

1.4. Layers of LINUX/UNIX

- ❖ LINUX/UNIX has three most important parts.
They are Kernel, Shell and File System

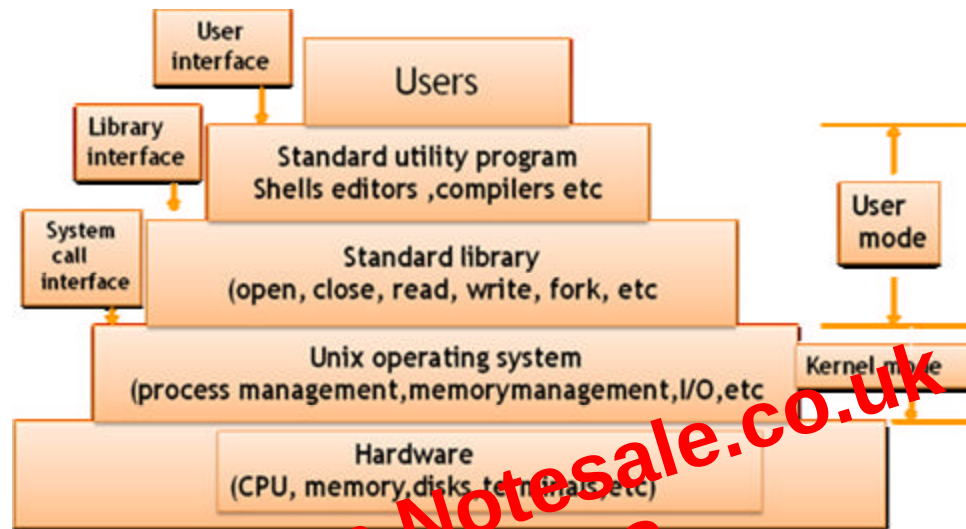


Fig 1.1 Layers of Linux

1.4.1 Kernel:

- ❖ Kernel is the heart of the operating system.
- ❖ It is the low level core of the System that is the interface between applications and H/W.
- ❖ Functions
 - Manage Memory, I/O devices, allocates the time between user and process, inter process communication, sets process priority

1.4.2 Shell:

- ❖ The shell is a program that sits on the as an interface between users and kernel
- ❖ It is a command interpreter and also has programming capability of its own.
- ❖ Shell Types
 - Bourne Shell (sh) (First shell by Stephen Bourne)
 - C Shell(sh)
 - Korn Shell (ksh)
 - Bourne Again Shell(bash)

2. Getting Started

- ❖ Use username and password for login.
- ❖ Login is user unique name.
- ❖ Linux is case sensitive.
- ❖ Password can be changed by the user at any time.

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Command: **top**

- ❖ To view the CPU usage of all processes.
- ❖ Syntax: **\$ top**

```

top - 16:11:52 up 2 days, 42 min, 6 users, load average: 0.00, 0.00, 0.00
Tasks: 133 total, 1 running, 132 sleeping, 0 stopped, 0 zombie
Cpu(s): 0.7% us, 0.1% sy, 0.0% ni, 99.0% id, 0.1% wa, 0.0% hi, 0.0% si
Mem: 2067260k total, 1172708k used, 894552k free, 82640k buffers
Swap: 5116660k total, 0k used, 5116660k free, 672976k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU  %MEM    TIME+  COMMAND
    1 root        0   0 1884   560  480 S   0.0   0.0   0:00.44 init
    2 root        34  19    0    0    0 S   0.0   0.0   0:00.00 ksoftirqd/0
    3 root         5 -10    0    0    0 S   0.0   0.0   0:00.09 events/0
    4 root         6 -10    0    0    0 S   0.0   0.0   0:00.01 khelper
    5 root        15 -10    0    0    0 S   0.0   0.0   0:00.00 kacpid
   30 root         5 -10    0    0    0 S   0.0   0.0   0:00.00 kblockd/0
   40 root        20  0    0    0    0 S   0.0   0.0   0:00.00 pdflush
   41 root        15  0    0    0    0 S   0.0   0.0   0:00.22 pdflush
   43 root         7 -10    0    0    0 S   0.0   0.0   0:00.00 aio/0
   31 root        15  0    0    0    0 S   0.0   0.0   0:00.00 khubd
   42 root        18  0    0    0    0 S   0.0   0.0   0:00.00 kswapd0
  117 root        19  0    0    0    0 S   0.0   0.0   0:00.00 kseriod
  192 root         5 -10    0    0    0 S   0.0   0.0   0:00.00 ata/0
  194 root        22  0    0    0    0 S   0.0   0.0   0:00.00 scsi_eh_0
  195 root        23  0    0    0    0 S   0.0   0.0   0:00.00 scsi_eh_1
  212 root        15  0    0    0    0 S   0.0   0.0   0:00.95 kjournald
 1123 root         6 -10 2736  452  312 S   0.0   0.0   0:00.01 udevd
  
```

Fig. 3.14 top command

4 File System

- ❖ Linux files are organized by a hierarchy of labels, commonly known as hierarchy structure.
- ❖ There are three types of files.
- ❖ They are
 - Regular Files:
 - This contains a sequence of bytes that generally corresponds to code or data.
 - Directory Files:
 - Directory file contains an entry for every file and subdirectory that it is placed.
 - Device Files:
 - These files correspond to the printers or other devices connected to the system.

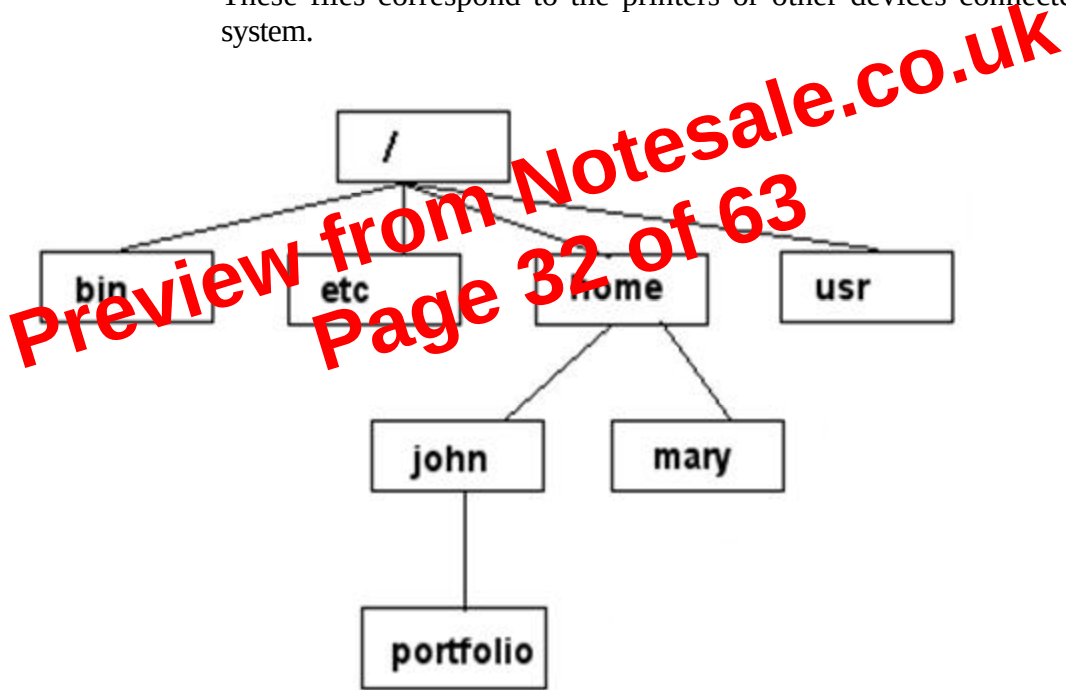


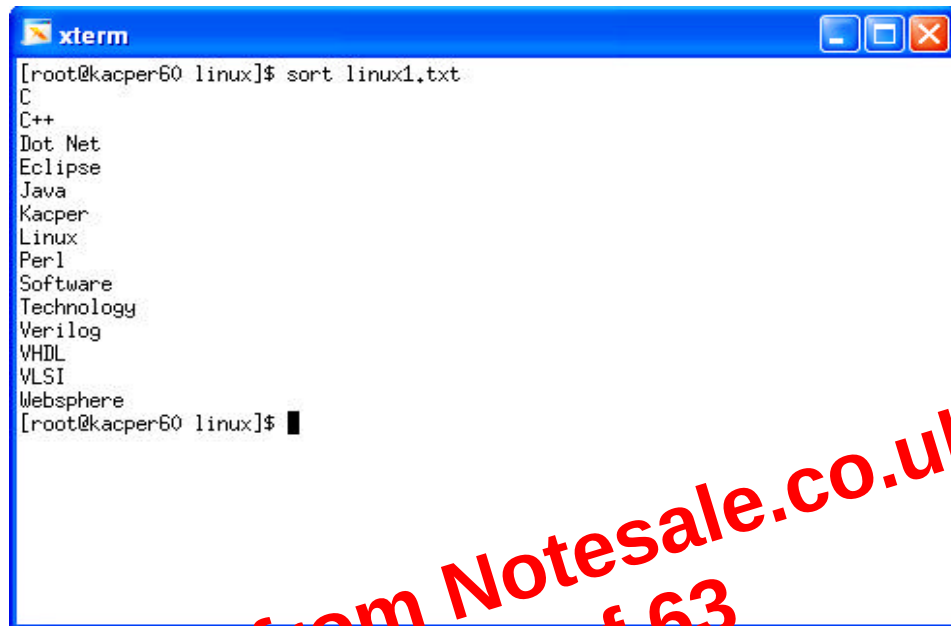
Fig. 4.1 File System

4.1 Directories in LINUX:

- ❖ Directory: /bin
/bin contains the binaries which are needed to run LINUX.
- ❖ Directory: /boot
/boot has all the files required for booting LINUX on system.
- ❖ Directory: /dev
/dev has the devices for all the files.
- ❖ Directory: /etc
/etc contains the configuration files of the various software.
Normally no one touch this directory.
- ❖ Directory: /home
/home is like My Documents in Windows.
This contains the username as the sub directory.
- ❖ Directory: /lib
/lib contains the libraries required for the system files.
- ❖ Directory: /lost+found
/lost+found contains the files which are damaged or which are not linked to any directory.
These damages are due to the incorrect shutdown.
- ❖ Directory: /mnt
This is the directory in which we mount the devices and other file systems.
- ❖ Directory: /opt
Here the optional softwares are installed.
- ❖ Directory: /root
The directory for the user root

Command: **sort**

- ❖ It prints the lines of the file in sorted order.
- ❖ Syntax:
\$ sort filename

A screenshot of an xterm window titled 'xterm'. The terminal shows the command '[root@kacper60 linux]\$ sort linux1.txt' and its output, which is a list of words sorted alphabetically: C, C++, Dot Net, Eclipse, Java, Kacper, Linux, Perl, Software, Technology, Verilog, VHDL, VLSI, and Websphere. The prompt '[root@kacper60 linux]\$' is visible at the bottom of the terminal output.

```
xterm
[root@kacper60 linux]$ sort linux1.txt
C
C++
Dot Net
Eclipse
Java
Kacper
Linux
Perl
Software
Technology
Verilog
VHDL
VLSI
Websphere
[root@kacper60 linux]$
```

Fig. 4.5 sort command

6. Shell Scripting

6.1 Scripting:

- ❖ Shell scripting provides the solution to a task as a combination of the UNIX utilities.
- ❖ Here pipes and file handling are used to connect subtasks.
- ❖ Scripting uses advanced utilities such as sort, cut, paste, join, grep, sed, awk, etc.

6.2 Utilities:

6.2.1 Sort:

- ❖ Sort records in file and the order default is ascending dictionary order.
- ❖ The available options for sort are

-t	Field separator
-k	Field to sort by
-n	Use numeric order
-r	Reverse direction

6.2.2 Join:

- ❖ Join combines two files based on value of common field.
- ❖ It's similar to join operation in relation algebra.
- ❖ The available options are

-1	Field to join on first file
-2	Field to join on second file
-t	Field separator

7.5 File Descriptors:

- ❖ The file descriptor has 3 standard file descriptors.
- ❖ They are
 - ➔ Stdin, Standard input to the program.
 - ➔ Stdout, Standard output from the program.
 - ➔ Stderr, Standard error output from the program.
- ❖ The file redirections are listed below:

>	Output redirect
>!	Output redirect but overrides noclobber option of csh
>>	Append output
>>!	Append output but overrides noclobber option of csh and creates the file if it doesn't already exist
	Pipe output to another command
<	Input redirection

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7.9.1.1 Cursor Movement:

- ❖ Arrow keys are used for the movement.
- ❖ Alternative keys used for the cursor keys are **h** for left, **j** for down, **k** for up and **l** for right.
- ❖ **^f** forward one screen.
- ❖ **^b** back one screen.
- ❖ **^d** down half screen.
- ❖ **^u** up half screen.
- ❖ **G** go to the last line of the file.
- ❖ **\$** end of the current file.
- ❖ **0** beginning of the current line.
- ❖ **e** end of the word.

7.9.1.2 Inserting the Text:

- ❖ **i** insert text before the cursor.
- ❖ **a** append text after the cursor.
- ❖ **I** insert text at begging of the line.
- ❖ **A** append text at the end of the line.
- ❖ **o** open new line after current line.
- ❖ **O** open new line before current line.

7.9.1.3 Deleting the Text:

- ❖ **dd** deletes the current line.
- ❖ **D** deletes from cursor to the end of line.
- ❖ **X** deletes the current character.

7.9.1.4 File Manipulation:

:w	Write changes to file
:wq	Write changes and quit
:w!	Force overwrite of file
:q	Quit if no changes made
:q!	Quit without saving changes
:!	Shell escape
:r!	Insert result of shell command at cursor position

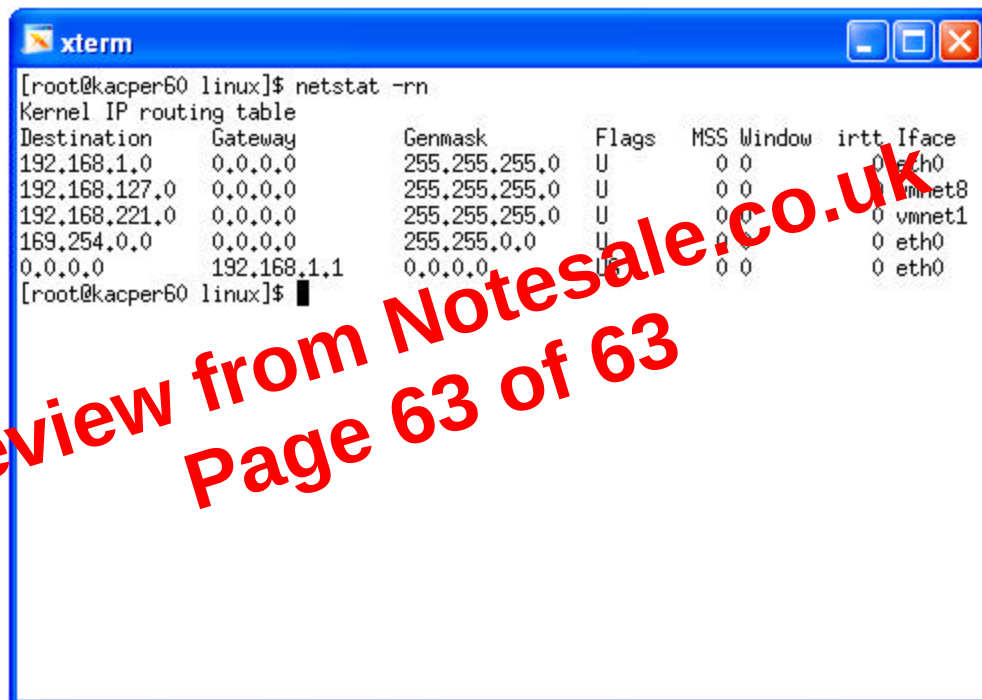
Command: ssh

- ❖ **ssh** (Secure SHell) is a program for logging into a remote machine and for executing commands on a remote machine.
- ❖ Syntax: **\$ssh [-l login_name] hostname**
- ❖ Examl: **\$ssh ip address**

We can connect to that particular system

Command: netstat

- ❖ netstat are used to check the connectivity of the network.
- ❖ Commad:
\$ netstat -rn



```
[root@kacper60 linux]$ netstat -rn
Kernel IP routing table
Destination Gateway Genmask Flags MSS Window irtt Iface
192.168.1.0 0.0.0.0 255.255.255.0 U 0 0 0 eth0
192.168.127.0 0.0.0.0 255.255.255.0 U 0 0 0 vmnet8
192.168.221.0 0.0.0.0 255.255.255.0 U 0 0 0 vmnet1
169.254.0.0 0.0.0.0 255.255.0.0 U 0 0 0 eth0
0.0.0.0 192.168.1.1 0.0.0.0 U 0 0 0 eth0
[root@kacper60 linux]$
```

Fig. 9.3 netstat command