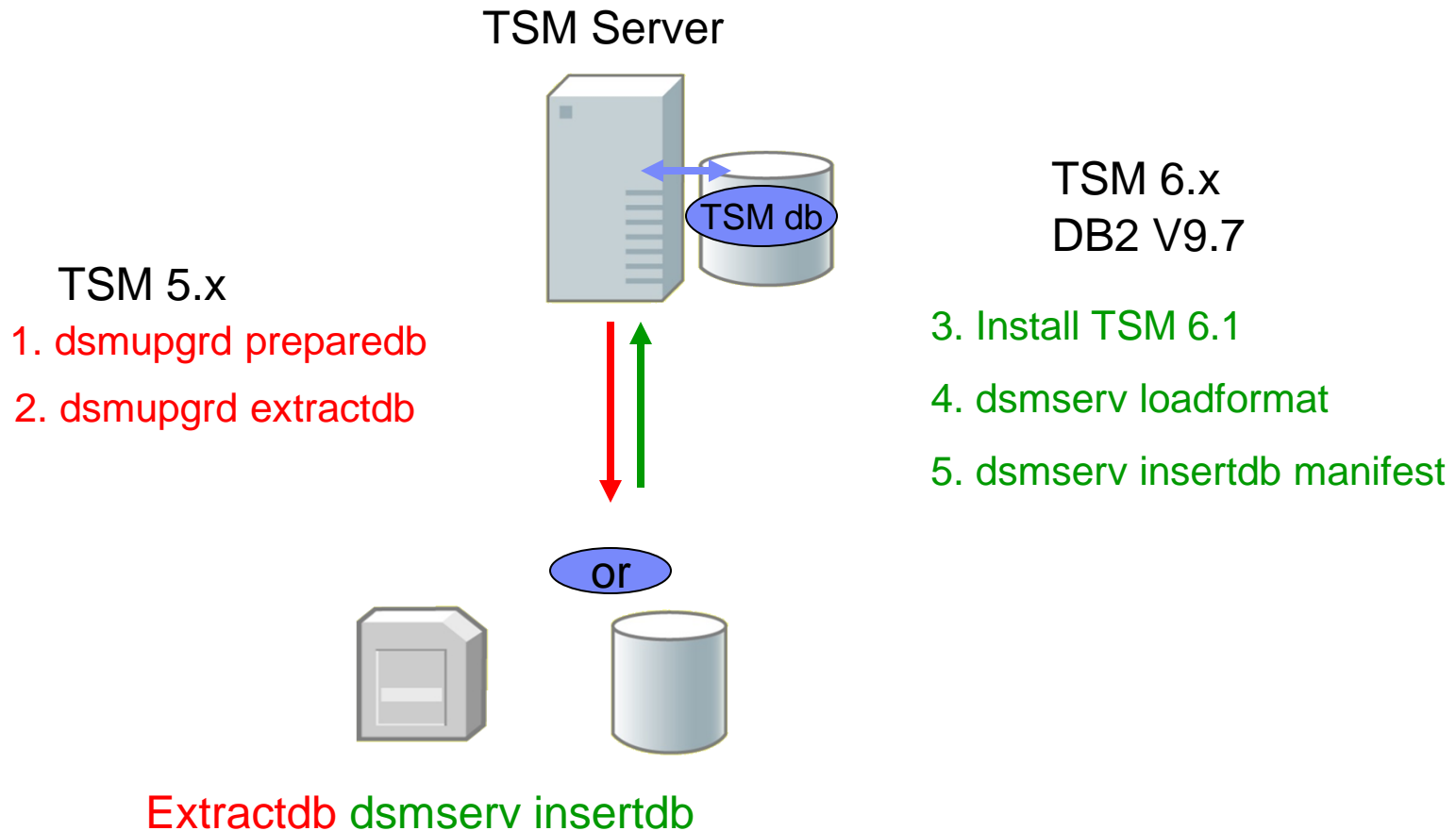
2. Install TSM 6.1

3. dsmserv loadformat

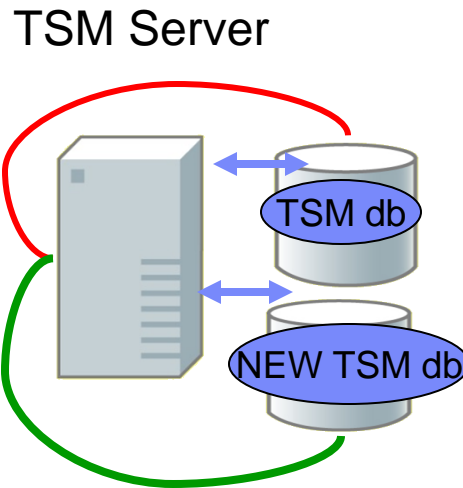
4a. dsmserv insertdb

Extractdb/dsmserv insertdb

Upgrade In-Place Process External Media



Upgrade In-Place Process Network



TSM 5.x

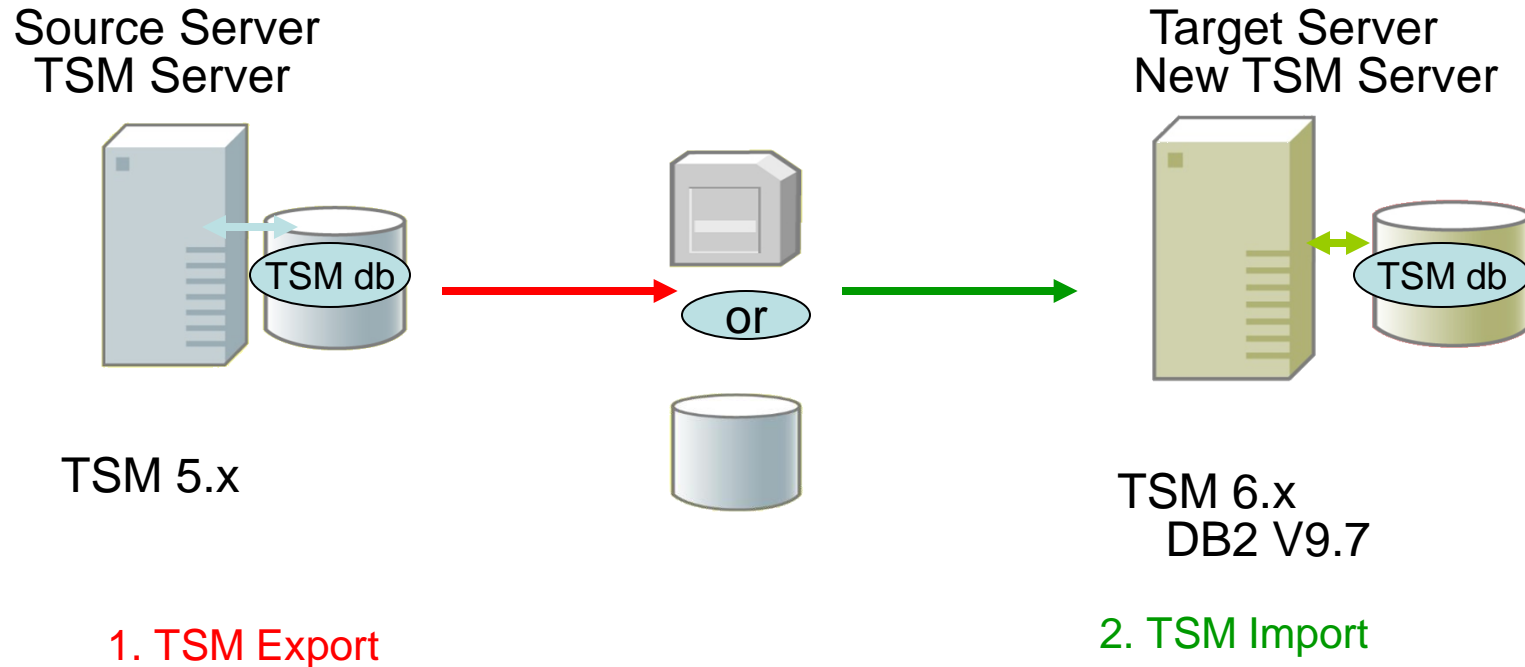
1. Dsmupgrd preparedb
- 4b. dsmupgrd extractdb

TSM 6.x

2. Install TSM 6.1
3. dsmserv loadformat
- 4a. dsmserv insertdb

Extractdb dsmserv insertdb

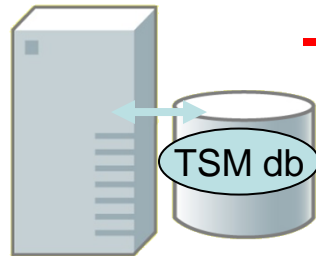
TSM Export/Import to New System Process (External Media)



TSM Export/Import done in separate steps

TSM Export/Import to New System Process (Server-to-Server)

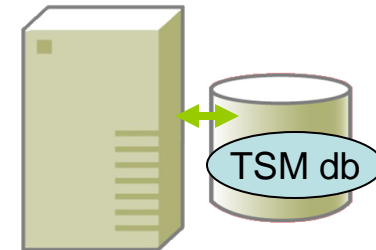
Source Server
TSM Server



TSM 5.x

1. TSM Export

Target Server
New TSM Server



TSM 6.x
DB2 V9.7

2. TSM Import

Server-to-Server

Export/Import done with Server-to-Server Connection

Why Use the DB Upgrade Wizards?

- They **greatly** simplify the upgrade process. Here is a **portion** of the process flow for one of the upgrade methods (upgrade to new system using network) after V6 install completed for AIX:
 1. Set up environmental variables for dsmupgrd utilities.
 2. Run the dsmupgrd preparedb command on source TSM 5.x system, check for errors.
 3. Create the userid, groups, instance directories, DB/LOG for the instance.
 4. Login and reset the password for the instance userid
 5. For all the directories that were created, Ensure the access permissions are set correctly
 6. Change the access permissions for the storage disk pools so that the instance ID can write to them



Why use the DB Upgrade Wizards?

7. Create the DB2 instance using the db2icrt command (under root)
8. Logoff, Login to the instance ID
9. Format the new database using dsmserv loadformat, check for errors
10. Start the insert process on target server (dsmserv insertdb), wait for message ANR1336I indicating source server can be started.
11. When ANR1336I issued, now start source server (dsmupgrd extractdb)
12. Monitor for completion, and then check for errors.
13. If all completes correctly, now configure DB backup for TSM V6.

....

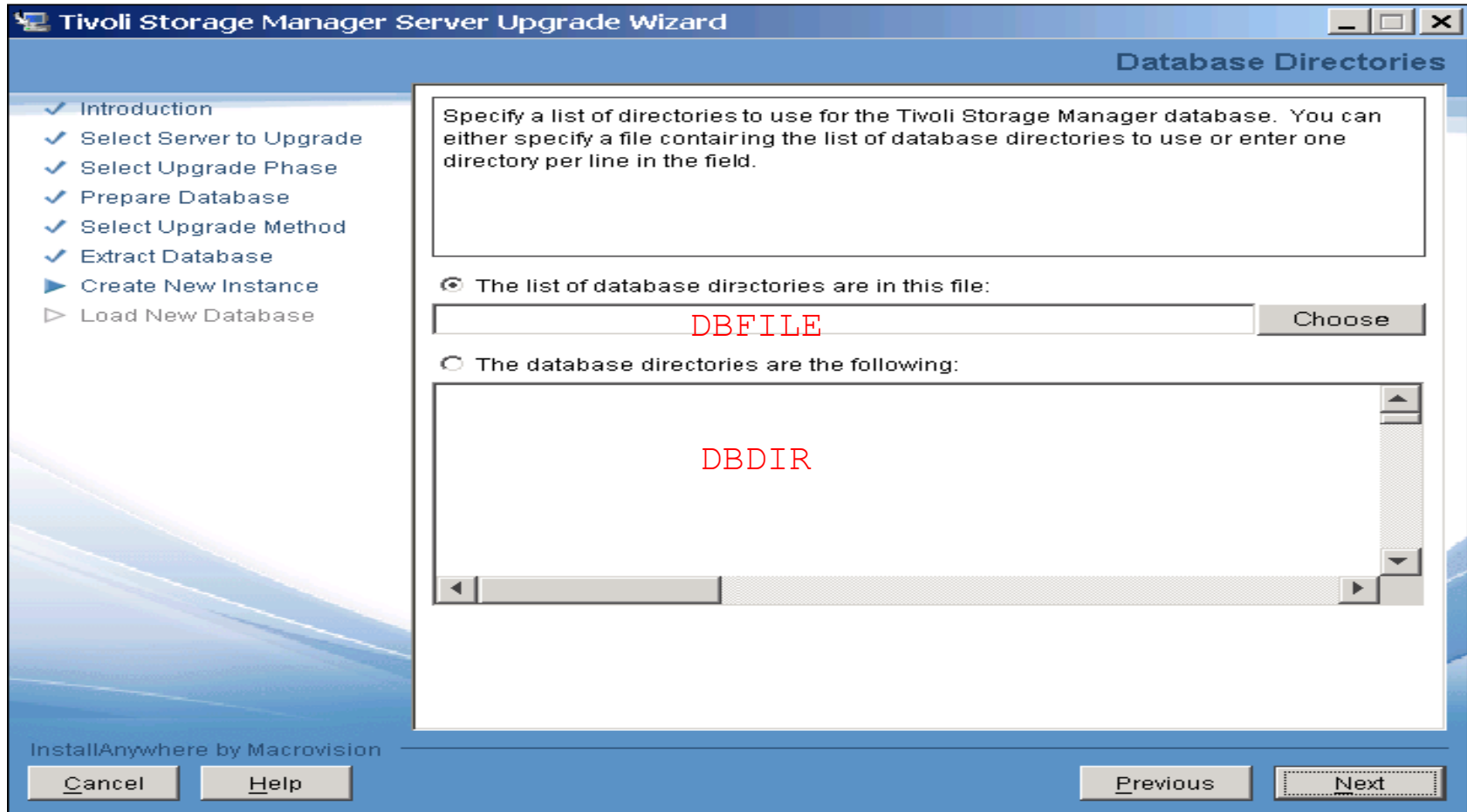
OR,,,Just use the DB Upgrade Wizard.

TSM V6 DB Upgrade Wizards

- ▶ Available on all TSM V6 Server platforms
- ▶ There are 2 wizards to use, depending on what kind of an install you are doing.
 - If you are doing an upgrade of an **existing** TSM server database, you should use the wizard **dsmupgdx**.
 - If you are creating a brand new **empty** database and are **not** upgrading an existing TSM server database, you should use the wizard **dsmicfgx**.



Hints and Tips for the DB Upgrade Wizards



Hints and Tips for the DB Upgrade Wizards

Tivoli Storage Manager Server Upgrade Wizard

Recovery Log Directories

Specify the directories for the database recovery logs.

✓ Introduction
✓ Select Server to Upgrade
✓ Select Upgrade Phase
✓ Prepare Database
✓ Select Upgrade Method
✓ Extract Database
▶ Create New Instance
▶ Load New Database

*Active log size (GB): ActiveLogSize

*Active log directory: Choose

*Primary archive log directory: Choose

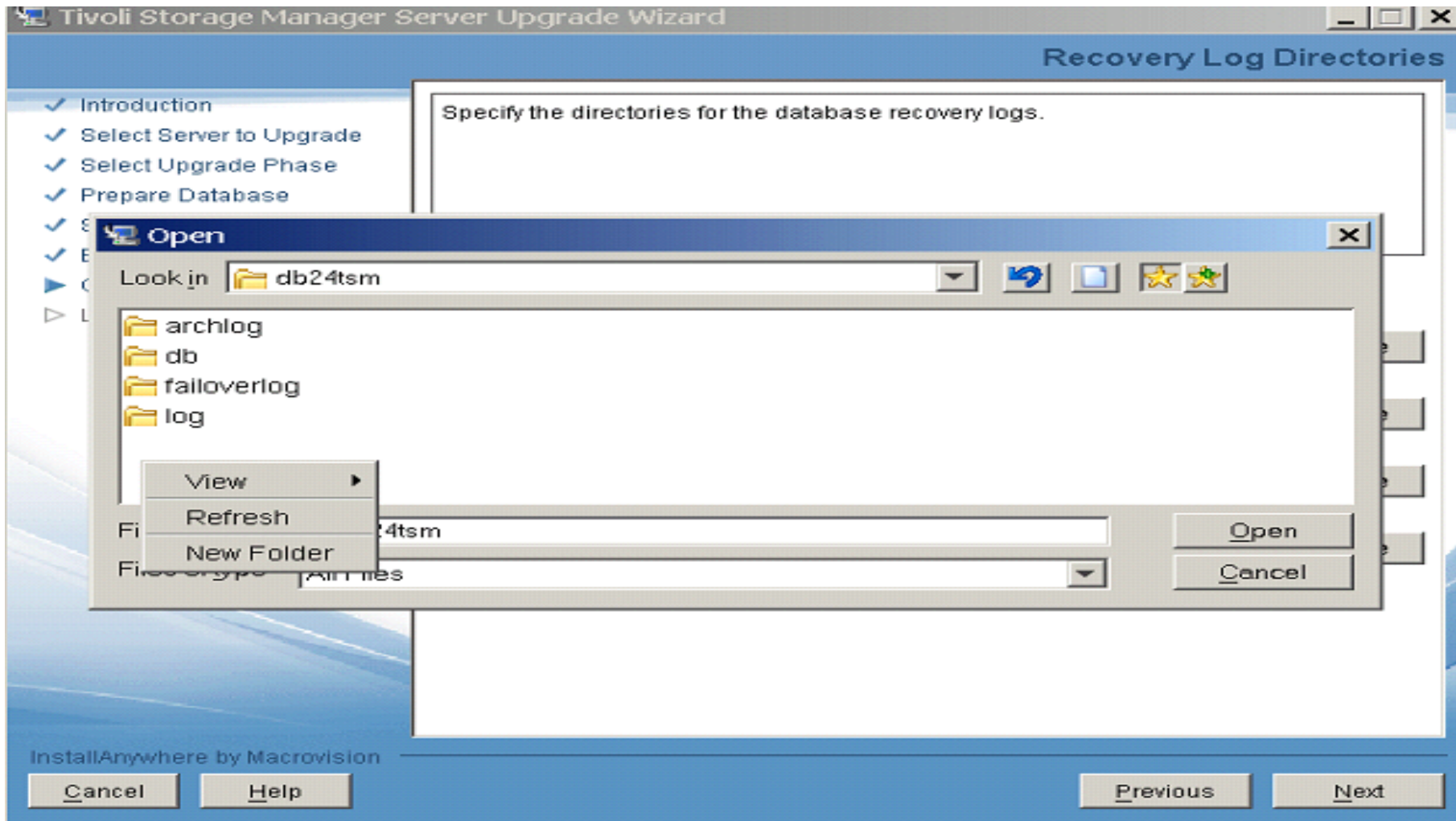
Active log mirror directory: Choose

Secondary archive log directory: Choose

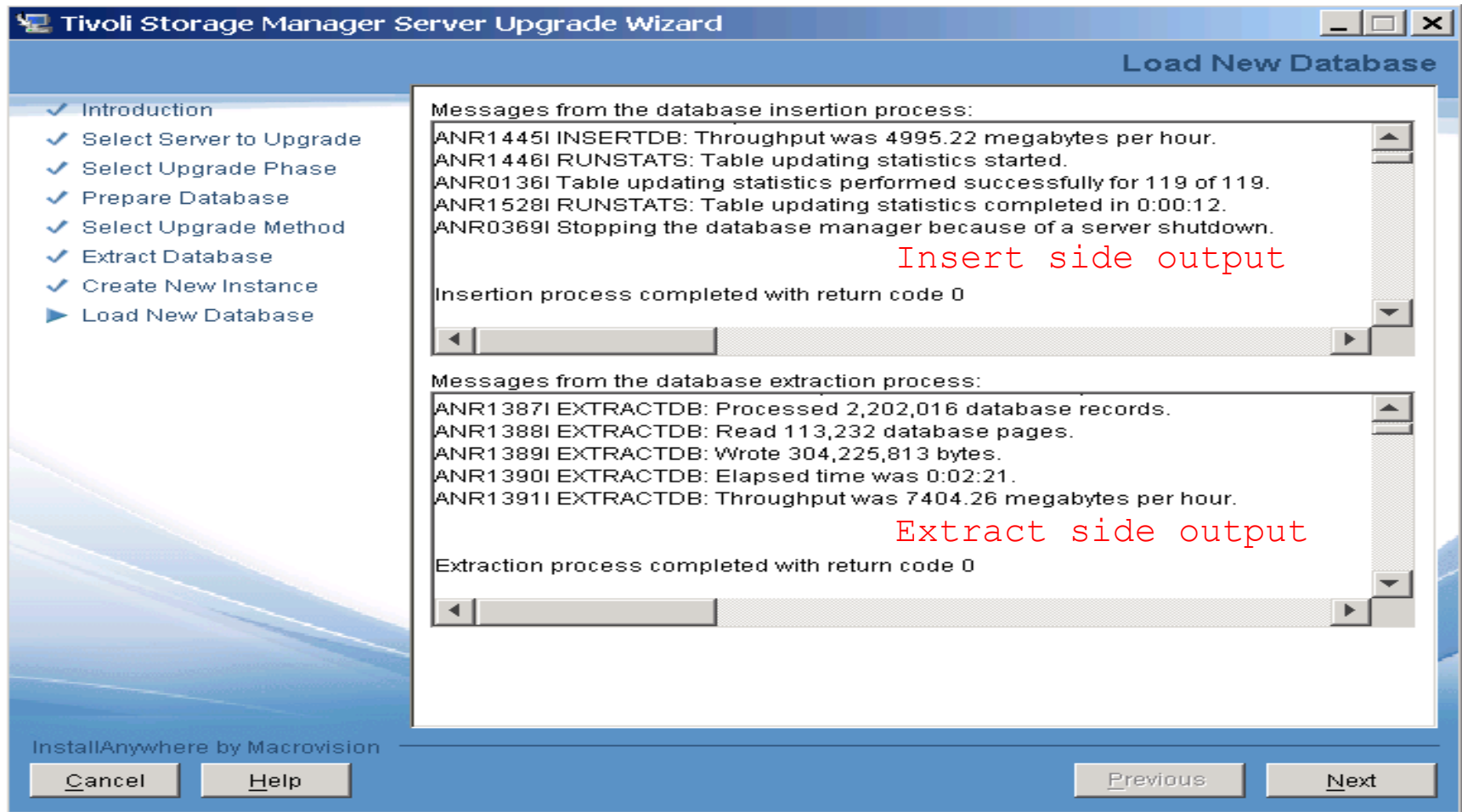
InstallAnywhere by Macrovision

Cancel Help Previous Next

Hints and Tips for the DB Upgrade Wizards



Completed Run of DB Upgrade Wizard





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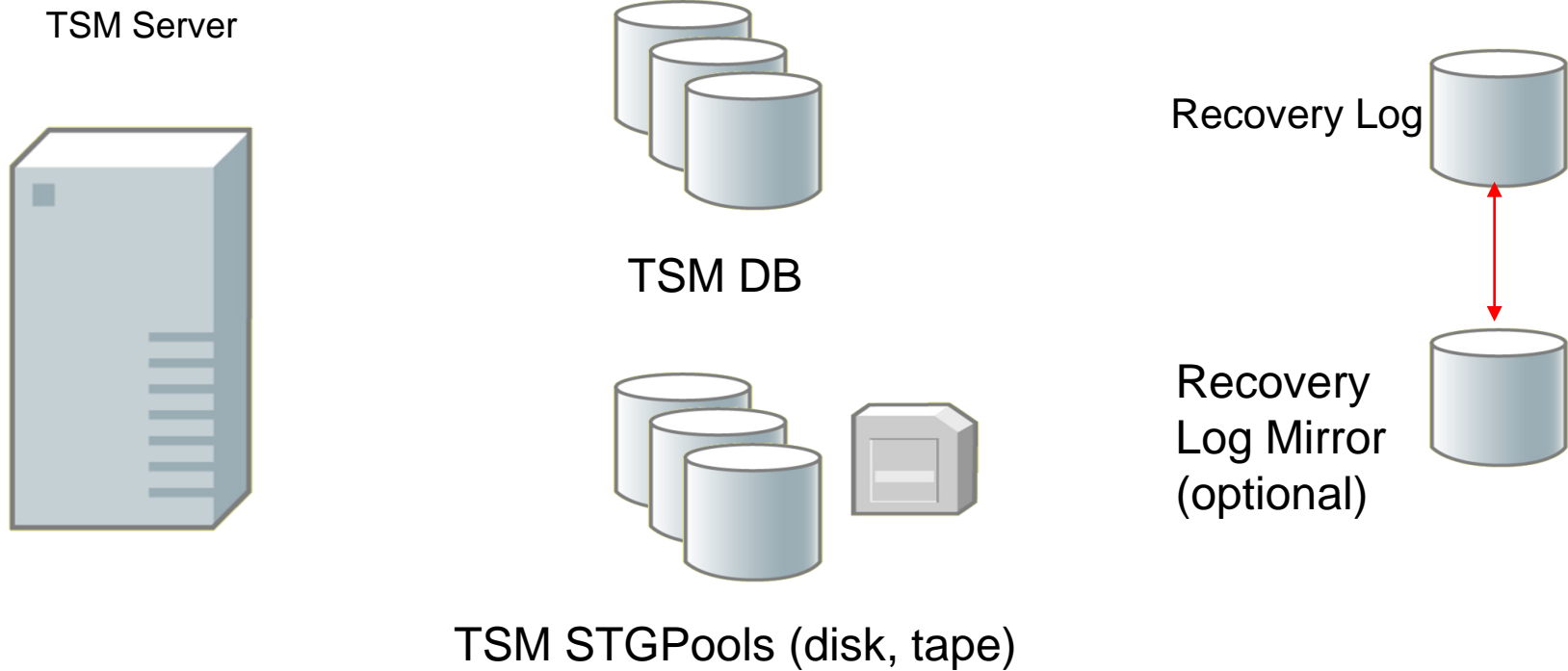
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A Look Back – the TSM DB and Log

Ondřej Bláha
CEE+R Tivoli Storage Team Leader



TSM Components (Before V6)



TSM Database

- Used to contain committed transactions
- Comprised of 1 or more database volumes
- Size Limit of 536GB
- Could be on RLVs or filesystems.
- DB could be mirrored (up to 2 times if user wished)
- If filesystems were used, users were required to format volumes before they could be used.
- Random IO access
- Audit of DB required TSM Server to be brought down. Audit could take a long time to complete.
- Database reorg required TSM server to be brought down, UNLOAD/LOAD could take a long time to complete.



ADSM / TSM Recovery Log

- Contains current transaction data.
- Could be run in “normal mode” or “roll-forward mode”.
- Could be on RLVs or filesystems.
- If filesystems were used, users were required to format volumes before they could be used.
- Sequential IO access
- Comprised of 1 or more recovery log volumes
- Maximum size of 13.5 GB.
- Recovery log could be mirrored (up to 2 times if user wished)
- If recovery log became full, TSM halted



ADSM / TSM DB Backup / Restore

- Could be full, incremental, or snapshot.
- Each run of a backup required a new volume
- If incremental backups were used, a restore required the full and each of the incremental backups to be restored to bring to current point in time.
- Could recover an individual DB volume if needed.
- Could restore to current time or point-in-time.
- Restore could be done with or without the use of volumehistory file
- A restore of the DB required existing volumes to be deleted and reformatted first.





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Looking Forward – the New TSM V6 DB and Log

Ondřej Bláha
CEE+R Tivoli Storage Team Leader

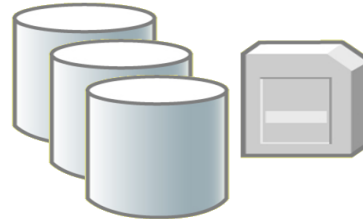


TSM V6 Components

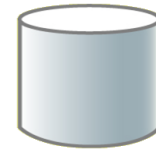
TSM Server



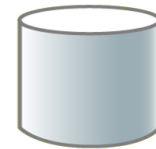
TSM DB



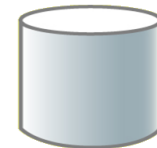
TSM STGPools (disk, tape)



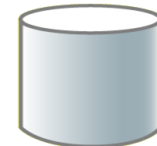
ActiveLogDir



MirrorLogDir



ArchiveLogDir



ArchFailoverLogDir



TSM V6 Database

- Contains committed transactions
- Can be spread over many (up to 128) directories
- DB Volumes are now managed by DB2. No need to format them.
- Individual DB volumes can no longer be restored.
 - ▶ Function was used infrequently.
- **Cannot** be placed on raw logical volumes
- **Can** be mirrored. (DB2 HADR or REPLICATE NODE)
 - ▶ Still can use HW mirroring if you want. (RAID1, RAID10)



TSM V6 Database

- Random IO access.
- Location(s) specified on DBDir/DBFile parameter of dsmserv format/loadformat commands.
 - ▶ DBDir – list of Dirs, separated by comma (up to 128 dirs)
 - ▶ DBFile – Text File containing list of Dirs (1 per line, up to 128 dirs)
- Add a new directory with the new Extend DBSpace command. Change is dynamic – does not require a restart of TSM.
- Currently there is no way to dynamically “reduce” the DB.
- New maximum supported size of 1TB.



TSM V6 Database

- Don't need to format volumes before using.
- On-line re-org done automatically.
- No longer need to do off-line audits.
- DB Backup / Restore is different (this will be covered later in presentation.) Can restore to either current time or point-in-time.



DSMSERV Format / Loadformat

dsmserv FORMAT / LOADFORMAT

[DBDirectory=<dbdir1[,dbdir2[,dbdir3...]]> | DBFile=<file>]

ACTIVELOGDirectory=<active log dir>

[MIRRORLOGDirectory=<mirror log dir>]

ARCHLogdirectory=<archive log dir>

[ARCHFailoverlogdirectory=<failover archive log dir>]

ACTIVELOGSize=<size of log in MB>

TSM Active Log

- “Active” Log is a TSM term. DB2 uses logs and archive logs.
- Contains current in-flight transaction data.
- Roll-forward mode only.
- Use is required.
- Sequential IO access
- Initial directory of active logs determined by ActiveLogDir parameter (on dsmserv format / loadformat); can be changed later in dsmserv.opt
- Active log files created in 512 MB sized files.
- Number of logs created is determined by ActiveLogSize / 512.
- If a transaction is not committed and all active log files are filled, then TSM halts.
- Default ActiveLogSize is 2GB, Maximum value is 128GB



TSM Active Log (Mirror)

- Used to contain mirrored copies of active transaction data
- Sequential IO access
- Use is optional but recommended.
- Initial directory of active log mirrors determined by MirrorLogDir parameter (on dsmserv format / loadformat); can be changed later in dsmserv.opt
- Change of MirrorLogDir requires TSM restart.
- If mirror log directory becomes full, message issued, TSM continues



TSM Archive Log

- Contains committed transaction data.
- Sequential IO access
- Use is required
- Initial directory of archive logs determined by ArchiveLogDir parameter (on dsmserv format / loadformat); can be changed later in dsmserv.opt
- Changing ArchiveLogDir directory requires TSM to be restarted
- Log files older than 2 full backups ago are removed after DB backup. (more on this later)
- If archive log directory becomes full, and no fail over archive log location has been specified, then TSM just keeps logs in the ActiveLogDir location and creates new ones. If THIS fills, then TSM halts.



TSM Failover Archive Log

- Use is optional but highly recommended. Consider use of large Network File System (NFS) mountpoint or large “cheap” disk for this. (more on this later)
- Sequential IO access
- Set with ArchFailOverLogDir parameter (on dsmserv format / loadformat), or added later in dsmserv.opt
- Log files are removed after DB backup. (more on this later)
- Changing ArchFailOverLogDir directory requires TSM to be restarted.



Number of Volumes Used for the V6 DB Backup

- Full Backup

- ▶ For devclass tape, at least one tape volume used
 - Contains the DB backup and also active/archive logs since last full
- ▶ For devclass file, at least 2 volumes used, name ends in '.dbv'
 - First contains the DB backup, 2nd contains active/archive logs since last full

- TSM DB Snapshot

- ▶ For devclass tape, at least one tape volume used
 - Contains the DB backup and also active/archive logs since last full
- ▶ For devclass file, at least 2 volumes used, name ends in '.dss'
 - First contains the DB backup, 2nd contains active/archive logs since last full

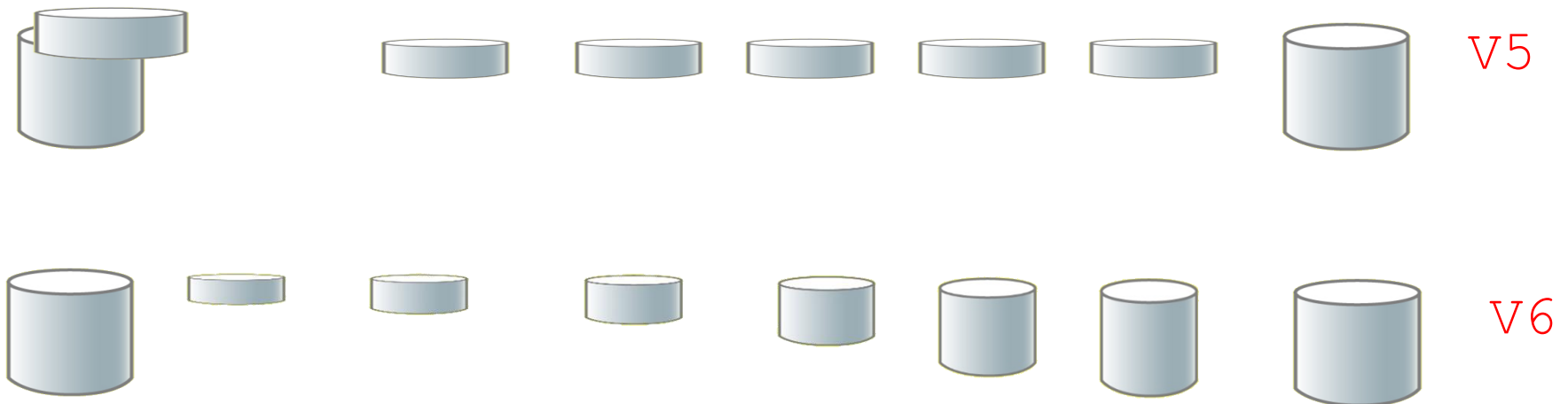
- Incremental backup

- ▶ Contains all archive logs since last full db backup (see next slide)
- ▶ For devclass tape, at least 1 volume used
 - Contains Changed pages, plus initial database metadata
- ▶ For devclass file, at least 2 volumes used, name ends in '.dbv'
 - Contains Changed pages, plus initial database metadata



Differences in the V6 Incremental Backup

- Different than V5.x TSM DB incremental backup
- Also called (in DB2 speak) an “Incremental cumulative backup”
- For V6, need full backup, plus LAST incremental backup for DB restore



Common DB Maintenance Tasks

- How do I move the TSM V6 DB to a new location?
 - ▶ Backup DB type=full devclass=xxx, halt server
 - ▶ Make new empty directories, create new dbdir file
 - ▶ Using DB2, drop the DB
 - ▶ Dsmserv restore db on=dbdir.file
 - ▶ Start the TSM Server

- How do I move the active logs to a new location?
 - ▶ Create a new directory to contain the active logs
 - ▶ Update dsmserv.opt ActiveLogDir to point to new directory
 - ▶ Halt and restart the TSM Server. DB2 automatically moves active logs to new directory.



Common DB Maintenance Tasks

- How do I add mirroring to the TSM V6 DB ?
 - ▶ Make a new empty directory for the log mirrors
 - ▶ Update the dsmserv.opt file MirrorLogDir Parameter
 - ▶ Stop and restart the TSM Server

- How do I extend my TSM V6 DB?
 - ▶ Create a new empty directory to contain the database volumes
 - ▶ Issue the Extend DBSpace command with the new DB directory.
 - ▶ DB is dynamically extended; there is no need to restart TSM



Common DB Maintenance Tasks

- How do I increase the size of my Active Logs?
 - ▶ Ensure that the location for the active logs has enough space for the new log size to be used.
 - ▶ Edit dsmserv.opt file for the TSM instance. Change or Add the ActiveLogSize parameter to the file. (Size is in MB; minimum is 2GB, maximum is 128GB.)
 - ▶ Restart TSM
 - ▶ New logs will be automatically defined, each 512MB in size until the ActiveLogSize amount is reached..
 - ▶ Mirrors , if being used. are also re-defined.



TSM V6 DB Backup FAQ

- ▶ Can multiple TSM DB Backups be placed on a tape?
 - Not in this release. This is a known requirement that will be implemented in a future release of TSM.
- ▶ Are space triggers supported with V6 and the DB?
 - Space triggers are no longer supported with the V6 DB.
- ▶ Can my TSM V6 DB backup be encrypted?
 - This is a known requirement, but is not implemented in this release. If you want, you can take a backup to a device that supports encryption such as the IBM System Storage™ TS1120 Tape Drive. This however requires an external key manager.



The End

Questions?

You are now ready for upgrading to or
Creating a New TSM v6 Instance

