Flexible backups to disk using HP StorageWorks Data Protector Express white paper

A powerful and simple way to combine the advantages of disk and tape backups to improve backup efficiency, reduce data restore time and minimize potential data loss

Introduction ......................................................................................................................................... 2
Tape backup and disk backup compared ............................................................................................... 2
Reducing potential data loss with D2D backup......................................................................................... 4
D2D backup implementation .................................................................................................................. 4
Making D2D backup easy and effective with Data Protector Express Virtual Libraries.......................... 5
D2D2Any option ................................................................................................................................ 6
Licensing considerations ....................................................................................................................... 7
Creating a Virtual Library for D2D backup and recovery and using the D2D2Any option for automated data movement .................................................................................................................. 8
An example of D2D backup using Data Protector Express Virtual Libraries.......................................... 13
Summary .......................................................................................................................................... 17
Data Protector Express ordering information.......................................................................................... 18
Data Protector Express special editions and packages.......................................................................... 19
For more information.......................................................................................................................... 20
Introduction

HP StorageWorks Data Protector Express is easy-to-use backup and recovery software with many powerful features that can be used and managed by organizations without specialist data protection IT staff. One of these features is the capability to back up data to disk (D2D backup) and automate the movement of these disk backups to other media using the Data Protector Express disk-to-disk-to-any (D2D2Any) option.

Disk-based backup is a core strength of Data Protector Express, and this white paper describes how to create D2D backups for improved data recovery performance using the Virtual Library feature and how to extend the D2D solution using the D2D2Any option. The end result is lower impact backups, reduced times for the most common recovery tasks and less exposure to potential data loss.

This white paper shows the relative advantages of disk and tape media for backup. It then has an overview of D2D backup implementations before describing in more detail how Data Protector Express implements D2D backup. Then, an example of using D2D backup to reduce exposure to data loss is described.

Tape backup and disk backup compared

Since magnetic disks were invented to store computer-generated data, tape has been the de facto standard backup medium for business data. It is well documented that the volume of data that must be managed has and continues to increase rapidly. To address this challenge, both tape and disk performance has increased. Today highly portable and durable tape cartridges can store hundreds of gigabytes of data, and disk capacities, reliability and price are such that disk can be used for both primary data and as a backup medium. Disk is a backup medium that complements, not replaces, tape. Disk is the best medium for frequent incremental backups, storage of recent backups and recovery of single files or small data volumes. Tape is the best medium for large full backups, long-term and offsite storage of backups and bulk restores of large volumes. The differences and benefits of both media are shown in Table 1.

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1 This is distinct from disk-based snapshot or mirroring technologies, which provide a copy for failover and/or recovery purposes. These technologies are usually hardware specific or require complex software solutions and are often not affordable or manageable for smaller organizations.
<table>
<thead>
<tr>
<th></th>
<th>Tape backup</th>
<th>Disk backup</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>Low per GB cost for tape media. Drive price and robotic price depend on performance. No power costs for stored media.</td>
<td>Low cost for entry-level (SATA) disks, higher cost for SAS, SCSI and Fibre Channel disks. Disk arrays expensive, JBOD and internal disk lower cost. Ongoing power cost for spinning disks.</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>High-performance tape drives are very fast for larger files and sequential backup and restores. Slower than disk for single file backup and restores. Good for full backup and restores.</td>
<td>Typically slower than tape for larger files and sequential backup and restores. Requires large RAID system to match tape streaming throughput. Faster than tape for single file backup and restores. An excellent medium for frequent incremental backups that can be combined to make a “synthetic” full backup on tape. Good for recovery based on multiple incremental backups.</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Media reliability is independent of drive reliability. Media is readable for 10+ years if stored and handled properly. Reliability can be reduced by slow backup sources or restore targets due to tape stop-starting.</td>
<td>Disks media reliability depends on disk type—SATA disk has 20% usage cycle while SAS, SCSI and Fibre Channel disks have 100% usage cycle. Disk warranted for 1 or 3 years depending upon type. Okay for slow backup sources or restore targets.</td>
</tr>
<tr>
<td><strong>Data compression</strong></td>
<td>Built-in to most tape drives to increase data storage capacity and transfer rate typically 1.5 to 3 times depending upon data type.</td>
<td>Typically relies on software data compression, which reduces performance of host machine.</td>
</tr>
<tr>
<td><strong>Remote replication</strong></td>
<td>Low cost because tapes can be moved off site.</td>
<td>Disks generally not portable. Replication requires additional hardware or software.</td>
</tr>
<tr>
<td><strong>Virus resistance</strong></td>
<td>Virus cannot spread to written tapes.</td>
<td>Disk is vulnerable to virus infection.</td>
</tr>
<tr>
<td><strong>Media handling</strong></td>
<td>Removable media needs tracking. Autoloaders and libraries add expense but automate media handling. Security implications to be considered.</td>
<td>Not typically an issue as disks are generally not moved. Security good as disks harder to steal. If disks are moved offsite, then the same issues must be addressed as when taking tape media offsite. Hot-plug disk enclosures are not designed to withstand frequent drive removal/replacement.</td>
</tr>
<tr>
<td><strong>Data encryption</strong></td>
<td>No encryption capable tape devices available today. Planned to be a feature of some tape drives in the near term. Current solutions require a host-based application or an in-line appliance to encrypt data before it is written to tape. Host-based applications likely to affect server performance.</td>
<td>Less of an issue because disk-based backups are typically not sent offsite. Similar solutions to current tape-based solutions with data encrypted before it is backed up to disk.</td>
</tr>
<tr>
<td><strong>Write once read many (WORM)</strong></td>
<td>WORM-capable tape drives are the lower cost, higher capacity solution. Some WORM-capable tape drives require special media; others use regular media.</td>
<td>Serious disk-based WORM solutions are often delivered as appliances and are more expensive than tape solutions. WORM disk solutions provide faster (random) access to the data. Usually combined with another WORM alternative, often tape, to provide long-term storage of the data.</td>
</tr>
</tbody>
</table>
Reducing potential data loss with D2D backup

As Table 1 shows, a major advantage of backing up to disk is the ease of increasing backup frequency. This allows organizations to move from backing up once per day to backing up several times per day. Backing up more frequently reduces the exposure an organization has to data loss. For example, if a daily full backup is scheduled to start at 20:00, all changes to a file made during the working day, since the previous full backup, can potentially be lost. Increasing backup frequency is typically done by scheduling regular incremental or differential backups to disk. This is illustrated in Figure 1.

**Figure 1.** Using disk-based regular incremental backup (1) compared to traditional daily tape backup (2) reduces exposure to data loss and can deliver faster single file recovery than tape-based recovery

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**D2D backup implementation**

Backup to disk is not new, but what is new is the way that Data Protector Express makes it easy, flexible and cost effective for organizations without specialized IT staff. Other methods of implementing D2D backup include “backup-to-disk folders,” disk-to-disk-to-tape modules or the use of Virtual Tape Library (VTL) hardware appliances.

Often, backup/recovery software uses backup-to-disk folders as targets for D2D backup. A common disadvantage with this is that the backups fail because the pre-allocated backup-to-disk folder runs out of space. Using this approach also restricts the data protection to a single backup generation because it does not allow backup rotation schedules to be used.

To address the disk utilization issues and to allow offsite storage of backups, some vendors have implemented disk-to-disk-to-tape (D2D2T) modules in their products. These typically implement a two-stage process. Step 1 is a disk-to-disk backup, most commonly using backup-to-disk folders. Step 2 is a separately configured copy job to copy the disk backup to tape. The copy job is treated as a separate task, which means recovery from tape is also a two-step process with recovery directly from tape not possible.

There have been recent advances in VTL appliances. Products such as the HP StorageWorks 1000i Virtual Library System (VLS1000i) are very easy to use and have increased the affordability of VTL appliances. The HP VLS1000i system and other VTLs emulate tape products, and backup/recovery...
software uses them as if the backup target is tape. Emulating tape products facilitates interoperability between the VTL appliance and backup/recovery software, such as Data Protector Express.

Like other methods of implementing D2D backup, Data Protector Express emulates the operation of a tape library. But, Data Protector Express does not have the inflexibility of backup-to-disk folders or require a separate job to move D2D backups to tape. The Data Protector Express implementation of D2D backup follows.

**Making D2D backup easy and effective with Data Protector Express Virtual Libraries**

Data Protector Express enables D2D backups through the creation of Virtual Libraries as backup targets. The user can specify any disk to provide capacity for the Virtual Library. The Virtual Library emulates the operation of a generic physical tape library. All the features available in Data Protector Express to support backup to physical tape libraries are supported for Virtual Libraries.

A Virtual Library can be set up with any number of virtual storage slots (equates to Virtual Cartridges) and virtual drives according to the requirements of the backup job that will use the Virtual Library. For ease of management, it is good practice to configure a Virtual Library for each backup job that will back up to disk.

The disks providing capacity for the Virtual Library can be any fixed local or network disk visible to the Backup Server or Media Server. Using any visible disk makes this implementation of D2D backup very cost effective because no premium is paid for the disk capacity and existing resources can be used. However, consideration should also be given to the underlying physical disks so that performance is maximized and exposure to data loss due to disk failure is minimized.

The Data Protector Express implementation of D2D backup is shown in Figure 2.

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**Figure 2.** Data Protector Express backups to disk are written to a Virtual Library configured using capacity from one or more disks

[Diagram showing the Data Protector Express backup process]
With multiple Virtual Cartridges, the Data Protector Express Virtual Library allows Virtual Cartridge rotation to keep multiple versions of data. The media rotation schedule determines the data retention time and the number of versions retained. Using media rotation increases the data recovery options compared to having a single file version backed up as would be the case using a backup-to-disk folder.

The capability to utilize any local or network disk capacity for the Virtual Library is possible because Data Protector Express accesses the storage through the host file system, for example, the local C:\ drive on a Windows system. The storage can be local disk, a mapped drive provisioned from a NAS system or a LUN on an SAN-connected disk array. As long as it is accessible through a drive letter, volume name or UNC path, it can be part of the Virtual Library. No disk space from the selected drive is used until the backup starts. When backup data is written to disk, space is consumed in 1-GB chunks as needed.

The Data Protector Express D2D technology delivers performance, reliability and ease of use. This functionality can be extended to create a hierarchy of backup media combining disk and tape with the D2D2Any option.

**D2D2Any option**

The addition of the Data Protector Express D2D2Any option further differentiates the Data Protector Express D2D backup technology from other D2D backup methods. With the D2D2Any option installed, a backup can be done from the source disk to a Virtual Library. Then, using a predefined policy, the data can be automatically moved (by setting secure erase as part of the policy) or copied to any other supported media. Data is typically moved from disk to tape.

The D2D2Any feature can be used to create a robust hierarchy of local media and, if a suitable network exists, remote media. For example, a backup could be done to a local Virtual Library, then moved to a remote Virtual Library then to tape. This allows for robust implementations of disaster recovery strategies. Another application of a backup hierarchy is to back up data stored on a high-performance disk array to a similar specification device for performance reasons, then to move the backup to lower cost, lower performance disk and ultimately move the backup tape for longer term retention.

Managing the disk capacity of the Virtual Library is automatic and policy based. If all the available storage is filled, Data Protector Express will implement the user-configured policies to move backup data to the next stage in the device hierarchy, typically to tape. The Data Protector Express Storage Domain can have up to 8 TB of configured Virtual Library capacity in one or more Virtual Libraries.

The management of backup data in the storage hierarchy is an integrated process controlled by policies. The data location is continually tracked through the hierarchy and data can be restored from any media to the source or to an alternate location. All the regular recovery options are available such as to restore a specific version of a file.

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2 Data Protector Express does not support configuring Virtual Libraries on removable media, such as USB-connected hard disk drives. For removable media, a backup-to-disk folder is configured to make the media a backup target.
The principle of operation of the Data Protector Express Virtual Library with the D2D2Any option installed is shown in Figure 3.

**Figure 3.** Using a Virtual Library with the D2D2Any option allows backups written to a Virtual Library to be moved/copied to any other supported media.

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**Licensing considerations**

The Data Protector Express Backup Server license includes the capability to create Virtual Libraries for D2D backup with a capacity of up to 8 TB. This capacity is measured as the total of all the configured Virtual Library capacity in the Data Protector Express Storage Domain.

The licensing policy for Virtual Libraries is the same as for physical devices, which means that each Media Server, including the Backup Server, includes the licensing for multiple single drive Virtual Libraries. Multi-drive Virtual Libraries require a Drive Expansion option for each drive in excess of one. Therefore, from a licensing perspective, it is more economical to create multiple single drive Virtual Libraries than a single multi-drive Virtual Library.

Assigning a Virtual Library to a server other than the Data Protector Express Backup Server requires that the server has a Data Protector Express Media Server license. As with the Data Protector Express Backup Server, a Data Protector Express Media Server supports up to 32 single drive devices or Virtual Libraries.
Creating a Virtual Library for D2D backup and recovery and using the D2D2Any option for automated data movement

This section shows the steps needed to create a D2D backup job. Full details are in the Data Protector Express documentation. First the Virtual Library is created. Then, backup and recovery jobs are created to use this Virtual Library. The easiest way to create the Virtual Library and the backup and recovery jobs is to use the Data Protector Express Wizards.

1. The Wizard to create the Virtual Library is in the D2D Device Wizards folder. From this, the Create Virtual Library Wizard is selected as shown in Figure 4.

Figure 4. The D2D Device Wizard
2. The Create Virtual Library Wizard has just two screens. The first screen is shown in Figure 5. Using this screen, the name of the Virtual Library is specified. The host machine for the Virtual Library is also specified. The default is the local machine. As previously described, unless the host machine is the Backup Server, it requires a Media Server license. The machine that hosts the Virtual Library must have access to the disk capacity for the Virtual Library.

**Figure 5.** Step 1 (of two) in the Create Virtual Library Wizard
3. The second Create Virtual Library Wizard screen configures the disk space used for the Virtual Library. This is shown in Figure 6. The top half configures the Virtual Library for D2D backups. The lower half is used if the D2D2Any license, to configure the movement of D2D backup data to tape or other supported media.

Figure 6. Step 2 (of two) in the Create Virtual Library Wizard

4. The available configuration parameters are:

   a. Select the number of Virtual Drives (Virtual tape drives) for the Virtual Library. Multiple Virtual Drives can improve performance by allowing multiple backup jobs to write simultaneously to a single Virtual Library. However, as previously described this requires Drive Expansion licenses for each Virtual Drive in excess of one per Virtual Library.

   b. Select the number of virtual storage slots for the Virtual Library. Each virtual storage slot corresponds to a Virtual Cartridge. Each virtual storage slot created consumes resources; therefore, it is recommended that the number of virtual storage slots equals the number of Virtual Cartridges required for the required media rotation scheme.

   c. The option to limit the capacity of the virtual cartridges is used when the D2D2Any option is installed and the disk backups in the Virtual Library will be moved or copied to tape and there is to be a one-to-one relationship between the Virtual Cartridges and physical media. If this option is not selected, the Virtual Cartridge will be created large enough to store the backup job at run time.

   d. If secure erase is enabled, whenever data is deleted from a Virtual Cartridge, the underlying disk is securely overwritten. With the D2D2Any option installed, when a

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The secure erase uses seven passes of random bits to ensure that the original can no longer be accessed.
backup is moved to another media and the secure erase is set, the source data is erased from the Virtual Cartridge after it has been successfully moved.

e. The disk drives used for the backup targets are selected as storage folders. Any local or visible network drive, by way of a UNC qualified name, can be selected. It is recommended that the target selected is on a different disk drive than the disk drive that contains the data to be backed up. This enhances performance and allows data recovery if the source data disk fails. Up to four storage folders can be selected. If the first storage folder is filled, the second storage folder will be used so that backups do not fail because of a lack of disk space.

The capacity allocated to the selected storage folder is specified and displayed as size (GB). As backups are written to disk, the used capacity is also shown. There is a configuration option for minimum free disk space. This defines the minimum free space that must be available in the storage folder for a backup to be written to it. When the minimum free space is reached, backups are written to the other specified storage folders. The minimum free space setting allows space for other users or applications that may also be using space on the host volume specified for the storage folder.

The Virtual Library is now configured and ready for use as a backup target. If the D2D2Any option is installed (or the software running in evaluation mode), there are additional configuration options to move or copy the backups in the Virtual Library to other media. Typically the backups in the Virtual Library will be moved to tape but it is possible to move backups through a hierarchy of media including to other Virtual Libraries. All devices to be used should be installed or created before setting the D2D2Any policies. The additional available configuration parameters are:

f. The “Copy policy” must be set to “Copy to device” to move or copy backups from the Virtual Library to other media.

g. The destination device name is used to select a destination device. This can be another Virtual Library, a tape device or an optical device in the Storage Domain.

h. The delay is measured from the time the data is successfully backed up to the Virtual Library before the copy job to the next device in the hierarchy is started.

i. The default is to “Enable tape devices” only, with other classes of device not selected by default. However, a device can be selected if its class can be used for the operation and tape can be deselected.

j. The retention policy of backups in the Virtual Library is configurable using three options:

   i. “Retain data until overwritten” specifies that backup data will be retained in the Virtual Library until it is specifically overwritten or erased by another backup or media job. This is a good policy to use for backups that need to stay online for fast D2D restores at any time.

   ii. “Retain data until copied” specifies that data will be retained in the Virtual Library until it is copied to the target device. Space in the Virtual Library will be released after the copy operation successfully completes. This is a good policy to use to fully optimize the use of disk space allocated to the Virtual Library.

   iii. “Retain data until space is needed” specifies that backup data will be retained in the Virtual Library storage until it is successfully copied to the target device and the storage folder is not full. If the Virtual Library becomes full, backups will be automatically deleted to release space for the new backup. Only backups that have been successfully copied to the target device will be deleted in least-recently used (LRU) order. This policy is the best one to use for normal
operations, as it provides the best balance of retaining backups in the Virtual Library and utilization of the Virtual Library capacity.

The Copy log options allow the amount of detail that is logged to be specified and also to specify where the log files should be stored, e-mailed or printed.

5. The Virtual Library and the D2D2Any option is now configured and ready for use. Operation is automatic and requires little management.

6. If the configuration needs to be modified, it can be done after the Virtual Library is created as shown in Figure 7. It is possible to set policies for individual virtual storage slots by overriding the policies for the Virtual Library. This allows certain backups to be retained in the Virtual Device for longer/shorter times than other backups or even to be permanently retained in the Virtual Library.

Figure 7. Tuning policies for individual virtual storage slots in the Virtual Library is easy after the Virtual Library is created. From the Favorites bar, select Devices, then locate and select the Virtual Library. Right-clicking a storage slot opens a properties window for the selected storage slot.

7. A Virtual Library configuration can be added to, edited or deleted after it is created provided it is not currently in use for a job. The import/export slots can be used to remove virtual tape cartridges from the Virtual Library. A virtual tape cartridge moved to an import/export slot will be deleted and all data on that cartridge will no longer be recoverable, as it is treated as being removed from the Data Protector Express Storage Domain.

8. The backup and recovery jobs for the Virtual Library are specified in exactly the same way as if a physical device is used.
An example of D2D backup using Data Protector Express
Virtual Libraries

Consider a user currently protecting data by running a full backup to a single tape drive each evening. This exposes a whole day’s work to potential data loss and because the full backup completes in the middle of the night, it is not until the next morning that confirmation of the job successfully completing is received⁴. There is a need to reduce the exposure to data loss from one day and a wish to simplify the restore process that currently involves locating a tape sometimes from an offsite location.

To reduce potential data loss, the user revises the backup schedule to back up every 4 hours thereby reducing the maximum potential data loss from 24 hours to 4 hours. This is done using incremental backups to disk. This also makes most restores easier and faster since they will be done from a local disk. Using the powerful Data Protector Express scheduler, daily, weekly, monthly and yearly backups are scheduled. This improves the data recoverability so that data can be recovered from any point in the past two years.

To meet these requirements, the rotation scheme described in Table 2 is used.

<table>
<thead>
<tr>
<th>Backup Job/ Media Set</th>
<th>Virtual Media in Set</th>
<th>Tape media sets (for copy)</th>
<th>Backup retention</th>
<th>Backup type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job #1 hourly set</td>
<td>5</td>
<td>0</td>
<td>1 day</td>
<td>Incremental</td>
<td>To Virtual Library every 4 hours starting at 00:00. Daily backup at 20:00 overrides hourly backup at 20:00 so just 5 media sets needed. Backup retained for 24 hours.</td>
</tr>
<tr>
<td>Job #1 daily set</td>
<td>4</td>
<td>0</td>
<td>1 week</td>
<td>Full</td>
<td>To Virtual Library at 20:00 each week day. Weekly backup at 20:00 overrides daily backup at 20:00 so just 4 media sets needed. Retained for 1 week.</td>
</tr>
<tr>
<td>Job #2 weekly set</td>
<td>4</td>
<td>4</td>
<td>4 weeks</td>
<td>Full</td>
<td>To Virtual Library at 20:00 each Thursday. Monthly backup on last Thursday of month overrides weekly backup that Thursday. Backups retained for 4 weeks. Backups copied to tape from disk when completed.</td>
</tr>
<tr>
<td>Job #2 monthly set</td>
<td>12</td>
<td>12</td>
<td>1 year</td>
<td>Full</td>
<td>To Virtual Library at 20:00 each last Thursday of month. Then copied to tape. Backups retained for 12 months. Backups copied to tape from disk when completed.</td>
</tr>
<tr>
<td>Job #2 yearly set</td>
<td>2</td>
<td>2</td>
<td>2 years</td>
<td>Full</td>
<td>To Virtual Library at 20:00 each last day of year. Then copied to tape. Backups retained for 12 months. Backups copied to tape from disk when completed.</td>
</tr>
</tbody>
</table>

Using this schedule, the backups are written to disk (Virtual Library) instead of tape. The user also requires an offsite copy of the data for added protection so backups are copied to tape so that they can be taken offsite. The weekly, monthly and yearly full backups are copied to tape on Thursday nights so they can be taken offsite on Friday.

⁴ It is possible to configure e-mail alerts to be sent on completion of a backup job with the job logs.
The flexibility of creating Data Protector Express Virtual Libraries and specifying Data Protector Express backup jobs allows this improved backup schedule to be implemented several ways. For simplicity, two Virtual Libraries are created and two backup jobs specified to write data to these Virtual Libraries.

The first Virtual Library is created with nine virtual slots and backed by enough disk capacity to hold four full and five incremental backups. This Virtual Library does not use the D2D2Any option to copy the disk backups to tape. The first backup job uses this Virtual Library as the target for the hourly and daily backups.

The second Virtual Library is created with 18 virtual slots and backed by enough disk capacity to hold 18 full backups. This Virtual Library does use the D2D2Any option. It is configured to copy the disk backups to tape when they have successfully completed. The second backup job uses this Virtual Library as the target for weekly, monthly and yearly backups.

Both Virtual Libraries and backup jobs are created using the Data Protector Express Wizards. The steps involved in creating both jobs are similar with the exception of the D2D2Any option, which is configured for the second Virtual Library to move the disk backups to tape. The steps to create the second Virtual Library and the second backup job are summarized here:

1. The Virtual Library is configured, as shown in Figure 6, with 18 virtual storage slots and one virtual tape drive. The D2D2Any option is configured to copy backup jobs from the Virtual Library to tape, 15 minutes after the backup job to the Virtual Library completes. To allow for fast restoration of data, backups are held in the Virtual Library until the space needs to be recycled for a newer backup. The backup data is then held on tape for the retention period defined by the media rotation policy specified by the backup job.

Figure 8. Creating the Virtual Library
2. The backup job is created using the Virtual Library just created as the backup target. When setting the schedule type, the “Schedule settings” are set to “Run repeatedly” and the “Rotation type” is to “Custom rotation” as shown in Figure 9.

Figure 9. Specifying the backup schedule while configuring the backup job

Selecting “Run repeatedly” opens the scheduling window as shown in Figure 10. The jobs to meet the schedules shown in Table 2 are easily specified using the graphical scheduler and in turn selecting “Week…,” “Month…,” “Year…,” and so on. In the example here the monthly backups are being set. The “Number of rotation sets” parameter specifies how frequently backup media is overwritten and as a result the retention period. A “rotation set” could actually consist of more than one piece of media depending on the size of the backup.

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5 A Virtual Library rotation set will only have more than one Virtual Cartridge if the “Limit capacity” setting is used and the backup size exceeds the capacity defined.
A full backup is always the first job to run as it establishes the baseline dataset for subsequent incremental backups. Media is automatically labeled as it is used, so tape media should not be pre-formatted for rotation type jobs. By default the media in the Virtual Library storage slots is named after the virtual storage slot it occupies. This can be changed to something more meaningful by revising the properties of that storage slot. The media in the storage slots is allocated, from slot 1 upwards, as needed by the rotation schedule specified.

3. The backup jobs will now run continually according to the schedules. The Virtual Libraries will hold the most recent backups so that most restore tasks will be from disk. The use of the D2D2Any option to copy Virtual Library backups to tape means that multiple versions of files, up to two years old, can be recovered.

The advantages of the revised schedule are summarized in Table 3.

Table 3. The beneficial effect of combining disk and tape backups

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum data loss is 24 hours work</td>
<td>Maximum data loss is 4 hours work</td>
</tr>
<tr>
<td>Media handling requires a tape to be handled daily</td>
<td>Media handling requires a tape to be handled weekly</td>
</tr>
<tr>
<td>Most recoveries were slower because they came from a full tape backup</td>
<td>Most recoveries are faster because they come from disk (Virtual Library)</td>
</tr>
<tr>
<td>Smaller number of file versions available for recovery if needed</td>
<td>More versions of files available for recovery if needed</td>
</tr>
</tbody>
</table>
In other backup products, this schedule would require separate jobs to be configured for each schedule type (hourly, daily, weekly, and so on) and media management would be more complex so that the net benefit of this process change would be small. With some other products, when moving backup to tape the user would be forced to make additional copies of the backup tapes to take offsite as an on-site copy would be required for restore jobs.

Using Data Protector Express with its sophisticated, yet easy-to-use, scheduler and integrated Virtual Libraries makes this change to the backup process easy to implement and easy to manage so the net benefits are significant.

**Summary**

- Data Protector Express has powerful and easy-to-use D2D backup and recovery capabilities.
- These capabilities allow the benefits of backing up to disk and tape media to be combined.
- The D2D and D2D2Any capabilities of Data Protector Express are superior to the “backup to disk folders” used in other vendors backup/recovery software.
- When the Virtual Device and D2D2Any policies have been configured, the movement of data is fully automated and tracked through the Data Protector Express catalog. Restoration of data can occur from any stage in the hierarchy, allowing users to select either the best location to restore from or which specific version of a file they want to restore.
Data Protector Express ordering information

**Base product** includes D2D backup capability with up to 8-TB Virtual Library capacity.

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB117AA</td>
<td>HP Data Protector Express Backup Server</td>
</tr>
</tbody>
</table>

**D2D2Any option** to add capability to move/copy disk backups to other supported media

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB130AA</td>
<td>HP Data Protector Express D2D2Any option</td>
</tr>
</tbody>
</table>

**Drive expansion option** needed for multi drive Virtual Libraries

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB133AA</td>
<td>HP Data Protector Express Drive Expansion (1 incremental drive)</td>
</tr>
</tbody>
</table>

**Media Server licenses** needed if Virtual Library not attached to Backup Server

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB119AA</td>
<td>HP Data Protector Express Media Server</td>
</tr>
<tr>
<td>BB120AA</td>
<td>HP Data Protector Express Media Server (3 pack)</td>
</tr>
</tbody>
</table>

**Other Data Protector Express Licenses**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB118AA</td>
<td>HP Data Protector Express Microsoft SBS Package</td>
</tr>
<tr>
<td>BB121AA</td>
<td>HP Data Protector Express Network Server Backup Agent</td>
</tr>
<tr>
<td>BB122AA</td>
<td>HP Data Protector Express Network Server Backup Agent (3 pack)</td>
</tr>
<tr>
<td>BB123AA</td>
<td>HP Data Protector Express Microsoft® Exchange Online Backup Agent</td>
</tr>
<tr>
<td>BB124AA</td>
<td>HP Data Protector Express Microsoft SQL Server Online Backup Agent</td>
</tr>
<tr>
<td>BB127AA</td>
<td>HP Data Protector Express HP DPSS Online Backup Agent</td>
</tr>
<tr>
<td>BB128AA</td>
<td>HP Data Protector Express Bare Metal Disaster Recovery</td>
</tr>
<tr>
<td>BB117AT</td>
<td>HP Data Protector Express Backup Server upgrade from HP StorageWorks Data Protector Express Single Server Edition</td>
</tr>
<tr>
<td>BB117AP</td>
<td>HP Data Protector Express Backup Server upgrade from HP StorageWorks Data Protector Express ProLiant Edition</td>
</tr>
</tbody>
</table>
Data Protector Express special editions and packages

Data Protector Express Small Business Server Package is a special package, orderable as a single SKU, made up of Data Protector Express Backup Server, Microsoft Exchange Online Agent, Microsoft SQL Server Online Agent and the Bare Metal Disaster Recovery option. It only runs on the Microsoft Small Business Server operating system. All the Virtual Library functions described in this paper and the ability to add the D2D2ANY option are available for this package.

Data Protector Express Single Server Edition is a special, reduced feature set, version of Data Protector Express that is part of the HP tape drives and tape autoloader solutions. It includes the capability to create a Virtual Library with up to 36-GB capacity. To create a larger Virtual Library and/or add the D2D2Any option Data Protector Express Single Server Edition must be upgraded to Data Protector Express (HP part number BB117AT).

Data Protector Express ProLiant Edition is a special, reduced feature set, version of Data Protector Express that is available to HP ProLiant users. It includes the capability to create a Virtual Library with up to 36-GB capacity. To create a larger Virtual Library and/or add the D2D2Any option, Data Protector Express ProLiant Edition must be upgraded to Data Protector Express (HP part number BB117AP).
For more information

- For more information on HP StorageWorks Data Protector Express, visit: http://www.hp.com/go/dataprotectorexpress
- For more information on HP StorageWorks Data Protector Express ProLiant Edition, visit: http://www.hp.com/go/dataprotectorexpress/pe
- To try Data Protector Express for 60 days, visit: http://www.hp.com/support/download/dataprotectorexpress
- For more information on HP StorageWorks 1000i Virtual Library System, visit: http://www.hp.com/go/vls1000i
- For more information on HP ProLiant SATA and SAS disk technologies, visit: http://www.hp.com/go/serial
- For more information on HP tape solutions, visit: http://www.hp.com/go/tape