



March Newsletter: Hard Drives 101

Hello!

As you may know, Cartwheel has a small data recovery lab in our office. If your hard drive crashes, we may be able to recover your data. When clients come in, they often ask why their hard drive crashed, if they did something wrong, and what they can do to prevent it in the future.

In this month's newsletter, we'll try to answer those exact questions. First, we need to explain what a hard drive is. This is Hard Drives 101. Enjoy!

All the best,
Your friends at Cartwheel

Hard Drives: Why did my hard drive crash?

What's inside my Hard Drive?

If you haven't seen a hard drive, it's about a 4x6" rectangular metal box (laptop hard drives are much smaller) that sits inside your computer. Inside the box, called the enclosure, are some round metal magnetic disks, called platters. Floating over the platters is a metal arm that has on it two sensors. These sensors are called the read and write heads. For those of us who remember, the whole thing looks like a miniature phonograph (yes, some of us ARE that old, thank you very much).

The platters spin very fast, while the heads float above them on a very, very, very thin layer of air (we're talking nanometers). The heads read and write data to the platter by sensing or changing the magnetic orientation of a tiny section of the platter.

Today's hard drives are complex, and like a new car, have a lot of built in safety features that can prevent an accident. They are constantly repairing themselves, and are much more reliable than they used to be. But they still crash.

Why did my drive crash?

Remember that microscopic layer of air between the platter and the head? If for any reason the heads touch the platter in an area where your data are, the drive experiences what is called a head crash. You may hear clicking or grinding sounds, and any data in that area will probably be lost forever.

That's just one scenario. The hard drive, with its motors, high speeds of rotation, and tiny parts is a delicate creature. All hard drives will fail eventually. The common wisdom is that they fail because of dirt, humidity, impact, heavy usage, or some other environmental factor.



What can I do to prevent a crash?

Any rational person may think, "I'll be very careful with my hard drive, keep my computer clean and dry and won't use it too much."

Unfortunately, it turns out that those factors don't really make a difference. Google did a large study about hard drive failures using their own drives (http://labs.google.com/papers/disk_failures.html), and found that temperature, humidity, and even heavy usage don't predict if a drive fails in the real world. The only accurate predictor is the manufacturer and model!

So all you have to do is find the most reliable hard drive and you'll be all set, right? Yes, but the problem is that manufacturers guard failure rate numbers with their lives, and they release new models too often for any testing labs to make useful recommendations.

What about Solid State Hard Drives?

A Solid State Drive (SSD) is a drive that uses memory chips (normally Flash memory) instead of a platter to store data. Since there are no big moving parts, like the platter and the arm, many people think that solid state drives do not fail. In fact, they do. Flash memory can only be written on a certain number of times before it wears out. That means your USB thumb drive or SSD will all fail eventually as well. Because the SSD industry is moving so fast, whether SSDs last longer than standard hard drives, or fail less, are questions we can't answer. No authoritative studies exist yet, and even if they did, by the time the study was analyzed, the technology would change.

The secret to safe data

If your drive crashes, its data may be recoverable. We don't have room in this newsletter to cover hard drive recovery, but let's just say that it's expensive and doesn't always work. There is only one secret weapon to keep your data safe from a hard drive crash. Yup, you guessed it: back it up.