

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

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What is computer architecture?

Why study computer architecture?

Common principles

# ***What is Computer Architecture?***

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# *Previously, Computer Architecture ~ ISA*

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## 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

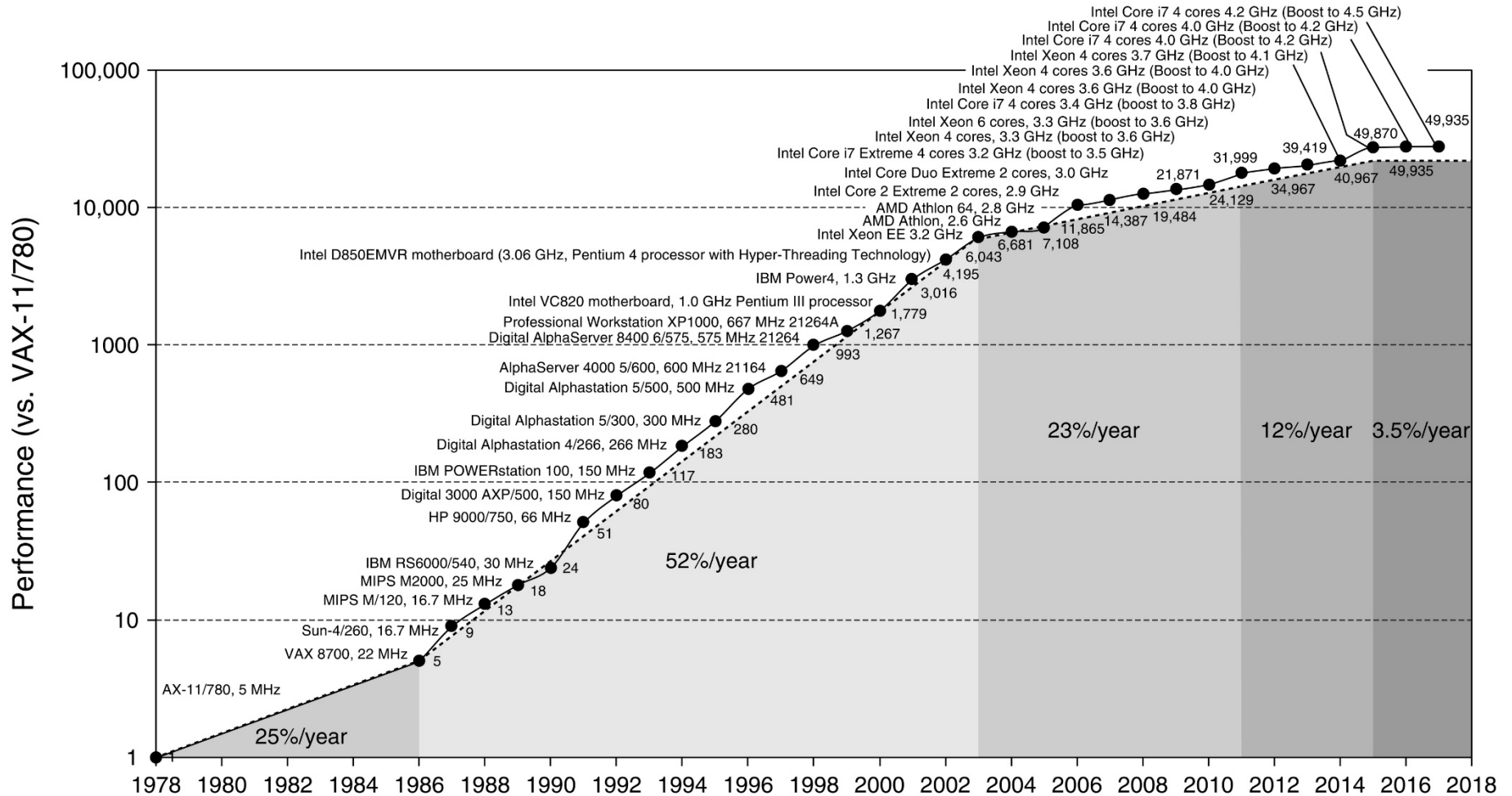
Pre-1980s: lots of action → CISC vs. RISC wars → 2 to 3  
decades of (almost) stability → new questions again

Our main focus: organization

# ***Goals of the Computer Architect***

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# Why Study Computer Architecture? - Historical Trends



# ***Why Study Computer Architecture?***

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# Why Study Computer Architecture Today?



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



## John Hennessy and David Patterson Deliver Turing Lecture at ISCA 2018

2017 ACM A.M. Turing Award recipients John Hennessy and David Patterson delivered the Turing Lecture on June 4 at [ISCA 2018](#) in Los Angeles. The lecture took place from 5 to 6 p.m. PDT and was open to the public. A video of the lecture can be viewed below.

Titled "A New Golden Age for Computer Architecture: Domain-Specific Hardware/Software Co-Design, Enhanced Security, Open Instruction Sets, and Agile Chip Development," the talk covers recent developments and future directions in computer architecture.

Hennessy and Patterson were recognized with the Turing Award for "pioneering a systematic, quantitative approach to the design and evaluation of computer architectures with enduring impact on the microprocessor industry."

## 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 learn about hardware now?

<https://youtu.be/3LVeEjsn8Ts?t=4268>

# *Relationship to Prerequisites*

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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