(Approx. 1257 words)

## Backup

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Life is constantly changing, meaning we should occasionally review our habits to see if they are still appropriate, and this is true for PC backups. So let’s take a high-level look at the subject. Your situation is undoubtedly different from mine, and your approaches will most likely differ.

Two basic backup techniques are copying the entire disk (cloning) and file-by-file. Cloning saves both your software and your data but requires that your backup medium be at least as large as your disk. In addition, there may be complications if you restore to a different PC, as old software may not be compatible with its new home. On the other hand, file-by-file backups can be updated far faster because only changes are saved. You can also do partial restores, replacing only corrupted files or restoring only missing ones. However, a complete restore of a file-by-file backup is slower (perhaps significantly so) than a restore of a clone because the data is scattered throughout the backup medium.

Full disk backups protect against disk failure, software malfunction, and malware, as a restore returns the disk to its state when you backed it up. Of course, this means you lose any changes you’ve made since then. It’s less satisfactory if you want to restore to a new PC. Most users buy PCs with an installed operating system (OS) with an OEM (original equipment manufacturer) license valid only for that machine. When you copy the entire disk contents to a new one, it now has an OS whose license isn’t valid.

Further, the software is configured for the old PC. All is not lost, however, as you may be able to mount the backup disk on your new PC and copy just the data you need from it. Be sure to test this before you need to do it, as there are possible complications, for example, if your hard disk is encrypted. When moving to a new PC, you’ll probably want to retain the OS and any applications you bought with it and install your other applications from their installation media.

File-by-file backups allow you to save just your data and thus will enable you to move it to a new PC, but you must be careful. For example, Windows users should back up the entire contents of [C:\Users](file:///C:\C:\Users) and Linux users the entire contents of /home. Be sure you get everything, as many important items are hidden.

Consider using both strategies, clone the disk after upgrading old software or installing new, and make frequent file-by-file backups to preserve your data.

The Terabyte capacities of modern hard disks leave you only two choices of backup medium, hard disks and the cloud. (Resist the temptation to back up to a separate partition of your system disk, as a disk failure will affect your system and your backup.) For example, backing up a 3-Terabyte disk to the cloud, assuming an upload rate of 3-Megabytes per second, would require close to 100 hours. However, I see rates around 100 Mbytes/second when writing to USB-3 external disks, meaning a 3-Tbyte disk backup would need a more reasonable three hours.

Your backup software can limit your choices for your next PC. For example, I use Back in Time, available only for Linux, and the backup disk is formatted as ext4. If considering changing operating systems, use different backup software and a different disk format.

Currently, USB is the most common interface for external disks. Using something else increases the risk that a new PC may not have the same interface or replacement drives may become unavailable.

Backup disks can be either internal drive or external. An internal drive is always available, making it suitable for scheduled backups. However, a serious PC problem, for example, overheating or a power surge could damage both the PC and your backups. An external drive, especially if connected to the PC only when in use, makes it more likely to survive a PC mishap. Leaving a USB drive always connected makes it function as an internal one and can support scheduled backups. Also, it’s less likely to be damaged by a catastrophic PC failure.

What do you back up, and on what schedule? I use open-source software, and I prefer to install software from current distribution media rather than from a backup if there is a problem. This ensures the software is up to date-and free from the inevitable configuration problems that seem to accumulate over the years. This solution is less desirable with proprietary software, where you would have to reinstall from the original installation media (or the recovery disks) and then do all the updating. A better solution here is to clone your disk when you install a new program or perform a significant upgrade. Then make file backups of only your home directory.

I’ve found that backup programs do a poor job of error reporting. Even experienced PC users are sometimes surprised to find their backups have failed without warning. Frequently check the backup program logs. I have one scheduled every Tuesday, and once found that my medium had failed three weeks before, meaning the last three backups had failed. If you make file-by-file backups, occasionally check the process by restoring one or a few, preferably to a different location, so that you can compare the originals with the backup versions.

You can streamline your backups by organizing the file system on your PC. For example, you can create an archive area where you keep old, seldom-accessed files. If you move files to it only once a year, you need back it up only once a year. As a result, your other backups will be faster and smaller. Of course, we all should delete far more old, obsolete files than we do, but an archive accomplishes almost as much and involves less agony.

The recovery process depends on the damage. An operator error or disk failure usually involves just restoring from a backup. This can require recovering a complete copy of your disk, which I’ve had to do after mistakenly restarting Windows during an update. As I noted above, PC failure is more troublesome if you use proprietary software. The safe course is to use the OS you bought with the PC, restore your home directory from your last file backup, and reinstall the installation media software whose licenses permit such things.

I prefer to keep at least one backup offline that is disconnected from the PC, making it safe from even a catastrophic power surge. Once a week, I back up my home directory automatically to an internal drive, and once a month, I back up to an external one. The large capacities of our hard disks mean that our backups are most likely stored near our PCs, where they could be damaged by catastrophic events, such as a house fire or flood. While these are unlikely, they happen, and taking special precautions with your valuable data, such as passwords, key financial records, and contacts, is worthwhile. In my case, these occupy less than 20 Mbytes and are easily stored on a USB memory stick or a cell phone. Because these are sensitive data, they should reside in an encrypted volume. Memory sticks are so small that asking a friend or relative to keep one for you is reasonable.

When you think about your needs, you will likely decide to use more than one backup technique. After all, there is more than one risk.