Introduction

CPE200, Fall 2023

Hank Dietz

http://aggregate.org/hankd/

University of Kentucky

Computer Engineering Sophomore Seminar

- Not a typical course, not doing engineering

- Intent is to:
  - Understand the profession & career choices
  - Build professional skills
  - Become able to leverage what UK offers
  - Build a sense of community

Profession & Career Choices

- What do computer engineers really do?
  (we will have some examples)
- What sorts of companies & jobs?
- Career path options

Professional Skills

- How to present yourself
  - Resume writing
  - Job search and interviewing
- Developing professional ethics
- Professional organizations: IEEE, ACM, PE

Leveraging What UK Offers

- Computer Engineering at UK
  - CPE degree requirements
  - Double/Dual majors, minors
  - Scholars program, Graduate school

- Faculty & facilities
- Student organizations
- Undergraduate research opportunities
- Co-op and Internship options

A Sense Of Community

- CPE is not a department
  - Undergrad is joint, administered by ECE
  - Grad is joint, administered by CS
  - You belong in both ECE and CS

- Departmental activities for ECE and CS
  - ECE JumpStart, 9-11AM, Aug. 24, FPAT 4th commons
  - CS Keeping Current, Noon, Aug. 30, Marksbury Theater

  …

Course Content (may change)

Topic	Lectures
Introduction to Computer Engineering Seminar	1
Computer Engineering Resumes	1
Career Fair Preparation, Co-op and Internships	1
CPE Degree Requirements	1
Advising	1
Career Paths	1
Ethics and IEEE Code of Ethics	1
Graduate School, Scholars Program, and Undergraduate Research	1
Sample Computer Engineering system design and performance debugging	2
Computer Engineering Areas and Faculty	2
Student Organizations	1

Course Structure and Grading

50% Attendance and participation
50% Homework and quizzes

- Material from lectures, cited activities, canvas, or `http://aggregate.org/CPE200`
- Class and other activity schedule will be announced via canvas
- No final exam

About Me

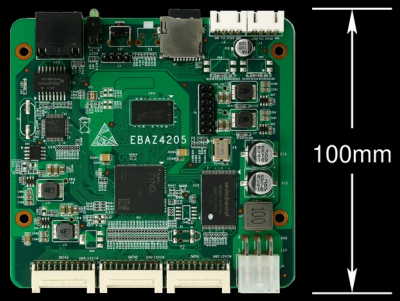
- 1st college grad in my family (my wife too)
- I started out as a double major EE+ME
- My degrees all say “Computer Science,” but are from an EE department

- Professional experience
  - Computer Engineering professor since 24
  - Research and consulting with companies
  - I ran the manufacturing company my Dad founded for a couple of years...

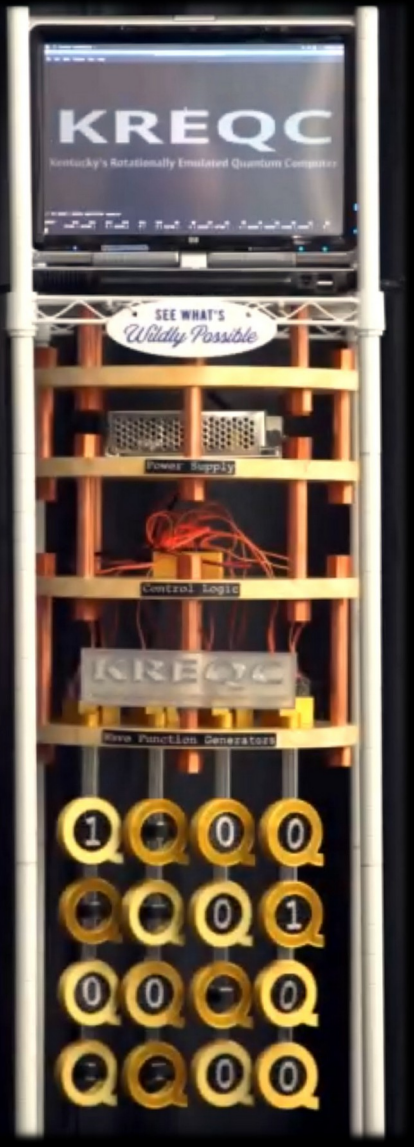
About Me

- Hank Dietz, ECE Professor, CPE DUS, and James F. Hardymon Chair in Networking
- Office: 203 Marksbury

- Research in:
  - Parallel computing HW+SW
  - Computational photography
  - Improving making technologies
- Lab: 108/108A Marksbury – I have **TOYS**!

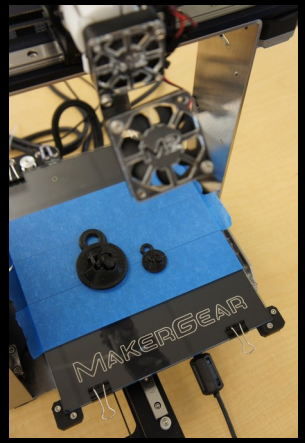

EBAZ4205
100mm


College of Engineering
Electrical & Computer Engineering


KREQC
Kentucky's Rotationally Emulated Quantum Computer
SEE WHAT'S
Wildly Possible
Power Supply
Control Logic
KREQC
Wave Function Generators


UK
ECE


Canon


MAKERGEAR


AMS
X1-Carbon
Bambu Lab

What Is Computer Engineering?

- Electrical Engineering is circuits & HW?
- Computer Science is programming & SW?

Computer Engineering is looking at HW+SW computing systems as a whole, with deep understanding of interactions between HW/SW.

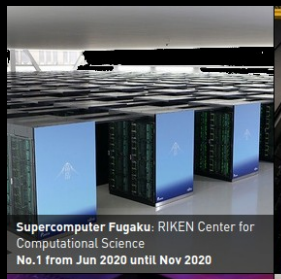
What is a computing system?

Computing Systems?

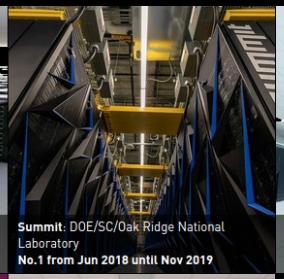
- Personal Computers (PCs)

PCs (yeah, old ones)

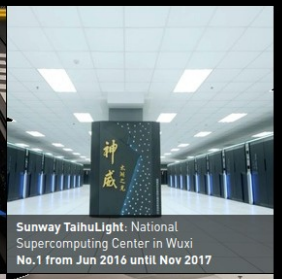
#1 Machines, http://top500.org



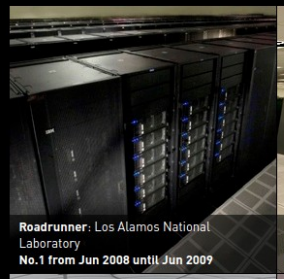
Supercomputer Fugaku: RIKEN Center for Computational Science
No.1 from Jun 2020 until Nov 2020



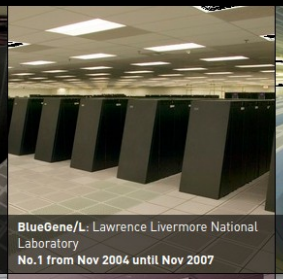
Summit: DOE/SC/Oak Ridge National Laboratory
No.1 from Jun 2018 until Nov 2019



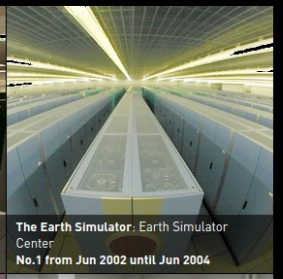
Sunway TaihuLight: National Supercomputing Center in Wuxi
No.1 from Jun 2016 until Nov 2017



Roadrunner: Los Alamos National Laboratory
No.1 from Jun 2008 until Jun 2009

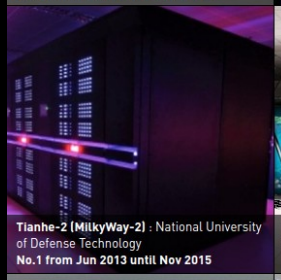


BlueGene/L: Lawrence Livermore National Laboratory
No.1 from Nov 2004 until Nov 2007

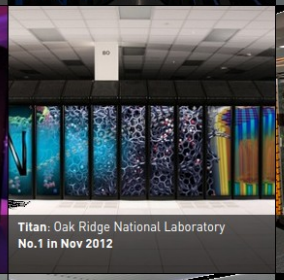


The Earth Simulator: Earth Simulator Center
No.1 from Jun 2002 until Jun 2004

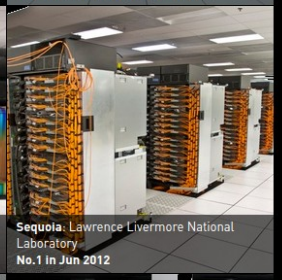
CM-5: Los Alamos National Lab
No.1 in Jun 1993



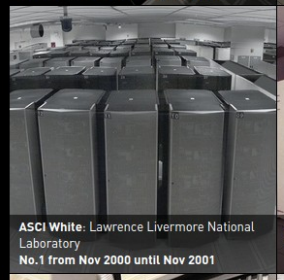
Tianhe-2 (MilkyWay-2) : National University of Defense Technology
No.1 from Jun 2013 until Nov 2015



Titan: Oak Ridge National Laboratory
No.1 in Nov 2012

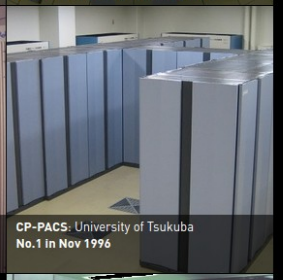


Sequoia: Lawrence Livermore National Laboratory
No.1 in Jun 2012

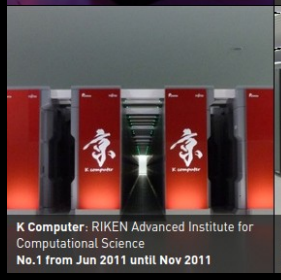


ASCI White: Lawrence Livermore National Laboratory
No.1 from Nov 2000 until Nov 2001

ASCI Red: Sandia National Laboratory
No.1 from Jun 1997 until Jun 2000

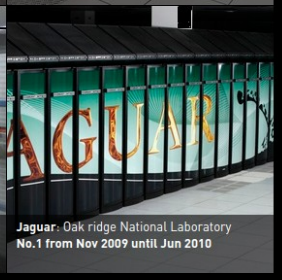


CP-PACS: University of Tsukuba
No.1 in Nov 1996



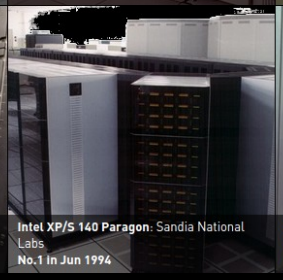
K Computer: RIKEN Advanced Institute for Computational Science
No.1 from Jun 2011 until Nov 2011

Tianhe-1A: National Supercomputing Center in Tianjin
No.1 in Nov 2010



Jaguar: Oak ridge National Laboratory
No.1 from Nov 2009 until Jun 2010

Hitachi SR2201: University of Tokyo
No.1 in Jun 1996



Intel XP/S 140 Paragon: Sandia National Labs
No.1 in Jun 1994

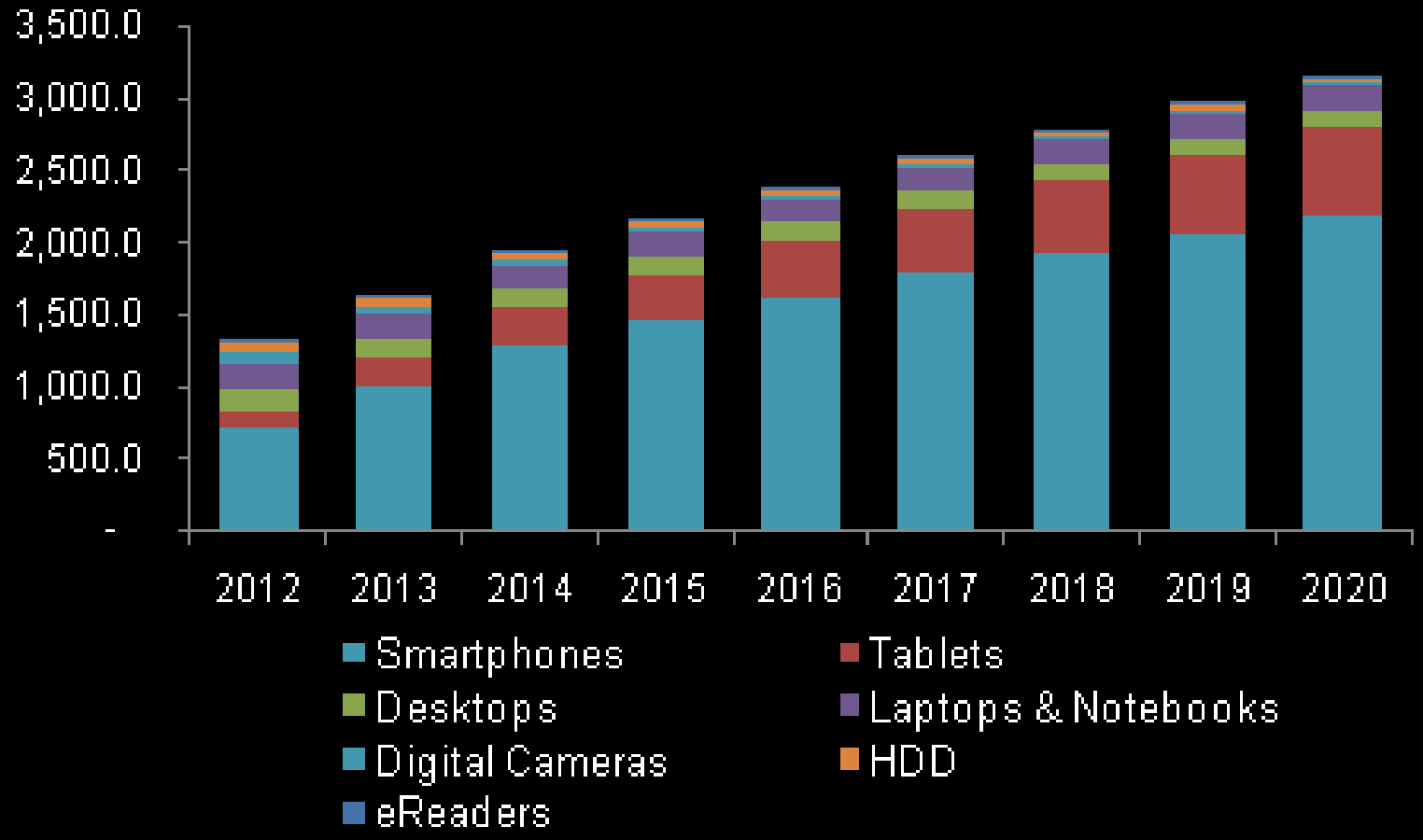
Numerical Wind Tunnel: National Aerospace Laboratory of Japan
No.1 in Nov 1993

8730112 cores, 1.1EFLOPS, 21MW

Computing Systems?

- Supercomputers
- Clusters, Farms, Grids, and Clouds (Warehouse Scale Computers – WSC, Software as a Service – SaaS)
- Servers
- Personal Computers (PCs)
- Personal Mobile Devices (PMDs)... usually “smart phones” and tablets

M-Unit Sales, Global Personal Electronics

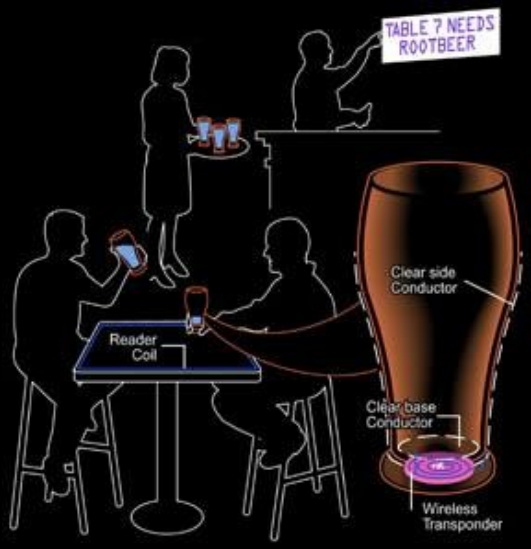


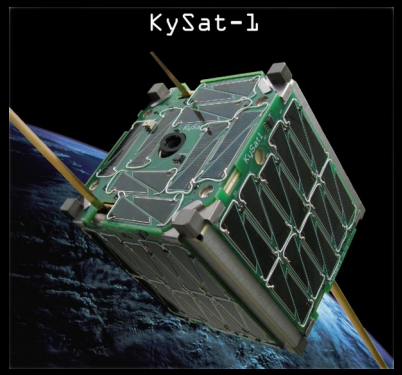
https://www.grandviewresearch.com/industry-analysis/personal-consumer-electronics-market

Computing Systems?

- Supercomputers
- Clusters, Farms, Grids, and Clouds (Warehouse Scale Computers – WSC, Software as a Service – SaaS)
- Servers
- Personal Computers (PCs)
- Personal Mobile Devices (PMDs)... usually “smart phones” and tablets
- Embedded computers, IoT (Internet of Things)

Embedded and IoT





Computer Engineering is the enabler for most tech.

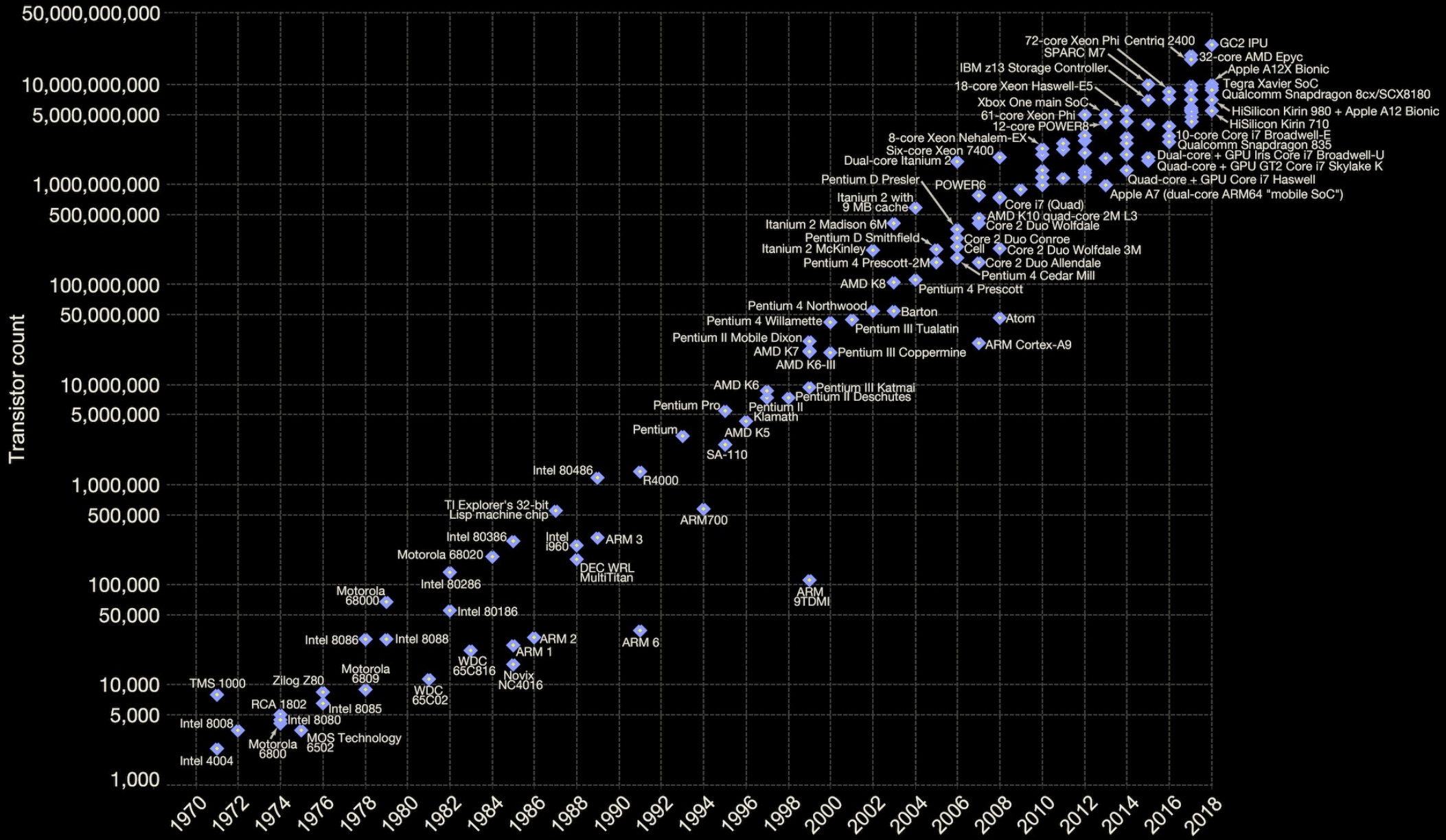
- Most modern devices depend on embedded computers for their basic functionality
- Computer engineers might work for
  - NVIDIA, Intel, AMD, IBM, Apple, etc.
  - Indeed top-rated employers are: Microsoft, Capital One, Northrop Grumman, Cisco, Verizon
  - Small groups are in most companies…

Enabler, yes!
But for how long?

Moore's Law – The number of transistors on integrated circuit chips (1971-2018)

Our World in Data

Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are linked to Moore's law.



Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)

The data visualization is available at OurWorldinData.org. There you find more visualizations and research on this topic.

Enabler, yes!
But for how long?

- ***Everything*** is getting exponentially better
  - Can do more with new devices
  - Not the same exponent for everything

- Because everything is changing fast, demand is high, but you need to keep up…

  Computer Engineers must be lifelong learners