Platform Technologies

Introduction

*Partially based on Based on Tanenbaum, Modern Operating Systems
& Management Information Systems: Managing the Digital Firm*

What is a Platform?

Hardware + Software + Networks = Platform

- In general, a computing platform is any pre-existing hardware environment, a piece of software that is designed to run within it, and any associated facilities used with it.

- A platform is any base of technologies on which other technologies or processes are built.

- Most *services* that the end users use will be build on top of platforms.

Generations of Computing

1. (1945–55) Vacuum Tubes
   - Punch cards and machine language programming

2. (1955–65) Transistors and Batch Systems
   - Mainframes (IBM 1401, IBM 7094), FORTRAN compiler

3. (1965–1980) ICs and Multiprogramming
   - IBM System/360, OS/360, multiprogramming, timesharing, MULTICS

4. (1980–Present) Personal Computers
   - IBM PC, DOS, Macintosh, Windows, Linux

5. (1990–Present) Mobile Computers
   - PDAs, Symbian OS, Blackberry OS, Smartphones, iOS, Android

Transistors and Batch Systems
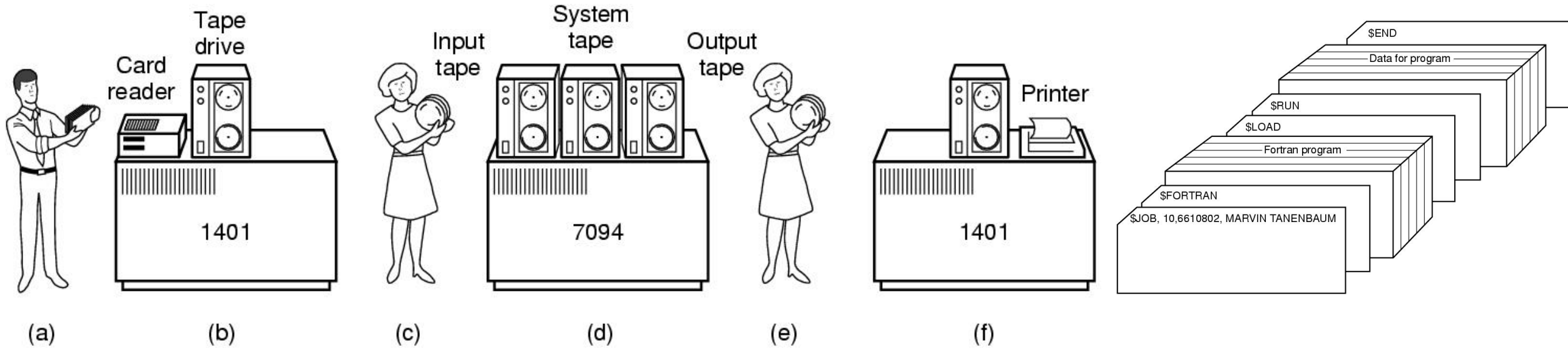
a) Programmers bring cards to 1401.
b) 1401 reads batch of jobs onto tape.
c) Operator carries input tape to 7094.
d) 7094 does computing.
e) Operator carries output tape to 1401.
f) 1401 prints output.

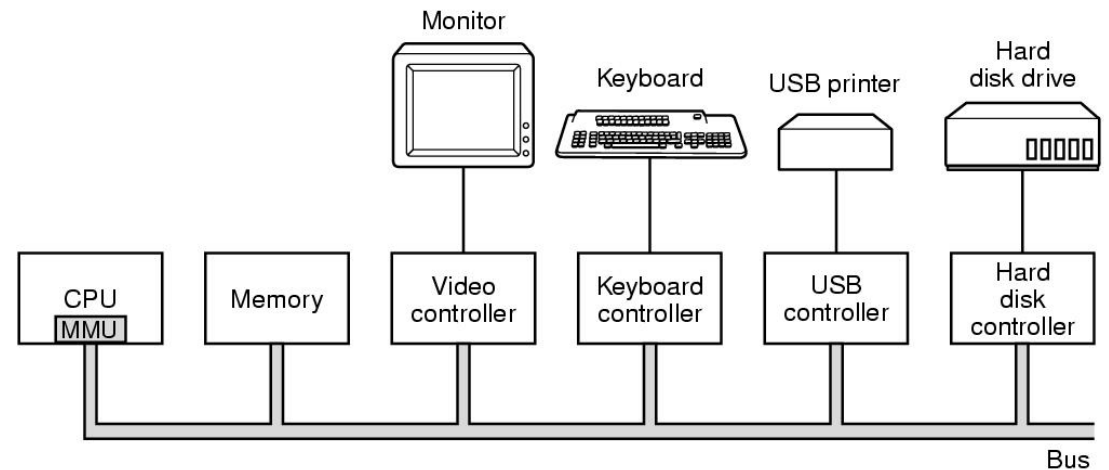# ICs and Multiprogramming

Job 3
Job 2
Job 1
Operating system

Memory partitions
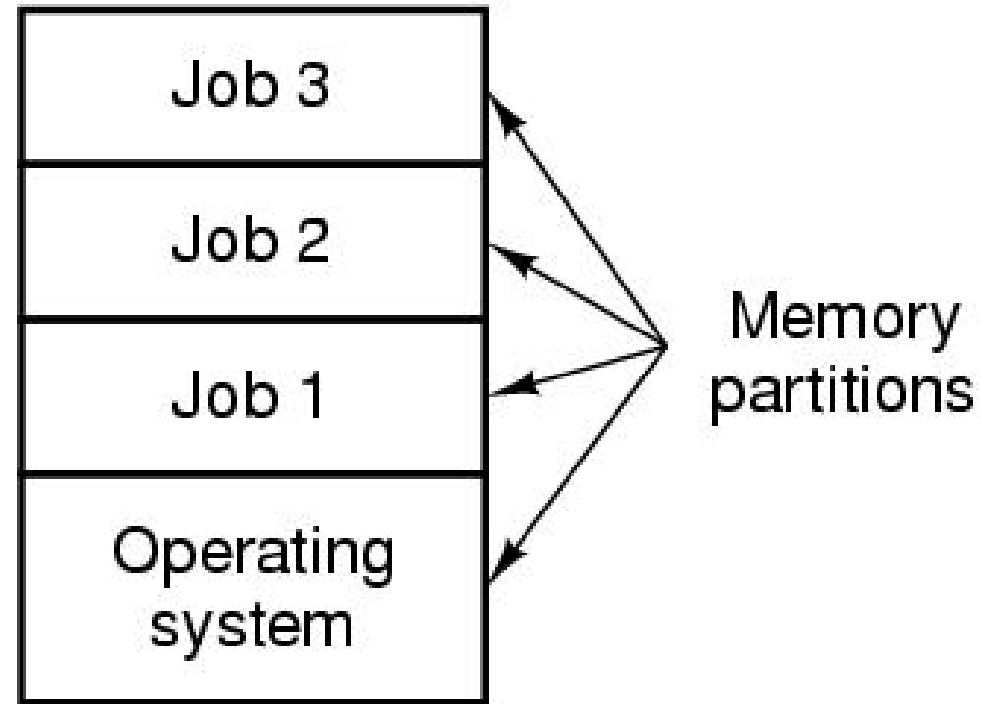
A multiprogramming system with three jobs in memory.

Modern computers

- A modern computer consists of:
  - One or more processors
  - Main memory
  - Disks
  - Printers
  - Various input/output devices
- Managing all these components requires a layer of software
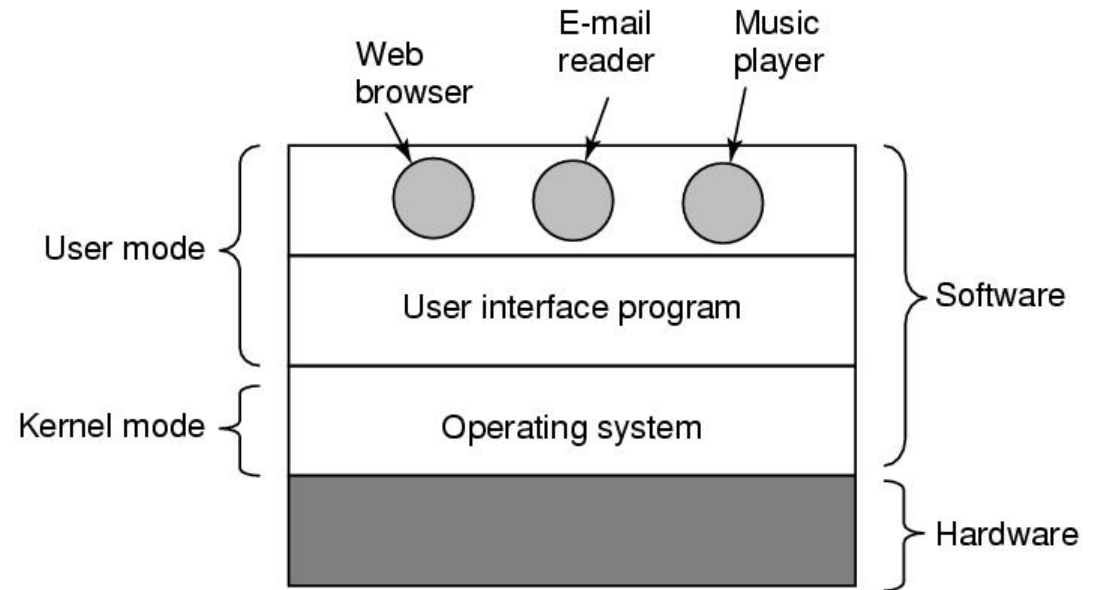 - the **operating system**

Hardware Architecture

- A set of disciplines that describes a computer system by specifying its parts and their relations provides physical environment.
- Common Types:
  - Commodity computing platforms
  - Video game consoles
  - RISC
  - Midrange computers
  - Mainframe computers
  - Supercomputer

Operating Systems

- A collection of software that manages computer hardware resources and provides common services for computer programs.

- The operating system is an essential component of the system software in a computer system.

- Application programs usually require an operating system to function.

- Examples?

What is an Operating System?

- The most important program that runs on your computer.

- It manages all other programs on the machine.
  - Every PC has to have one to run other applications or programs.
  - It's the first thing "loaded".

- In simple terms, an operating system is a manager.
  - It manages all the available resources on a computer, from the CPU, to memory, to hard disk accesses.

What is an Operating System?

- Major cost of general purpose computing is software.

- An operating system is a program that acts an intermediary between the user of a computer and computer hardware.

- Operating systems simplify and manage the complexity of running application programs efficiently.

The Operating System as an Extended Machine
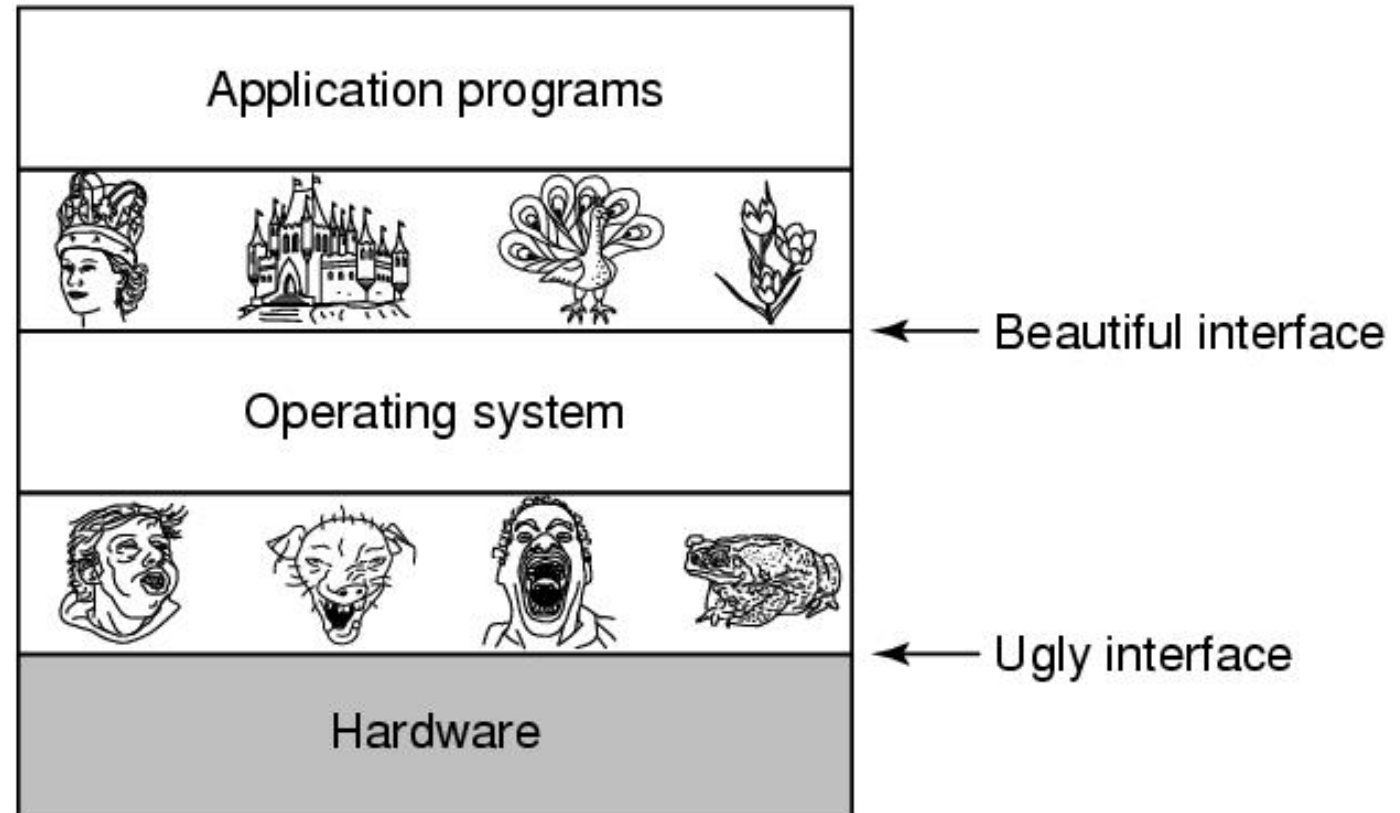
Operating systems turn the ugly hardware details into beautiful abstractions for the use of other software.
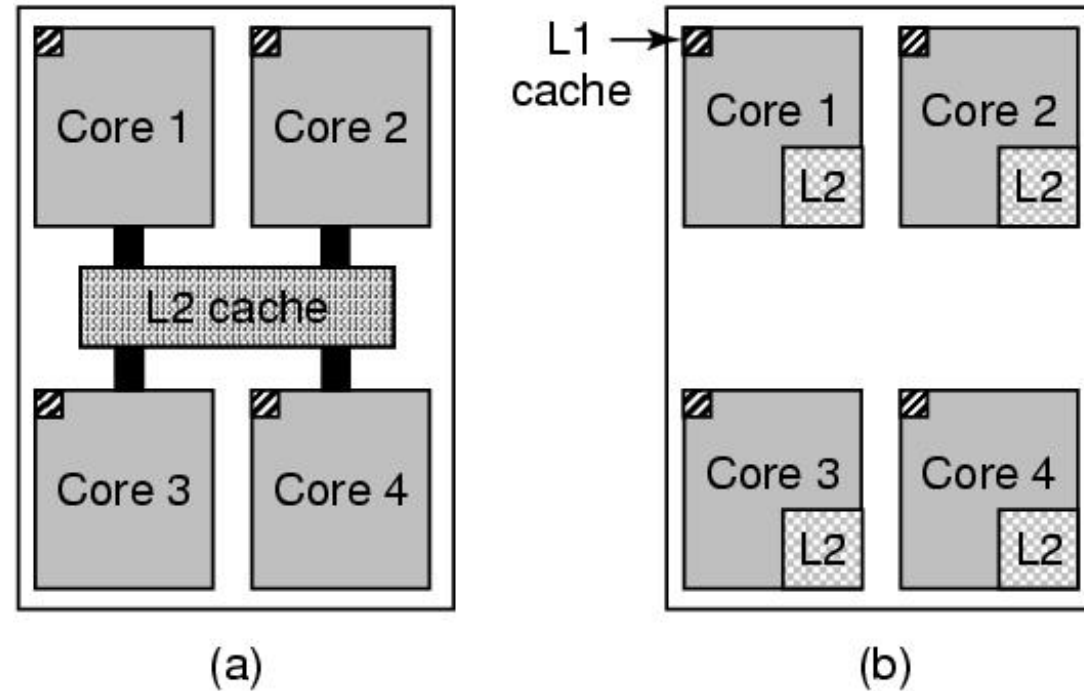
The Operating System as a Resource Manager

- Allow multiple programs to run at the same time

- Manage and protect memory, I/O devices, and other resources

- Includes multiplexing (sharing) resources in two different ways:
  - In time
  - In space

Operating System Concepts

- Processes
- Address spaces (Memory)
- Files
- Input/Output
- Protection
- The shell

- Development in computing over time
  - Large memories
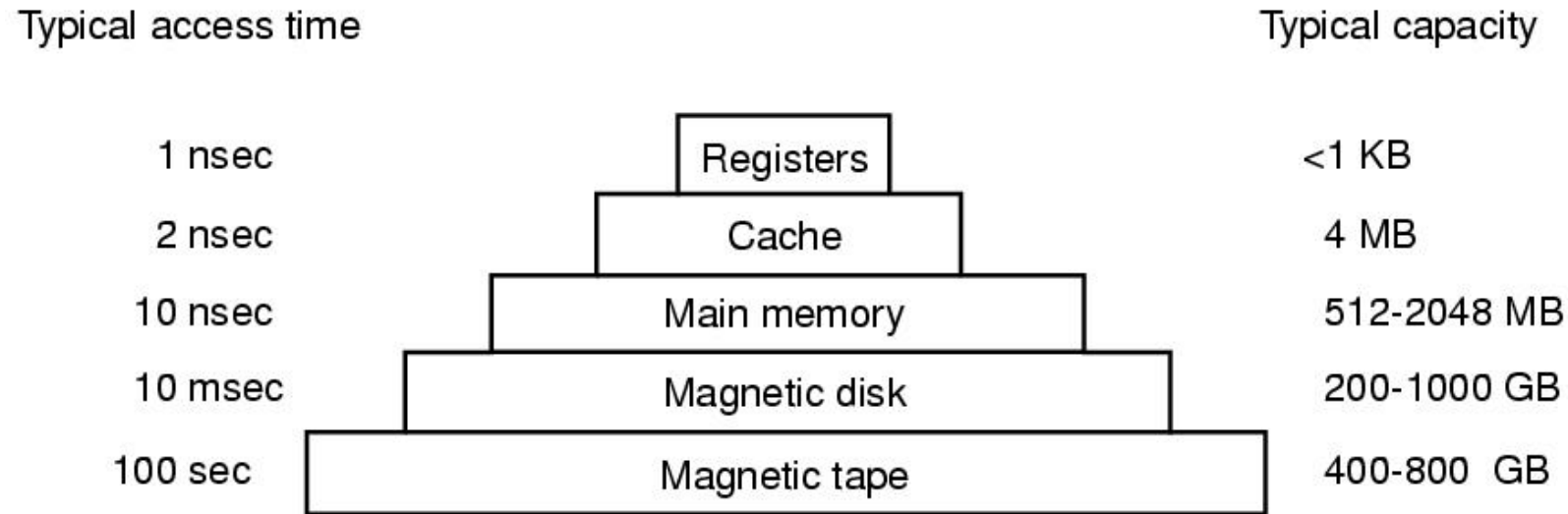 - Protection hardware
  - Disks
  - Virtual memory

Multithreaded and Multicore Chips

(a) A quad-core chip with a shared L2 cache.
(b) A quad-core chip with separate L2 caches.

Memory

Typical access time

Typical capacity

1 nsec	Registers	<1 KB
2 nsec	Cache	4 MB
10 nsec	Main memory	512-2048 MB
10 msec	Magnetic disk	200-1000 GB
100 sec	Magnetic tape	400-800 GB

- Questions when dealing with cache:
  - When to put a new item into the cache.
  - Which cache line to put the new item in.
  - Which item to remove from the cache when a slot is needed.
  - Where to put a newly evicted item in the larger memory.

Disks
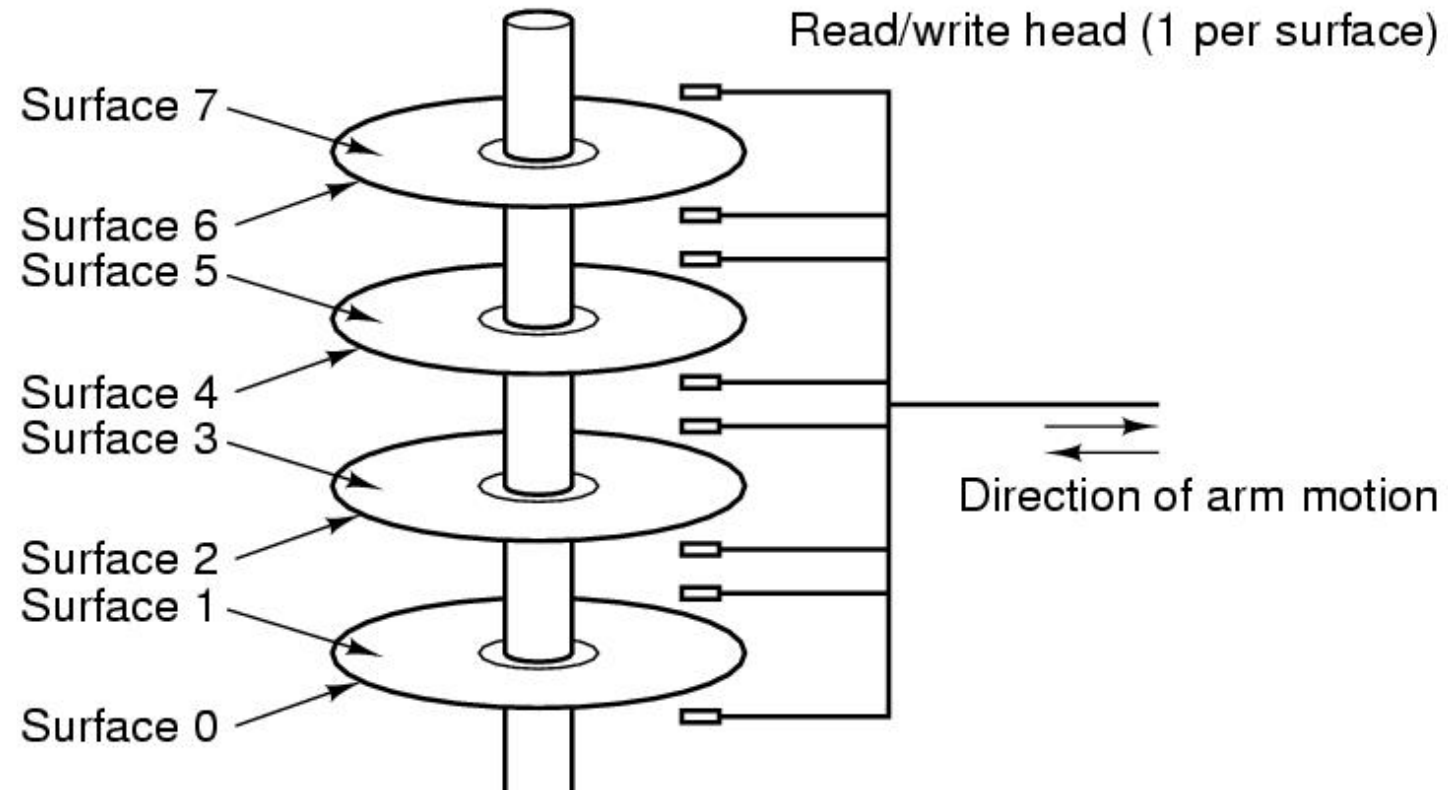
Structure of a disk drive.

I/O Devices
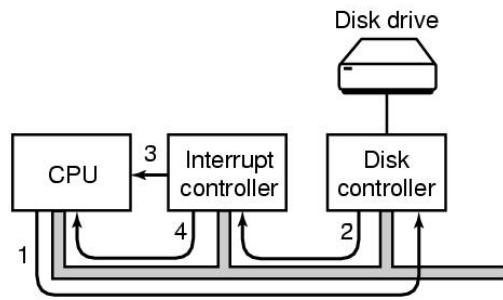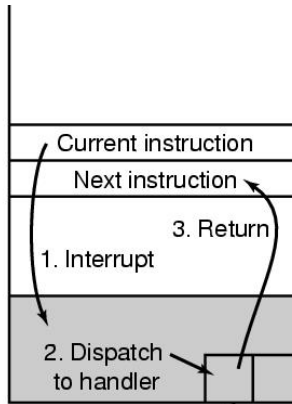
- (a) The steps in starting an I/O device and getting an interrupt.
- (b) Interrupt processing involves taking the interrupt, running the interrupt handler, and returning to the user program.

Buses
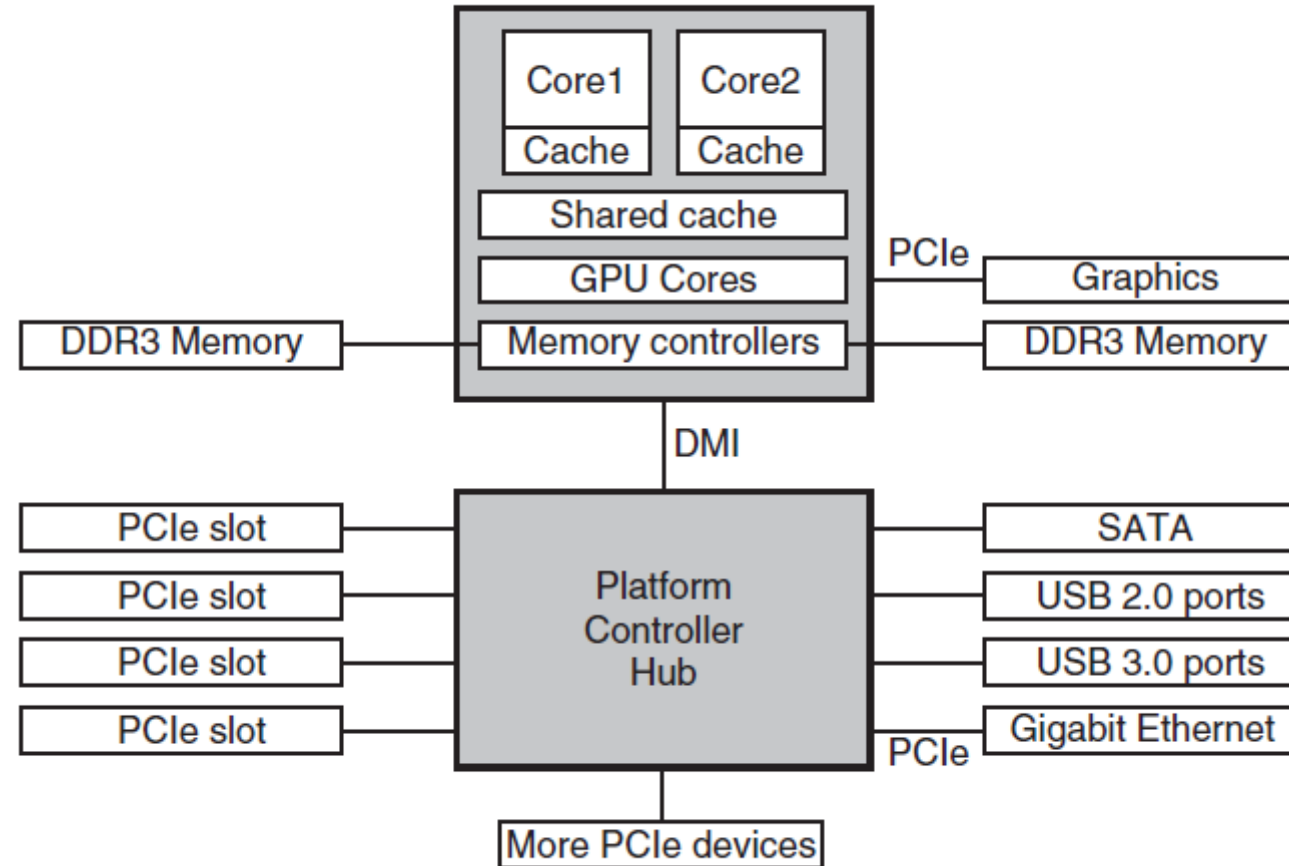
The structure of a large x86 system.

Types of Operating Systems

- Mainframe operating systems
- Server operating systems
- Multiprocessor operating systems
- Personal computer operating systems
- Handheld operating systems
- Embedded operating systems
- Sensor node operating systems
- Real-time operating systems
- Smart card operating systems

Evolution of IT infrastructure

- General-purpose mainframe and minicomputer era: 1959 to present
  - 1958: IBM first mainframes introduced
  - 1965: less expensive DEC minicomputers introduced
- Personal computer era: 1981 to present
  - 1981: Introduction of IBM PC
  - Proliferation in 80s, 90s resulted in growth of personal software
- Client/server era: 1983 to present
  - Desktop clients networked to servers, with processing work split between clients and servers
  - Network may be two-tiered or multitiered (N-tiered)
  - Various types of servers (network, application, Web)

Evolution of IT infrastructure

- Enterprise computing era: 1992 to present
  - Move toward integrating disparate networks, applications using Internet standards and enterprise applications
- Cloud and mobile computing: 2000 to present
  - Cloud computing: computing power and software applications supplied over the Internet or other network

Enterprise Computing 1992–present)

Enterprise Server

Internet

Cloud and Mobile Computing (2000–present)

- Hardware
- Software
- Services
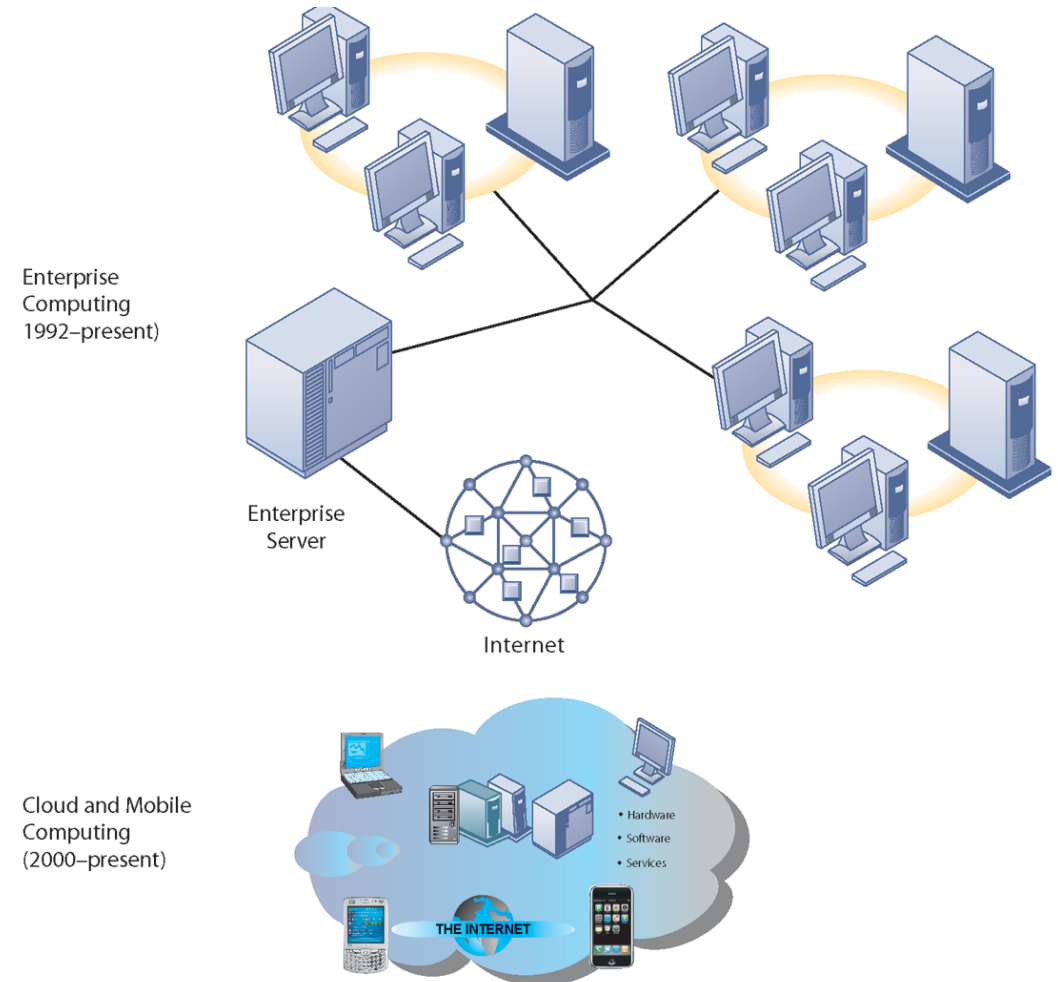
THE INTERNET

Infrastructure Components

- IT Infrastructure has seven main components:
  1. Computer hardware platforms
  2. Operating system platforms
  3. Enterprise software applications
  4. Data management and storage
  5. Networking platforms
  6. Internet platforms
  7. Consulting system integration services

Internet Platforms
Apache
Microsoft IIS, .NET
Unix
Cisco
Java

Computer Hardware Platforms
Dell
IBM
Sun
HP
Apple
Linux machines

Data Management and Storage
IBM DB2
Oracle
SQL Server
Sybase
MySQL
EMC
Apache
Hadoop

IT Infrastructure Ecosystem

Operating Systems Platforms
Microsoft Windows
Unix
Linux
Mac OS X
Chrome
Android
iOS

Consultants and System Integrators
IBM
HP
Accenture

Networking/ Telecommunications
Microsoft Windows Server
Linux
Novell
Cisco
Alcatel-Lucent
Nortel
AT&T, Verizon

Enterprise Software Applications
(including middleware)
SAP
Oracle
Microsoft
IBM

Infrastructure Components

- Computer hardware platforms
  - Client machines
    - Desktop PCs, mobile devices, laptops
  - Servers
    - Blade servers: ultrathin computers stored in racks
  - Mainframes:
    - IBM mainframe equivalent to thousands of blade servers
  - Top chip producers:
    - Intel, AMD, ARM, IBM
  - Top firms:
    - IBM, HP, Dell, Lenovo

Infrastructure Components

- Operating system platforms
  - Operating systems
    - Server level: 65% run Unix or Linux; 35% run Windows
    - Client level:
      - 90% run Microsoft Windows (XP, 2000, CE, etc.)
      - Mobile/multitouch (Android, iOS)
      - Cloud computing (Google's Chrome OS)
- Enterprise software applications
  - Enterprise application providers: SAP and Oracle
  - Middleware providers: BEA

Infrastructure Components

- Data management and storage
  - Database software:
    - IBM (DB2), Oracle, Microsoft (SQL Server), Sybase (Adaptive Server Enterprise), MySQL
  - Physical data storage:
    - EMC Corp (large-scale systems), Seagate, Maxtor, Western Digital
  - Storage area networks (SANs):
    - Connect multiple storage devices on dedicated network

Infrastructure Components

- Networking/telecommunications platforms
  - Telecommunication services
    - Telecommunications/cable company charges for voice lines and Internet access
    - AT&T, Verizon
  - Network operating systems:
    - Windows Server, Linux, Unix
  - Network hardware providers:
    - Cisco, Alcatel-Lucent, Nortel, Juniper Networks

Infrastructure Components

- Internet platforms
  - Hardware, software, management services to support company web sites, (including web-hosting services) intranets, extranets
  - Internet hardware server market:
    - IBM, Dell, Oracle, HP
  - Internet services:
    - Amazon, Google
  - Web development tools/suites:
    - Microsoft (.NET) Oracle (Java), Adobe

Infrastructure Components

- Consulting and system integration services
  - Even large firms do not have resources for full range of support for new, complex infrastructure
  - Software integration:
    - ensuring new infrastructure works with legacy systems
  - Legacy systems:
    - older TPS created for mainframes that would be too costly to replace or redesign
  - Accenture, IBM Global Services, EDS, Infosys, Wipro

Module Outline

1. Introduction
2. Processes
3. Scheduling
4. File Systems
5. Networking & Data Communication
6. Distributed Systems
7. Platform Security
8. Operating System Administration – Linux
9. Operating System Administration – Windows
10. Server Basics

Module Resources

- Lecturer:
  - Nimal Skandhakumar
  - nimal@sjp.ac.lk
  - 0769804524
- LMS Course:
  - https://lms.fhss.sjp.ac.lk/course/view.php?id=1406