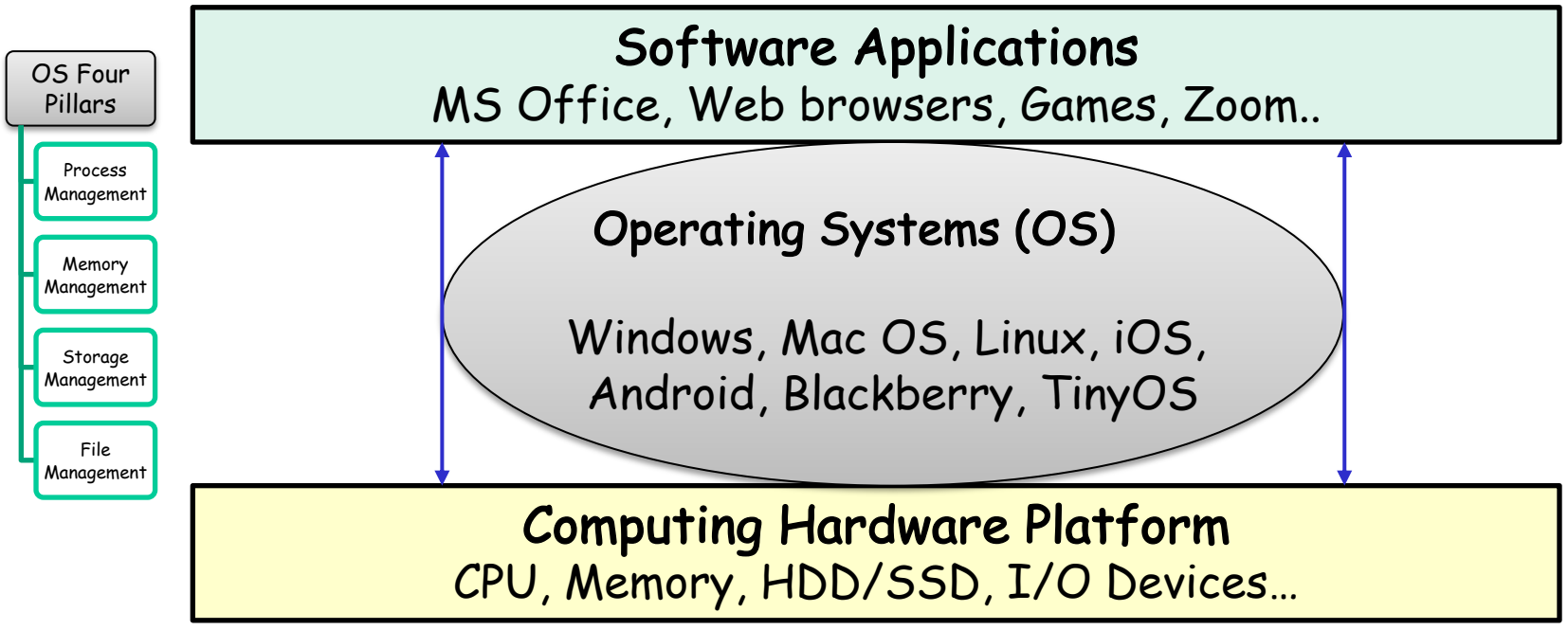
CS 3305A
Fall 2023

Operating Systems (OS) Introduction: A Historical Perspective

Lecture 1_b
Sept 11, 2023

Operating System (OS)

- What is an Operating Systems (OS)?
  - The software layer between user applications and hardware
  - Manages / Optimizes the hardware resources



Operating System (OS)

- Brief History of OS:
  - First generation: 1945 – 1955
    - Vacuum tubes and plug boards
  - Second generation: 1955 – 1965
    - Transistors, batch systems
  - Third generation: 1965 – 1980
    - Integrated circuits, Multiprogramming
  - Fourth generation and beyond: 1980 – present
    - Very Large Scale Integration (VLSI), Personal Computers, Advanced ultra-high-speed communication networks.

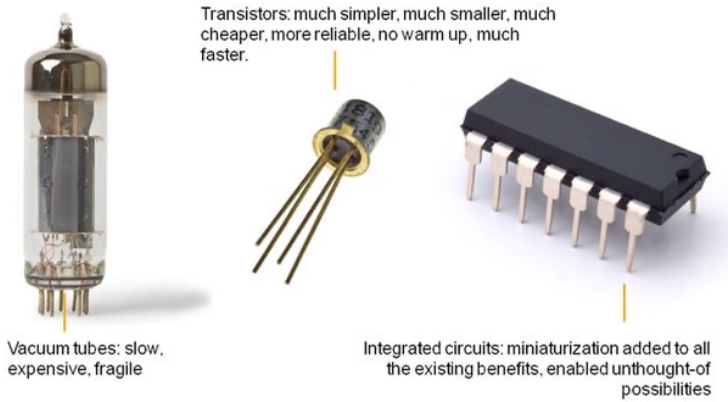
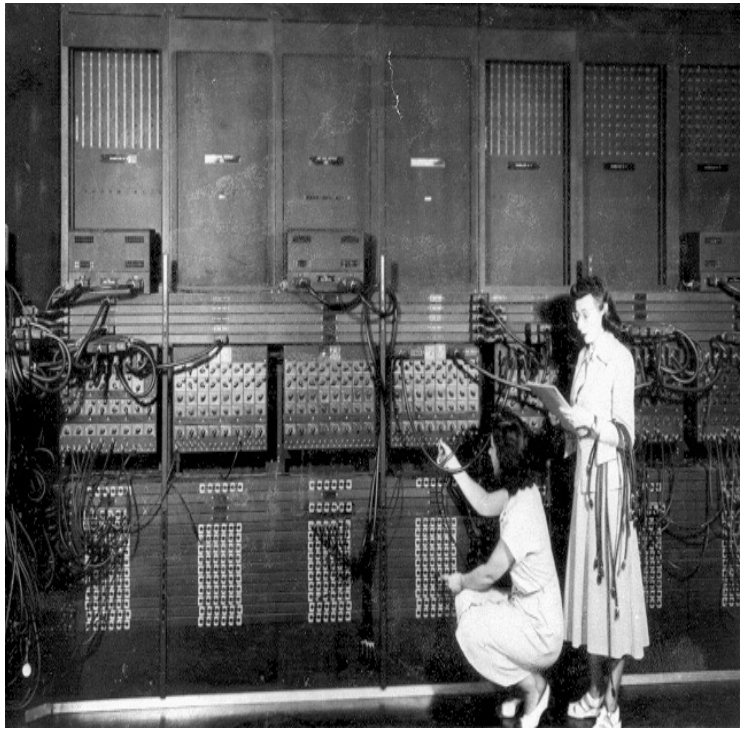


image source: https://www.quora.com/How-does-a-transistor-help-in-reducing-the-size-of-an-electronic-device

First Generation (1945-1955): Direct Input

- Run one job at a time
  - Enter it into the computer (might require rewiring)
  - Run it
  - Record the results
- Programming languages were unheard of
- Assembly languages were not known
- No reason for an OS



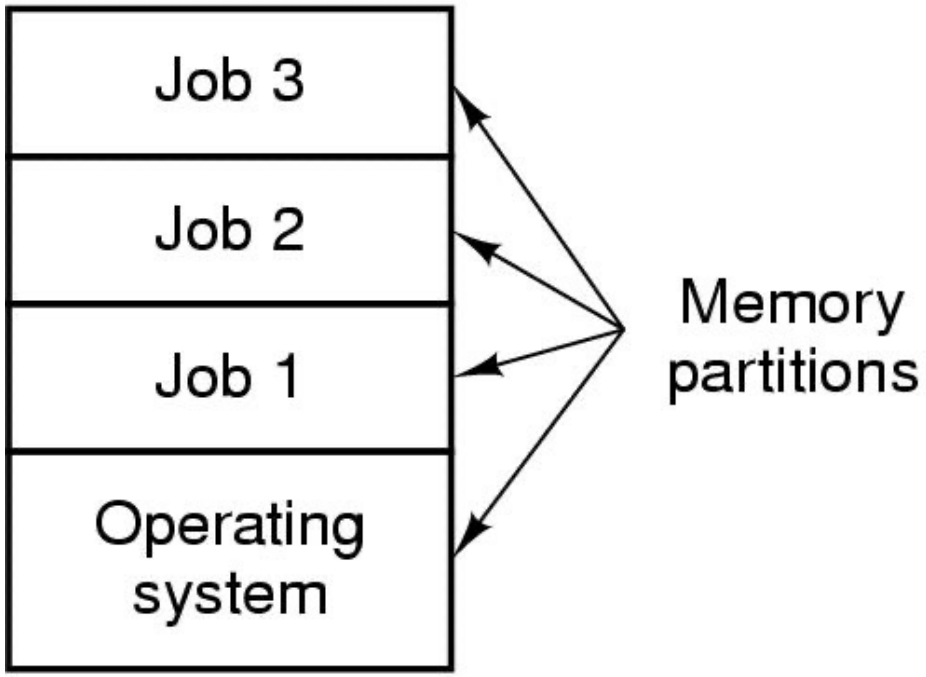
Eniac, 1945

Image source: https://www.datacenterdynamics.com/en/analysis/eniac-at-75-a-pioneer-of-computing/

Second Generation (1955-1965): Batch Systems

- Programs were written on paper in either FORTRAN or assembly
- Programs encoded on punched cards
- The card deck was taken down to the input room and handed to one of the operators
- Programmer would come back later for results
- A first example of an OS for this generation is IBM's OS/360
- Considered a landmark operating system

Third Generation (1965-1980): Multiprogramming



- Development of Integrated Circuits (IC)
- Multiple jobs in memory
- Multiprogramming allowed several jobs to be active at one time

Fourth Generation (1980- present): Personal Computers

- Personal computing changed the computing industry
- Intel came out with the 8080 in 1974
- Lots of companies produced complete systems
- The Control Program for Microcomputers (CP/M) from Digital Research Inc. was used as OS

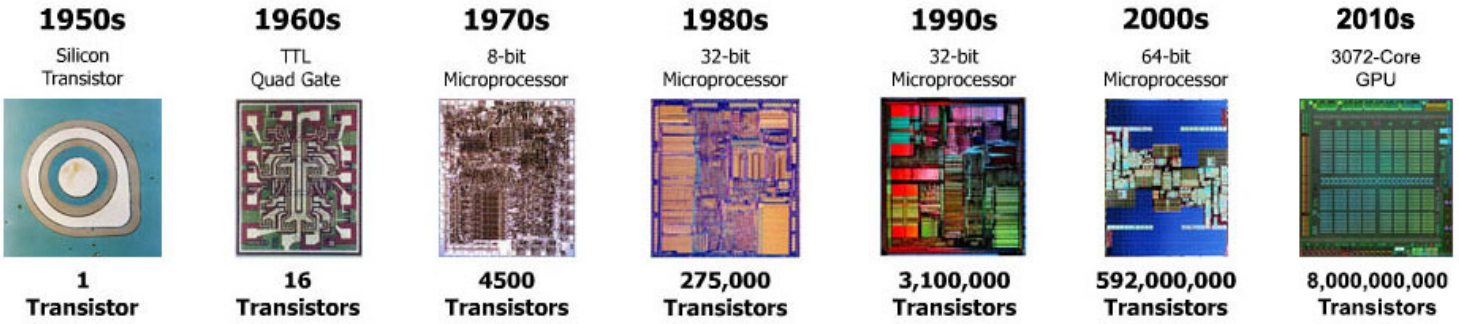


Image source: https://www.computerhistory.org/siliconengine/

Fourth Generation (1980- present): Personal Computers

- Now came the 16-bit systems with Intel's 8086
- IBM designed the IBM PC
- IBM needed an OS for their PCs; CP/M behind schedule
- IBM went to Bill Gates and Mr. Gates offered an OS called **DOS** (Disk Operating System)
- DOS came from a company called Microsoft
- The new OS was renamed MS-DOS

Fourth Generation (1980- present): Personal Computers

- Up to this point all operating systems were command line
- Steve Jobs saw the possibility of a user-friendly PC
- This led to the Apple Macintosh in 1984
- Used Motorola's 16-bit 68000
- Of course it had the first GUI
- BTW, Apple only started using Intel processors in 2006

What about UNIX?

- Let's go back to the late 60's
- MULTICS was the first large timesharing OS developed jointly between MIT, General Electric (computing division eventually sold to Honeywell) and Bell Labs
- But,…. OS was written in a language called PL/1
- Not a lot of these got sold but they were very popular with those who bought. Last one was put out of commission in 2000

What about UNIX?

- One of the computer scientists at Bell Labs who worked on MULTICS was Ken Thompson
- Ken and few others decided to write a one-user version of MULTICS in the C language. This became UNIX.
- This was open source which led to other versions: System V (AT&T) and BSD (Berkeley Software Distribution)
- A computer scientist, Andrew Tanenbaum created a new OS (using C) that would be compatible with UNIX but completely different on the inside - This was MINIX or mini-Unix; released in 1987
  - Better structured than UNIX
  - MINIX-2 released in 1997
  - MINIX-3 released in 2006

LINUX

- After MINIX was released a newsgroup, *comp.os.minix* was formed.
- Quickly had 40,000 subscribers who wanted to add stuff
- One was a Finnish student named Linus Torvalds
- Torvalds wanted to add features which led to other things
- Eventually this led to his own OS called Linux (August 1991)
- Linux is a notable success of the open source movement

Summary

- We have discussed what is an operating system
- We have looked at a brief history of operating systems
- Now it is time to learn more about the insides of an operating system

- Next Lecture: Child and Parent processes