CMPSC 100

Computational Expression

You’re already playing a game, but I’m not going to tell you the rules.

Compute it out, wizardfolk.

Now that you’re at the right table, discuss one question that you have about either reading, making sure to identify which you’re referring to.

Computational thinking

- Idea advanced by Jeanette Wing (Carnegie Mellon) in the mid-2000s; has ancestors earlier (~1980)
- Is made up of several ideas, but I settle on two:
  - Decomposition—breaking a problem apart
  - Abstraction—generalizing the “rules” governing a problem
- How did you employ this kind of thinking to solve the game we played at the beginning of class?
  - How did you “decompose” it?
  - How/what did you “abstract?”
- Fun fact: all of the table names are Ubuntu Unix builds.

Computational thinking

> Stating the difficulty of a problem accounts for the underlying power of the machine—the computing device that will run the solution

JEANETTE WING, "COMPUTATIONAL THINKING"

Computational thinking: the Bit Ladder

0 0 0

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_ _ _

_ _ _

_ _ _

_ _ _

1 0 0

- Solve in 7 steps or fewer:
  - Transform the binary “word” “000” >> “100”
  - Changing only 1 bit at a time
  - You may only use a 1 or 0 in any position (no fancy “bases” other than 2)

Computational thinking: the Bit Ladder

0 0 0

0 0 1

0 1 1

0 1 0

1 1 0

1 1 1

1 0 1

1 0 0

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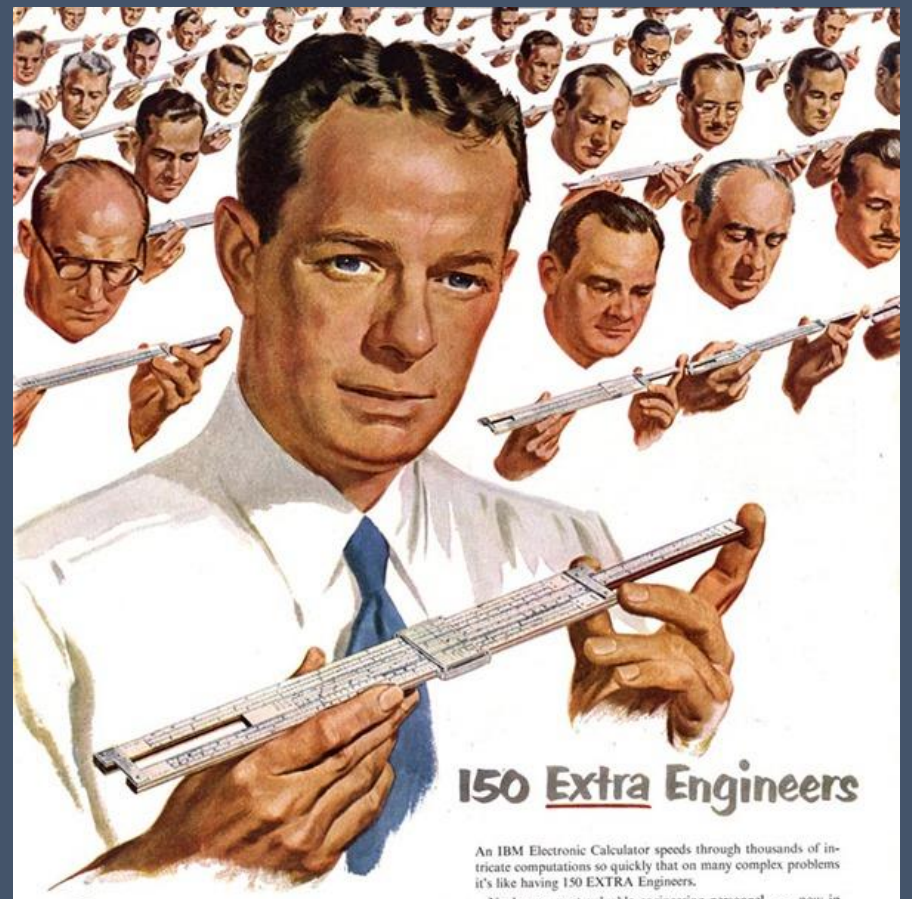

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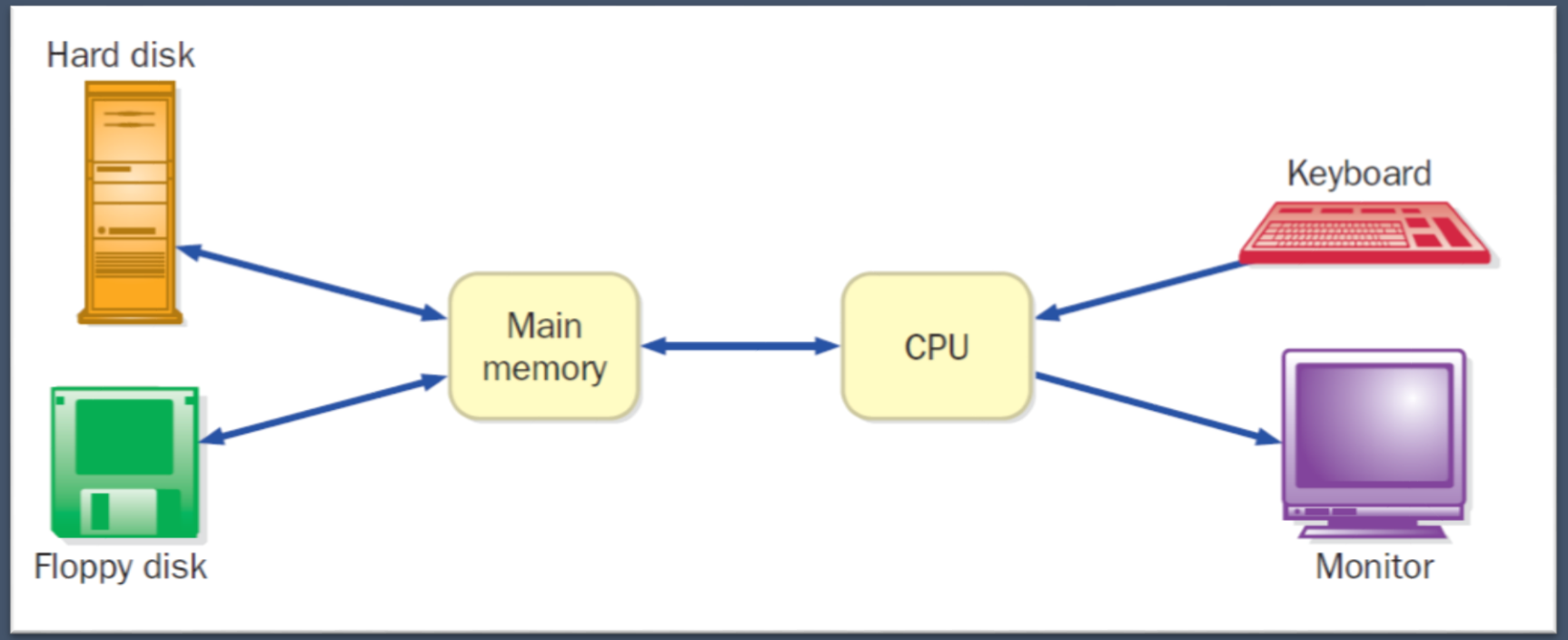
Current computers aren't that different

- The main computer hardware components are still:
  - CPU
  - Main Memory (RAM)
  - Secondary Memory (hard disk drive; solid state drive)
- The main computer software components are still:
  - The operating system
- Peripheral devices, though useful to us humans are, in most cases, for our convenience.

Current computers aren't that different

- Much like systems 60+ years ago, we still measure memory using:
  - Metric prefixes like kilo-,mega-,giga- (we've really only crept up the scale over time)
  - Base 2 (binary) number systems as basis for representing information
  - Digital vs. analog representation

But what does this have to do with us?



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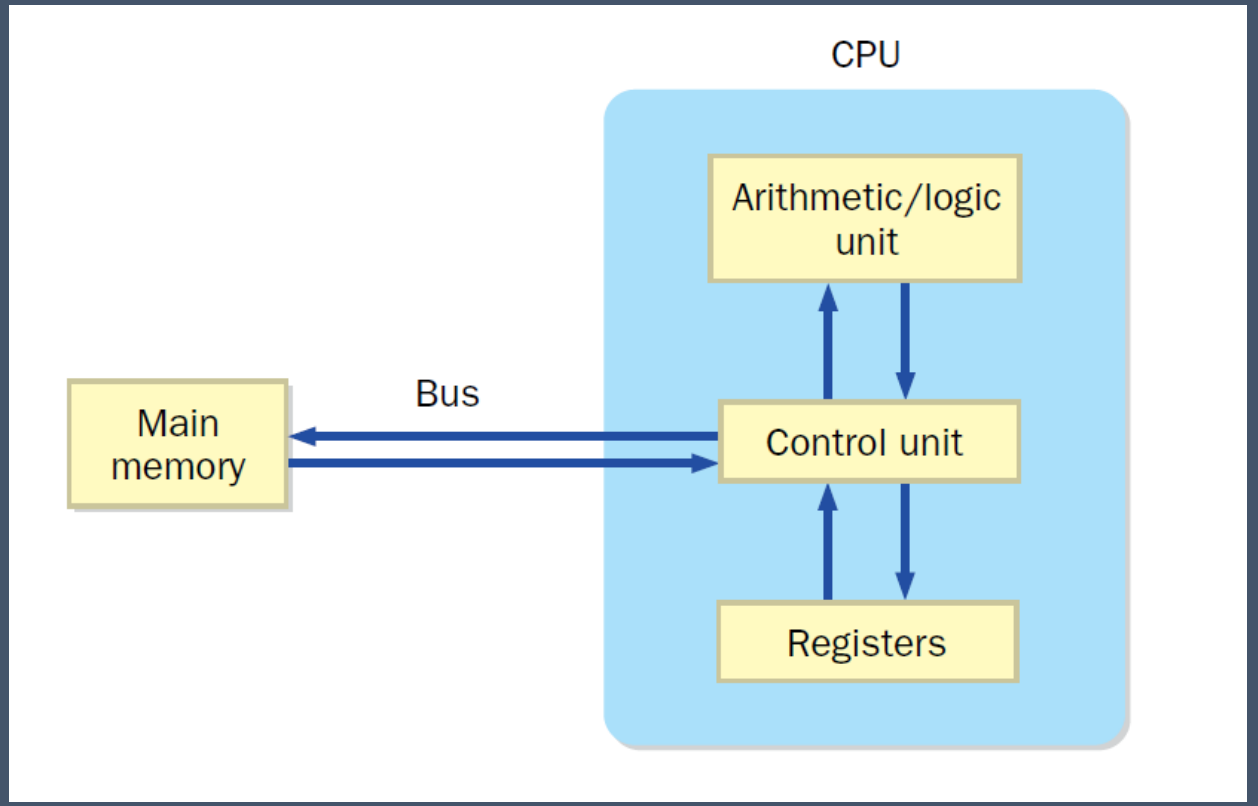

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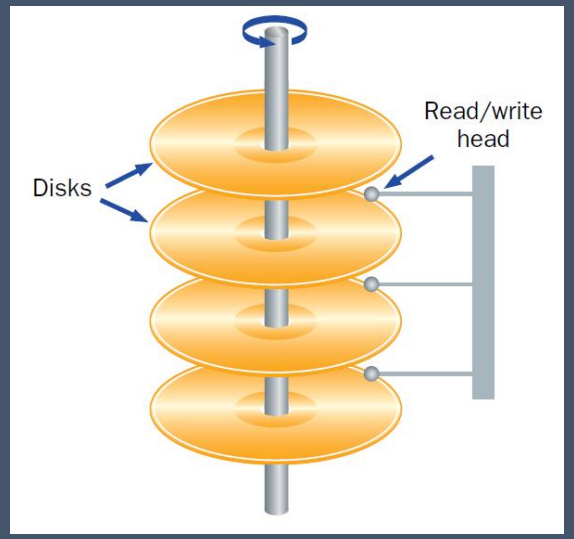

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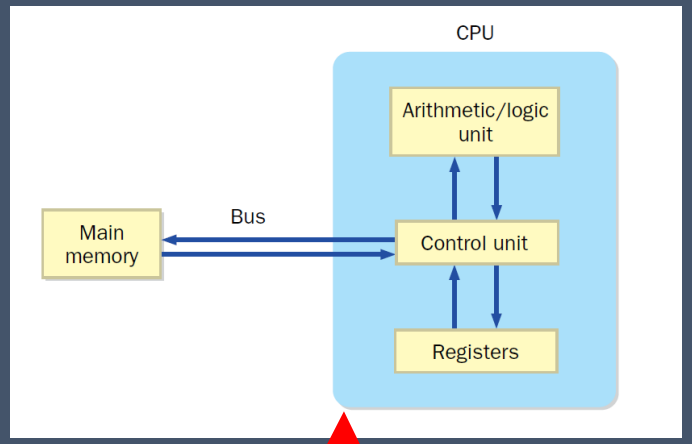

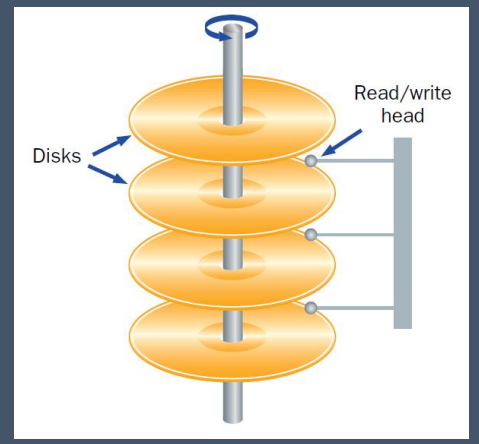

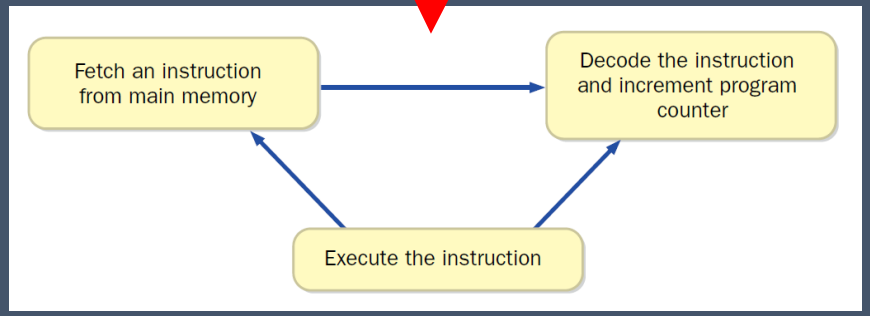

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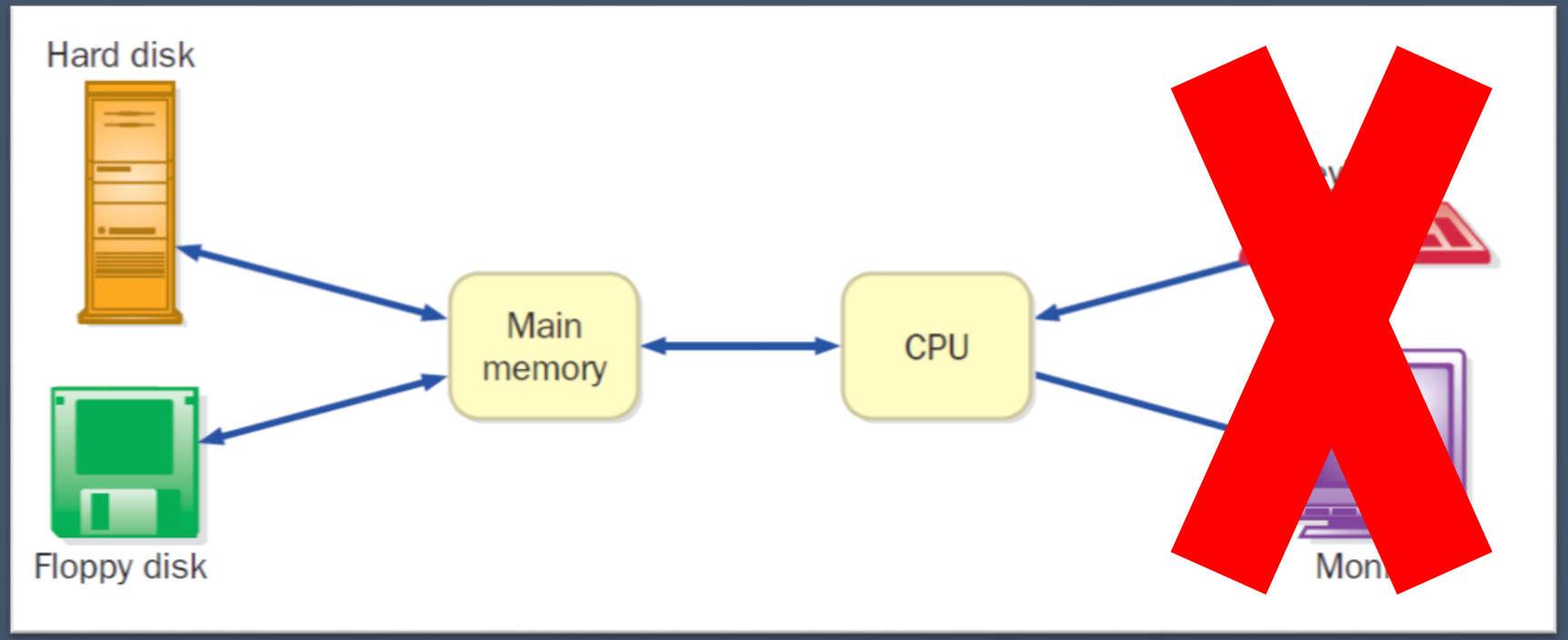

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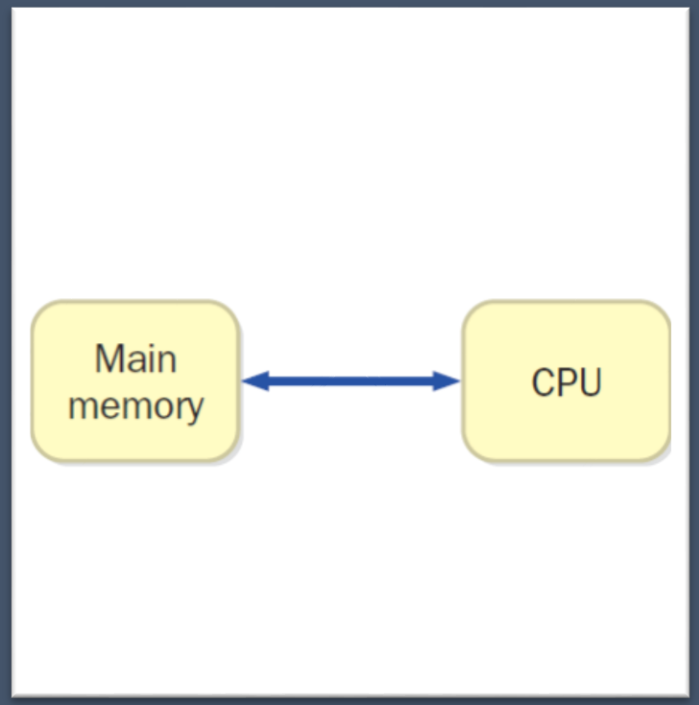

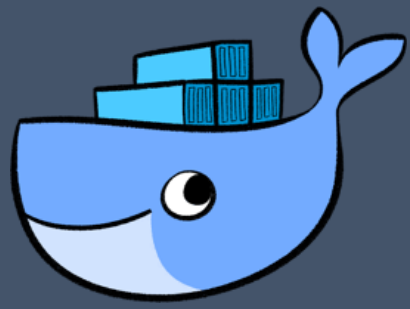

So what is a “container?”

> A container is a standard unit of software that packages up code and all its dependencies so the application run quickly and reliably from one computing environment to another.
>
> DOCKER WEBSITE

So what is a “container” really?

- In this course, take container to mean:

An operating system image:

- built from a Dockerfile that is
- based a “base” image stuffed with extra software so
- when run (“containerized”) dumps into main memory &
- ensures that everyone’s software runs the same way everywhere independent of personal system config.

Tangent: what is an “image?”

Unfortunately not this.

Tangent: what is an “image?”

- A snapshot of a computers “file systems” at a given point in time.
- You can have:
  - A Unix image
  - A Windows image
  - A Mac image
- We can even take snapshots of personal machines, and install them elsewhere!

So what is a “container” really?

Dockerfile > Image > Container

But, sometimes…

Base image > Dockerfile > Image > Container

I have 01100011 problems, “containers” are 01

“dumps into main memory”: Or, a Problem or Not?