

VERITAS NetBackup Storage Migrator for UNIX v4.5

TECHNICAL OVERVIEW

Solaris 2.6, 7, 8, 9 with VxFS 3.4
HP-UX 11, 11.11, 11i with Online JFS 3.3
SGI/IRIX 6.5.10F with XFS

TABLE OF CONTENTS

Table of Contents	2
Executive Summary	3
NSMU Key Functionality	3
Storage Migrator Family of Products	3
Product Overview and Terminology	3
NetBackup Storage Migrator for UNIX Platform Support	5
NetBackup Storage Migrator uses the following methods for secondary storage:	5
NetBackup Storage Migrator for UNIX Remote Storage Methods	6
Migration Process	6
Benefits of Using NetBackup Storage Migrator	6
NetBackup Storage Migrator Integration with Network Attached Storage Devices	7
Storage Hierarchies	7
NetBackup Storage Migrator Integration with NetBackup	7
Administrative Controls	7
User Controls	8
File Migration Process	9
File Selection and Pre-Migration	9
Determine the Storage Method	9
Creation of Migration Work Lists	9
Copy to Secondary Storage	9
Update the File Handle Database	10
Release Disk Space by Purging Data Blocks from Disk	10
Slices	10
File Caching	10
Tape and Optical Media Management	11
Disk Space Management	11
Manufacturer's Suggested Retail Price	11
Additional Help	12

EXECUTIVE SUMMARY

This document is intended to provide a high-level overview of the technical functionality of the Storage Migrator for UNIX v4.5 product from VERITAS and how the HSM process works within the UNIX environments. The reader of this document should be familiar with UNIX and storage management terminology.

Storage Migrator enables system administrators to automatically move older, inactive files to lower-cost storage devices such as optical jukeboxes and tape libraries on their network. Storage Migrator leaves behind small “placeholder” files to ensure that users maintain their familiar directory structure. The placeholders provide transparent file access, by automatically retrieving migrated files when they are accessed.

VERITAS Storage Migrator for UNIX is targeted at enterprise customers managing many terabytes of data.

- Centralized administration functions fit perfectly into large data center environments that are centralizing management of their distributed enterprise. Storage Migrator enables enterprise environments to manage their data from heterogeneous platforms to a central location with the Storage Migrator by using one of the remote method options of storing data.
- Sophisticated media management capabilities appeal to data center managers with thousands of tape or optical volumes in the data center as well as at off-site locations, and who also might have experience with mainframe media management.
- The support for high-end robotics and high-speed devices will be important to those customers who have already made an investment in that hardware. NetBackup and Storage Migrator can share the same libraries and devices.
- Tight integration with NetBackup and other VERITAS products ensures that this product will fit into the customers existing environment and not require the customer to change their environment to fit the requirements of Storage Migrator.

NSMU Key Functionality

Industry/Market	Key Functionality
NetBackup users with investments in tape or optical libraries	Storage Migrator for UNIX will share optical or tape libraries with NetBackup to protect a customer's investment in their existing hardware, not requiring additional hardware investments.
Organizations with storage management problems due to the amount of data to be backup up and managed	Storage Migrator for UNIX moves the oldest files on a network server to a secondary storage device, yet allowing continuous access to the data. This accomplishes two major tasks: 1) Speeds up backups as there is less data to be backed up, which saves money on backup media. 2) Frees up space on networked servers, as the placeholder file (UNIX inode) is all that is left on the disk unless a configurable slice size has been defined to retain a copy of some of the data with the placeholder. (Slices are configurable from 0 to 2 Gigabytes) 3) Automatically monitors online disk utilization allowing organizations to fully utilize their existing storage.
Organizations with long-term data retention periods	Storage Migrator for UNIX automates the management of the data lifecycle. Administrators create policies based on their unique data retention requirements to ensure compliance with internal and external regulations.

STORAGE MIGRATOR FAMILY OF PRODUCTS

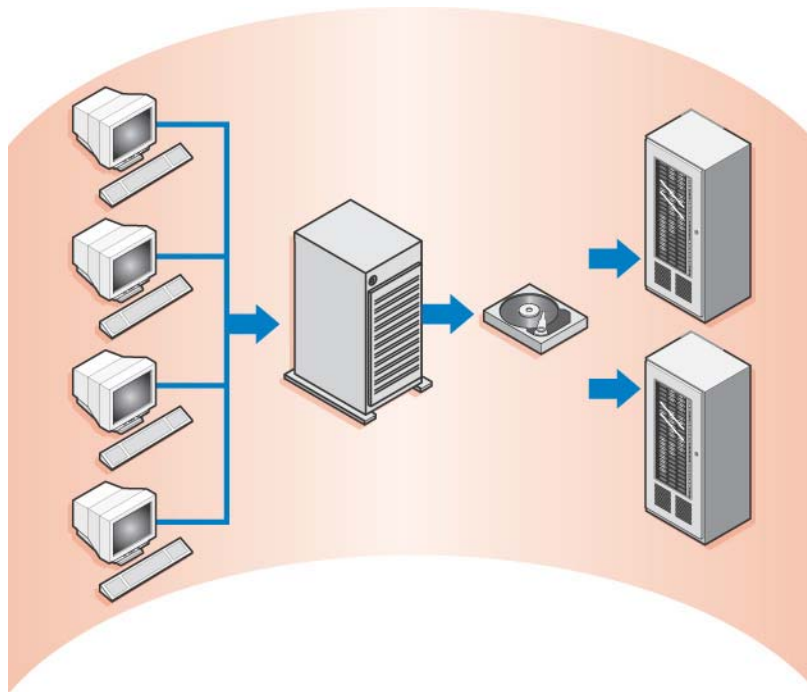
The Storage Migrator families of products consist of Hierarchical Storage Management products for the Windows and UNIX platforms. The product family consists of the following products today:

- NetBackup Storage Migrator for UNIX v4.5
- NetBackup Storage Migrator for Windows 2000 v3.0 (July '02 version 4.0 will be available)
- NetBackup Storage Migrator for Exchange v3.0 (July '02 version 4.0 will be available)

This paper focuses on NetBackup Storage Migrator for UNIX.

PRODUCT OVERVIEW AND TERMINOLOGY

Storage Migrator for UNIX manages data storage on UNIX servers by managing the movement of data between primary storage (the file server's hard drive) and secondary storage (hard disk, optical jukeboxes and tape libraries). Inactive (seldom accessed) files are moved or migrated from primary storage to secondary storage and replaced with a small placeholder file to free up the space on the server's hard disk.

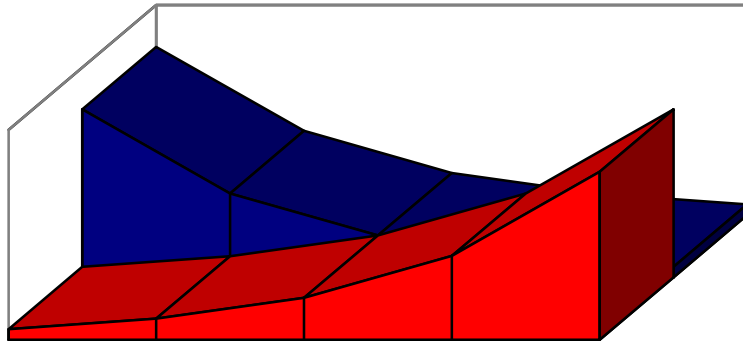


NetBackup Storage Migrator manages the oldest data that is stored on the network servers. It migrates the oldest data into the storage hierarchy, be it magnetic disks, optical libraries, or tape libraries (Making redundant copies of migrated data is highly recommended for data safety). NetBackup Storage Migrator leaves behind a placeholder on the server that the clients can access and recall their files from the storage hierarchy at any time.

When a user/process, accesses a file that is migrated, NetBackup Storage Migrator intercepts the request, and the file(s) is recalled from secondary storage back to the file server's hard drive.

NetBackup Storage Migrator automatically manages the storage on the file server according to administrator-defined guidelines set for each individual managed volume. In addition to the automatic storage management features, an administrator can create and schedule activity to move specific data to and from secondary storage at specific time intervals, via the calendar based JAVA interface.

VERITAS NetBackup Storage Migrator for UNIX is a Hierarchical Storage Management (HSM) application that works in conjunction with VERITAS NetBackup for UNIX to efficiently manage data on a corporate network. NetBackup Storage Migrator provides administrators with tools to manage disk space in various UNIX file systems and platforms. NetBackup Storage Migrator increases the amount of disk space available to users by migrating files from a local online file system to a secondary storage device, such as a tape device, or another disk, as space is required by the online file system. When a user attempts to access or open a migrated file, it is automatically retrieved from secondary storage and cached to the online file system. Except for the delay in performing the retrieval, users and applications are unaware that the file exists on secondary storage and is being retrieved. Also if the tape containing the requested data is not currently in a robotic library a pending request will be posted to NetBackup media manager, which supports various alerts such as email to be sent to the appropriate administrators so they can make the requested media available to Storage Migrator. This allows you to remove tapes from libraries as your data grows freeing tape slots within libraries, but at the same time this will require human intervention in order to cache the data that has been requested.



■ Data Growth ■ Backup Window

NetBackup Storage Migrator for UNIX is integrated with NetBackup to provide customers an answer to shrinking backup windows and continuing data growth. NetBackup is Storage Migrator “HSM” aware, so backup operations do not trigger unnecessary caches of migrated files, plus the two share the same media manager, allowing the applications to share secondary storage devices, which reduces your total cost of ownership. Whenever considering a HSM solution always make sure that your backup and HSM products are compatible, otherwise your backup and HSM processes can thrash your file systems, during backups by caching all migrated data flooding your disks.

HSM is not a substitute for a backup solution. All of the meta data (placeholders and directory structures on the primary disk) needs to be secured for easy restoration if a disaster does occur.

By migrating unchanging, less frequently used files to secondary storage, the time required to perform system backups or to recover a server is reduced. The effect is so dramatic, that the percentage of data removed from the server is nearly equal to the percentage reduction in backup/restore times.

NetBackup Storage Migrator for UNIX Platform Support

Storage Migrator Release	Operating System	File System Type
V4.5	HP-UX 11.0, 11.11	OnlineJFS 3.3
V4.5	IRIX 6.5.x	XFS
V4.5	Solaris 2.6, 7, 8, 9	VxFS 3.4

NETBACKUP STORAGE MIGRATOR FOR UNIX

NetBackup Storage Migrator for UNIX uses directly connected tape, optical disk, or magnetic devices for its secondary storage. Each Storage Migrator server that you want optical or tape attached must have a NetBackup media server license, or a SAN media server license. The NetBackup/Media Manager Shared Storage Option “SSO”, method of attaching SAN devices is also fully supported. The remote options also include Alternate Disk (NFS mounted file systems), FTP, and automatic migration using NetBackup. Support for large-capacity library devices eliminates the need for operator action to either migrate or cache files and allows for better utilization of large expensive robots. The net result is an apparent unlimited online storage but at a lower cost per megabyte because the extra storage is on lower-cost media such as tape or optical, and a reduced amount of time needed to backup and restore data.

NetBackup Storage Migrator uses the following methods for secondary storage:

- Direct Attach/SAN methods
- Tape (Including WORM tape devices (Write Once Read Many))
- Optical Re-writable Platters
- Optical WORM Platters
- Remote Methods
- Alternate Disk (NFS shared disk or other directly attached disk storage)
- File Transfer Protocol (FTP) (Typically a remote machine)
- NetBackup Method (The next release of NetBackup Storage Migrator the NB method will feature a new architecture called Data Store.)

NETBACKUP STORAGE MIGRATOR FOR UNIX REMOTE STORAGE METHODS

NetBackup Storage Migrator for UNIX supports directly attached peripherals (including SAN attached devices supported with NetBackup/Media Manager SSO) as well as three “remote” methods of secondary storage; “Alternate Disk”, using NFS mounted disk file systems on remote machines or another locally attached file system. NetBackup method, which uses the user, directed backup and restores of NetBackup to copy and retrieve migrated data. The FTP option, which allows migrations to any FTP compatible machines disk including mainframes or another HSM, managed file systems. The remote methods are typically used when sites are trying to centralize their mass storage, for economies of scale, or security purposes. The NetBackup method of HSM, uses the “user directed” backups and restores of NetBackup to copy and cache data automatically. This method of HSM was originally developed for sites that did not have directly attached tape drives on their Storage Migrator server. This allowed the data to be moved to a NetBackup media server and then directly to tape. The drawbacks of using the NetBackup method of HSM, is that both the Storage Migrator database and the NetBackup catalog records and holds the meta data for as long as the file is retained. Also NetBackup does not have a concept of media consolidation, so even if you removed some of the files, the tape media cannot be cleaned up until all the files within that NetBackup image have been deleted. The new Data Store method coming in the next release will allow you to write to a remotely attached tape device, and allow for media consolidation.

MIGRATION PROCESS

There are two main steps in the data migration process. In the first step, NetBackup Storage Migrator selects files to be migrated based on pre-defined selection criteria and “pre-migrates” them, by adding them to a list that will be processed, and pre-allocates space within the Storage Migrator databases. In the second step, NetBackup Storage Migrator copies these files to one or more secondary storage devices, and then updates the specific location information of each copied file in the pre-allocated entries of the databases. The copied files are now secured within NetBackup Storage Migrator’s secondary storage and are still fully accessible on disk as before. Now the copied files are dual stated, with a copy/copies (multiple copies of data are highly recommended, Storage Migrator allows you to make two copies during the initial copy phase which can be on different types of media, and can track a total of eight copies) within secondary storage and still present on the primary file system. This is the best of both worlds, the files can be purged when space is needed, and still fully accessible at disk speeds, and the data blocks are excluded from backups, which reduces the backup and restoration times (The placeholders are still backed up to allow for a full recovery of all files.) When the file system capacity reaches the administrators specified limits these dual stated files will be purged (data blocks of the files are freed from disk). The placeholder (UNIX inode) still remains in the original directory and information about each migrated file (size, number of copies, location, and type of media for each copy) resides in a database on the server.

When a user/process accesses a migrated file, if it has not been purged it is instantly available at normal disk speeds, if the file has been purged NetBackup Storage Migrator makes it available by caching the data back to disk. The load time and read speeds of your secondary storage devices dictate the speed of your access to the migrated and purged data. Users/processes on remote systems can access a managed file system by using FTP or NFS. After NetBackup Storage Migrator caches the migrated file(s) back into the file system, FTP or NFS transfers occur as if the file had never been migrated.

NetBackup Storage Migrator can also use an NFS mounted file system as a secondary storage device. However, NetBackup Storage Migrator cannot migrate files from an NFS mounted file system.

BENEFITS OF USING NETBACKUP STORAGE MIGRATOR

- Gives users transparent access to migrated data, resulting in virtually unlimited disk storage space.
- Reduces the time needed to perform backup operations or recover servers, and also reduces the total cost of backup media.
- Optimizes a customer’s investment in storage capacity across the entire enterprise by migrating inactive data to units with lower unit storage costs, and can share the libraries used by NetBackup.
- NetBackup Storage Migrator utilizes robotic storage devices that can eliminate operator delays when accessing data.
- Reduced administration costs by automating many aspects of your storage management strategy.

NETBACKUP STORAGE MIGRATOR INTEGRATION WITH NETWORK ATTACHED STORAGE DEVICES

NetBackup Storage Migrator, in general cannot manage Network Attached Storage devices like Network Appliance Filers. Hierarchical Storage Management (HSM) software needs a low level interface into a file system. NFS shared file systems like the Filers do not allow the low level interfaces that are required for HSM and the industry standard Data Management Application Programming Interface/XOpen Data Storage Management (DMAPI/XDSM). However the exceptions to the rule are the VERITAS ServPoint NAS Server, and Enigma Data's SmartMove.

VERITAS ServPoint is an open software solution for NAS. It enables you to transform industry-standard servers and storage arrays into enterprise level NAS file servers.

With VERITAS ServPoint, you can leverage off the shelf hardware or repurpose existing hardware for NAS. This flexibility lowers your cost of ownership and extends the life of your hardware.

ServPoint NAS offers enterprise level scalability and high availability for NAS. Built on proven VERITAS technology - Volume Manger, NetBackup, Storage Migrator, Cluster Server, and Volume Replicator, providing unsurpassed high availability with multiple RAID configurations, clustering up to 32 nodes for fail-over, and protection for disaster recovery.

Streamline IT administration and improve storage utilization by consolidating UNIX and Windows file services under a single NAS engine. The ServPoint GUI simplifies storage management and lets you manage all your NAS appliances from a single management console.

Enigma Data's, SmartMove is a specialized HSM "light" that uses UNIX links and Windows CIFS redirection for HSM like operations on NetApp Filers. <http://www.enigmadata.com/>

STORAGE HIERARCHIES

NetBackup Storage Migrator for UNIX allows you to keep and track up to eight copies of all your migrated data.

Additionally not all customers want just tape as there secondary storage option. Storage Migrator allows you to mix and match your needs with the peripherals you want. One example would be using Storage Migrator to manage a fast expensive disk array, and migrate its data to JBOD (just a bunch of disk, typically using VERITAS Volume Manager), after 60 days of inactivity as the first step within the hierarchy. At the same time as you make your copy to JBOD; you could also make an additional copy to tape. Then after say an additional 60 days of inactivity on the JBOD those files are moved to another tape (you always want at least two copies since tapes do go bad and offsite copies do get lost!) and free the space on the JBOD. Storage Migrator allows up to eight copies of your data, on many different types of media. It is best to be flexible, since your data storage needs change as new devices are released.

NETBACKUP STORAGE MIGRATOR INTEGRATION WITH NETBACKUP

There are several advantages to implementing NetBackup Storage Migrator with NetBackup in a UNIX environment:

- NetBackup is Storage Migrator "HSM" aware, meaning that an attempt to backup a file that has been migrated will not result in that file being unnecessarily recalled/cached, and just the placeholder needs to be secured with NetBackup.
- NetBackup Storage Migrator enables more efficient backups of data. Since less-often-used files are migrated to secondary storage, only the placeholder file needs to be backed up by NetBackup.
- NetBackup and NetBackup Storage Migrator share the same media manager, making the most efficient use of large secondary storage devices.
- Using NetBackup to backup slow machine/networks data to a NetBackup Disk Storage UNIT, and then using Storage Migrator to manage the NetBackup fragments (NetBackup, when backing up to a disk storage unit breaks the backup into smaller files called fragments for disk efficiency and speed.) The advantage for administrators and users is that you can run many backups from slower machines to the same disk. Another advantage is that during a NetBackup restore, the only file that needs to be cached back is the NetBackup fragment that contains the file(s) that are being restored.

Deeper integration with VERITAS NetBackup for UNIX is the future of NetBackup Storage Migrator for UNIX. This will include further integration with the NetBackup administrative console, support for Vault implementations and continuing improvements to interoperability with other VERITAS products like ServPoint NAS.

ADMINISTRATIVE CONTROLS

The administrator configures and manages the operation of NetBackup Storage Migrator. During the configuration, the administrator can choose the file system that NetBackup Storage Migrator should manage and tailor the application to meet the migration requirements of those file systems. For example, with NetBackup Storage Migrator, allows the administrator to

define when files are eligible for copying to secondary storage, and how many copies to make of each file. Additionally you can choose which types of secondary storage devices you wish to use.

Parameters the administrator can configure for each file system are:

- Space thresholds at which NetBackup Storage Migrator stops and starts migration
- Criteria that NetBackup Storage Migrator uses when selecting files to migrate
- Criteria that NetBackup Storage Migrator uses when selecting migrated files to purge from disk
- Choice of media to write the selected files to, including how data is written on that media (Block sizes for example)
- Number of Media copies
- Volumes on which to store each copy of the files
- Whether or not to use concurrent recording to speed up migrations when multiple devices are available
- Quotas on the amount of space that a user can restrict from migration
- Number of bytes at the front end of each migrated file to be retained on disk to satisfy many operational read requests without caching the entire file (up to 2 Gigabytes configurable with DMAP) Some vendors call this the “stub or slice value.”
- Number of migration levels to use
- Group files, typically used with project-oriented data so all the files migrate together and are cached back together when needed.

After configuring the system, the administrator can initiate and control file migrations in many ways within NetBackup Storage Migrator:

- Manually administered commands by the administrator
- By allowing automatic migration to occur whenever configured control parameters are exceeded
- By grooming the file system periodically using the inbuilt JAVA GUI's scheduler or a crontab entry to schedule automatic migration

Through these and other methods, an administrator can set up NetBackup Storage Migrator to operate automatically, requiring little or no human intervention.

Migration controls include:

- Proactively making space available before it is needed by grooming the file system and copying files to secondary storage without purging them. Migrated files remain available on disk unless free space falls below configured limits at which time NetBackup Storage Migrator will purge (delete) the data blocks of the previously migrated files, which just leaves the placeholders on the disk.
- Checking file system free space and keeping it within configured limits. If space is below configured limits, NetBackup Storage Migrator purges available files, or migrates and purges additional files as necessary to provide enough free space.
- Activating and deactivating NetBackup Storage Migrator configured file systems.
- Managing the NetBackup Storage Migrator log space.

NetBackup Storage Migrator also offers a comprehensive suite of tools for managing media within the system. These management capabilities include:

- Registering media for use with NetBackup Storage Migrator
- Consolidating volumes to recover voided space (reclaiming tape space)
- Listing database information about all NetBackup Storage Migrator volumes
- Scanning volumes and displaying information about their contents
- Displaying the location of migrated files
- Validating contents of files and volume databases that store information on migrated files
- Restoring lost files
- Reconstructing lost NetBackup Storage Migrator databases
- Moving migrated files to new media, which makes moving to newer technologies of secondary storage a very easy and fast.
- Exporting migrated files (and volumes) to another NetBackup Storage Migrator managed file system

USER CONTROLS

The administrator can provide users with some control over file migration, purging, and caching operations by allowing them to use either the command line interface or the End User JAVA GUI. (Some sites prefer not to enable this interface for all users.) Monitoring NetBackup Storage Migrator activities and status via a JAVA GUI (File system Browser Interface).

Volunteer the pre-migration of specified files

Grouping of files that are used together so all the files migrate and are cached together

Force the purging of specified files

Create a stop file that lists files that NetBackup Storage Migrator should not migrate.
Create a list of files that NetBackup Storage Migrator should always migrate
Cache files in advance of their anticipated use by a user program. This can reduce the run time of the program by staging all files to the server the night before they are actually needed for instance.

FILE MIGRATION PROCESS

During the migration phase, NetBackup Storage Migrator selects files, and then copies them to secondary storage. If the file system becomes full or fills to a predefined high-water mark, NetBackup Storage Migrator makes space available by purging migrated files from the disk. The main steps are:

- Select files to migrate
- Pre-migrate selected files
- Determine the Storage Method
- Create work lists for copying files to alternate storage
- Pre-allocate database entries for each file
- Copy files to secondary storage
- Updating the database to show specific location of all files
- Release disk space by purging data blocks from disk

File Selection and Pre-Migration

NetBackup Storage Migrator selects files whenever the high-water mark is exceeded or the migbatch process is run for “grooming” the file system. The selection process applies the controls selected by the administrator. NetBackup Storage Migrator selects files by scanning the NetBackup Storage Migrator managed file systems, evaluating each file according to the selection criteria established. The default criteria are based on file size and time elapsed since the last access (additional criteria can be used). Files that meet the criteria become candidates for migration and are placed on a work list. During the pre-migration phase, the work list is made and the File Handle Data Base (FHDB) is extended with pre-allocated space for specific copy information such as media name, and offset of data on the media such as fast positioning information. One entry per copy is created in the FHDB per file. The File Name Data Base (FNDB) contains information about ownership, filename, and other variable information about a file. One entry per file is created in the FNDB during “pre-migration”.

Each migrated file is assigned a file handle number, which NetBackup Storage Migrator uses to identify migrated files. The file handle is stored in the both the FHDB and the FNDB for each file system. Each managed file system uses a separate database.

NetBackup Storage Migrator selects these files until there are no more files that meet the selection criteria or until it selects enough to reduce space used to a predefined level called the low watermark.

Determine the Storage Method

After pre-migrating the file, NetBackup Storage Migrator reads the storage method(s) defined in the configuration file for the file system and assigns them to the selected files. At this point the standard migration process can be redirected and site-specific migration policies could be applied. Such policies may include, copies files by size, or by owner to different types of media.

Creation of Migration Work Lists

The work lists provide input for the copy processors that copy pre-migrated files to secondary storage. One work list is created per method selected. If you have multiple secondary storage devices you can concurrently write to multiple devices striping a file per device to minimize the time it takes to copy all the selected files.

Copy to Secondary Storage

The copy processors read the entries from their assigned work list and copy the indicated files to secondary storage. If the configuration specifies concurrent recording and devices are available, different files can go to different devices simultaneously. If two copies of a file are migrated, they can also be recorded simultaneously.

Copy operations that do not complete successfully are reprocessed the next time NetBackup Storage Migrator starts that copy processor.

Update the File Handle Database

The final step in the migration process is to update the FHDB to reflect the locations of all the copies of the data. Both disk (non-purged) data and secondary storage copy locations are kept.

Release Disk Space by Purging Data Blocks from Disk

The NetBackup Storage Migrator system monitors disk space allocation. When the file system fills to a predefined high watermark, NetBackup Storage Migrator makes space available immediately by purging, migrated files. (This releases the data blocks on disk, but does not effect the placeholder “inode” information.) The FHDB is then updated to show that the file is no longer on disk and must be cached from secondary storage when accessed. See the Slices information about how much information is left on the primary storage device.

SLICES

NetBackup Storage Migrator allows you to configure an amount of data that you want to retain on disk after a purge is complete (All of the data blocks are copied to secondary storage.). The portion of copy of the file that NetBackup Storage Migrator keeps on disk is called the slice. This value is used for applications such as GUI interfaces that want to iconify a representation of each file.

The slice value is a configurable file system parameter and can be set to a different value for each file system. A read request, which is totally within the amount of the configured slice, will be immediately satisfied, by using the data blocks remaining on the disk. If the read request spans the slice or is completely beyond the slice, the whole file is cached back. (A partial file caching option is also available.) Depending on the size of the slice, you can prevent some GUI interfaces and standard utilities like file and head from accidentally caching a large number of migrated files. The slice can be configured to zero length or up to 2 Gigabytes.

FILE CACHING

The name of a migrated file remains in its original directory and visible to the user as a migrated file. (Migrated files appear just like they have never been migrated, so not to confuse end users.) Before a user can access data in a migrated file, NetBackup Storage Migrator must cache the data back. If NetBackup Storage Migrator has not purged the migrated copy from disk, it simply accesses the data, resulting in a no caching delay. Otherwise, NetBackup Storage Migrator copies files from secondary storage and “reattaches” the data blocks to the original placeholder in the original directory and filename. Caching places the file’s data blocks back on disk and sets a cached flag in the extended attributes of the inode. If a cached file is left unmodified, the FHDB entry remains valid. When the file space is needed, NetBackup Storage Migrator simply purges the data blocks. When a user modifies a cached file, however, NetBackup Storage Migrator sets its FHDB entry to obsolete, making the modified file into a non-migrated file, which again may become eligible for migration at a later time. If there are two copies of the file and one copy is somehow damaged, NetBackup Storage Migrator automatically caches from the other copy. In all instances, caching occurs automatically and without extra effort on the part of the user. Because the application accessing the data is blocked during the cache operation, a delay can occur when caching migrated files to primary disk. The length of the delay depends on several factors:

- Availability of drives
- Availability of the volume
- Load time of the media
- Transfer rates from secondary storage to primary disk
- Size of the file(s)
- Level of activity on the system

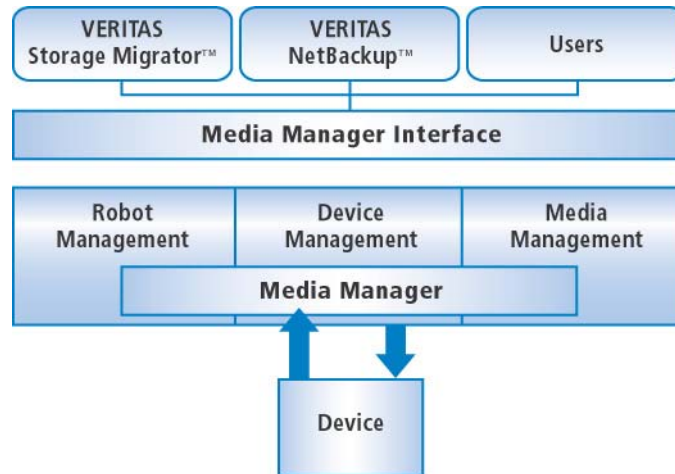
You can minimize caching delay by configuring enough tape or optical devices to handle the peak demand, and matching device characteristics to the size and frequency of access for migrated files. For instance, if one device is available, then only caches or migrations on one piece of media can be processed at a time. All other cache requests must wait, however, if four devices are available to NetBackup Storage Migrator, a maximum of four simultaneous caches are possible, assuming no migrations are active.

TAPE AND OPTICAL MEDIA MANAGEMENT

NetBackup Storage Migrator makes use of the same media manager as NetBackup, which allows economy of scale and reduces the number of robots required to manage your data. During configuration, the NetBackup Storage Migrator administrator defines the storage methods that are available to it. For NetBackup Storage Migrator, the type of media that these storage methods define can be magnetic disk, tape, optical disk, or remote storage. The administrator also defines which methods, and therefore which media, to use for specific file systems. The configuration for one file system could specify that the migrated files go on a tape, while files from another file system could go to similar media or a totally different media.

When transferring data to or from a storage device, NetBackup Storage Migrator determines from its own volume database the volume on which to store the migration data. It then includes the volume information in a tape request to the device manager which then assigns drives based on availability.

The media manager tracks the location of both online and offline volumes and keeps this information in its database. The device manager and robotics software use this information to verify that the correct media is used.



DISK SPACE MANAGEMENT

NetBackup Storage Migrator provides parameters and processes that allow the administrator to maintain free space between configured limits and avoid a full disk condition. Migration parameters include the high and low watermarks, which determine when files are migrated and purged. In addition, minimum age and minimum size parameters can be used to control which files are selected for migration.

Grooming processes can be started via the NetBackup Storage Migrator JAVA GUI, command line or the JAVA GUI's calendar based scheduler. These processes perform the following functions:

- Select and migrate files to secondary storage without removing the migrated copies from the disk (migbatch)
- Create more disk space immediately by purging migrated files from the disk (miglow)
- Force the migration of designated files (migpurge/mignospace)

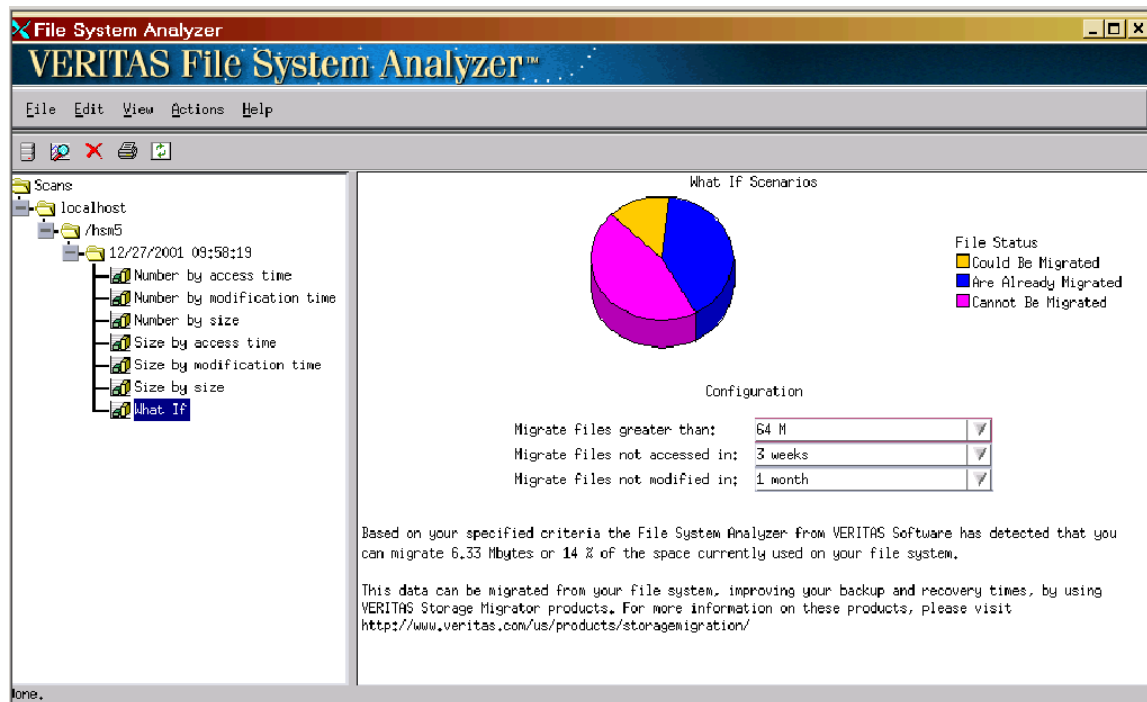
MANUFACTURER'S SUGGESTED RETAIL PRICE

Please contact your local VERITAS sales representative for pricing information on NetBackup Storage Migrator for UNIX.

ADDITIONAL HELP

Information on the NetBackup Storage Migrator product can be found on the VERITAS Software web site at: <http://www.veritas.com/products/category/ProductDetail.jhtml?productId=storagemigratorunix>

Also available at the above link, is the download for the File System Analyzer tool. The File System Analyzer (FSA) for UNIX graphically illustrates the benefits of using NetBackup Storage Migrator. The FSA scans a UNIX file system, returns data on its makeup and allows administrators to perform "what if" scenarios to determine criteria for migration and test file migration strategies.



For more information contact the VERITAS Software inside sales department at (800) 327-2232.

VERITAS Software Corporation
 Corporate Headquarters
 350 Ellis Street
 Mountain View, CA 94043
 650-527-8000 or 866-837-4827

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