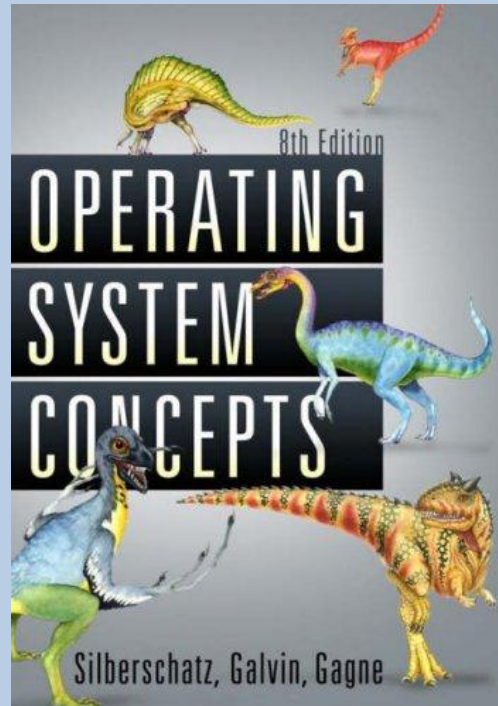


Introduction to PC Operating Systems



Operating System Concepts 8th Edition
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Chapter 1

Introduction

An operating system is a program that manages the computer hardware. It also provides a basis for application programs and acts as an intermediary between the computer user and the computer hardware.

Mainframe, Personal Computers, Handheld Computers, others.

Mainframe Operating Systems

Designed primarily to optimize utilization of hardware.

Personal Computer Operating Systems

Designed to support complex games, business applications, etc.

Handheld Computer Operating Systems

Provide an environment in which a user can easily interface with the computer to execute programs.

Other Operating Systems

Are designed to be convenient, and some to be efficient and some a combination of the two. (i.e. number pad, indicator lights)

Objectives

- To provide a grand tour of the major components of operating systems.
- To describe the basic organization of computer systems.

What Operating Systems Do

First, we need to understand that a computer system can be divided roughly into four components; **hardware, operating system, application programs and users.**

Computer Hardware is the physical components of your computer system.

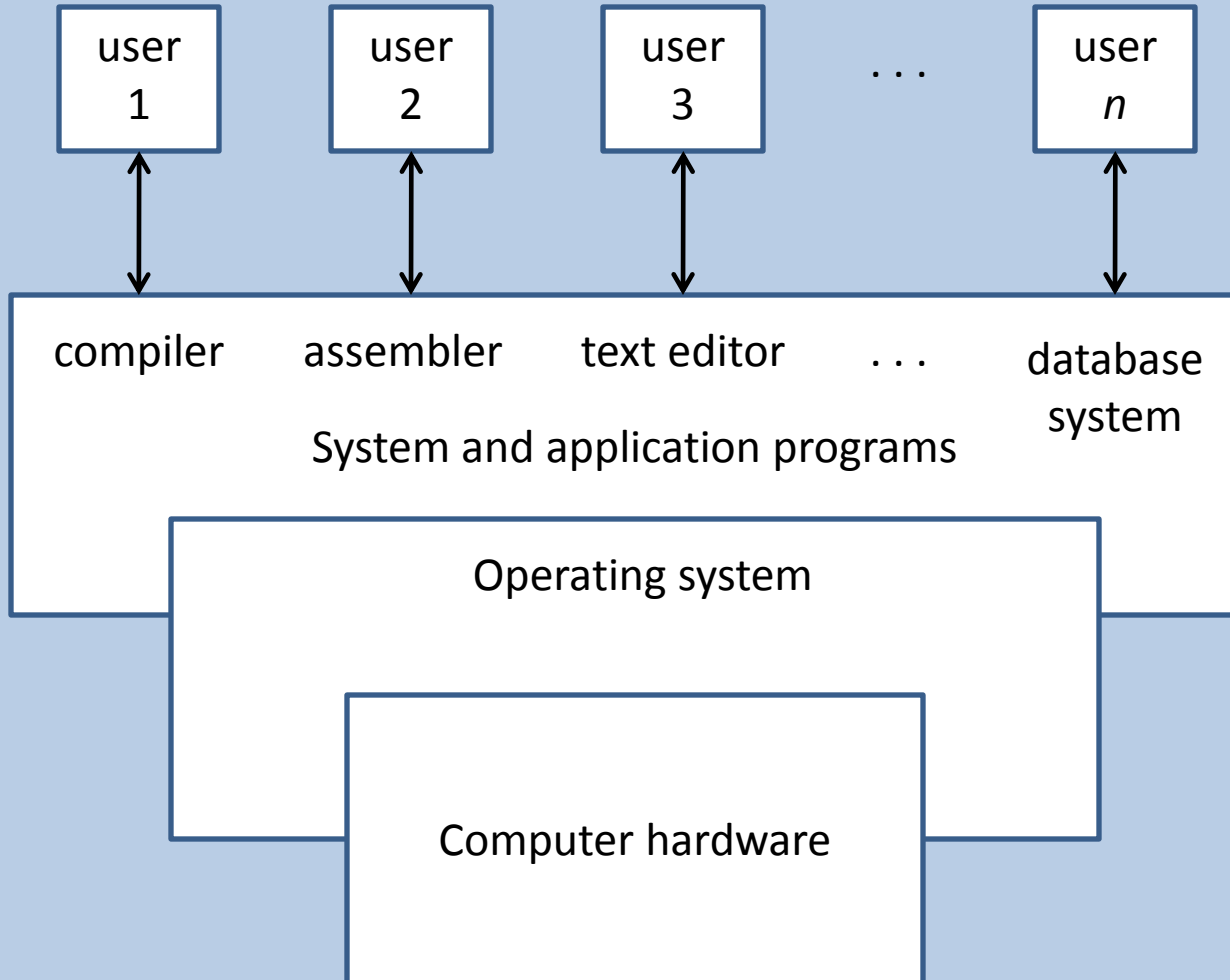
Operating system is the set of computer instructions, called a computer program, that controls the allocation of computer hardware such as memory, disk devices, printers, and CD and DVD drives, and provides the capability for you to communicate with the computer.

Systems software functions as a *bridge* between computer system hardware and the application software and is made up of many control programs, including the operating system, communications software and database manager.

Application program software is a set of specific computer instructions that is designed to allow you to accomplish a particular task. (i.e. a word processing program)

A **User** is person who uses the computer directly or use the information it provides.

What Operating Systems Do



Abstract view of the components of a computer system.

User's View of the Operating System

A user's view varies depending on the interface being used.

For **PC users**, the operating system is designed mostly for ease of use, with some attention paid to performance and none paid to resource utilization.

User of the **mainframe** sits at a terminal or minicomputer in addition to other users accessing the same computer through other terminals. Resources are share and information may be exchanged among users. The operating system is designed to maximize resource utilization. *(CPU time, memory and I/O to be used efficiently among all users)*

User's View of the Operating System (cont.)

In other cases, users sit at workstations connected to networks of other workstations and servers. These users have dedicated resources at their disposal, but they also share resources such as networking and servers-files, compute, and print servers. Therefore their operating system is designed to comprise between individual usability and resource utilization.

Recently, a variety of handheld computers have come into fashion. Some are standalone units for individual use. Some are connected to networks, either hardwired or wirelessly. Because of power, speed and interface limitations, they perform relatively few remote operations. Individual usability and battery life is important.

User's View of the Operating System (cont.)

Some computers have little or no user view. For example, numeric pads that which are embedded computers. These computer are found in home devices and automobiles.

They may turn indicator lights on or off to show status, but their operating systems are designed primarily to run without user intervention.

System View of the Operating System

From the computer's point of view, the operating system is the program that is most intimately involved with the hardware. The operating system simply allocates the computer resources. The operating system makes it possible for the computer resources to be accessed and to work together without conflicting so that the computer can operate smoothly. These resources include CPU, memory, storage media, I/O devices, etc. The operating system acts as the manager of these resources, deciding how to allocate them to specific programs and users so that it can operate the computer system efficiently and fairly.

System View of the Operating System (cont.)

The management of the resources become especially important where many users are accessing the same mainframe or minicomputer.

The operating system is also seen as a control program, which manages the execution of user programs to prevent errors and improper use of the computer.

Defining Operating Systems

The operating system is the one program running at all times on the computer – usually called the kernel. Other than the kernel, there are two other programs that may be associated with your computer: **system programs**, which are associated with operating system but not a part of the kernel and **application programs**, which include all programs not associated with the operation of the system.

Storage Definitions

Bit – basic unit of storage (*containing one of two values [0 , 1]*)

Byte – eight bits (*the smallest convenient chunk of storage on most computers*)

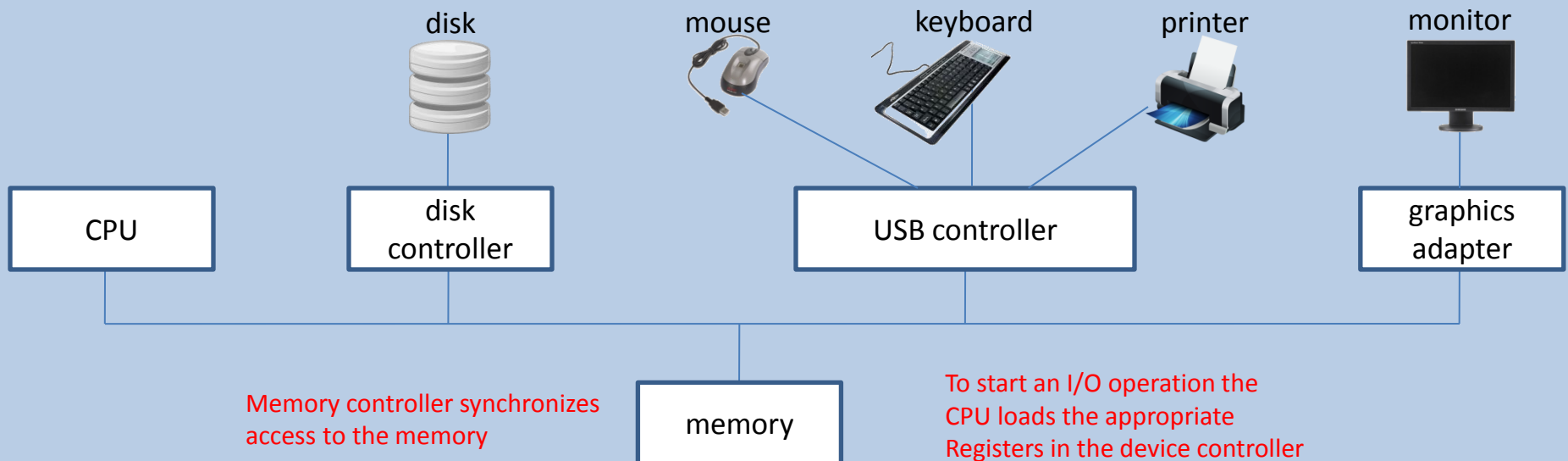
Word – made up of one or more bytes

Kb = 1024 bytes, Mb = 1024², Gb = 1024³ (*1024 rounded to 1000*)

Computer-System Organization

Computer-System Operation

Today's computer systems consist of one or more CPUs and a number of device controllers connected through a common bus that provides access to share memory as shown in the figure below. Each device controller is in charge of a specific type of device (for example, disk drives, audio devices, and video displays).



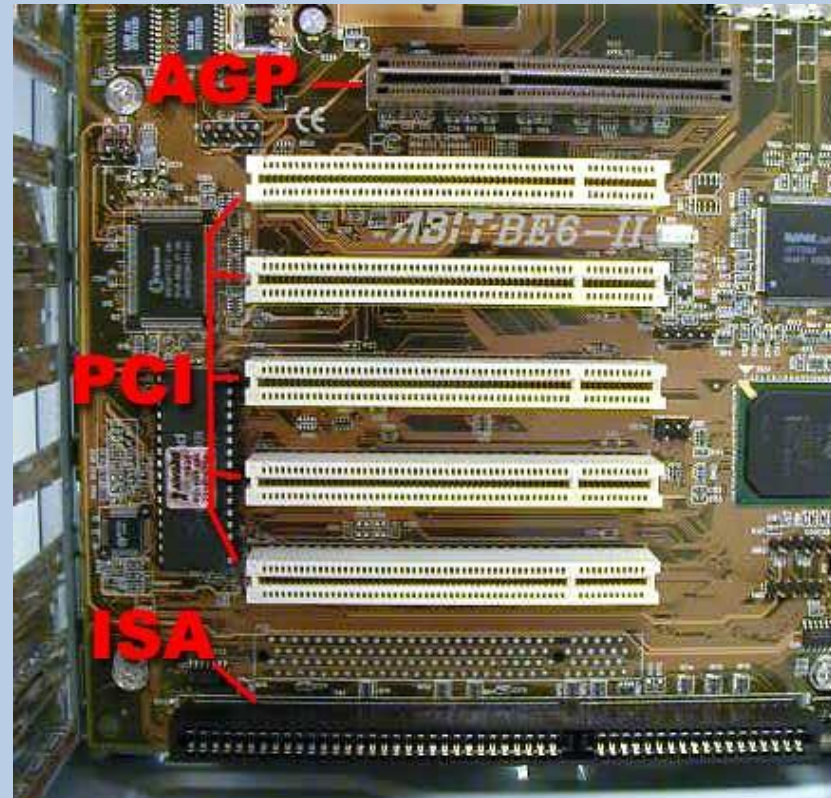
Computer-System Organization (cont.)

Computer-System Operation

AGP – *Accelerated Graphics Port*

PCI - *Peripheral Component Interconnect*

ISA - *Industry Standard Architecture*



Computer-System Organization (cont.)

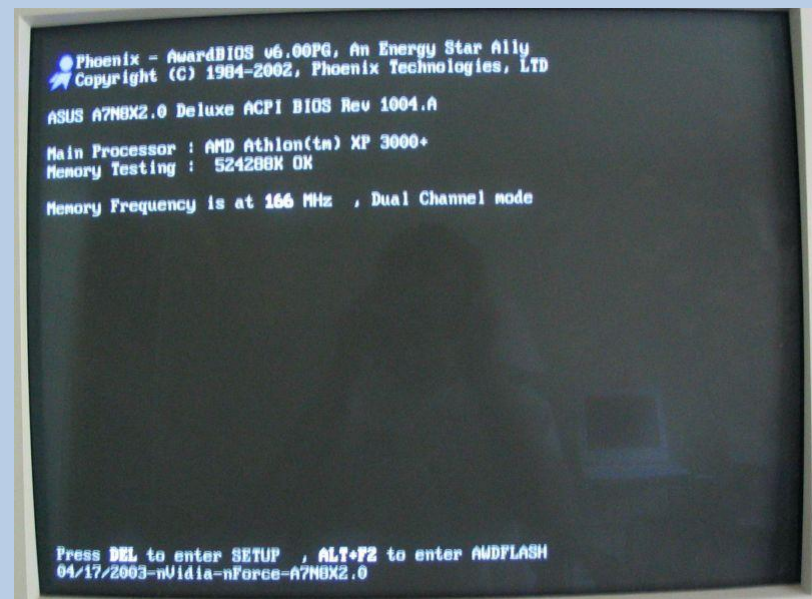
General Purpose computer refers to computers that follow instructions, thus virtually all computers from micro to mainframe are general purpose. Even computers in toys, games and single-function devices follow instructions in their built-in program.

Special Purpose computers

In contrast, computational devices can be designed from scratch for special purposes. (jogging , flight simulators, medical equipment, etc.)

Computer-System Organization (cont.)

For a computer to start running, powered on or rebooted, it needs to have an initial program to run. This program is called the bootstrap program. It is stored in ROM (Read Only Memory) or electrically erasable programmable read-only memory (EEPROM), known as **firmware**, within the computer hardware. It initializes all aspects of the system, from CPU registers to device controllers to memory content.



Computer-System Organization (cont.)

The bootstrap program must know how to load the operating system and how to start executing that system.

1. Locate and load the operating system (kernel).
2. Starts execution of first process (**Init**, which is the parent of all processes.)
3. Waits for an event.

The occurrence of events are usually signaled by an interrupt from either the hardware or software. Hardware may trigger an interrupt at any time by sending a signal to the CPU. Software may trigger an interrupt by executing a special operation by a system call (monitor call).

Computer-System Organization (cont.)

The bootstrap

```
Network boot from AMD AM79C970A
Copyright (C) 2003-2005 VMware, Inc.
Copyright (C) 1997-2000 Intel Corporation

CLIENT MAC ADDR: 00 50 56 98 48 FB  GUID: 5018C033-EE26-426D-9EBF-4E331730CFA2
CLIENT IP: 10.30.40.112  MASK: 255.255.255.0  DHCP IP: 10.30.40.20
GATEWAY IP: 10.30.40.254

Provisioning Services bootstrap v5.1.1.2950

Copyright (c) 2001-2009 Citrix Systems, Inc. All rights reserved.

Local MAC          : 0050569848FB
Local IP           : 10.30.40.112
Subnet mask        : 255.255.255.0
Default gateway    : 10.30.40.254
Login server       : 10.30.40.32:6910
Bootstrap loaded at 90AB:0000 Size 3D30

Connecting to the Provisioning Services. Please wait...
ULD1:server@10.30.40.32:6923;virtual disk found;
```

```
iper v
XE Network Boot 03.23.2009
C) Copyright 2009 Microsoft Corporation, All Rights Reserved.

CLIENT MAC ADDR: 00 15 5D 4C C9 10  GUID: F572A6A7-4540-446F-AA13-FADE94C7D038
CLIENT IP: 192.168.1.111  MASK: 255.255.255.0  DHCP IP: 192.168.1.100
GATEWAY IP: 192.168.1.100

Provisioning Services bootstrap v5.1.1.2950

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Local MAC          : 00155D4CC910
Local IP           : 192.168.1.111
Subnet mask        : 255.255.255.0
Default gateway    : 192.168.1.100
Login server       : 192.168.1.102:6910
Bootstrap loaded at 8AE9:0000 Size 3D30

Connecting to the Provisioning Services. Please wait...
LD1:server@192.168.1.102:6927;virtual disk found;
```

Computer-System Organization (cont.)

The **kernel** is the central part of an operating system, that directly controls the computer hardware. Usually, the kernel is the first of the user-installed software on a computer, booting directly after the BIOS. Operating system kernels are specific to the hardware on which they are running, thus most operating systems are distributed with different kernel options that are configured when the system is installed. Changing major hardware components such as the motherboard, processor, or memory, often requires a kernel update. Additionally, often new kernels are offered that improve system security or performance. The two major types of kernels competing in today's computer markets are the Windows kernel and the unix-like kernels.

Computer-System Organization (cont.)

BIOS is an acronym for Basic Input / Output System. It is the first part of the computer to boot, and usually decides from where to boot the operating system. The BIOS is also responsible for some of the most basic computer interfaces such as keyboard and video, hence its name.

When the CPU is interrupted, it stops what it is doing and immediately transfers execution to a fixed location. The fixed location usually contains a starting address where the services routine for the interrupt is located. The interrupt service routine executes; on completion, the CPU resumes the interrupted computation.