CSE 120
Day 2 Notes

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Levels of Transformation

Ultimately all computations have to eventually become voltages and moving electrons.

How do we conceptualize and solve problems?

Create Levels of abstraction Compilers, asm, ISA, components micro-ops, etc.

We create space between us and the computer by grouping together large groups of operations into abstractions, which have higher level, more informationally dense interfaces.

What is architecture?

Architecture is ISA + microarchitecture.

The ISA is the set of assembly instructions. Informs how to format and pass instructions to a CPU.

Goal is to open black box of hardware interaction with ISA.

ISA should be viewed as a protocol, or language, or format for communicating with a CPU.

ISA's tend to stick around since it would require a major amount of retooling in order to change the underlying ISA. This is because the ISA is the CPU, program interface, so it is relied upon by both the CPU and all programs written for that platform.

What is microarchitecture?

How do we break up individual instructions? How do we divy up work between arithmetic, logic, and memory management units.

Can we run different parts of instructions in parallel? Can we reorder operations to reduce latency?

The microarchitecture has enough information to build a logical diagram, which can then be used to create circuit diagrams, which can then be cut into a chip using lithography.

Microarchitecture is made of ALUs, cores, buses, etc.

Logic is made up of gates, registers, etc.

Circuits are made up of transistors, capacitors, etc.

Process Node refers to average size of transistors. This usually is calculated through a transistor density per mm^2.

What is performance?

Performance is about how fast a machine can execute code. How fast it can read, process and output. Number of operations per unit of time.

Efficiency is a sister concept which is about the usage of resources for a given output. In terms of hardware that would be cooling requirements and power consumption. Cost is also a part of efficiency.