CSC104 winter 2013

Why and how of computing

week 8

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Text: Picturing Programs

Outline

Modern hardware architecture

operators and operating systems

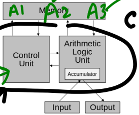
Notes

what Von Neumann looks like

bottleneck

0100 0101 P 1001

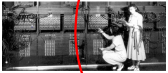
CPU



bus connects ALU/control to memory (RAM) and I/O keyboard, monitor, storage, etc.

32 wires
64 wires.

data stored separately



IR
PC
R1, R2,
R3

1. LOAD A1 R1
2. LOAD A2 R2
3. ADD R1 R2 R3
4. STORE R3 A3
5. HALT

P

PC 5

IR HALT

R1 0100

R2 0101

R3 1001

Fetch
Decode
Execute

(define A3 (+ A1 A2))

where Von Neuman's going

There are some issues

to close.

FP

- Von Neumann bottleneck — increasing memory speed, CPU speed, all communicate through same.

wavelength of light too close to space between wires!

- mortality of Moore's Law

empirically, size computer memory halves ≈ 18 months, and speed increases proportionately.

limit to miniaturization

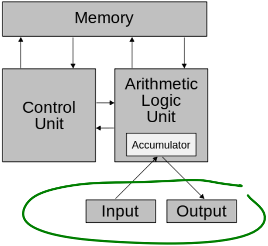
→ heat dissipation

→ resolution of circuit diagrams photographically

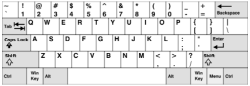
input, output

for geezers

computer waits for input.. user waits for output.



much larger than smart phone



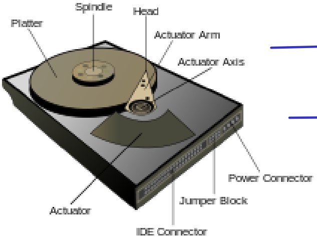
lots of real estate
to get ideas in, out
doesn't fit in pocket

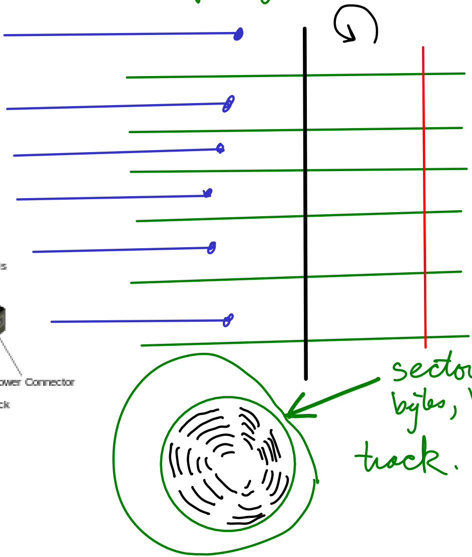
storage

hard drive

when power's off, your info is here.

MTBF ~ 5 years.





cylinder

sectors ~ 102K (
bytes, byte ~ 8 bits

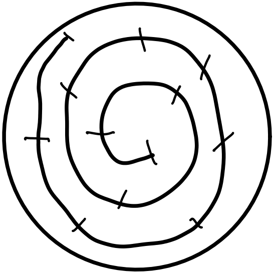
track.

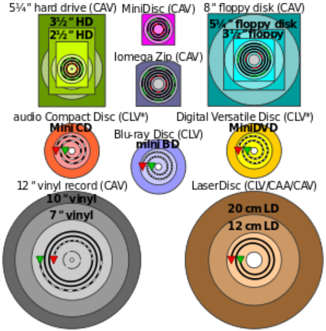
storage

compact disc

laser lights create "pits" in inner CD surface, later read pattern of pits back.

sector, eg 1024 bytes



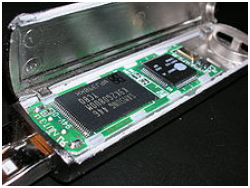


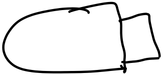
storage

flash drive

stores electrons in silicon dioxide chambers

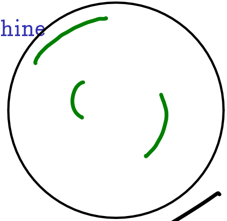
- persists when power is removed
- no macroscopic moving parts.





bits, files, buffers

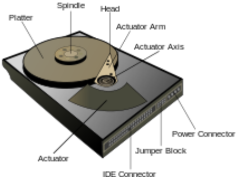
protect us from the machine



computer (OS) reads all info from

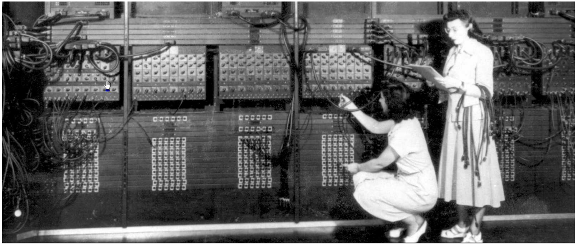
our creation

into main memory & presents it as a single "place"

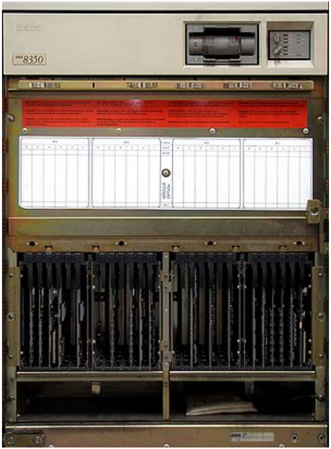


machines take over in batches

Machines began to take over setting the program counter to a new job, collecting the output, fetching memory. . . but it was still one job at a time.

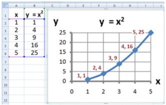


time sharing, version 0.1

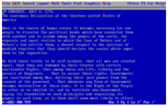


one user, one program, one computer

task-switching to time-splitting, v 1.0



	A	B
1	x	$y = x^2$
2	1	1
3	2	4
4	3	9
5	4	16
6	5	25



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IN CONGRESS, JULY 4, 1776
The unanimous Declaration of the thirteen united States of
America

When in the Course of human events it becomes necessary for one
people to dissolve the political bands which have connected them
with another and to assume among the powers of the earth, the
separate and equal station to which the Laws of Nature and of
Nature's God entitle them, a decent respect to the opinions of
mankind requires that they should declare the causes which impel
them to the separation.

We hold these truths to be self-evident, that all men are created
equal, that they are endowed by their Creator with certain
unalienable Rights, that among these are Life, Liberty and the
pursuit of Happiness. - That to secure these rights, Governments
are instituted among Men, deriving their just powers from the
consent of the governed, - That whenever any Form of Government
becomes destructive of these ends, it is the Right of the People
to alter or to abolish it, and to institute new Government,
laying its foundation on such principles and organizing its
powers in such form, as to them shall seem most likely to effect
A:\DEC-IND.TXT                                Doc 1 Pg 1 Ln 1" Pos 1"
```

Does one task stop, or only appear to stop, for the other?

unix (mostly) to the desktop

GUIs, time-sharing, networking, flame-wars

an operating system should have

- kernel (shell, shielded access to hardware, referee sharing)
- utilities

Notes