

Using IBM Tivoli Storage Manager™ with Network Appliance NearStore™

IBM Tivoli Software and Network Appliance, Inc. | 12/20/2002 | TR3228

Updated 07/07/2005

TECHNICAL REPORT

Network Appliance, a pioneer and industry leader in data storage technology, helps organizations understand and meet complex technical challenges with advanced storage solutions and global data management strategies.

Abstract

The purpose of this paper is to provide information on joint solutions offered by IBM Tivoli® and Network Appliance™ that deliver disk-based backups of servers, storage devices, and clients in combination with Network Appliance's NearStore disk storage systems. The information on the following pages is intended to provide solution design and implementation detail for the system administrator beyond that of marketing collateral but short of the product documentation.

Audience

The information in this paper is intended for system and storage administrators responsible for configuring, tuning, and running backups of servers, storage devices, and clients on a network.

Solution Overview

With the flexible policy-based automation available in Tivoli Storage Manager, a unique style of backup is possible that leverages the advantages of both disk and tape. The initial backups can be stored or "staged" on the NearStore system and, using Tivoli Storage Manager, the staged backup images can be automatically migrated to tape storage devices based on administrator-defined thresholds. Tivoli Storage Manager policies automate this entire process so that no user intervention is required. Backup data stored on the NearStore device can be migrated off to tape storage to free up the disk space for the next round of backups. This solution enables most routine restores to be accomplished without timely tape mounts using the disk backups, while tapes created by Tivoli Storage Manager can be immediately sent off-site for disaster recovery or used to restore older data when required.

Tivoli Storage Manager limits the bandwidth needed for backups and restores by performing progressive incremental backups. When a data restore is required, Tivoli Storage Manager transfers only the necessary version of the files, rather than the full backup plus the associated incrementals. This also reduces the total amount of storage space required by the storage management system.

The Tivoli Storage Manager can also utilize NDMP to backup data on the NearStore directly from the NearStore to tape. The tape drives must be attached to the NearStore, or they can also be attached to a server and managed by Tivoli Storage Manager. For a detailed description on how to implement NDMP with Tivoli Storage Manager, see the Tivoli manual: TSM Administration Guide, the chapter; Using NDMP for Operations with NAS File Servers.

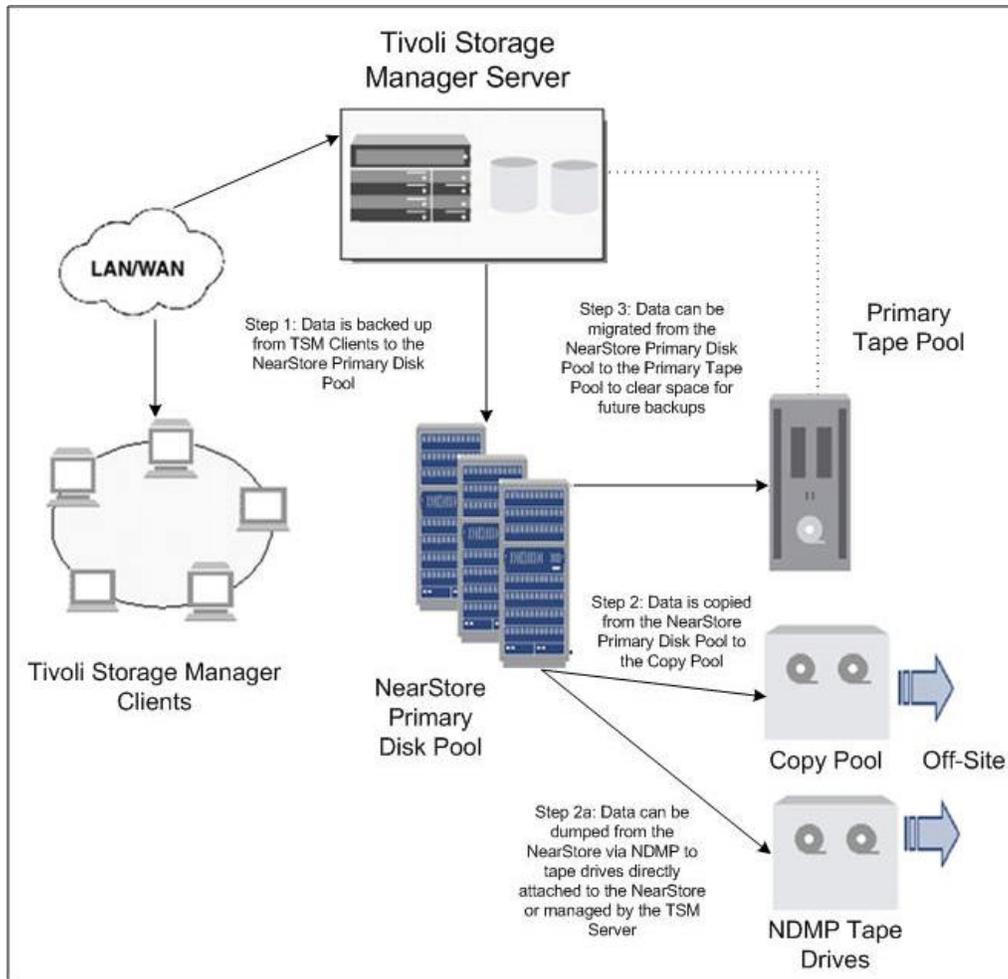


Figure 1. Data Flow

Server Backup and Recovery Solution Backup

Full, incremental, or differential backup data from multiple Tivoli Storage Manager clients can be sent simultaneously over the LAN or WAN to an NFS, CIFS or Fibre Channel or iSCSI mounted NearStore appliance (Step 1). The NearStore appliance is configured as a Tivoli Storage Manager Primary Storage Pool. Tivoli Storage Manager provides two access methods when using disk-based storage solutions, DISK and FILE device type. In order to realize maximum performance from TSM, Tivoli recommends that NearStore be configured as a FILE device type. The FILE device type is used for storing data on disk in *simulated* storage volumes. The storage volumes are actually files. Data is written sequentially into standard files in the file system.

Tivoli Storage Manager's use of the NearStore Primary Storage Pool provides an opportunity to temporarily buffer the data from multiple clients for subsequent staging to tape. This allows users to initiate more backup tasks than the number of tape drives configured without interleaving the data of multiple clients in a single stream. Migration of the buffered data to tape allows TSM to utilize tape more efficiently by minimizing tape gaps which are typically created

by pauses in data transmission resulting from stop and start tape maneuvers. Caching the data to a disk pool also allows TSM to reorganize the data in an intelligent manner as it's written to tape in order to allow for the most efficient restore.

Data written in the primary storage pool hierarchy can also be duplicated in one or more Copy Storage Pools (Step 2). This provides protection against disasters, media or hardware failures, or other events that could render data in the primary pool unusable. Data can be duplicated in the Copy Storage Pool either by (1) simultaneously writing to one or more copy pools as the data is stored in a primary pool or (2) by storing data only to a primary pool but later copying data from the primary pool to the copy pool. The Copy Storage Pool can either be another NearStore device or a tape device used for off-site vaulting. According to business requirements, disk capacities, and disaster recovery needs, scheduled policies should be configured to migrate backup images from the NearStore Primary Disk Pool to the Primary Tape Pool for long-term backup operations (Step 3). The backup images on the NearStore appliance are mounted via NFS, CIFS, iSCSI or Fibre Channel on the Tivoli Storage Manager Server and migrated to attached SCSI or Fibre Channel tape drives also attached to the Tivoli Server.

Tivoli Storage Manager is NDMP aware and can backup data at the volume, directory or file level. As an added benefit, using the directory backup, FAServer Snapshots can be backed up, as they are represented as directories on the FAServer.

Restore

A successful implementation will allow high-performance restores from short-term backups residing on the NearStore appliance and additional restores from long-term backups residing on local or off-site tapes. In either case, the source for restoration is transparent to the Tivoli Storage Manager Client, because the Tivoli Storage Manager Server automatically tracks the location of the backup images and initiates the restore process. Restore data from the mounted NearStore appliance will travel through the Tivoli Storage Manager Server to a LAN or WAN connected Tivoli Client. The Tivoli Client can be the system from which the original backup was created or a different system for redirected restore purposes.

Solution Configuration

Configuring a NearStore Primary Storage Pool

1. **Define a storage pool that is associated with the FILE device class, or use one of the default storage pools that Tivoli Storage Manager provides (ARCHIVEPOOL, BACKUPPOOL, and SPACEMGPOOL).**

For example, enter the following commands on the command line of an administrative client:

```
define devclass FILE devtype=file mountlimit=50 maxcapacity=2000M  
directory=/opt/Tivoli/tsm/server/bin/
```

```
define stgpool nearstorepool FILE maxscratch=50 highmig=85 lowmig=40
```

This sequence of commands defines the storage pool NEARSTOREPOOL on the NearStore device. It also allows up to 50 files of 2GB each to be created by TSM to

contain the client data. When the NearStore storage pool reaches 85 percent capacity, it will start migrating data off to the next storage pool if one has been set up.

The mount limit value for FILE device classes is used to restrict the number of mount points (volumes or files) that can be concurrently opened for access by server backup and recovery operations. Any attempts to access more volumes than indicated by the mount limit cause the requester to wait. The maximum value for this parameter is 256.

2. **Specify the new storage pool as the destination for client files that are backed up, archived, or migrated by modifying existing policy or creating a new policy.** Essential commands are DEFINE COPYGROUP or UPDATE COPYGROUP and ACTIVATE POLICYSET.

Configuring Tape Storage Pool

1. **Attach one or more tape devices, or a tape library, to your server system.** Depending on the type of tape device, the LIBRARY, PATH, DRIVE, DRIVE PATH and DEVCLASS will use device specific parameters. To enable the server to use the tape device, you must enter a series of the following commands:

```
DEFINE LIBRARY  
DEFINE PATH to the library  
DEFINE DRIVE  
DEFINE PATH to the drive  
DEFINE DEVCLASS  
DEFINE STGPOOL
```

2. **Update the NearStore storage pools so that it points to the copy storage pool as the next storage pool in the hierarchy.**

```
update stgpool nearstorepool nextpool=tapepool
```

3. **Define a copy storage pool.** A copy storage pool provides a means of recovering from disasters or media failures in the primary storage pools. You can back up multiple primary storage pools to one copy storage pool. If multiple copies are necessary, you can also back up a primary storage pool to multiple copy storage pools.
4. **Set up administrative schedules or a script to back up the primary storage pools to the copy storage pool. Tape drives can be vaulted for safekeeping.** You can issue the BACKUP STGPOOL command to back up the primary storage pools to copy storage pools. Backing up storage pools requires an additional 200 bytes of space in the database for each physical file copied. (Small client files are typically aggregated within physical files, and the 200 bytes are for the entire aggregate.) As more files are added to the copy storage pools, reevaluate your database size requirements.

Solution Support

Network Appliance

NearStore supports the following data transfer protocols:

- NFS
- CIFS
- FCP
- iSCSI

NearStore is offered in configurations starting at 8TB and scaling up to 96TB

IBM TIVOLI Software

Tivoli Storage Manager Client Support

- IBM AIX
- Sun® Solaris™
- HP-UX
- Microsoft Windows ME/XP
- Microsoft Windows NT 4.0
- Microsoft Windows 2000
- Apple® Macintosh OS, OS X
- Compaq Tru64 UNIX
- Linux
- Novell® NetWare™
- SGI IRIX

Tivoli Storage Manager Servers

- IBM AIX
- Sun Solaris
- HP-UX
- Microsoft Windows NT, Windows 2000, Windows XP Professional

Additional Resources

Network Appliance

For more information about the NearStore family of appliances, please visit:

<http://www.netapp.com/products/nearstore/>

For a detailed blueprint and architecture of NearStore, please visit:

http://www.netapp.com/tech_library/3187.html

IBM Tivoli Software

For more information about IBM Tivoli Storage Manager, please visit:

<http://www.tivoli.com/products/index/storage-mgr/>

For a complete listing of supported devices, please visit:

http://www-3.ibm.com/software/sysmgmt/products/support/IBM_TSM_Supported_Devices.html



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