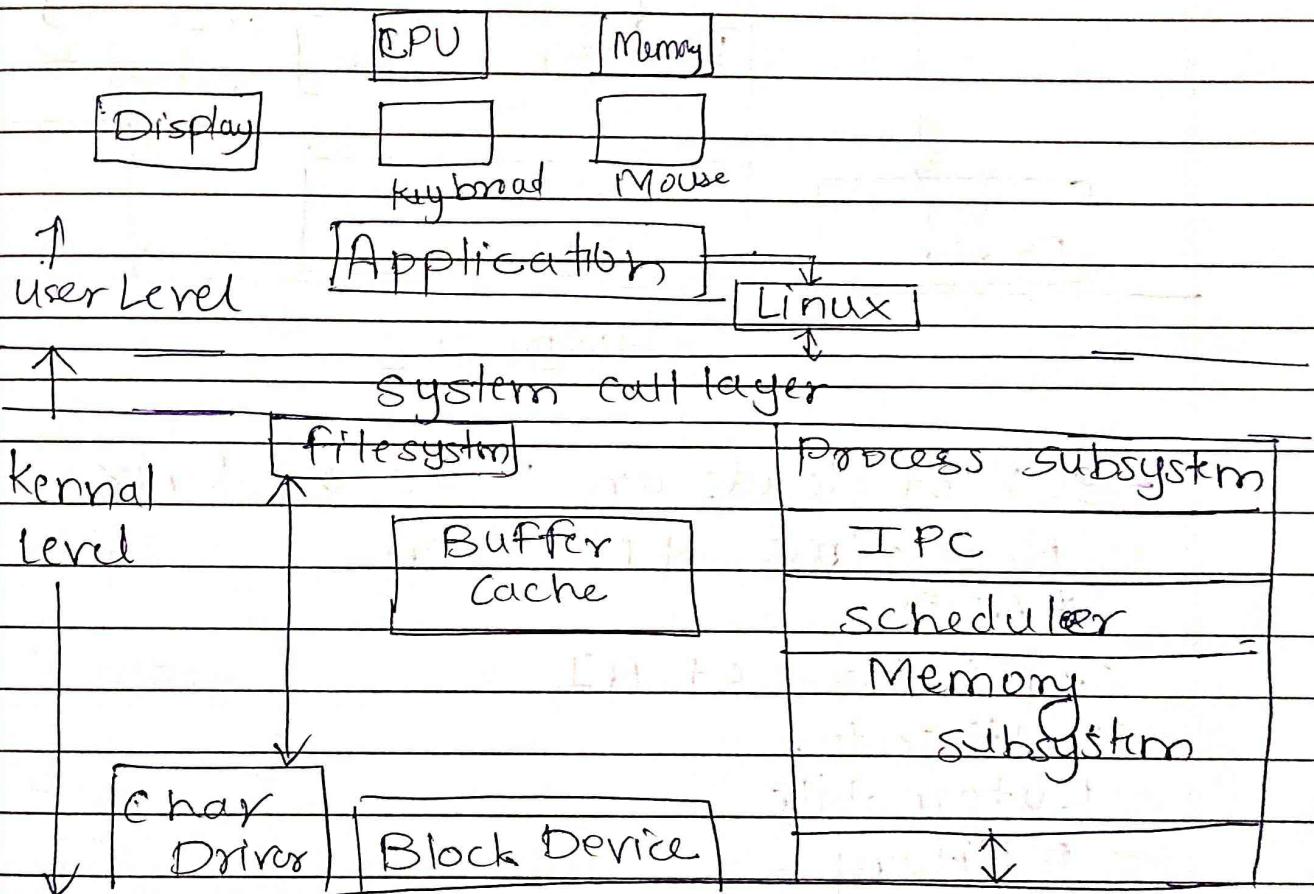
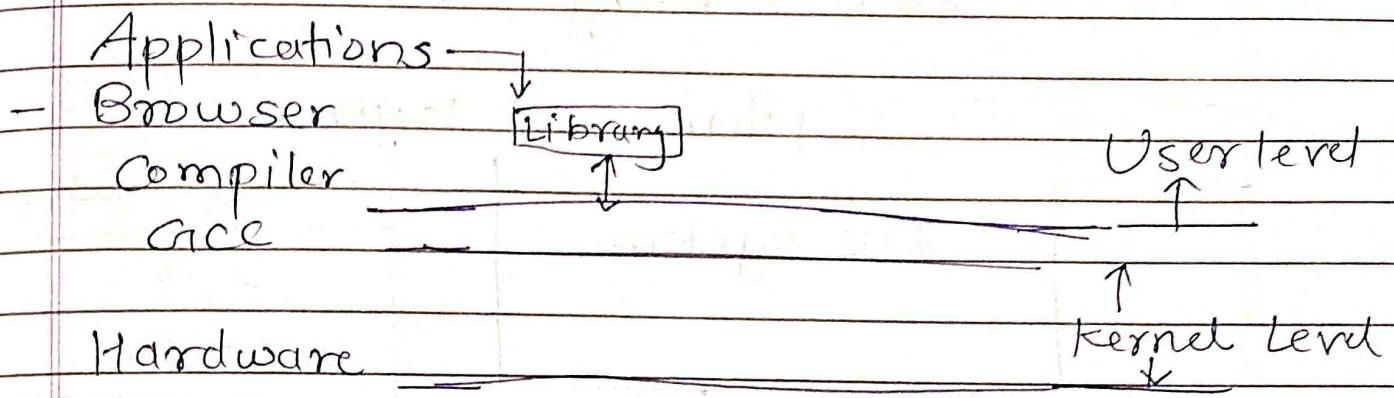
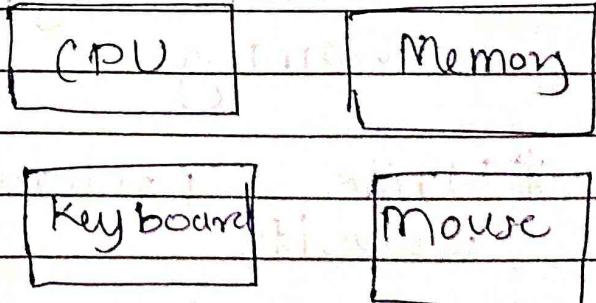


Unix System Programming

Page No. _____
Date 29/1/22

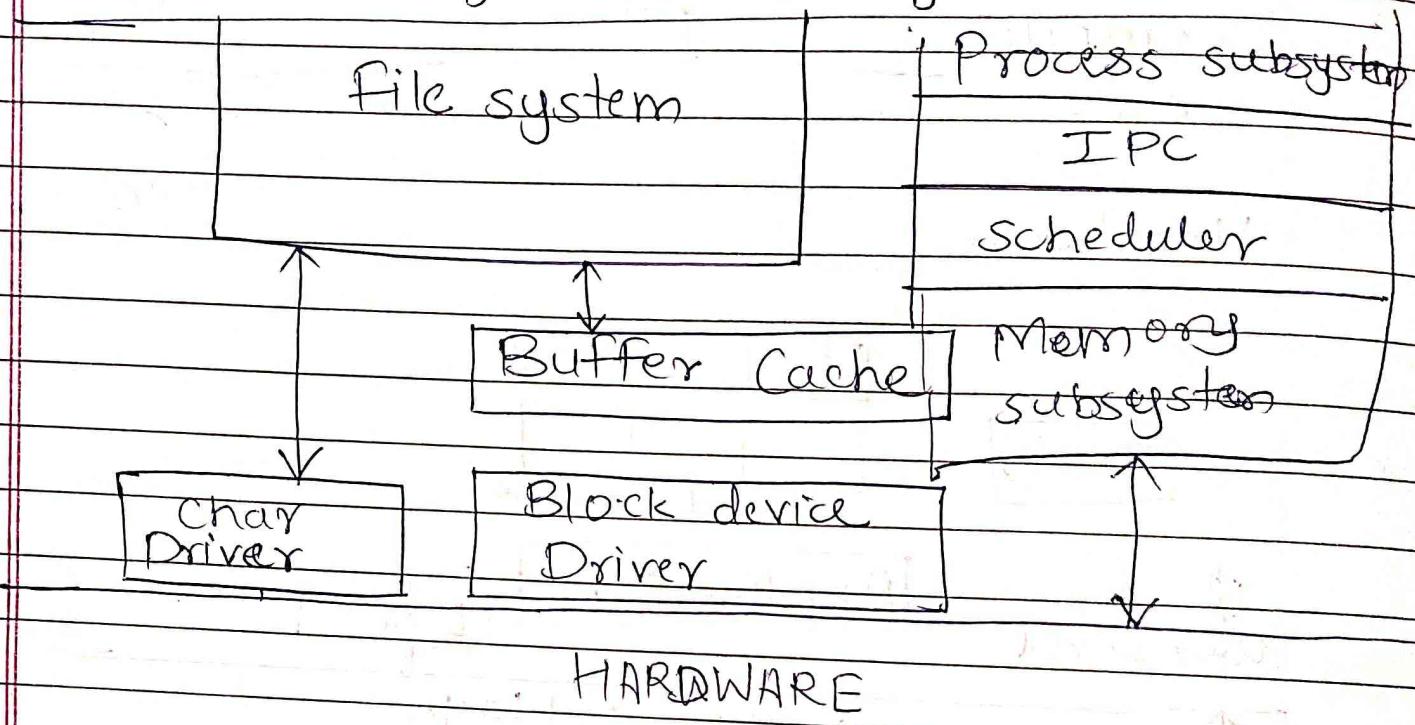


HARDWARE



Safe Driving — Linux — Tesla

System call layer



HARDWARE

- 90% of clouds are based on Unix
- Real time application
 - *ADAS

Application of AI

- Health sector
- Automobile
- Military
- Self driving cars, banking
- YouTube suggestion
- Gaming

* Write a program for implementing website

Schedulers

Schedulers available in system

- Disk scheduler → different request coming from o.s

Network scheduler

- CPU sch.

- Job sch.

• ~~OS~~

Big data → Machine learning
→ Artificial Intelligence

Anomaly Detection

28/1/22

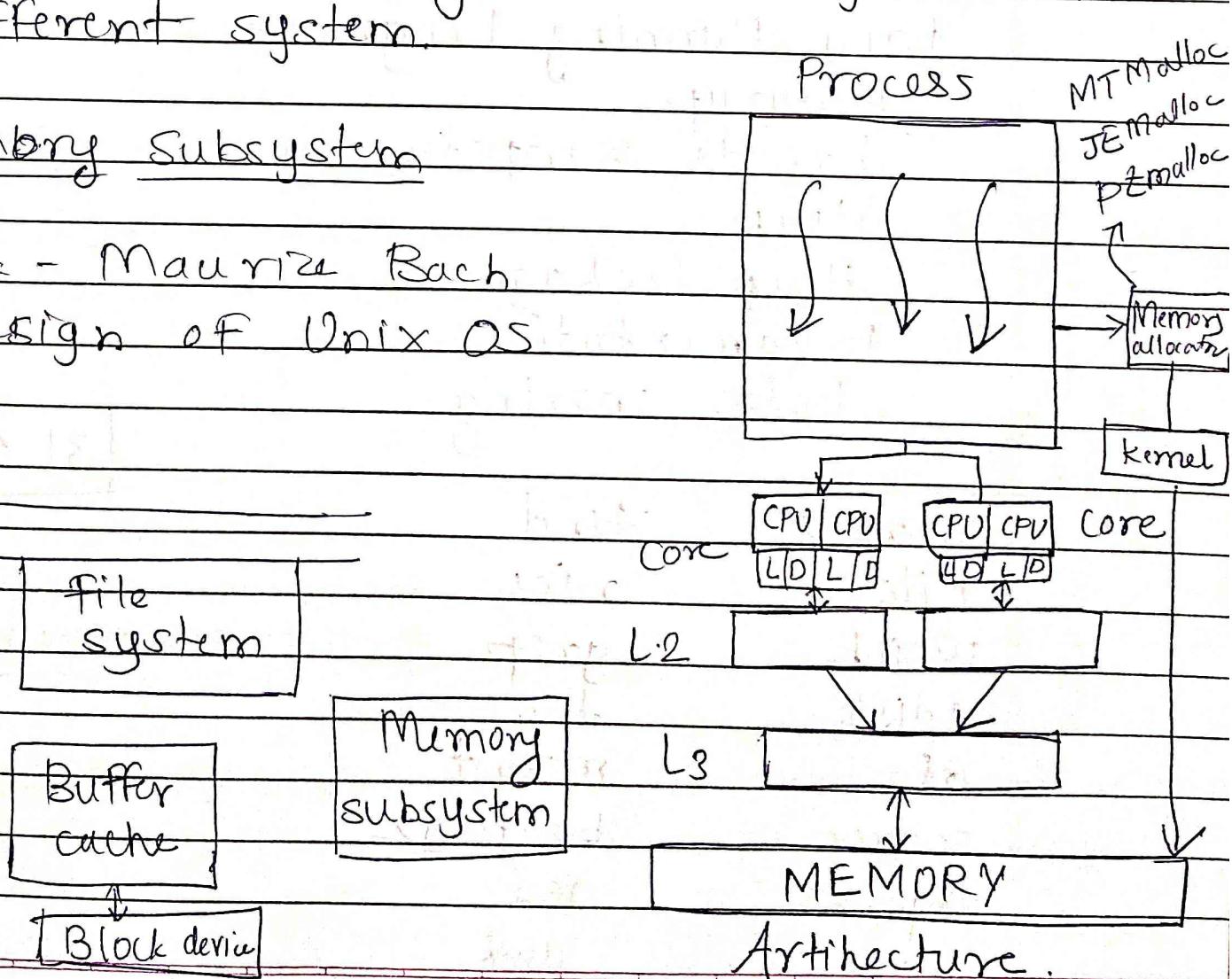
strace

This helps knowing different syntax of different system.

Memory Subsystem

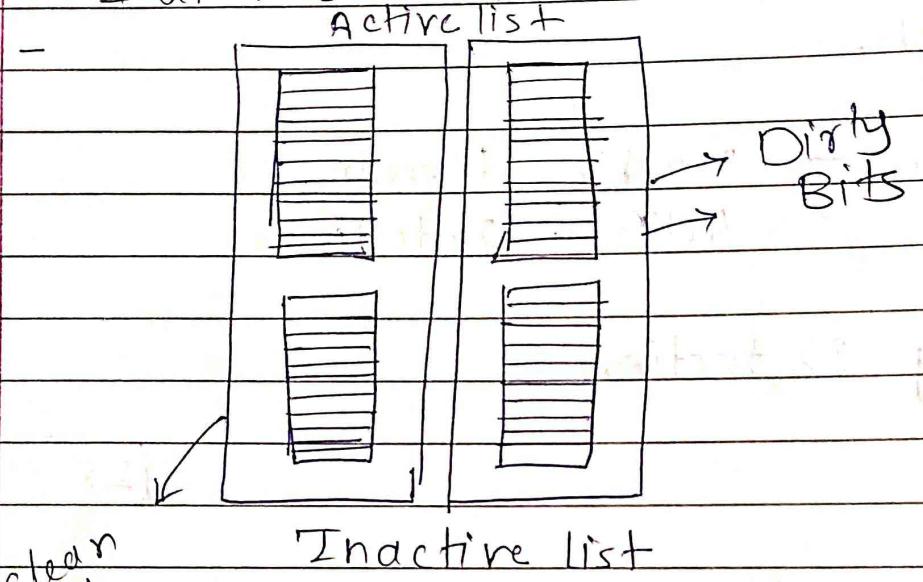
Book - Maurice Bach

Design of Unix OS



* Deep Relation betn Buffer cache & Memory subsystem.

- Buffer cache is now called as page cache
- system is called `fsync()`
- Database exist due to `Fsync()`



Long Running Programs

Blow up

Threads compete for

Heap

Heap leakage

Fragmentation

False sharing

[31/11/22]

apropos

find

file

nice

which

grep

fdisk

tar

df

mount

source

bzip-gz

tar, ps

sed

cd

awk

`fsync`

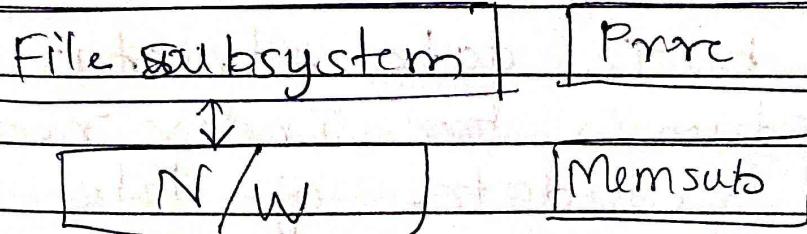
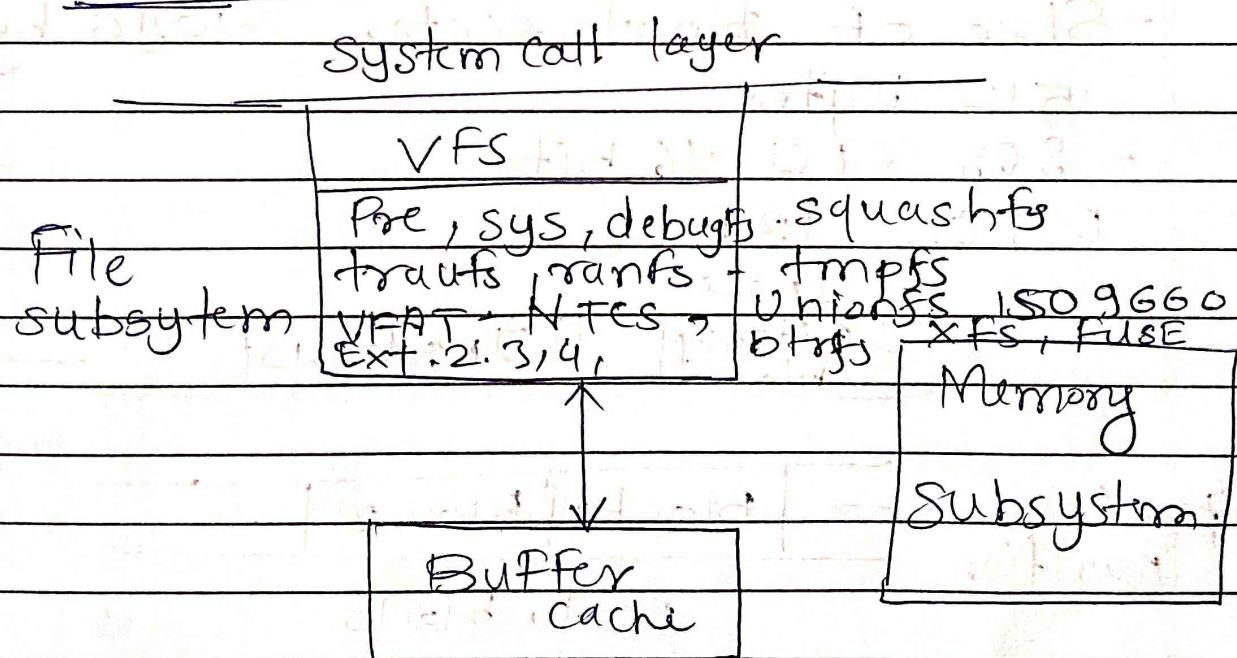
cat, join, paste

/sof	cat
fuser	echo
strace	chmod
ltrace	wc
watch	xargs
man	rpm
info	*gcc-f
ldd	touch
split	killlast
sort	mkdi-
unique	

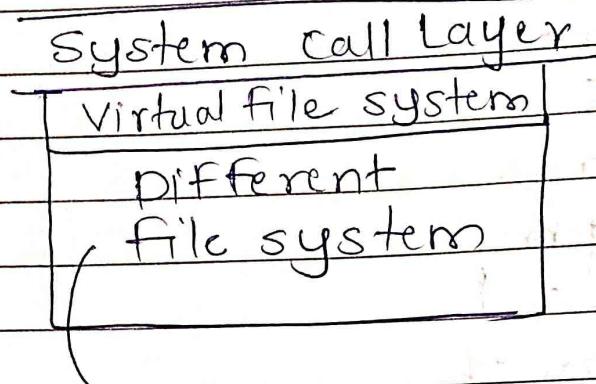
These are some of commands.

How cloured is used?

Common set of operations
for all file systems



* Unix file system



ext cluttered

Hard disk

Zonal

superblock

Bitmap block

Boot Sector

Partition Table

Active Partition

This shift
this area

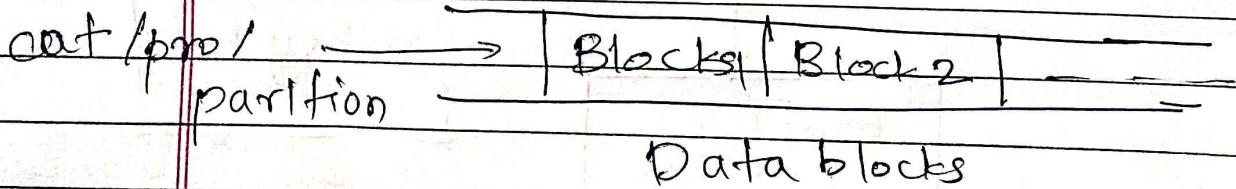
- Size of Boot sector 512 bytes or 4096 bytes.
- 808 CPU 16 bit

BIOS 13h

Inode

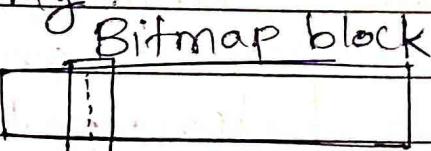
Bitmap block

Inode List



Inode is basic data structure
Inode stands for Index node
Metadata of file
all data

- Inode contain all information which you are saving.



→ 1 Byte of info

1 Byte contain 8 Bit

- Complete file system chapter is depends on Bitmap block, Inode list and superblock.

File:-

- i) File contain Data plus MetaData (Inode)
(Actual data) Data + Meta Data (Inode)

Application → open()

open() close() read() write()

name()

Inode	{	cget()	talloc()	alloc()
		free()		free

I/W - TCP/IP

Sockets files.

Books More & Back

Key	Linux	Unix
1) Development	Linux is open source and is developed by linux community	Unix was developed by AT&T Bell labs and is not open source
2) Cost	free	licensed OS
3) Supported file system	Ext2, Ext3, Ext4, JFS, ReiserFS, XFS, Btrfs, FAT, FAT32, NTFS	fs, gpfs, hfs, hft, ufs, xfs, zfs
4) GUI	Use KDE and Gnome Other GUI supports are LXDE, Xfce, Unity, Mate	Unix was initially a command based OS. Most of the Linux distribution now have Gnome
5) Usage	Desktop, servers, smartphones to mainframes.	Servers, workstations or PCs
6) Default shell	Bash	Bourne shell
7) Target processor	Intel's x86 hardware processors. 20+ processor families	C Unix supports PA-RISC and Itanium family
8) Example	Ubuntu, Debian, GNU, Arch Linux	Sunos, Solaris SCO UNIX, AIX, HP/UX.

Unix Introduction

What is Unix?

UNIX is operating system which was first developed in the 1960s, and been under constant development ever since.

By OS, we mean the suite of programs which make the computer work. It is a stable, multi-user, multi-tasking system for servers, desktops and laptops.

Types of Unix

- 1) Sun Solaris
- 2) GNU/ Linux
- 3) Macosx

Unix operating system

The UNIX operating system is made up of three parts 1) The kernel, the shell and the programs.

The Kernel

The kernel of UNIX is the hub of the operating system : It allocates time and memory to programs and handles the filestorage and communications in response to system calls.

The Shell

The shell acts as an interface between the user and kernel. When a user logs in, the login program checks the username and password, and then starts another program called the shell. The shell is command line interpreter. It interprets the command the user types in and arranges for them to be carried out. The commands are themselves programs : when they terminate, the shell gives the user another prompt ('.' on our systems)

Files and processes.

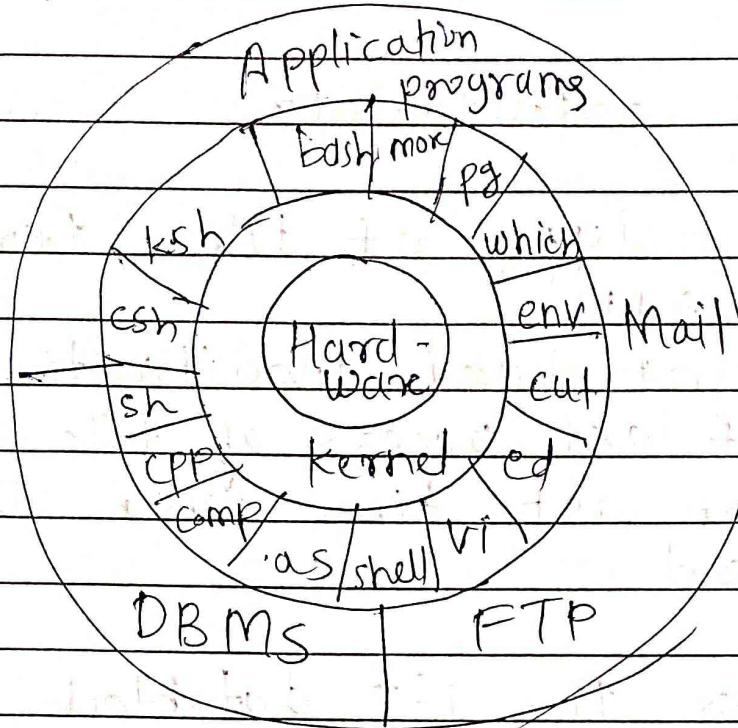
Everything in UNIX is either a file or a process.

A process is an executing program identified by unique PID (process identifier).

A file is collection of data. They are created by users' text editors, running compilers etc.

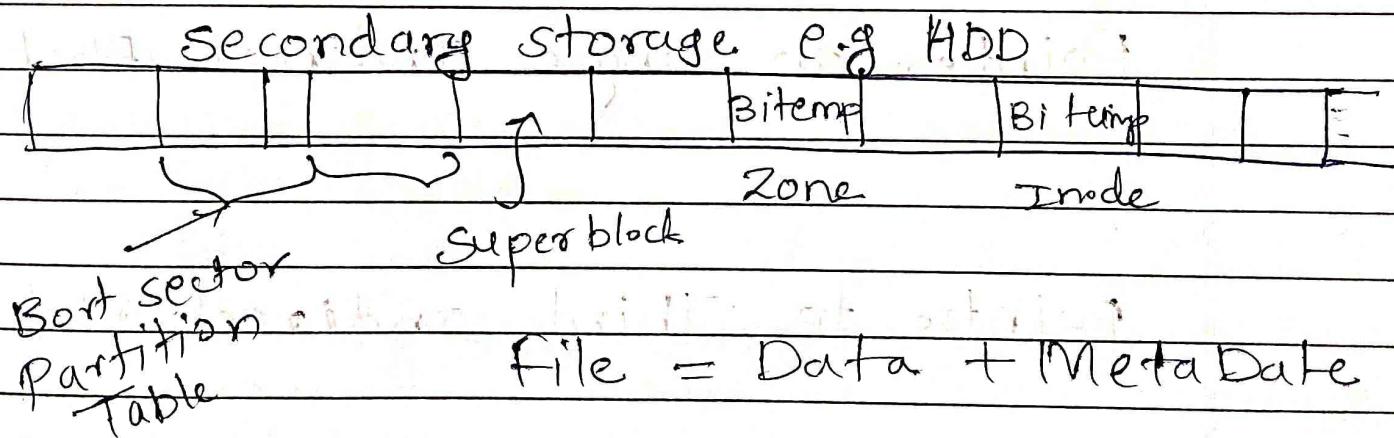
Ex of files
a document

Unix Architecture



4/2/22

Unix file system



BIOS - Int 13h → work to read the data from your hard disk

* How to create file system in your system?
Installer - OS

mkfs - + eatx

Inode - Metadata,

Mode - Types of file, Permission
UID, GID

Time of Last Modification of file.

Time of last access of file

Time of last time when Inode was modified.

Links

Address for 1st datablock

2nd

↓

10th

Pointers to single Indirect Block

Pointers to Third, Indirect Block

files

Regular
Directory
Symbolic link

pipe
sockets
Devices File

- Websocket are related to socket.

- Device file available in sda
/dev/loop1

2 }
3 } binary
:
:

- Devices file are used for mounting another
file system on a file

* Inode

- Status of Incore Inode

- Whether some processes are waiting
for the inode.

- Incore Inode different from Disk copy

- Incore Copy of file different from Disk

- Whether this Inode is a Mount Point

- Logical Device no. of file system

- Pointer to other Incore Inodes.

- Reference Count.

Database

Set of file (MySQL)

* command

mount -r -t ISO9660 /dev/cdrom /mnt/cdrom

Software

Collection of specialized program is called software

1) Application Software

Word Processor, Browser, database, Presentation

2) System Software

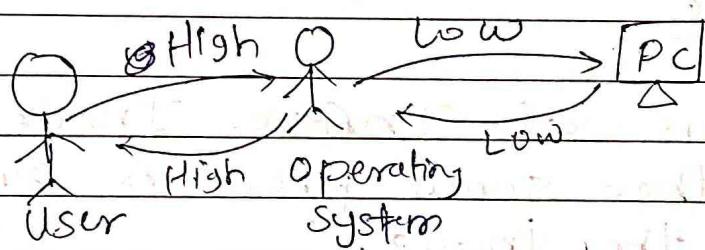
1) Operating system

2) System utilities

- i) Disk cleanup ii) Disk defragmenters:
- iii) Disk Compressor
- iv) RDIS

Operating system is interface between human being and computer.

Suppose



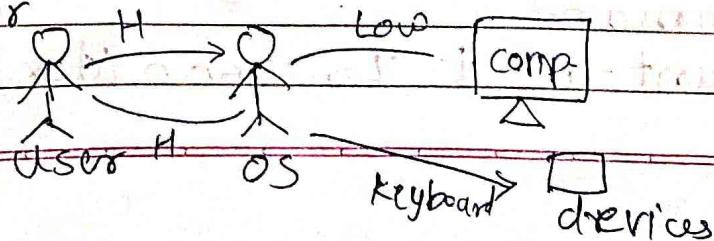
Functions

- 1) Memory Management
- 2) File management
- 3) Security
- 4) Disk management
- 5) Job scheduling
- 6) Processor Management

Services of OS

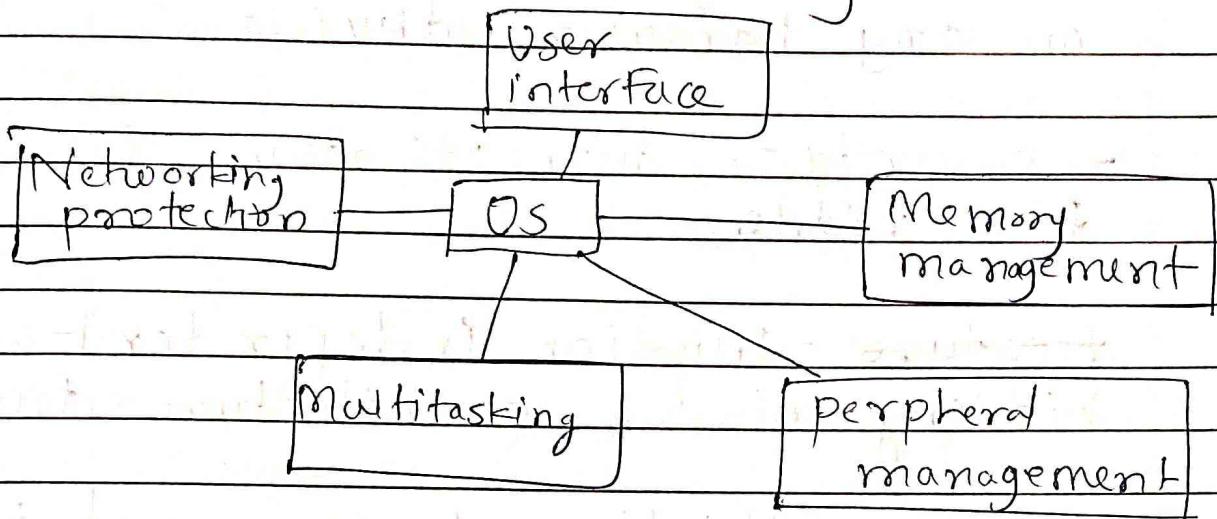
1) Program execution

Devices is a driver is most important operator



Operating system is divided into three types

- 1) Single user / single tasking
- 2) Single user & multi tasking
- 3) Multi-user multi tasking



What is Unix?

Unix is command user interface operating system

Mini computers

Micro computers

Super

Main frame.

1969

MUTICS

↓
M-2 users

UNICS

uniplexed information computing
system developed assembly
language.

MULTICS / Features of Unix

Multi user capability can user accesses
system resources at same time ram,
memory, application program.

- Multiprogramming means multiple applications run at same time.
- Portability - We can run the software on any hardware devices.
- Security :- Authentication, file security, file hidden

~~features~~ - Mission independent - Mission hiding mission architecture from user.

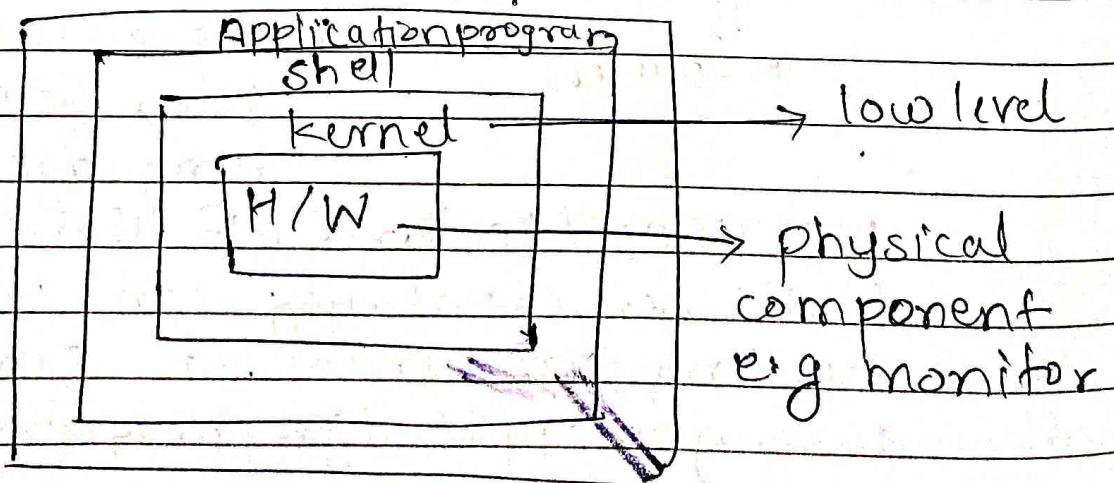
Shell - collection of command is called shell

Generally shell high level language

Pipes and Filtration

Pipes is kind of redirection and filter is what output required is

Unix architectures user



* Kernel

- Low level languages
- It is heart of operating system
- Kernel is interface between shell and hardware is called kernel.
- Kernel always perform low level task for e.g. devices management, system management, memory management.

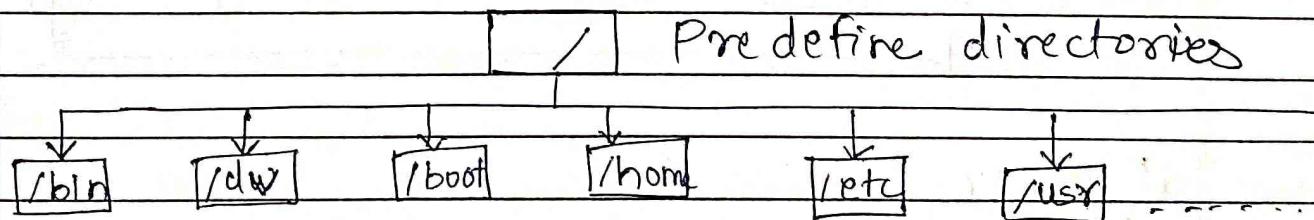
* Shell

- High level language
- Collection of unix command is called shell

* Application program

- Which are satisfying user requirement word processor, browser, powerpoint, spreadsheet, database.

* Unix file system architectures



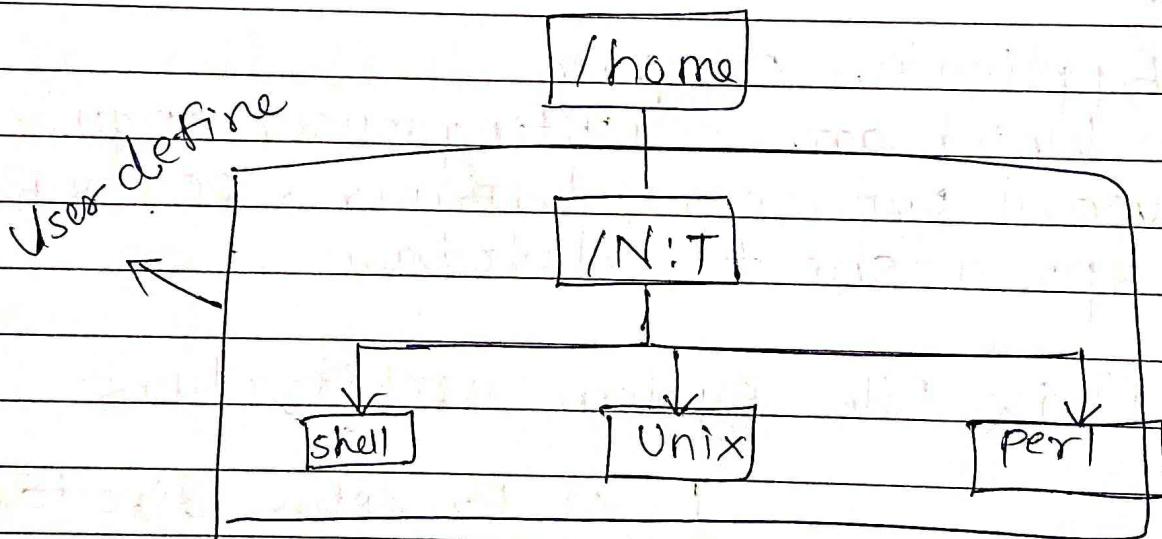
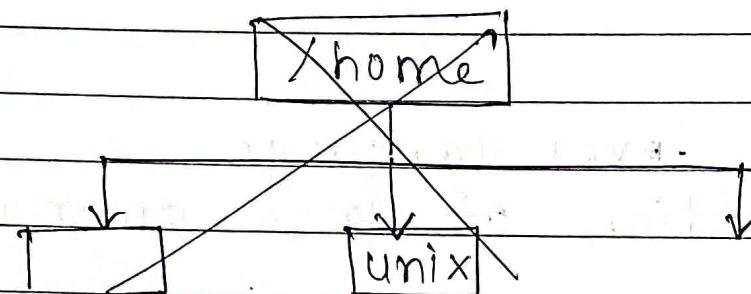
- Unix is case sensitive operating system
- /bin stand for binary it contains all executable file available for users.
- /dev → device it contains all device driver
- /boot → contain all Bootable related system

/home - It contains user as well as sub users.

/etc - It contain configuration file & disk related file

/usr - It contain default directory

- All directory in unix operating system is in dark blue.



Flowers

Related to particular organization

e.g. BSD → Berkeley software distribution
Sun Solaris

Sun Microsystems

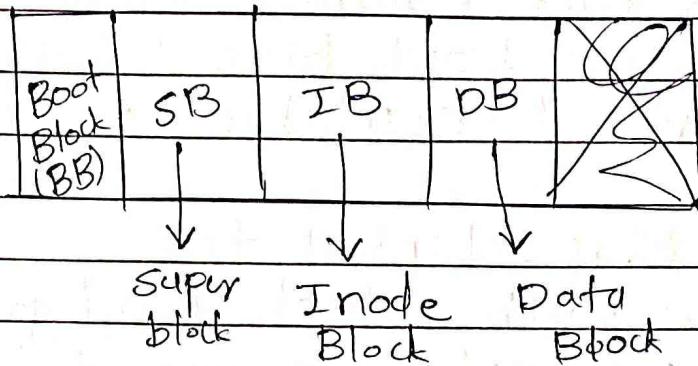
IBM Aix

HP

Linux → Line based

Unix → command based

* Unix file system organization



- In unix, file system organization available in physical and logical block.

Logical block are divided into 4 blocks

- 1) Boot Block
- 2) Super block
- 3) Inode Block
- 4) Data Block

- Boot Block contain all bootable objects.
- Super Block contain file system related.
 - o like how many block allowed, how many blocks unallowed, & file system
- Inode Block

I means Index it contain unique number type of file and mode of file.

- File system o

- Data Block when the real data store in this block.

Unix Basic commands

Unix files colors:-

Blue or Dark Blue : Directory

Green : Executable or recognized data file.

Sky Blue : Linked file

Yellow with black background : Device

Pink : Graphic image file

Red : Archive file or Zip Files.

Unix Files Notations:

- Ordinary or Regular File

d Directory

c Character special file

b Block special file

l symbolic link

p Named pipe

s Socket

* Executable file

@ linked file

Unix Basic Commands

Unix is collection of commands:

A command is a specific instruction given to a computer application to perform some kind of task or function.

- All commands are started with alphabet characters
- All commands should lower case characters
- Commands

4 comm.

1) who

2) whoami

3) date

4) cal

5) pwd → present working directory

ls → list · ls displays all file present current location.

cd... → to come out from space

who → How many user are login in

whoami → ~~who~~ is login in

man → Manual pages information

who --count → It will show how many user are present.

cal → calendar

man cal → day month year

cal -j

cal -3 → 3 Month calendar will display previous present and next

date → provide date

date +%a → display day in short form

date +%Y-%A → display day in full form

date +%Y.%B →

man date → Entire information will display.

Files

Files are classified into Three types

- 1) Normal file / Ordinary
- 2) By default files are available black color
- 3) ls -l

cat command

cat → Concatenate file

- 1) Create a file
- 2) Displaying file contains
- 3) Append file

cat > → Standard output redirectional operator.

cat > Nehal

Welcome to Neha S.G.S.I.E.T.

ls

Clear → to clear previous command

cat -n Naresh Tech

Appent redirectional operators

cat >>

to ~~con~~ save ^{and exit} → control-D (ctrl-D)

b → only for non blank lines

touch → To create empty file / We can create multiple empty file
File * → to really check this file are empty or not

touch -a → To display last access time.
touch -m → To modification time.
touch -d → To date and time.
touch -c → No create.

man touch .

stat filename → It will display all the stat File name, size, block, input, output, regular file.

2) Directory

Directory contain subdirectory and file.

*Commands

i) mkdir → make directory we can create empty directory

Darkblue represents directory

ii) pwd → current working directory

iii) cd → ch To change directory

iv) cd - → provide current location

v) cd ~ → What is your default location means

come

vii) `cd ..` → From working directory to previous directory.

viii) `cd ../../` → At time come from two directory

ix) `rm filename` → to remove directory
only empty directory/file

ix) `rm` → To remove file and directories

(x) `rm -i` → to remove regular empty file ? If we type y then it will remove if n then remain same.

(xi) `rm -v` → Explain what is being done

xii) `rm -R dir` → To remove directory

xiii) `cp` → copying p.files → copy paste

xiv) `mv` → move → cut paste

xv) `mv -v` → It always display what has been done

xvi) `cp -r` → whenever you are working on directory then use recursive