Sunbeam Institute of Information Technology
Pune and Karad

Module - Concepts of Operating System

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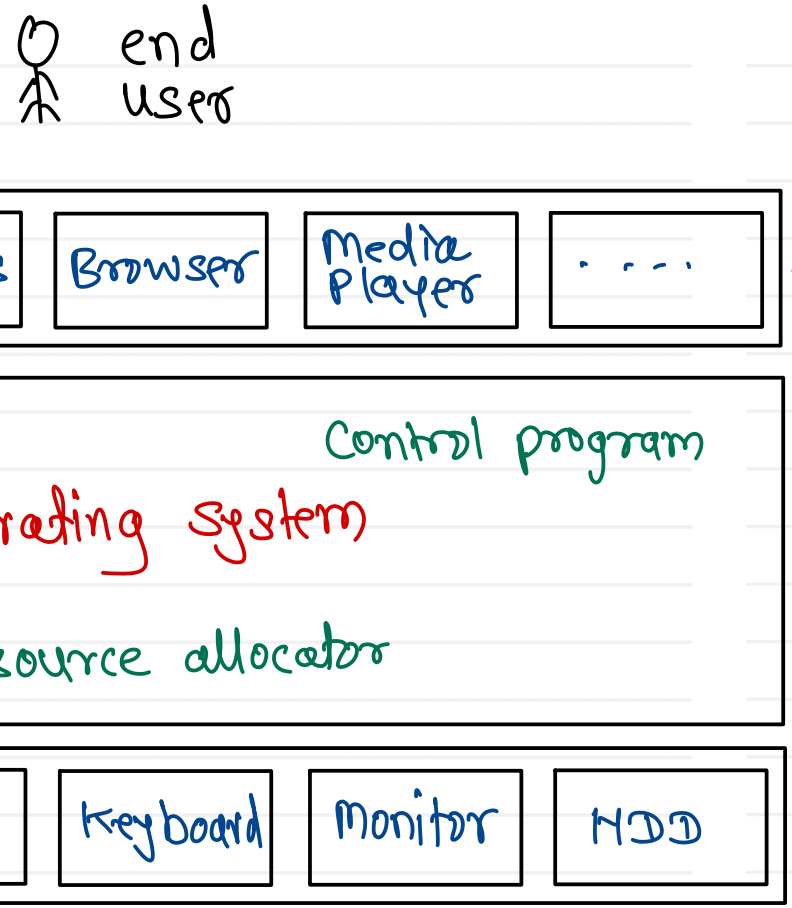
Operating system



- interface between end user & hardware

- interface between end user applications & hardware

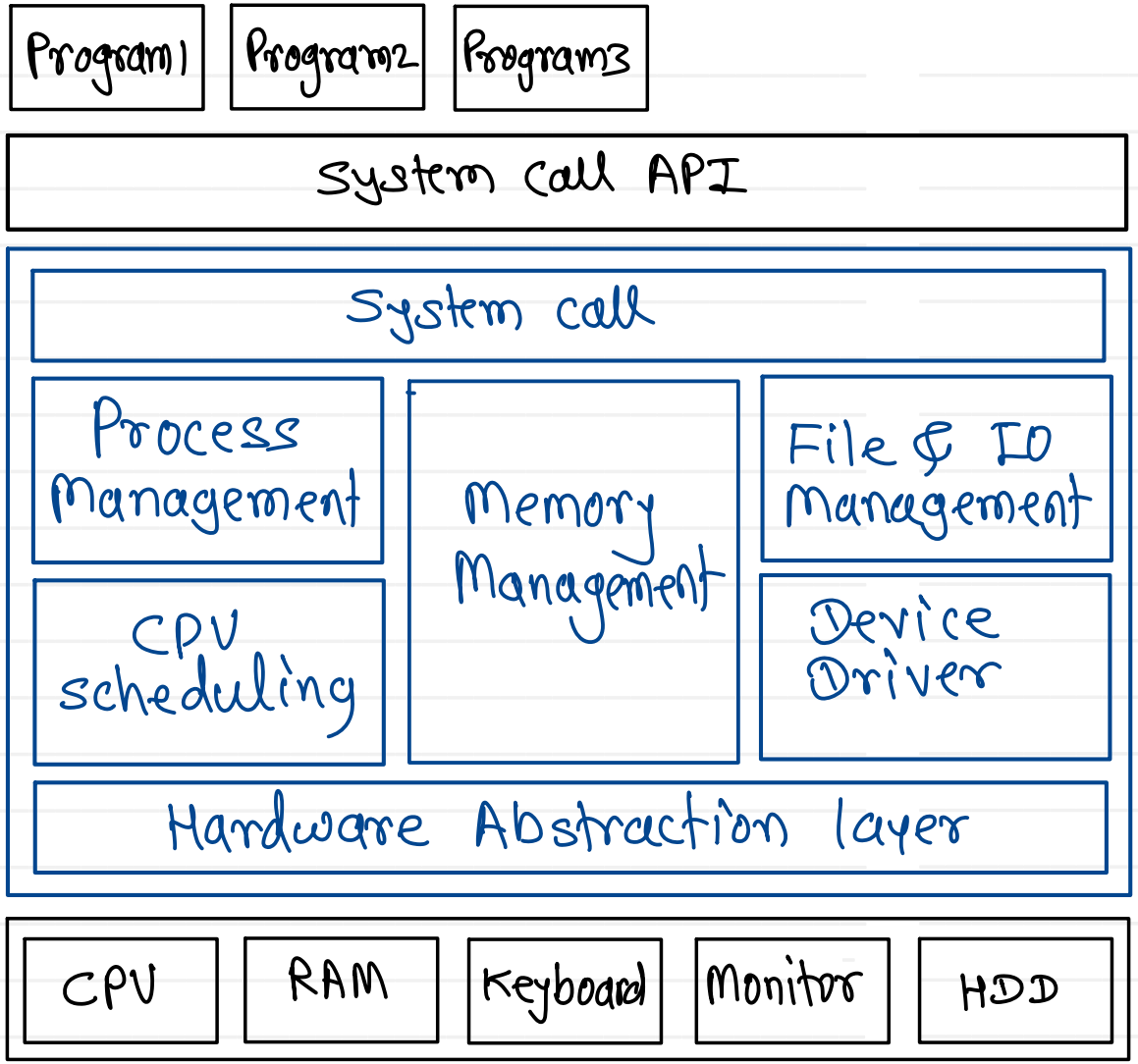
- control program which controls execution of all programs running on it

- resource allocator/mgr which manages all h/w resources

CD/DVD/ISO - Core OS + Appl^n s/w + System Utilities

(Kernel)

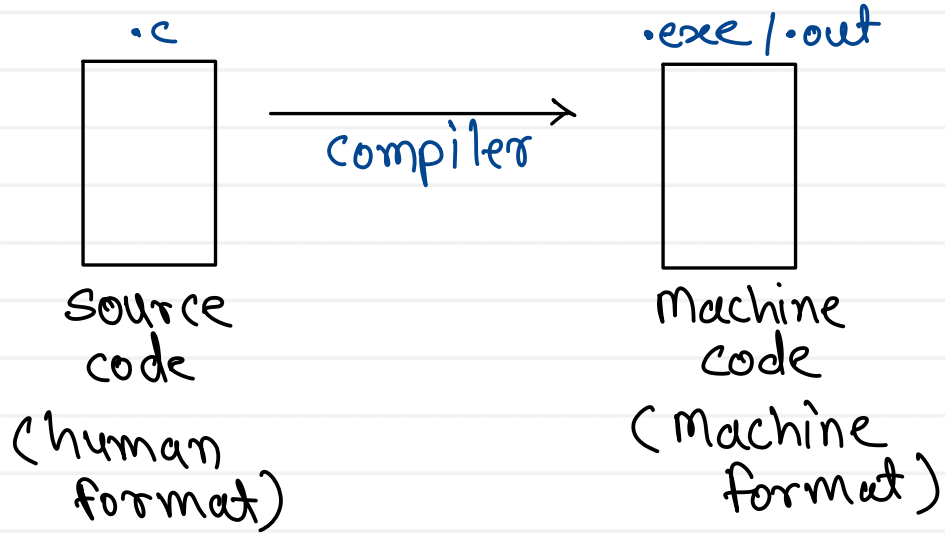
Linux kernel architecture



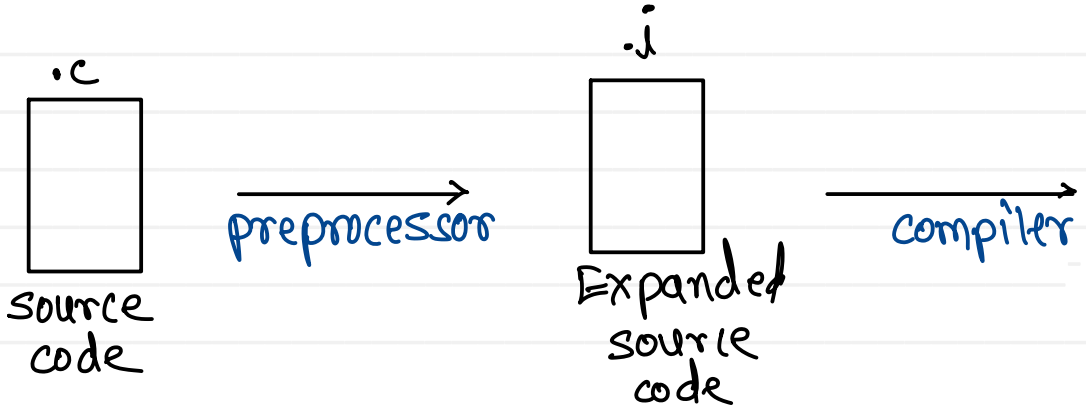
- Networking
- User interfacing
  security & protection

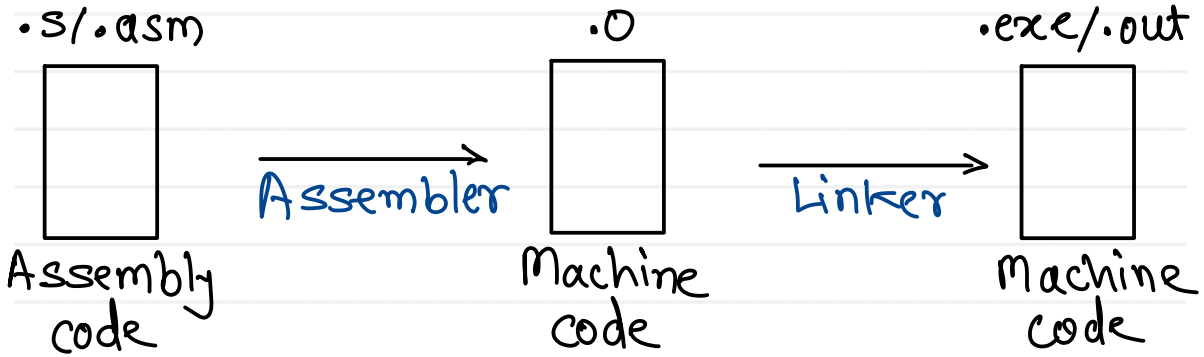
Program compilation steps

Process : Program in execution
Program : set of instructions to machine (CPU)

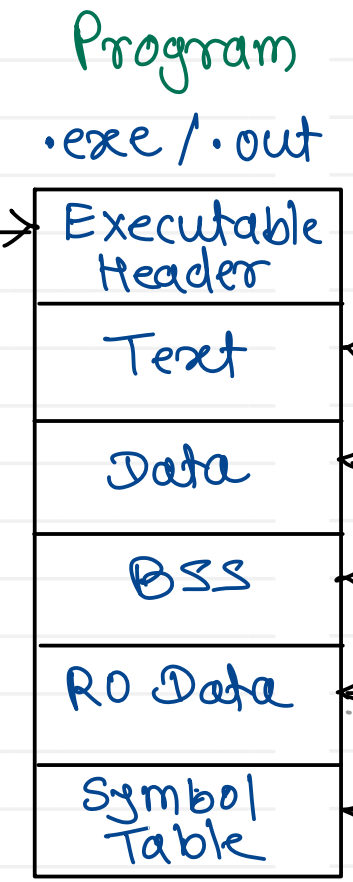


Toolchain : (gcc)
- set of tools which work on source code one by one to convert it into machine code.
1. Preprocessor (cpp)
2. Compiler (cc)
3. Assembler (as)
4. Linker (ld)
5. Debugger (gdb)
6. Utilities (make, objdump)





Program



- info about program
- type of program (CLI / GUI / library)
- address of entry point function
- info about remaining sections (start, end, size)
- magic number
  - identity to file format
  - 2 or 4 bytes

windows - .exe - Portable Executable → MZ

Linux - .out - Executable Linking Format → ELF

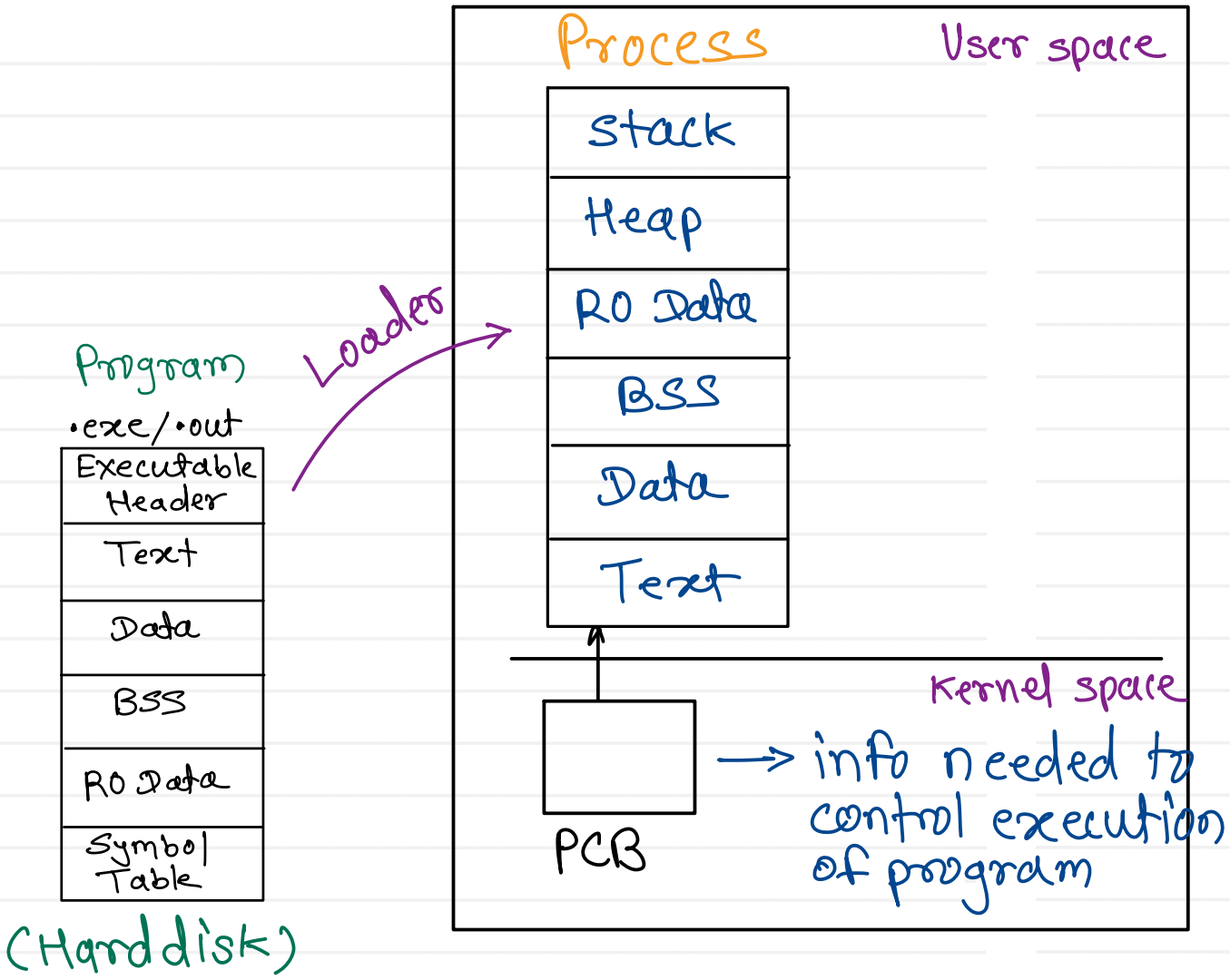
(Sectioned binary)

.class - 0xCAFEBABE

To read sections of executable use tools - readelf / objdump in linux

- instructions of program in machine code format
- initialized static & global variables
  `int num2 = 10;`
- uninitialized static & global variables
  `int num1;`
- Read Only data (string constants)
- info about symbols
  - symbols are variables & functions of program

symbols: var - name, addr, type, section
fun - return type, name, addr, type args.



PCB - Process descriptor
↓
struct task_struct
(sched.h)

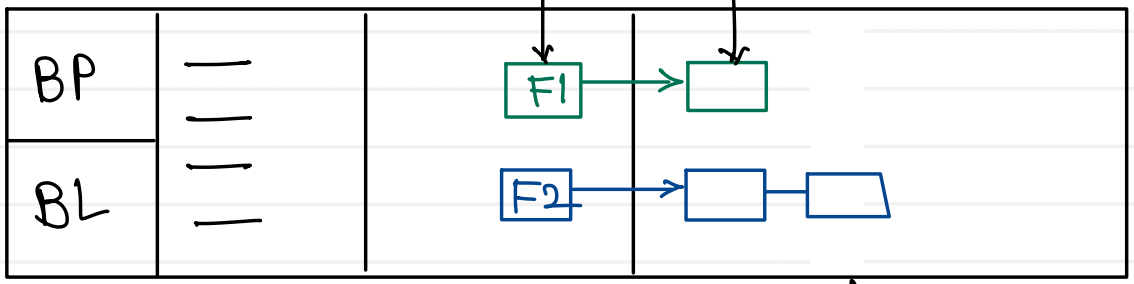
1. pid, ppid
2. exit status
3. mem info (base, limit, segment/page table)
4. sched info (algo, prio, state...)
5. file info (opened files ....)
6. IPC info (signals .....)
7. execution context
8. kernel stack

File

File : collection of data
File : data + metadata
(Actual content) (information about file)
↓
data block

- name
- size
- type
- user/owner, group
- permissions
  - read/write/execute
    - user/group/others
- time stamps
  - create/modify/access
- no. of links
- info about data blocks
  ↓
  File Control Block (FCB)

File system – orgnizing files on partition



Configurable at the time of formatting

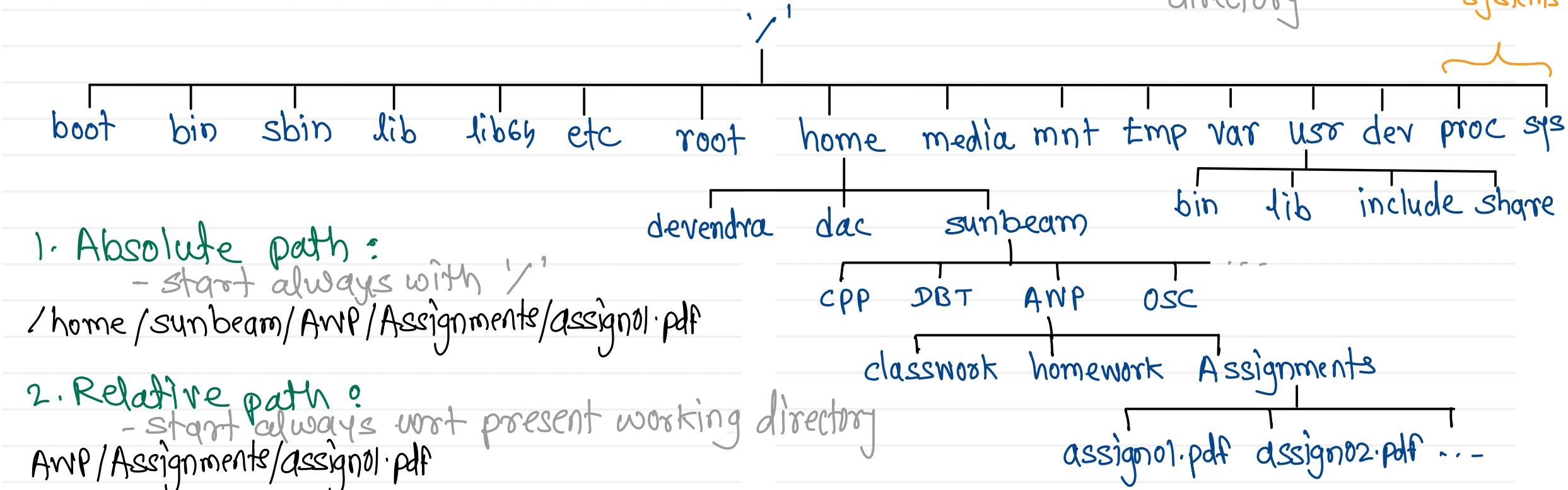
booting related programs
1. Bootstrap program
2. Boot loader program

info about volume (partition)
- capacity
- label
- empty, filled
- list of free data blocks

Linux file structure

- linux follows root file structure
- starting point is root denoted by '/'

file → file
folder → directory
Administrator → super user
admin → root



1. Absolute path :
   - start always with '/'

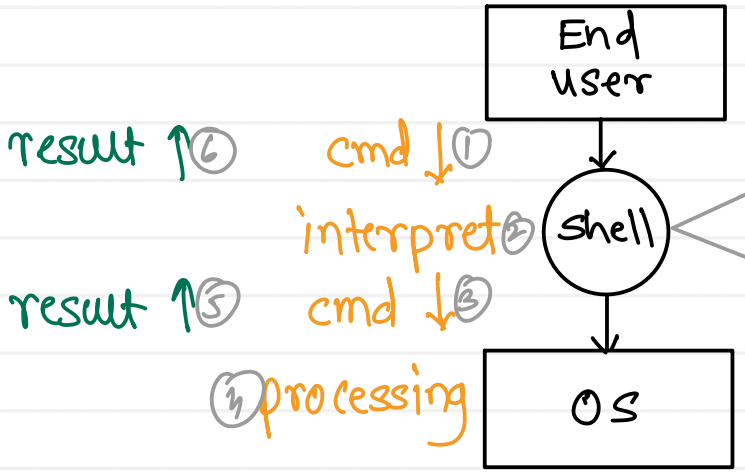
/home/sunbeam/AVP/Assignments/assign01.pdf

2. Relative path :
   - start always with present working directory

AVP/Assignments/assign01.pdf

User Interfacing

- User interfacing is provided by one of the program & it is called as "shell"
- shell is an intermediate betn OS & user
- shell is a command interpreter



- in Vbuntu default shell is 'bash'

BASH - Bourne Again Shell

echo $SHELL - will show default shell

chsh - to change default shell

CLI based shell (Command Line Interface)
- Windows - cmd.exe, powershell.exe
- Linux - bsh(sh), bash, csh, ksh, zsh

GUI based shell (Graphical User Interface)
- Windows - explorer.exe
- Linux - KDE (Komman Desktop Env)
  - GNOME (GNU Network Object Model Env)

Thank you!!!

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