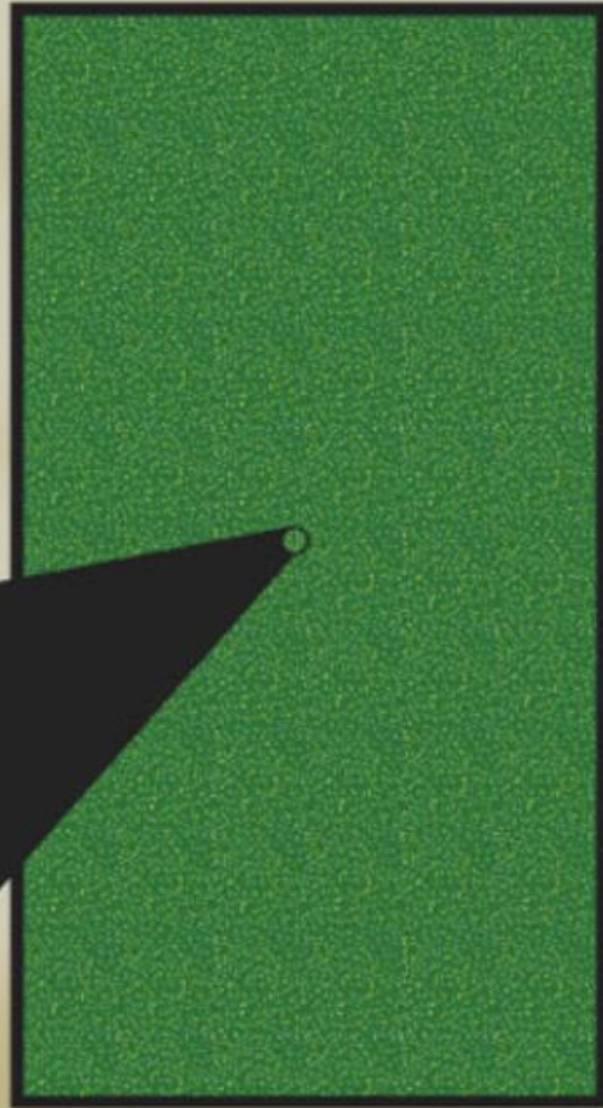


The Nuts and Bolts of Computers and Networks



Ever wonder how computers work?

It's millions of tiny bees doing a lot of math, so you don't have to!

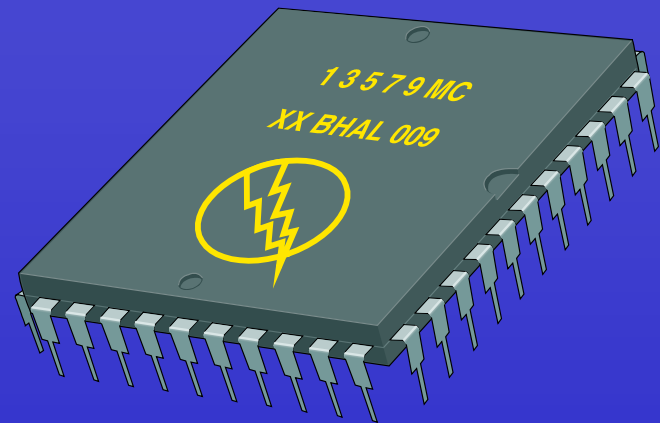


In order to understand how networks work, you must understand this important underlying dynamic...

- The DANCE between MAGNETIC and ELECTRIC

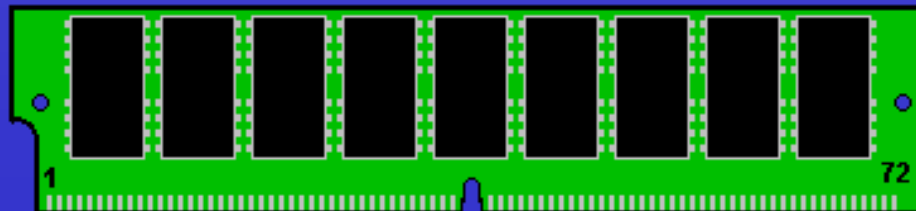
The ELECTRIC

- The PROCESSOR CHIP is the “boss” chip. Like a single-minded manager it is responsible for all the “thinking”. Any changes that are made to your data are handled right here.

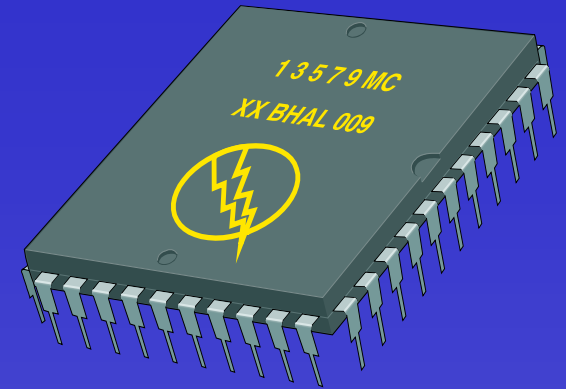


The ELECTRIC

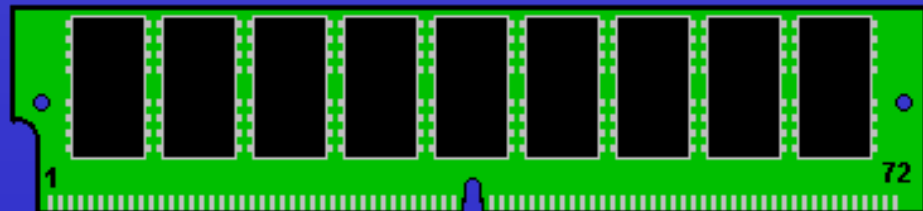
- The Random Access Memory (RAM) is the instant memory of the computer.
- Able to fill and flush pages of information in nanoseconds, these chips are the key to the computer's speed.
- RAM is analogous to the nebulous gray matter of the brain: lots of room to store stuff.



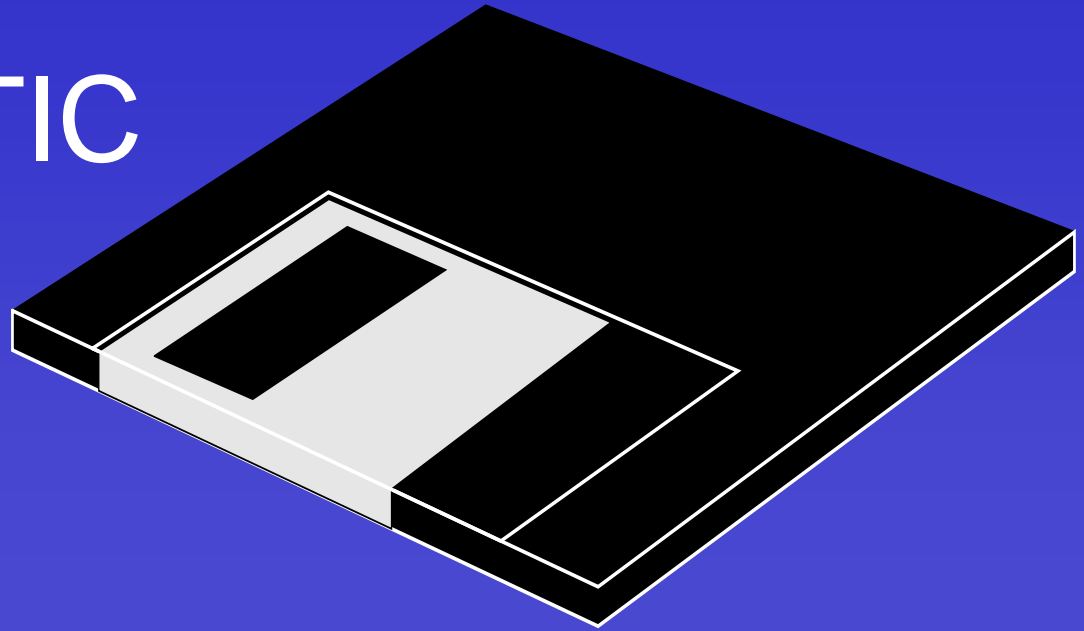
The ELECTRIC



- Together the PROCESSOR and the RAM are like the human brain
 - able to store a reasonable amount of stuff
 - able to cogitate and make new stuff
- Fast!
- But they require electricity. Very vulnerable.



The MAGNETIC



- The FLOPPY DISK is a round sliver of plastic covered with magnetic material-- just like audio tape
- It plays like a phonograph, so it's easy to access any point quickly

The MAGNETIC

- The HARD DISK is a fast and large storage disk inside the computer. Sealed and permanent, it can do everything the floppy drive does, only faster



The MAGNETIC

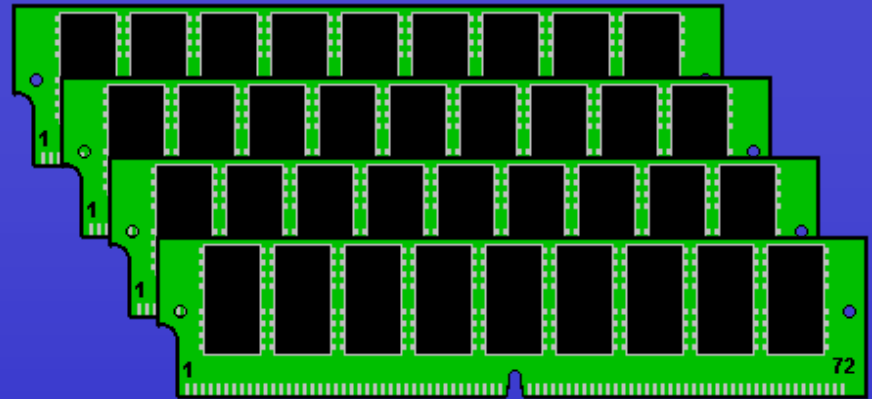
- The FLOPPY and HARD DISK are a reliable storage medium unaffected by electricity.
- Like a library
 - Capacity limited to whatever shelf space you're willing to pay for
 - Stuff can remain on the shelves for years, untouched and unchanged

The MAGNETIC

- Slow
- Transfer times measured in milliseconds vs. RAM's nanoseconds



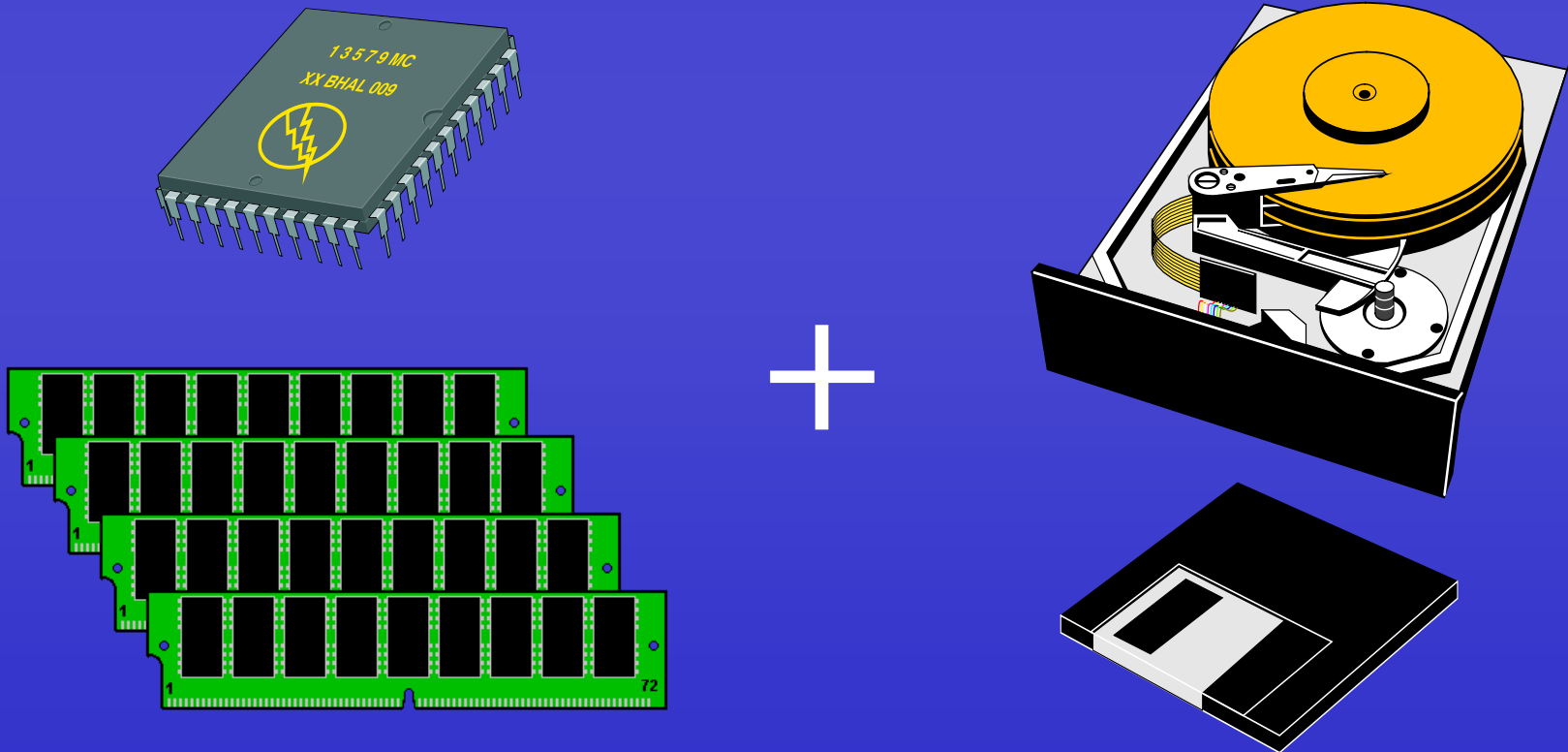
9/1000 sec
(9 milliseconds)



70/1000000 sec
(70 nanoseconds)

The MAGNETIC and the ELECTRIC

- Combines speed and reliable storage

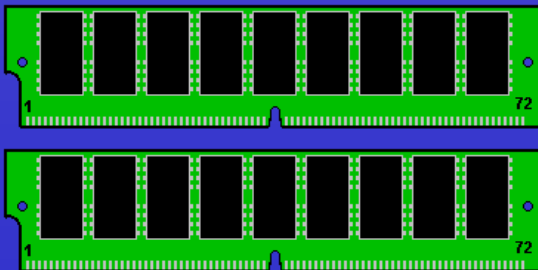


The DANCE: at the beginning

- When computer is turned off it is stone stupid
- Computer's BIOS chips holds instructions for finding and loading OPERATING SYSTEM
- OS stored on MAGNETIC medium
- Birth to High School graduation in 60 seconds flat

The DANCE: in its full glory

- Loading software = transferring MAGNETIC to ELECTRIC
- Running software = rearranging ELECTRIC
- Saving your work = transferring ELECTRIC to MAGNETIC



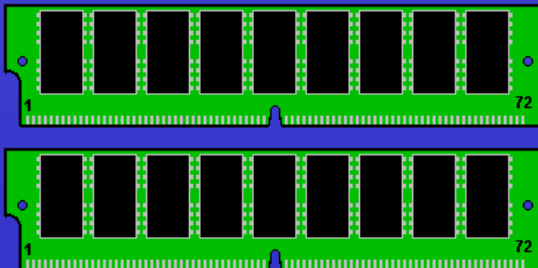
The DANCE: a couple insights

- The typical computer has 1:100
ELECTRIC to MAGNETIC memory ratio

500 GB Hard Drive



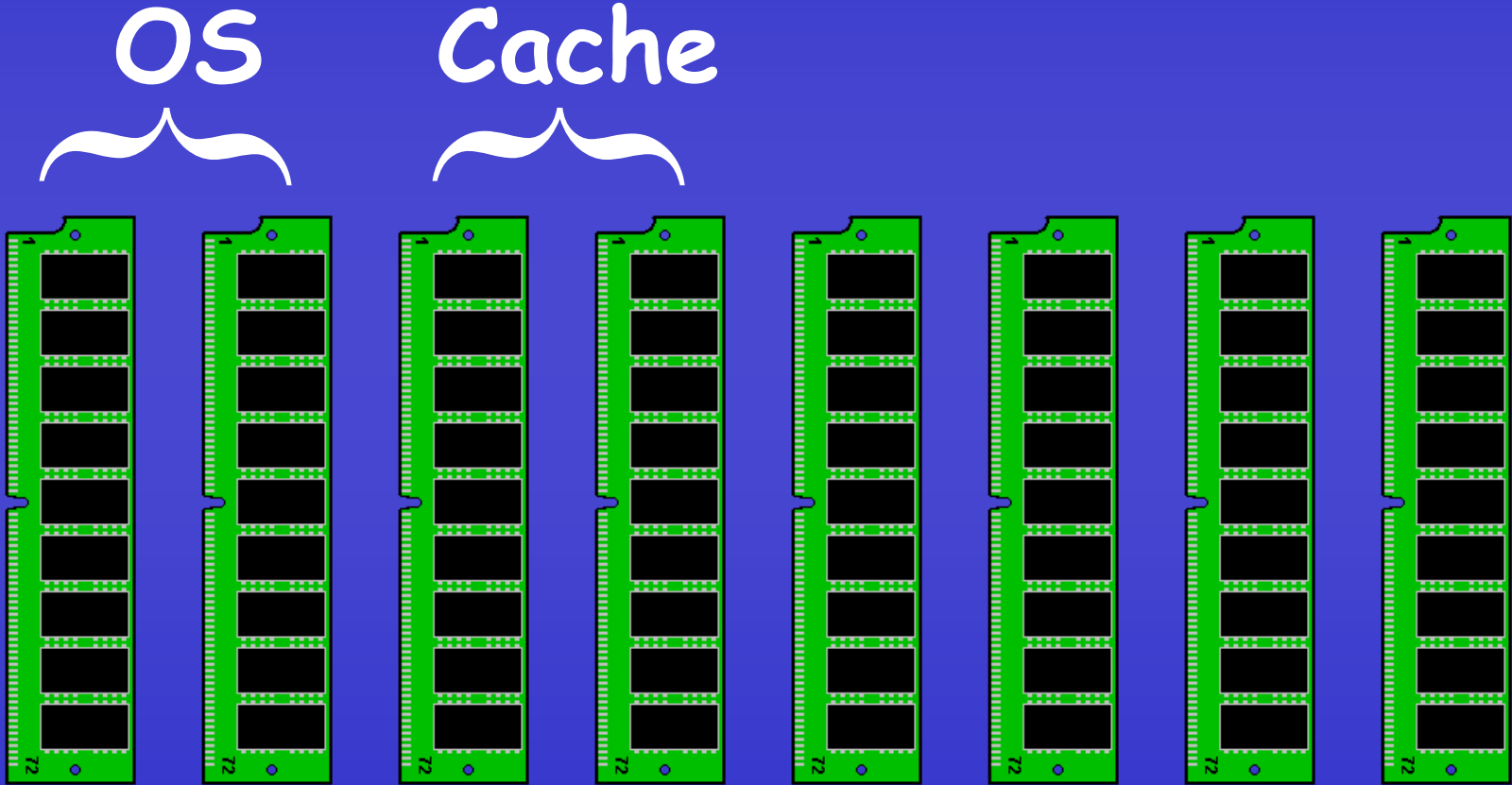
4 GB RAM



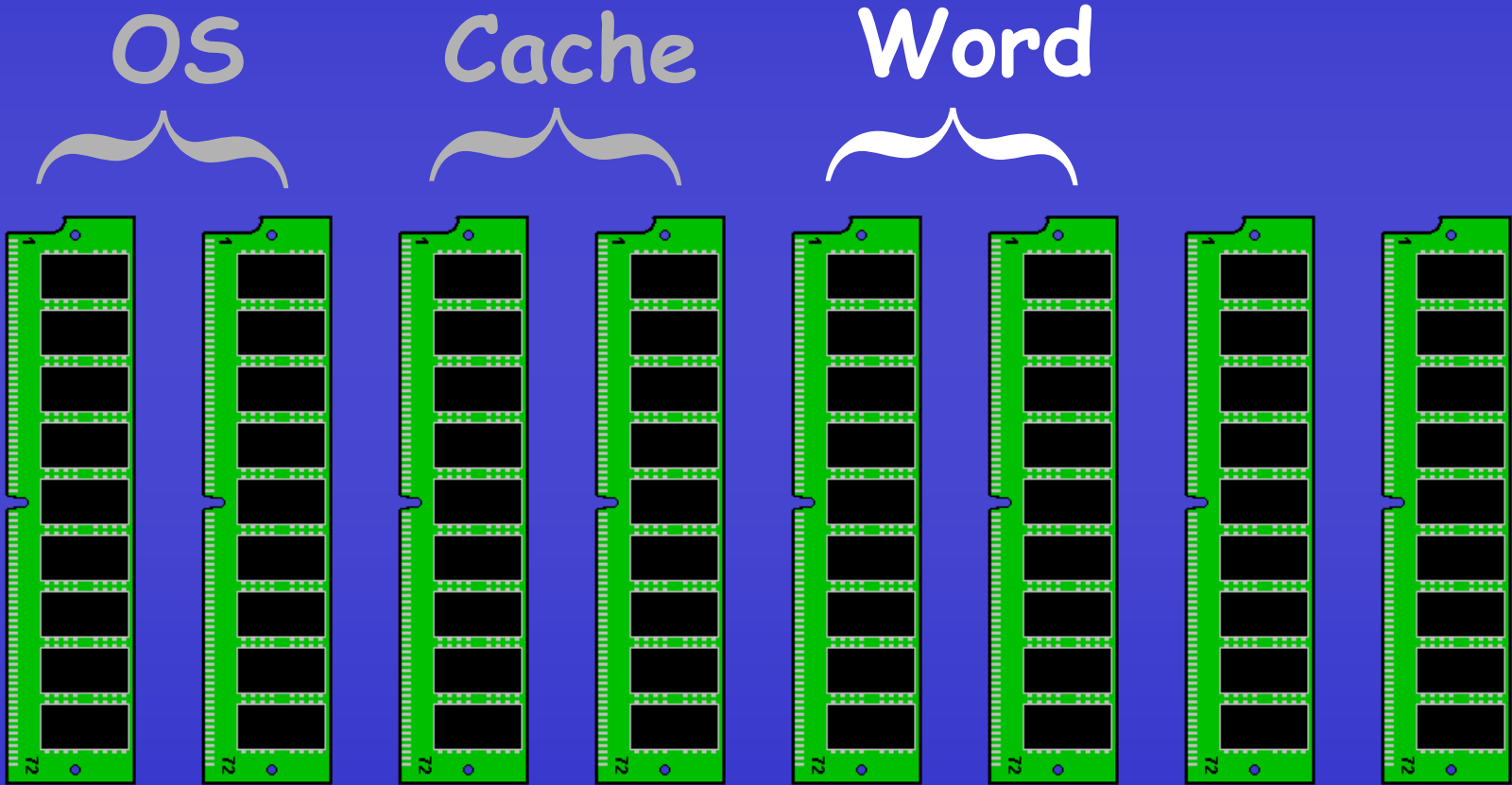
The DANCE: a couple insights

- System conserves precious RAM by selectively loading components of software
- Once RAM limit is reached, system “swaps” ELECTRIC and MAGNETIC memory to allow the use of more software simultaneously

RAM management: loading the OS takes 1GB

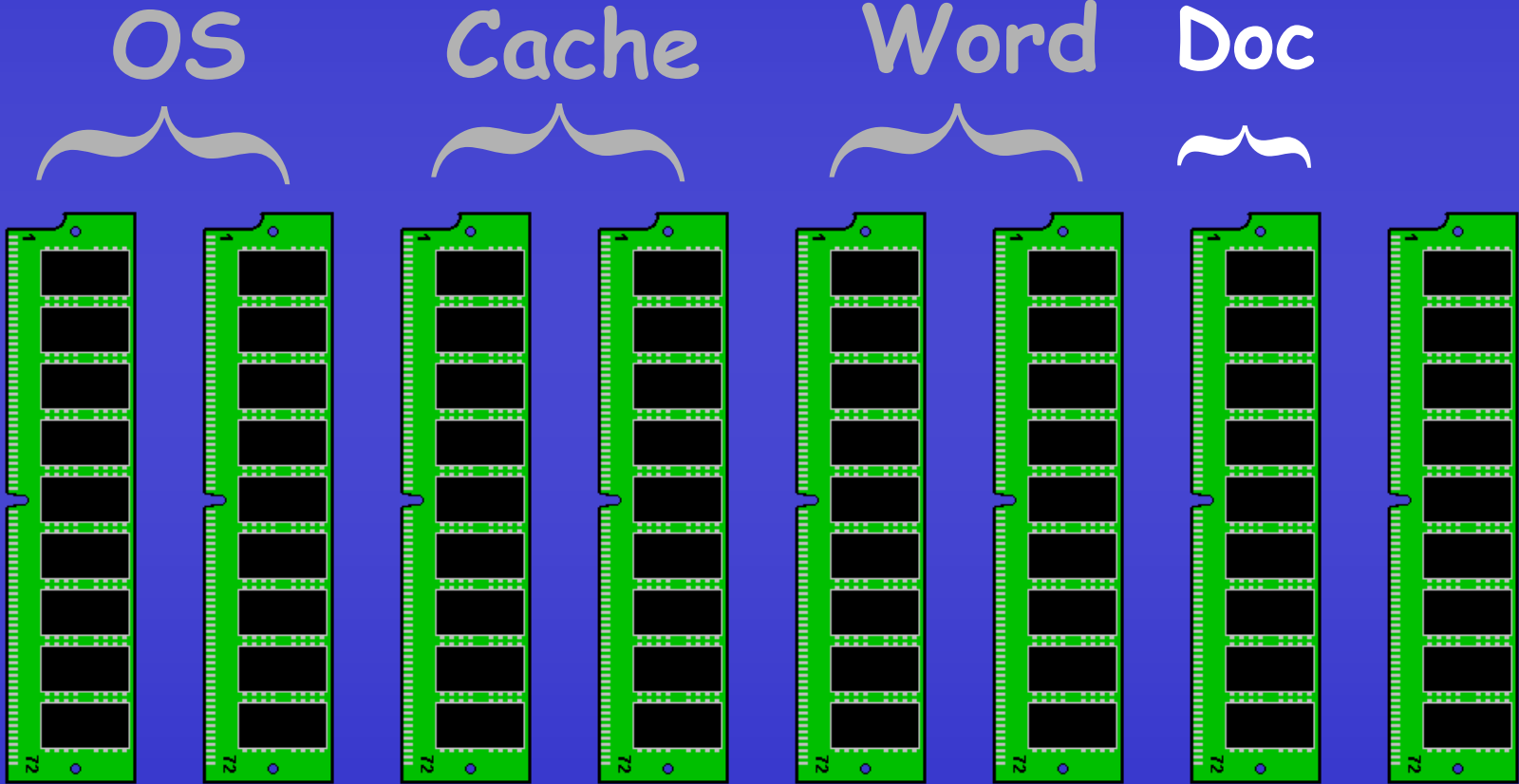


RAM management: opening word processor takes 500MB



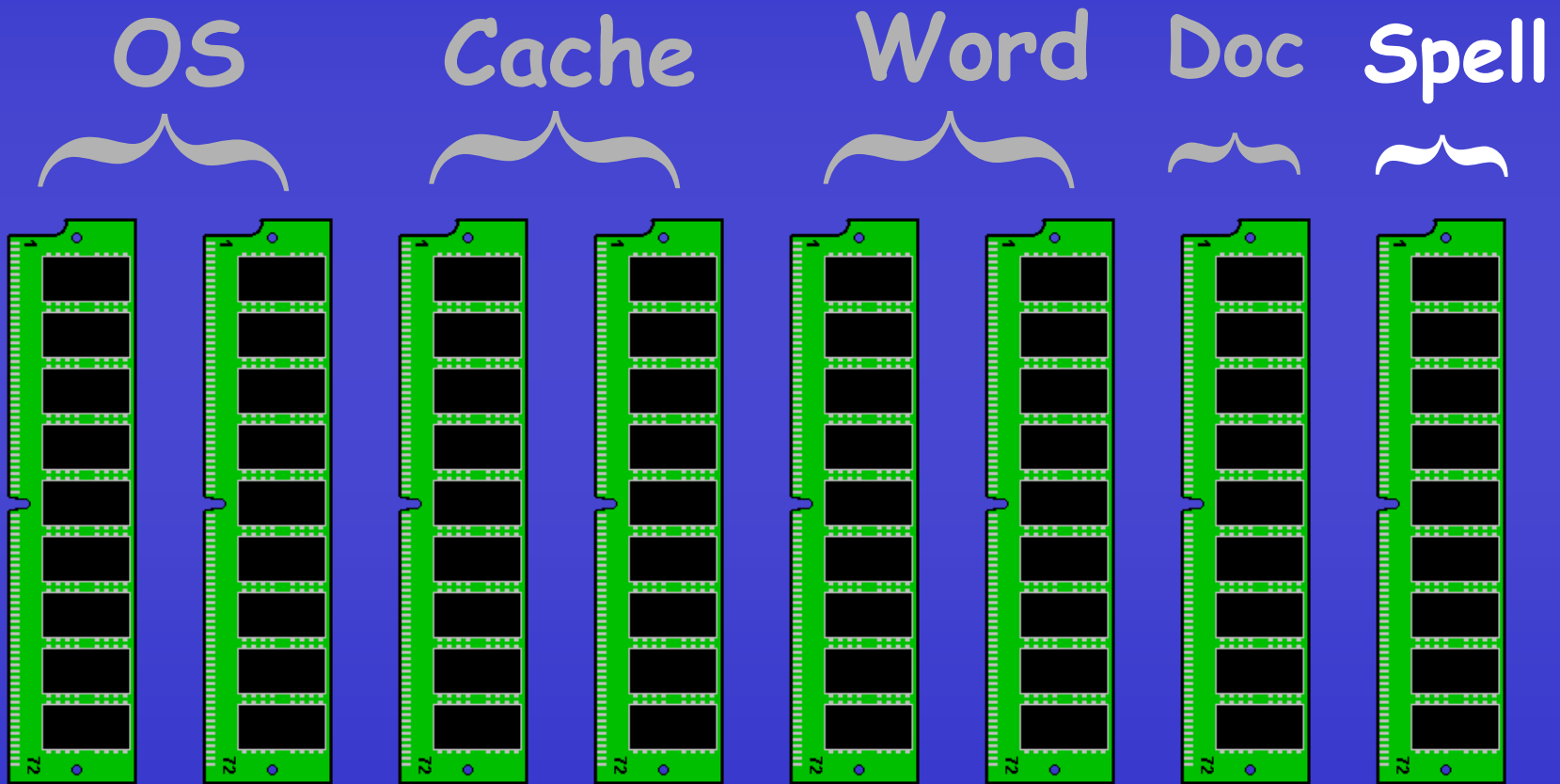
RAM management:

opening document to edit takes 50MB



RAM management:

loading dictionary fills the RAM



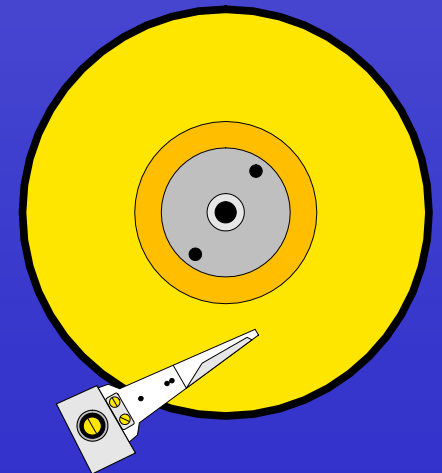
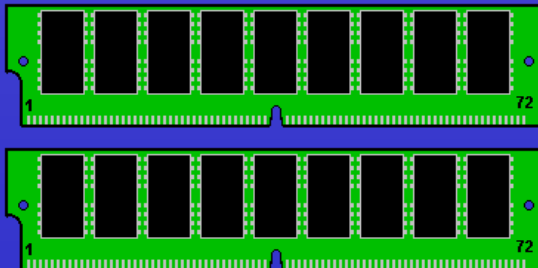
RAM management:

“swapping to the hard disk”

- Allows you to work with more programs simultaneously
- Hard drives much slower; slows your processing
- “Thrashing”: overworking the hard drive when swapping data
- The more RAM, the better performance

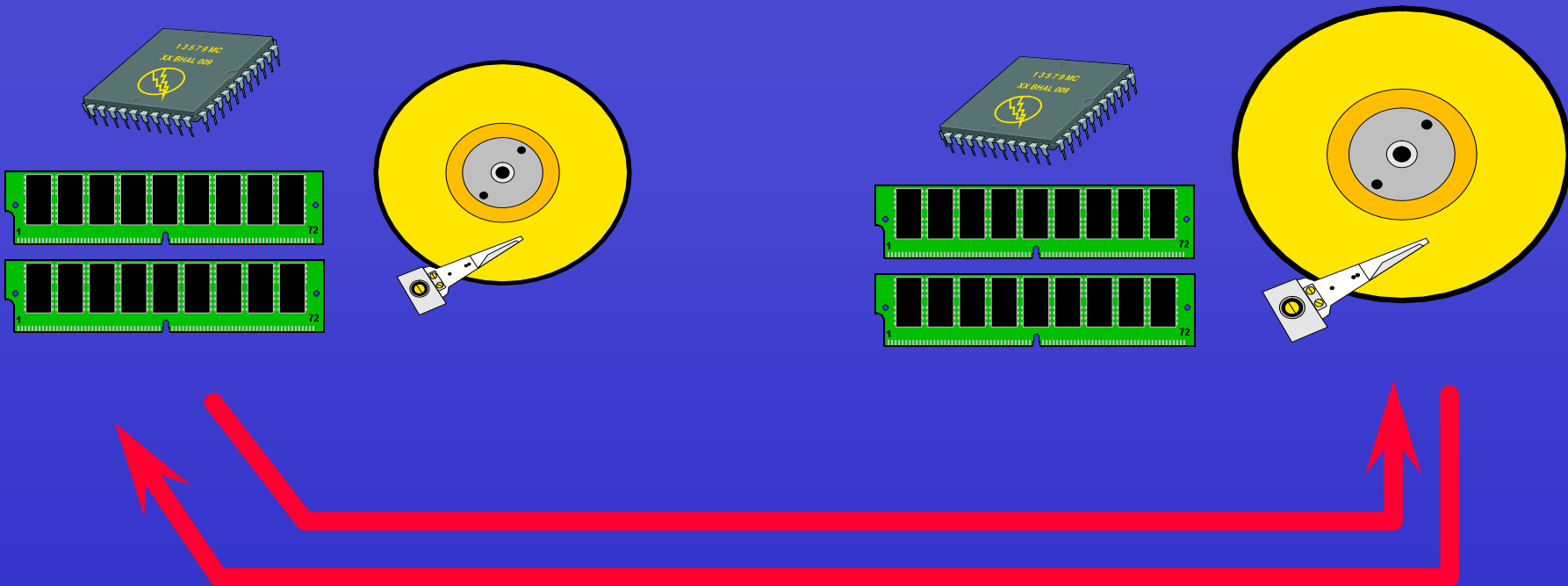
Once again, the DANCE

- Loading software = transferring MAGNETIC to ELECTRIC
- Running software = rearranging ELECTRIC
- Saving your work = transferring ELECTRIC to MAGNETIC



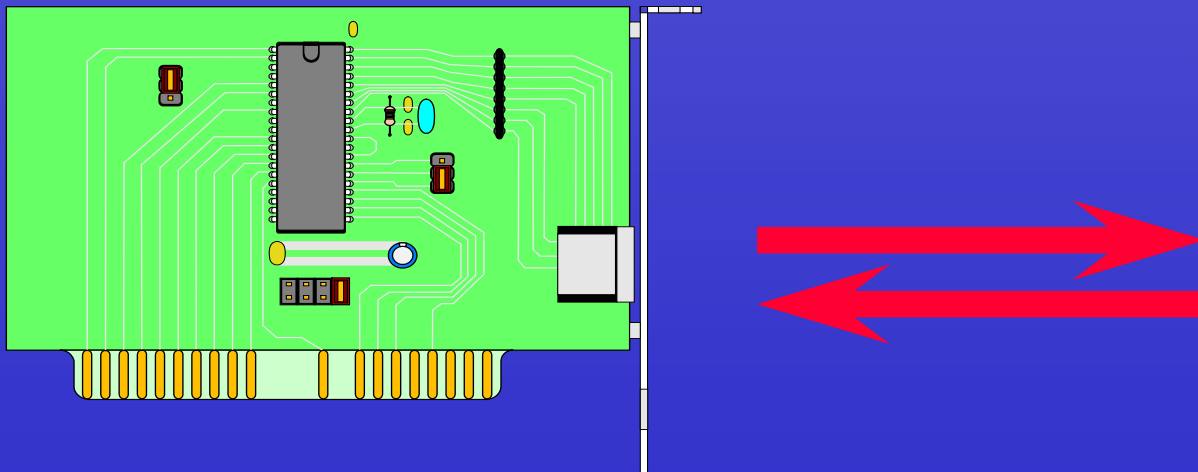
The DANCE on a network

- The same dynamic -- only the MAGNETIC memory is elsewhere



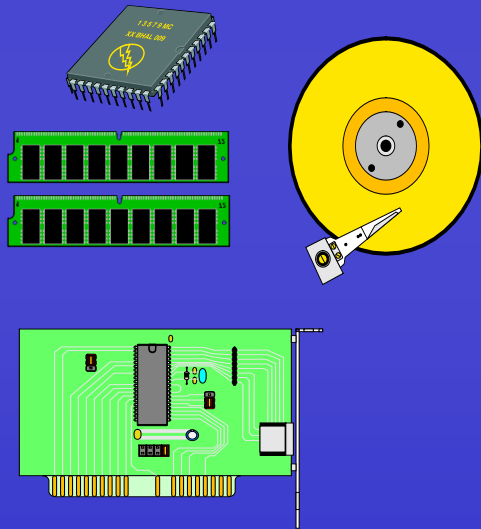
The Network Interface

- Usually built-in
- Provides a way to transmit data across a wire from one computer to another
- “Ethernet” 100mbit or 1,000mbit

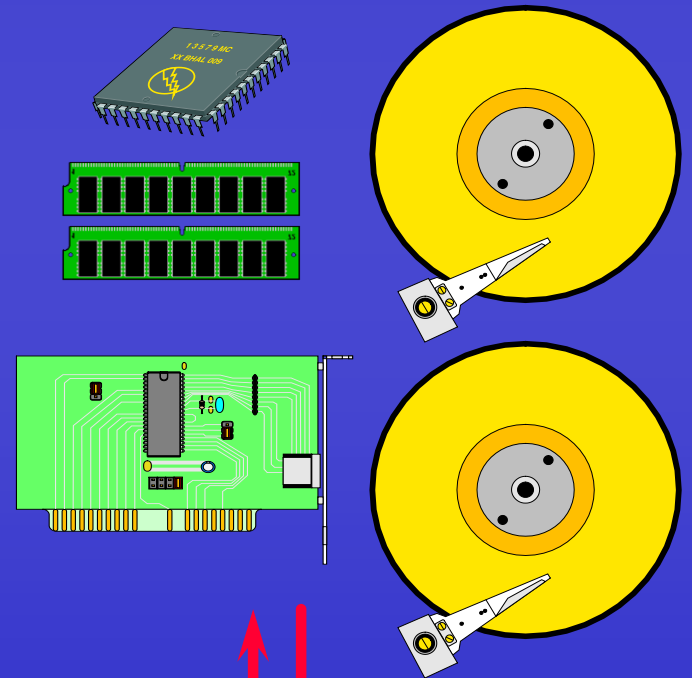


Client/Server Computing

Client



Server



The Client/Server Relationship

- The data from the SERVER's MAGNETIC memory is transferred to the CLIENT's ELECTRIC memory



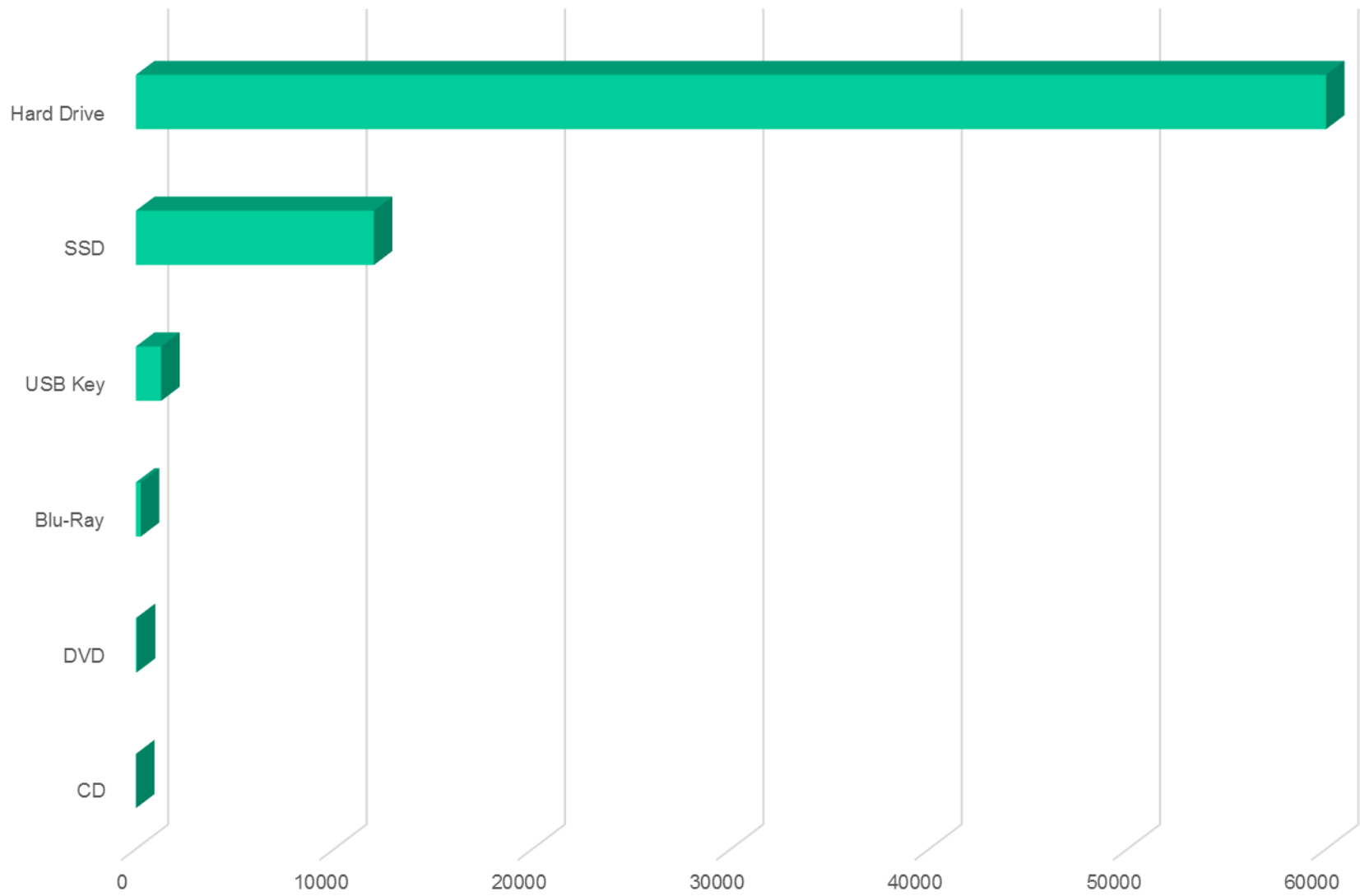
Client Retains Its Functionality

- The CLIENT can load software and data from the SERVER
- The CLIENT still operates with the same PROCESSOR and RAM and does all the “thinking”
- The SERVER’s job is to simply hand out files from its MAGNETIC storage space

Oh, about that “magnetic” thing...

- The bulk of storage remains magnetic
- Optical discs (CDs, DVDs)
- “Flash RAM” non-volatile electronic memory
- Solid State Drives (SSD)
 - SSD 2TB = \$700 (\$350 / TB)
 - Mag 8TB = \$250 (\$35 / TB)

Storage Sizes



The End