Appendix

History of Computer Generations

- **Pre-computing generation 1792 - 1871**
  - Charles Babbage's "Analytical Engine"
  - Purely mechanical
  - Designed, but never actually built
    - Required high-precision gears/cogs that didn't exist yet
  - A man before his time
    - When this works, we'll need software!
    - First programming language
    - World's first programmer:

        Ada Lovelace

History of Computer Generations

- Pre-computing generation 1792 – 1871
- First generation 1945 – 1955
  - Vacuum tubes, relays, plug boards
  - Seconds per operation!
    - Focus on numerical calculations
  - No programming language
    - Everything done using pure machine language or wiring electrical circuits!
  - No operating system
    - Sign up for your time slot!
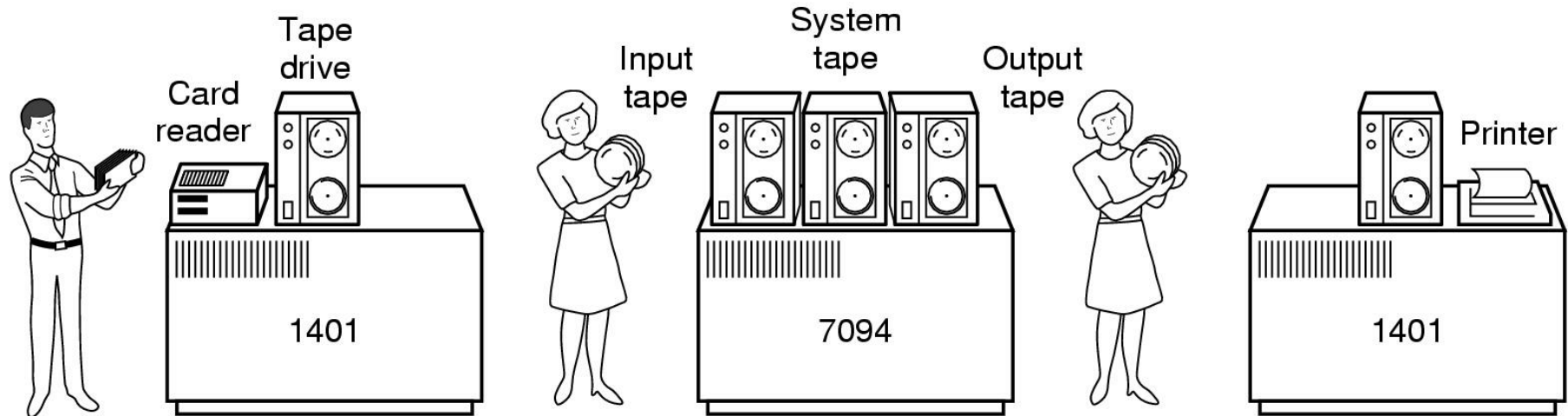 - Progress: Punch cards!

History of Computer Generations

- Pre-computing generation 1792 – 1871
- First generation 1945 – 1955
- Second generation 1955 - 1965
  - Transistors, mainframes
  - Large human component
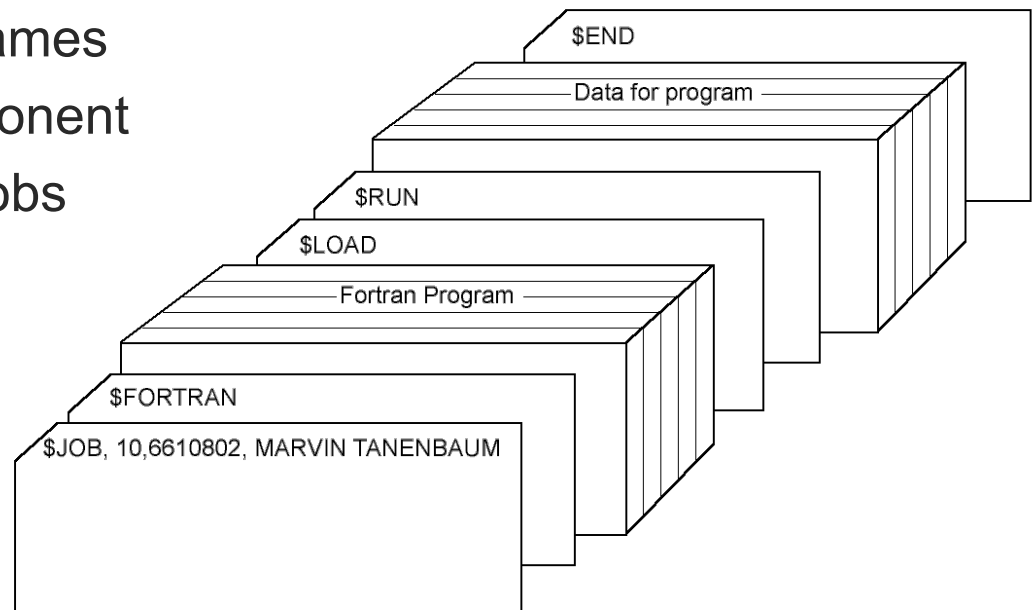
History of Operating Systems

- Problem: a lot of time wasted by operators walking around machine room

- One solution: An early "batch system" by IBM
  - bring cards to 1401
  - read cards to tape
  - put tape on 7094 which does computing
  - put tape on 1401 which prints output

History of Computer Generations

- Pre-computing generation 1792 – 1871

- First generation 1945 – 1955

- Second generation 1955 - 1965
  - Transistors, mainframes
  - Large human component
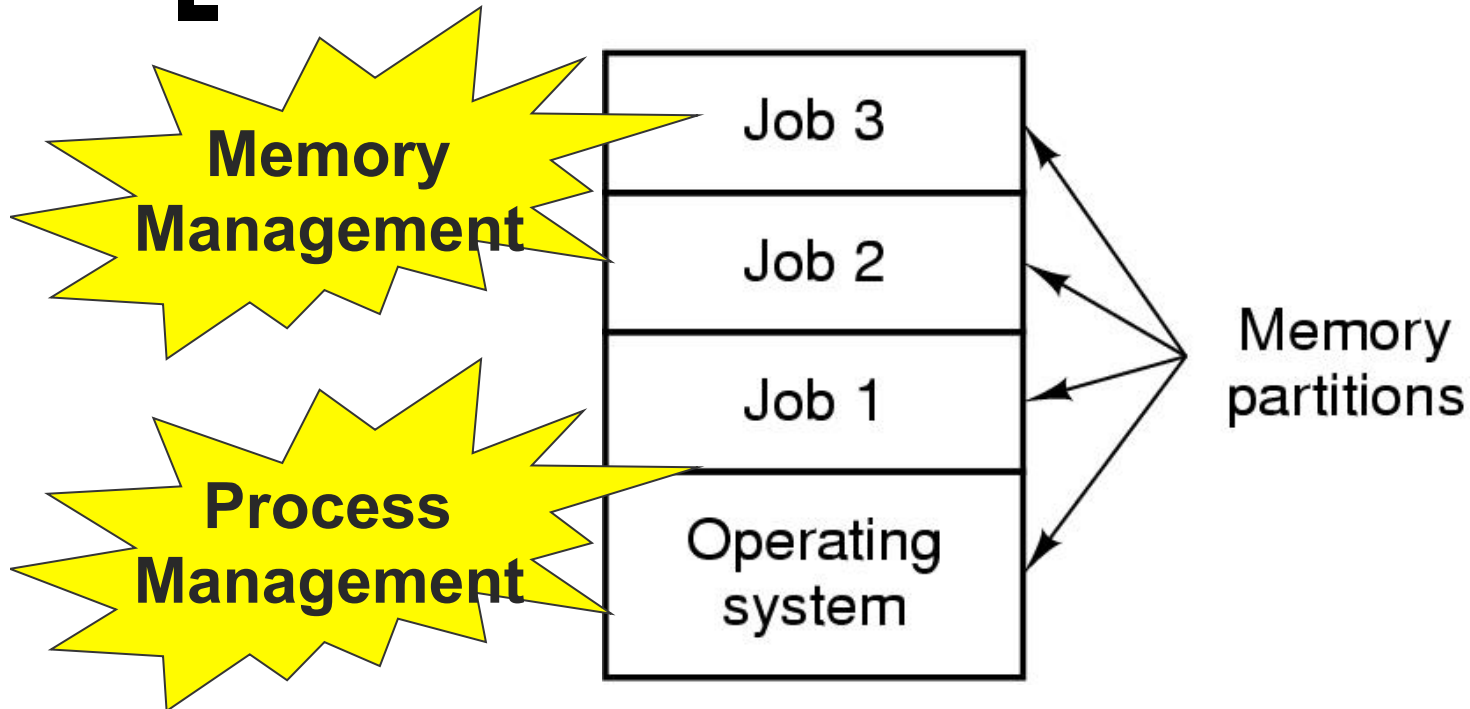 - Solution: Batched jobs

History of Computer Generations

- Pre-computing generation 1792 – 1871
- First generation 1945 – 1955
- Second generation 1955 – 1965
- Third generation 1965 – 1980
  - Integrated circuits and multiprogramming
  - IBM's New model: all software and OS must work on all platforms
    - A beast!
  - Progress: Multiprogramming
    - Keep the CPU busy

History of Operating Systems

Memory Management

Process Management

| Job 3 |
| Job 2 |
| Job 1 |
| Operating system |

Memory partitions

- Multiprogramming/timesharing system
  - Three jobs in memory – 3rd generation

History of Computer Generations

- Pre-computing generation 1792 – 1871
- First generation 1945 – 1955
- Second generation 1955 – 1965
- Third generation 1965 – 1980
  - Integrated circuits and multiprogramming
  - IBM's New model: all software and OS must work on all platforms
  - Progress: Multiprogramming and timesharing
  - Progress: Spooling
    - Always have something ready to run
  - MULTICS + minicomputers == UNIX!

History of Computer Generations

- Pre-computing generation 1792 – 1871
- First generation 1945 – 1955
- Second generation 1955 – 1965
- Third generation 1965 – 1980
- Fourth generation 1980 – present
  - Personal computers
  - Multi-processors
  - Phones
  - …