Unit 12

SYSTEM SOFTWARE

UNIT STRUCTURE

12.0 Learning Objectives :

After working through this unit, you should be able to :

- Explain the basic concept and role of system software in computer systems
- State the concept and functions performed by Operating Systems in computers
- Define Microsoft Operating System, Unix Operating system, Linux Operating system and Network Operating Systems (NOS)
- Mention the significant features and functions performed by NOS
- Specify various types of NOS

12.1 Introduction :

❖ **Operating Systems :**

As we know that, the Operating system (OS) is software, having various programs and data that runs on computers which controls the computer hardware and provides common services for efficient execution of various application software.

For hardware functions such as input and output and memory allocation, the operating system work as an intermediary between computer hardware and application programs, although the application code is usually executed by the hardware, but will regularly call the operating system (OS) or be interrupted by it. Operating systems (OS) are found on almost any device that contains a

computer – from video game consoles and cellular phones to super computers and web servers.

Examples of popular modern operating systems (OS) for personal computers are Microsoft Windows, Mac OS X and GNU/Linux.

The components of an operating system (OS) all exist in order to make the different parts of a computer work together. All software–from financial databases to film editors–needs to go through the operating system in order to use any of the hardware, whether it is as simple as keyboard or mouse or complex as an Internet connection.

With the aid of the firmware and device drivers, the operating system extends the most basic level of control over all of the computer's hardware devices. It manages memory access for programs in the RAM, it determines which programs get access to which hardware resources, it sets up or resets the CPU's operating states for optimal operation at all times and it organizes the data for long–term non–volatile storage with file systems on such media as disks, tapes, flash memory, etc.

The operating system acts as an interface between an application and the hardware. The user interacts with the hardware from ?the other side ?. The operating system is a set of services which simplifies development of applications. Executing a program involves the creation of a process by the operating system. The kernel generates a process by assigning memory and other resources, establishing a priority for the process (in multi–tasking systems), loading program code into memory and executing the program. The program then interacts with the user and/or other devices and performs its intended function.

Common contemporary operating system (OS) families include Darwin (Mac OS X), BSD, Linux, SunOS (Solaris/Open Solaris) and Windows NT (XP/ Vista/7). While servers basically run embedded system Unix or some Unix–like operating system, markets are divided amongst several

Operating systems (OS). Operating system (OS) tells computer how to use its components. Operating System (OS) work as an interpreter between the hardware, application program and the user. When the program wants hardware to do something, it conveys through the operating system (OS). Similarly, when the user wants computer to do something (e.g. printing, copying), the user request is handled by the operating system (OS). The examples of operating system (OS) are UNIX, Microsoft Windows, Macintosh and LINUX.

❑ **Check Your Progress – 1 :**

1. Operating systems are, _____ software.

   [A] Application [B] System

   [C] Media [D] None of the above

2. Identify operating system from the given options.

   [A] Windows [B] UNIX [C] Linux [D] All of the above

The operating system performs following functions–

From the user's point of view, the purpose of an operating system (OS) is to assist him in the mechanics of solving problems. Specifically, the following functions are performed by the system :

1. Job sequencing, scheduling and traffic controller operation
2. Input/ output programming
3. Protecting itself from the user; protecting the user from other users
4. Secondary storage management
5. Error handling

Action	OS Does This
You turn on the computer	Hardware management
You execute an application	Process management
Application reads a tape	Hardware management
Application waits for data	Process management
Process waits while other process runs	Process management
Process displays data on screen	Hardware management
Process writes data to tape	Hardware management
You quit; the process terminates	Process management
You turn off the computer	Hardware management

You can view a computer system as being built from 3 general components : the applications, the hardware and the operating system a (Ref. Figure 1.1.). The hardware includes pieces such as a keyboard, central processing unit (CPU), a printer and hard drive. You can think of these as the parts. You can touch it physically also. Applications are why you use computers; they use the rest of the system to perform the particular task (for ex., send electronic mail, play a game, edit a memo). The operating system (OS) is the component that on one side controls and manages the hardware and on the other manages the applications.

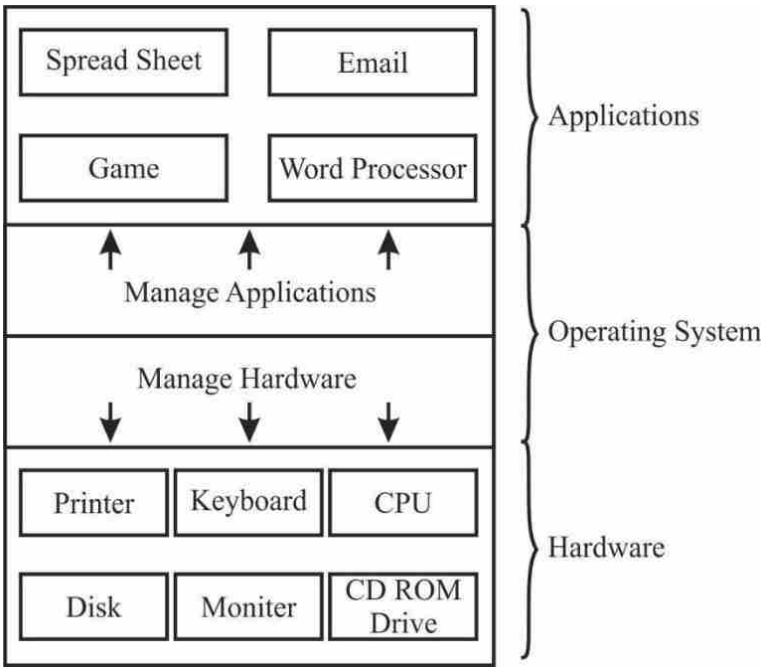

Fig. 12.1 : Computer System Components

❑ **Check Your Progress – 2 :**

1. The devices which you see and touch are called _____.

   [A] Hardware [B] Software

   [C] Both [A] and [B] [D] None of the above

2. Operating system is _____.

   [A] Hardware [B] Software [C] Utility [D] Database

3. The role of the operating system is _____.

   [A] Manage Hardware [B] Manage Process

   [C] Both [A] and [B] [D] Developing programs

12.2 Network Operating Systems :

A Networking Operating System is also Operating System (OS) that contains large number of programs and components that allow a computer running network operating system to serve requests from other computer for web sites, data and provide access to other resources such as file systems and printer.

The network operating systems allow computers to communicate and share data across the network while overseeing the network's security and controlling network operations.

12.2.1 The commonly used Network Operating Systems are discussed bellow :

- **Novell :** As the market leader, Novell set the stage for a long line of PC LAN innovations that extend well beyond simple file and print services. Novell designed the NetWare Load Module (NLM) to enable third–party companies to write server–side NetWare applications and enterprise–oriented features, such as data recovery and fault tolerance.
- In terms of scalability, Novell extended the power and performance of NetWare by allowing other companies to port NetWare from its Intel–only origin to high–end RISC systems, such as the HP9000. At the network level, the routing capabilities and simple client configuration of Novell's IPX protocol suite enables NetWare customers to easily construct networks of any size. Novell has further reinforced the ease–of–installation and ease–of–maintenance of NetWare with the release of NetWare Directory Services (NDS), a global directory structure for all NetWare resources.
- **Banyan Systems :** Banyan Systems' VINES (Virtual Network Software) provides file and print serving services similar to NetWare, but VINES run with existing network protocols, such as TCP/IP, SNA and others. More significantly, VINES was the first PC LAN product to support a network directory service, which Banyan named StreetTalk. StreetTalk presents a single directory that encompasses multiple servers and allows users to login only once to access multiple servers. Of course, Novell later added its own network directory service in version 4.1 of NetWare and other network operating systems vendors are following suit. Banyan is, however, unbundling StreetTalk and offering it for other platforms, such as Windows NT.
- **IBM :** IBM's original PC LAN product was the LAN Server, a dedicated server product that shares the same protocol suite (NetBIOS/NetBEUI) and same overall architecture as Microsoft's LAN Manager Product. This

should not be a big surprise because IBM was one of the core developers of the NetBIOS/ NetBEUI protocol suite and the Server Message Block (SMB) architecture used by IBM, Microsoft and others. IBM's DOS–based LAN Server technology was then integrated into its OS/2 server product. OS/2–based file and print servers have achieved a reputation for stability and reliability; however, OS/2 servers tend to be implemented in sites that have other IBM equipment—AS/400 and mainframes in particular.

- **Microsoft :** Microsoft acquired most of its networking technology from 3Com Corporation. Microsoft incorporated the 3Com technology in its main product lines, starting with LAN Manager, a dedicated file and print server similar to IBM's LAN Server offering. Microsoft then went on to extend its networking technology into workgroup environments with the release of Windows for Workgroups and Windows 95. None of these Microsoft products offered the stability or performance of a dedicated Novell NetWare server—but this changed with the advent of Windows NT Server.
- Windows NT Server is an enterprise–oriented product that can compete head–to–head with NetWare. Windows NT Server also offers additional features and value—most notably, the capability to run on a wide range of platforms, fully integrated support for TCP/IP and support for a range of software products that enable an NT Server to function as a full–blown application server.

❑ **Check Your Progress – 3 :**

1. AS400 is a system of _____.

   [A] IBM [B] Microsoft

   [C] Banyan [D] None of the above

2. _____ network–based operating system is developed by Banyan Systems.

   [A] NetWare [B] Windows–NT

   [C] DOS [D] VINES

3. DOS stands for _____.

   [A] Distributed Operating System [B] Distributed Open System

   [C] Disk Operating System [D] Disk Open Source System

12.2.2 The network operating systems perform the following functions :

- Add, manage and remove users who wish to use resources on the network.
- Allow users to access data on the network. This data resides on the server.
- Allow users to access data found on another network such as the internet.
- Allow users to access hardware connected to the network.
- Protect data and services located on the network.

12.2.3 Network operating system features may include :

- Support for hardware ports
- Security features such as authentication, authorization, login restrictions and access control directory services and Name services
- Print, file, data storage, replication and backup services

- Remote access
- System management
- Auditing tools and Network administration with graphic interfaces
- Clustering capabilities
- High availability and Fault tolerance.

❑ **Check Your Progress – 4 :**

1. Identify the feature of a Network Operating Systems from the given options :

   [A] Remote access [B] System management

   [C] Support for Hardware ports [D] All of the above

2. Identify the which is not a feature of Network OS.

   [A] Manage users [B] Sharing of hardware

   [C] Provides GUI [D] Data protection

12.3 Utilities :

Utility is the program that makes computer system easy to use or perform highly specialized functions. Utilities are used to manage disks, troubleshoot hardware problems and perform other tasks that the operating systems are not able to do.

Utility software is a kind of system software designed to help analyse, configure, optimize and maintain the computer. A single piece of utility software is usually called a utility or tool. Utility software should be contrasted with application software, which allows users to do things like creating text documents, playing games, listening to music or surfing the web. Rather than providing such kinds of output–oriented or user–oriented functionality, utility software normally concentrates on how the computer infrastructure (including the computer hardware, application software, operating system and data storage) operates.

Due to this, utilities are often rather targeted and technical at people with a higher level of computer knowledge.

Most utilities are highly specialized and designed to perform only a single task or a small range of tasks. However, there are also some utility suites that combine several features in one piece of software. Most major operating systems come with several pre–installed utilities.

❑ **Check Your Progress – 5 :**

1. Identify Utility program from the given options :

   [A] Word processor [B] Excel

   [C] Disk defragment [D] Browser

2. WinZip or Win–RAR are _____ software.

   [A] Application [B] Operating System

   [C] Utility [D] Driver

12.4 Let Us Sum Up :

System software is the program that controls computer hardware. It also maintains computer operation efficiently. The main components of system software are operating system, network operating system and utility.

An operating system (OS) is an interface between user and hardware; an OS is responsible for the coordination and management of activities and the sharing the resources of the computer.

The operating system (OS) acts as a host for computing applications that are run on the machine. As a host, one of the purposes of an operating system (OS) is to

❖ **Handle the details of the operation of the hardware.**

The operating system performs following functions–From the user's point of view, the purpose of an operating system is to assist him in the mechanics of solving problems. Specifically, the following functions are performed by the system :

1. Job sequencing, scheduling and traffic controller operation
2. Input/ output programming
3. Protecting itself from the user; protecting the user from other users
4. Secondary storage management
5. Error handling

A Networking Operating System is an operating system (OS) that contains programs and components that allow a computer running network operating system to serve requests from other computer for web sites, data provide access to other resources such as printer and file systems. Novell Netware, UNIX and Windows NT are the main NOS.

❖ **The network operating systems perform the following functions :**

- It can add, remove and manage users.
- Allow users to access data which commonly resides on the server.
- It also allows users to access hardware connected to the network.
- It protects data and services located on the network.

❖ **Network operating system features may include :**

- It supports features like security, authentication, authorization, login restrictions and access control
- Using NOS features we can access name services and directory services
- It supports features like exchange of files, print, data storage, backup and replication services
- Remote access is possible.
- Network administration and auditing tools with graphic interfaces
- Using NOS we can support clustering.
- In NOS Fault tolerance and high availability features.

Utility is the program that makes computer system easy to use or perform highly specialized functions. Utilities are used to manage disks, troubleshoot hardware problems and perform other tasks that the operating systems are not able to do.

12.5 Glossary :

OS : Operating System. It is a system software, which manages processes, memories, storage and IO devices.

NOS : Network Operating System. It is a operating system which supports networking.

TCP/IP : Transmission Control Protocol and Internet Protocol. These protocols are used in the networking.

DOS : Disk Operating System. It is a simple command–oriented operating system developed by Microsoft.

12.6 Suggested Answers For Check Your Progress :

- **Check Your Progress 1 :**

  1. [B] 2. [D]

- **Check Your Progress 2 :**

  1. [A] 2. [B] 3. [C]

- **Check Your Progress 3 :**

  1. [A] 2. [D] 3. [C]

- **Check Your Progress 4 :**

  1. [D] 2. [C]

- **Check Your Progress 5 :**

  1. [C] 2. [C]

12.7 Assignment :

❖ **Broad Questions :**

1. What do you mean by operating systems ? State the functions performed by operating systems.
2. What is network operating system ? State the examples of NOS. Discuss the significant features and functions of NOS

❖ **Short Notes :**

1. Utilities
2. Novell Netware
3. Windows NT
4. Unix Operating Systems.
5. IBM Operating Systems.

12.8 Activity :

Explain the importance of System Software in your own words.

12.9 Case Study :

Collect the information about UNIX operating. List feature of UNIX operating system and explain each feature in detail.

12.10 Further Reading :

1. Computer Fundamentals by P.K.Sinha and Priti Sinha.
2. Discovering Computers 2016 by Shelly Cashman Series. CENGAGE publications.
3. Computer Fundamentals by Pearl Software, Khanna Book Publishing.
4. Computer Networks by Tanenbaum, Prentice–Hall India Publications.