

Welcome to CSE 502

Introduction

Today's Lecture

- Course Overview
- Course Topics
- Grading
- Logistics
- Academic Integrity Policy
- Homework

Course Overview (1/2)

- Computer Architecture is
 - ... the **science** and **art** of selecting and interconnecting hardware and software components to **create computers** ...
- Computer Architecture is an umbrella term
 - Architecture: software-visible interface
 - Micro-architecture: internal organization of components
- This course is mostly about **micro-architecture**
 - What's inside the processor (CPU)
 - What implications this has on software

Course Overview (2/2)

- This course is hard, roughly like CSE 506
 - In CSE 506, you learn what's inside an OS
 - In CSE 502, you learn what's inside a CPU
- This is a project course
 - Learn why things are the way they are, first hand
 - We will “build” emulators of CPU components

Why Study CompArch (1/3)

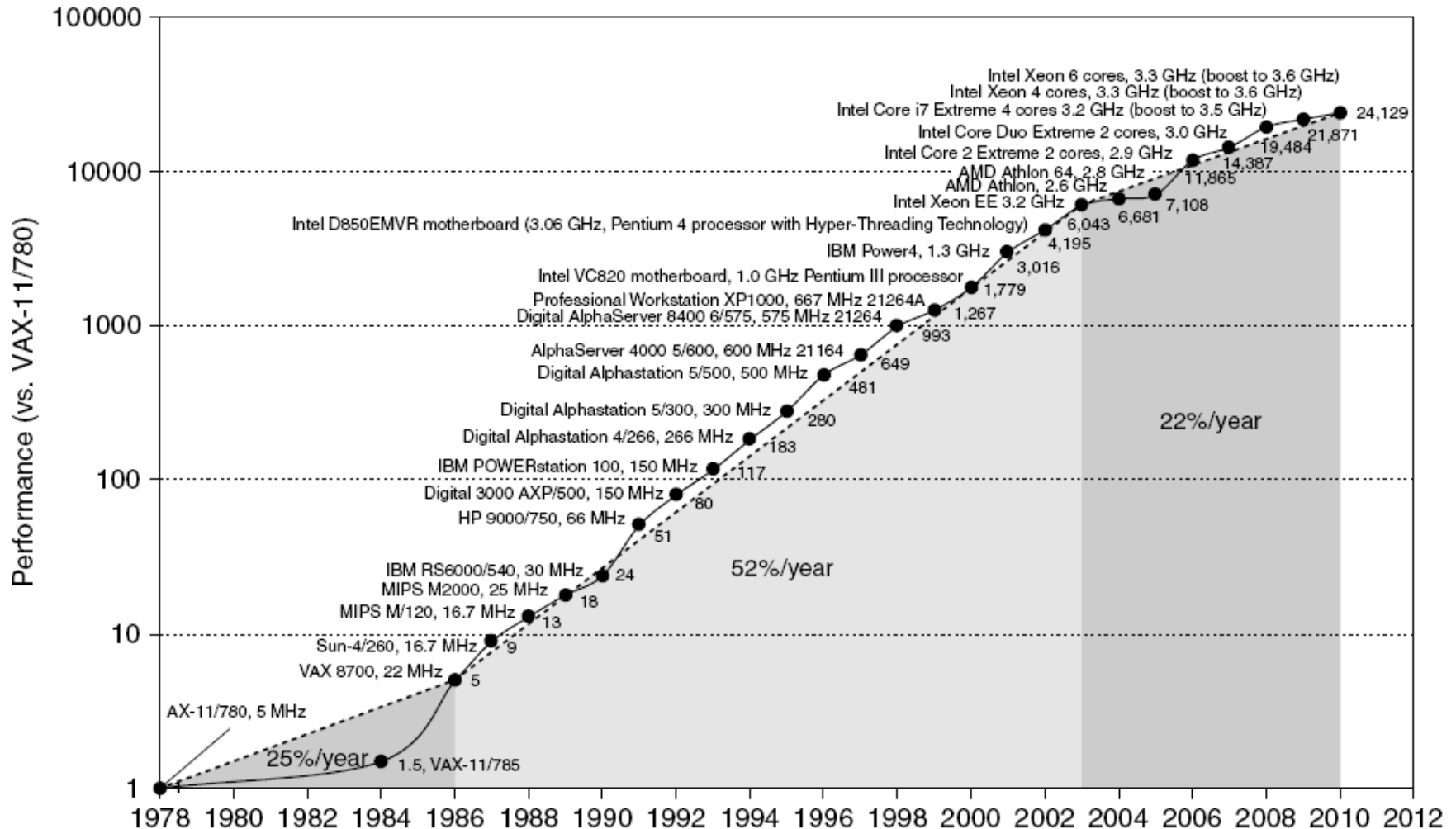
- You need one more qualifier/graduation requirement

✗ *Bad answer!*

- You want to become a computer architect
- You want to learn what's inside a processor
 - Because you're curious (and there is no computer w/o a processor)
 - To write better/faster application code
 - To write system software (OS, compiler, etc.)
- Computer architecture is cool and intellectually fascinating
 - What is the most complex man-made device?
 - There are billions of transistors in a modern processor chip

✓ *Better answer!*

Why Study CompArch (2/3)



Why Study CompArch (3/3)

- Sources of performance improvement:
- Improvements in semi-conductor technology
 - Faster transistors
 - More transistors
- Improvements in computer architecture
 - Architects work to turn the additional resources into speed/power savings/functionality!

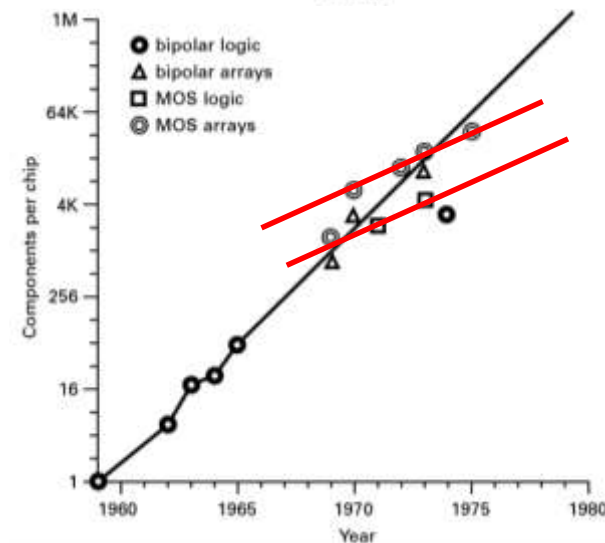
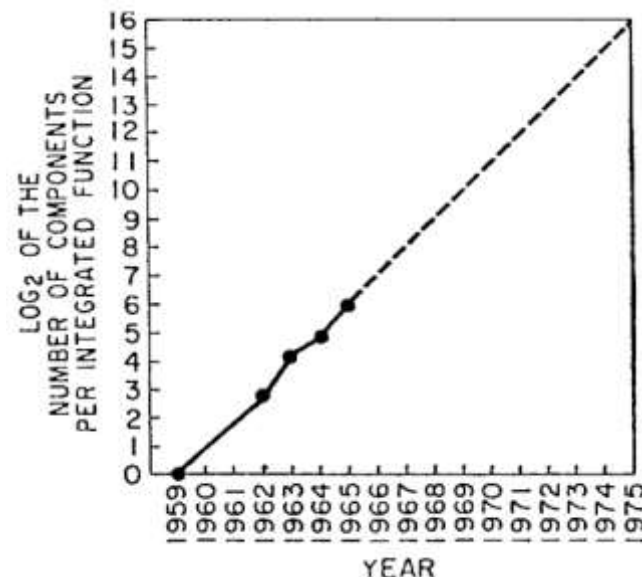
This class is about how this is possible

Moore's Law

- 1st Moore's Law (1965)

“The complexity for minimum component costs has increased at a rate of roughly a factor of two per year. Certainly over the short term this rate can be expected to continue, if not to increase.”
- 2nd Moore's Law (1975)

“The new slope might approximate a doubling every two years, rather than every year”



Moore's law now used to describe exponential tech. growth

Course Topics

- Intro/Review
- Instruction Decode
- Pipelining
- **Memory Hierarchy**
- **Processor Front-end**
- **Execution Core**
- Multi-[socket(SMP,DSM) | thread(SMT,CMT) | core(CMP)]
- Vector Processing and GPUs

Will devote most attention to items in ***bold***

Grading (Standard Option)

	Due Date	Points	Grading	Required?
1 Homework	Mar 31	10	Curve 0 to 100	No
2 Warm-up Projects	Feb 3/Feb 28	20	Absolute Value	No
1 Course Project	Last class	100	See below	Yes
1 Final Exam		40	Absolute value	No
Participation		10	Curve 0 to 100	No

Course Project	Points
5+ stage, Direct-mapped Caches	50
5+ stage, Set-Associative Caches	60
Super-Scalar, Set-Associative Caches	70
Super-Scalar, Out-of-order, Set-Associative Caches	80
Any of the above +Branch predictor	+10
Any of the above +TLBs	+10

Without curve, need 100 points to get an A

Grading (Research Option)

- If you are...
 - Pursuing a PhD
 - Pursuing an MS thesis
 - Planning to take 523/524 with me
- You may select a **research** option for the grade
 - **Only** available with instructor's approval
- When selecting this option...
 - Must work **alone** on everything
 - Attain **at least** 60 points of the Standard Option
 - Grade will be based on **subjective** research progress

Note: Of the two, this is the **harder** option

Logistics (1/3)

- Project milestones
 - There are *no* official project milestones
 - If *you* need milestones, send me a milestone schedule
 - I will deduct 5 points for each milestone you miss
- Books
 - Recommended for reference, not required
 - Does not mean you shouldn't get them
 - Do not pirate books
 - Modern Proc. Design: Fundamentals of Superscalar Proc.
 - Computer Architecture (Hennessy & Patterson)

Logistics (2/3)

- Working in groups
 - Permitted on everything except Final
 - Groups may be of any size
 - Points deducted on group work are multiplied by group size
 - Great opportunity or Rope to hang yourself – you pick
- Attendance
 - Optional (but highly advised)
 - No laptop, tablet, or phone use in class
 - Don't test me - I **will deduct** grade points

Logistics (3/3)

- Blackboard
 - Grades will be posted there, nothing else
- Course Mailing List
 - Subscription is **required**
 - <http://piazza.com/stonybrook/spring2017/cse502/home>

Academic Integrity Policy

- You may...
 - Discuss assignment, design, techniques
- You may **not**...
 - Share code outside your group
 - Use any code not distributed as part of project handouts
 - Exceptions are possible, but must receive explicit permission
- You **must** declare group composition...
 - Explicitly via email to TA and instructor
 - Explicitly for each assignment
 - At most **five** days after assignment handout

Homework

- Independent hacking projects
 - Mostly on QEMU and related software
- If interested...
 - “Pick up” assignment during office hours
 - Come with all group members
 - If can’t make it during office hours
 - Schedule an appointment

Questions?