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

What is computer architecture?

Why study computer architecture?

Common principles

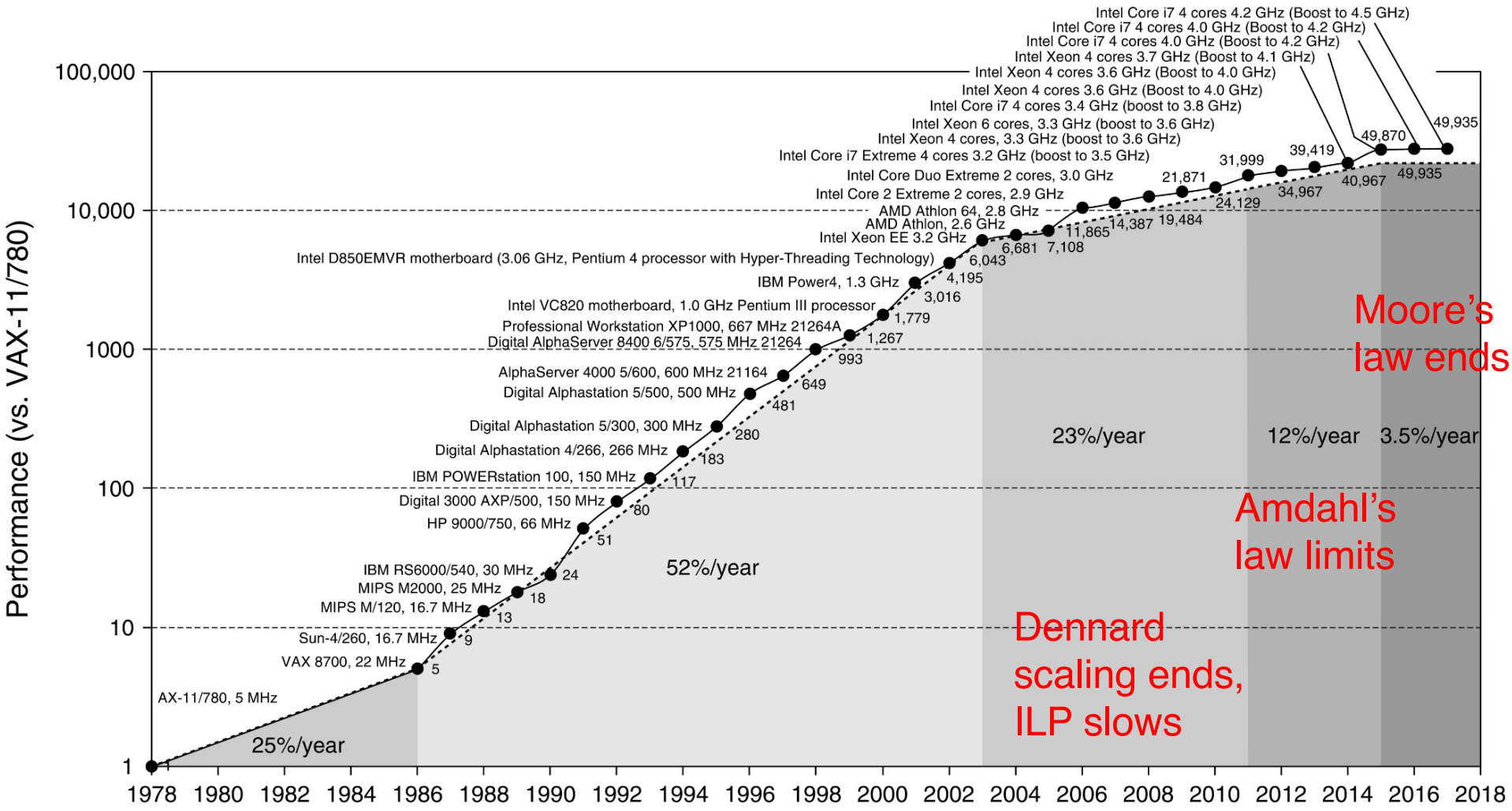
What is Computer Architecture?

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
- Action no longer in ISA
  - But not always the case: CISC vs. RISC – what happened?
- Our main focus: organization

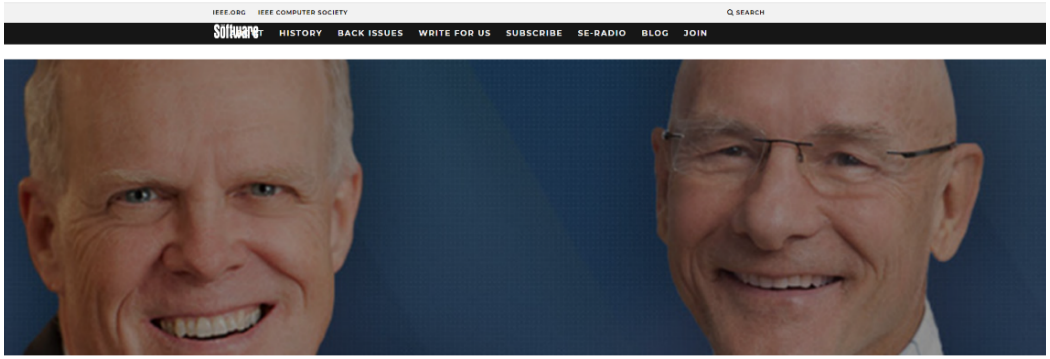
Goals of the Computer Architect

Why Study Computer Architecture? - Historical Trends



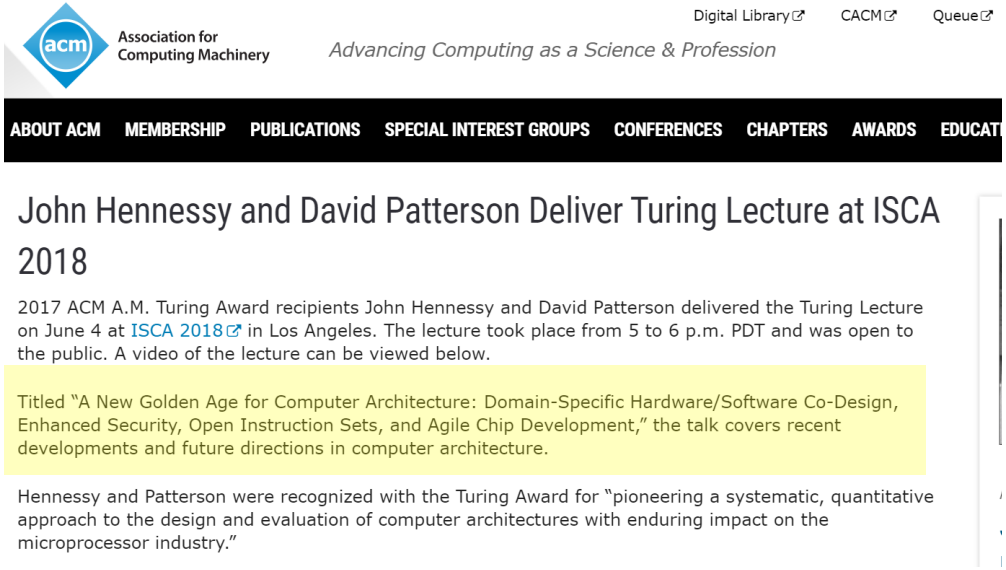
Why Study Computer Architecture?

Why Study Computer Architecture Today?



'Nobel Prize for Computing': Newly named Turing Award winners foretell a 'new golden age' for computer architecture at ISCA.

Golden Age of Computer Architecture!



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 hardware now?
https://youtu.be/3LVeEjsn8Ts?t=4268

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