

Operating Systems

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Chapter 1. Introduction



1.5 Operating System Concepts

1. Processes

The key concept in operating systems is process. **A process is a program in execution.** Associated with each process:

1. Address space: it is a memory locations from 0 to some maximum (code, data and stack) where the process can read and write.
2. A set of resources: registers, open files, outstanding alarms, related processes and other needed information to run the program.

Process table is where the information of each process is there as an entry for each process.

Associated system calls are creation and termination of the process.

Child process created by another process (parent).

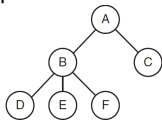


1. Processes

Inter-process communication (IPC) provide communications and synchronization between processes.

UID a process started by a person with UID has the same UID.

Superuser or Administrator a UID with special power that override protection rules in a system.



2. Address space

Is a memory from 0 to some maximum that a process can access. When multiple processes are in memory a kind of protection is needed which is usually provided by hardware and controlled by the operating system.

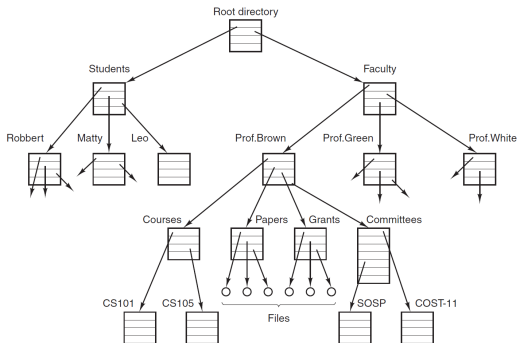
Virtual memory: allows a process with an address space larger than the available physical memory to run.

Memory management is an important part of an operating system.



3. Files

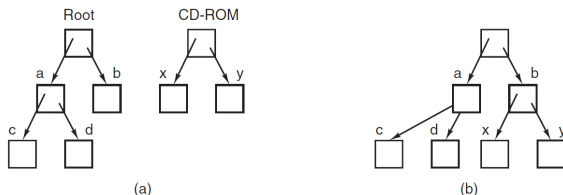
One of the key concepts in an operating system. Several system calls are needed to deal with files; read, write create, delete, move, copy, etc. Files are stored in directories. The model of directories and files gives a rise to the **file system**





3. Files

Mounted file system: in UNIX like systems there is no notion of drives (C:, D:,...), instead any file system in a CD, floppy or USB stick can be mounted in a known place:



Special files: in UNIX special file like; block special file, character special file. Pipe is one kind of special files.



4. Input/Output

Many physical devices are connected to a computer which needs a management. This management is done through I/O software that is consisted of two parts one is applied to many or all devices, the other part is the device driver which is specific to one I/O device.

5. Protection

Files in UNIX are protected by providing 9-bit numbers for access control. System should be protected against external intruders as viruses.

6. The Shell

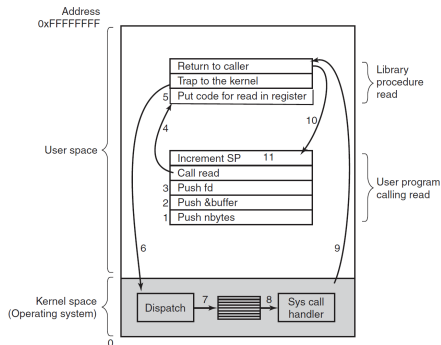
Is a command interpreter between the user and the operating system. It is not part of the OS and it serves as a standard input and a standard output. The shell starts up by typing the prompt then waiting for user commands. When a user types the name of the program to be run the shell will create a child process. Inside the child the program will be run. Most computers today use GUI as a user interface which serves as a shell.



1.6 System Calls

System calls

- ▶ If a process running in user mode needs system service, such as reading data from file, it needs to issue a trap instruction to transfer control to kernel mode.
- ▶ Read system call: *read(fd, buffer, nbytes);*





1.7 Operating Systems Architecture

The inside architectures of an operating system have some forms beside others:

- ▶ Monolithic Systems
- ▶ Layered Systems
- ▶ Microkernel
- ▶ Client-Server Model
- ▶ Virtual Machines
- ▶ Exokernel