ECE485 Computer Architecture

Lesson 1

Computer Systems Courses

| ECE 281: Digital Design & Comp Arch | → | ECE 382: Embedded Comp I (microcontrollers) | → | ECE 383: Embedded Comp II (FPGAs) | → | ECE 485: Adv Computer Architecture |

ECE 387: Introduction to Robotics

Which is the Best ECE CompE class?

1. 281
2. 382
3. 383
4. 387
5. 485

# Your Instructor
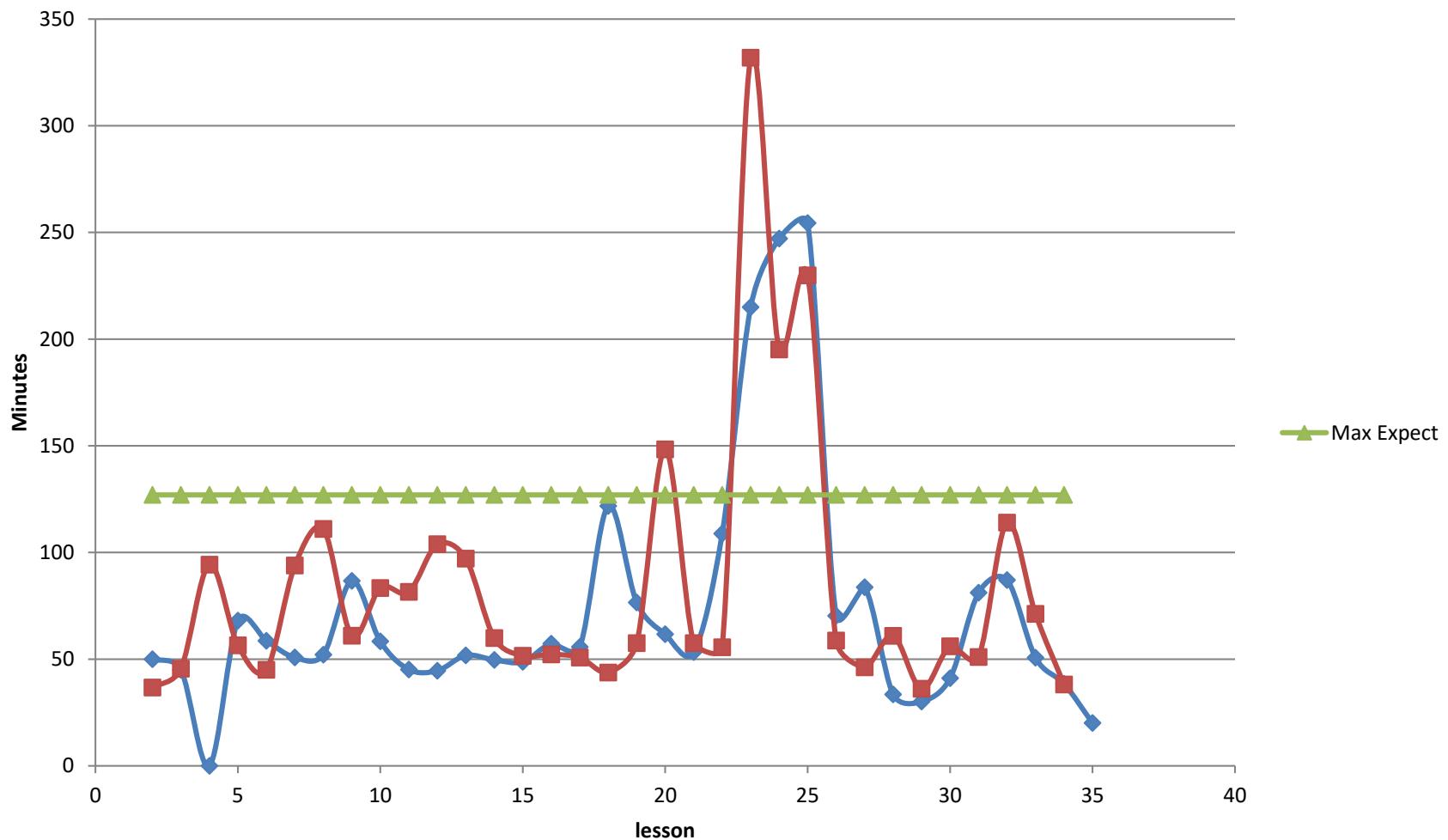
- Name: Dr George York
- Office: 2E42
- E-mail: george.york@ afacademy.af.mil
- Related Experience (62E)
  - Missile Guidance Processor– Eglin AFB – RISC
  - Media (DSP) Processors (TI & Hitachi) – UWash
  - NSA…

Course Overview

- Assess Architectures of Various Computers and their Subsystems
- Evaluate Architecture Performance <u>Quantitatively</u>
- Transition to Graduate Level Work
  - Resolve ill-Defined Problems
  - ~~Research paper~~
  - ~~Oral Presentation~~

Timelogs--ECE485
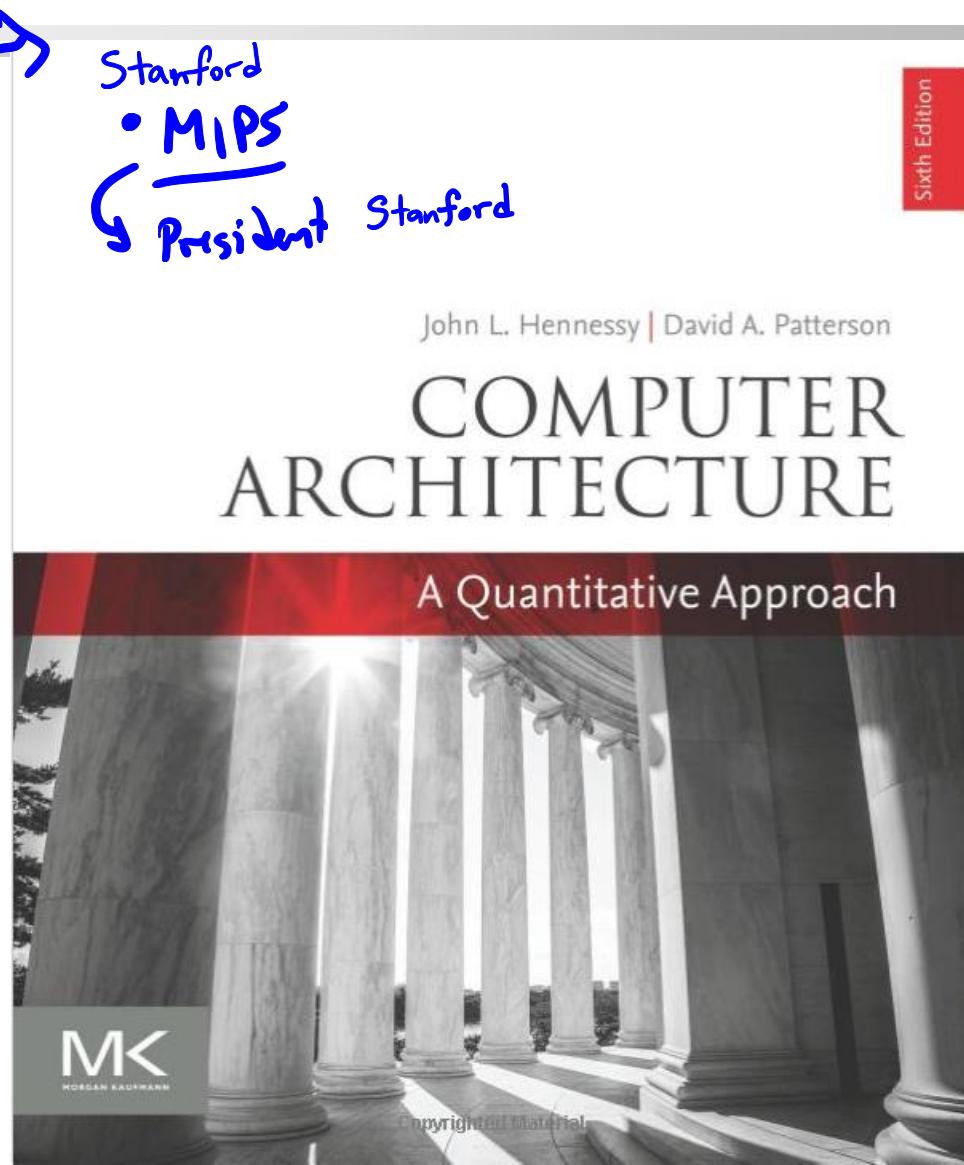
What is the textbook for this course?

1. *Computer Architecture and Organization*
2. *Computer Architecture: From Microprocessors to Supercomputers*
3. *Computer Architecture: A Quantitative Approach*

Course Overview

- Textbook
  - *Computer Architecture:
    A Quantitative Approach*,
    Sixth Edition, 2019
    by **John Hennessey &
    David Patterson**
  - The **Definitive Text** on
    computer architecture

Handwritten annotations:

Stanford
- MIPS
President Stanford

Berkley
- SPARC → SUN
- RAID

Book cover:

Sixth Edition

John L. Hennessy | David A. Patterson

COMPUTER
ARCHITECTURE

A Quantitative Approach

MK
MORGAN KAUFMANN

I have my textbook already?

1. yes
2. no
3. It is in the mail
4. I do not plan on getting the textbook

Course Website and Syllabus

- https://usafa.blackboard.com
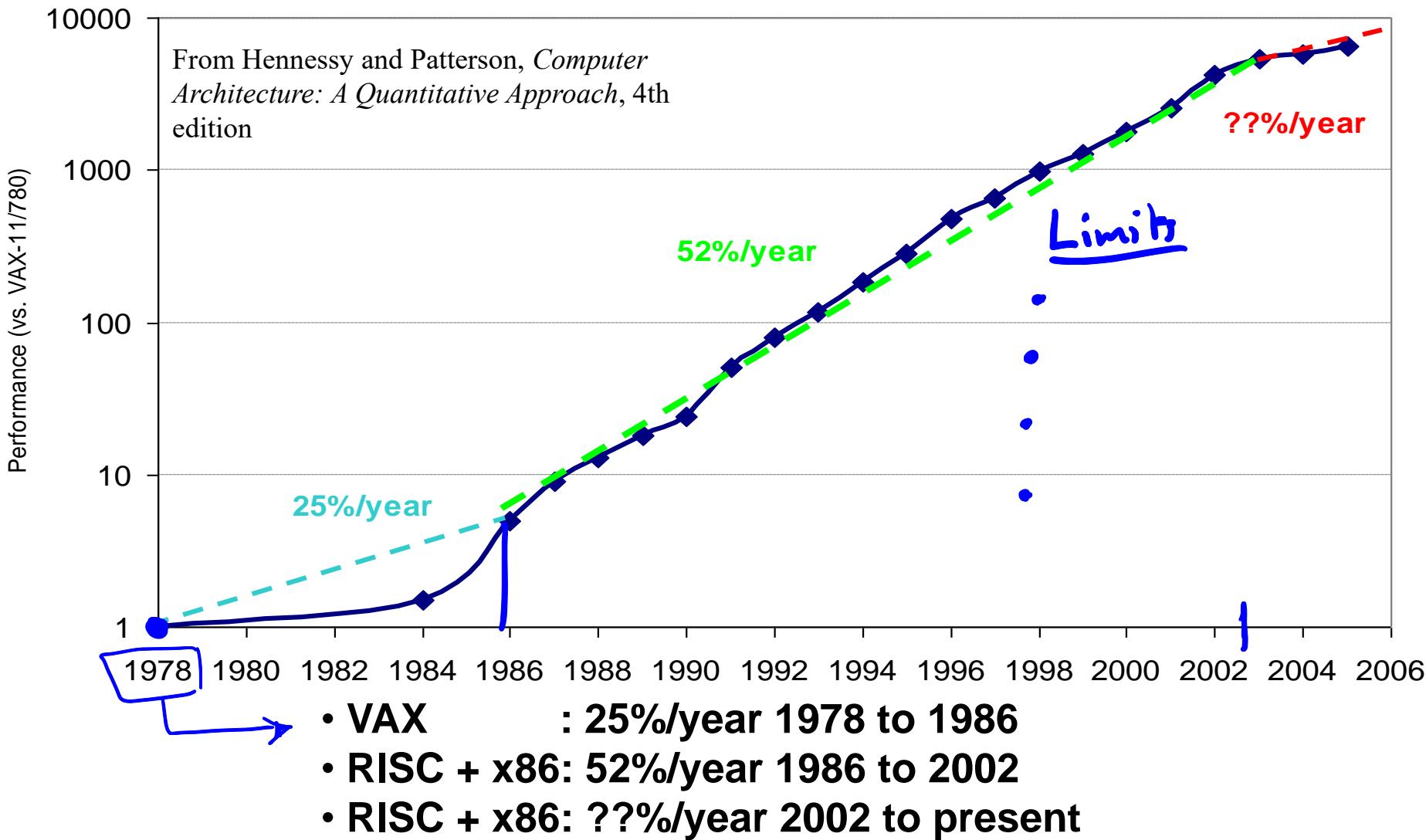
202530-G-DFEC-ECE485-T2A : ADVANCED COMPUTER ARCHITECTURE

- Skills Review   (due BOC M4)

- CPH   (CPH1 due BOC M2)

- <u>No extensions</u> (like for TDYs) for assignment deadlines

  - Vivado → not need until lesson 19

  - Teams

  - Gradescope

Computer Generations
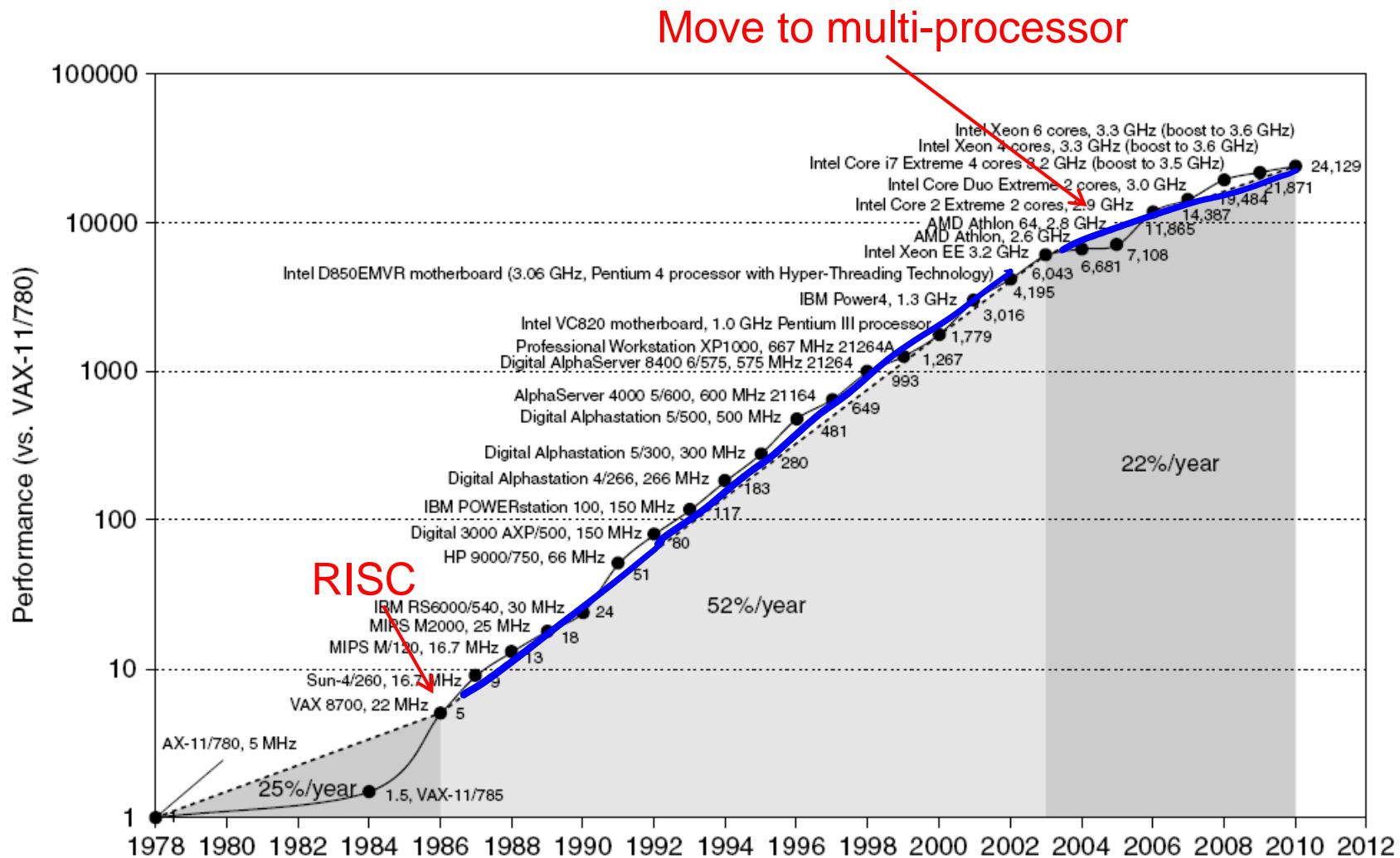
- 1st gen: vacuum tubes
- 2nd gen: transistors
- 3rd gen: MSI, LSI devices *SSI*   *VLSI*
- 4th gen: packing as many transistors onto one chip
- 5th gen: multiple cores

Crossroads: Uniprocessor Performance (2006 textbook)

From Hennessy and Patterson, *Computer Architecture: A Quantitative Approach*, 4th edition

Performance (vs. VAX-11/780)

25%/year

52%/year

Limit

??%/year

- VAX   : 25%/year 1978 to 1986
- RISC + x86: 52%/year 1986 to 2002
- RISC + x86: ??%/year 2002 to present
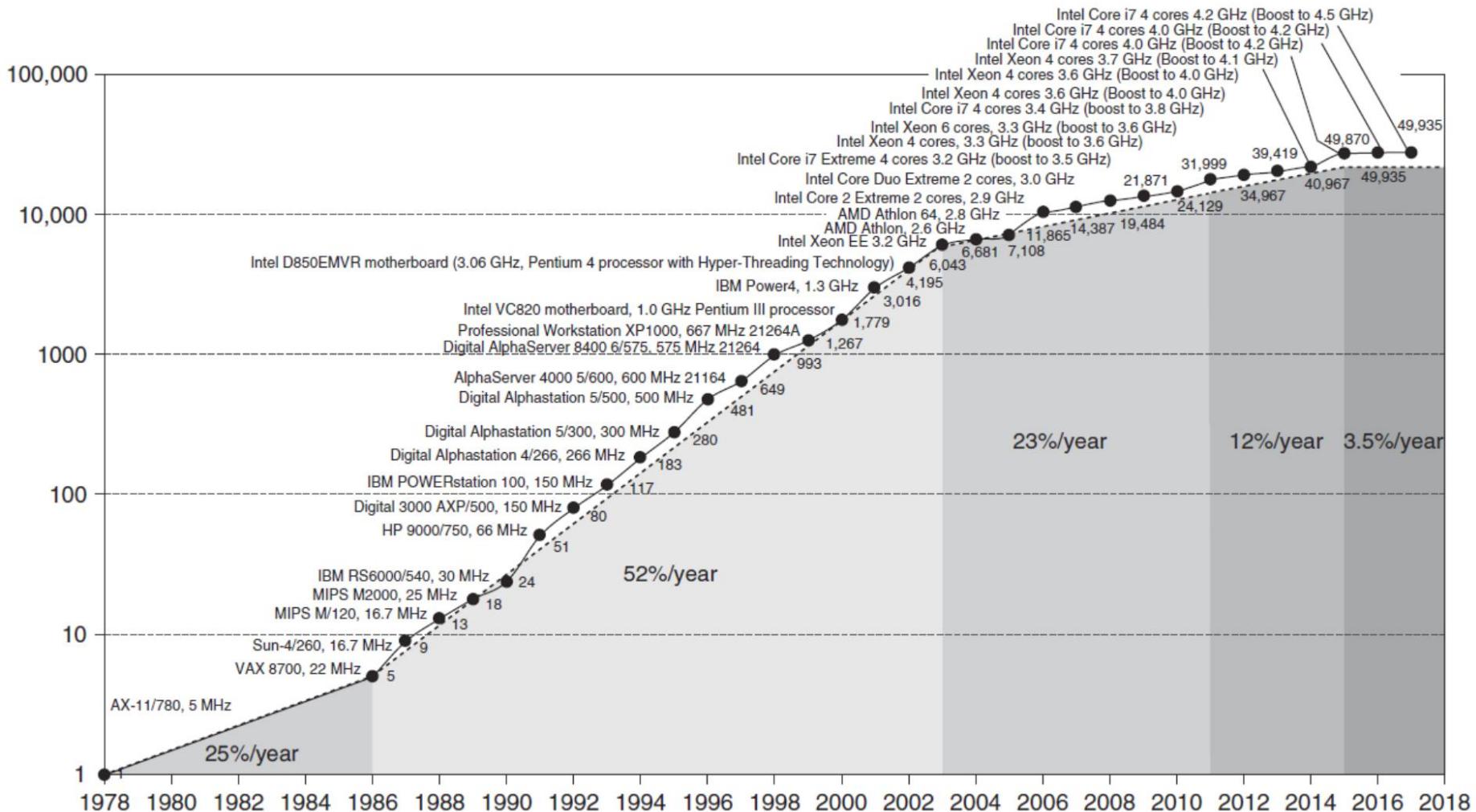
Single Processor Performance

2012 textbook

Single Processor Performance

2019 textbook

13

Bandwidth versus Latency?

1. Latency is the time it takes from the beginning to the end of an individual task

2. Bandwidth is the average throughput for all the tasks.

3. If you increase the bandwidth, you also decrease the latency

4. 1 and 2 above

5. All the above

Trends in Hardware

Which is easier to improve?

1. Bandwidth
2. Latency