



# Protecting TSM Data with Incremental Exports

## Attaining Higher Resilience

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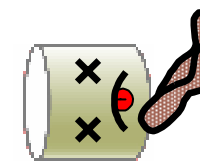
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## Levels of Protection

- Protection against software corruption
  - DB Backups of the TSM database
- Protection against hardware and media failure
  - Mirroring of DB, Log
  - Make a copy of backups to a Copy Stg Pool
- Protection against site disaster
  - Do it with remote copies
  
- Protection against human error / malicious attacks



Hard Disk

## Library Sharing

Sharing Tape drives and library slots between multiple TSM servers

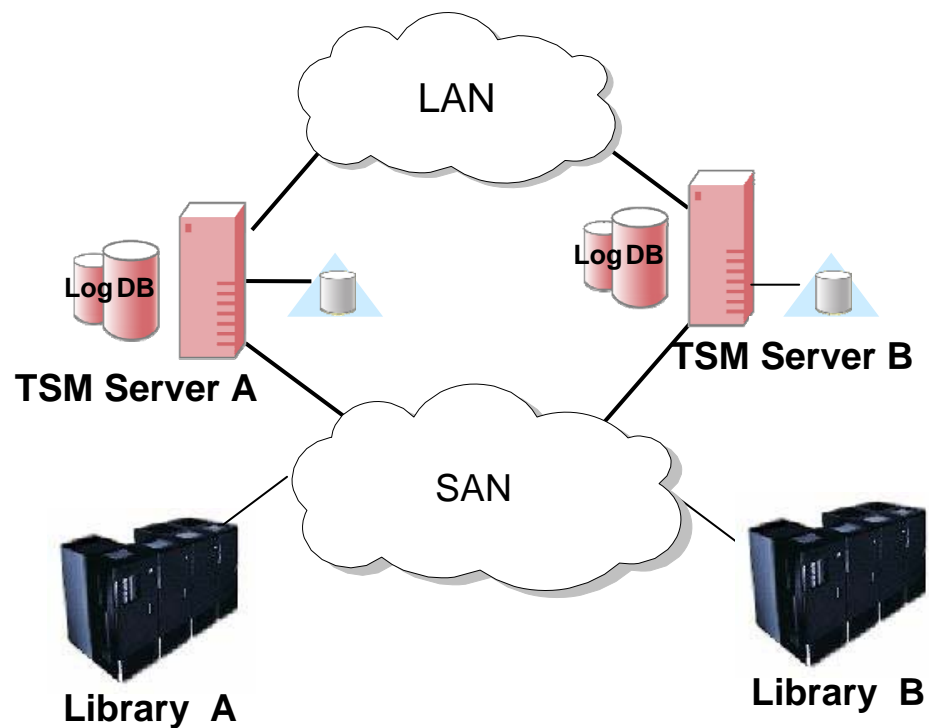
- Tape volumes are not shared.
- Only valid in a SAN with Fibre attached tape drives.

Advantages:

- Performance
- Ease of use
- Resilience

Constraint:

- A SAN is required



# Virtual Volumes

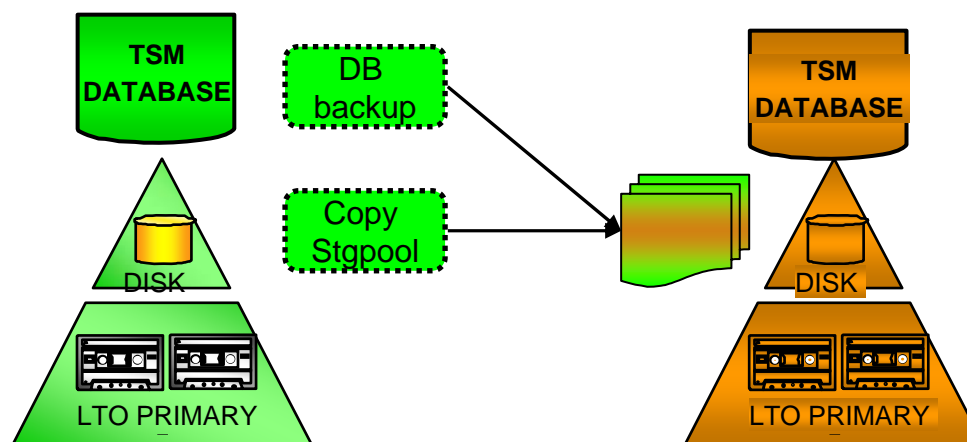
- Employing a secondary TSM server to store the primary TSM server's data
- The data is stored as Virtual Volumes
  - Appear as sequential media volumes on the source server
  - Actually stored as archive files on the target server

## Advantages

- New nodes integrate easily into the schema

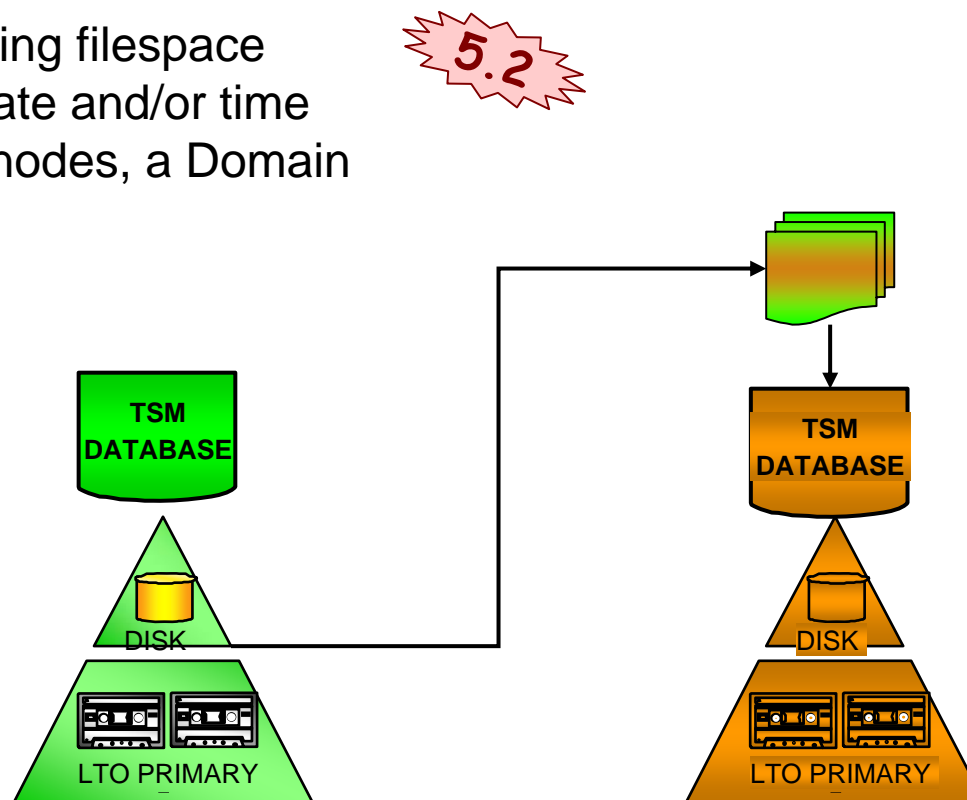
## Drawbacks

- Complex to understand
- Many tiny volumes....



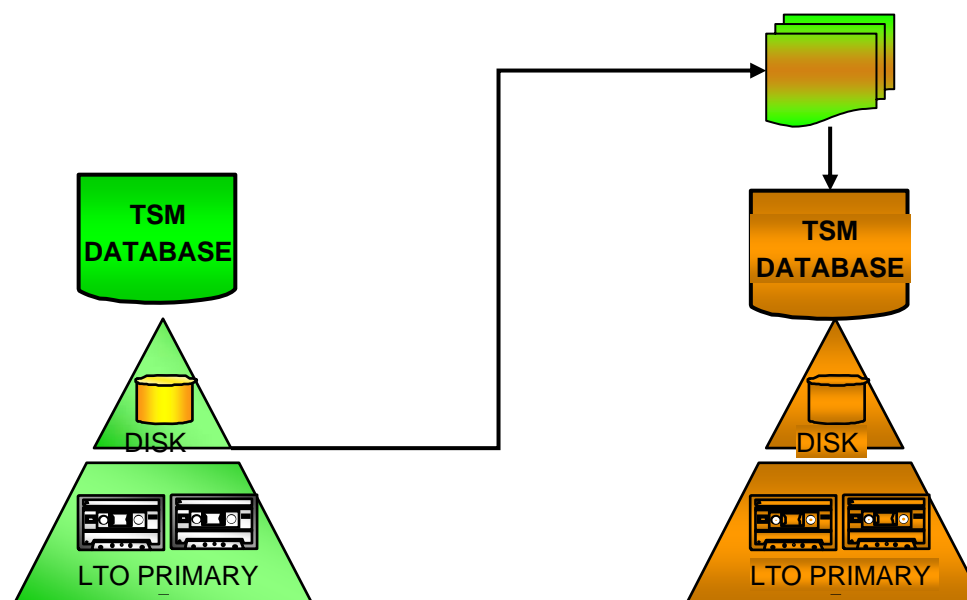
## Export / Import

- Can export/import as a single operation –
  - data transmits over the LAN
- Can merge data into an existing filespace
- Can take data new since a date and/or time
- Can specify a node, a list of nodes, a Domain
  - Even a filespace



## Advantages of Export / Import

- Increased resilience
  - Truly independent copies ensures that software corruption or human error are not duplicated
  - No need to restore a TSM Database



## Disadvantages of Export / Import

- Not a true incremental
  - The TSM Administrator is responsible to ensure data is copied.
- Interference with other processes
  - Expiration, backup, restore
- All or nothing
  - One unreadable tape will render the whole export futile
- Performance ...
  - Benchmark at the end of the presentation
- Hangs ...





## Considerations of Export / Import on the target TSM Server

- Expiration takes place only if `filedata=all` is specified
  - Schedule it regularly
- Management Class Rebinding does not take place.
- Retention policies need not be the same as on the source TSM server.



## Case Study 1

- Document Management System which uses TSM on AIX as the document repository (IBM DB2 Content Manager Ondemand)
- Documents loaded during the night
- Many online users during the day
- Data stored on WORM media and magnetic disk.
- Recovery requirements: 10-20 minutes in case of hardware failure, software failure, site failure

## Solution

- One production server, one standby server
- DB2 database is synchronised nightly
- TSM data is copied nightly using Incremental Export



## Case Study 1 (cont)

### Failover

- In case of a problem with TSM, tape library or server:
  - A second server entry in OnDemand allows for read-only access
- In case of site failure:
  - The production server is taken down.
  - DNS is updated.

### Advantages

- Resilient: data is replicated without replicating corruptions
- Efficient: only latest data is replicated
- Automated: TSM can remain a black box



## Case Study 2

- Document Management System which uses TSM on **Windows** as the document repository (IBM DB2 Content Manager OnDemand)
- Documents loaded during the night **and day**
- Many online users during the day
- Data stored on magnetic disk **only** (except for Copy Stg).
- Recovery requirement: 2-10 minutes in case of hardware or software failure, 1 hour in case of site failure

## Solution

- Protection against site failure:
  - DB2 & TSM DB and Disk Stg Pools are replicated using DoubleTake.
- Protection against hardware failure:
  - Local Copy StgPool on tape media.
- Protection against human or software error:
  - Incremental Export of selected data to a third TSM server



## Case Study 2 (cont)

### Failover

- In case of a problem with hardware, site failure :
  - The production server is taken down.
  - DNS is updated.

### Advantages

- Data is replicated quasi-instantly
- DoubleTake provides failback functionality



# Benchmark of Export vs Virtual Volumes

## Setup

- TSM 5.3.1.2 on AIX 5.3 ML02.
- pSeries 650 partitioned with 2 CPU, 1 GB RAM,
  - 2 TSM instances on the same system
- 2 FC adapters for tape, 2 FC adapters for disk traffic
  - No tape access during the tests
- DB & Log volumes on HDS 9980
- Volumes of DevClass FILE on HDS 9500
  - Pre-formatted at 2GB / volume



# Benchmark of Export vs Virtual Volumes

## Scenario

- Step 1 – Incremental export of workload – to FILE STG in TSM1
- Step 2 – Virtual Volumes between TSM1 and TSM2
  - Backup stg primaryStg copyStg (maxproc=1, mountLimit=4)
- Step 3 – Export from TSM1 to TSM2
  - Export node toserver=tsm2 filedata=all merge=yes
- Step 4 – Add 2'800 files to workload
- Repeat steps 1 & 2
- Step 3 – Incremental export
  - Export node toserver=tsm2 filedata=all merge=yes fromdate= fromtime=

Notes: No other activities during the tests



# Benchmark of Export vs Virtual Volumes

## Workload

- Base workloads
  - A : 10'000 files      100k each    (0.98 GB)
  - B : 100'000 files    100k each    (9.98 GB)
  - C: 1'000 files        1 MB each    (0.97 GB)
  - D: 10'000 files      1 MB each    (9.60 GB)
  - E: 100 files         100 MB each (9.64 GB)
  
- Notes: no TSM compression, jpeg data





# Performance comparison – Results

(seconds)

Workload			client	Virtual Volumes		Incr Export		Other tasks	
File size	No.File	GB	Incr	Full	(+2'800)	Full	(+2'800)	Backup-set	Move nodedata
A 100k	10'000	1	54	23		26			23
B 100k	100'000	10	367	192	4	246	12		350
C 1MB	1'000	1	19	17		13			21
D 1MB	10'000	10	196	188	56	196	58	254	240
E 100MB	100	10	138	183		184			350



## Conclusion

- Incremental Export is a promising technique for protecting TSM data
- Bonus benefit
  - A second set of retention policies are offered
- Wish list:
  - Capability to ensure consistency between two TSM servers
  - Less contention with other processes

