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Creating a backup schedule with the HP StorageWorks D2D Backup System and tape using HP Data Protector Express 3.5 white paper



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Overview

This white paper describes how to set up a backup schedule that includes both the HP StorageWorks D2D Backup System and a tape device using HP Data Protector Express. It provides two examples of how to implement a backup schedule using the D2D Backup System plus additional backup copies on physical tape.

Background

HP StorageWorks D2D Backup System

The HP StorageWorks D2D Backup System belongs in the relatively new class of storage systems called “virtual tape.” Virtual tape devices present themselves to operating systems and applications as physical tape devices. This tape emulation provides the key benefits of disk-to-disk (D2D) backup—hands-free daily backup, rapid data recovery, and a more reliable backup process—while allowing organizations to integrate the backup device into their IT environment more quickly and easily than other forms of disk-based backup. Implementation is easy because a virtual tape system appears just like a tape device, and most backup and recovery applications are designed to work with tape devices.

Virtual tape devices, like other forms of disk-based backup, do have some disadvantages compared to tape, however. HP recommends that the D2D Backup System be used in conjunction with tape to provide the complete disaster protection afforded by removable media that can be stored offsite and away from any site-wide catastrophe. The most common approach to combining the D2D Backup System with physical tape is to copy the emulated backup cartridges to physical tape cartridges using the backup application. But because virtual tape devices are relatively new, no backup application today has yet been optimized to automate the copy from virtual tape to physical tape.

HP Data Protector Express

HP Data Protector Express delivers simple, secure, and reliable data protection for a single server or a small network. HP offers the D2D Backup System with an optional Data Protector Express software kit that includes all the components needed to protect up to four servers. This bundle provides a complete solution that protects four servers, each with a copy of Data Protector Express and a “local” virtual tape drive or virtual tape autoloader on the D2D Backup System.

Data Protector Express also has a software-enabled method of backing up to disk, the D2D backup feature. Its backup target can be any local or network disk. While this is a very flexible method for D2D backup, it does not have the built-in resilience and protection of using a dedicated device such as the D2D Backup System. The Data Protector Express D2D backup feature can be extended with the Data Protector Express D2DAny option, which automates movement of the disk-based backups to tape or other media.

Because the D2D Backup System presents itself as a tape device, it cannot be used as a target for Data Protector Express D2D backup. This tape emulation also prevents the use of the Data Protector Express D2D2Any option with the D2D Backup System. This paper describes how to use the copy job function in HP Data Protector Express to copy a D2D Backup System virtual cartridge to a physical tape cartridge.

Backup schedule example

Our hypothetical organization for this example uses a Simple-10 backup schedule to back up a file server onto a 10-slot virtual autoloader configured on the D2D120 Backup System. Simple-10 is one of the predefined tape rotation schedules built into Data Protector Express 3.5. Simple-10 provides the following:

- Daily incremental backups (Monday through Thursday)—Four media sets¹ are required, which are overwritten every week.
- Weekly full backups (every Friday)—Three media sets are required, which are overwritten every fourth week.
- Monthly full backups (last Friday of the month)—Three media sets are required, which are overwritten every three months.

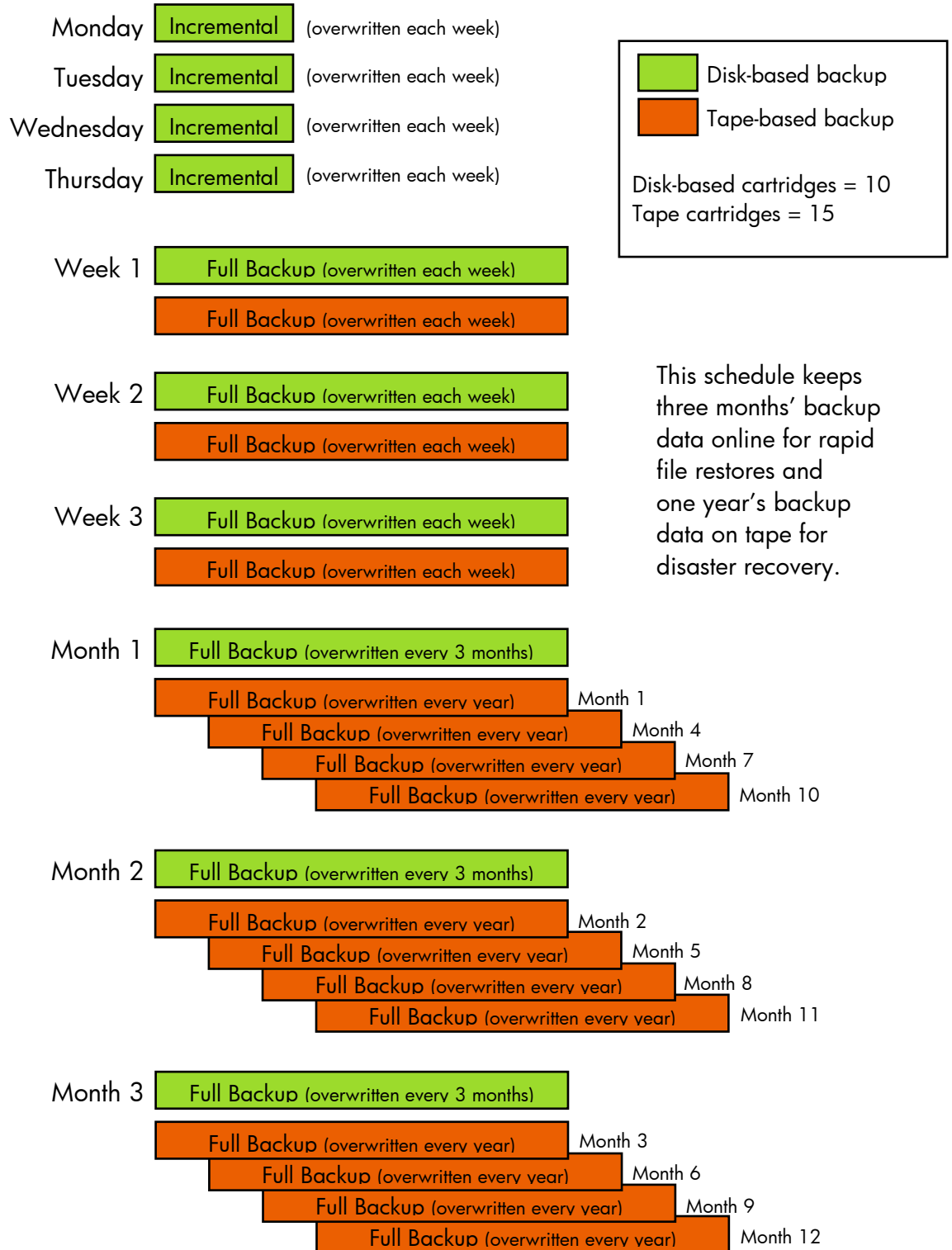
This backup schedule stores the server's backup data from the last three months on the virtual 10-slot autoloader on the D2D Backup System, where it can be used to restore lost data very quickly when the need arises.

In addition to the backup data stored on the D2D Backup System, the organization wants periodic backups on physical tapes that can be stored offsite, and the server has an HP Ultrium 920 (LTO-3) tape drive for this purpose. These offsite tapes are the foundation of the disaster recovery plan in the event of a catastrophe that affects both the organization's servers and the D2D Backup System, which are located in the same building. The organization has decided it needs a full backup on tape each week: overwriting the weeklies each month and keeping the monthlies for a year before overwriting them. This requires 15 physical media cartridges (12 yearly and 3 monthly).

Figure 1 illustrates the virtual and physical cartridges needed for this dual backup schedule.

¹ A media set consists of all the media required for a backup job. Some backups require multiple cartridges to hold the volume of backup data. In these cases, the media set has more than one cartridge. This would require a virtual autoloader with more than 10 virtual tapes, which is easy to configure with the D2D Backup System.

Figure 1. Organization's desired backup schedule



Hardware configuration

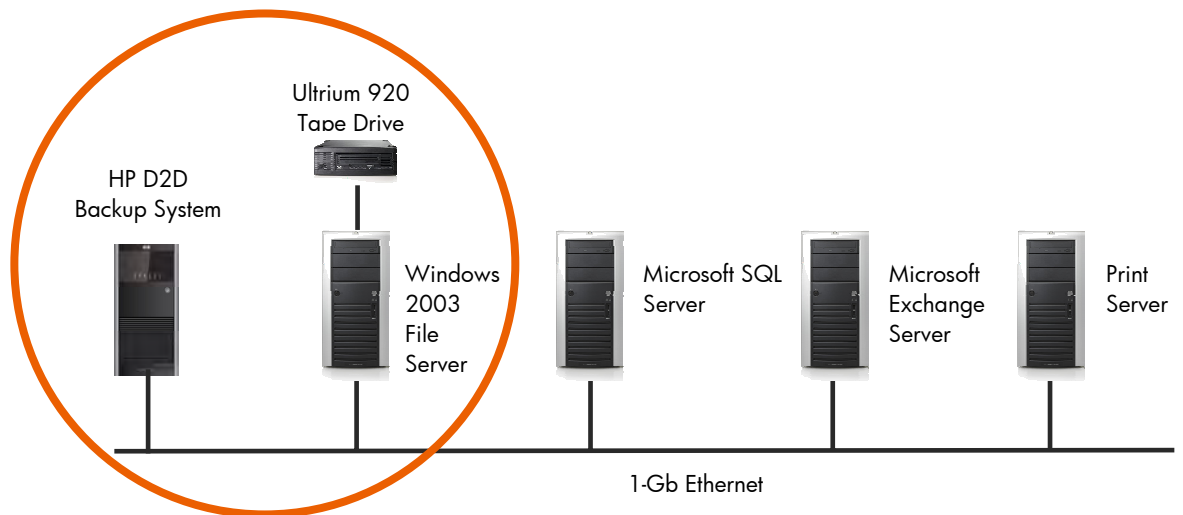
The backup process shown in this example uses the configuration shown in Figure 2:

- A 1-Gb Ethernet (iSCSI) network
- A file server running Microsoft® Windows® Server 2003, plus two other Windows-based servers
- HP D2D120 Backup System with three 10-slot HP autoloaders configured
- HP Ultrium 920 (LTO-3) tape drive connected to the file server
- Data Protector Express 3.5

Note that the screens are different if you are using Data Protector Express 3.1. We recommend upgrading to version 3.5. Data Protector Express customers are entitled to upgrade for free as part of the included first year of support.

Although the organization has other servers on the same network, this example focuses on how to set up a backup schedule for one of these servers. The other servers would be set up in a similar way, using the same schedule or a different one. Note that the approaches described in this paper can be used with Data Protector Express for any supported combination of server, D2D Backup System (or the HP StorageWorks 1000i Virtual Library System [VLS1000i]), and tape device. The tape device may be local to the server being backed up or it may be attached to a backup server on the same network.

Figure 2. Hardware configuration



How to implement the chosen backup schedule

Setting up a backup schedule to match the organization's requirements for holding three months' worth of data on disk and one year's worth of data on tape involves two steps:

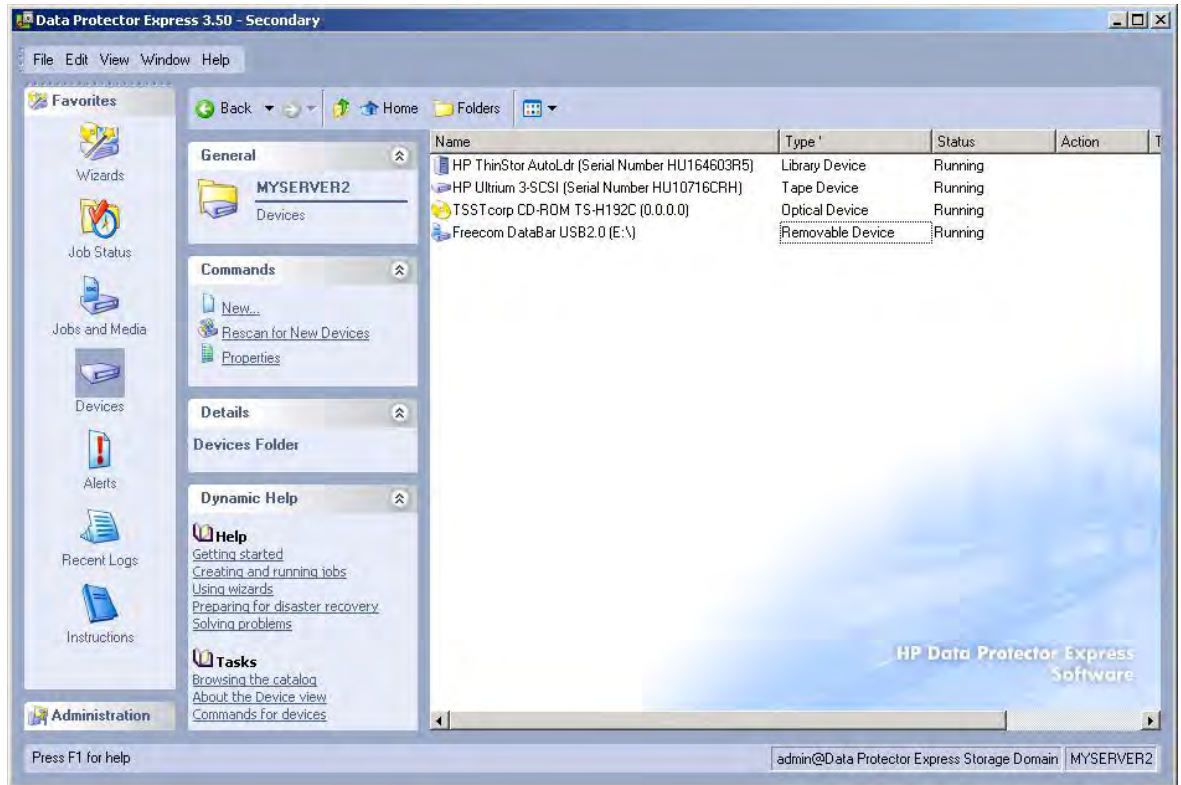
- Use Data Protector Express to set up the Simple-10 schedule to back up the server to the D2D Backup System.
- Create a separate process to create backups on tape. This can be approached in two ways:
 - **Option 1: Back up to D2D Backup System, then copy jobs to tape.** After the initial Simple-10 rotation scheme has run through for the first time and created the virtual media for each segment of the rotation (the daily, weekly, and monthly backups), create physical tape copy jobs for each weekly and monthly backup using the Data Protector Express "Copy job" function. This method has the advantage that it produces an exact copy of the virtual cartridge on the tape cartridge and there is just one rotation schedule. However, because the virtual media is only created when the backup has been run, the copy-to-tape job can only be created after the virtual media is created during the initial backup.
 - **Option 2: Back up to D2D Backup System with separate backup to tape.** For this option, a second backup rotation is set up to back up directly to a tape drive. This method produces two separate versions of the backup data that are not identical and requires that two parallel backup jobs be created. It has the advantage that both jobs can be set up at the same time when the D2D Backup System is installed.

The balance of this paper describes how to implement the sample backup schedule using Data Protector Express 3.5.

Creating the Simple-10 rotation scheme

This procedure assumes that the initial setup and installation of the D2D Backup System is complete and an HP autoloader has been configured with 10 slots. It also assumes that Data Protector Express is installed on the host server and it can access the virtual autoloader on the D2D Backup System. The Devices folder of Data Protector Express shows the autoloader as “HP ThinStor AutoLdr” and the locally connected HP Ultrium 920 tape drive as “HP Ultrium 3-SCSI” (see Figure 3).

Figure 3. Data Protector Express Devices folder

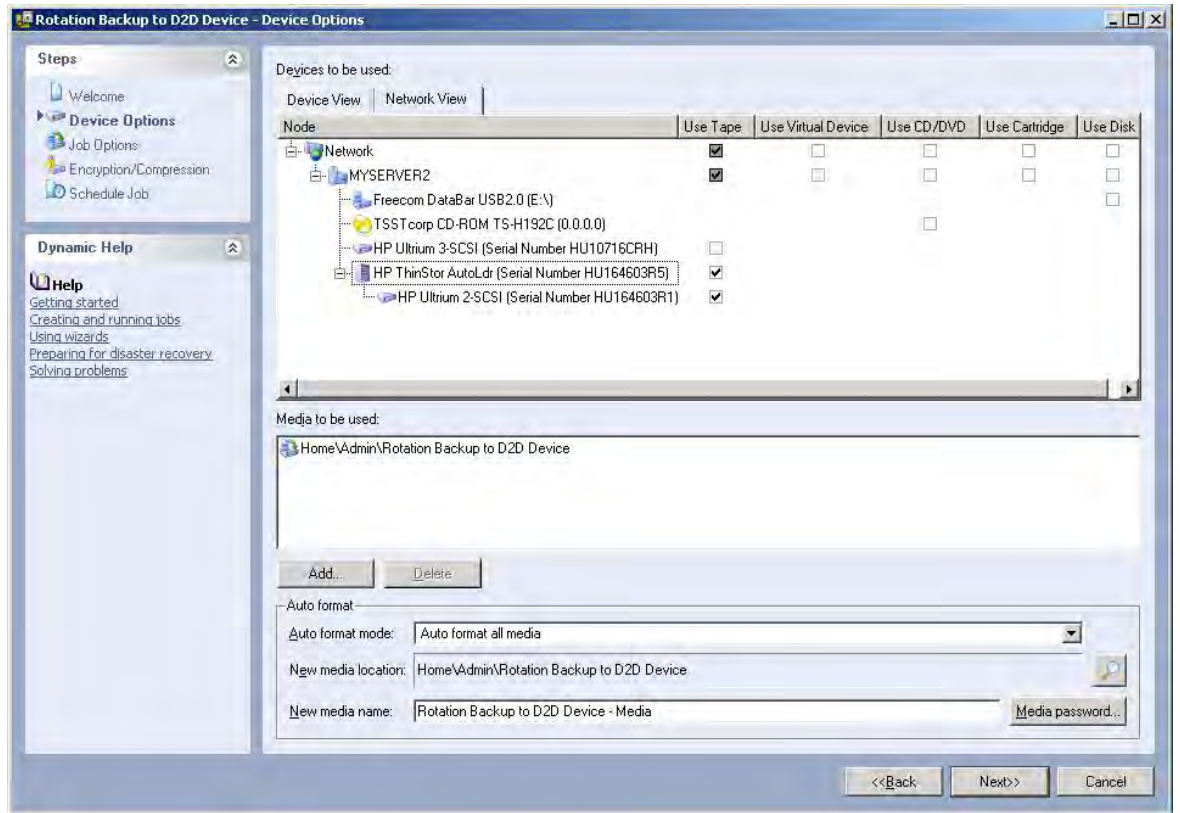


After checking that the autoloader has been configured, use the Data Protector Express backup wizard to create the backup job. In this case, all files on the local server are being backed up, so select the Backup Local Machine wizard.

The first step is to give the backup job a meaningful name, in this case “Rotation Backup to D2D device.”

Next, select the target device to be used for backup: the “HP ThinStor AutoLdr,” which is the virtual autoloader on the D2D Backup System (see Figure 4). The “Media to be used” automatically assigns a folder to contain the media for this backup.

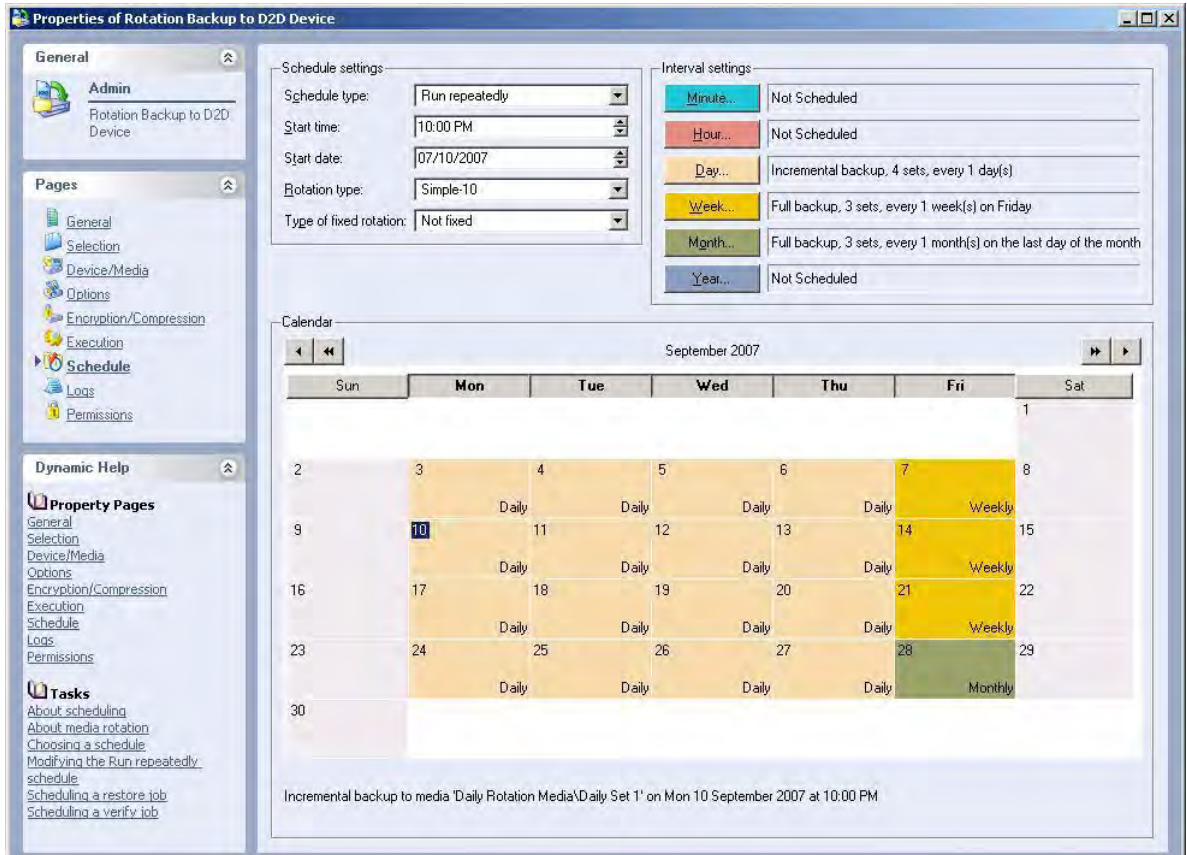
Figure 4. Device/Media Properties for the backup job on D2D Backup System



Now, select the backup options. Most options in this step, such as backup mode and write mode, should be left in their default configuration, as they are controlled by the rotation scheme selected later in the wizard and any settings given here will be overridden. The only option you may want to change is whether a verify pass should be carried out after the backup completes. Verification is recommended to ensure that the data written to tape is accurate, but it does make the backup take up to twice as long to complete.

Because you want your tape rotation to continue indefinitely, select **Run repeatedly** from the Schedule type dropdown box and **Simple-10** from the Rotation type dropdown box (see Figure 5). Specify a start time of 10pm to ensure that backups occur outside of normal business hours. You can also change the start date if you want to wait until a specified date before commencing the rotation scheme. Without this, the first backup job will start on the same day. The calendar view shows the backup jobs that will take place over the course of the next month. In this case, there are daily incremental backups Monday through Thursday, weekly full backups every Friday, and monthly full backups on the last day of every month.

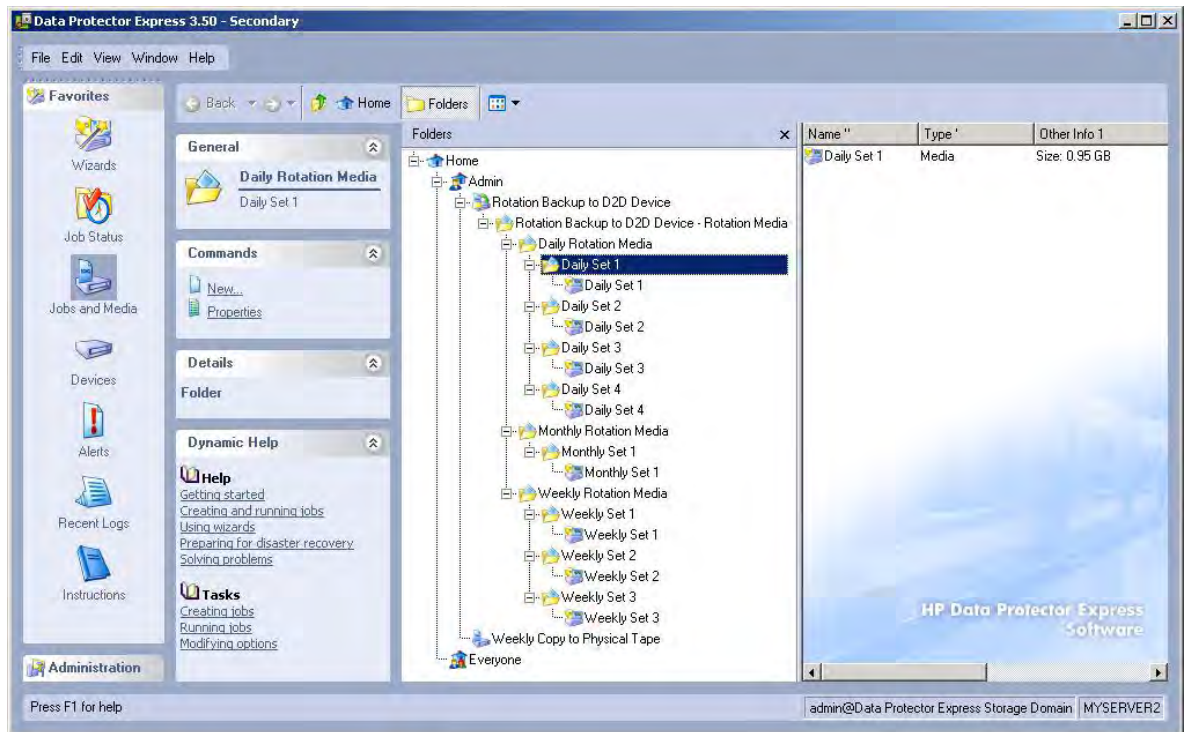
Figure 5. Rotation schedule



The backups will begin to run according to the rotation schedule. The virtual cartridges in the D2D Backup System autoloader are formatted and named as each job begins, and entries into the Data Protector Express media database appear as each backup runs.

Figure 6 shows the media that has been formatted and named after the first month of the rotation schedule has completed.

Figure 6. Media created after one month



At this point, the first part of the backup schedule has been accomplished: backing up to the D2D Backup System. Next, the two ways you can create the necessary backup tapes with Data Protector Express are discussed.

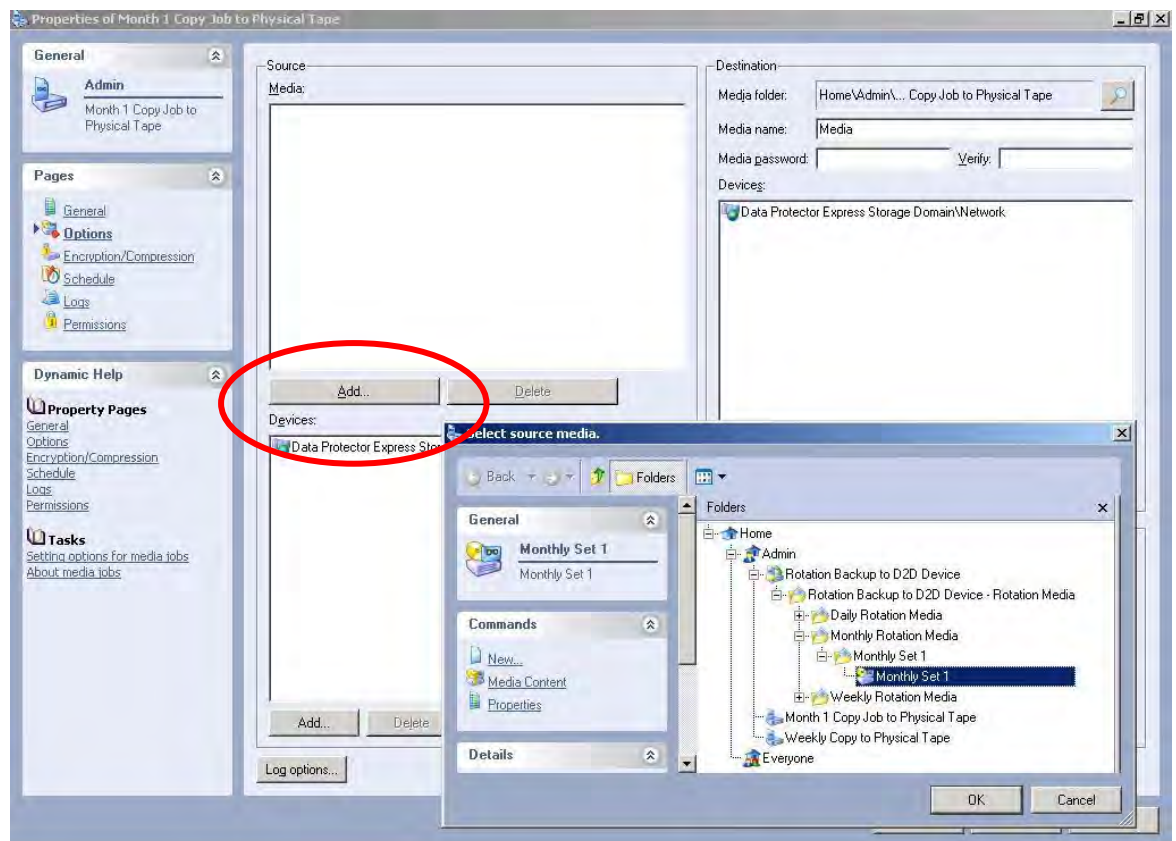
Option 1: Creating media copy jobs

For this option, the backup cartridges on the D2D Backup System are being copied directly to a physical tape cartridge. This creates an exact copy of the tape. For this example, the first monthly tape to copy is selected, but the same process would be used for scheduling copies of the other tapes in the backup schedule. To create the first copy job:

- Select the **Jobs and Media** option from the Favorites menu and double-click the **Admin** folder. (This assumes Data Protector Express still has the default configuration where all jobs are created by the administrator.)
- Select **New** from the Commands bar or right-click in the Jobs pane and then select **New**.
- Select the **Copy Job** option from the New Copy Job dialog box that is displayed.
- Give the job a descriptive name, in this case “Month 1 Copy Job to Physical Tape.”

To set up a copy job, configure the job options for both the source media and device and the destination media and device. Figure 7 shows that the Add dialog box has been clicked under the source media pane. Select **Monthly Set 1** as the source media in this case, which is highlighted in the resulting selection box.

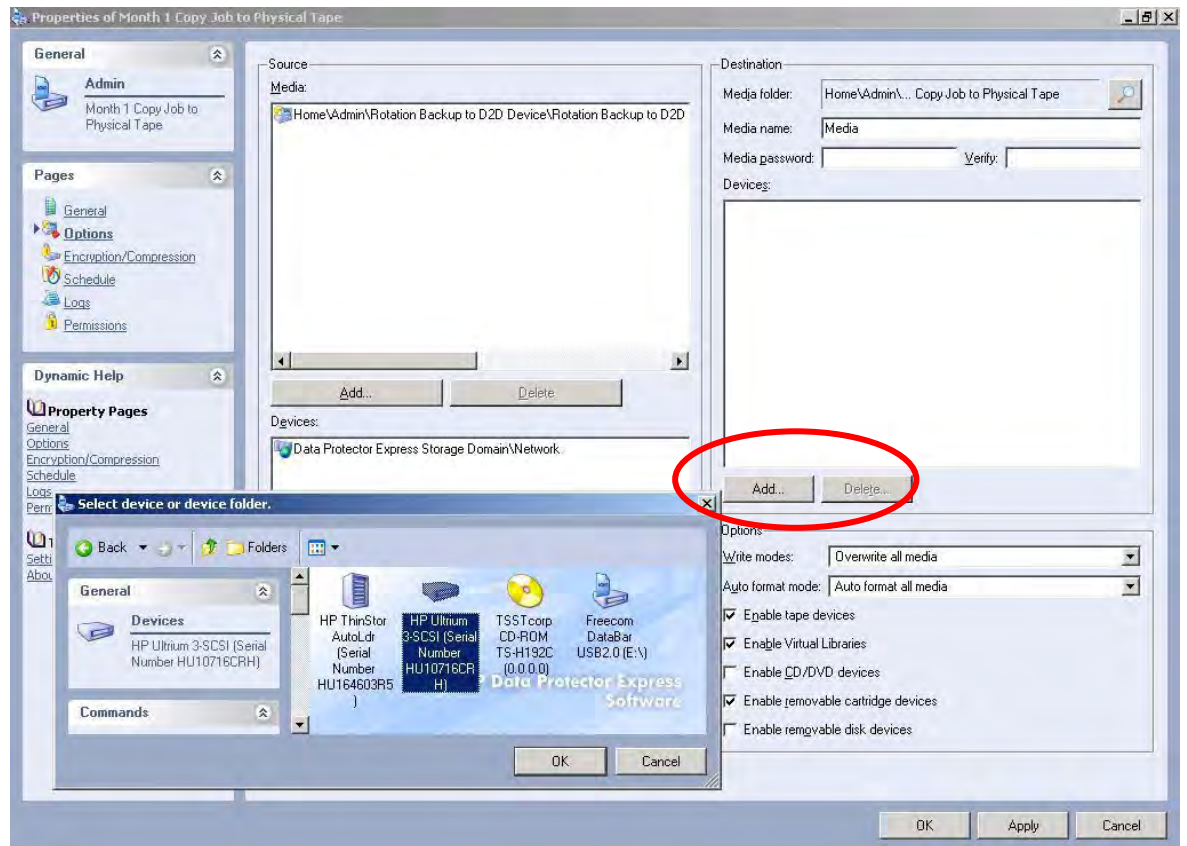
Figure 7. Setting the Copy Job source options



Note that there was no need to choose a source device in this case, as there is only one device that can access the source media: the autoloader configured on the D2D Backup System.

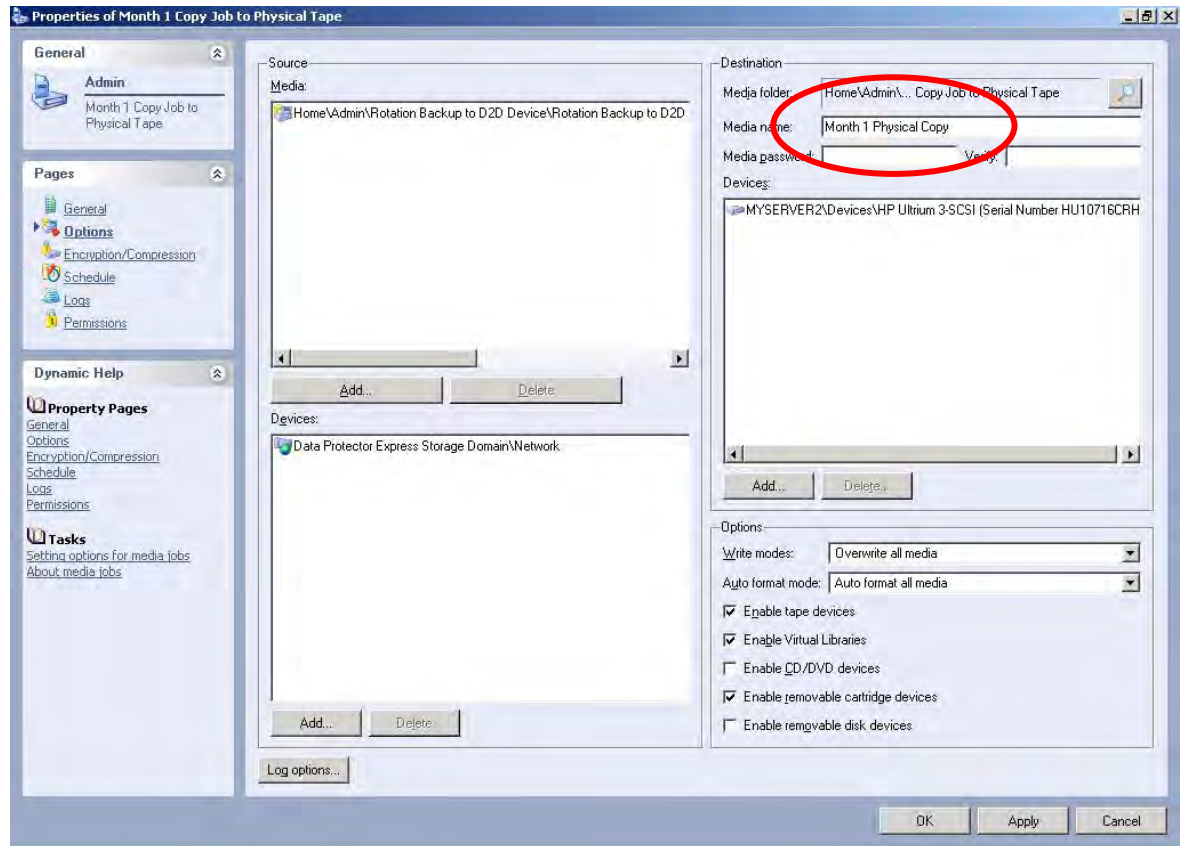
Add the details for the destination device. Figure 8 shows that the Add dialog box for the destination device has been selected. The selection of the Ultrium 3-SCSI tape drive as the destination device shows in the resulting selection box.

Figure 8. Selecting the destination device for the copy



Now, give the destination media a descriptive name, like "Month 1 Physical Copy."

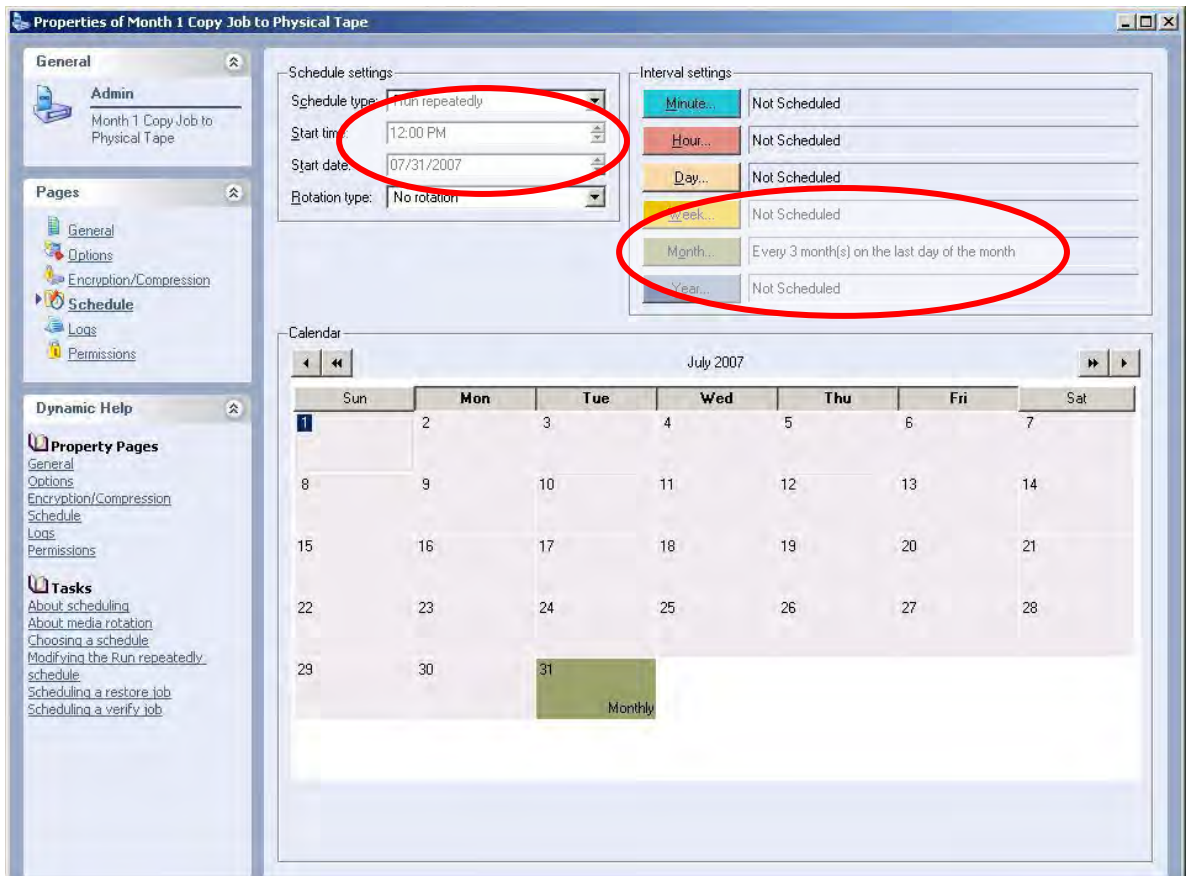
Figure 9. Copy Options page



The next step is to assign a schedule to the copy job as shown in Figure 10. In this case, the schedule has been set to “Run repeatedly” but a rotation type does not need to be defined. The copy is set to run at a start time of 12pm, two hours later than the original backup job. (Note that the time between the backup and copy operations **must be adequate for the backup to complete** before the copy job begins. If your backups typically take longer, leave a bigger gap between backup job and copy job.)

In addition, the start date has been set to run on the last day of the first month of the backup rotation scheme, that is, you are ensuring that “Month 1 Copy Job to Physical Tape” does in fact copy the “Monthly Set 1” media on the day that it was last created, and on every other month subsequently so that you do not accidentally copy the “Monthly Set 1” media in the wrong month where the backup job is actually writing to “Monthly Set 2” media.

Figure 10. Copy job schedule



Clicking the Month button allows you to schedule the monthly copies, as shown in Figure 11. In this case, the copy job is running every three months and it runs on the last day of the month. This rotation requires four separate pieces of media to retain backup data for one year before overwriting. The tapes should be clearly labeled to avoid overwriting the wrong tapes.

Figure 11. Schedule by month

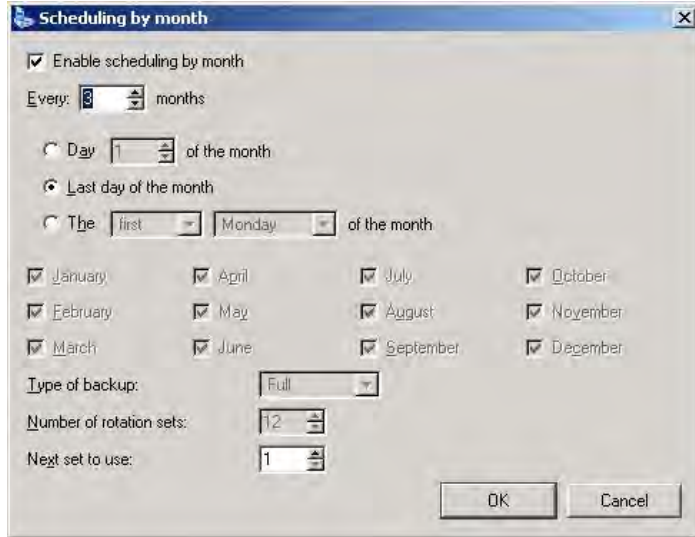
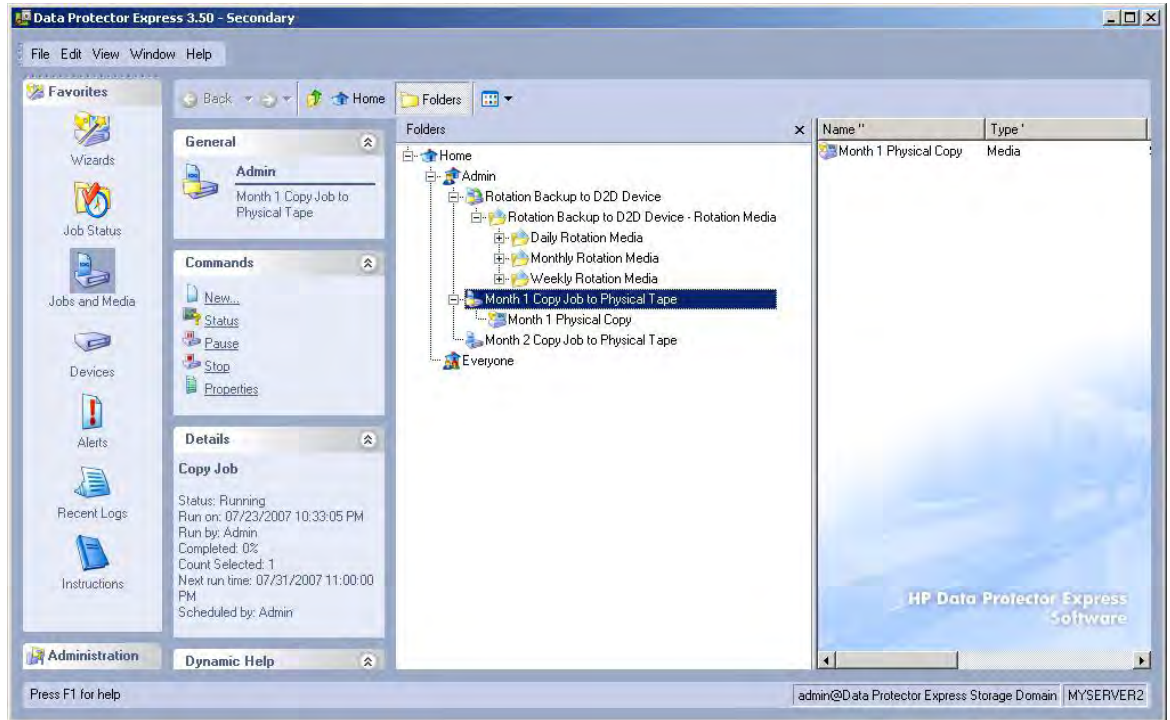


Figure 12 shows the Jobs and Media page with two physical copy jobs created and the “Month 1 Copy to Physical tape” job completed. The additional copy jobs for the weekly backups and Month 2 and 3 backups would be set up in the same way.

Figure 12. Backup and copy jobs



Option 2: Creating a separate backup on tape

For this option, a parallel backup schedule will be set up on physical tape to complement the one set up on the D2D Backup System. This option is the simplest way to achieve backups to both the D2D Backup System and physical tape. This method does not copy the virtual cartridges on the D2D Backup System to tape. It uses two independent backup jobs, one to the HP D2D Backup System and the other to a tape drive.

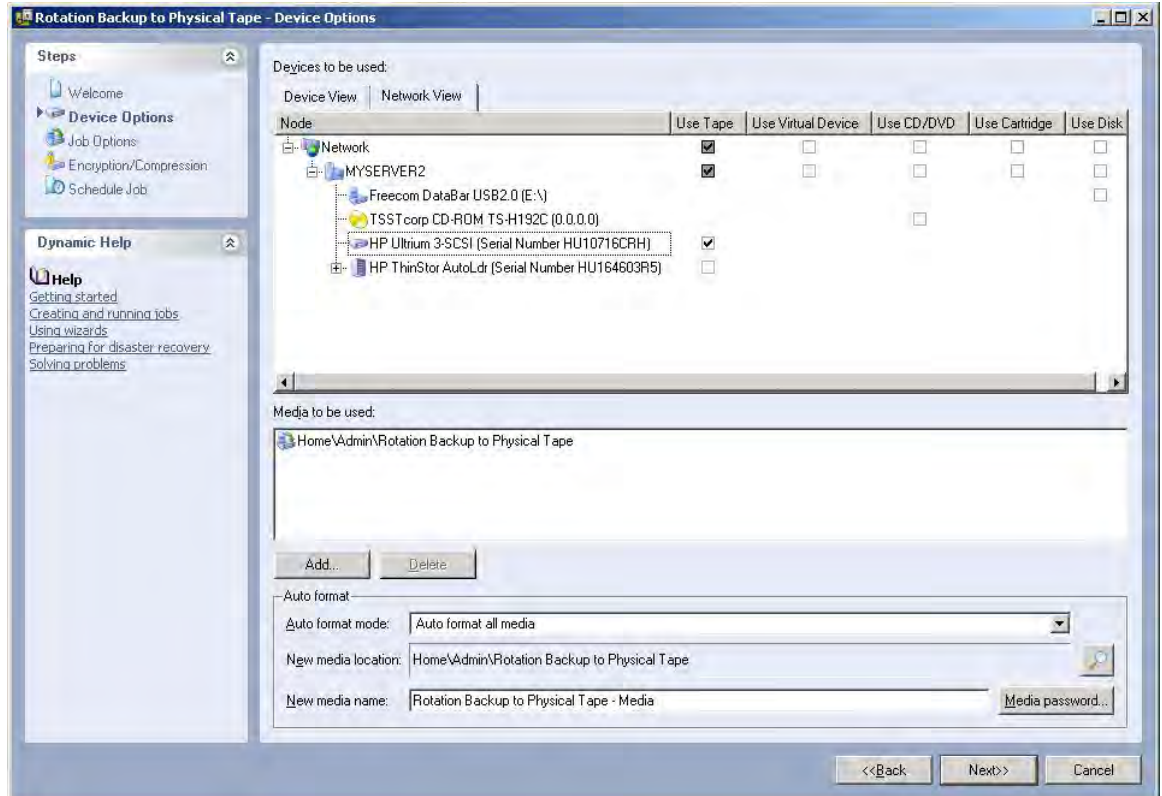
To create a backup on tape to meet the hypothetical organization's needs, set up the following rotation:

- Weekly full backups on Fridays, which are overwritten every fourth week (three tape cartridges or cartridge sets required)
- Monthly full backups, which are overwritten every year month (12 cartridges or cartridge sets required)

To begin, use the Data Protector Express backup wizard to create the backup job. Just as with the rotation set up for the D2D Backup System, all files on the local server will be backed up, so select the Backup Local Machine wizard. Give the backup scheme a meaningful name, such as "Rotation Backup to Physical Tape."

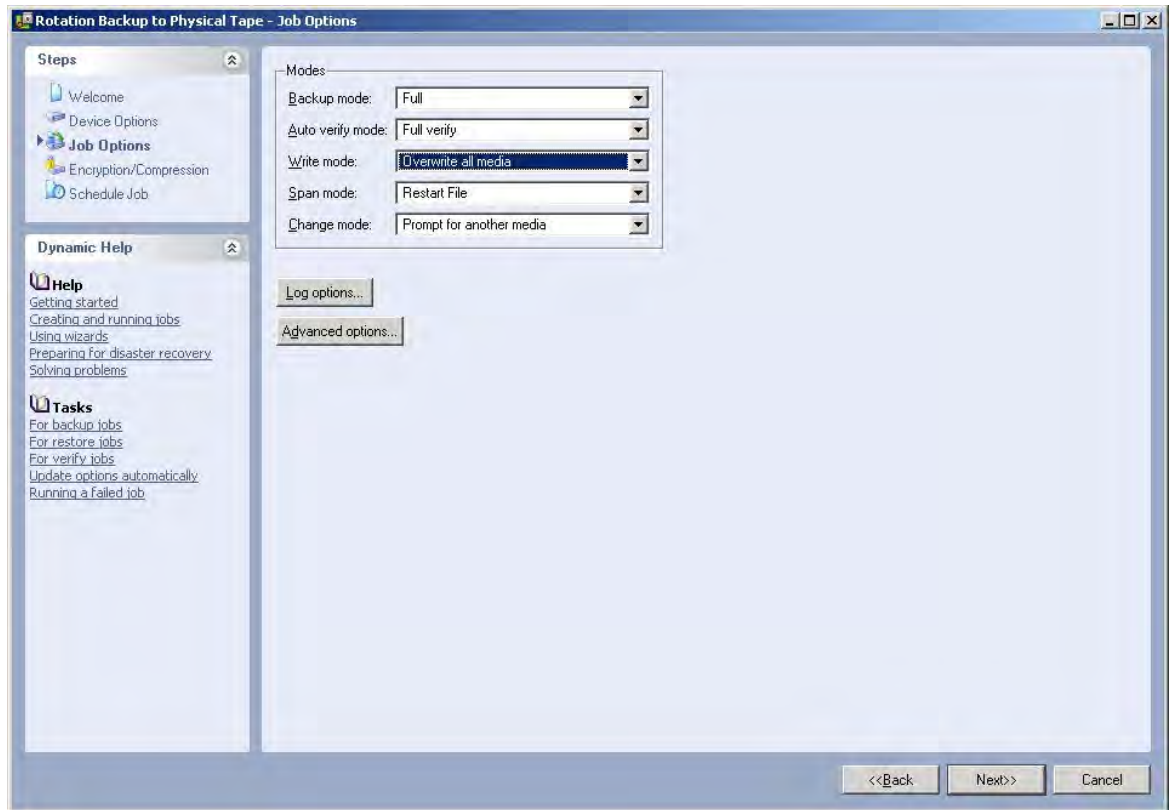
Next, select the device to be used for the backup, the HP Ultrium 920 tape drive that is connected to the server (see Figure 13). Data Protector Express automatically assigns a folder to contain the "Media to be used" for this backup.

Figure 13. Device and media properties for the backup to physical tape



After selecting the device, set the backup options. Most options in this step, such as backup mode and write mode, may be left in their default configuration, as they are controlled by the rotation scheme selected later in the wizard. The only option you may want to change is whether a verify pass should be carried out after the backup completes. As with the backup to the D2D Backup System, verification is recommended to ensure that the data written to tape is accurate.

Figure 14. Backup job options



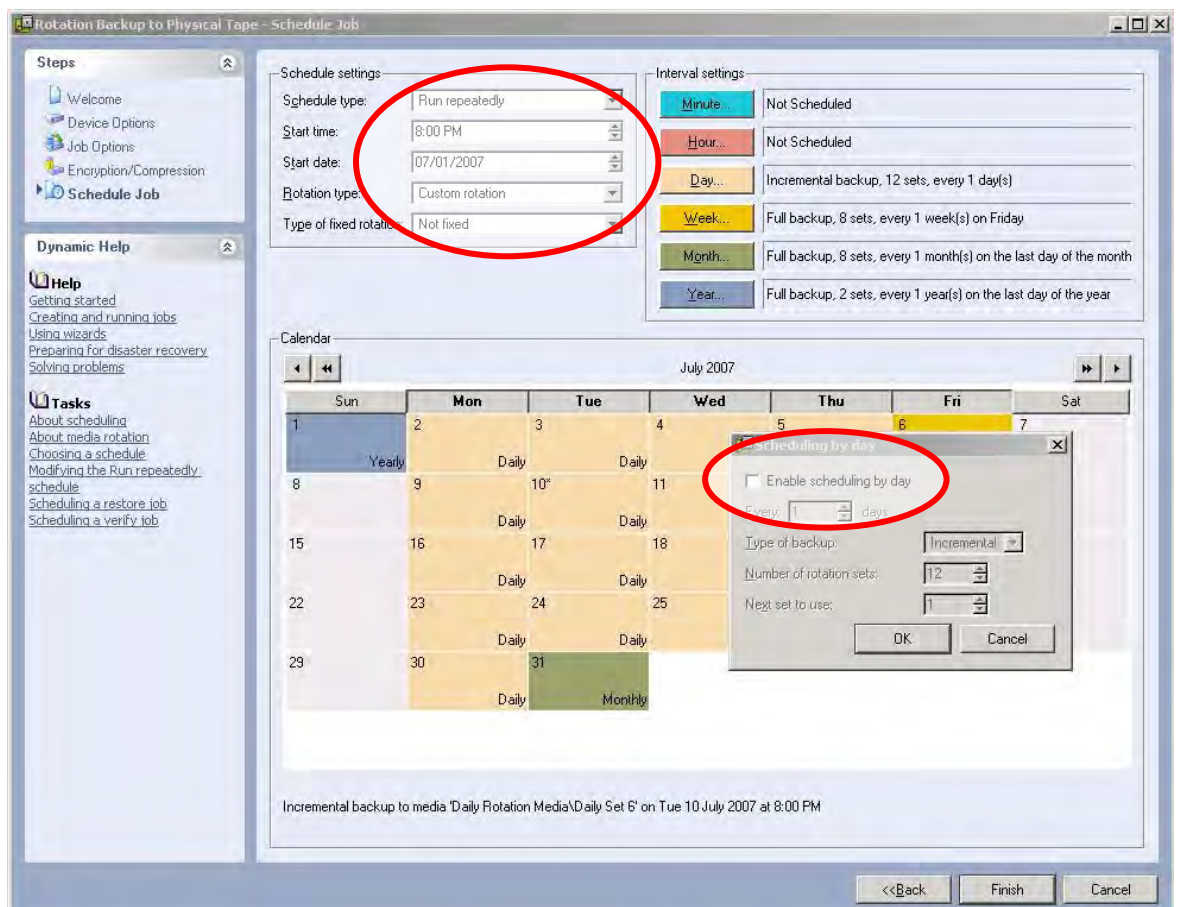
The next step is to configure a custom rotation schedule for this backup schedule. All built-in rotation schedules in Data Protector Express include daily incremental backups, but this is not required in this case. The daily backups are being handled by the D2D Backup System.

Select a schedule type of **Run repeatedly** and a rotation type of **Custom rotation**. Importantly, the start time is set to 8 pm—two hours before the full backups start on the D2D Backup System. Depending on the amount of data to be backed up, the speed of the network connection, or what other backup jobs are in progress at the time, more time may be required. It is important that the backup job to physical tape completes before the backup to the D2D Backup System.

Running the backup to tape before the backup to the D2D Backup System ensures that, in virtually all cases, a file that needs to be restored will come from the D2D Backup System, which is much faster for single file restores than a tape drive. For example, assume that a full tape backup completes on Friday at 9:30pm. This is now the latest backup of the server, so if no further backups are run, then any restores of data in the following week that are not included in the daily incremental backups will default to the physical tape backup. However, because the full backup to the D2D Backup System is scheduled for 10pm on the same Friday, any restores during the following week will default to using the latest full backup on the D2D Backup System.

Now, begin to customize the schedule to meet the organization's backup requirements. Daily backups are not required, so the first task is to disable this by clicking the Day button under Interval settings. This displays the Scheduling by day dialog box, where you will unselect the **Enable Scheduling by day** box to prevent daily backups from running (see Figure 15). Do the same for yearly backups as these are also not required.

Figure 15. Turning off the daily backups

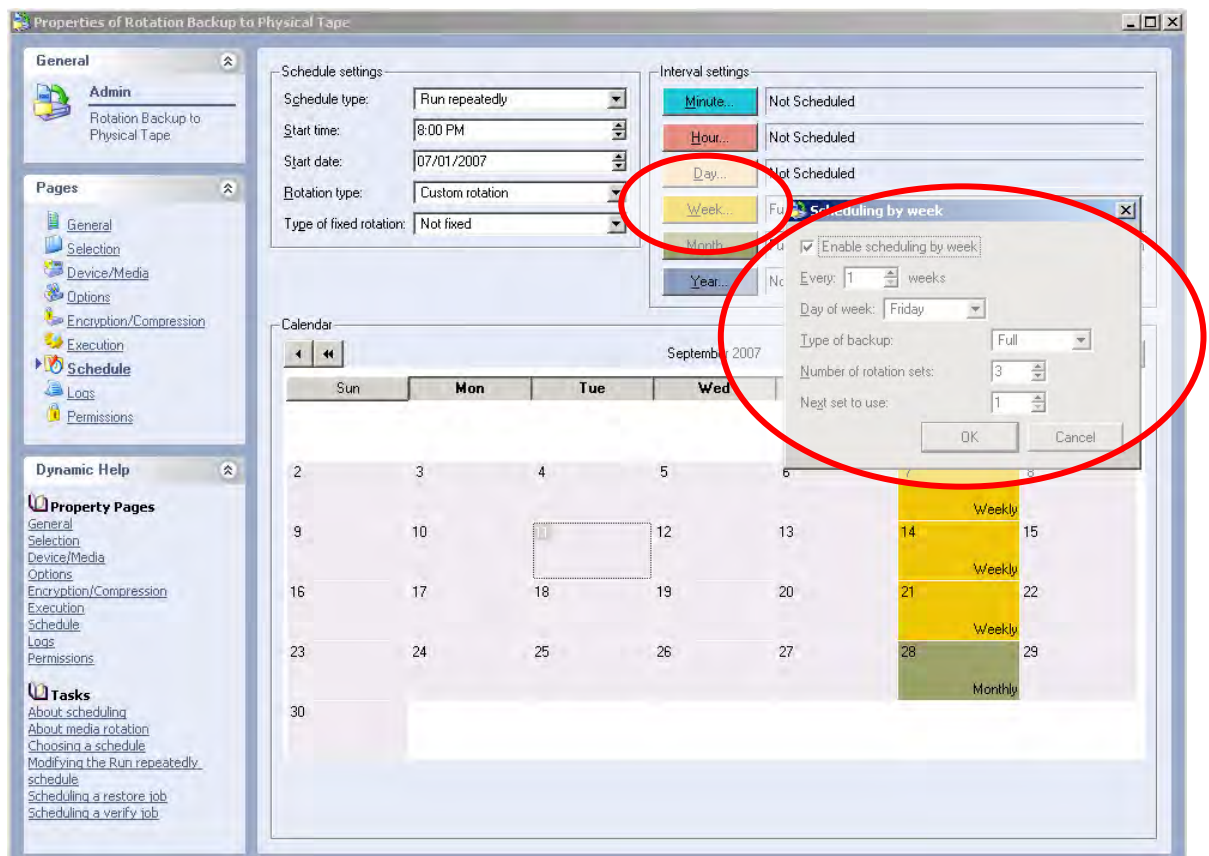


Now schedule the weekly backups by clicking the Week button under Interval settings. This displays the Scheduling by week dialog box as shown in Figure 16. The following settings are required:

- Scheduling by week enabled
- Every: 1 weeks
- Day of week: Friday
- Type of backup: Full
- Number of rotation sets: 3
- Next set to use: 1

This means that full backups will run on Fridays (the same as the backup to the D2D Backup System), and there will be four cartridges needed for this backup schedule.

Figure 16. Scheduling weekly full backups

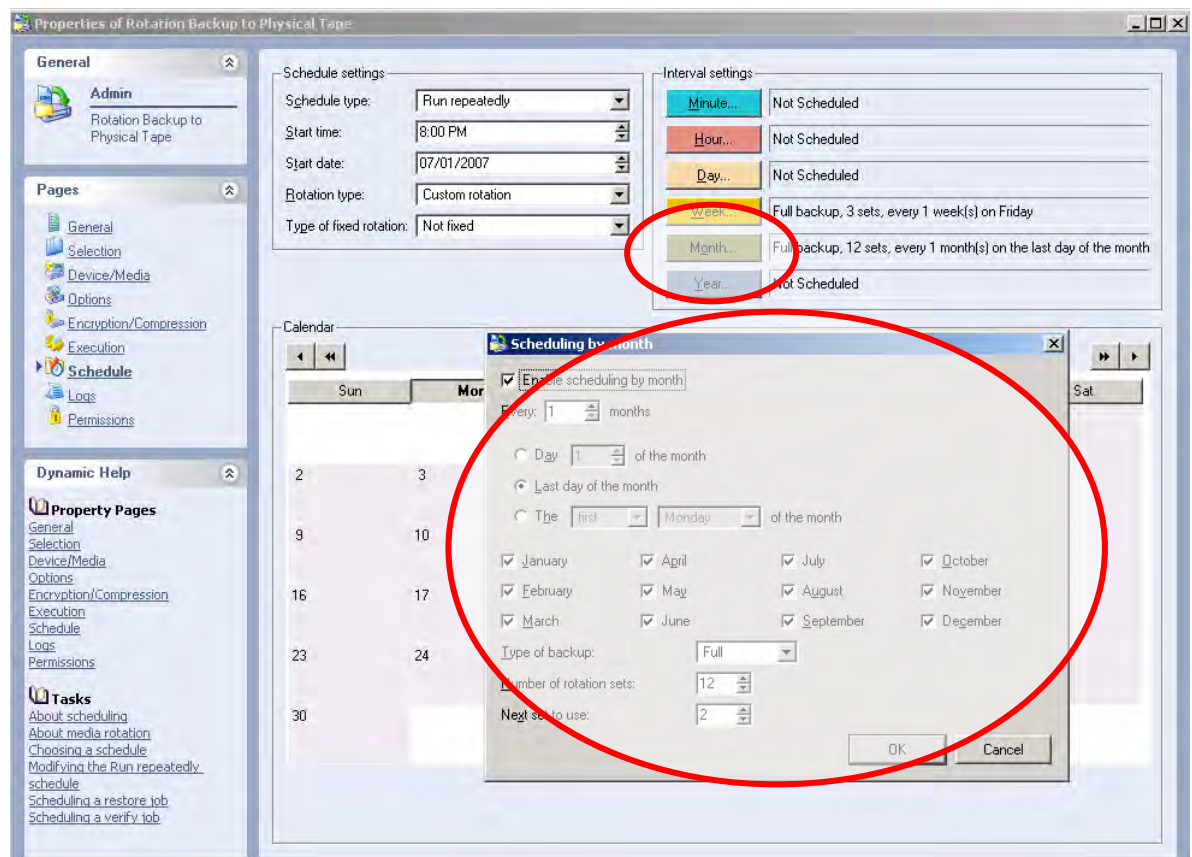


Next, set up the monthly backup schedule. To do this, click the Month button under Interval settings. This displays the Scheduling by month dialog box as shown in Figure 17. The following settings are required:

- Scheduling by month enabled
- Every: 1 month
- Last day of the month selected
- Every month checked
- Type of backup: Full
- Number of rotation sets: 12
- Next set to use: 1

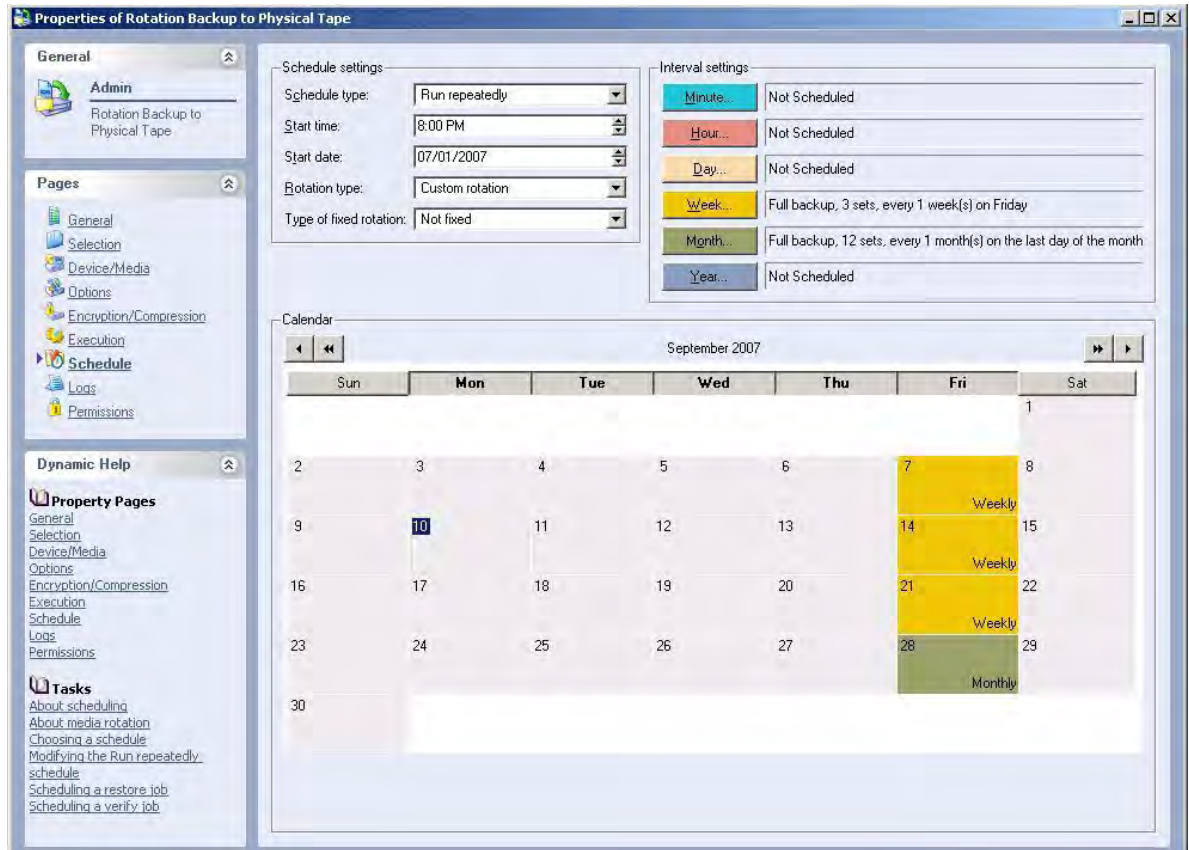
This means that a full backup will run every month, on the last day of the month and 12 tapes will be used before overwriting the first one.

Figure 17. Scheduling by month



The completed schedule page is shown in Figure 18 and is now ready to run.

Figure 18. Finished schedule for backup to tape



Summary

The examples shown in this paper describe how HP Data Protector Express software can be used to create a workable backup strategy that combines the D2D Backup System for fast disk-based recovery and a tape device for the added protection of storing media offsite. Of course, the backup schedule that suits your organization may be quite different from Simple-10, and your requirements for the frequency of making copies to physical tape may be more or less than in this example. The methods of combining disk-based backup and tape-based backup will be the same, however, so you will need to adapt these processes to your needs.