



# Excuse Me, But Do You Have the Time?

**Back in 1982**, I was a SSgt in the USAF, finishing my undergraduate degree at the University of Central Florida. Because of my course load, I was spending lots and lots of time in the computer center (I was taking Operating Systems, Compilers, and Assembly Language all in the same semester). The media I used for programming (punched cards) cost \$0.94 for 500 cards. If you were paranoid (I was) and wanted a backup for security (I did), all you needed was an IBM 514 Duplicator, a deck of fresh cards, and about 2 minutes to duplicate 500 cards. My electronic footprint at that time, was three decks of cards (one for each class) so in 6 minutes, I could backup everything I needed.

However, I wearied of spending nights fighting for cardpunch machines, and then having to wait in line to run my job. I decided to surge forward with new technology. I bought a home computer—a Commodore SuperPet 9000—and it was awesome! It had not one, but two processors—a MOS 6502 (running Commodore OS with Commodore Basic and a Word Processing program), and a Motorola 6809 (running a Waterloo Programming Operating System, supporting APL, Fortran, COBOL, Pascal, Basic and Assembler). It had a blazing clock speed of 1 MHz. It was possibly the most technologically advanced small computer for the time (31 years ago).

My purchase included a Hayes 300 baud Smartmodem, and a dot-matrix printer for a total price of about \$4,000. It did not come with a floppy disk unit, and I could not afford the higher-priced quad-density Commodore 8080, so I bought the cheaper Commodore 4040 dual disk drive—a single unit with two disk drives, each with a capacity of 340K. Before long, I migrated almost everything I had previously done manually (using my typewriter) to disk. I had disks for each class, disks with games, disks with lists of my VHS tapes ... you get the idea. I had around 20 disks with “critical” information.

To backup all of my “critical” files, it took several boxes of disks, and about 2 – 4 minutes to copy each disk separately. As often happened, if disk had a single bad spot, you had to scrap the entire disk, and start with a new one. I could happily spend an entire night backing up 20 disks. I tried to remember to do it once a month, so a bad disk would never cost me more than 30 days of lost work. (I also learned to backup school data daily, sometimes hourly.) Come to find out, the backup took up quite a bit of my time. Sometimes, a full evening per month, with maybe an hour each couple of days for important programs, files, reports, etc.

Over the intervening years, I advanced from floppies to “firmies” (what else did you call

those 3.5-inch floppies that were not very floppy on the outside?) to CDs, then USB drives, and now, the cloud.

The problem, of course, is that as the capacity for backup media increases, the amount of information that I need to backup increases. Every backup medium I used eventually became totally full from the vast amount of digital information I now considered important to keep backup copies of.

But the cloud? It is huge! For about \$45 a month, I can have up to one terabyte of mostly-always-available storage. Is that too costly? Several commercial cloud providers provide five gigabytes totally free!

Advantages? It is online, always current, and virtually transparent to the user. Disadvantages? You have to be online. While the data synchronization and access occurs transparently, it does consume some bandwidth. You have a 5MB file that you want to access and modify? 5MB transfers pretty quickly. You want to access a 5GB database? Well, unless you have some mechanism in place to download or modify just a few records it might take you 1,000 times as long to download and then upload a modified version.

When I first started on the path to becoming a computer scientist, way back at the University of Central Florida in 1974 (it was called Florida Technological University back then), I had a class in data structures from an adjunct professor who, in his full-time job, designed and maintained large-scale databases. He taught me, “It is always about the tradeoff between time and space.” Make something run faster, it probably takes up more storage. Reduce storage, and the application almost always takes longer to execute.

All I am trying to say is that nothing is free. Large-scale cloud usage requires increased access and file update time. Do not plan for real-time performance when bandwidth is congested, the Internet is down, or lots of users are all trying to access really large cloud files.

By the way, remember those punched cards that cost about \$1 for 500 cards? Well, one card equaled about 160 bytes, so \$1 bought me 80Kbytes of storage. This equates to about \$12,500 per gigabyte of storage. Makes the cloud quite a bargain.

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