Lecture-5

Topics:

- Classification of Operating systems.
- DOS,UNIX,LINUX

Evolution of OS

Operating system timeline

First generation: 1945 – 1955

Vacuum tubes

Plug boards

Second generation: 1955 – 1965

Transistors

Batch systems

Third generation: 1965 – 1980

Integrated circuits

Multiprogramming

Fourth generation: 1980 – present

Large scale integration

Personal computers

Next generation: ???

Systems connected by high-speed networks?

Wide area resource management?

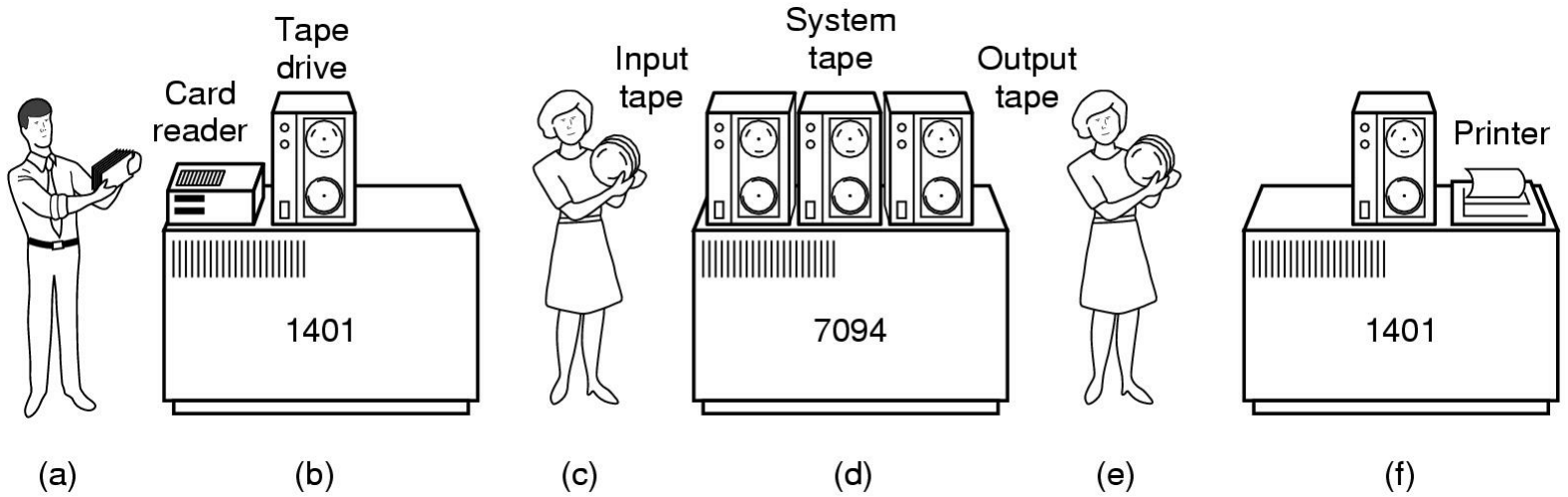
First generation: direct input

- **Run one job at a time**
  - Enter it into the computer (might require rewiring!)
  - Run it
  - Record the results

- **Problem: lots of wasted computer time!**
  - Computer was idle during first and last steps
  - Computers were ***very*** expensive!

- **Goal:** make better use of an expensive commodity: computer time

Second generation: batch systems

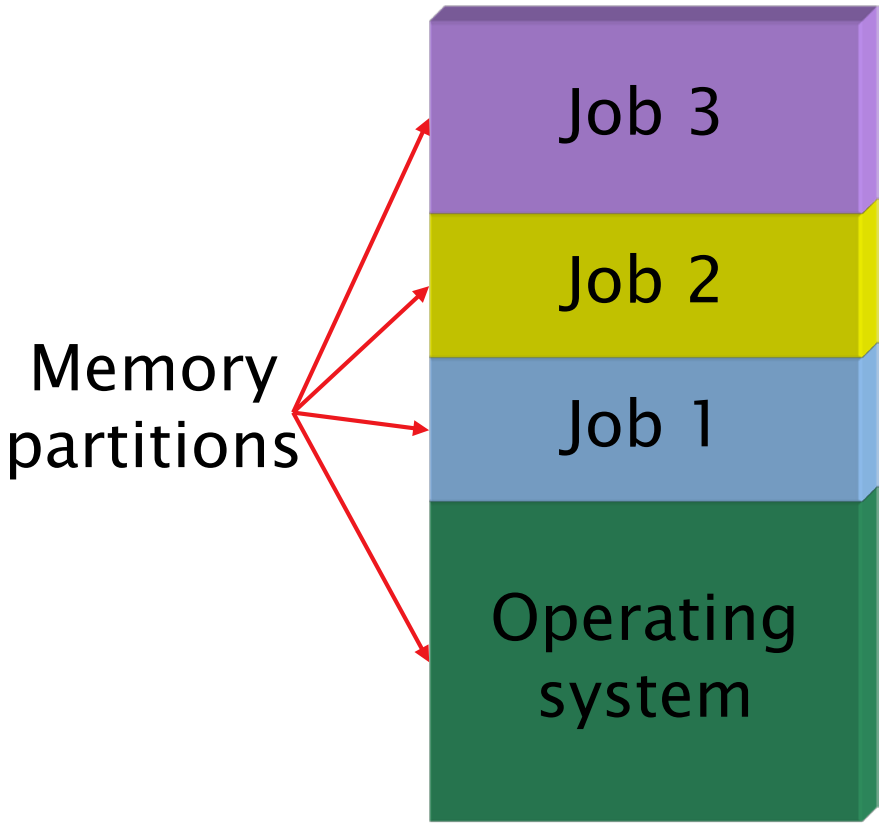


- Bring cards to 1401
- Read cards onto input tape
- Put input tape on 7094
- Perform the computation, writing results to output tape
- Put output tape on 1401, which prints output

Spooling

- Original batch systems used tape drives
- Later batch systems used disks for buffering
  - Operator read cards onto disk attached to the computer
  - Computer read jobs from disk
  - Computer wrote job results to disk
  - Operator directed that job results be printed from disk
- Disks enabled simultaneous peripheral operation on-line (spooling)
  - Computer overlapped I/O of one job with execution of another
  - Better utilization of the expensive CPU
  - Still only one job active at any given time

Third generation: multiprogramming

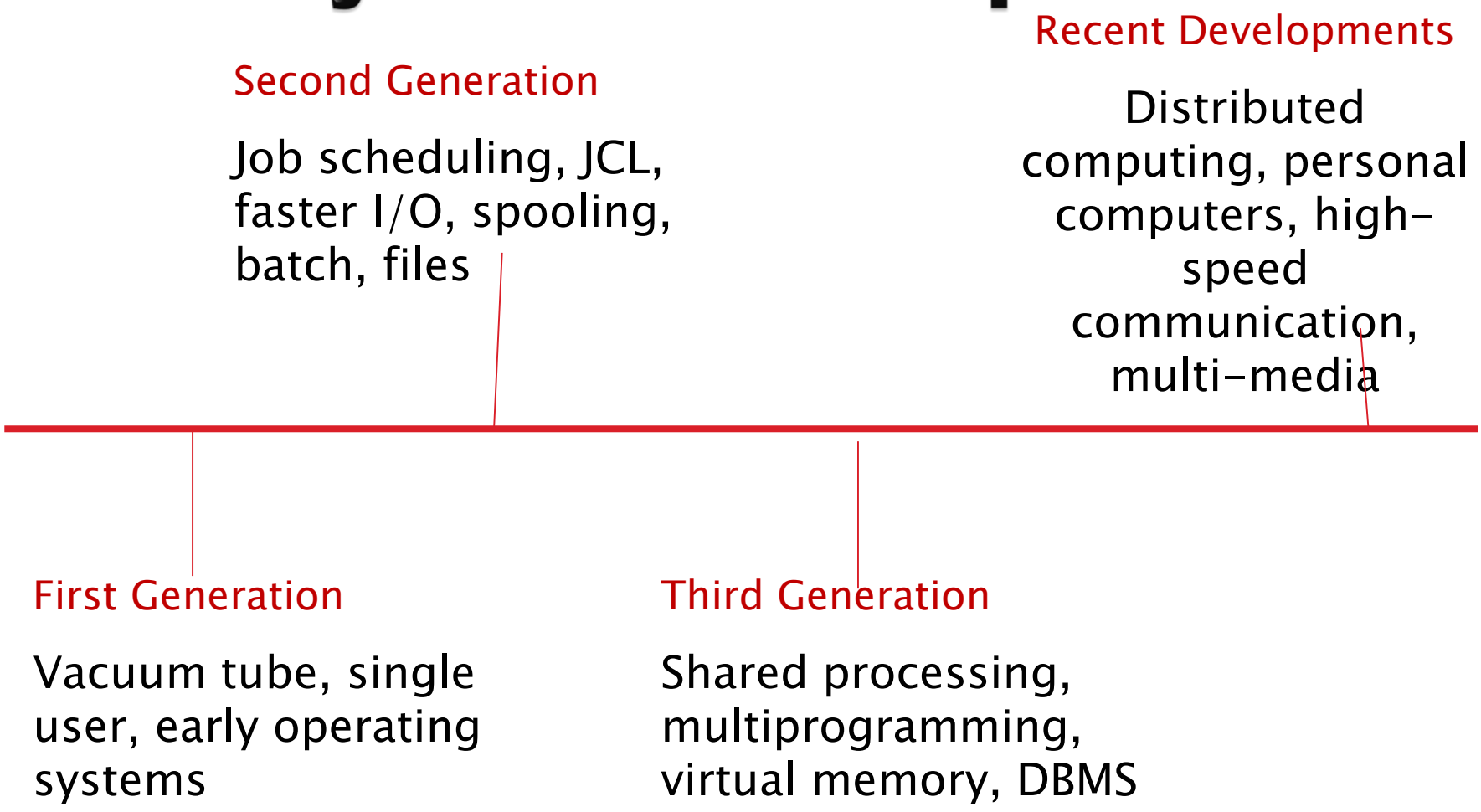


- Multiple jobs in memory
  - Protected from one another
- Operating system protected from each job as well
- Resources (time, hardware) split between jobs
- Still not interactive
  - User submits job
  - Computer runs it
  - User gets results minutes (hours, days) later

Timesharing

- Multiprogramming allowed several jobs to be active at one time
  - Initially used for batch systems
  - Cheaper hardware terminals -> interactive use
- Computer use got much cheaper and easier
  - No more “priesthood”
  - Quick turnaround meant quick fixes for problems

Brief History of Operating Systems Development



Operating system classification

Operating Systems can be classified as:

- *GUI:* Graphical User Interface operating systems are operating systems that have the capability of using a mouse and are graphical
- *Multi user:* allows multiple users to utilize the computer and run programs at the same time
- *Multi processing*: allows multiple processors to be utilized
- *Multi tasking*: allows multiple software processes to be run at the same time
- *Multi threading:* allows different parts of a software program to run concurrently

Major OS's

- Unix
- Windows
- Linux
- Mac OS
- Embedded OS's (Android, iOS)
- Real-Time OS's

Which is the BEST OS??

- NONE are “best”

- Consumer POV
  - Buy whatever turns you on
- Professional POV
  - Cost, tasks, maintenance, support, legacy issues, popularity (network effects), etc.

A Little History – Mainframes

- Mainframes – from 1950

1. Earliest computers had no OS at all!
2. Proprietary (custom) OS's
3. VMX
4. Early Unix versions
5. Unix was invented at AT&T Bell Labs

A Little History – Unix

- Mainframes were often *shared* by many users
- A *multiuser OS* was needed
- Unix arose to fill this need
  - **IBM, Digital Equipment Corporation (DEC), Honeywell, Hewlett Packard**
  - **Each had their own proprietary version on Unix**

A Little History – Early Personal Computers

- Microcomputers based on the first integrated CPU chips ~ late 1970's
  - MITS **Altair** 8800 (MS's big break)
  - Commodore 64
  - Atari ST
  - TRS 80
  - Apple 2 (Apple 1 was a kit)
  - Each machine had their own **proprietary OS** (or none at all for the Altair!)

A Little History – PC's n Macs

- PC's and Macs – 1980's
  - IBM PC
    - IBM hired MS to supply DOS (A basic **command-line OS**)
    - MS *bought* DOS from another party
  - Apple Macintosh
    - Apple wrote there own **GUI OS**
    - Apple *borrowed* the idea from Xerox PARC

A Little History – Windows OS

- IBM PC needed a GUI
  - IBM hired MS to write OS2 for PS2 (not Playstation!)
  - MS wrote Windows at the same time
  - Guess who won?

  - Why did MS win?
    - DOS was a “cash cow” for MS
    - Windows had backward compatibility w DOS
    - PC hardware was cheaper than Mac HW

What is Linux???

- Linux is based on a free source code version of UNIX
- This source is compiled to Intel CPU machine code
- Commercial versions are available

- Internal SW architecture is circa 1960's
  (A multi-user OS for a single-user machine)

Why is Linux Important

Three Main Reasons

1) Academia

   CS discipline was built with UNIX systems

2) Replacement of legacy hardware

   Linux on PC is cheaper than “Big Iron”

3) Internet plumbing

   Is all Unix-based, will not be re-done

Why is Linux Important
The Internet

- Internet routers and other hardware where originally run on old expensive Unix machines
- Linux is replacing these machines because it runs on cheaper hardware
- Learn Linux if you plan to study computing more