ADVANCED OPERATING SYSTEMS

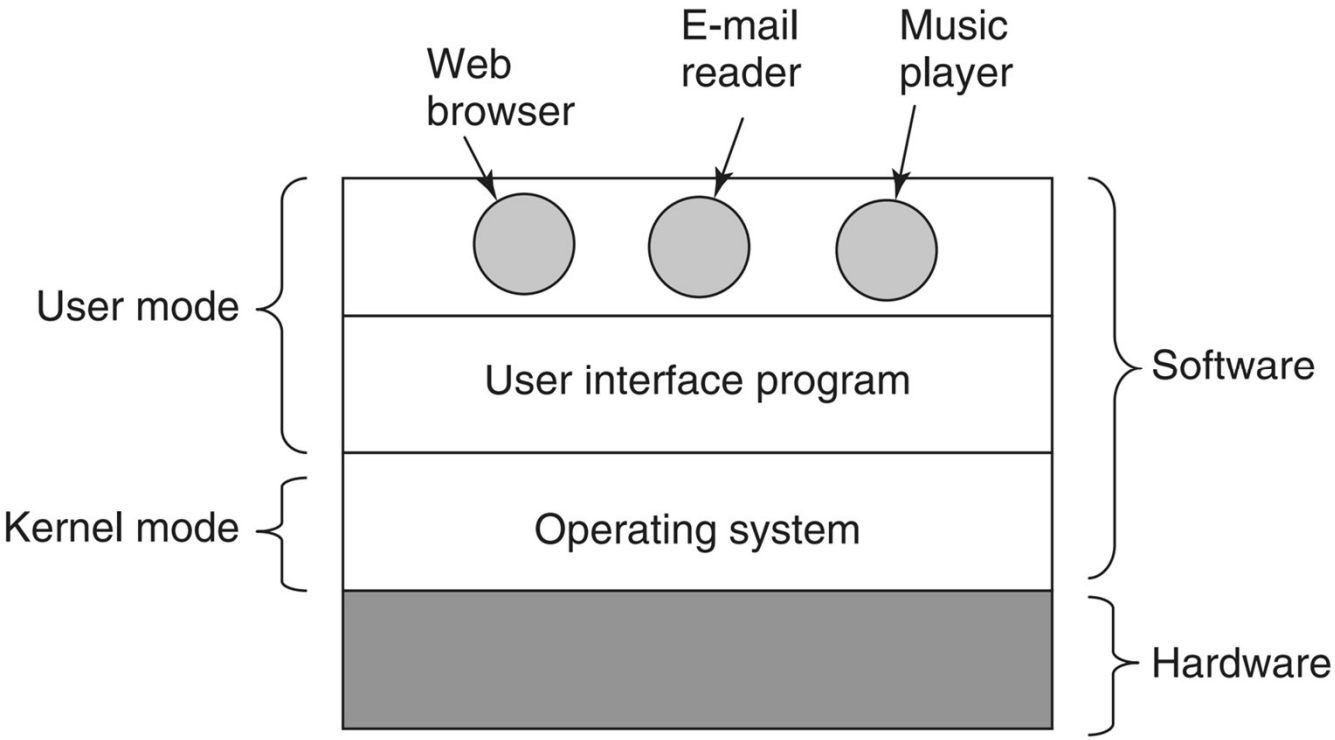
References

- Modern Operating System, A.S.Tanenbaum, 4th Edition, Prentice Hall

Chapter 1

INTRODUCTION

Introduction



- A computer system consists of
  - hardware
  - system programs
  - application programs

What is an Operating System?

- It is an extended machine
  - Hides the messy details which must be performed
  - Presents user with an abstraction, easier to use

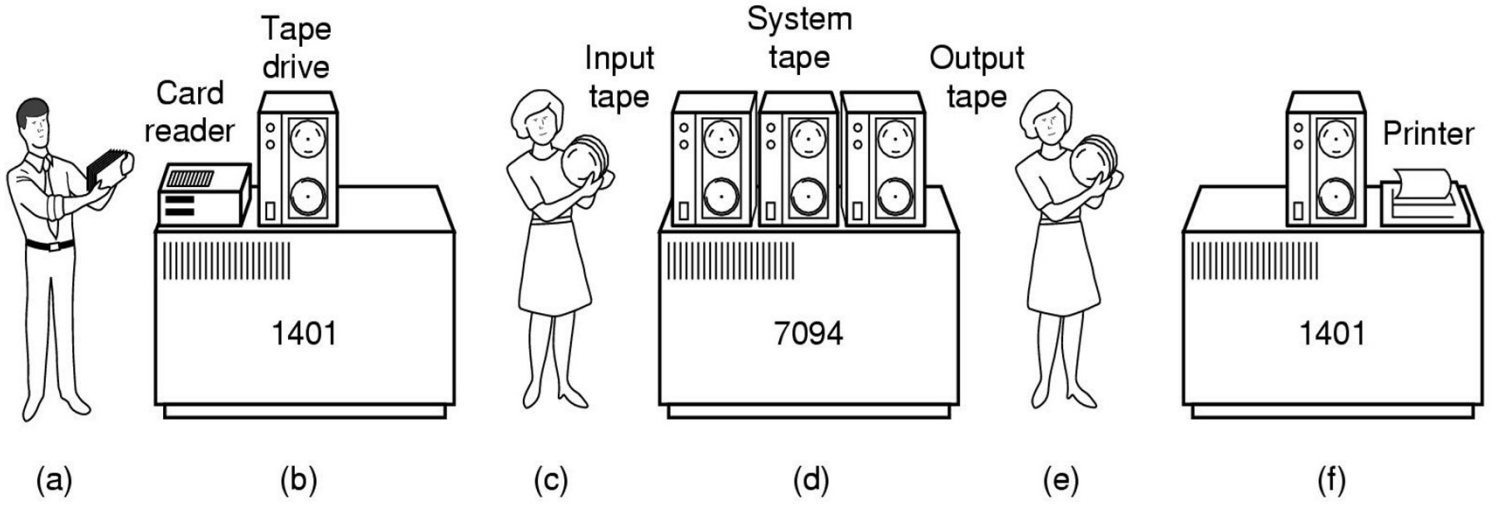
- It is a resource manager
  - Each program gets time with the resource
  - Each program gets space on the resource

History of Operating Systems (1)

- First generation 1945 - 1955
  - vacuum tubes, plug boards
- Second generation 1955 - 1965
  - transistors, batch systems
- Third generation 1965 – 1980
  - ICs and multiprogramming
- Fourth generation 1980 – present
  - personal computers
- Fifth Generation (1990–Present)
  - Mobile Computers

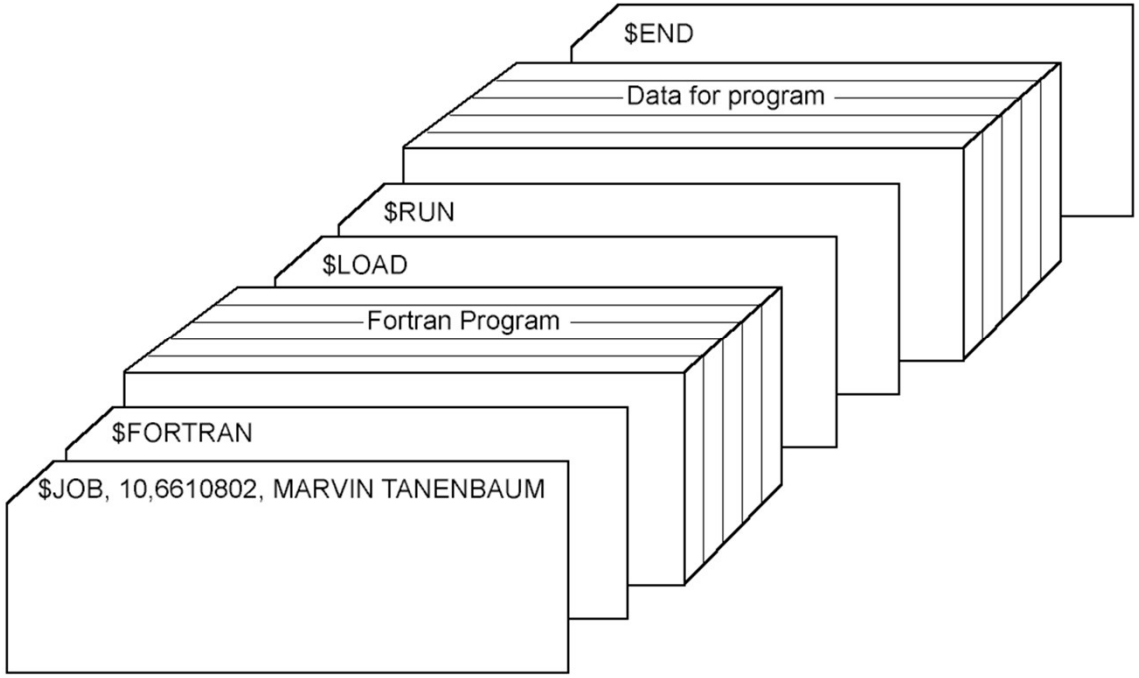
History of Operating Systems (2)

- Early batch system
  - bring cards to 1401
  - read cards to tape
  - put tape on 7094 which does computing
  - put tape on 1401 which prints output



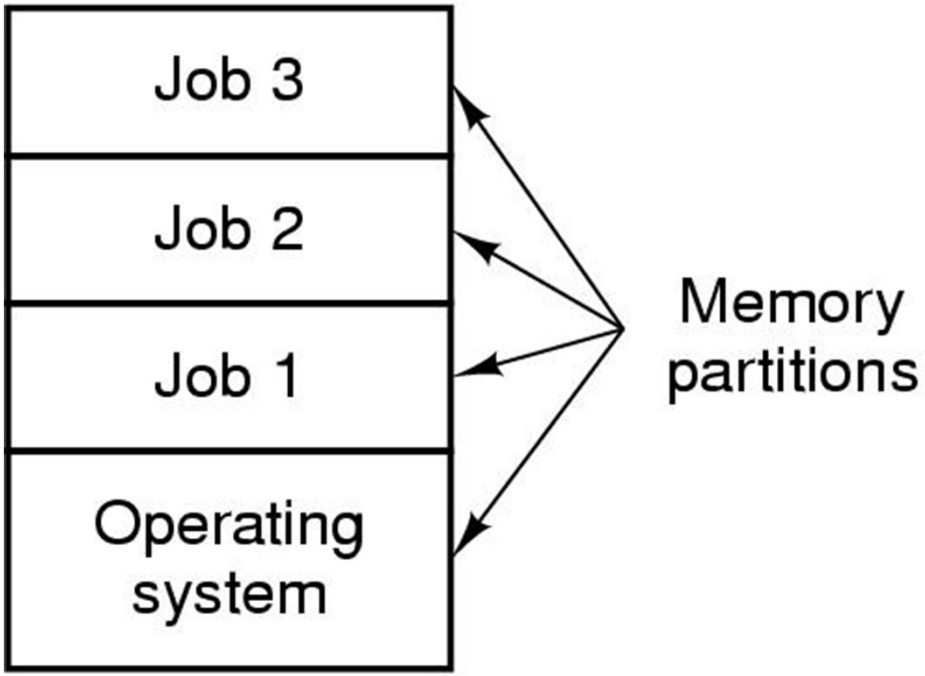
History of Operating Systems (3)

- Structure of a typical FMS job – 2nd generation



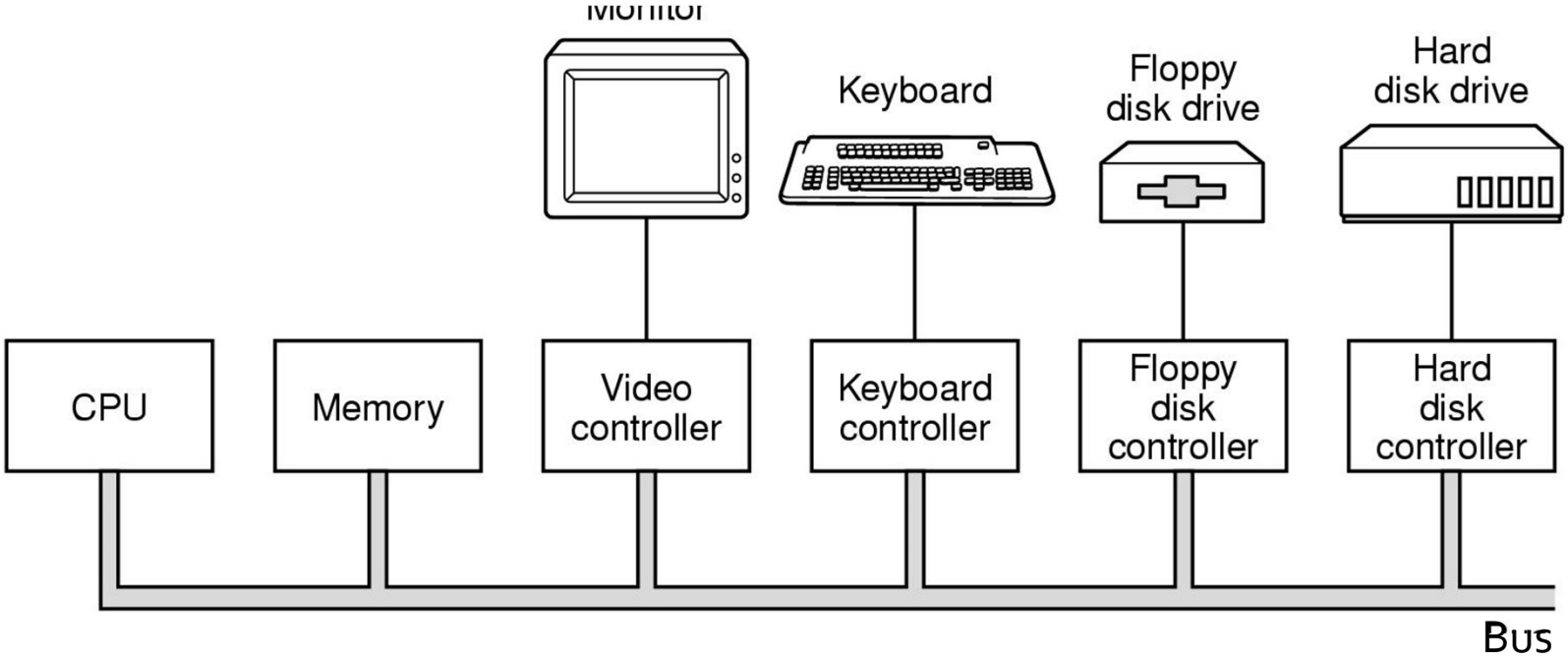
History of Operating Systems (4)

- Multiprogramming system
  - three jobs in memory – 3rd generation



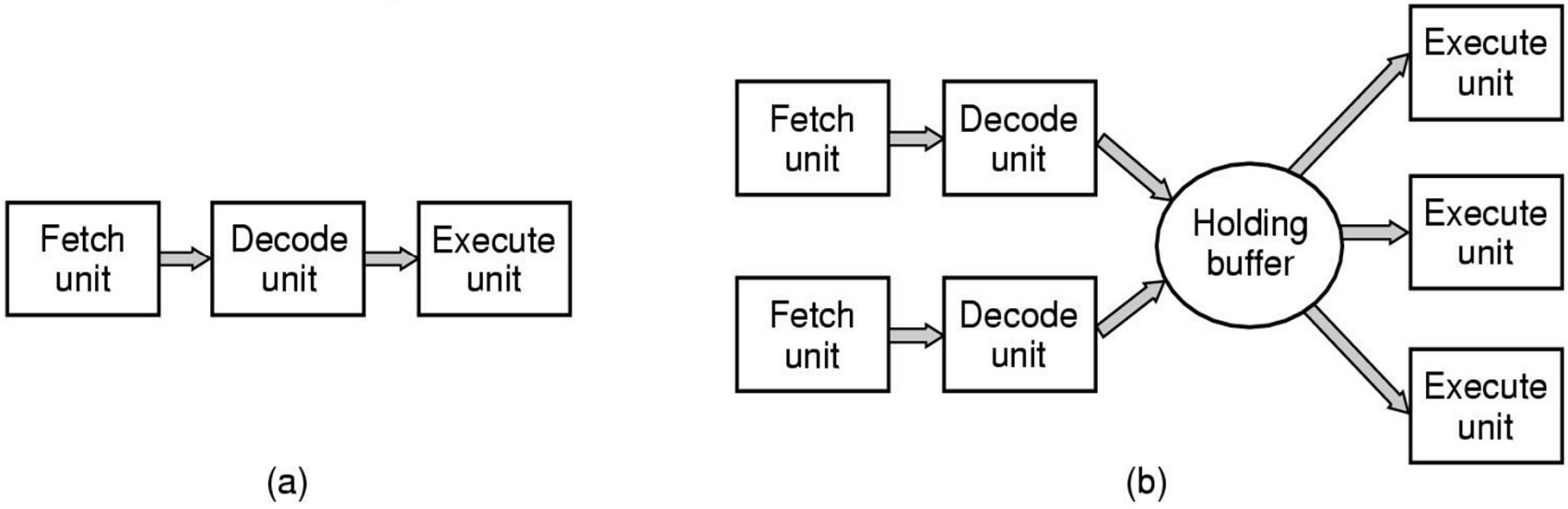
Computer Hardware Review (1)

- Components of a simple personal computer



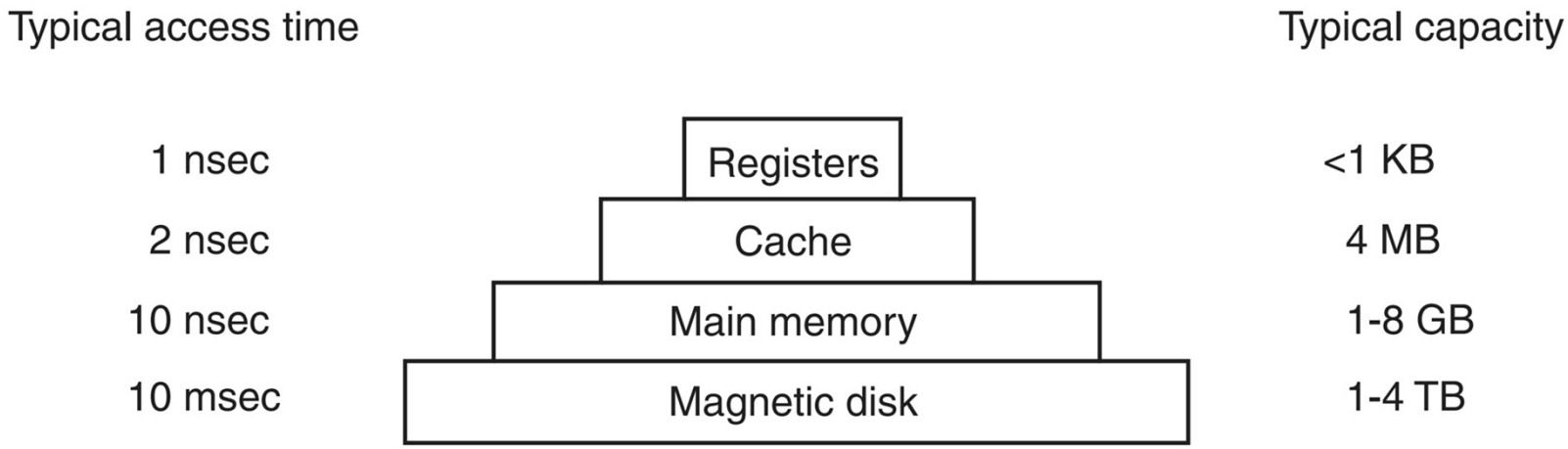
Computer Hardware Review (2)

- Processors
  - (a) A three-stage pipeline
  - (b) A superscalar CPU



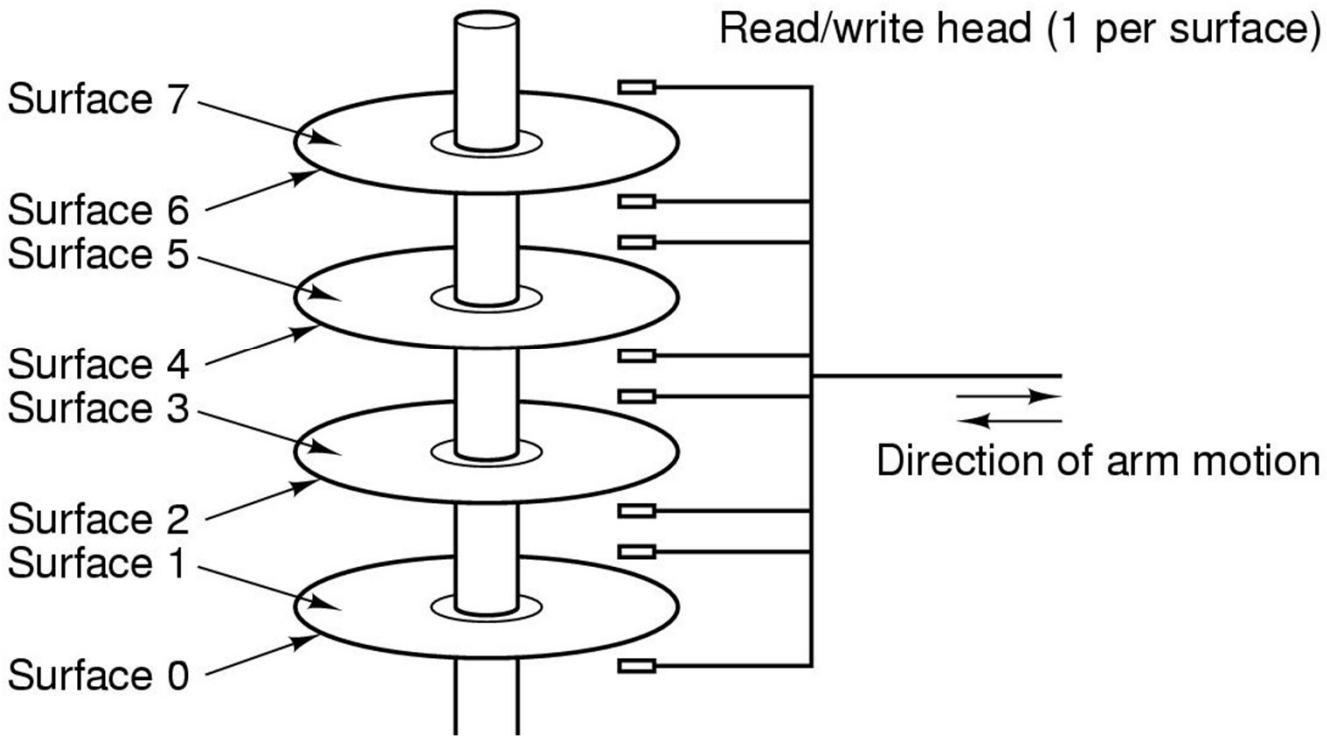
Computer Hardware Review (3)

- Typical memory hierarchy
  - numbers shown are rough approximations



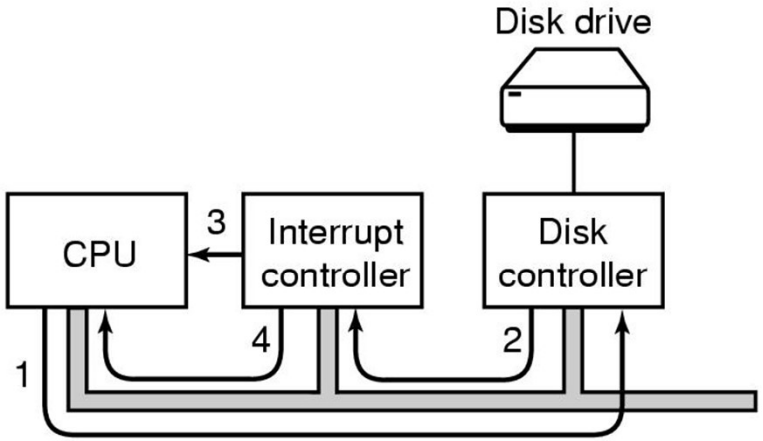
Computer Hardware Review (4)

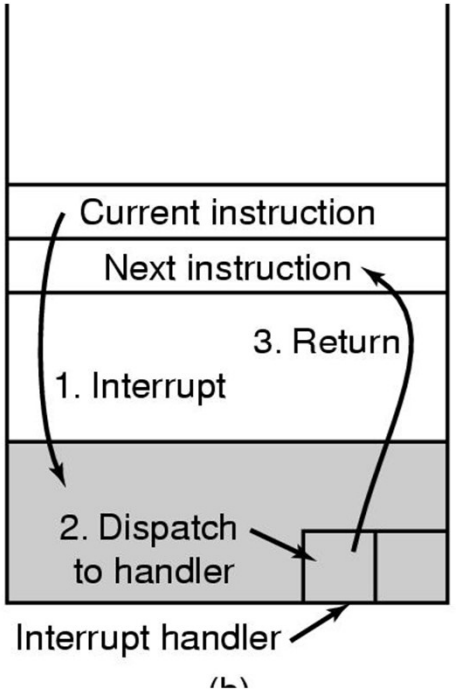
- Structure of a disk drive



Computer Hardware Review (5)

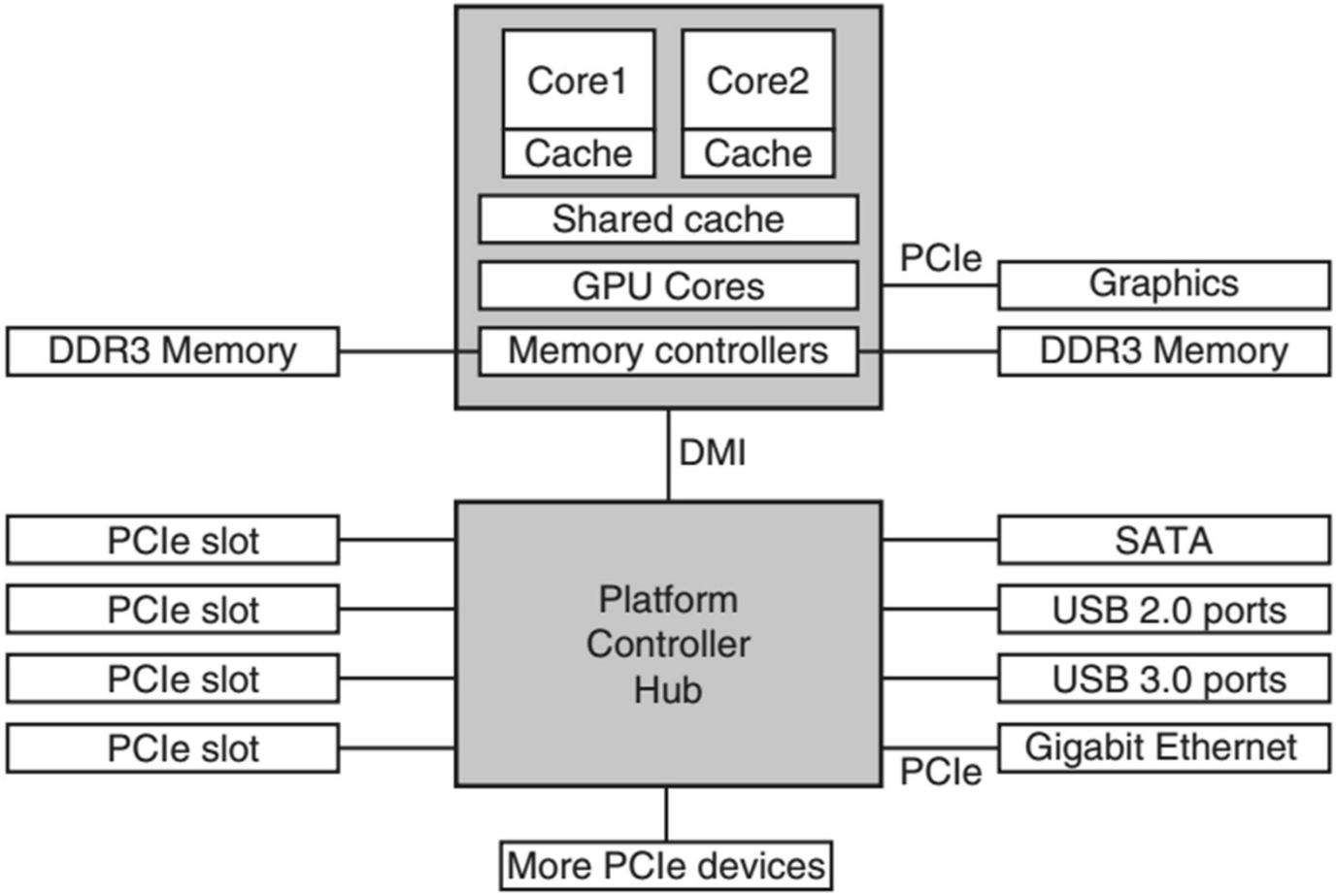
- (a) Steps in starting an I/O device and getting interrupt
- (b) How the CPU is interrupted





Computer Hardware Review (6)

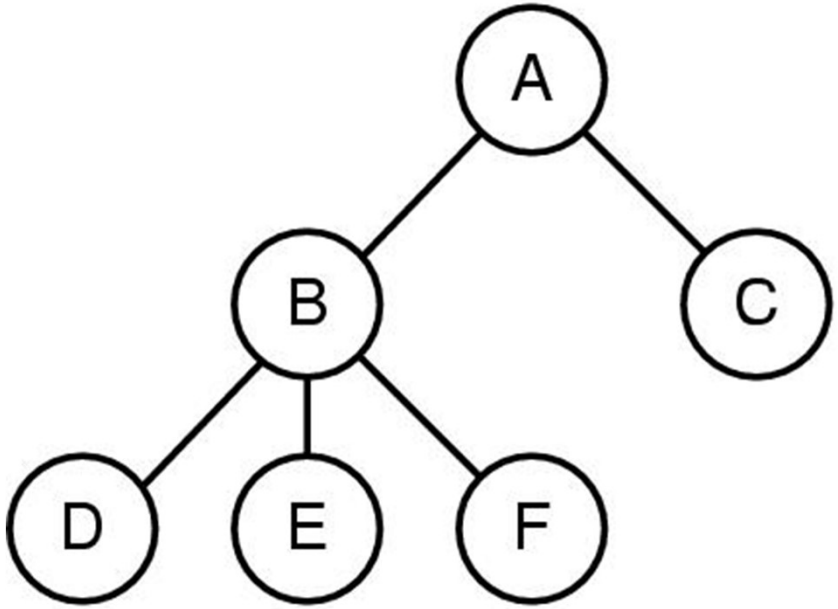
- Structure of a large x86 system



The Operating System Zoo

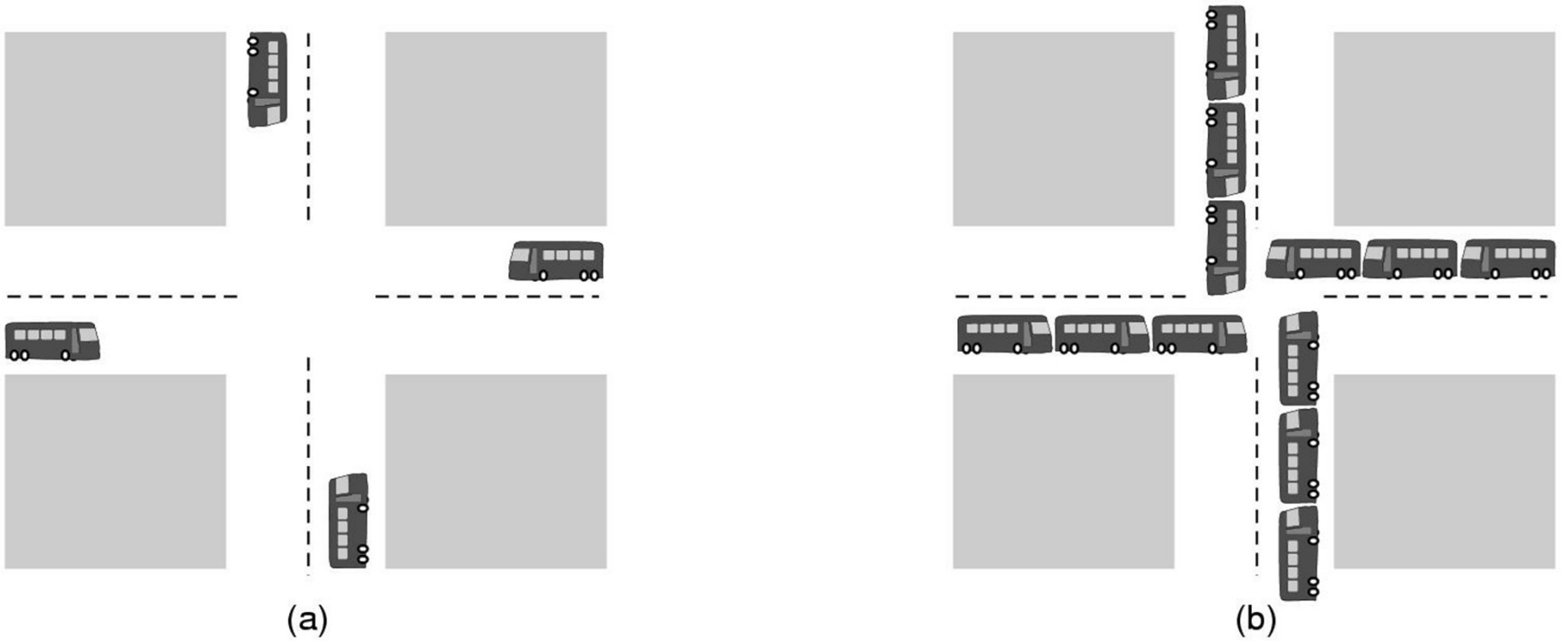
- Mainframe operating systems
- Server operating systems
- Multiprocessor operating systems
- Personal computer operating systems
- Handheld Computer Operating Systems
- Embedded operating systems
- Sensor-Node Operating Systems
- Real-time operating systems
- Smart card operating systems

Operating System Concepts (1)



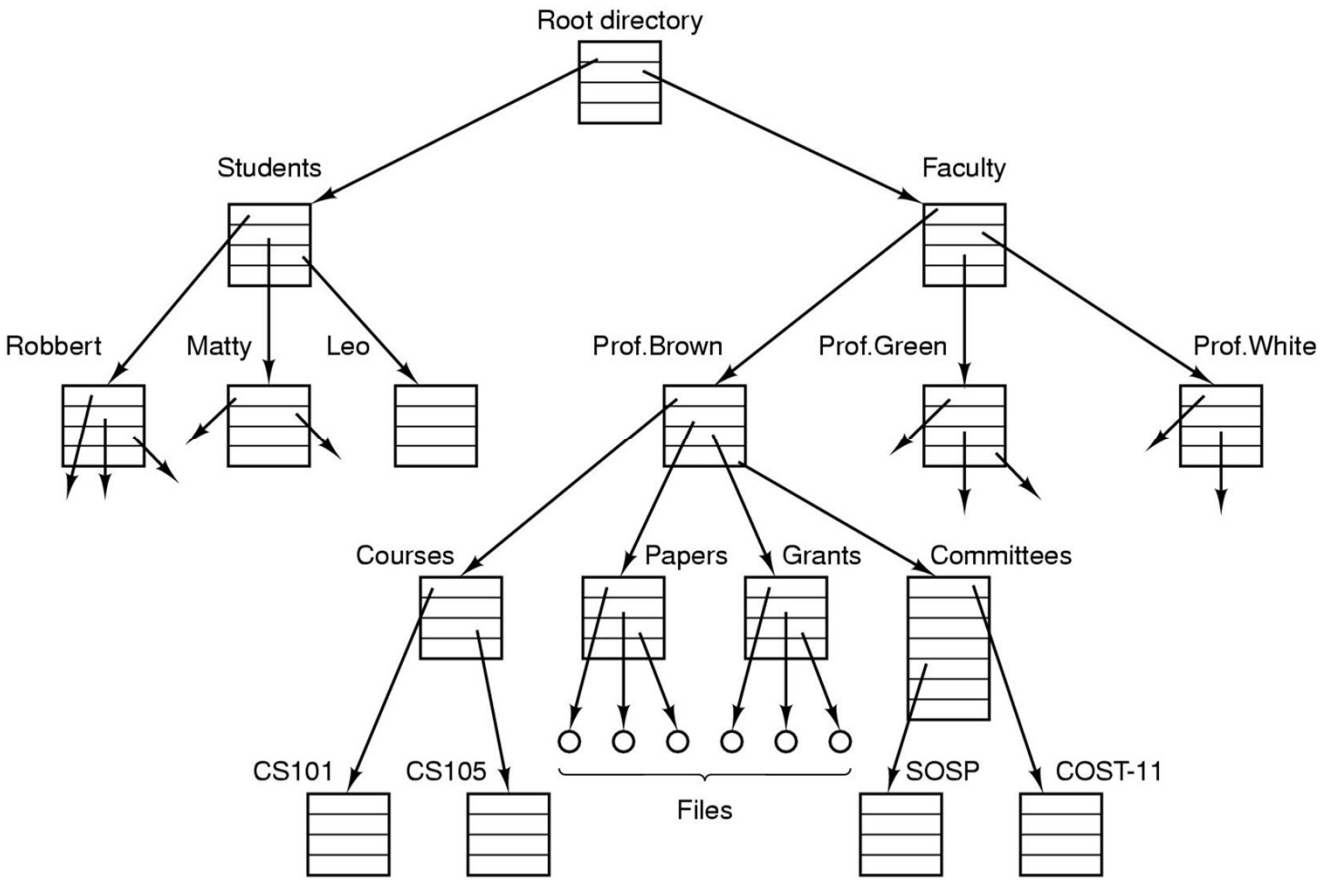
- A process tree
  - A created two child processes, B and C
  - B created three child processes, D, E, and F

Operating System Concepts (2)



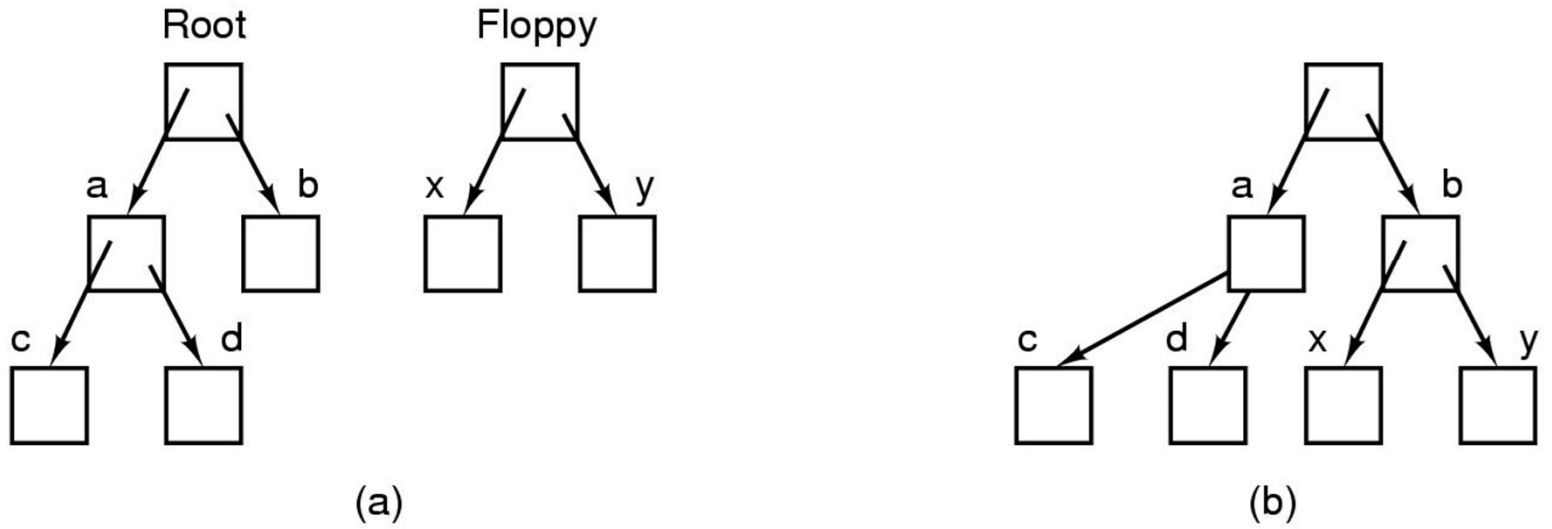
(a) A potential deadlock. (b) an actual deadlock.

Operating System Concepts (3)



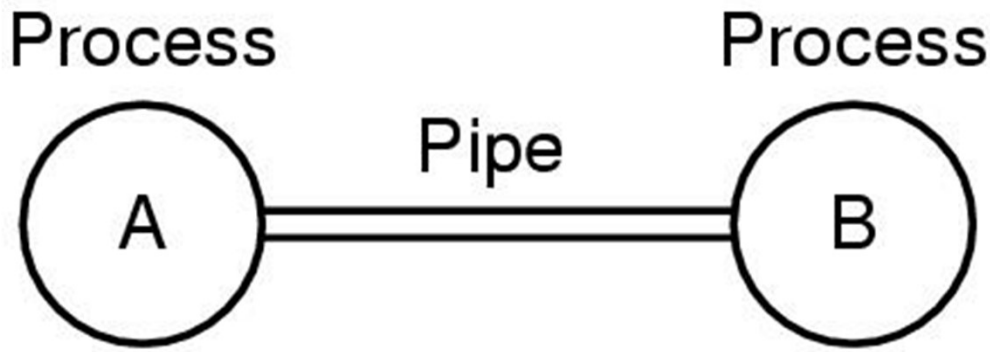
File system for a university department

Operating System Concepts (4)



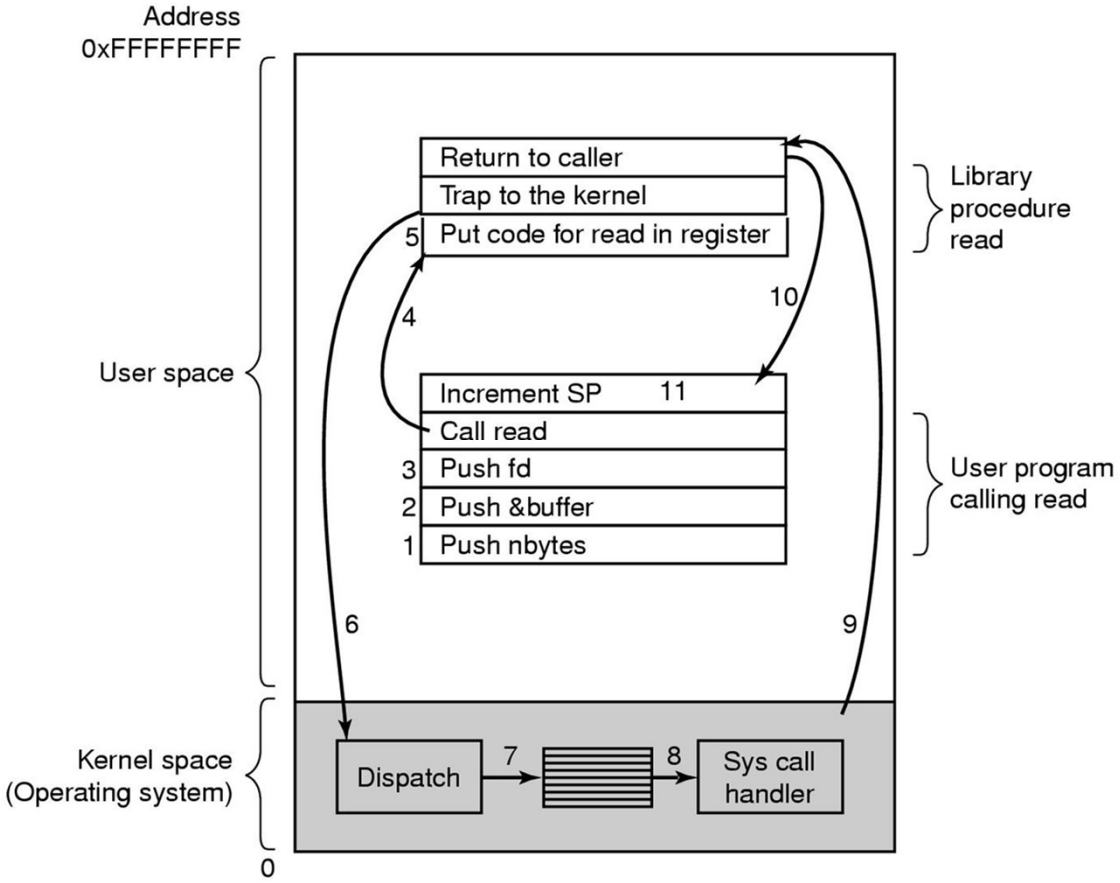
- Before mounting,
  - files on floppy are inaccessible
- After mounting floppy on b,
  - files on floppy are part of file hierarchy

Operating System Concepts (5)



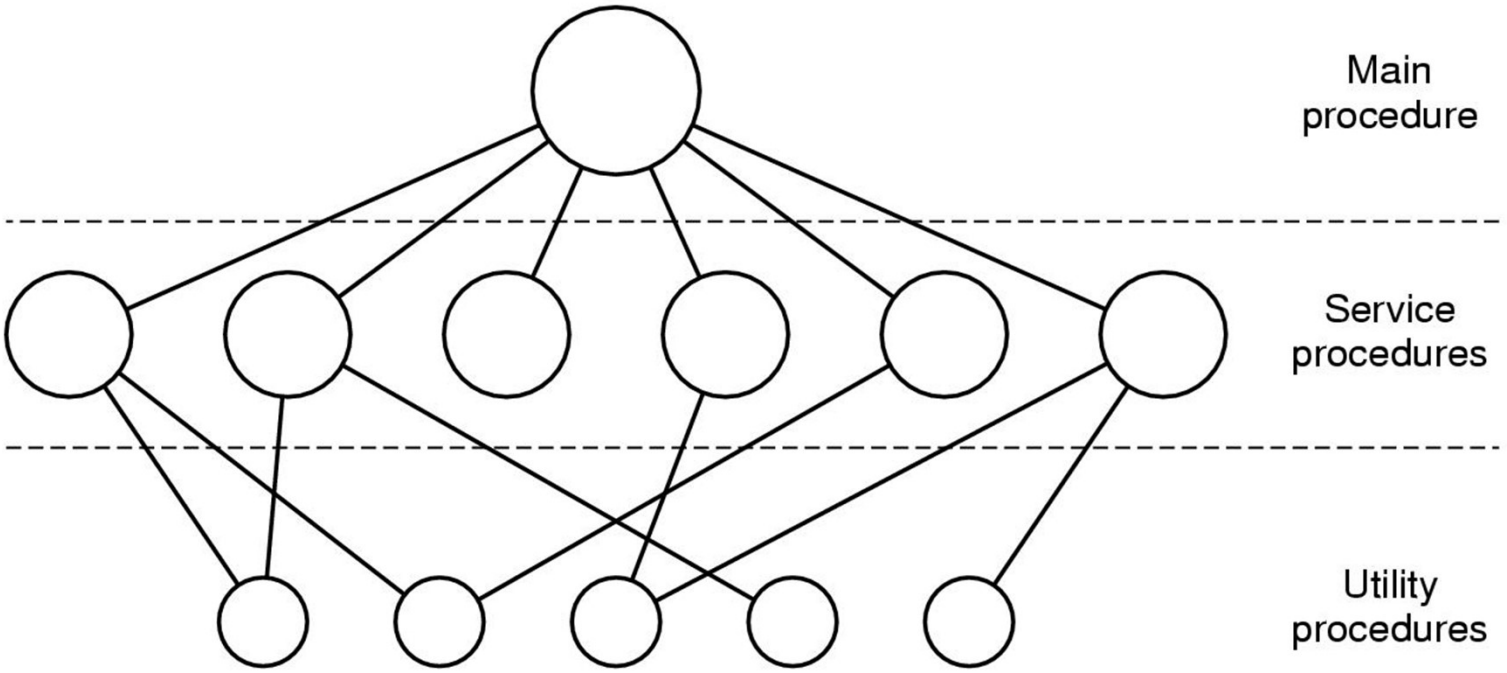
Two processes connected by a pipe

Steps in Making a System Call



There are 11 steps in making the system call read (fd, buffer, nbytes)

Operating System Structure (Simple, monolithic)



Simple structuring model for a monolithic system

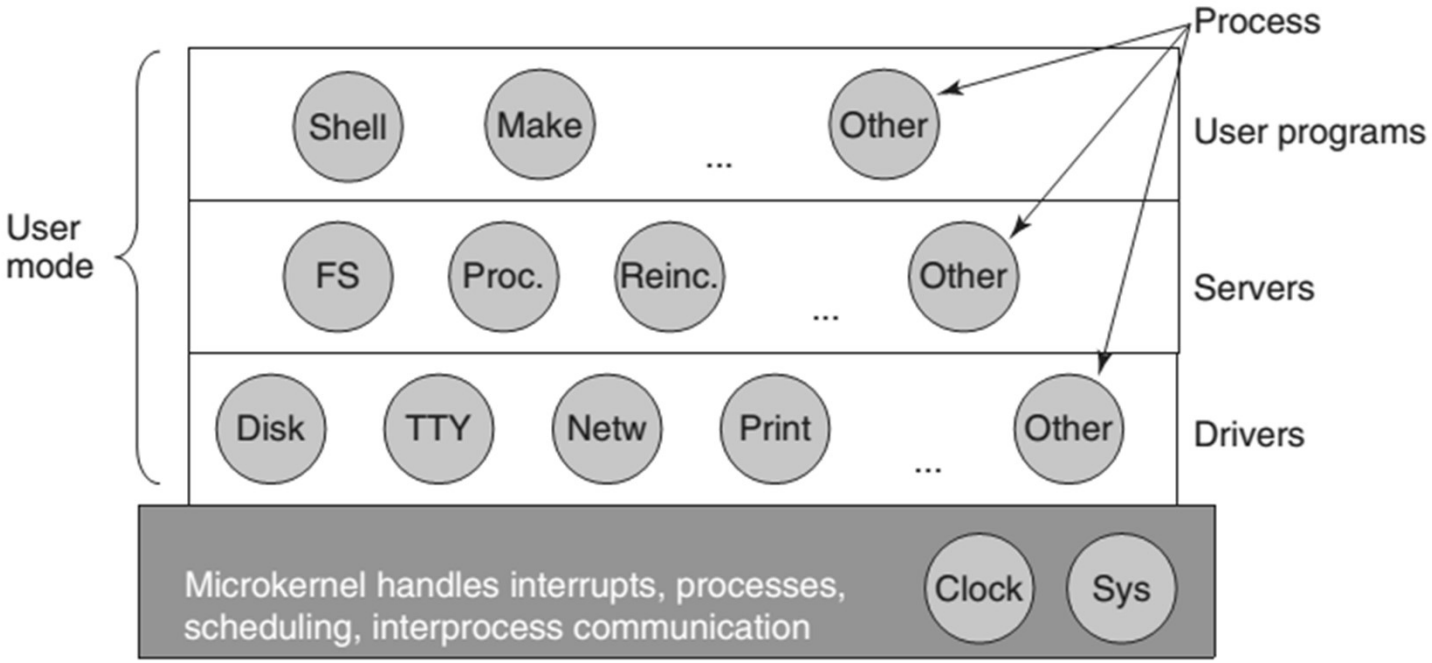
Operating System Structure (Layered)

Layer	Function
5	The operator
4	User programs
3	Input/output management
2	Operator-process communication
1	Memory and drum management
0	Processor allocation and multiprogramming

Structure of the THE operating system

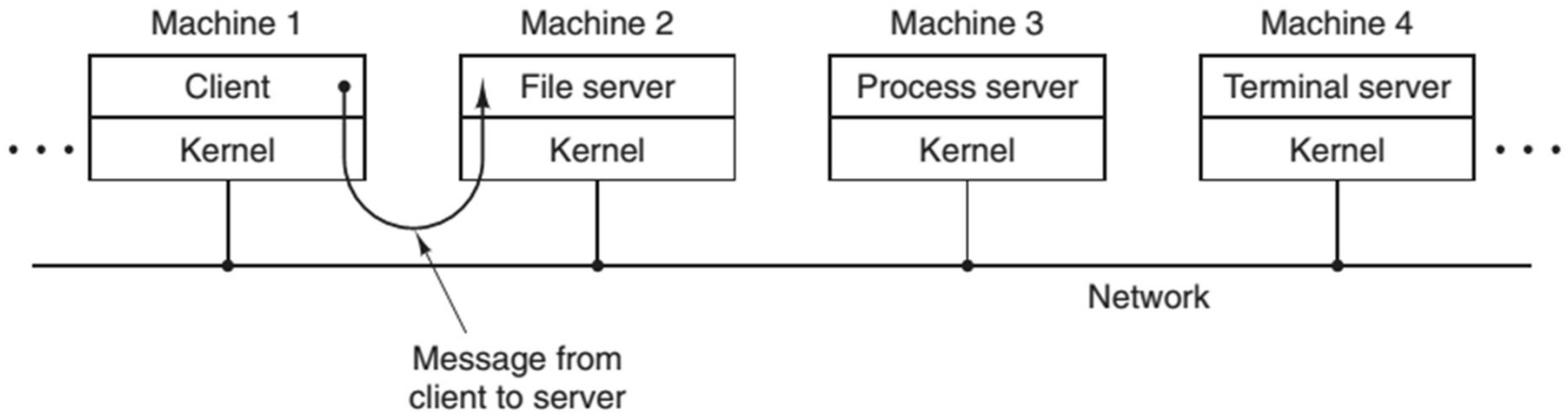
- Multics : Used rings instead of Layers: Inner ones are being more privileged , Trap used to communicate between rings

Operating System Structure (Microkernels)



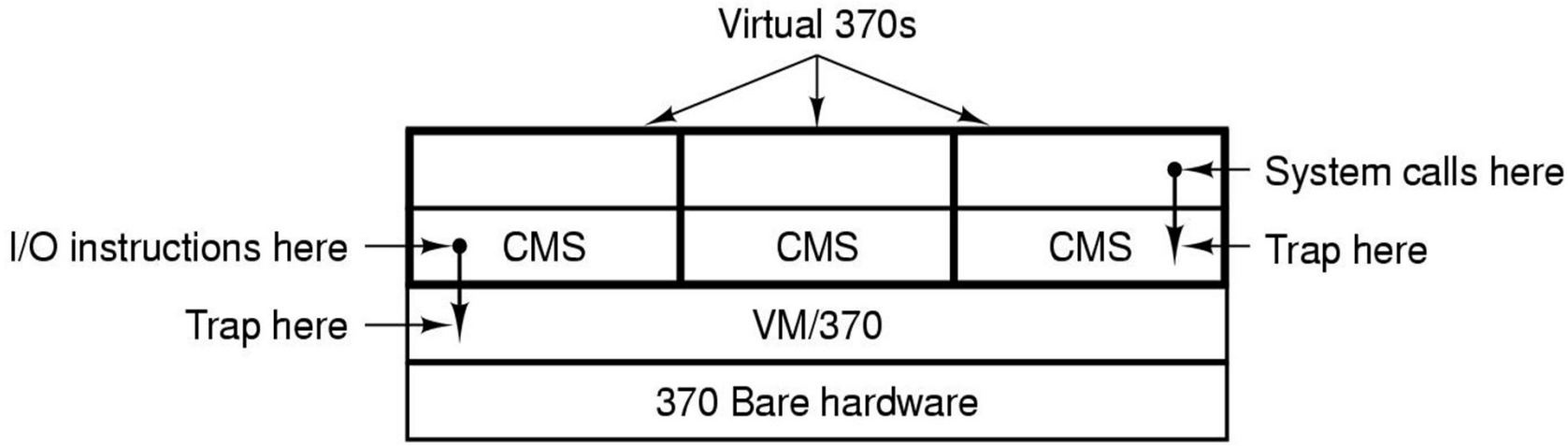
Simplified structure of the MINIX system

Operating System Structure (Client-Server)



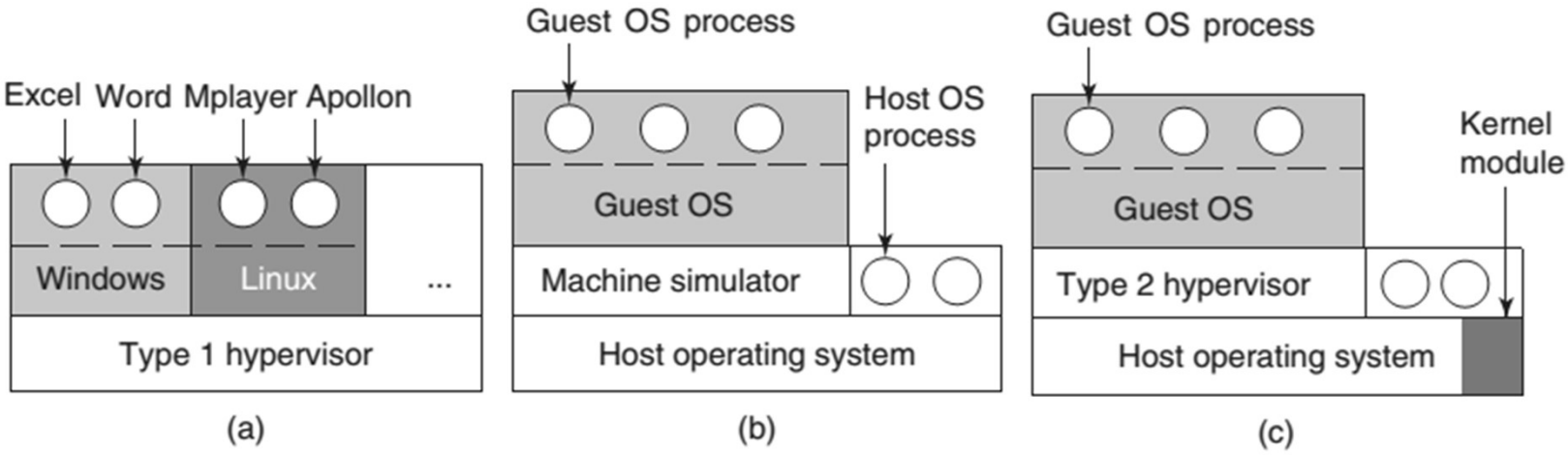
The client-server model over a network

Operating System Structure (Virtual Machine)



Structure of VM/370 with CMS

Operating System Structure (Virtual Machine)



(a) A type 1 hypervisor. (b) A pure type 2 hypervisor. (c) A practical type 2 hypervisor

Operating System Structure (ExoKernel)

- Each virtual machine gets its subset of resources.
- Exokernel Runs in kernel Mode.
- It allocates Resources to VMs and it checks the resource security.
- It tracks which resources Assigned Which VMs