Using Yosemite Backup Virtual Tape Libraries to Accelerate Backup and Restore Operations

Virtual tape libraries combine the best of both worlds, using disk as the primary backup medium and tape for long-term archiving. Using backup software from Yosemite Technologies, IT organizations can combine the strengths of Dell™ PowerEdge™ servers and Dell PowerVault™ disk and tape hardware to create virtual tape libraries designed to improve the performance, reliability, flexibility, and scalability of network backup and restore operations.

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Tape-based backups have commonly been used in data centers, but the problems with tape as a backup medium are well known: spotty reliability, high operational costs, and slow performance. For example, typical problems that plague tape-based backups include medium or cartridge failure during backups or restores; unreported failures or incomplete backups; misplaced or mislabeled media; long backup windows and verifications; and slow serial access times.

Meanwhile, the cost of disk-based storage has dramatically decreased, and in many scenarios backing up and restoring data to and from hard disks can be achieved at a much faster rate than possible with tape technologies, enabling shorter backup windows with disk-based storage. Growing dissatisfaction with traditional tape-based backups, combined with the viability of disk as the primary target for backups, has made disk-based backups a popular data protection strategy.

Although tape is still preferable for long-term archiving because of its portability and off-line security, many enterprise IT organizations are finding that a combination of the two technologies helps provide excellent, cost-effective data protection (see Figure 1). Yosemite Backup™ software can be used in conjunction with Dell disk and tape hardware to create such hybrid backup environments.

Enterprise-class performance for backups and restores

Disk-based backups can address some of the problems of tape-based data storage, but they can still leave critical data at risk. However, a disk-based backup can be effective when implemented in a multi-tiered storage hierarchy—for example, a disk-to-disk-to-tape (D2D2T) backup architecture with an automated tape loader or library. When implemented with tape and disk hardware,
Yosemite Backup software offers several features to enhance enterprise data storage.

**Virtual tape libraries and Disk-to-Disk-to-Any option**

One promising technology that is quickly gaining acceptance is the virtual tape library (VTL). This technology employs a disk array that functions as a virtual tape device or library, emulating the key characteristics of tape backup while providing the benefits and convenience of disk backup. External VTL appliances typically rely on proprietary hardware and software to implement the VTL function, which can increase costs and, in some cases, limit scalability. In contrast, Yosemite Backup software embeds the VTL function as an integrated feature, thereby providing the benefits of an external VTL appliance while avoiding drawbacks inherent in proprietary VTL technology.

The disk-to-disk technology in Yosemite Backup software offers the flexibility of two levels of disk-based backup architecture. The first level is disk-to-disk backup, in which the backup process uses designated disk volumes as the backup target—offering the performance, reliability, and ease of scalability of disk-based backups. The second level is Yosemite Backup’s Disk-to-Disk-to-Any (D2D2N®) option. D2D2N® allows for true management of data through a hierarchy of storage devices (see Figure 2). For example, a backup is performed from the source disk to a target disk (configured as a VTL). D2D2N® then manages the movement of the data from the secondary disk to tertiary storage (magnetic, tape, or optical disc) using predefined criteria, such as the VTL reaching a capacity limit or an established time schedule.

D2D2N® provides the flexibility to create multiple storage hierarchies that can consist of other virtual libraries. Data can be moved to other disk systems, and from there to tape for off-site archiving. Because Yosemite Backup is designed to provide true disk-to-disk-to-Any functionality, it is not restricted to a rigid D2D2T configuration. In addition, all data is tracked through the Yosemite Backup catalog, freeing backup administrators from manually copying data to tape or keeping track of where data is going.

D2D2N® is designed to maximize the capabilities of the storage infrastructure cost-effectively, enabling administrators to create VTLs from underutilized disk capacity in similar or heterogeneous environments. The storage folders that are created for use by D2D2N® can be spread across any combination of storage and on any supported platform. As a result, storage can be pooled from Novell® NetWare®, Linux®, and Microsoft® Windows® environments to create the VTL. Yosemite Backup does not restrict IT environments to one platform, nor does it require proprietary hardware or additional third-party software to function as a VTL. In addition, Yosemite Backup software can be managed from a central console and is designed to restore data from any target medium in the hierarchy without staging to a VTL first.

As a result, Yosemite Backup’s integrated VTL approach is designed to provide numerous advantages over traditional disk-only or tape-only backups, including the following benefits:

- A single, simple console for operation and administration
- Fast and highly reliable backups and restores with multiple drives or volumes

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Figure 1. Comparison of typical backup and recovery media

Yosemite Backup software embeds the VTL function as an integrated feature, thereby providing the benefits of an external VTL appliance while avoiding drawbacks inherent in proprietary VTL technology.

![Figure 2. Hierarchy of storage devices allowed by the Yosemite Backup Disk-to-Disk-to-Any option](Image)
Simultaneous backup and restore operations
• Utilization and pooling of storage from multiple, heterogeneous systems
• Direct restores to the point of origin from any target—magnetic disk, tape, or optical disc
• “Spill-over” pools that allow heterogeneous servers to utilize disk volumes and thereby help ensure that backups complete successfully by not running out of disk space
• Creation of multiple backup hierarchies, such as D2D2D2T and D2D2D2O
• Management of multiple copies of the same backup on different media
• Ability to maintain established tape-based policies and processes, including rotation-type backup schedules

Self-Tuning Logic technology
The primary advantage of a disk-based backup is its potential to dramatically reduce the backup window. Yosemite Backup software maximizes this advantage by offering intelligent data streaming, which helps minimize the impact of backups on systems. The Self-Tuning Logic™ technology included in Yosemite Backup is designed to create an unlimited number of data streams to and from the backup source and target system for fast backup and restore operations (see Figure 3).

Self-Tuning Logic is designed to automatically configure the backup streams by detecting how the backup sources are configured, helping provide optimal performance. For example, if a physical disk is configured as multiple logical volumes, Self-Tuning Logic detects this configuration and sets up the backup appropriately.

Flexible, fast restores
In tape-based backup environments, storage software tools often require a restore from tape to a secondary disk and then back to the primary disk, effectively staging the data administrators wish to restore and increasing the restore time. In contrast, Yosemite Backup gives administrators the option of restoring directly from any backup target (magnetic disk, tape, or optical disc) if available on that medium.

Restore performance can be as important as backup performance. Because Yosemite Backup tracks all data in a central catalog, administrators can restore a single file or even a particular version of a single file, rather than a complete disk image—enabling fast, simple data restores that require minimal administrative time.

Dell hardware and Yosemite Backup: Multi-tiered storage architecture
Dell PowerVault and PowerEdge hardware enable enterprise IT organizations to easily add disk-based backup capabilities to their existing backup infrastructures. When combined with Yosemite Backup software’s integrated VTL and D2D2N® option, Dell hardware can be implemented in a plug-and-play manner to minimize the disruption to existing backup operations.

For example, consider an enterprise scenario in which an IT organization must back up data from eight servers and 130 client PCs. Microsoft SQL Server™ database software and Microsoft Exchange run on two of the eight servers. Data from all the servers and clients is backed up to a Dell PowerVault 122T DLT VS80 auto-loader, which provides up to eight media slots (see Figure 4). A full backup is performed every Friday, and incremental backups are performed Saturday through Thursday. One month’s worth of backups is stored at any given time. Data changes by about 20 percent each day. The backup window is eight hours, but the IT organization has difficulty backing up approximately 400 GB of data within this timeframe.

To resolve this problem, the IT organization in this scenario could upgrade the tape devices from digital linear tape (DLT) to Ultrium 3 Linear Tape-Open (LTO-3) technology. Such an upgrade would increase the backup speed because LTO-3 has a specified backup rate of 288 GB/hour compared to the specified backup rate of approximately 10.8 GB/hour for DLT VS80. However, the LTO-3 enhancement still would not overcome issues inherent in tape-only environments such as inefficiency, inflexibility, and limited scalability.

To help overcome such limitations, the organization could implement Dell disk hardware, configuring the environment for D2D2T backups. For instance, a Dell Storage Server (PowerEdge 830)
running Microsoft Windows Storage Server 2003 Release 2 (R2) can provide a network attached storage (NAS) platform. In this scenario, the Dell Storage Server can act as both the Yosemite Backup application server and the disk storage platform, using Yosemite Backup software’s integrated VTL to drive the D2D2T operation. Advantages of this implementation include the following:

- A backup server is not required when the Yosemite Backup VTL is integrated with the Dell Storage Server.
- Backups and restores can be completed more quickly and more reliably than possible with tape-only backups.
- Restores can occur directly from tape or disk back to the point of origin.
- The Yosemite Backup VTL can utilize available disk capacity from Windows, Linux, and NetWare servers, providing heterogeneous “spill-over” capability.
- Concurrent backups and restores can take place using the Yosemite Backup VTL architecture, allowing for multiple virtual drives.

Figure 5 shows the architecture for the example scenario with the Dell Storage Server added for D2D2T backups. This configuration allows the IT organization to keep the existing tape hardware while helping to improve backup and restore performance. Cost for the added hardware can be offset by enhanced scalability, performance, reliability, and availability.

For further scalability, a Dell PowerVault MD1000 system can be added (see Figure 6). This Serial Attached SCSI (SAS)/Serial ATA (SATA) device is attached behind the Dell server and is designed to provide up to 3.75 TB of additional raw disk storage capacity when fully populated with fifteen 250 GB SATA II hard disk drives. Furthermore, up to two more PowerVault MD1000 systems can be attached for up to 11.25 TB of additional raw disk storage.

The PowerVault 122T tape auto loader also can be replaced with the PowerVault 124T tape auto loader to provide a capacity and performance boost in the Figure 4, 5, and 6 scenarios. This tape auto loader provides up to 16 media slots and either an LTO-2-L drive or an LTO-3 drive, which are designed to achieve a native backup rate of 86.4 GB/hour or 288 GB/hour, respectively. This configuration enables disk-to-disk and disk-to-tape backups to complete well within the eight-hour backup window.

**Enhanced storage performance and reliability**

Enterprise IT organizations can significantly enhance backup and recovery performance by migrating to D2D2T configurations such as those provided by Yosemite Backup software and Dell PowerEdge and PowerVault disk and tape systems. IT organizations can help reduce costs by integrating a disk system as a VTL—for example, deploying a Dell Storage Server to serve as a VTL can cost less than upgrading existing tape auto loaders and media. This savings can allow IT organizations to take advantage of investments in existing hardware and media while gaining the improvements in performance, reliability, scalability, and flexibility provided by disk-based backups.

**FOR MORE INFORMATION**

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