College of Information Studies

University of Maryland Hornbake Library Building College Park, MD 20742-4345

Computers

Session 1

INST 346

Agenda

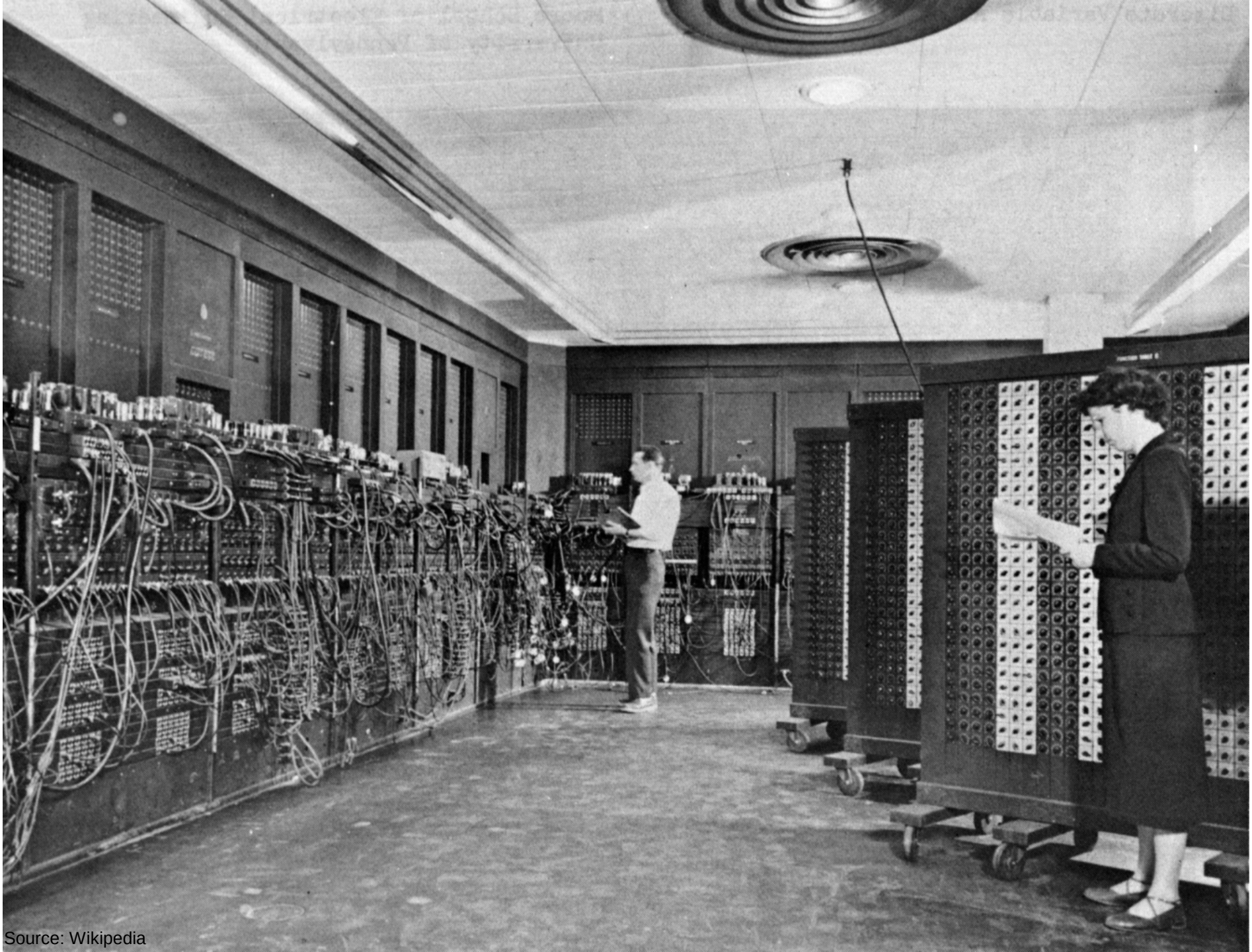
- The Computer
- The Course

A COMPUTER WANTED.

WASHINGTON, May 1.—A civil service examination will be held May 18 in Washington, and, if necessary, in other cities, to secure eligibles for the position of computer in the Nautical Almanac Office, where two vacancies exist—one at $1,000, the other at $1,400..

The examination will include the subjects of algebra, geometry, trigonometry, and astronomy. Application blanks may be obtained of the United States Civil Service Commission.

The New York Times
Published: May 2, 1892



Source: Wikipedia

Source: Wikipedia

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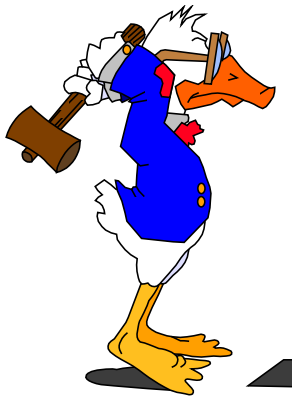
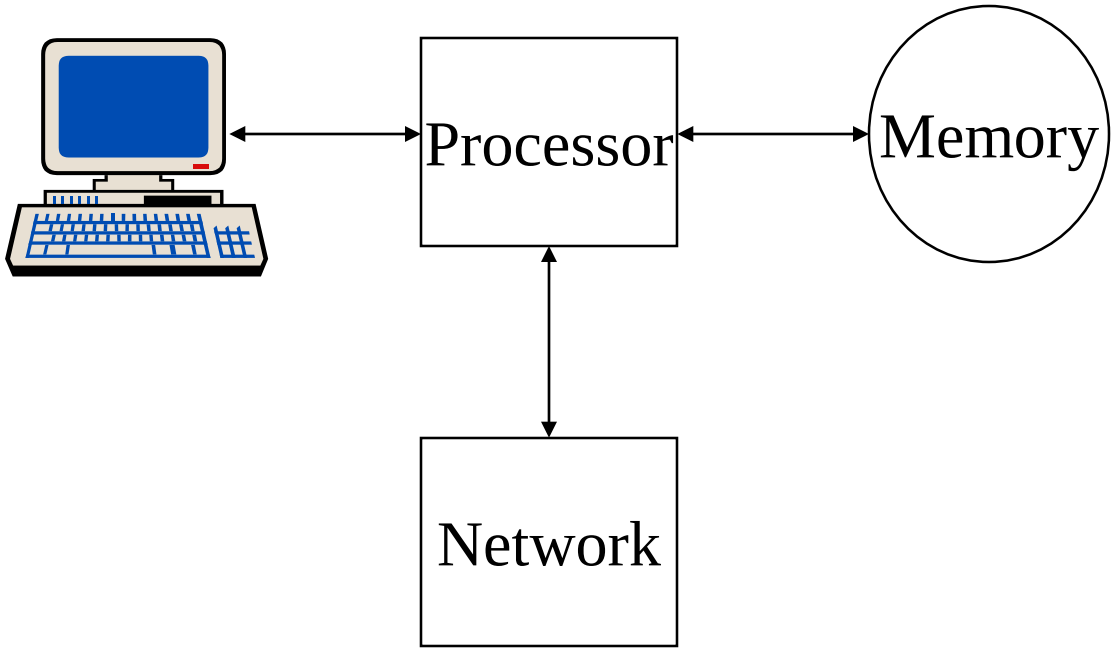
Source: Wikipedia

The Big Picture





Hardware Processing Cycle

- Input comes from somewhere
  - Keyboard, mouse, microphone, camera, …
- The system does something with it
  - Processor, memory, software, network, …
- Output goes somewhere
  - Monitor, speaker, robot controls, …


Core™ 2 Quad Q9300, LGA775 Pkg
2.50 GHz, 6MB L2 Cache Total, 1333 MHz FSB, 45nm
Requires electrically compatible board - PCG 05A
PROD. CODE: BX80580Q9300
S-SPEC: SLAWE
MM #: 897360
EAN 5 032037 008426
FPO/BATCH #: L802A904
UPC 7 35858 19975 9
VERSION #:E34794-001
1.25V max
PACK DATE: 02/27/2008
MADE IN MALAYSIA

What's that?

Frequency

Unit	Abbreviation	Cycles per second
hertz	Hz	1
kilohertz	KHz	10^3 = 1,000
megahertz	MHz	10^6 = 1,000,000
gigahertz	GHz	10^9 = 1,000,000,000

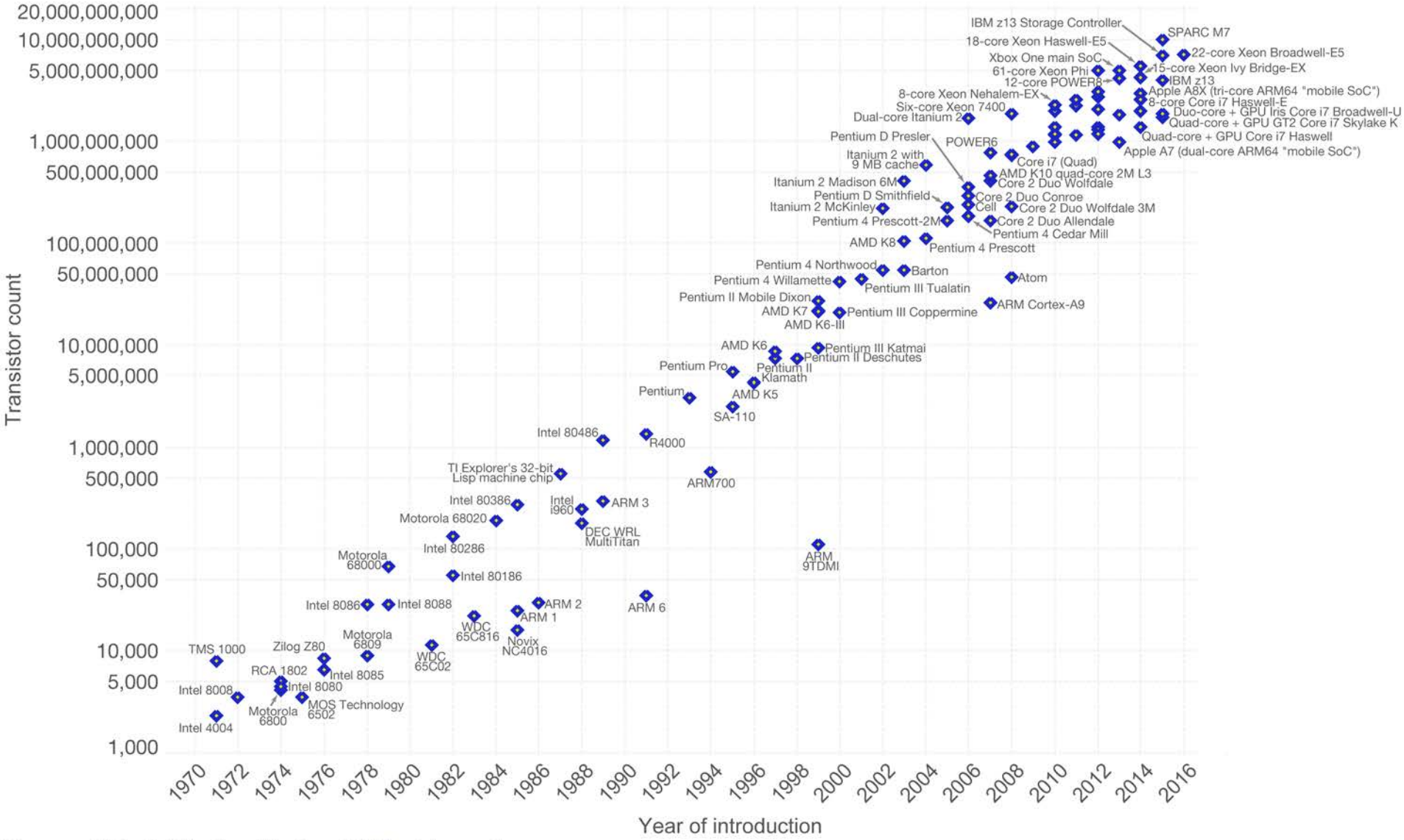
Time

Unit	Abbreviation	Duration (seconds)
second	sec/s	1
millisecond	ms	10^{-3} = 1/1,000
microsecond	μs	10^{-6} = 1/1,000,000
nanosecond	ns	10^{-9} = 1/1,000,000,000
picosecond	ps	10^{-12} = 1/1,000,000,000,000
femtosecond	fs	10^{-15} = 1/1,000,000,000,000,000

Moore's Law – The number of transistors on integrated circuit chips (1971-2016)

Our World in Data

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are strongly linked to Moore's law.



Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)

The data visualization is available at OurWorldinData.org. There you find more visualizations and research on this topic.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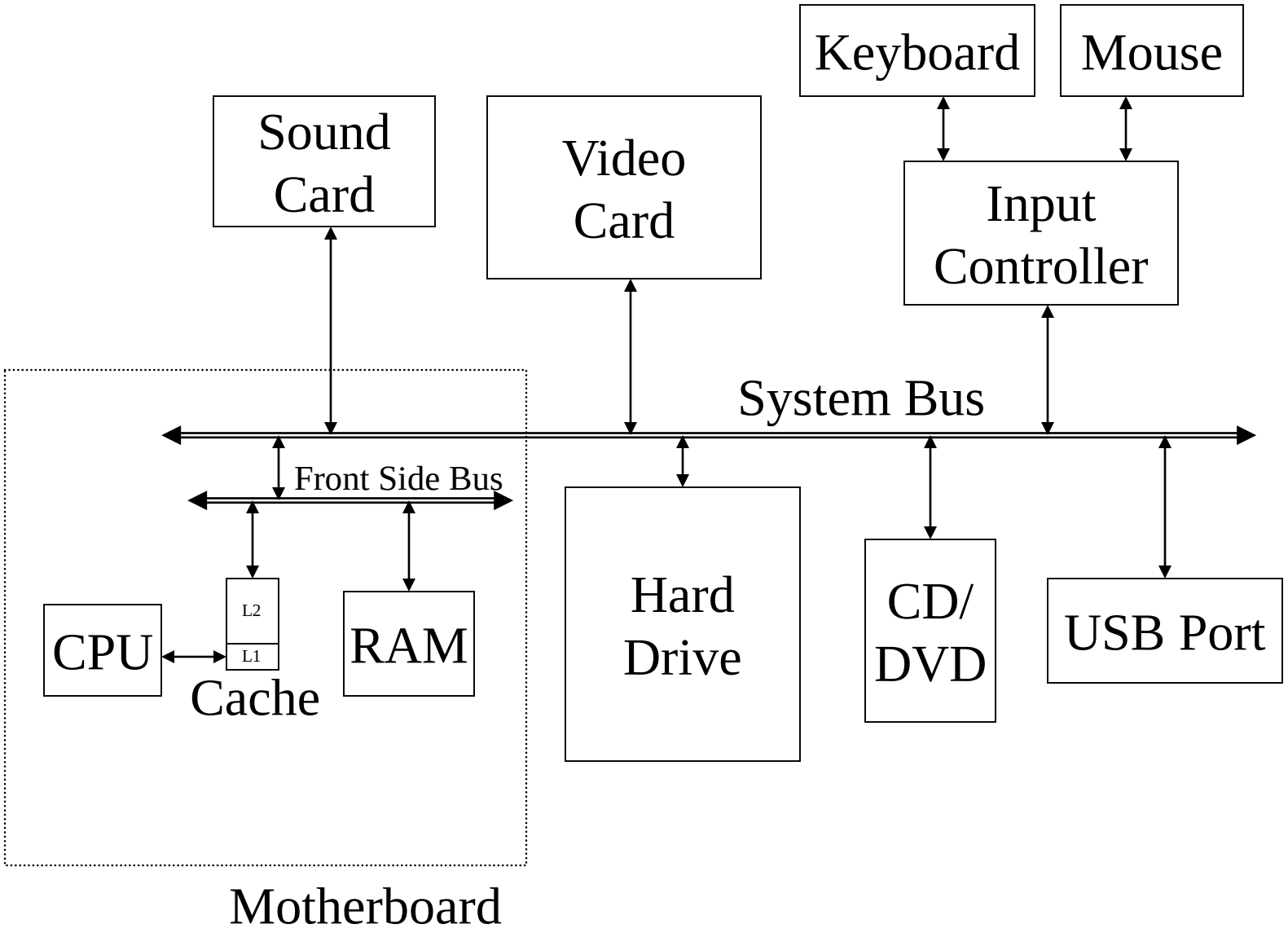
More cores!

System Architecture



Source: Wikipedia

Units of Size

Unit	**Abbreviation**	**Size (bytes)**
bit	b	1/8
byte	B	1
kilobyte	KB	$2^{10} = 1024$
megabyte	MB	$2^{20} = 1,048,576$
gigabyte	GB	$2^{30} = 1,073,741,824$
terabyte	TB	$2^{40} = 1,099,511,627,776$
petabyte	PB	$2^{50} = 1,125,899,906,842,624$

Moore’s Law

- Processing speed doubles every 18 months
  - Faster CPU, longer words, larger cache, more cores
- Cost/bit for RAM drops 50% every 12 months
  - Less need for “virtual memory”

Extracted From Shelly Cashman Vermatt's Discovering Computers 2004

Input Devices

- Text
  - **Keyboard**, optical character recognition
  - Speech recognition, handwriting recognition
- Direct manipulation
  - 2-D: **mouse**, trackball, touchpad, touchscreen
  - 3-D: wand, data glove
- Remote sensing
  - Camera, speaker ID, head tracker, eye tracker

Binary Data Representation

Example: American Standard Code for Information Interchange (ASCII)

01000001 = A	**01100001 = a**
01000010 = B	**01100010 = b**
01000011 = C	**01100011 = c**
01000100 = D	**01100100 = d**
01000101 = E	**01100101 = e**
01000110 = F	**01100110 = f**
01000111 = G	**01100111 = g**
01001000 = H	**01101000 = h**
01001001 = I	**01101001 = i**
01001010 = J	**01101010 = j**
01001011 = K	**01101011 = k**
01001100 = L	**01101100 = l**
01001101 = M	**01101101 = m**
01001110 = N	**01101110 = n**
01001111 = O	**01101111 = o**
01010000 = P	**01110000 = p**
01010001 = Q	**01110001 = q**
…	**…**

Output Devices

- Visual
  - Screen, projector, head-mounted display, CAVE
- Acoustic
  - Speakers, headphones
- Physical
  - Tactile (vibrotactile, pneumatic, piezoelectric)
  - Force feedback (pen, joystick, exoskeleton)
  - Thermal
- Vestibular (motion-based simulators)
- Locomotive (treadmill, stationary bicycle)
- Olfactory

Agenda

- The Computer

➢ The Course

A Personal Approach to Learning

- Work ahead, so that you are never behind
- Find new questions everywhere
  - Then find the answers somewhere
- Enrich your practical skills relentlessly
- Pick topics you want to learn more about

The Fine Print

- Group work is encouraged on homework
  - But you must personally write what you turn in
- Deadlines are firm and sharp
  - Allowances for individual circumstances are included in the grading computation
- Academic integrity is a serious matter
  - No group work during the exam!
  - Scrupulously respect time limits

Before You Go

On a sheet of paper, answer the following (ungraded) question (no names, please):

What was the muddiest point in today's class?