

CPSC 457

Introduction, History, Basic concepts

Contains slides from Mea Wang, Andrew Tanenbaum and Herbert Bos

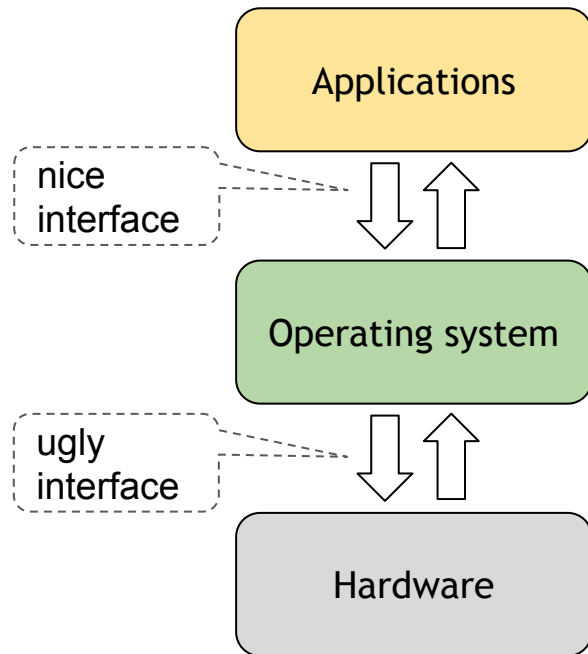
- attempt to define OS
- brief history of OSes
- Chapter 1 of the book

Defining an OS

- no 'precise' definition
- it is a layer of software that provides application programs with a better, simpler, cleaner, model of the computer (hardware)
- it manages all resources
- it is the software that runs all the time (mostly in kernel mode)
- all other applications need it in order to run
- we can look at an OS from two different perspectives:
 - as an **extended machine**
 - as a **resource manager**

OS - an extended machine

- abstraction/generalization is key to managing complexity
- first we define and implement the abstractions
 - eg. files - working with files is easier than dealing with raw disk space
- then we use these abstractions to write applications and solve problems
 - e.g. file editor, image viewer
- the abstractions allow us to mask the ugly hardware and provide nice interfaces instead
- many OS concepts are abstractions
- some similarity to OO (pure virtual class, interface)



OS - a resource manager

- resource allocator
 - multiplex resources
 - multiplex in time
 - eg. 3 programs trying to print to the same printer (spooling)
 - eg. 2 programs trying to run at the same time (scheduling)
 - multiplex in space
 - eg. 2 programs allocating memory
 - manage conflicts among multiple programs or users
- control program
 - controls execution of programs
 - prevent errors and improper use
 - OS is responsible for handling all interrupts and traps

- When was the first OS invented?
 - 1930s
 - 1950s
 - 1970s
 - 1990s

History of operating systems

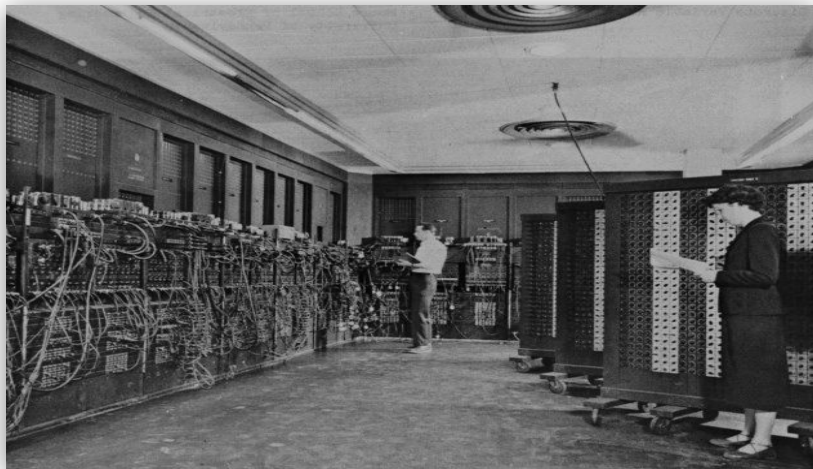
- When was the first OS invented?

- 1930s
- **1950s**
- 1970s
- 1990s

- OSes often developed by customers instead of HW manufacturers
- IBM developed first OS in the 60's

History of operating systems

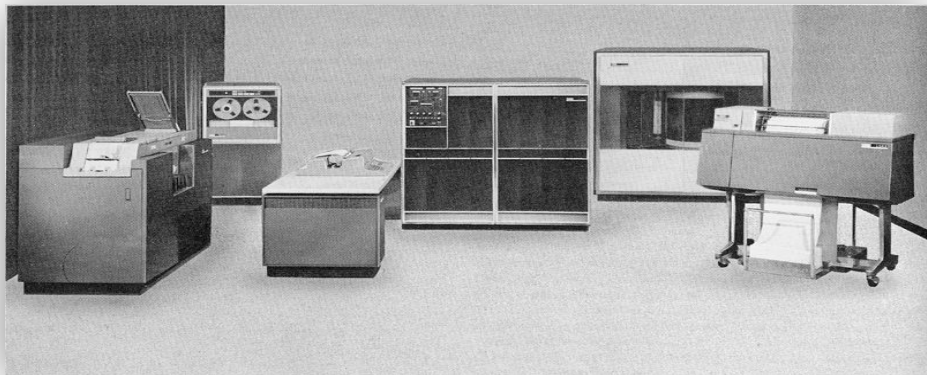
- 1st generation (1945 - 1955): Vacuum Tubes and no OS



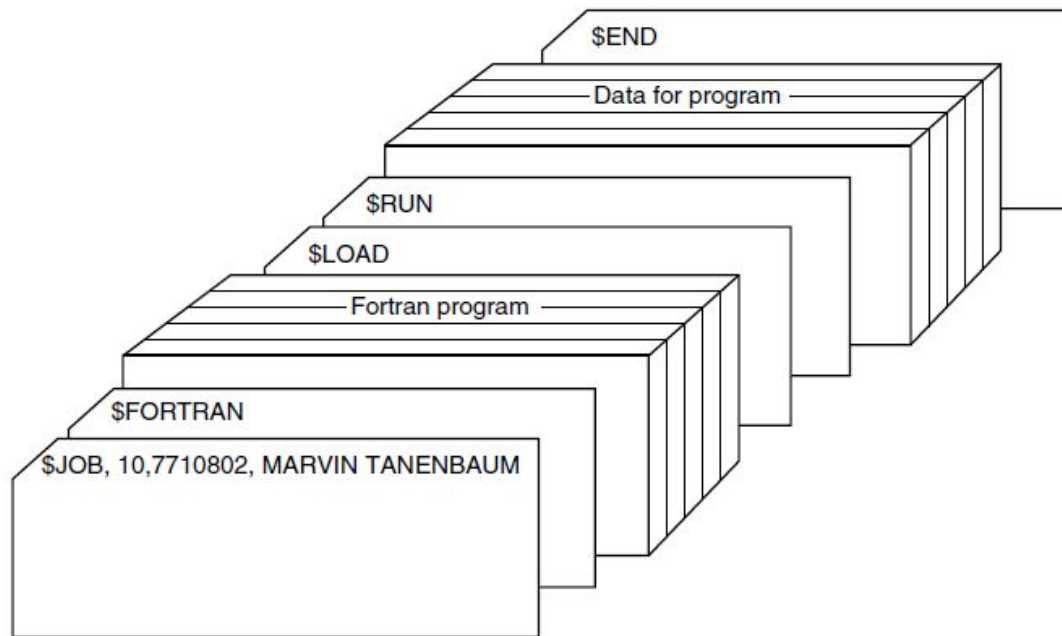
- programs hard-wired, later on punch cards
- written in machine language
- HW with complicated wiring
- designers = builders = programmers
- only basic numerical calculations
- one user/application at a time
- no OS (no need)

History of operating systems

- 2nd generation (1955 - 1965): Transistors and Batch Systems
 - mainframe computers
 - FORTRAN & COBOL programs on punch cards
 - OSeS: FMS (Fortran Monitor System) and IBSYS (IBM's OS)
 - important concepts: **batch systems**

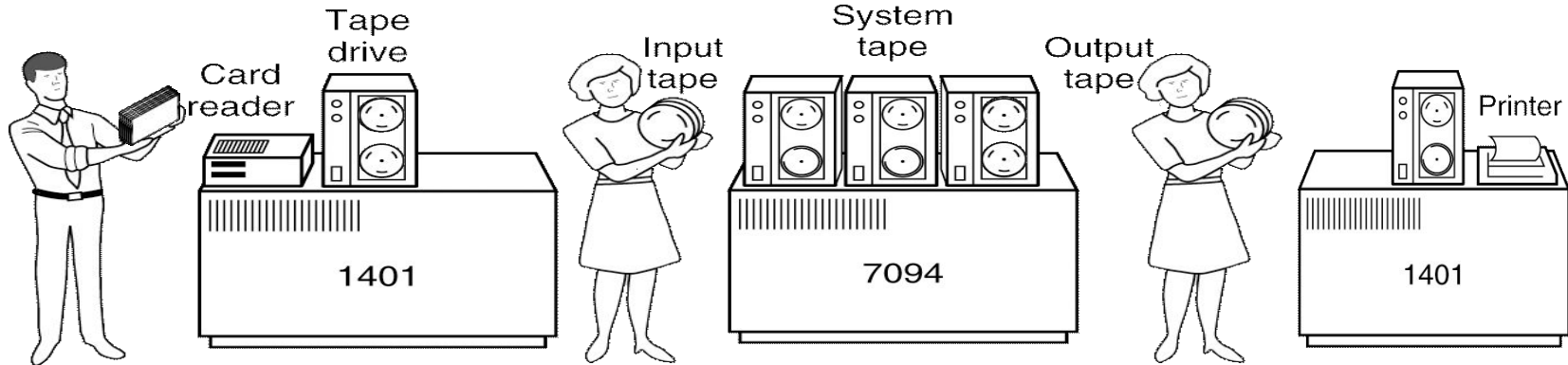
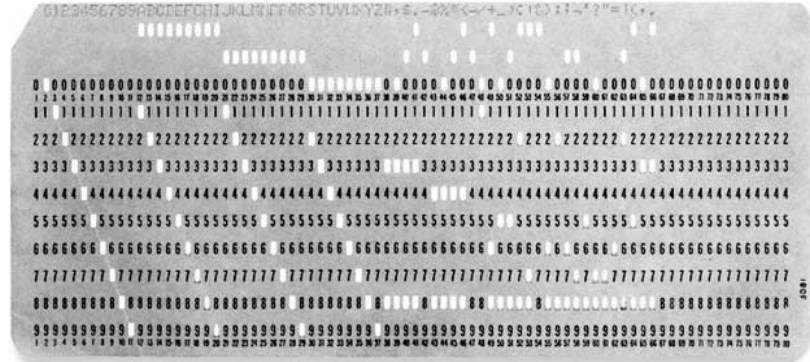


Batch systems



Structure of a typical FMS job

Batch systems

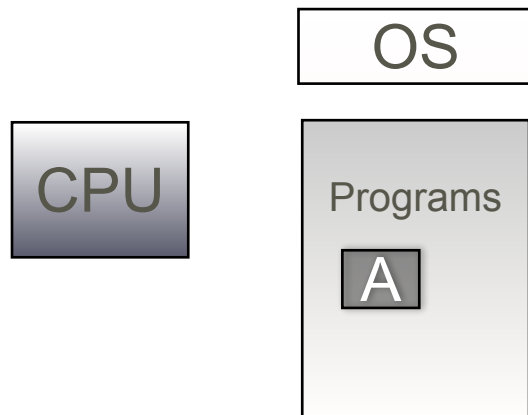


History of operating systems

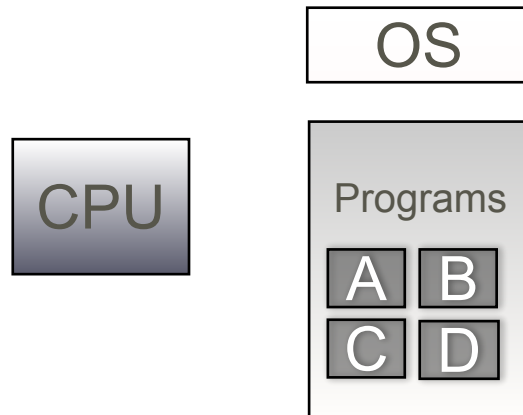
- 3rd generation (1965 - 1980): ICs and Multiprogramming
 - Uses ICs (Integrated Circuits)
 - OSeS: IBM OS/360, CTSS (by MIT), MULTICS (complicated, but influential), UNIX (inspired by Multics), and eventually Linux (90's)
 - Important concepts:
 - **multiprogramming**: a different job in each memory partition, CPU execute other jobs while waiting for the I/O of some jobs
 - **spooling** (Simultaneous Peripheral Operation On Line): read jobs from cards to disk, load jobs from disk automatically, no more tapes
 - **time-sharing**: multiple users using one computer simultaneously & interactively

Multiprogramming

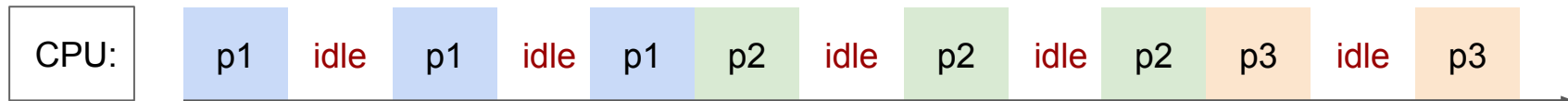
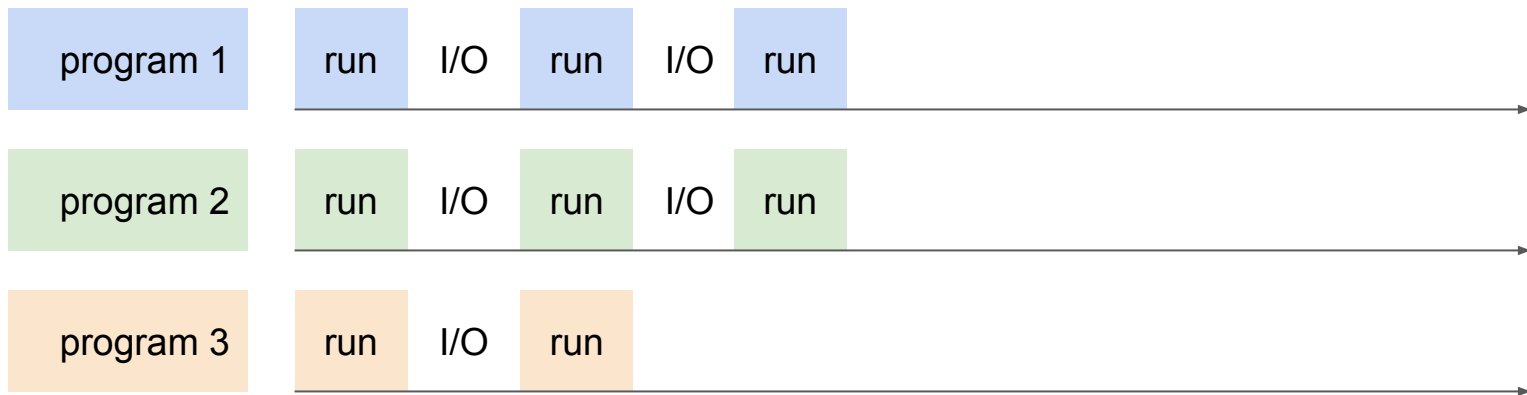
Single Program



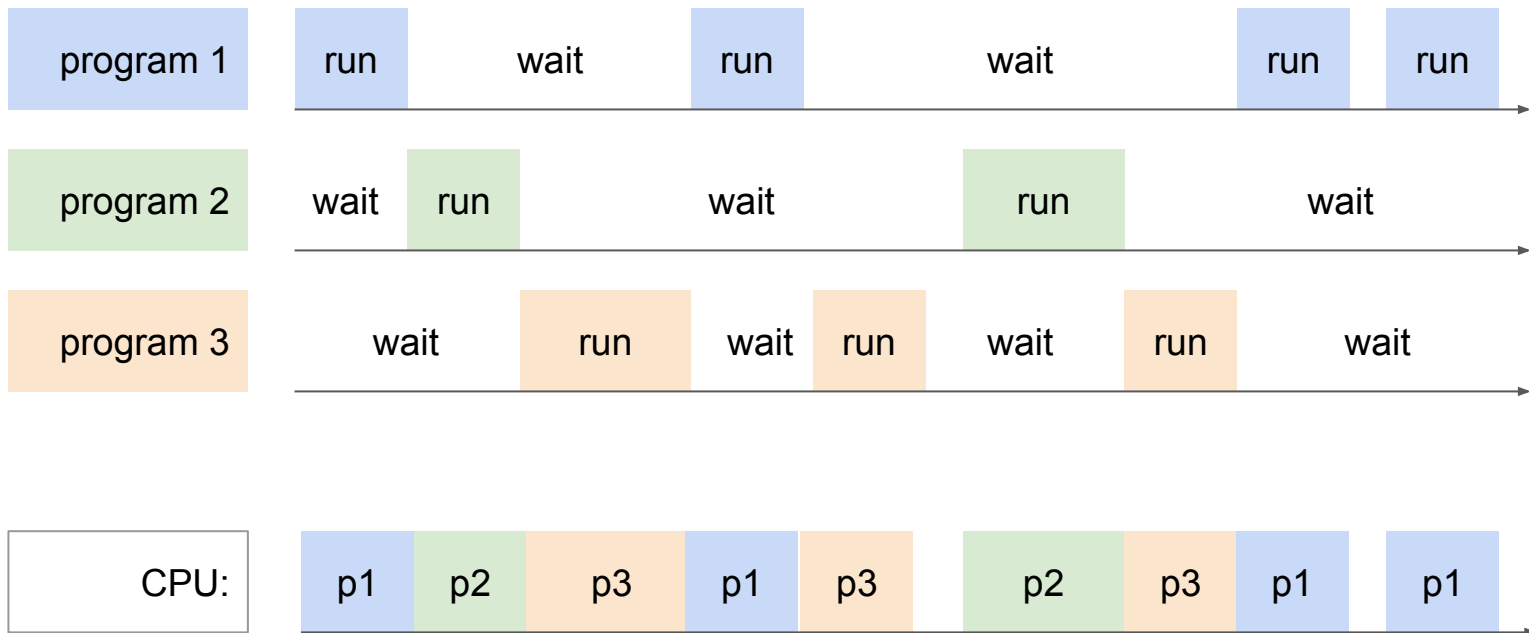
Multiprogramming



Running one program at a time

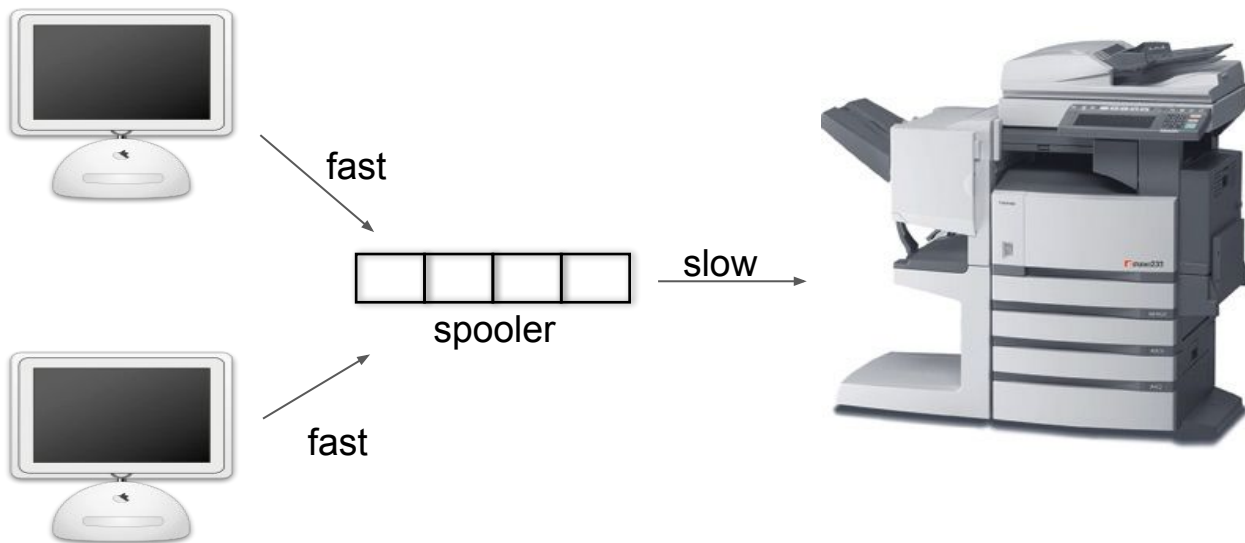


Multiprogramming



Spooling

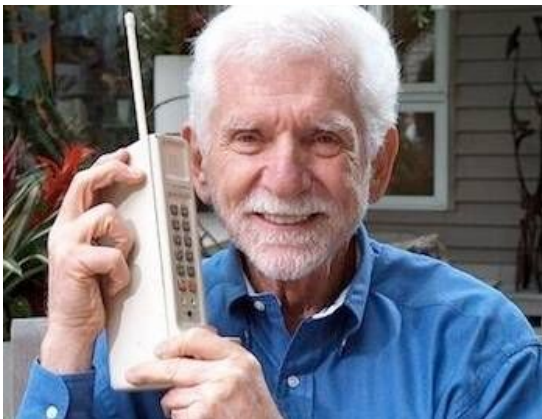
- spooling is typically used to deal with slow devices / peripherals, eg. printers:



- spooling can be used (somewhat) to deal with deadlocks in concurrent programming

History of operating systems

- 4th generation (1980 - present): personal computers
 - cheap mass-produced computers
 - user friendly shells on top of OS
 - Windows, Mac OS, Linux + GNOME / KDE
- 5th generation (1990 - present): mobile computers



History of operating systems



- Computer History Museum
 - <http://www.youtube.com/user/ComputerHistory>
 - <http://www.computerhistory.org>
 - <http://www.youtube.com/watch?v=qundvme1Tik>

Summary

- Define OS
 - An extended machine
 - A resource manager
- OS history
 - Batch systems
 - Multiprogramming
 - Spooling
 - Time sharing
- References:
 - 1.1 - 1.2, 1.4 (Modern Operating Systems)
 - 1.1 (Operating System Concepts)

Example question

- Which of the following concepts introduced interactive service for multiple users?
 - batch system
 - multiprogramming
 - spooling
 - timesharing

Questions?