HyperTape

from BridgeHead Software

Enterprise Backup Solutions White Paper

Document M8010 Version 3.1 rev.3 April 2002

Document	**HyperTape Enterprise Backup Solutions White Paper**
Reference	**M8010**
Version	**3.1 rev.3 April 2002**

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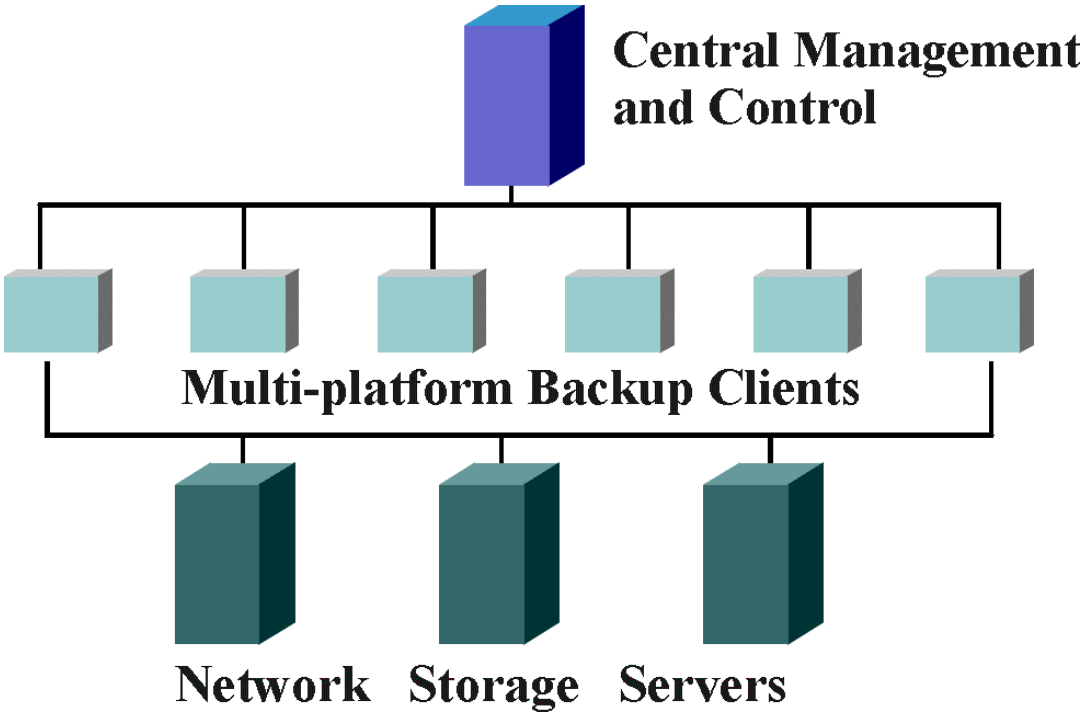
Solutions to a growing problem…

Many of today's organizations are faced with a problem: they have numerous file servers, often from multiple vendors, but no automated or centralized storage software to guarantee consistent backup policies. Most of these companies and institutions have a heavy investment in existing systems that are hard to cover in a single backup strategy.

HyperTape Enterprise Backup is a client/server solution for every storage environment, including distributed and enterprise operations. Its pioneering three-tier backup model provides a dedicated server to centralize backup administration and events. Its open architecture supports both centralized and distributed storage devices. Restore operations, unless otherwise defined are handled by the individual clients where the data belongs.



HyperTape provides easy, economical access to large capacity, high-performance data storage via its customer-driven functionality, open architecture, centralized management, and media and robotic management capabilities.

Planning for the future

You probably depend on more than one source to achieve your enterprise-wide computing goals. It is our goal to provide network backup automation capabilities that satisfy your requirements in the most demanding and diverse multi-vendor environments.

In addition to your complex IT environment, you probably have many types of storage support within your organization: corporate wide, remote/mobile, local /departmental, database backup, legacy systems applications and client/server considerations. In order to satisfy your needs, your suppliers must understand this complex picture.

As connectivity increases and price performance improves at around 8% to 12% each quarter, storage capacity is exploding. It is common to see companies placing an additional 30% to 50% storage demand on networks every year. With the development of new image based applications, these trends are likely to accelerate. The network data management crisis has reached epidemic proportions; the associated management costs can exceed the purchase price of the systems.

You can save your company enormous sums of money by implementing automated data management systems that streamline your storage processes. The savings come from lower costs for backups, centralized control and staffing, from hands-off operations, less data control and higher productivity.

Companies should not underestimate the business impact caused by network downtime and storage constraints. Surveys show that the average loss of revenue due to storage failure is around $125,000 for small companies and more than $1 million for large companies.

The question is whether you can afford not to have a comprehensive backup solution. The value of the data stored on file servers is usually far greater than the value of all the hardware and software components combined. Recent studies have shown that most companies cease trading or are acquired by another company within a year of experiencing a data disaster lasting ten days or more.

Choosing a solution

We all recognize the explosive growth of data pulled onto networks from databases, applications, audio clips, video and other very large binary objects. Uncontrolled capacity growth often results in poor network performance and inefficient solutions for data backup.

Selecting the right product for a particular situation is challenging. It involves the interplay of dozens of factors, including:

- How much data must be backed up?
- How much time is there to perform backup?
- Where will the data be stored and for how long?
- Are there databases to back up?
- Will database backup be online or offline?
- What kind of network environment do you have?
- Do you have enough bandwidth to support network storage solutions?
- Who will restore the data?
- Do you foresee moving to another operating system or hardware environment?
- What storage devices do you already have?
- Does your prospective backup software support your devices and existing software?

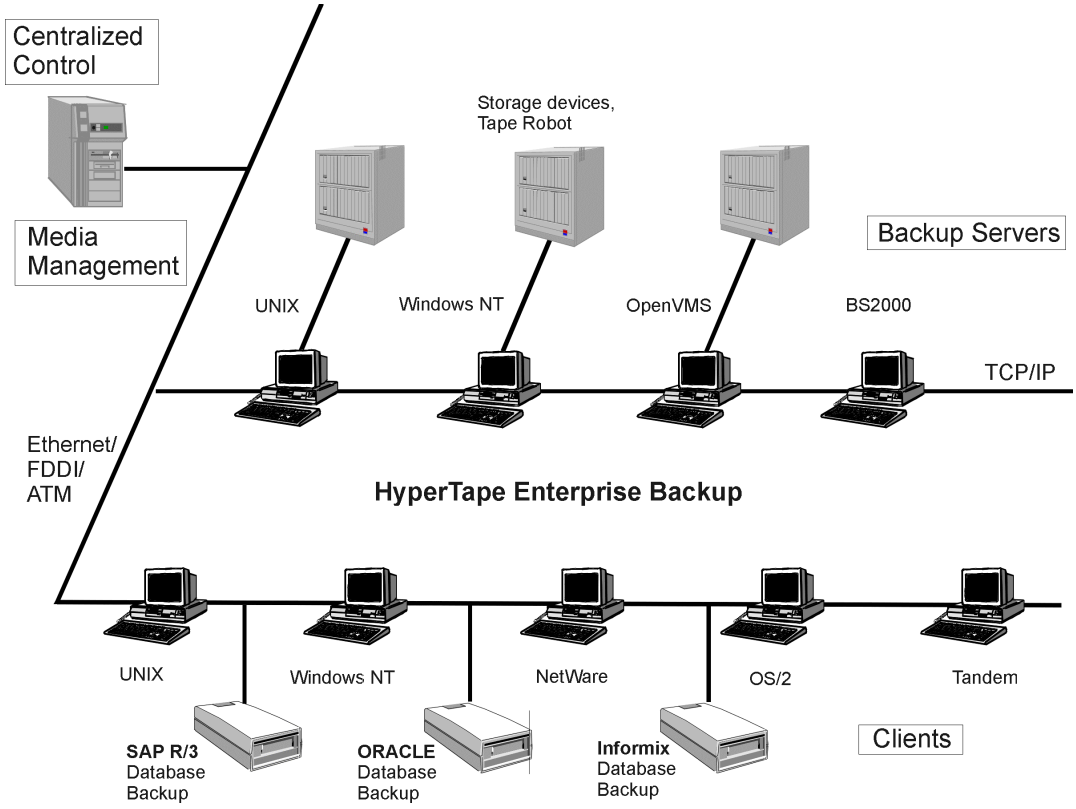
Organizations often select VARs, System Integrators and distributors based on their ability to audit the internal needs of a company and to provide a clear solution that addresses all of the issues. In the long term, organizations that invest the resources to audit their storage needs and to implement the right backup and restore solution will be best poised to thrive.

HyperTape is a highly reliable, automated, process-driven backup solution for fast changing heterogeneous environments. It is easy to use and helps organizations institute consistent procedures for their distributed users.

What will you need tomorrow?

The hardware components of most networked organizations are broken down into several areas:

- Client systems to be backed up and requiring restore services
- Server systems where databases and data warehouses reside
- Mainframes and Backup Servers for mirroring, storing and caching data
- Storage devices - either onsite or offsite
- Multi-platform network environment: Windows NT/2000, Windows 95/98/Me, OpenVMS, NetWare, Tandem, Linux, UNIX platforms etc.



Any backup management solution that you select must have the:

- Ability to integrate all components under centralized control, with administration of backup, restore, and media management in one location
- Flexibility to choose local, centralized, or distributed backups using the same consistent interface
- Functionality to handle the backup of applications, files and databases, with the capability of integrating with user-written interfaces
- Interoperability to store any client to any server, and any server to any storage device
- Ability to extend to new devices and tape technologies
- Ability to model Fibre Channel and Storage Area Network devices

According to a VAR Business study published in 1997, the top issues that customers face when evaluating a storage management product are:

- Centralized, GUI-based management of storage devices and network functions
- Integration of storage management functions
- Wide breadth of client platform coverage
- Online data management
- Customizable backup options
- High data integrity
- Ease of use
- Icons, drag-and-drop menus and configurable screens
- Integrated, cross-application interfaces
- Self-healing capability such as failover, fault prediction and performance optimization
- Scalability
- Support for additional heterogeneous servers, devices and applications, with high performance and low complexity
- Centralized monitoring of numerous distributed devices
- Proactive planning tools
- High availability
- Maintenance of all data online at all times: downtime is unacceptable
- Automatic failure recovery
- Ease of implementation, including planning, installation, configuration, tuning, advice and migration
- Easy integration with existing networks and network management infrastructures
- Accommodation of legacy data

HyperTape provides solutions for each of these issues. It is a high performance network storage management application that provides for online and offline backup of mission-critical data, databases and applications. It is designed for medium to large computing enterprises and increasingly heterogeneous environments.

The rest of this paper looks more closely at HyperTape and its component parts.

HyperTape Enterprise Backup…

HyperTape is one of the industry's leading storage management applications for backing up and restoring critical data, databases and applications across networks. It has a cross-platform, highly scaleable architecture, which conforms to industry standards. This allows customers to increase dramatically the range of systems they can attach to their automated tape and optical systems and to improve the price/performance of their robotic technology. HyperTape provides easy, economical access to large capacity, high-performance data storage for any network.

Customer-driven functionality and open architecture make HyperTape the most flexible and focused network backup software available. It supports centralized, distributed and mixed backup technologies. In a changing and uncertain world, you need flexible applications that can help you grow or re-size your systems. That is why HyperTape supports the broadest possible mix of clients, servers and storage media devices.

HyperTape is a server and client backup solution for every storage environment, including distributed and enterprise operations. It is an open, integrated product for network-centric backup environments, including Windows NT/2000, Windows 95/98/Me, OpenVMS, NetWare, OS/2, Tandem and most UNIX platforms (see web site **www.BridgeHeadSoftware.com** for full list).

It provides online backup agents for SAP R/3, Oracle, Informix, MS Exchange, SQL Server, and other databases. An extensive array of jukeboxes and tape libraries are supported, including ADIC, Breece Hill, Compaq, EMASS/GRAU, Exabyte, Fujitsu, HP, IBM, Odetics/ATL, Sony, Spectra Logic and StorageTek. HyperTape integrates seamlessly with third party software and centralized control consoles that manage capacity, IT policies, and automation.

There is an increasing awareness at board level of the cost of storing and managing data. At the same time, backup and data protection is becoming increasingly important. Distributed system management, network storage management, and network backup and recovery are quickly becoming strategic parts of company planning.

Backup strategy

Performing regular backups is a crucial and often neglected network storage management task. A manager's time is often so caught up with network issues that the mundane storage challenge is overlooked. But while your users pile on new applications, databases, data types such as sound, 3D interactive images and video, you struggle with the task of planning capacity and administering the backup processes.

Backing up a hard disk full of data is a tedious chore. It is often neglected, despite the inevitable impact of a crash, theft, virus, or natural disaster.

Manual local backup of every system is becoming impractical for many workstations and large file servers with massive amounts of storage. It is often more convenient and economical to use large capacity, high performance data storage on a mainframe or an enterprise server. Keeping backup media on site may protect valuable data from human error and hardware failure, but not from other disasters or theft.

The major reason for catastrophic data loss is not knowing how to prevent that loss. The backup issues facing the system administrator are not always clear. Many tape drive vendors would like users to concentrate only on hardware issues, such as tape drive speed, capacity and mean time between failures.

However, it takes a broad understanding of the issues, from backup media options and methods, to restoration procedures, through network and scheduling, to select and implement a solid backup system.

If you are the system administrator, don't find out too late that the backup system or procedures are inadequate or unreliable. The resulting data loss might be catastrophic. A solid backup system comprising hardware, software and clear procedures is an absolute necessity.

Making network backup easy

HyperTape uses a network's existing hardware and software components. It allows organizations to use their existing storage more effectively. HyperTape provides automatic, unattended backup of PCs, workstations, departmental servers and enterprise servers across networks, and supports a variety of tape, optical, and other magnetic storage media. The product is primarily designed for high-speed network backup to automated high capacity peripheral systems. It can handle an unlimited number of concurrent sessions between any number of network nodes.

Since it is network-based, any file stored within HyperTape-based systems can be backed up from any node on the network.

The HyperTape concept is to bring the workstation and server data to the server or mainframe backup station, where they can use either HyperTape and Media Management software, or an existing mainframe storage management system.

With the right operating system and enough bandwidth to send data to the mainframe or server, you can have LAN/WAN based data managed automatically.

HyperTape allows you to constantly monitor all network backup and restore operations. E-mail messages can be sent to inform you of the status of backup and restore operations. If an error occurs, warning messages are issued automatically. The messages include pointers to the detailed log files that can be used to determine the cause of any problem.

HyperTape supports existing standard or industry standard interfaces for network backup and recovery utilities. It includes OpenMedia, its own multi-platform enterprise media manager for all aspects of media management, including choice of tape, offsite (vaulting) policies, tape retirement and automated drive cleaning. Alternatively, HyperTape can interface to other tape library management systems that monitor tape usage and ensure that the correct tape is used for backup and restore operations.

All these features, combined with the benefit of increased uptime and reliability, make HyperTape the right choice for the most demanding customer environments.

HyperTape concepts

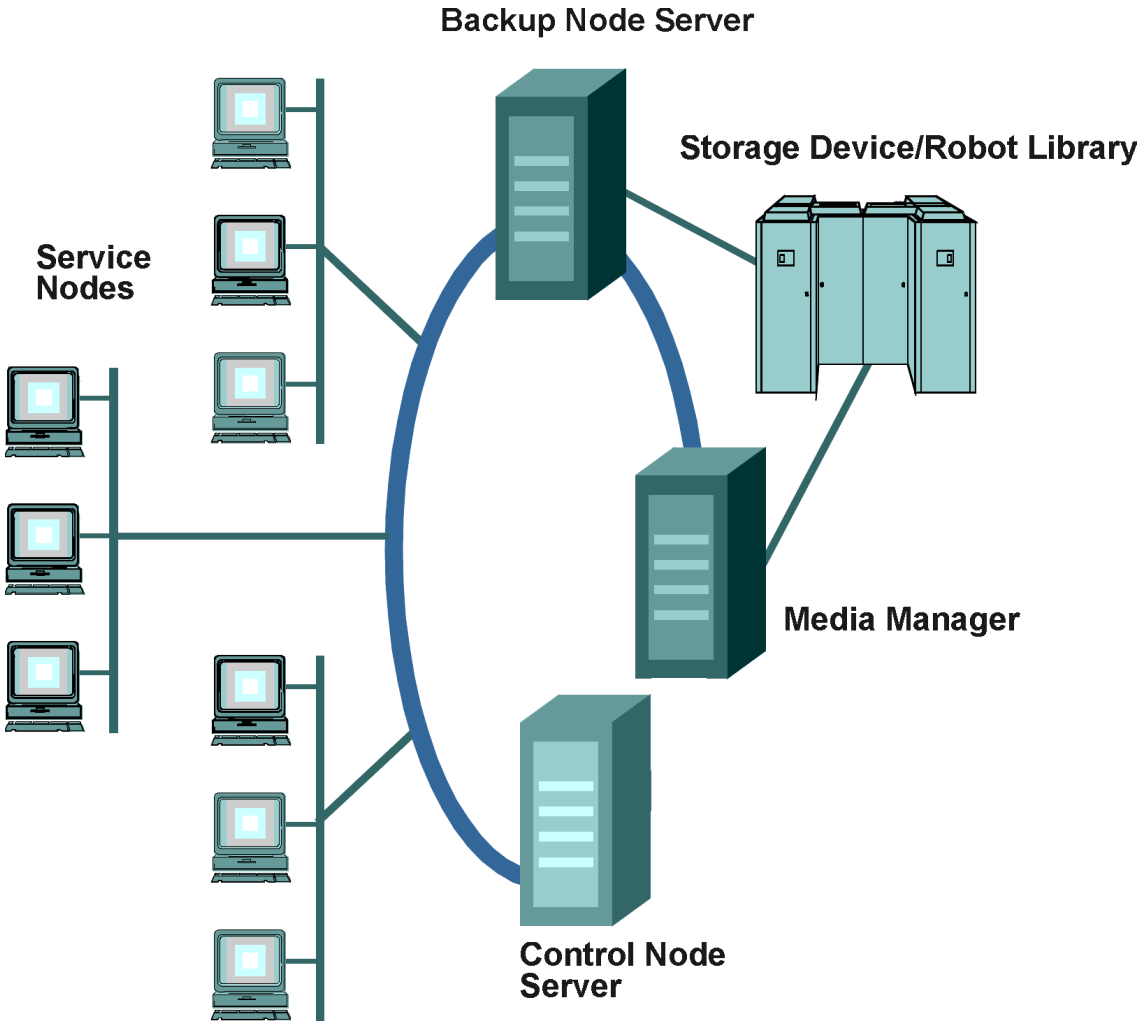
HyperTape uses a five-layer model. First, the backup itself is a three-tier construct:

- Control Node
- Backup Node
- Service Node

Then there are two further optional layers:

- Media Management
- Robotic Storage Management

A key advantage of HyperTape is the ability to segregate the control and management functions in this separate server. The Control Node uses the control path between the control server and the backup clients to initiate backup. A separate data path manages the backup between the Service Node (backup client) and the Backup Node, and on to the attached storage device.



The Control, Service and Backup Nodes work together to create a connection that ensures a reliable network data transfer. Any of the supported network protocols, including TCP/IP and DECnet, can be used to establish sessions between the nodes. It is possible to select one protocol to be used for the control path and another one, geared toward higher throughput, for the data path. Once the backup operation is completed, the Service Node notifies the Control Node of the status. This concept allows for fully centralized network backup management.

The processes are organized in three of the most common backup related tasks:

- SAVE creates a saveset containing the contents of the selected objects (normally file systems or databases)
- RESTORE restores a selected file or system from a remote saveset
- LIST lists the date and time a saveset was created, and the names of the files in the saveset

HyperTape OpenMedia provides the media management layer of HyperTape. It has facilities for volume, saveset and device management including onsite/offsite rotations, for robotics or human operator control, facilities for user and host administration and for system policy application. It can handle multiple distributed robots and allow them to be shared between applications. OpenMedia sends instructions to robots via an open interface to HyperTape Robot Manager or a third party robot manager, providing the interface between the Backup Node and the tape library.

HyperTape OpenMedia was designed, in the late 1990s, specifically to model and support even the most complex Storage Area Networks (SANs) and Fibre Channel multi-hosted devices.

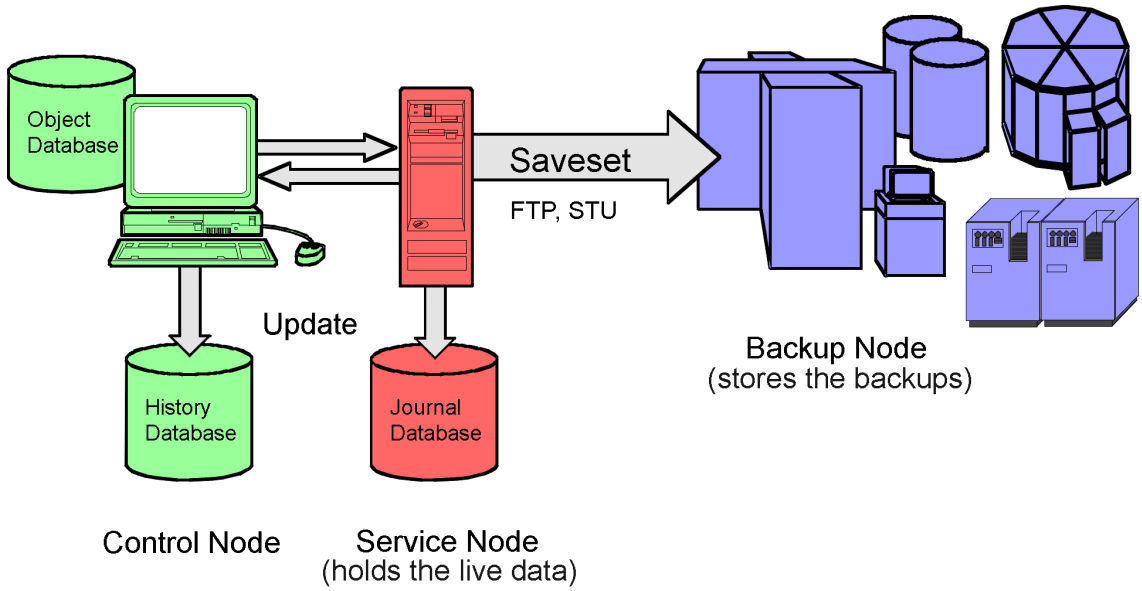
How HyperTape works…

HyperTape backup management

Manual backup is often a reactive process. Managers tend to spend little time analyzing which files are being backed up, how often, and why. Introducing automation and built-in intelligence streamlines the operation, enforces best practices and lowers expenses through lower personnel costs.

HyperTape manages the backup and restore process pro-actively. It looks at all the data throughout the network and automatically transfers copies of the data away from the local disk to the selected combination of tape, disk or optical media.

The HyperTape Control Node module is responsible for fully automated backup, retrieval and management of objects on the network. It provides a powerful management tool for enterprise-wide backup and recovery. It eliminates manual operator activities; schedules backup activities and supports its customers in unattended operation, as well as facilitating disaster recovery activities, off-site processing and volume movement. At the same time, the system administrator retains the option of assigning local users the rights to intervene in the process.



Automatic Backup Procedure

The *Object Database* is the HyperTape Backup Management file that provides a list of *objects* stored on the network and a description of storage management policies. The database provides many sophisticated features for file-selection and command procedures. The object has fields that describe the media management options appropriate for the backup, for example, whether to append to tapes. There are specific media-management options for HyperTape OpenMedia or generic fields to allow integration with other media managers. The flexibility gives users the option to back up an entire hard disk, selected files, or a combination of files. HyperTape can also schedule command procedures to run at a specific date and time.

The storage management policy identifies the systems being managed, provides lists of characteristics for objects and allows the storage administrator to define selection routines that associate backup and storage management criteria with objects.

Objects are collections of data elements that do not have conventional record structures. An object is a named bitstream whose size can vary from a few kilobytes to several gigabytes. Examples of most common objects include files, databases, directories, volumes, grouped volumes, etc.

Automated backup management comes down to two basic functions:

- selecting objects for processing
- deciding and executing required processes or services to process each object

Objects are selected when their pending action date indicates that they need processing. Once backup policies are defined, the administrator can choose any of the common backup strategies. As the criteria, drives and files to back up are selected, HyperTape saves the selection, together with a default command procedure, as an entry in the Object Database. These strategies can be replicated as templates to use at other sites.

HyperTape's calendar feature completes the automation of backup. As long as the Control Node and Service Node are online, the Control Node's *auto - launch* feature starts the remote process and performs the backup.

HyperTape features a whole range of facilities that enable users to implement their preferred storage management policy on a network wide basis. Storage management is a cyclic procedure, which assures that data is backed up in conformity to a policy defined by the network storage administrator. Backup can now be based on the storage management policy of the installation. During a storage management cycle, the Control Node selects objects for processing based on requirements described in the Object Database.

The Control Node uses the database to interpret the storage management policy and to provide an automatic management capability to process the requests for the listed objects.

Backup process automation

The calendar features define the backup frequency and type (full, incremental, monthly) and how many generations of each to keep. The Control Node uses the Object Database to initiate daily, weekly, and monthly backups. These can be scheduled by the day of the week or by dates.

The Service and Control Nodes support user exits for pre- and post-processing. Automatically, at the scheduled time, the Control Node launches the process on the Service Node to start copying data to the Backup Node.

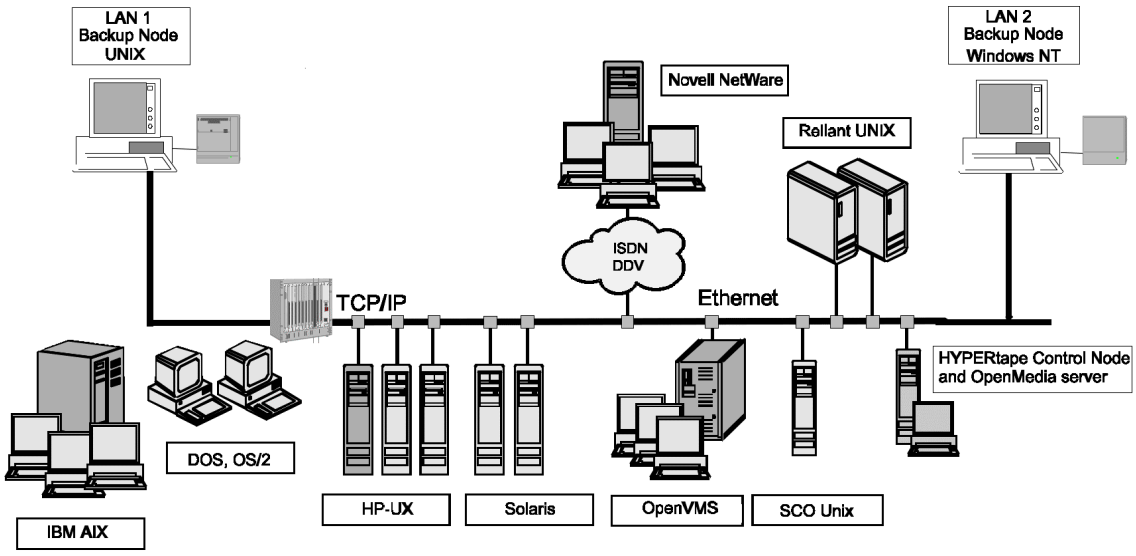
HyperTape also contains many additional customization points, so you can build a library of sophisticated backup procedures.

The diverse capacity, performance and changing cost characteristics of disks, automated tape libraries, various optical disk devices and magnetic tape all have an impact on your backup policy. Magnetic disks are often included as the highest level of the hierarchy to hold incremental backups that require small capacity for a short period of time. However, the volume of object data effectively precludes retaining objects on disk storage permanently. Advances in automated tape and optical storage libraries (robotic jukebox arrangements) now provide a large-capacity storage medium, with cost and performance characteristics between those of magnetic tape and magnetic disk.

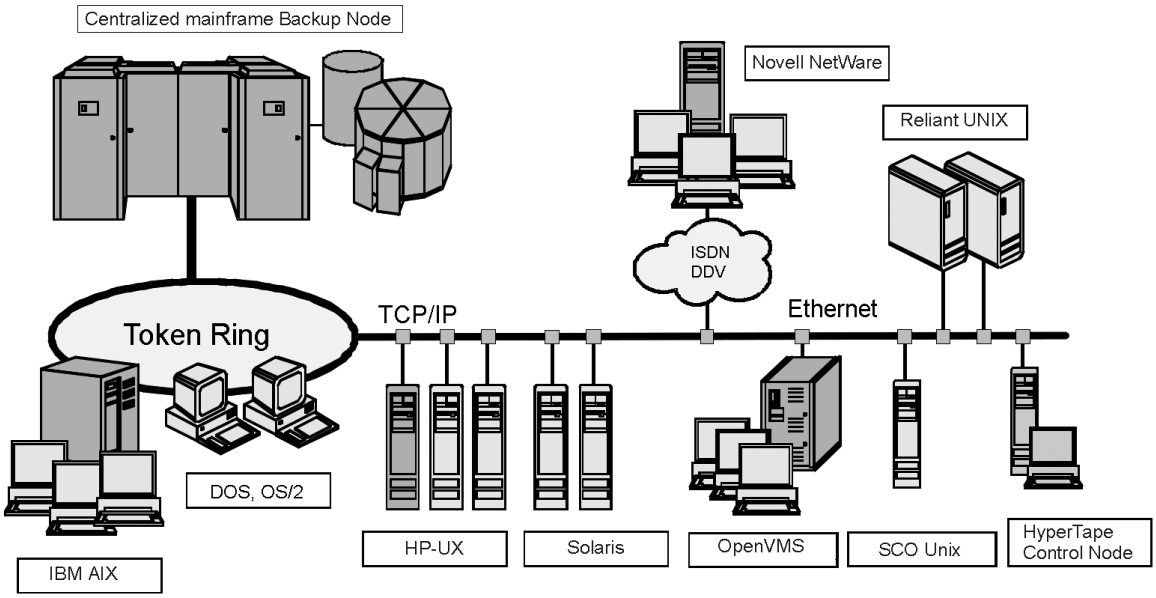
Backup policy

When scheduled backup times arrive, the Service Node starts sending data to the Backup Node. The backups run their course then notify the designated administrator of the outcome. In case of errors, the messages point to simplified logs that summarize each failed session and explain the errors in plain English.

The data is under the control of the Backup Node when it arrives there. HyperTape OpenMedia or other third-party software can take over.



A typical HyperTape network with distributed Backup Nodes



A typical HyperTape network with a centralized Backup Node

Once you have selected your files and established the calendars or command procedures, the backup process to an extent becomes a routine. HyperTape is designed to be used unattended overnight when there is little other network activity. The administrator need only check for any exceptions each morning.

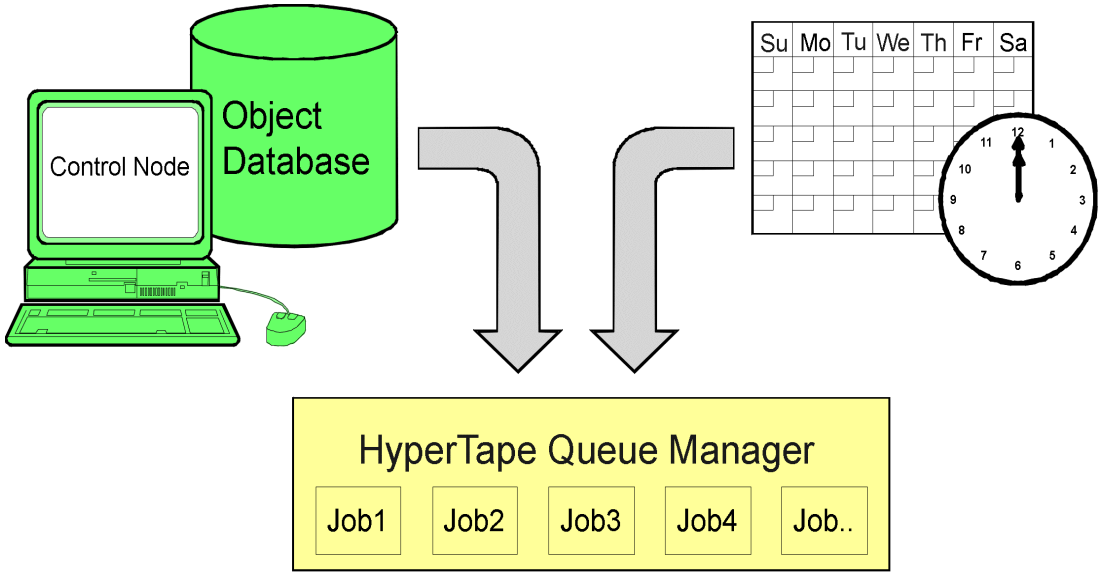
HyperTape components…

Control Node

The Control Node handles central management and control. A key advantage of HyperTape is the ability to segregate these functions in a separate server. The Control Node defines when, where, what and how to backup. It runs on a growing list of operating systems, including:

- Microsoft Windows NT / 2000
- Compaq OpenVMS (VAX and Alpha)
- Sun Solaris
- HP-UX
- IBM AIX
- SGI IRIX
- Reliant Unix
- Compaq Tru64 Unix

The Control Node initiates unattended backups from Service Nodes to the appropriate Backup Node. It should therefore be a system with maximum uptime and access to all Service Nodes on the network.



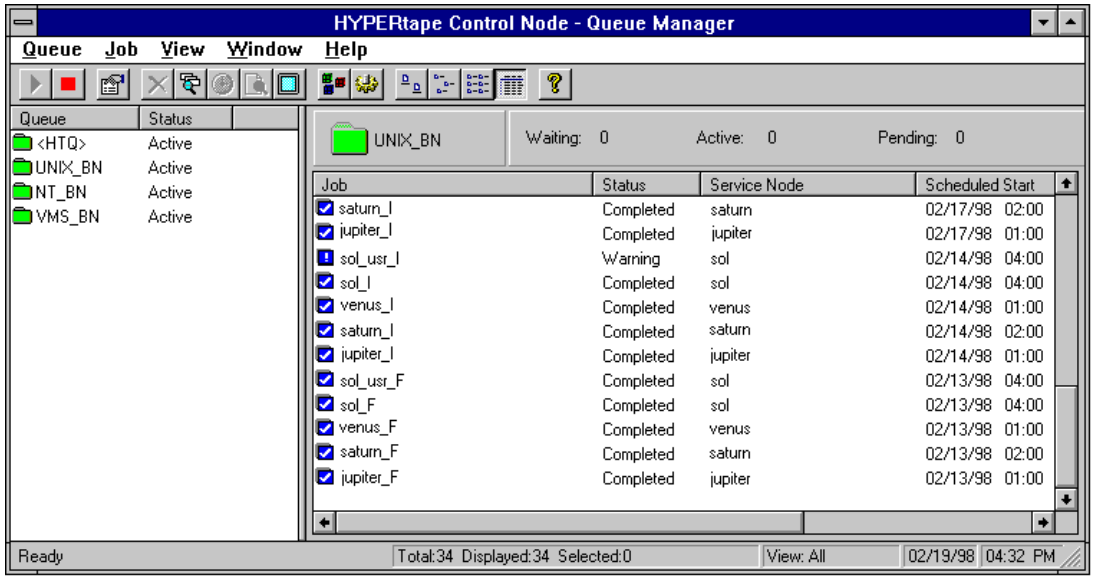
HyperTape Control Node Queue Manager

Multiple Control Nodes can be configured and used for various purposes including administrative control, redundancy, etc.

The ability to locate existing backups quickly is fundamental to any backup and recovery system. The *History Database* records the names of all savesets, journal files, backup dates and times, saveset sizes, and the Backup Node on which the savesets were written.

The HyperTape Control Node delivers both flexibility and high performance options to protect mission-critical data and applications. The advanced Scheduler, Object and Queue Manager have sophisticated load balancing that allow the system administrator to define the start times for jobs, and also to define objects (files, partitions, disks, etc.,) network segments and queuing.

Administrators can set up a centralized monitor for backup operations across multiple networks and for all distributed workgroups. This leads to significantly lower administrative costs within multi-platform environments and also to the highest backup reliability.



HyperTape Queue Manager (on Windows NT/2000)

The graphical Scheduler gives complete timing control of backup policy. The full color calendar shows all full, monthly, incremental, day of week and month backups, and Generation Cycles. The Generation Cycles option allows you to preserve an appropriate number of backups.

You can also set a policy for preventing backups, which is useful for avoiding overheads associated with planned equipment maintenance or IS tasks.

Powerful reporting facilities

Reporting is assisted through the use of color coded graphical icons that indicate the backup status of each object, for example Active, Completed, Waiting, or Failed. Objects such as disks, partitions, databases, files, or systems are easy to add and define. You can define the backup paths and use file patterns to include and exclude groups of files.

Service Node

Systems containing objects to be backed up are called Service Nodes. Commands to initiate backups are sent to the Service Node from the Control Node and the Service Node then copies the data to the designated Backup Node.

To restore data to the client, the user first selects the data. The Service Node employs a resident file known as the *Journal Database* to restore the data. This holds details of every file within every saveset. It is used to find the specific files, which are selectively restored from a saveset.

HyperTape supports a large number of Service Nodes, including:

- Windows NT (Intel and Alpha)
- Windows 2000
- Windows 95, 98 and Me
- OpenVMS (VAX and Alpha)
- Linux
- NetWare
- Tandem
- OS/2

And many Unix platforms, such as:

- Sun Solaris
- HP-UX
- Compaq Tru64
- IBM AIX
- SGI IRIX
- Reliant Unix
- SequentDYNIX/ptx
- Fujitsu UXP
- SCO UNIXware
- SCO Openserver
- NCR SVR4

Restore

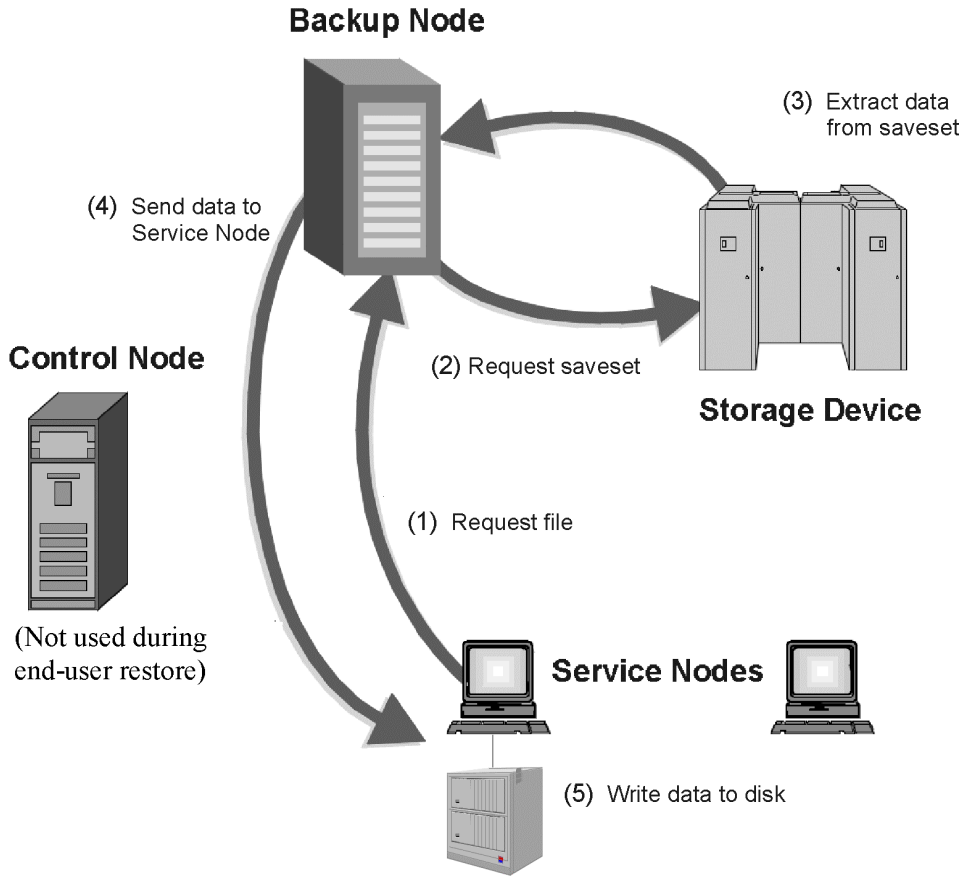
The most important storage issue is access to data. Users are not so concerned about backup as the availability of the files and applications that they need. HyperTape Restore functionality is designed with this in mind.

Data may be lost for a variety of reasons: corruption, viruses, accidental deletion, physical damage, or even a change of office location. HyperTape Restore locates information on request and retrieves it to the desktop.

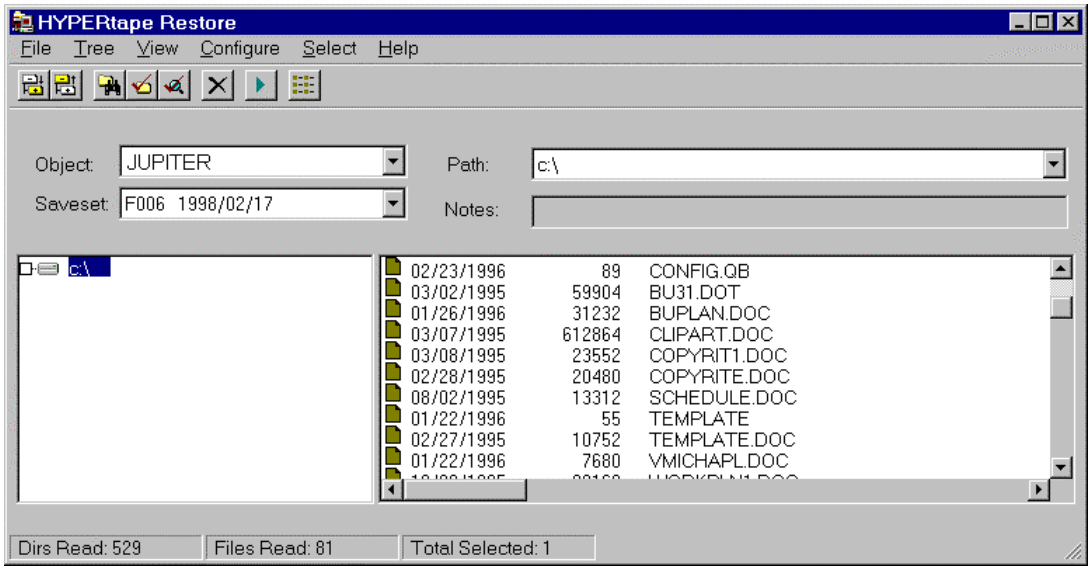
HyperTape Restore sends files across the network quickly and easily. The illustration below identifies the steps in a filtered restore operation. Filtered Restore is a BridgeHead innovation where only the specific file or data moves across the network. These steps are:

1. The user on the client Service Node requests a file.
2. The Backup Node requests the saveset from the storage device/devices, or asks the media manager where it is stored.
3. The Backup Node extracts the required data from the saveset.
4. The Backup Node sends the data to the Service Node.
5. The Service Node writes the required file to disk.

The result is lower resource demands on the network and CPUs.



The Service Node keeps track of all versions of all files that have been backed up. When you specify a file to restore *by name*, HyperTape finds and restores it. The strength of this design is that the system does not ask for the name or location of the tape or cartridge cassette that holds the most recent version of that file: it is automatic.



Restoring from a Service Node (on Windows NT/2000)

If no file version is specified, HyperTape restores the most recent version using the last full and incremental savesets. It does not matter on which tape, or on how many tapes, the information resides, nor does it matter if the savesets are kept on different media or at multiple locations.

No matter if some of the data or files reside on tape and others on disk, HyperTape automation restores the files.

Restoring files requires no coordination between the backup administrator and the user, (providing the security criteria are met). Providing both systems are running their respective applications, the user retrieves the files directly from the tape loaded automatically at the Backup Node. This is advantageous for work groups where users are responsible for their own files.

Alternatively, the backup administrator can use HyperTape restore facilities at the Control Node, to select and send files back across the network to a client. This works well where backup administrators require complete control over corporate data or when restoring a complete Service Node after catastrophic data loss.

Backup Node

HyperTape Backup Node software resides on the network storage server. It stores the backup data in savesets sent from the client Service Nodes.

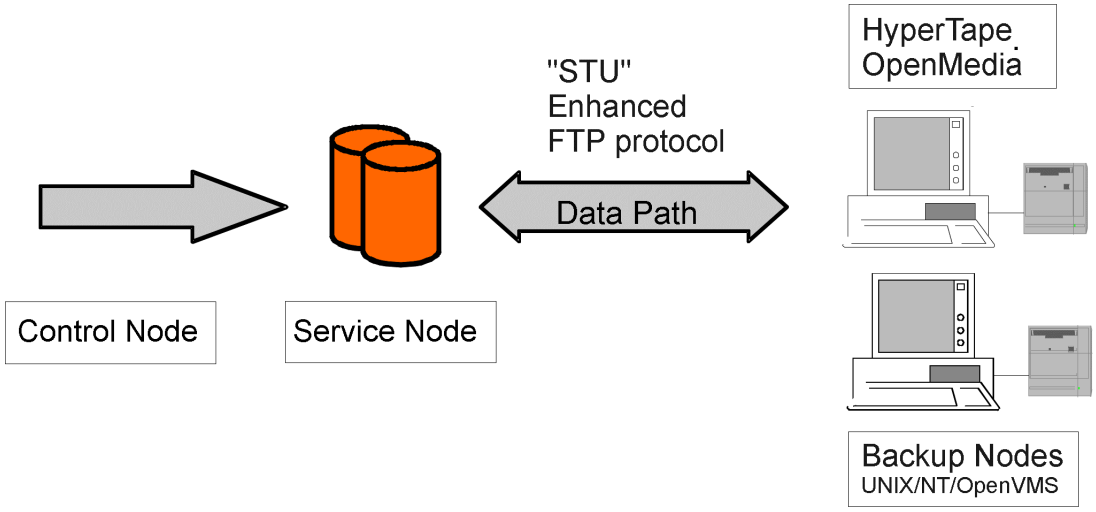
Organizations should keep open as many network configuration options as possible. To support this strategy, the Backup Node can be any system on the network with an automated tape cartridge library or a robotic optical jukebox and file storage and retrieval software. The Backup Node automates the management of long-term storage.

It can be either:

- An open systems node where HyperTape media management software writes data to disk or direct to tape. Examples of supported open systems Backup Nodes are UNIX, OpenVMS and Windows NT/2000.
- A mainframe, where data is moved by simple FTP and then handed over to host-based management software such as a Hierarchical Storage Manager (HSM). Examples of Backup Nodes with host-based media management are MVS, BS2000 and Cray.

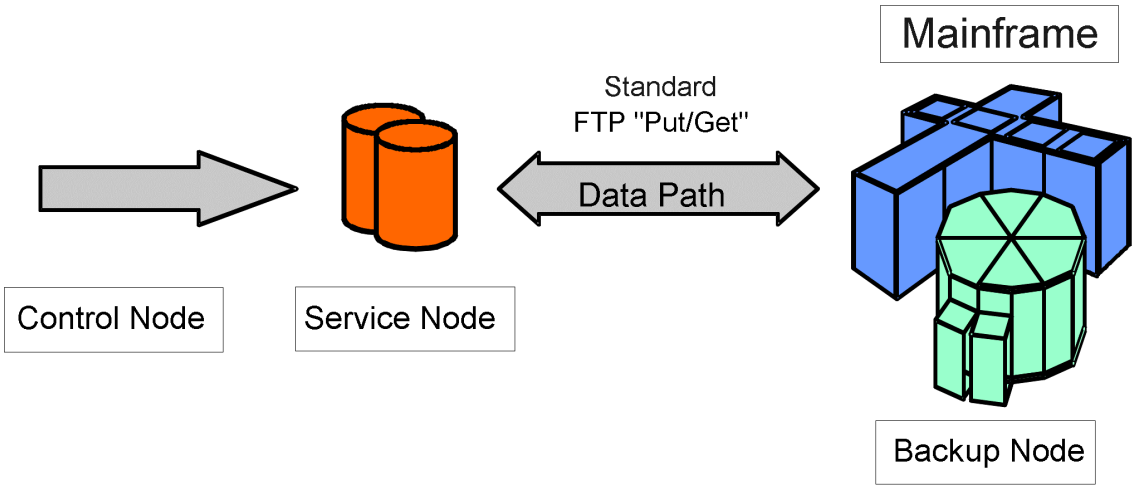
The Backup Node with a robotic tape library completely automates both off-line storage and the restore procedures. It physically moves the tapes from the tape drive to storage and back.

HyperTape OpenMedia is a comprehensive, multi-platform media manager, which you install on your distributed Backup Nodes.



System with distributed Backup Nodes

With mainframe systems, the host-based storage management facilities take over.



System with mainframe Backup Node

A HyperTape configuration often includes several Backup Nodes, thus providing further flexibility and redundancy.

Some of the more common supported Backup Nodes are:

HyperTape OpenMedia Media Management

- Windows NT (Intel and Alpha) Windows 2000
- OpenVMS (VAX and Alpha)
- UNIX (Solaris, HP-UX, Reliant Unix, Compaq Tru64, AIX, IRIX, Sequent etc.)
- Linux

Host-based Media Management

- Siemens BS2000
- Bull GCOS8
- IBM MVS, VM, VSE 370
- UNISYS OS2200
- Cray UNICOS

OpenMedia

HyperTape OpenMedia manages storage media across large and small enterprises. The main facilities it offers are:

- Volume management
- Saveset management
- Device management
- Robotics or human operator control
- User and host administration and authorization
- System policy application

OpenMedia provides you with the tools you need to describe your own organization, and to monitor, control and automate your storage management.

The HyperTape Backup Node uses OpenMedia to:

- Allocate tapes
- Find backups
- Schedule vaulting

On the HyperTape Control Node, the backup object specifies the parameters that OpenMedia uses to select volumes on the Backup Node.

OpenMedia is flexible and adaptable, which makes it suitable for use in a wide variety of organizations. It can stand alone as a media manager, work in concert with other HyperTape components, or integrate with other storage applications. It is designed to be easy to integrate with both robot managers and tape writing products such as backup or HSM applications.

OpenMedia maintains a database for modeling your storage servers, both in terms of physical items such as the volumes and host systems in your enterprise, and in terms of abstract entities such as media pools and user privileges.

With OpenMedia, device and tape allocation is made at run-time, so decisions are based on flexible criteria rather than hard coded. This allows new hardware to be utilized or old hardware to be marked down without requiring any change to the application or job stream.

OpenMedia knows the read and write capabilities of each device: this is important when new devices are purchased and old media are only read-compatible. Device independence allows you to use new devices easily, without requiring extensive rewrites or manual intervention.

Probably the single most important feature of backup systems is the ability to protect against a site disaster. This requires offsite media. OpenMedia implements multiple rotation models and facilitates network backup, multi-site interoperation and offsite media tracking.

When integrated with a robot manager, OpenMedia automatically chooses suitable tapes, and then calls the robot manager to issue appropriate load and unload commands. OpenMedia monitors and records the location and status of the robot's tapes and devices when the robot loads, unloads and relocates the tapes.

The Application Program Interface (API) is designed to help VADs and OEMs to integrate OpenMedia with their own products.

OpenMedia architecture

At the heart of OpenMedia is a relational database with an ad hoc query mechanism. The software is implemented using a client /server architecture. The server does most of the work of OpenMedia, in response to requests generated by the clients.

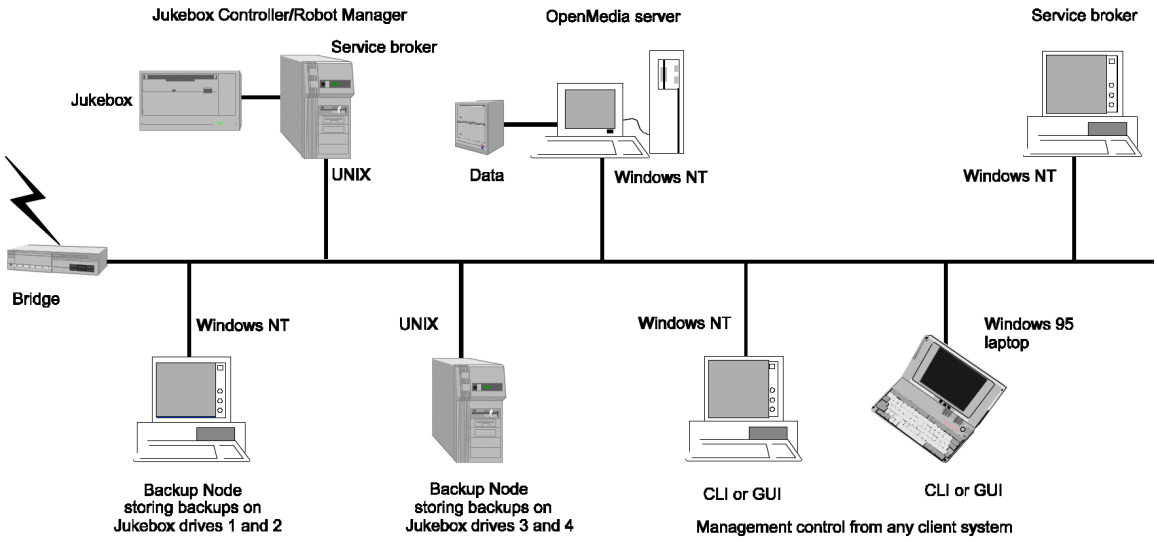
Most client/server applications are static: they require manual intervention when a client or server subsystem is moved to another host. By contrast, OpenMedia uses a *dynamic* service broker. This means that clients ask for a service rather than a particular server, and are routed to the server currently offering that service.

Clients can use services on the network without knowing where the server is running. There is no need to update client and peer processes with server location information when a server process is moved to another host. After the server starts, it registers the service(s) it offers with the service broker.

Multiple service brokers can be defined to provide redundancy so clients can always find a broker and then locate the service. This means that you do not have to reconfigure any clients when a server is temporarily moved.

A number of clients are provided as part of OpenMedia. These include a Graphical User Interface and a Command Line Interface for writing scripts. Utility components for administering the system are also included within the product.

The operation of OpenMedia can be divided into two types: media and administration. For example, the management of tapes is media related, whilst the management of users and their privileges is administration related. This division of work runs through the design.



OpenMedia model

The OpenMedia model describes the entire enterprise by defining the ways that entities relate to each other. For example, tapes reside in media locations, which reside in a locality. Some relationships are “one to many”: one media location can contain several tapes, but a tape can reside in only one media location at a time. Other relationships are “many to many”: one device can read several media types and one media type can be read by several devices. Entities and relationships are defined in an SQL-based ODBC compliant relational database.

Many-to-many relationships can be ranked so that some related objects have precedence over others. For example, a media location has most and least preferred devices. To reduce the time operators spend walking between the devices and the tape store; you could give higher preference to the device closest to the tape store.

OpenMedia server

The operation of OpenMedia is undertaken by server software. Several servers may be installed in an enterprise. Each server provides the media management for a particular locality. If multiple servers are installed, clients can ask for disparate services and may be connected to different servers. All servers can be managed from any location.

Graphical User Interface (GUI)

The Graphical User Interface (GUI) allows manipulation of objects in the database from any client workstation. For example, the system administrator can interrogate the database to discover which tapes are past their expiry dates, then scratch them ready for reuse, or see which tapes are due to be sent to an offsite location. The GUI allows system managers and operators to manage, interrogate and change data in the OpenMedia database. The GUI can accept look-and-feel instructions to behave as Microsoft Windows, Motif or Open-Look, and provides a comprehensive context-sensitive help.

Command Line Interface (CLI)

The Command Line Interface (CLI) provides a way of issuing server requests directly from the command line. Its primary purpose is to allow the development of scripts for managing media and for integrating OpenMedia with other applications, but it can also be used interactively, for example by dial up telnet applications for remote support. The CLI's online help provides information about all the commands and other relevant topics.

Jukebox Controller

The jukebox controller is an OpenMedia component, which is automatically started on any hosts that are designated as robot controllers. It allows robots to be shared between applications, thereby maximizing the return on investment.

OpenMedia can handle multiple distributed robots. Its jukebox controller has an agent-script architecture, which allows the robot commands to be issued locally: the parameters to the script allow multiple robots to be supported easily.

The agent-script model can be specific to a device or a robot, allowing different robot architectures to be supported. Sometimes all robot commands have to be used by a single host, even though the devices in the robot may be connected to different hosts. This is no problem for OpenMedia, because the distributed agent-script model allows one host to respond to all prompts for a jukebox. On the other hand, if each host can issue its own robot commands, for example, if the robot is network attached, then the agent is registered only for these particular devices.

OpenMedia is designed to allow any application to utilize the media management service. The combination of GUI, CLI and API, together with the open agent-script based robot linkage, provides a truly open interface.

Application Program Interface (API)

The API allows client applications to interact directly with the server. It is used internally by the GUI, CLI and jukebox controller components of OpenMedia.

Robot Manager

The HyperTape Robot Manager provides the link between OpenMedia and the robot devices. From any location, you can:

- Load and unload tapes
- Move tapes from any source to any destination
- Load tapes using a bar code label or slot number
- View the contents and status of all robots

Because of the Robot Manager's client/server architecture, you can view and manage robots throughout the network from a central point. This allows you to deploy remote storage robots and so optimize your network backup throughput.

Command Line Interface (CLI)

The Robot Manager Command Line Interface supports commands for loading and unloading tapes, retrieving library contents and performing inventory. The CLI is used automatically by OpenMedia to complete the integration of HyperTape Backup Nodes with robotic libraries.

Java-based Graphical User Interface (GUI)

The Robot Manager GUI is a Java application that is also provided for Windows systems as a simple program that runs from the start menu.

Summary…

To meet the storage challenges of the new millennium, organizations are seeking out integrated distributed system solutions. Driving the move to automated backup software and procedures is the need for optimal network performance, limited exposure to data loss, small backup windows, and reduced operational costs. HyperTape addresses these concerns, from high end, sophisticated, distributed multi-platform environments to small-office backup applications.

In today's rapidly changing environment, you need to choose a product that:

- Allows a centralized or distributed model
- Is not platform centric
- Offers a complete solution or integrates with existing mainframes
- Can scale to thousands of Nodes
- Is proven in sites with Terrabyte backup requirements
- Supports a wide range of backup agents (file, platform and database)
- Has an open architecture so you can call other backup programs and integrate with robot managers
- Provides central or end-user restore options

Each HyperTape software component has comprehensive on-line help. In addition, the comprehensive documentation set includes:

- *HyperTape Getting Started Guide*
- *HyperTape System Manager Guide*
- *HyperTape Control Node Guides*
- *HyperTape Backup Node Guides*
- *HyperTape Service Node Guides*
- *HyperTape Database Backup Reference Manual*
- *HyperTape OpenMedia Concepts and Facilities*
- *HyperTape OpenMedia System Manager Guide*

For more information on backup solutions, network attached storage and for storage management considerations and vendor selection, contact BridgeHead by referring to page 2 of this *White Paper* or to our corporate WEB site:

www.BridgeHeadSoftware.com