

Tape Rotation Schemes

Many users, network managers and small-business owners alike, believe that performing a daily backup using the same single data cartridge protects them from disaster. However, this line of thought is in itself a disaster. By using only a single tape, you are not archiving a history of your data. Corrupt data often exists long before it rears its ugly head into a system crash. By using a single tape, you could be backing up corrupt data and have no chance of finding the clean file or files you have backed up. Having multiple copies on a single media is not acceptable either. In order to protect yourself, you must have multiple copies in multiple places to be assured of retrieving your data in the event of a disaster.

Now you may say, "What if I back up everything on a new tape, every day?" You could do that, but if you have a large data repository, the cost of ownership related to data cartridges can sharply increase.

We suggest using one of two industry-standard tape rotation schemes that are designed to protect your data as well as minimize the cost of ownership related to data cartridges. By incorporated a mix of daily, weekly, monthly and quarterly backups, you can be sure that you have a complete history of your data from various points in time.

Cost Implications:

Although both tape rotation schemes effectively serve the purpose of protecting your data, each has different cost considerations. While the Tower of Hanoi is more difficult to implement and manage, it is much more cost-effective than that of Grandfather-Father-Son. However, if network management is an issue for your organization, it makes sense to use the simplest method and assume the slightly more expensive cost associated with the Grandfather-Father-Son method

Alternative Media:

You never want to make the mistake of trusting your tapes or your media rotation scheme alone. It is always wise to use different types of media and different devices to backup your data. For example, you can frequently back up all your data to a 8-mm DAT drive and also to a separate 4-mm DAT drive. This doubles your chances of having a good copy of your data. Also keep several copies of your most important data in several locations.

Grandfather-Father-Son Method

One of the most commonly used tape rotation schemes is called Grandfather-Father-Son. This scheme uses three sets of tapes for daily, weekly and monthly backup sets. To execute the Grandfather-Father-Son rotation scheme, you will need twelve sets of media. The actual number tapes required in each media set will vary depending on how much data you need to backup.

The first set, "Son," represents your daily backups. Assign four tapes as incremental daily backups and label them "Monday" through "Thursday." These tapes will be used to perform daily incremental backups and can be reused weekly on the day that they are labeled.

A second set of up to five weekly tapes, called "Father," is used to perform full backups on the day in which you do not perform a daily incremental backup. This media set should be labeled "Week 1" through "Week 5" and can be reused monthly on the day matching its label.

The final set of three tapes, called "Grandfather," is used to perform full backups on the last business day of each month and can be reused quarterly.

This rotation scheme will back up data on a daily, weekly, monthly, and quarterly basis. In some instances, archived data is required for periods longer than one quarter. In these cases, media sets are often pulled from the rotation and store off-site.

An illustration of the Grandfather-Father-Son rotation scheme is located below.

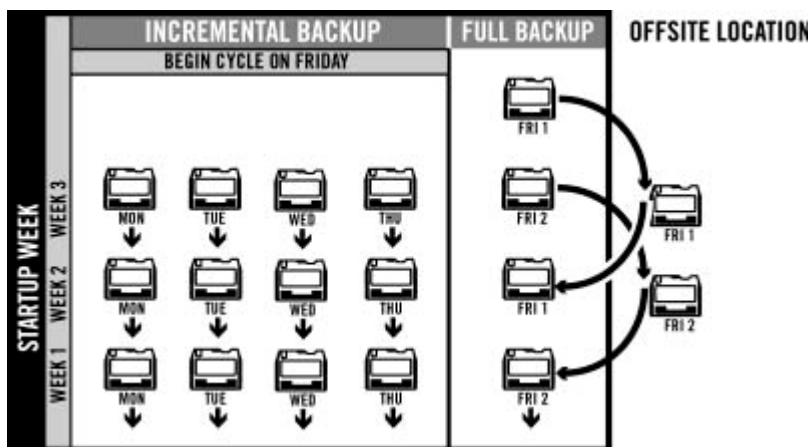
		MONTH 1				
		MON	TUES	WED	THURS	FRI
GRANDFATHER-FATHER-SON MEDIA ROTATION SCHEDULE	The white squares represent the most recent backups while the shaded squares represent previous backups. Only the daily tapes have been reused. Note that the weekly backup is performed on Fridays.					W1
						W2
						W3
				WED	THURS	W4
		MON	TUES	MONTH 1		

Six-Cartridge Weekly Backup Principle

A simpler and more cost effective implementation of Grandfather-Father-Son is called the Six Cartridge Weekly Backup. Perfect for small businesses, this backup principle requires daily backups and a single weekly off-site backup copy to provide a data history of up to two weeks. Friday backups are full backups. Monday through Thursday backups are incremental. Here are the steps:

1. Label each of six cartridges with **FRI 1, FRI 2, MON, TUE, WED, THU**.
2. Start the cycle on a Friday and backup the entire hard disk onto cartridge **FRI 1**.
3. On Monday, take the **MON** cartridge and back up only the files that have been created or modified since the last backup (**FRI 1**). This is an incremental back up and should be stored on-site. (A full backup, rather than incremental, can be used, if desired).
4. Repeat Step 3 on Tuesday, Wednesday, and Thursday, using corresponding data cartridges.
5. On Friday, take data cartridge **FRI 2**, and perform a full backup. You have just completed a full rotation of the weekly principle. Again, be sure to store this data cartridge off-site.
6. The weekly process continues by repeating Step 3 and Step 4 using the same **MON, TUE, WED, THU** data cartridges. Step 5 is implemented by alternating cartridges **FRI 1** and **FRI 2**.

An illustration of the Six-Cartridge Weekly Backup Principle is located below.



Tower of Hanoi

The other popular tape rotation scheme is called Tower of Hanoi. With the Tower of Hanoi, four media sets are used and are labeled as "A," "B," "C," or "D." The number of tapes in each media set will vary depending on the amount of data you are protecting. Starting on day one, perform a backup using set "A" every other day. Set "A" can be reused on a daily basis but never two days in a row. You begin and continue using set "B" on the first "non-A" backup day and repeat using set "B" every fourth back session. Media set "C" begins on the first "non-A, non-B" day and repeats every eighth session. Media set "D" begins on the first "non-A, non-B, non-C" day and repeats every sixteenth session.

Increasing your backup history is easy because adding a media set (e.g, set "E" beginning on a "non-A, non-B, non-C, non-D" session and repeating every 32 sessions) doubles the history of your backup. The Tower of Hanoi scheme makes it easy to recover data -- the more often a media set is used, the more recent the archived data is that resides on the set

Best practices suggest that five media sets should be used if you are applying the Tower of Hanoi to weekly backups and eight media sets if you are applying it to daily backups.

An illustration of the Tower of Hanoi tape rotation scheme is provided below.

TOWER OF HANOI MEDIA ROTATION SCHEDULE		MEDIA SET															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		A		A		A		A		A		A		A		A	
			B				B				B				B		
					C								C				
									D								
																	E

RETURN TO DAY 1