

Computer Organization

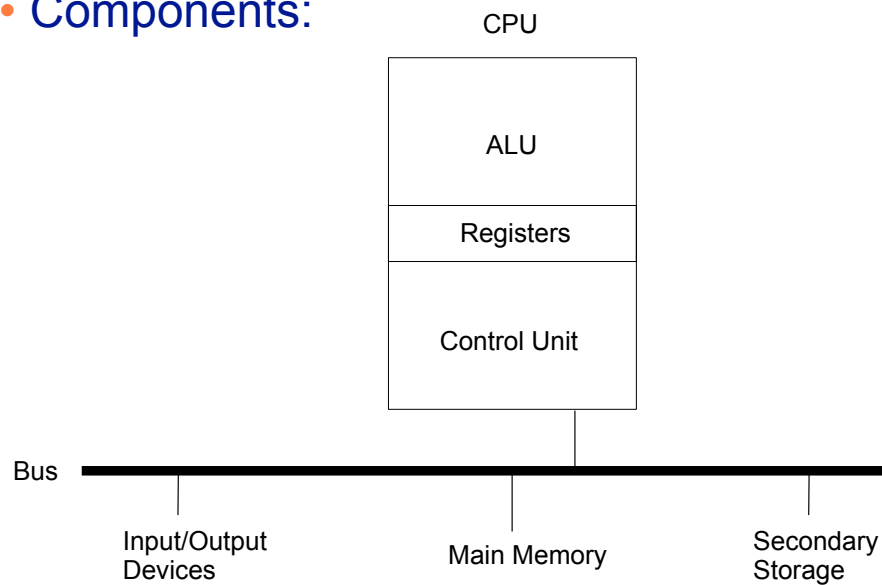
CS 1428
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Hardware Organization

- Components:



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Hardware Components

- Central Processing Unit (CPU)
 - Arithmetic Logic Unit (math, comparisons, etc)
 - Control Unit (processes instructions)
 - Registers (storage locations in processor)
- Main Memory (RAM): Storage for:
 - data
 - instructions (stored programs)
- Secondary Storage
- Input/Output Devices
- Bus: moves data one piece at a time (32/64³ bits)

Registers

- Special purpose storage locations in processor
- Program Counter (PC)
 - Stores the memory address of the next instruction to be executed
- Instruction Register (IR)
 - Stores the current instruction
- Accumulator (ACC)
 - Where the results of all arithmetic operations and loads is stored.

Program

- Program is a set of instructions
- Stored in main memory
- Instructions are stored sequentially
- Instructions are in machine language (binary)

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Instruction Cycle

(aka Execution Cycle)

- How does the computer execute a program?
- Fetch the next instruction from memory
 - then increment the program counter
- Decode the instruction
 - interpret components of the instruction
- Execute
 - set things up and send command to appropriate components (ALU, memory, etc)
- Repeat

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Instruction types

- Data transfer
 - Move data to and from memory and registers
- Arithmetic/Logic:
 - perform operations that produce values (in accumulator)
- Comparisons:
 - sets bits of comparison register
- Branch/Jump:
 - set program counter to a different value to make the cycle continue in a different part of the program

Von Neumann Architecture

- The organization described here is called Von Neumann Architecture.
- Instructions are stored in memory with data
- Sequential execution of instructions
- Both data and instructions travel on same bus, which causes a bottleneck.