Faster Backups and Restores With Disk-Based Backup

VERITAS Backup Exec™ 9.1 for Windows Servers

The Benefits of Backup To Disk
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EXECUTIVE SUMMARY

The ongoing data explosion, combined with increased system availability requirements, has resulted in a greater strain on IT organizations to provide the necessary data protection in the face of ever-shrinking backup windows. And while the amount of data and need for system availability may be going up, the number of hours in a day is not increasing. And in many cases, neither are the people or hardware resources required to manage that data.

But recently, that ever-shrinking window for data protection has been swung wide open with new disk-based backup functionality. While the basic technology has existed for quite some time, only recently has it become practical, from a cost (ROI) and from a technology perspective, to implement disk based backup as part of your overall disaster recovery plan.

The numerous benefits of implementing a disk-based solution are now immediately available. Storage backup solutions that incorporate backup to disk offer significant benefits over traditional backup targets; most commonly tape drives or tape libraries. These benefits include:

• Improved Backup Speed
• Quicker recovery of data
• Improved reliability of Media
• Reduce total cost of ownership
• Reduced IT intervention and management required

With these benefits, IT organizations seeking to meet the business demands being placed on them, and companies looking to compete in today’s economic landscape, are turning to disk-based backup. In fact, in a recent survey conducted by InfoStor, 64% of respondents indicated that they planned to purchase disk-based backup products in the upcoming year, and 42% of respondents indicate that they plan to purchase disk based backup products instead of tape to enhance their existing data protection plans.

With VERITAS Backup Exec™ 9.1 for Windows Servers, organizations can take advantage of the benefits of disk-based backup. Backup Exec software delivers disk-based backup that helps reduce backup times, deliver faster restores, and improve overall efficiency.

This white paper will outline the key benefits of new backup to disk functionality, and how it has overcome the historical problems of disk in the data protection environment. It will cover an overview of disk-based characteristics and then a detailed discussion of the benefits to be gained from implementing disk based solutions as part of the overall data lifecycle protection schema. Three real world use cases will be included. Finally, we will cover how Backup Exec software’s backup to disk functionality works to meet the challenges of today’s IT organizations.
UNLOCKING THE POWER OF DISK-BASED BACKUP

WHAT IS BACKUP TO DISK?
Backup to disk is a basic method to utilize disk for data protection. In general, a backup to disk solution writes the same data to a file on a disk volume, as it would have to a tape. Therefore, when a backup to disk operation is finished, a single file the size of the backup will exist on target volume that contains all the files that were backed up.

Backup to Disk on a LAN:
In this example, data on the LAN is backed up by Backup Exec software onto a disk target (such as a NAS appliance, JBOD, or Disk Array) instead of traditional media, such as tape or a tape library.

Note: JBOD is “Just A Bunch of Disks”

Backup to Disk on a SAN:
In this example, data on the LAN is backed up by Backup Exec software via SAN onto a Disk Array, instead of traditional media, such as tape or a tape library.

When using Backup Exec in a SAN, the SAN Shared Storage Option is recommended.
HOW HAS DISK-BASED BACKUP BECOME PRACTICAL?
The basic technology has existed for some time, but the major hurdles that prevented wide scale adoption of the
technology included cost of disk followed by a number of minor technology issues that include drive spanning, file
management, and disk management.

Backup to disk functionality has evolved to where most major backup applications allow you to span multiple
drives. Today’s most effective backup to disk solutions support all rewriteable removable media, such as DVD-
RW, CD-RW, ZIP, JAZZ and others. File management has been added to allow administrators to set
configurable size limits and maximum numbers of file per backup job. Disk Management has been addressed by
allowing the backup applications to reserve disk space to prevent disk full errors and even provide early warning
when media reaches specific capacity thresholds. Backup to disk also supports running multiple jobs, up to 16, to
a fixed target disk in more advanced backup packages. Even advanced features such as auto detect of buffered
reads in device settings are leveraged by backup to disk to provide increased performance.

BENEFITS OF BACKUP TO DISK

Disk-based backup solutions bring improved backup and recovery speeds and new efficiencies to IT departments.
Disk enables faster, more flexible backups and restores. Although tape has made significant improvements
in throughput and capacity over the past few years, it is still a sequential access medium and is very inflexible
compared to disk.

SPEED
• Faster Recoveries and Backups – In most cases, backup to and restore from disk is faster than using tape.
  Using disk has the following performance strengths:
  • Backups to disk are faster than tape drives when comparing raw throughput and disks are random access
devices that can instantly start to transfer files, whereas with tape, the tape must be loaded, accessed, and
  sequentially written to.
  • Disk Volumes, especially RAIDs, have very fast read performance which rival throughput performance of the
  newest tape drives
  • Using disk Snapshot technology, disk backups and restores are virtually instant
  • No tape mounting or positioning delays when compared to a mechanical tape library/device

FLEXIBILITY
• Reduces exposure to data loss – The benefits of disk backups enable faster backups (nearly instant with
  snapshots) that can be stored very efficiently. This allows administrators to schedule more frequent backups,
  which lowers the exposure of data loss.
• Flexible Utilization of Disk Devices – Disk used as backup devices can support simultaneous backups,
  restores, and duplication operations if need be. This is impossible with sequential tape devices.

EFFICIENCY
• Simultaneous Backups to Disk (Multi-streaming) do not require Multiplexing/Interleaving – To backup
  multiple sources to a single tape drive, a technology called Multiplexing or Interleaving is used. While
  Multiplexing can greatly increase the efficiency of tape devices, its main disadvantage is slower restores. Using
disk eliminates the need for multiplexing since disk is inherently a random access device. Additionally, In fact,
the ability to write multiple streams of data (multiple backup jobs) simultaneously to individual backup files (one
file per job) on a disk provides exceptional performance and granularity that tape solutions cannot approach
even with the most sophisticated multiplexing, multi-threaded solutions.
• Data Protection Operations using Disk are potentially more Reliable – Although both disk and tape drives
  are mechanical devices, tape drives, tape libraries, and especially the tapes themselves have been
  troublesome in the past, causing delays or failures in backup or restore operations. Using disk as a high
  frequency, short-term data protection medium and tape as an archival medium, these problems can be greatly
  reduced.
• **Creating Disaster Recovery Media from Backups made to Disk is more efficient** – Duplicating existing tapes to store off-site has been available for years. By using a backup to disk strategy, tapes for off-site storage can be made from the disk-based backup, freeing up servers, and improving availability.

• **The added speed and flexibility of disk makes it easier to test disaster recovery procedures** – Disaster Recovery plans are useless if they don’t work, so validation that they do work is mandatory. However, most DR plans are not tested due to the time or inconvenience of this complex process. Using disk for recovery can ease the inconvenience and speed up the testing...making DR testing a bit easier.

• **Easier to add more capacity by dynamically adding space to backup target** – This can be achieved simply as with a software tool that enables on-line volume expansion such as VERITAS Volume Manager™.

**EXPENSE**

• **Reduced Data Protection Total Cost of Ownership** – Through the benefits mentioned above, using disk can increase the efficiency, speed, and flexibility of your data protection scheme. These benefits, along with possibly lowering tape related failures could help lower the total cost of ownership of storage management.
  • Physical media management has often proved cumbersome with legacy tape solutions and has been inherently error prone.
  • Tape media usage has to be tracked and media has to be regularly replaced adding to the overall cost burden of data management.

• **Inexpensive ATA disk drives/arrays offer a compelling case for using disk as a data protection medium** – Prices for ATA drives and arrays have come down to an affordable point for data protection uses, especially when the added benefits of using disk are weighted in.

**WHY TAPE IS STILL NEEDED**

From the list above, it may appear that tape may not have much of a future in data protection. However, tape technology still has some key advantages that disk technology has not (yet) solved.

• **Tape requires less electricity and cooling than disk** – A tape sitting in a box or library needs no electricity or cooling.

• **Tape can handle rough treatment compared to disk** – Tapes can be thrown in a box, survive large drops, and tolerate shipping better than a disk drive which needs to be carefully packed for shipping.

• **Tape is still much cheaper than disk** – New large capacity tapes are bigger and cheaper than today’s disk drives. Unfortunately, those costs can add up dramatically, as evidenced in Customer Scenario 3 (page 9).

• **Tape is still the best medium for long term & off-site storage** – Due to the advantages above, tape is still the most efficient way of protecting a business from disaster or for long-term storage. Never underestimate the throughput of a UPS truck.

In identifying the benefits backup to disk brings, it is important to be clear on what this solution is not. Disk-based backup improves the speed of backups and restores. And this reduces the amount of time application or database servers are taken offline for backups; thereby improving availability. However, disk-based backup does not mean servers can stay online during backups. For servers that need 7x24xforever availability (such as your Exchange, SQL or web servers), additional technology solutions such as split mirror off-host backup needs to be incorporated into the overall backup scheme. These additional solutions can be found at www.veritas.com/backupexec, under White Papers.
CUSTOMER USE CASES

The following represents three common scenarios for implementing a disk-based backup strategy. While these certainly do not cover all possible uses or configurations, they do illustrate the most common problems that companies indicate they need to solve today.

SCENARIO 1 – REMOTE SERVER DATA PROTECTION
Remote Server data protection is often the most problematic of all the backup scenarios for corporations. Remote locations often do not have the same level of IT resources or expertise to manage and monitor backup performance and success. Adding backup to disk to your overall backup strategy can largely eliminate remote diagnostics and management. Often times, remote backups to tape will fail due to the inability to constantly stream data. This failure occurs due to the repeated repositioning of the tape heads, often referred to as “shoe shining,” when constantly streaming data, resulting in the inability to achieve a successful backup. The ongoing wear and tear on the media reduces the life expectancy of the media and increases the risk of data loss. In addition, the tape drives will require more frequent maintenance and cleaning. The result is higher management and tape costs, with increased opportunity for backup failure.

The fact that disk is inherently a random access device greatly improves backup success for these remote locations. No more shoe shining of tapes, no more manual backup media rotation, no more reliance on remote staff to do the right things (swap tapes, courier tapes to head office). The ability to remove the uncertainty of data protection at remote sites will greatly improve overall corporate data protection. Not only will IT administrators sleep better, employees who have been recruited to help with backups will be extremely happy to no longer have the added responsibility of monitoring backups and managing media rotation. The overall impact is faster, more reliable backups, reduced tape costs, and more effective use of IT and non-IT resources at remote locations.

SCENARIO 2 – SERVER DATA PROTECTION WITH DISK AS YOUR BACKUP TARGET FOR DISK STAGING
Companies looking to reduce their backup windows are also using a disk staging strategy to reap the benefits of disk-based backup. By using the high-speed backup to disc, applications are up and fully available in much less time. Once the backup is on the disk (or staged), the backup to tape can be performed later, in the background. And in the event that the data is needed, the restore performance improves even more than your backup time. Files are now immediately available for restore purposes. No more hunting for the tape, mounting the tape and then spooling to the specific location on tape for that file.

For example, an accounting firm that was looking to reduce its backup windows and improve availability was backing up using traditional backup to tape methods that took approximately 16 hours to fully backup. By simply adding disk into the mix, the backup window has been reduced to 2 hours and 40 minutes. The impact was an 83% reduction in backup time.

<table>
<thead>
<tr>
<th>Example: Results of moving to disk-based backup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Via Tape Backups</td>
</tr>
<tr>
<td>• Approximately 16 hours</td>
</tr>
<tr>
<td>• Required multiple tapes</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

This type of timesavings clearly illustrates how disk-based backup is re-opening the backup window.

For companies looking to minimize or make no additional hardware purchases, there are still opportunities to leverage disk-based backup to reduce backup windows and restores, and improve overall efficiency. One option is to allocate temporary disk space for disk staging. This allows you to still get the advantage of the shorter backup time, but after backing up to disk, immediately have the backup run to tape. Once completed, you are able
to delete the original backup to disk since most major backup applications allow you to restore from tape back to the original server in this type of disk staging backup scenario. That disk space is then freed up to perform other backups or is available for other temporary usage.

Example: Data is backed up to a disk device temporarily, then moved to tape.

The other way to maximize current disk resources is to still perform your full backups on a regular basis to tape (typically during off-peak hours), and then run your daily incremental or differential backups to disk. This will allow you to use minimal disk. You can allow these to accumulate over the course of the week before moving all of these incremental/differential backups to tape before your next full backup. Not only does this give you the improved backup speeds, but it gives you the benefit of the high speed restore since the most commonly required files for restore are those that have been modified and are now available on disk.

Example: Full backups go to tape, but incrementals are backed up to disk.
SCENARIO 3 – SERVER DATA PROTECTION WITH DISK AS YOUR PRIMARY BACKUP
WITH TAPE BACKUP FOR DISASTER RECOVERY AND ARCHIVAL

With the cost of disk having come to such a reasonable cost-per-megabyte, the ability to use disk as your primary backup is now truly viable. Large tape libraries with many media slots require major capital expenditures, and the media costs themselves can quickly multiply. For example, let’s assume you have a 2TB storage environment with a 50GB daily change rate using 80 GB tape media. In this instance, more than 541 tapes would be required using a rotation/retention schedule as follows:

**Assumptions**

- 2 TB of data to backup
- Tape holds 80 GB of data

**Daily Incremental Backups**

- Performed once per day, and 4 times per week
- Incremental Backup Tapes to be retained for 4 weeks
- This will require only 1 tape for the incremental backup

\[
\text{1 Tape for Incremental Day} \times \text{4 Daily Incrementals Week} \times \text{4 Week Retention} = 16 \text{ Tapes}
\]

**Weekly Full Backups**

- Performed once per week, and three times per month
- Weekly Full Backup Tapes to be retained for 3 months
- This will require 25 tapes for a weekly full backup (25 Tapes X 80 GB = 2 TB)

\[
\text{25 Tapes for Full Week} \times \text{3 Weeks Month} \times \text{3 Month Retention} = 225 \text{ Tapes}
\]

**Monthly Full Backups**

- Performed once per month
- Monthly Full Backup Tapes to be retained for 12 months
- This will require 25 tapes for a monthly full backup (25 Tapes X 80 GB = 2 TB)

\[
\text{25 Tapes for Full Month} \times \text{12 Month Retention} = 300 \text{ Tapes}
\]

\[
\text{Total Tapes Required} = 542 \text{ Tapes}
\]

At a cost of $50 per tape, that comes out to $27,050 per year. The advantage of a combined disk/tape backup solution is that it changes the backup schedule and the rotation/retention policy. This greatly reduces the amount of tape media required. Disk backups are also RAID protected and are always online for quick recoveries.
VERITAS MAKES DISK-BASED BACKUP A REALITY

VERITAS Backup Exec for Windows Servers is the market leading Windows data protection solution, and provides the functionality needed by today’s IT organizations to make disk-based backup effective and cost efficient. Backup Exec software enables high-speed backups and restores with following:

- **File Management** – Delivers configurable size limits and maximum number of files to be backed up.
- **Disk Management** – Provides early warnings to avoid “disk full” errors, improving successful backups.
- **Multi-Streaming** – Enables high-speed backups for multiple streams of data (multiple backup jobs) simultaneously to individual backup files (one file per job) on a disk. As indicated earlier, this functionality provides exceptional performance and granularity that tape solutions cannot approach even with the most sophisticated multiplexing, multi-threaded solutions.
- **Drive Spanning** – Supports all rewriteable removable media that has a file system driver:
  - DVD-RW
  - CD-RW
  - ZIP
  - JAZZ
  - Floppy Disk

With a completely new user interface introduced in version 9.0, Backup Exec software provides a simple, easy to use administration console with “guide me” wizards that walk novice and seasoned storage professionals alike through the necessary steps to set up a backup to disk job.

*Backup Exec’s New User Interface and Wizards Make Disk-Based Backup A Snap*
EXTENDING DISK-BASED BACKUP WITH DUPLICATION OF DATA

In addition to the backup to disk, VERITAS Backup Exec 9.1 for Windows Servers features Duplication of Backup Data functionality (introduced in Backup Exec 9.0 software). This functionality extends the power of disk-based backup, letting you duplicate a backup job, once that high-speed backup job has been completed. It works like this – the administrator selects a scheduled backup job as the source. Then backup job runs first. Once it completed, the backup sets it created can then be copied to the destination you selected for the duplicate job.

Creating a Duplicate Backup Job Is As Easy As The Click Of A Button

Duplication of Data makes disk staging simple and easy, and ties directly into the backup to disk scenarios discussed earlier. It enables disk staging, and lets IT administrators offload data to tape for true disaster recovery or just to open up a temporary disk space being used for that backup job. Together with disk-based backup functionality, VERITAS Backup Exec 9.1 for Windows Servers helps reduce backup and restore windows while maximizing the storage resources currently being used.
SUMMARY

Until recently, the ongoing data explosion, as well as the need for increased system availability, has resulted in an ever-shrinking backup window. However, advances in disk-based backup technology have made backup to disk a true, viable, and cost effective alternative to traditional backup media. Backup to disk lets IT organizations get more out of their current backup windows. It brings the benefits of faster backup and restores, high performance with multi-streaming, greater control of data, and reduced intervention on the part of IT administrators and other resources. As a result, the adoption curve for backup to disk is very steep reflecting growing confidence among the user community that the technology solutions meet and exceed the demands being put on them by customers.

As the leading Windows data protection solution, VERITAS Backup Exec 9.1 for Windows Servers delivers some of the most advanced backup to disk functionality, giving today’s IT a high-speed, flexible, and efficient solution to manage today’s backup windows, and still provide business critical data protection.

1 Source: “Users weigh in on tape-vs.-disk backup debate” InfoStor (April 2003)
2 Source: Gartner Dataquest “2002 Storage Management Software Market Share” (April 15, 2003)