

Introducing the Dell PowerVault RD1000:

A Portable Disk-based Replacement for Traditional Low-End Tape Backup

The new Dell™ PowerVault™ RD1000 removable disk drive is designed to cost-effectively match or surpass the advantages of traditional entry-level and low-end tape backup while providing the backup and restore performance of a hard disk drive. This article discusses the potential benefits of deploying the PowerVault RD1000 in enterprise data centers.

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Attempts to entirely replace traditional entry-level and low-end tape backup with different technologies have typically failed because they could not match tape's portability, capacity, archiving capability, or cost-effectiveness. The IT industry has therefore been exploring technologies that both complement tape and address its biggest disadvantages: its relatively low performance during backup and restore operations, and its relatively high failure rates compared with hard disk drives (HDDs).

One alternative has been disk-to-disk (D2D) systems. However, these systems are not typically deployed alone as a true tape replacement. Instead, rather than backing up data directly to tape, enterprises use D2D systems as an interim step to help increase performance: the backup application writes data to the D2D target,

and then later moves the data to tape for off-site disaster recovery and long-term storage—an architecture known as disk-to-disk-to-tape (D2D2T). Although D2D2T has performance and availability advantages over a tape-only design, these advantages typically also increase system costs and complexity.

The new Dell PowerVault RD1000 is designed to replace traditional entry-level and low-end tape entirely while still maintaining the advantages of D2D systems (see Figure 1). The PowerVault RD1000 is a removable backup disk drive that cost-effectively matches and surpasses key advantages of tape and provides the backup and restore performance of random access HDDs. It can be used in many ways, but is primarily intended to back up critical data for high-end desktops and entry-level servers.

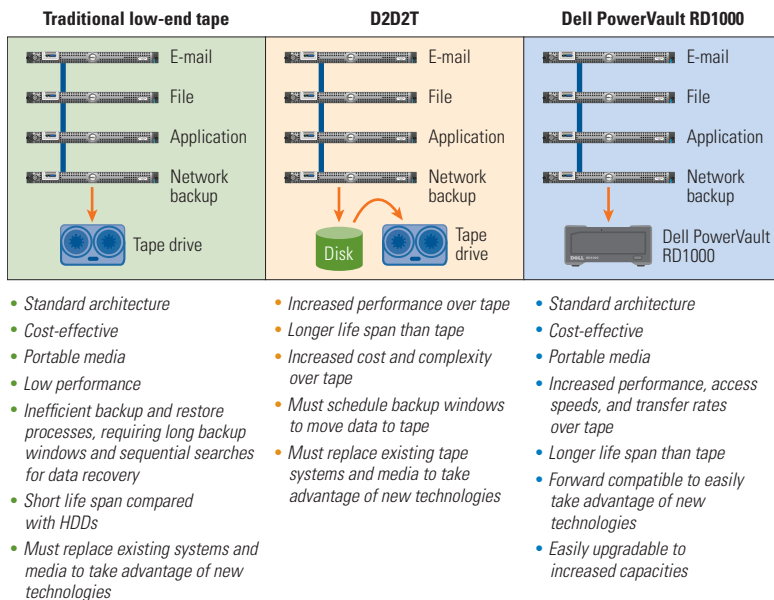


Figure 1. Backup using the Dell PowerVault RD1000 compared with traditional low-end tape and disk-to-disk-to-tape backup

Introducing the Dell PowerVault RD1000

The PowerVault RD1000 enables the same traditional backup process as tape—that is, moving data directly to a device with removable media. To a host computer or server, the PowerVault RD1000 removable disk cartridge looks like a tape cartridge. However, backup performance is significantly increased: the PowerVault RD1000 can take less than an hour to back up 80 GB of native data at its 25 MB/sec external USB transfer rate (up to 30 MB/sec internal Serial ATA [SATA]), while the same operation can take a typical digital linear tape (DLT) VS160 drive over 2 hours, a typical DAT72 drive over 6 hours, and a typical Travan drive over 11 hours (see Figure 2).

The 3.5-inch PowerVault RD1000 uses a removable 2.5-inch HDD suspended in a durable cartridge and designed for portability—the same drives typically used in notebook computers because of their size and locking-head feature. Small-form-factor HDDs like these have undergone significant advancements recently, resulting in enhanced mechanical reliability and life span, including a mean time to failure of 550,000 hours. Features such as ramp-load heads and fluid dynamic bearings are designed to eliminate head-media contact and disk sticking. Its protective design has enabled the removable disk cartridge to pass Dell drop tests of nearly 1 meter onto a tiled concrete floor without damage.

In addition, the PowerVault RD1000 is designed to be easy to deploy, avoiding complex setup procedures; to be compatible with most common backup applications; and to offer plug-and-play capability in most backup architectures. Deploying it should not typically require changing storage designs, complicating backup processes, or adding unnecessary costs.

Comparing the Dell PowerVault RD1000 with low-end tape

In addition to providing the advantages described in the preceding section, the PowerVault RD1000 is designed to match or exceed traditional low-end tape media in performance, reliability, cost-effectiveness, and simplicity of backup and restore operations.

Performance. Like tape drives, HDDs vary in throughput and performance. The advantage that HDDs have over tape is the ability to randomly access recorded data—even if data is written in a sequential format, the PowerVault RD1000 can access and read the data randomly, helping essentially eliminate seek time and significantly reducing single-file restore times. And because PowerVault RD1000 disk cartridges are available in native capacities ranging from 40 GB to 120 GB, this storage system's high capacity combined with its USB transfer speed of up to 25 MB/sec for the external version and SATA transfer speed of up to 30 MB/sec for the internal version enable enterprises to perform full backups every day in much less time than it takes to

perform even incremental backups to low-end tape, which typically transfers at about 3 MB/sec.

Reliability. A tape drive's life span can be limited by the magnetic head, which makes physical contact with the tape media as it reads and writes data. This contact degrades both the head and the tape, and can eventually result in the failure of both the drive and the media. Because the PowerVault RD1000 has no such direct contact and features the same simple connector interface typical of HDDs, it has an expected reliability at least 10 times better than typical low-end tape drives, with its life span limited primarily by the connector rather than the cartridge itself. These physical advantages allow the PowerVault

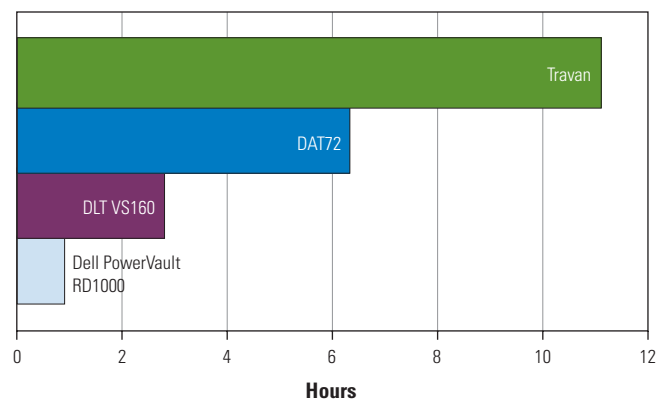


Figure 2. Typical time to back up 80 GB of native data for the Dell PowerVault RD1000 compared with common tape media

	Dell PowerVault RD1000	DAT72	Travan
Native capacity	40 GB to 120 GB (with planned expansion to 160 GB)	36 GB	20 GB
Native SATA performance	Up to 30 MB/sec (external USB performance up to 25 MB/sec)	3.5 MB/sec	2 MB/sec
Backward and forward compatibility	✓		
Electrostatic discharge (ESD)–protected cartridge	✓		
Drag-and-drop functionality	✓		
Cartridge status indicator	✓		
No required cartridge cleaning	✓		
Mean time to failure	550,000 hours	125,000 hours	370,000 hours
Specified media uses	5,000	200	200
Typical relative price	1x	2x	1.5x

Figure 3. Comparison of Dell PowerVault RD1000 removable disk drive with DAT72 and Travan tape drives

RD1000 cartridge to handle more than 5,000 load/unload actions, giving the media a usage life span more than 25 times longer than that of typical low-end tape media.


Cost-effectiveness. To take advantage of ongoing storage capacity advancements for tape drives, enterprises must regularly purchase new tape drives and the associated new media. The PowerVault RD1000, however, features both backward and forward compatibility, helping avoid obsolescence problems: as higher-capacity cartridges are introduced, they can work with existing docks, and vice versa. The simplicity of the PowerVault RD1000 design therefore allows for superior total cost of ownership when compared to low-end tape.

Simplicity of backup and restore operations. Using simple drag-and-drop functionality can make managing a PowerVault RD1000 with a backup application easier than using a low-end tape device. In addition, the PowerVault RD1000 dock automatically tracks how many times a cartridge has been loaded, saving administrators from the tedious task of manually tracking cartridge use—an especially valuable feature in complex media rotation systems.

Restoring an entire disk volume from incremental low-end tape backups, meanwhile, requires going through every piece of tape media that has been used in the backup process—and if the backup catalog is somehow contaminated, it can only be re-created by another time-consuming search of every piece of affected media. Even with an intact catalog, however, finding a file requires a slow serial search of the correct tape cartridge. The PowerVault RD1000, in contrast, uses the random access approach of HDDs to locate and retrieve data, helping significantly simplify file recovery compared with tape.

Figure 3 summarizes how the PowerVault RD1000 surpasses two common tape technologies, DAT72 and Travan, in performance, feature set, and cost-effectiveness.

Creating a single disk-based solution for backup and restore

Before the arrival of removable disk technology, enterprises had to choose between tape, disk, or a combination to back up their high-end desktops and low-end servers, with each method having its own architecture, performance, and cost trade-offs. The new Dell PowerVault RD1000 removable disk drive is designed to provide a viable alternative to these choices, combining the portability, capacity, archiving capability, and cost-effectiveness of tape with the high performance, simplicity, and reliability of disks in a single backup drive. 

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