

Playing it safe... Backup, backup, backup!

With years of being in the Information Technology industry, many people approach me with questions regarding their computers and the data stored on them. The most critical question that people have addressed me on is their BACKUP. Too many times, they tell me that they have lost data due to carelessness, power surges & drops, hardware failures, or system halts.

First of all, you should recognize the fact that you only need a backup if you do not wish to research, retype, and recheck all of the information that you have stored on your computer or network. The data that you store on your computer is recorded on a hard drive. The hard drive is comprised of disk platters coated with a metal oxide. This coating allows the disk to retain a magnetic charge which, in fact, represents your data. The disks that hold the data are written to using heads that float on armatures which record the information onto the platters as they spin at speeds around 7,200 rpm (revolutions per minute). The main point to understand from this summary is that we're talking about a precise method to record your data.

When you buy a hard drive, you may notice that it is rated with a Mean Time Between Failure (MTBF) number. This number represents how many hours the drive may be expected to function properly, most of these numbers are over 100,000 hours. (**Note:** There are 8,760 hours in a YEAR; this number represents over 11 years of CONSTANTLY being ON (*without* regard to power management features).) If you get more hours than the rating, you should consider yourself lucky. However, this is a MEAN which indicates you will have those which perform for less time than the MTBF too! That is why you need to consider a backup method.

A backup system can be implemented using tools that you already may have handy: a floppy disk, a CD-R writing device, a tape drive or a ZIP Drive®. If your only option is a floppy drive, then you need to consider what you need to back up. If it is substantial, you may need to consider purchasing an alternative that offers greater storage capacity. Sample capacities are as follows:

Device	Capacity*
Floppy Drive	1.44 MB
Internal/external tape drive	Varies from 100MB or greater
Iomega ZIP Drive®	100MB or 250 MB
CD-R/CD-RW	674MB/700MB
Iomega JAZ Drive®	1GB or 2GB
DVD-R/RW (Read/Read Write)	4.7GB – 9.4GB
Online Storage	Varies upon contract**

* These numbers are generalizations, capacities will vary by device.

** This option is only viable with a high speed connection, prices may vary.

Most DOS and Windows-based operating systems come equipped with a simple backup utility. If you have purchased a backup/storage device other than a floppy drive, then it may come with its own proprietary utility designed to exploit its use within a backup system. If you find that your available backup systems do not offer you enough features, then there are additional backup software applications which may be purchased from Veritas, Computer Associates, Symantec, and other vendors. For network-based solutions (client/server environments), the list is more substantial.

Some backup systems may use terms which are unclear to the general user. The two obvious terms are BACKUP and RESTORE. There are, however, three terms which are critical to understanding how your backup will work:

FULL (Normal)	A backup where ALL files are backed up. All archive bits have been reset upon completion
INCREMENTAL	A backup where ONLY CHANGED and NEW files are backed up. All archive bits have been reset upon completion.
DIFFERENTIAL	A backup where ALL CHANGED files are backed up. No archive bits are reset upon completion.

The way it works...

When a file is created, it is marked to indicate that it needs to be backed up. The operating system does this with an attribute of the file called the ARCHIVE attribute. In the case of a new or modified file, the attribute is turned ON to indicate to the computer that the file needs to be backed up (Archived).

The **FULL** backup (also called a NORMAL backup) allows the user to make a copy of ALL of the files in the Backup Selection. This method is typically the slowest because it takes the "whole selection" into the backup. Once the file is backed up, the system turns off the Archive attribute. This indicates that the file has been backed up (archived). Files that had their bit initially set with OFF (indicating a previous backup was made) are backed up, too.

Analogy: Every piece of paper in the "A Originals" filing cabinet is photocopied and marked with the copy date. No piece of paper is overlooked. The copies of all papers in the "A Originals" filing cabinet are then stored in the "A FULL copies" filing cabinet.

The **Incremental** backup only backs up the files that were created or edited since the last FULL/Incremental backup or those that were never backed up--ARCHIVE attribute is ON. Once the file is backed up, the system turns the ARCHIVE bit to OFF. This indicates that the file has been backed up (archived).

Analogy: Only the papers CREATED or EDITED **AFTER** the Full Backup copy date are copied and marked with the copy date. No other originals are copied. The copies are then stored in the "A Incremental copies" filing cabinet.

The **Differential** backup only backs up the files that were created or edited since the last FULL/Incremental backup or those that were never backed up--ARCHIVE attribute is ON. Once the file is backed up, the system does NOT do anything to mark the file as backed up.

Analogy: Only the papers CREATED or EDITED **AFTER** the Full Backup copy date are copied, but **NOT** marked with the copy date. No other originals are copied. The copies are then stored in the "A Differential copies" filing cabinet.

Why would one choose one method over another? Speed, history and reliability.

If a Full backup is made every day, the time that it would take to backup the important files would grow each day. As you save and create files on your computer, more files would need to be backed up. As a result, the backup would grow increasingly

longer. After a while, knowing that the task would last X many hours, you may become so discouraged by the time involved that the backup would soon be perceived as a waste of time.

However, if a FULL backup is made WEEKLY and an INCREMENTAL is made DAILY, then a backup would only take a long time ONCE in a while (when doing the FULL backup) and the daily backup could be completed quickly. Remember, only the files that are new or have changed will be backed up by the incremental backup. If a restore were needed, the full backup would be restored, then the daily incrementals would be restored from the time of the FULL backup through to the date of the file needed.

If a FULL backup is made WEEKLY and a DIFFERENTIAL is made DAILY, then a restore would be performed by restoring the full backup and restoring the last differential backup. The drawback to a differential backup is the time that it takes to perform on a daily basis. The time lost in the backup, however, is readily recovered by the shorter restoration speed.

Each user or business has their own needs to address when creating and maintaining a backup system. There are many schemes for retaining the backup, (e.g., Grandfather, Father, Son:daily, weekly & monthly) by which copies are moved off-site or retired. Whenever working with a backup, it's important to remember—**consistency is the key**. Do your backups regularly and do not vary, you will find recovery is far less painful than rekeying in all of the data that has been lost.

If you have a question or would like to have a concept explained, please feel free to send an email to support@tech4now.com. Not all submissions will be addressed through this column. If you feel you have an urgent issue that needs immediate attention, you may indicate that in your email or call Holzsager Technology Services, LLC at (201) 797-5050 for service.