

Chapter 1: Fundamentals of Quantitative Design & Analysis (Part 1)

What is computer architecture?
Why study computer architecture?
Common principles

What is Computer Architecture?

Previously, Computer Architecture ~ ISA

Instruction set architectures

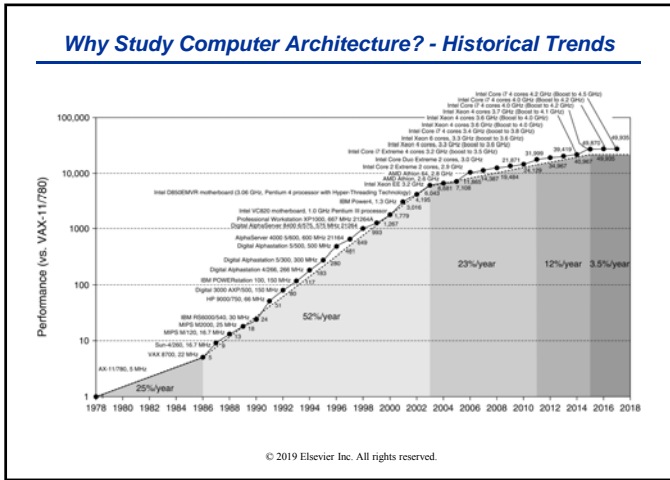
- Most ISAs today are general-purpose register based
 - Operands may be registers or memory locations
 - Register-memory vs. load-store
- Addressing modes
 - Register, immediate, displacement, ...
- Operand sizes
 - 8 bits, 16 bits, 32 bits, 64 bits, SP and DP FP
- Operations: Arithmetic, memory, control flow, floating point
- Encoding: fixed vs. variable length

Evolution of ISAs

- Pre-1980s: lots of action → CISC vs. RISC wars → 2 to 3 decades of (almost) stability → new questions again

Our main focus: organization

Goals of the Computer Architect



Why Study Computer Architecture?

Why Study Computer Architecture Today?

Golden Age of Computer Architecture!

"Nobel Prize for Computing? Newly named Turing Award winners forecast a 'new golden age' for computer architecture at ISCA."

See slides here: <http://iscaconf.org/isca2018/docs/HennessyPattersonTuringLectureISCA4June2018.pdf>

Full video here: <https://www.acm.org/hennessy-patterson-turing-lecture>

QnA: Why software community needs to learn about hardware now? <https://youtu.be/3LVeEisn8Ts?4266>

Relationship to Prerequisites

Prerequisite
How to design a computer?

This course
How to design a computer WELL?
Emphasis on Quantitative vs. Qualitative

Be sure to check the handout for details on the prerequisites