

Chapter 1: Introduction (Story-telling)

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Computer Programs (software)

- A computer is versatile (surfing online, shopping, games, for work, for fun, etc..)
- Networked computers are hubs of information
- Computer just can't do physical labor for you
- Other machines? (Refrigerate just refrigerates, washing machine just washes, toaster toasts)
- Good analogy, computer just computes.
- How? Computer Programs, only soft thing can make it so powerful and magical



Computer Programs (software)

- Tells a computer (actually CPUs) what to do
- Any simple/complex programs consist of instructions
- Instruction relating to ISA of the CPU (x86, ARM, LC-3, etc.), extremely primitive
- Hardware: physical computer, accessories
- Software: Computer programs
- Programming: design and implement programs
- OS, video games, word processor
- Basics of programming, foundation to complex

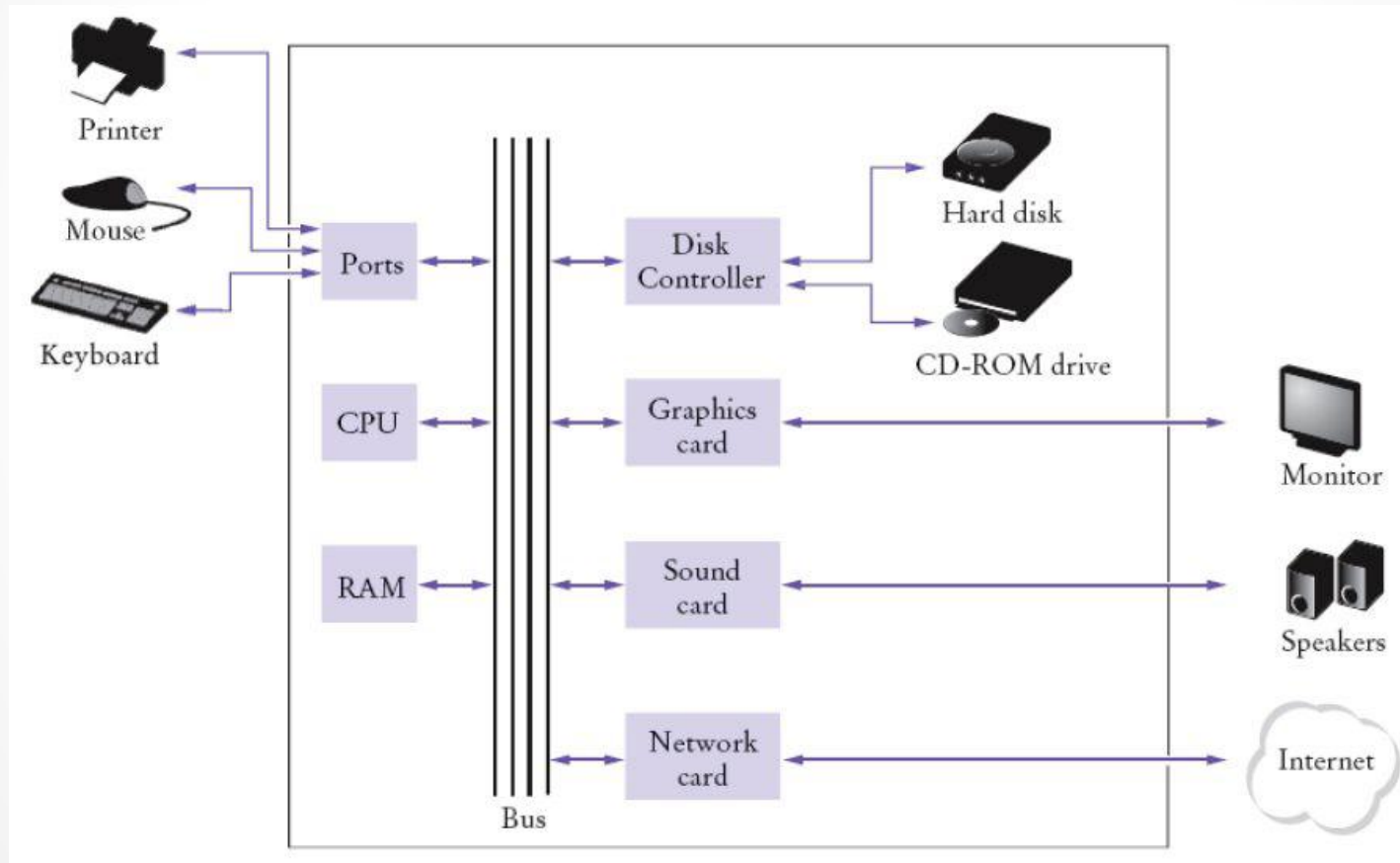


Computer Architecture

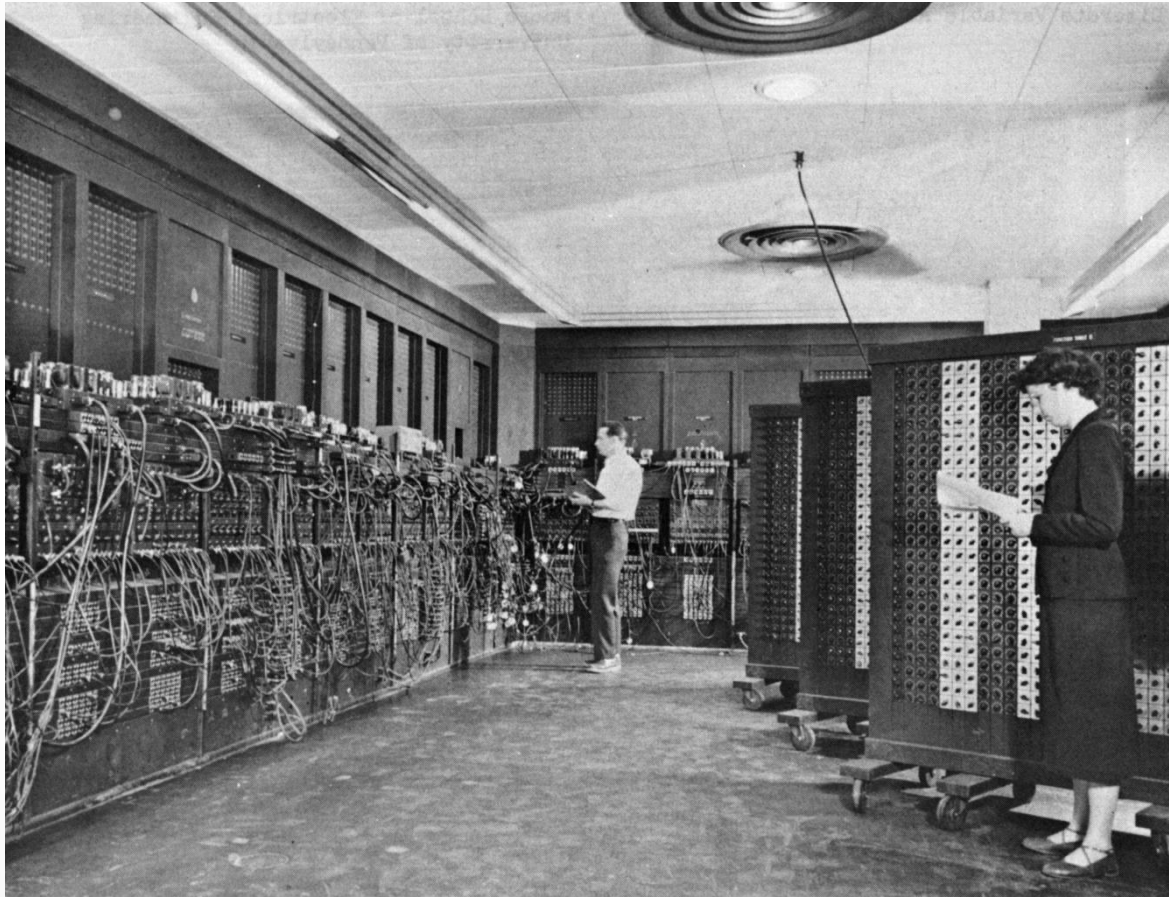
- Von Neumann model
 1. processing unit (CPU) (cell of transistors)
 2. control unit
 3. memory (RAM, DRAM)
 4. mass storage (Hard disk, SSD)
 5. I/O (mouse, printer, scanner etc.)
- ENIAC



Computer Anatomy



ENIAC



High-level vs. Low-level

- Even a small program has tons of instructions
- Low-level languages, instructions specific
- High-level counterparts, instructions wrapped
- Bridge from high -> low: Compiler
- Numerous high-level langs
- Low langs are ISA(instruction-set architecture)-specific (machine code && assembly code)
- Java, one of the most widely used high-level ones



Human vs. Computer

Humans brain:

$$a = x + y - z$$

CPUs meditate:

load x, r1

load y, r2

load z, r0

add r3, r1, r2

sub r0, r3, r0

store r0, a



Java History

- 1991, James Gosling and Patrick Naughton “Green”
- Sun Microsystems acquired by Oracle (DBMS magnate)
- James at Google now, say no to Oracle’s proprietary strategy
- Originally for small internet apps, called applets



Why Java?

- Simpler than C++ and many other OOPs
- Free library that is extremely rich, a big plus
- Safe, so learn faster
- Portable, platform-independent: Win, UNIX, Linux, BSD, Mac OS. Thanks to Java Virtual Machine (JVM)



Multithreaded: user mode, no system calls

Text vs. Schematic

- Almost all langs use text to program
- Some programming use diagrams for niche market, the most notable one, Labview
- General practice found textual code easier to read and manipulate

Editor vs. IDE

- In ancient times (10 yrs or so), we use editor and CLI (Demo time)
- Now we can still use it to show we are geeks, but IDE(Integrated Development Environment) rules nowadays



Eclipse for Java (Demo time)

Preliminary Eclipse Tutorial

- HelloWorld program
- Syntax appetizer: Whitespace, braces, indentation, case sensitive, main method, semicolons, string literal, reserved words
- Syntax? Executable, Unambiguous, Terminating
- Semantics?



Program Bugs (errors)

- Grace Murray Hopper
- 09/09/1947
- Moth trapped in his primitive computer, Relay #70



Common Bugs

- Compile error:
 1. Missing ;
 2. Misspelled identifier
 3. Missing ()
 4. Missing “”
- Run-time error:
 1. Missing main method
 2. Undefined math calc (5/0, infinity is terrific, but computer doesn't accept overflow ☹)



Pseudocode vs. (real) code

- Pseudocode describes program flow in quasi-human language
- Real code must follow syntax of the PL you are utilizing

