

Operating system concepts

User and Operating-System Interface

By Prof K R Chowdhary

JNV University

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OS Structure. (Kernel=OS)

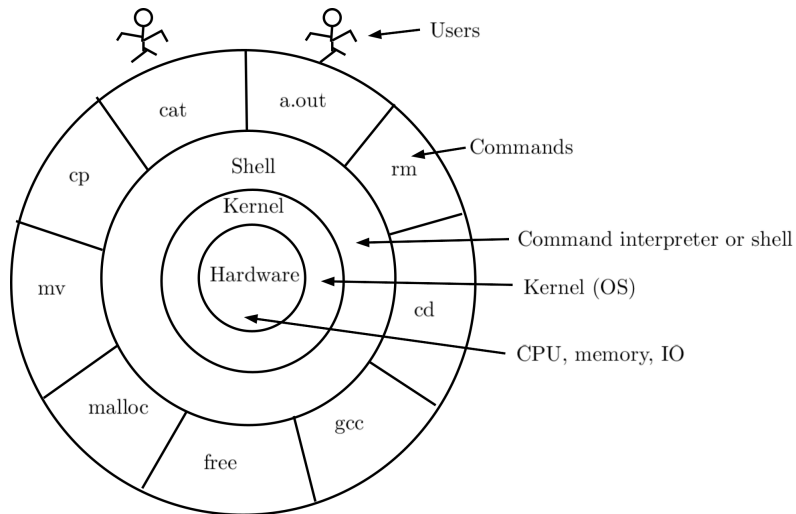


Figure 1: OS Structure

User and Operating-System Interface

There are several ways for users to interface with the operating system. But, there are two fundamental approaches.

- ▶ *Command-line interface*, or *command interpreter*, that allows users to directly enter commands to be performed by the operating system.
- ▶ The other allows users to interface with the operating system via a *graphical user interface*, or GUI.

Command interpreters:

- ▶ Some operating systems include the command interpreter in the kernel (e.g. DOS). Others, such as Windows and UNIX, treat the *command interpreter* as a special program
- ▶ On UNIX and Linux systems, a user may choose among several different shells, including the *Bourne shell*, *C shell*, *Korn shell*

Command interpreters..., Some commands.

```
krc@krc-Inspiron-13-5378: ~  
krc@krc-Inspiron-13-5378:~$ pwd  
/home/krc  
krc@krc-Inspiron-13-5378:~$ ls  
aa      BCA.docx  Desktop  Downloads  Music  Pictures  temp.doc  Templates  works  
aa.m    BCA.pdf   Documents missfont.log neo    Public    temp.docx Videos  
krc@krc-Inspiron-13-5378:~$  
krc@krc-Inspiron-13-5378:~$ ls -l  
total 136  
-rw-rw-r-- 1 krc krc  613 Jun 20 13:14 aa  
-rw-rw-r-- 1 krc krc  145 Jun 20 09:19 aa.m  
-rw-rw-r-- 1 krc krc 6595 May 31 18:15 BCA.docx  
-rw-rw-r-- 1 krc krc 57246 May 31 18:15 BCA.pdf  
drwxr-xr-x 14 krc krc 4096 Sep  1 11:40 Desktop  
drwxr-xr-x 42 krc krc 4096 Aug  8 09:40 Documents  
drwxr-xr-x  3 krc krc 4096 Aug 27 16:39 Downloads  
-rw-rw-r-- 1 krc krc  310 Aug 12 12:48 missfont.log  
drwxr-xr-x  2 krc krc 4096 Jan 26  2023 Music  
drwxrwxr-x  3 krc krc 4096 Jul 15 23:25 neo  
drwxr-xr-x  3 krc krc 4096 Aug 31 15:58 Pictures  
drwxr-xr-x  2 krc krc 4096 Jan 26  2023 Public  
-rw-rw-r-- 1 krc krc 9216 Jul 14 10:35 temp.doc  
-rw-rw-r-- 1 krc krc 4918 Aug  7 22:10 temp.docx  
drwxr-xr-x  2 krc krc 4096 Jan 26  2023 Templates  
drwxr-xr-x  2 krc krc 4096 Jan 28  2023 Videos  
drwxr-xr-x 65 krc krc 4096 Aug 11 09:27 works  
krc@krc-Inspiron-13-5378:~$ df  
Filesystem      1K-blocks    Used Available Use% Mounted on  
tmpfs            785268      2160    783108   1% /run  
/dev/sda4       74501012   35837720 34833124  51% /  
tmpfs           3926332      0    3926332   0% /dev/shm  
tmpfs            5120         4     5116    1% /run/lock  
/dev/sda5       95533536   38928096 51706372  43% /home/krc/works  
/dev/sda1       523244      6216    517028   2% /boot/efi  
tmpfs           785264     1664    783600   1% /run/user/1000  
krc@krc-Inspiron-13-5378:~$
```

Command interpreters work by system calls

- ▶ *Function of command interpreter*: Get and execute the next user-specified command.
- ▶ The commands given at this level manipulate files: *create*, *delete*, *list*, *print*, *copy*, *execute*, and so on. (The MS-DOS and UNIX shells operate in this way.)
- ▶ Commands can be implemented in two ways.
 - ▶ Command interpreter itself contains the code to execute the command. Ex. *command.com* in DOS
 - ▶ UNIX implements most commands through system programs.
For example:
rm file.txt
would search for a file called *rm*, load the file *rm* into memory, and execute it with the parameter (argument) *file.txt*.

Some Commands of Unix

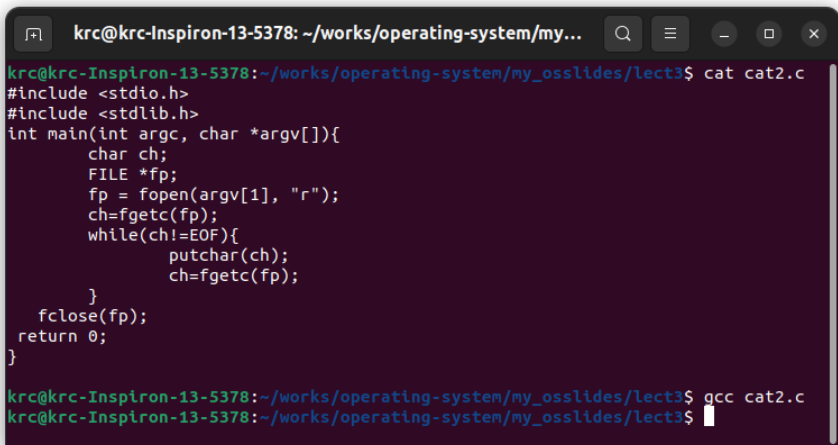
Command	Description
<i>ls</i>	Lists the files and directories
<i>cat file.txt</i>	Displays the file file.txt
<i>mv f1 f2</i>	Renames file f1 as f2
<i>cp f1 f2</i>	Copies file f1 into file f2
<i>gcc abc.c</i>	Compiles the abc.c file
<i>df</i>	Display the file system
<i>wc file1</i>	Count words, lines and char in file1
<i>gedit f1</i>	Opens the editor for file f1
<i>vi f1.txt</i>	Opens the vi editor for file f1

Online unix terminal:

https://www.tutorialspoint.com/linux_terminal_online.php

Your program to implementing the 'cat' Command

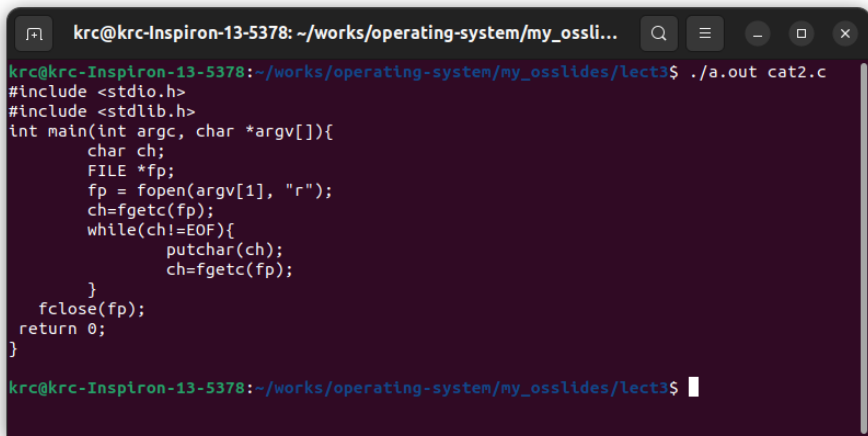
Like, compiler allocates space for a *char* (1 byte) and names it as *ch*, the compiler creates a data structure 'FILE' and points it by pointer *fp*.



```
krc@krc-Inspiron-13-5378: ~/works/operating-system/my...
krc@krc-Inspiron-13-5378:~/works/operating-system/my_osslides/lect3$ cat cat2.c
#include <stdio.h>
#include <stdlib.h>
int main(int argc, char *argv[]){
    char ch;
    FILE *fp;
    fp = fopen(argv[1], "r");
    ch=fgetc(fp);
    while(ch!=EOF){
        putchar(ch);
        ch=fgetc(fp);
    }
    fclose(fp);
    return 0;
}
krc@krc-Inspiron-13-5378:~/works/operating-system/my_osslides/lect3$ gcc cat2.c
krc@krc-Inspiron-13-5378:~/works/operating-system/my_osslides/lect3$
```

Running the cat Command program

At command line, 'cat2.c' is passed as argument 'argv[1]' to main, the program opens cat2.c in 'r' mode, reads it, and prints on screen.



```
krc@krc-Inspiron-13-5378: ~/works/operating-system/my_ossl...
krc@krc-Inspiron-13-5378:~/works/operating-system/my_osslides/lect3$ ./a.out cat2.c
#include <stdio.h>
#include <stdlib.h>
int main(int argc, char *argv[]){
    char ch;
    FILE *fp;
    fp = fopen(argv[1], "r");
    ch=fgetc(fp);
    while(ch!=EOF){
        putchar(ch);
        ch=fgetc(fp);
    }
    fclose(fp);
    return 0;
}
```


Graphical user Interface

- ▶ Another strategy for interfacing with the operating system is through a user friendly graphical user interface, or GUI.
- ▶ Because a mouse is impractical for most mobile systems, smartphones and handheld tablet computers typically use a touchscreen interface.
- ▶ Traditionally, UNIX systems have been dominated by command-line interfaces. Various GUI interfaces are available. These include the Common Desktop Environment (CDE) and X-Windows systems, which are common on commercial versions of UNIX, such as Solaris and IBM's AIX system.

System Calls: Special programs or functions calls, as part of Kernel

- ▶ *System calls* provide an interface to the services made available by an operating system. These calls are generally available as routines written in C or C++
- ▶ Writing a simple program to read data from one file and copy them to another file. `$ cp file1.txt file2.txt`
- ▶ In an *interactive system*, this approach will require a sequence of system calls ?
- ▶ The user can then use the mouse to select the source name, and a window can be opened for the destination name to be specified.