

Operating System Structure ch 2

In the following lectures we will consider the components and services that are provided by different operating systems.

System Components

Many modern computer systems share the goal of supporting the following components:

▪ **Process management**

A process can be thought of a program in execution. A process needs certain resources to accomplish its task. Also the process various initialization values.

A process is the unit of work in a system. Such a system consists of a collection of processes, some of which are system processes others are user processes. All processes execute concurrently by multiplexing the CPU among them.

The OS responsible for the following activities in connection with process management:

- Creation and deletion both user and system processes.
- Suspending and resuming processes.
- Providing mechanisms for process synchronization.
- Providing mechanisms for process communication.
- Providing mechanisms for deadlock handling.

▪ **Main Memory Management**

The main memory is the central to the operation of a modern computer system. For a program to be executed it must mapped to absolute addresses and loaded to the M.M.

The OS responsible for the following activities in connection with M.M management:

- Keeping track of which parts of memory are currently being used and by whom.
- Deciding which processes are to be loaded into memory when memory space become available.

- Allocating and deallocating memory space as needed.

- **File Management**

For convenient use of the computer, the OS provides a uniform logical view of information storage. The OS abstracts from the physical properties of its storage device to define the logical storage unit, the file.

A file is a collection of related information defined by its creator. These files are organized in directories to ease their use.

The OS responsible for the following activities in connection with file management:

- Creating and deleting files.
- Creating and deleting directories.
- Supporting primitives for manipulating files and directories.
- Mapping files onto secondary storage.
- Backing up files on stable storage media.

- **I/O System Management**

One of the purposes of OS is to hide the peculiarities of specific hardware devices. The OS responsible for the following activities in connection with I/O system management:

- A memory management component that includes buffering, caching and spooling.
- A general device driver interface.
- Drivers for specific hardware devices.

- **Secondary Storage Management**

The computer system must provide secondary storage to back up main memory because that are hold by MM are lost when power is switched off and the MM is too small to accommodate all data programs. The OS responsible for the following activities in connection with disk management:

- Free space management

- Storage allocation
- Disk scheduling

- **Networking**

A distributed system collects physically separate heterogeneous systems into a single coherent system, providing the user with the access to various resources that the system maintains. Access to a shared resource allows computation speed up, increase functionality, increase data availability, and enhance reliability.

- **Protection System**

Protection is any mechanism for controlling the access of programs, processes, or users to the resources defined by the computer system. This mechanism must provide means for specification of the controls to be imposed and means for enforcement. Protection can improve reliability by detecting latent errors at the interfaces between component subsystems.

- **Command Interpreter System**

Command Interpreter System is the interface between the user and the OS. Some of these Command Interpreter Systems are user friendly such as mouse based windows and menus. In other shells, commands are typed on a keyboard.

Operating System Services

An operating system provides an environment for the execution of programs. It provides certain services to programs and to the users of these programs. The specific services provided differ from one operating system to another but we can identify common classes. These operating system services are provided for the convenience of the programmer, to make the programming task easier.

1. Program execution
2. I/O operation
3. File system manipulation
4. Communications
5. Error detection
6. Resource allocation
7. Accounting
8. Protection

System Calls

System calls provide the interface between a process and the operating system. These calls are generally available as assembly language instructions and they are usually listed in the various manuals used by assembly language.

System Programs

System programs provide a convenient environment for program development and execution. Some of them are simply user interfaces to system calls others are considerably more complex. They can be divided into these categories:

- File management
- Status information
- File modification
- Programming language support
- Program loading and execution
- Communications

System Structure

A system as large and complex as a modern operating system must be engineered carefully if it is to function properly and to be modified easily. There are three different system structures:

- Simple structure
- Layered Approach
- Microkernel

System Design and Implementation

The problems and steps of system design and implementation are as follows:

- Design Goals
- Mechanisms and Policies
- Implementation