LIS-3353

Hardware

The software has to run on something...

(remember big rules)

1. Math
2. Instructions

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Let's tighten up our definition of computer a bit:

It needs the ability to have **changeable** instruction sets.

1) Someone (the creator) applied instructions at the beginning, (this is pretty much anything electronic and not the important part.

2) Someone can CHANGE the instructions on it, NOW, after you acquired it.

Broad definition: Computer, by parts

- Input
- Processor
- Output

Slightly Less Basic

INPUT

PROCESSOR

STORAGE

OUTPUT

(power)

(“gluing it all together”)

PROCESSOR (CPU)

Brains of the operation. “Does” the things.

(GPU's are quite similar; just slightly more optimized to make pretty pictures and animations...

and increasingly, other stuff.e.g bitcoin mining, scientific calculations)

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Bitcoin farm

Power

Lately, not a lot. At all.

Even old computers - generally less than a lamp.

- ..touch it. :)

STORAGE

- Permanent (REALLY BASIC)
- Semi-Permanent (Firmware/ROM/Bios)
- Changeable
    - Short-Term (RAM)
    - Long-Term (All them “drives”)

PERMANENT

- The “Board.” That's about it.

- Reliance on this layer is increasingly rare, for obvious reasons.

(ROM used to mean this, now it usually means the next thing...)

Semi-Permanent Storage (Firmware)

- Much of what you think of as “permanent” is more likely “firmware”

  That is, technically changeable, but you don't do it a whole lot, only when you want to make deep, fundamental changes/updates to how the hardware operates.
- BIOS
- ROMS
- Devices (routers, cameras, dj equipment, etc)

“Changeable” storage
(another badly named thing in computing)

So, you're in the library using books to work on a paper like it's ancient history or something...

RAM

RAM

(when people say “memory”)

- what you're working on **now**

- **(short term memory)**

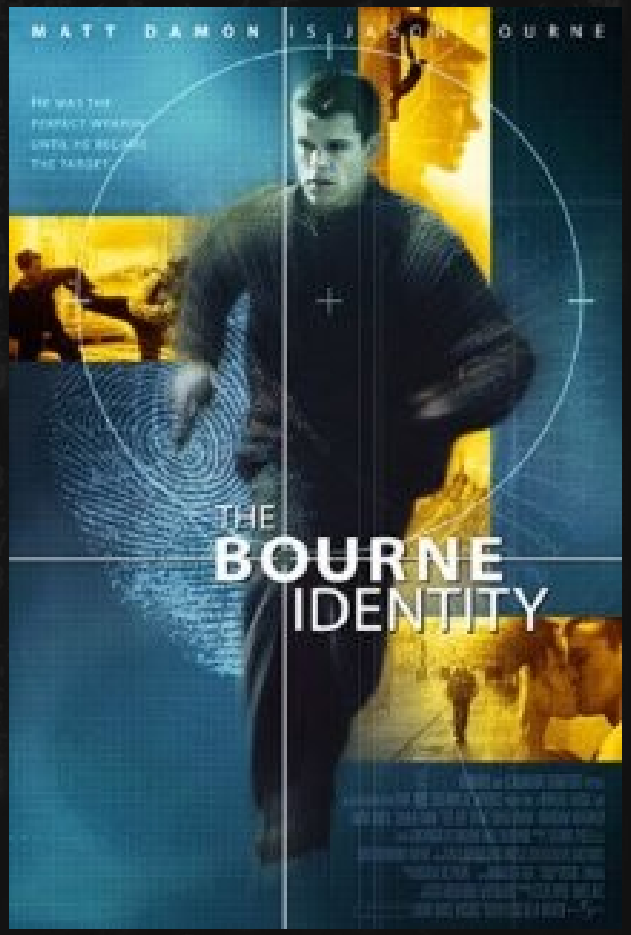
DRIVES (hard, solid-state, CD, etc.)

All (usually local) information that you can get to.

- (long term memory)

I won’t be putting movies on the quiz, but...

Hard drive was accidentally `rm -rf`-ed, he's trying to recover it. His RAM is fine.



All data was preserved, but his hard drive is now read only. Also, has minimal RAM.

“Drives”

Old school

* Floppies
* CD-ROM, DVD-ROM (blu-ray ROM?)

Today

* Hard Drives – IDE v. SATA (or external USB)
* USB thumb
* SD/microSD
* SSD's (the future! Possibly identical to RAM, soon)

“Spinny circle thing and a pointy thing”

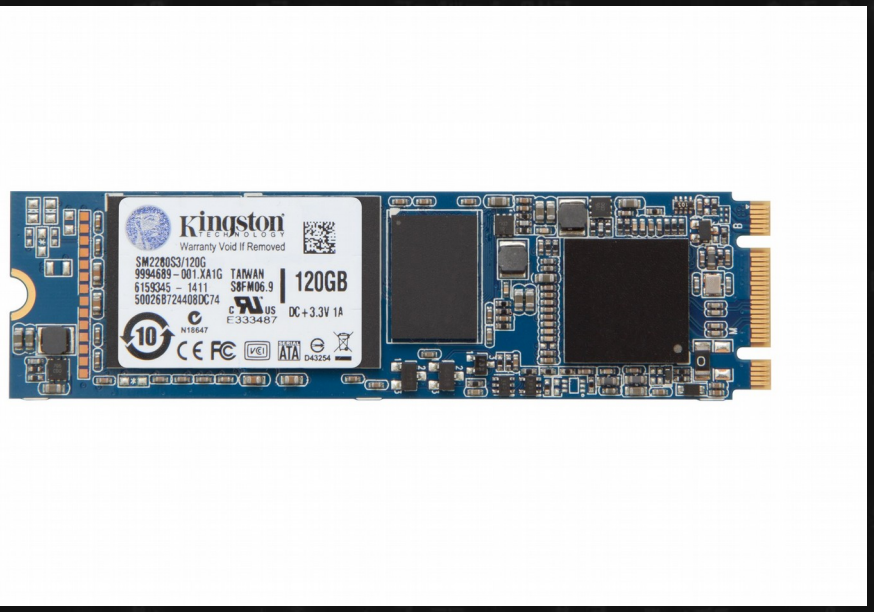
Vinyl Records, Floppies, Laserdiscs.

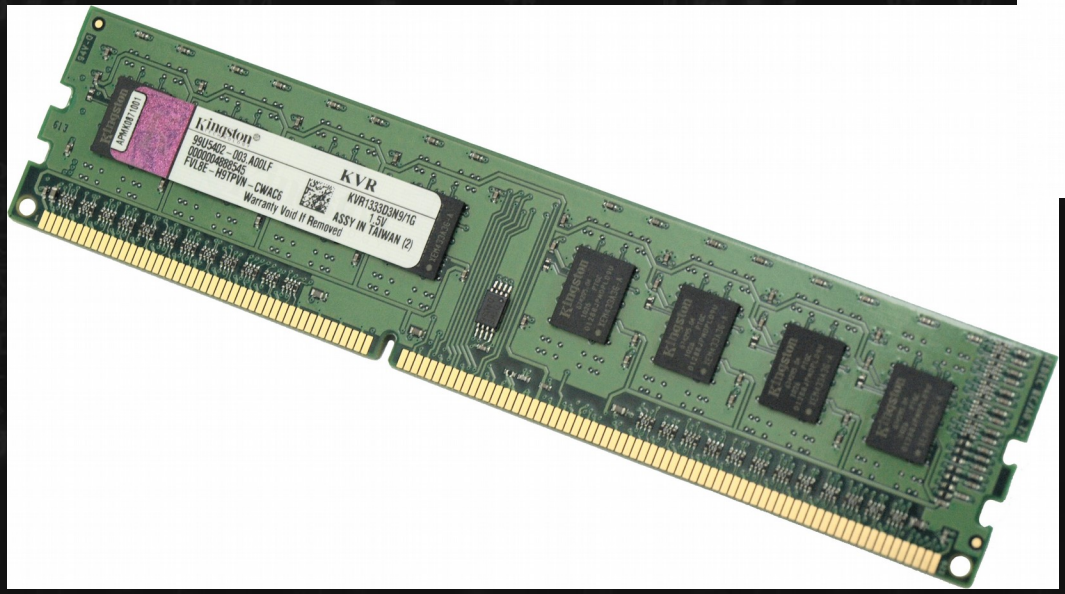
* CD-ROM, DVD-ROM (blu-ray ROM?)

* Hard Drives – IDE v. SATA (or external USB)

Any “disc,” really….

To further confuse the issue:
SSD's





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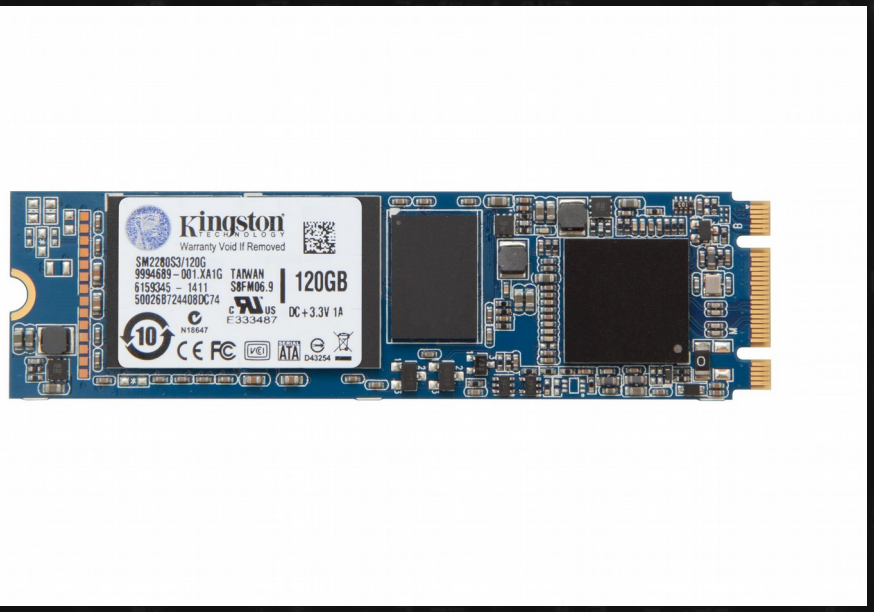
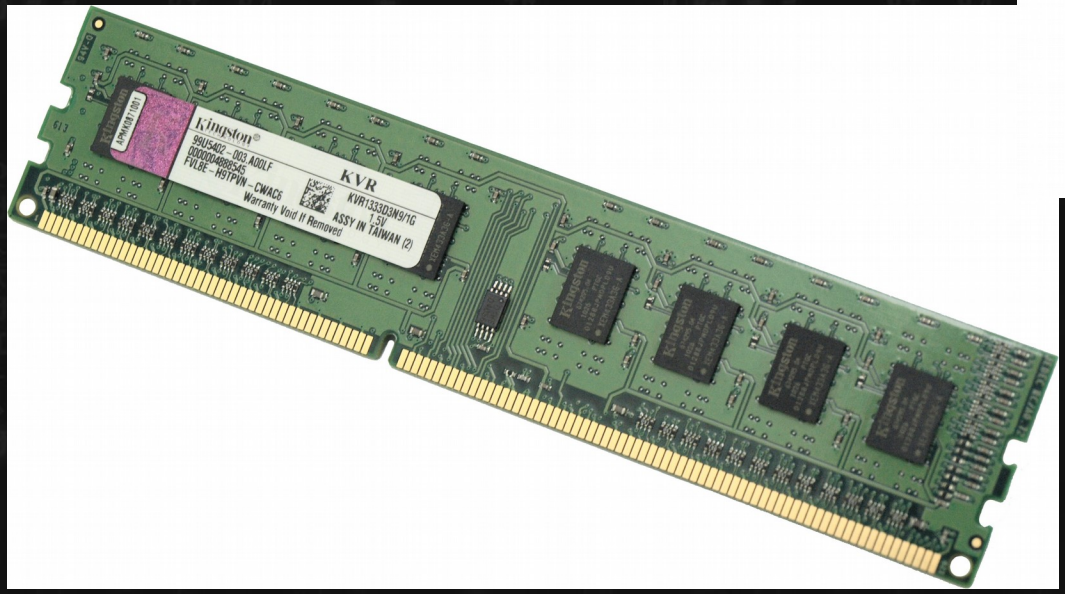




INPUT - OUTPUT

Human Input

Human Output

Digital Input

Digital Output

(Increasing trend towards “digital until the very last possible second… consider why?”)

Human Input (analog)

Keyboard

- Touchscreen
- Webcam
- Microphone
- Motion-Sensor
- Mouses/Buttons/Sticks
- Thermometers?

(and other “Internet of things” stuff”

Human Output (analog)

- Screen*
- Speakers*/Headphones*
- Paper

- “Internet of things” stuff here too? Oculus Rift, Drones, lights/temp in your house, etc.

*but what are the “wires” lately? More to come

Digital Input/Output

- General purpose:

  Old-school – *Serial* and *Parallel*

  New hotness: *Universal Serial Bus! (USB)*

  Input, output, charging, various sizes

  (oh, and also whatever Apple's things are that should probably just be USB - Europe's cell phone chargers are, by law, ALL Micro USB....discuss)

Digital Input/Output

Internet Data Oriented:

Phone line

Ethernet (wire)

Wireless (802.11 and bluetooth)

Digital/Analog Stuff

Generally, the wires going to the outputs are moving from analog to digital.

Advantage: Signal Quality.
(Monster Cables are definitely a ripoff here)

Disadvantage: Sometimes, reduced interoperability, opportunity for DRM.

Audio

Analog: “RCA” – usually the “1/8” in jack, sometimes 1/4
(arguably the best standard ever created, stop being suckers)

Digital: Bluetooth, USB, occasionally Ethernet and others

Video

ANALOG

TV Video: Cable cord, but lately the RCA A/V (Red / White / Yellow)

(also, occasionally “composite,” RGB)

Computer Video: VGA

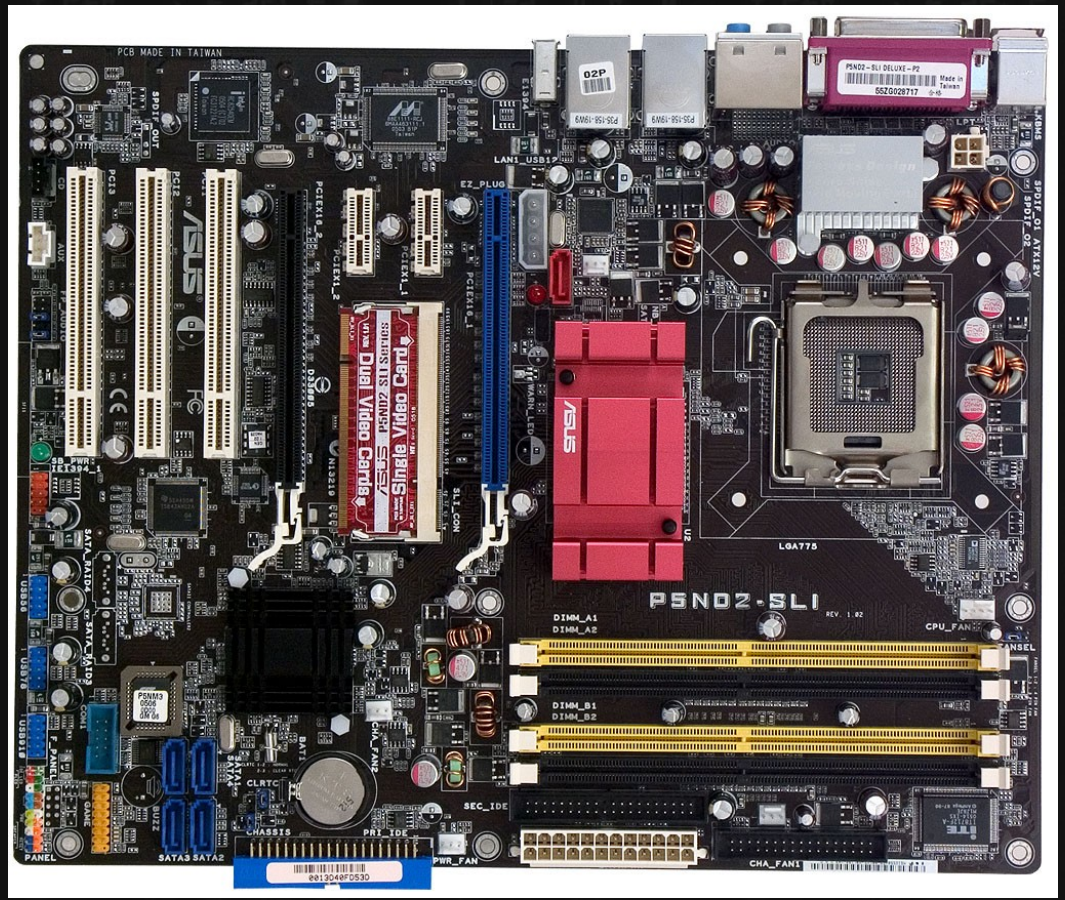
DIGITAL:

DVI

HDMI

“glue”

Motherboards. Where it all comes together.



Ridiculous computing factoids

- The Apollo Computer = Original NES
- Your cell phone > All of NASA, 1969
- A singing birthday card > computing power than all the combined Allied forces in 1945

MOORES LAW

Raw computing power is extremely CHEAP and PLENTIFUL for most real-world applications:

Moore's Law just got weird:

OLD SCHOOL – computers are expensive, so only build in functionality you need.

TODAY – computers are basically free, so $@^$ it. Throw the cheapest one in right NOW!!! FIRST TO MARKET WOO

We know about these:

Macs

Dells

What about these?

- Nintendo
- Xbox
- Router
- mp3 player
- ipad
- ...

Oven...


4:25 pm
dacor
The Life of the Kitchen
Discovery
iQ
dacor
The Life of the Kitchen
Discovery
AMERICAN MADE
FAMILY OWNED
dacor
engadget

- Here comes a rant....

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HOPEFULLY, YOU?

Or someone that ACTUALLY CARES about you?

Or someone who can be relied on to do the right thing for you, maybe because you pay them, or they are required to by law?

(please feel free to freak out at the fact that it's increasingly none of the above)

What is a computer?

What if it's made of "general purpose computer" parts...

...but then, someone thinks that you
(or someone you trust)
(or someone you pay)
(or even some paid public servant or figure)

shouldn't be able to write your own instructions for it?

- If you have to manually root, jailbreak, unlock, or letterbomb it to make it do **exactly** what you want (or even worse, if you **can't**) maybe it shouldn't be considered a computer.

  Perhaps, an appliance.

- Don't get me started on the idea that a private company (as opposed to public law) can dictate what I do with legally obtained data or software...

...also, environmental impact

Imagine:

“I’m sorry, this is a ‘chair’ hammer. You cannot build tables with it. This violates the warranty. Also, it is strongly suggested that you don’t tell other people how to build tables with it; and we will delete that discussion from the internet. Also, you talk to much about it, we may try to have you arrested”

So what?

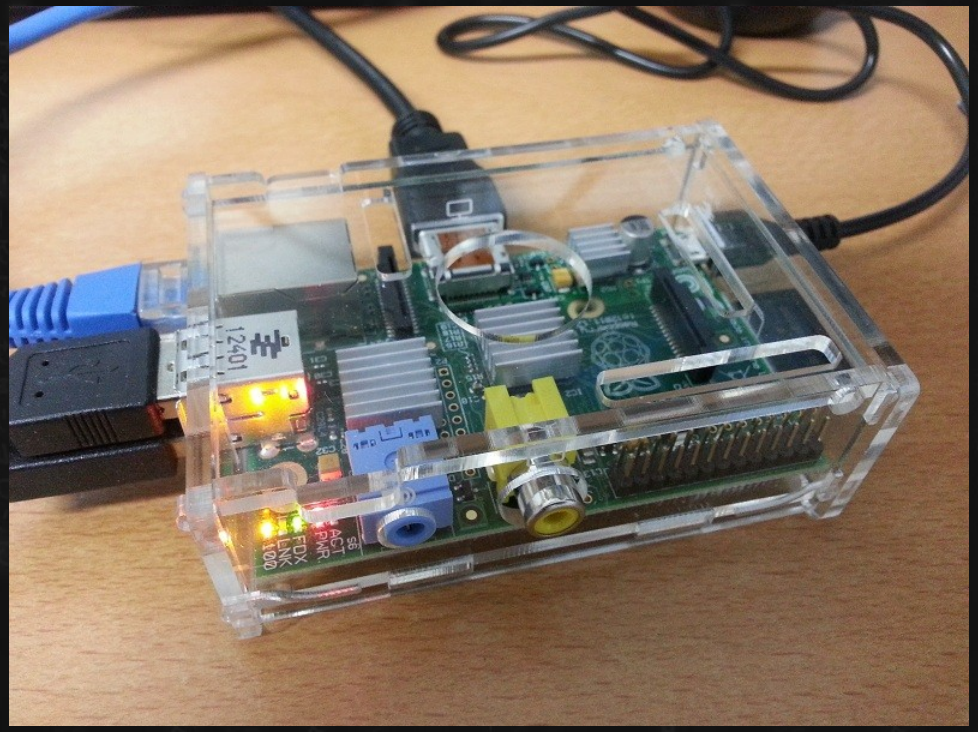
The bad:

- Companies will pretend that “hardware” and “software” can’t be separated to jack up prices (i.e. non-changeable instructions) Lookin’ at you, APPLE (eh, google too, but not as bad)

- IoT (and most general) cybersecurity is garbage, because you throw an ultracheap, untested computer in your toaster and rush to market, and now your toaster is attacking your family.

So what?

The good news: This means we can all buy cheap computers to play and learn with.



Current idea for final project :)

The cloud doesn't exist, so.....

Do a "cloud" thing not in the "cloud," and teach other people to do it too.

Thursday will be step 1...