Sairam INSTITUTIONS

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CS8493

OPERATING SYSTEMS

UNIT No. 1

1.8 System Calls, System operation

Version: 1.XX

System Calls

System call is the programmatic way in which a computer program requests a service from the kernel of the operating system it is executed on. A system call is a way for programs to **interact with the operating system**. A computer program makes a system call when it makes a request to the operating system's kernel. System call **provides** the services of the operating system to the user programs via Application Program Interface(API). It provides an interface between a process and operating system to allow user-level processes to request services of the operating system.

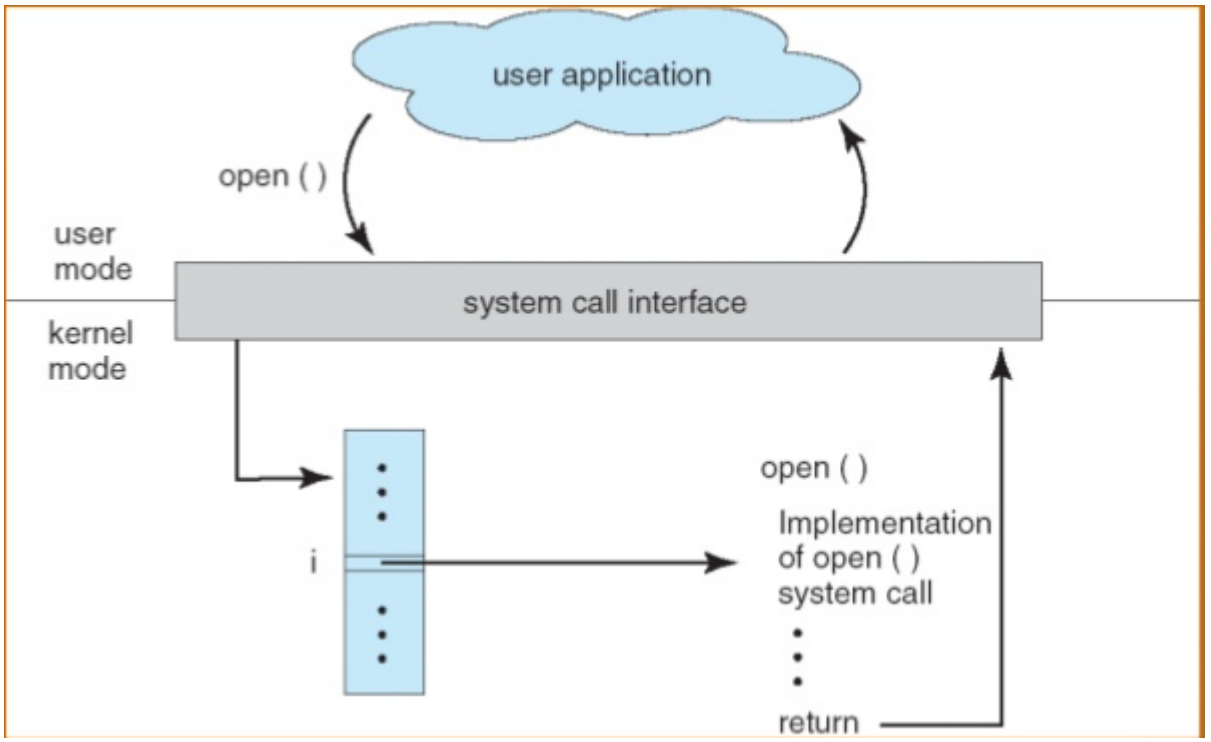
Example:- Consider that we have to write a program to read data from one file and to copy them to another file. The first input that the program will need is the names of the two files, the input file and the output file. In an interactive system this approach will require a sequence of system calls first to write a prompting message on the screen and then to read from the keyboard the characters that define the two files. After file names are obtained , the program must open the input file and has to create the output file, Each of these operations require additional system calls

Even simple programs may make heavy use of the operating systems. Frequently the system executes thousands of system calls per second.

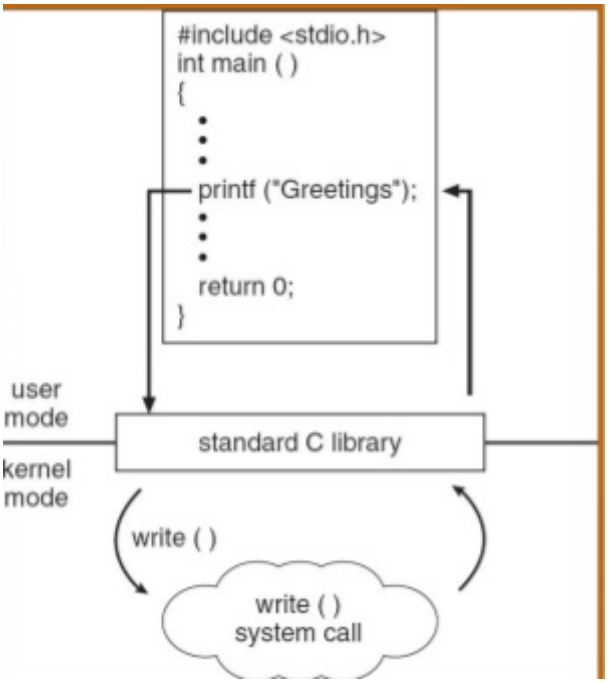
Three of the most common API available to application Programmer are

1. Windows API for windows Systems
2. POSIX API (used virtually all versions of Unix, Linux and Mac OS
3. Java APL for Java Virtual Machine

The figure shows handling of a user application invoking open() system call



C program invoking printf() library call, which call write() system Calls



System Calls occur in different ways, depending on the computer in use Often, more information is required than simply identify the system call.

For Example, to get input, we may need to specify the file or device to use as the source, as well as the address and length of the memory Size

Types of System Calls

1. Process Control

2.File Management

3.Device Management

4.Information Maintenance

5.Communication

6.Protection

1. **Process control:**
end, abort
load ,Execute
create process, terminate process
get process attribute, set process attribute
wait for time
wait event, Signal Event
allocate and free memory.

2. **File management:**
Create file, delete file
open, close
read, write ,reposition
get file attributes, set file attributes

3. Device Management

Request device, Release Device

Read, Write, Reposition

Get Device attributes, set device attributes

Logically attach or detach device

4. **Information Maintenance**

Get time or date, set time or date

Get system date, set system date

Get process, device attributes

5. **Communications**

Create, delete communications connections

Send, Receive message

Transfer status information

Attach or detach remote devices

5. **Protection**

Set permission(), get permission()

Allow_user(), deny_user()

Types of System Calls	**Windows**	**Linux**
Process Control	CreateProcess() ExitProcess() WaitForSingleObject()	fork() exit() wait()
File Management	CreateFile() ReadFile() WriteFile() CloseHandle()	open() read() write() close()

Device Management	SetConsoleMode() ReadConsole() WriteConsole()	ioctl() read() write()
Information Maintenance	GetCurrentProcessID() SetTimer() Sleep()	getpid() alarm() sleep()
Communication	CreatePipe() CreateFileMapping() MapViewOfFile()	pipe() shmget() mmap()

System Programs

According to Computer Hierarchy, one which comes at last is Hardware. Then it is Operating System, System Programs, and finally Application Programs. Program Development and Execution can be done conveniently in System Programs. Some of System Programs are simply user interfaces, others are complex. It traditionally lies between user interface and system calls.

They can be divided into these categories

File Manipulation

These system programs are used to manipulate system files. This can be done using various commands like create, delete, copy, rename, print etc. These commands can create files, delete files, copy the contents of one file into another, rename files, print them etc.

Status Information

The status information system programs provide required data on the current or past status of the system. This may include the system date, system time, and available memory in system, disk space, logged in users etc.

File Modification

System programs that are used for file modification basically change the data in the file or modify it in some other way. Text editors are a big example of file modification system programs.

Programming Language Support

These system programs provide additional support features for different programming languages. Some examples of these are compilers, debuggers etc. These compile a program and make sure it is error free respectively.

Program Loading and Execution

The system programs that deal with program loading and execution make sure that programs can be loaded into memory and executed correctly. Loaders and Linkers are a prime example of this type of system program.

Communications

These system programs are needed for system communications such as web browsers. Web browsers allow systems to communicate and access information from the network as required.

Application Programs

Application programs can perform a wide range of services as per the needs of the users. These include programs for database systems, word processors, plotting tools, spreadsheets, games, scientific applications etc.