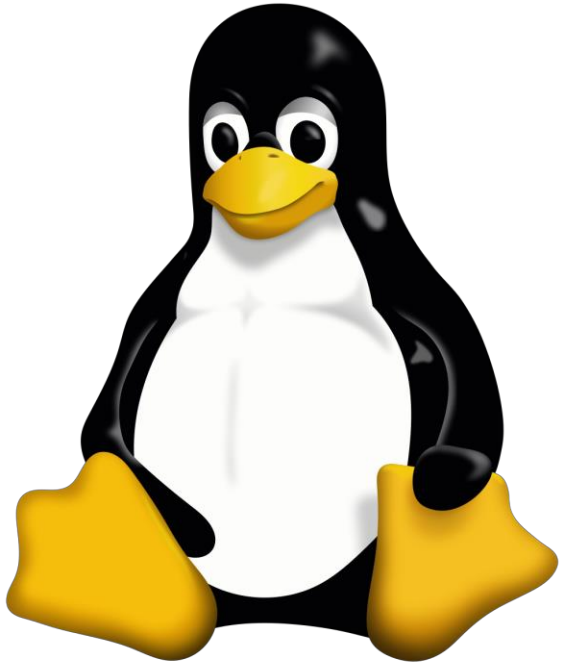
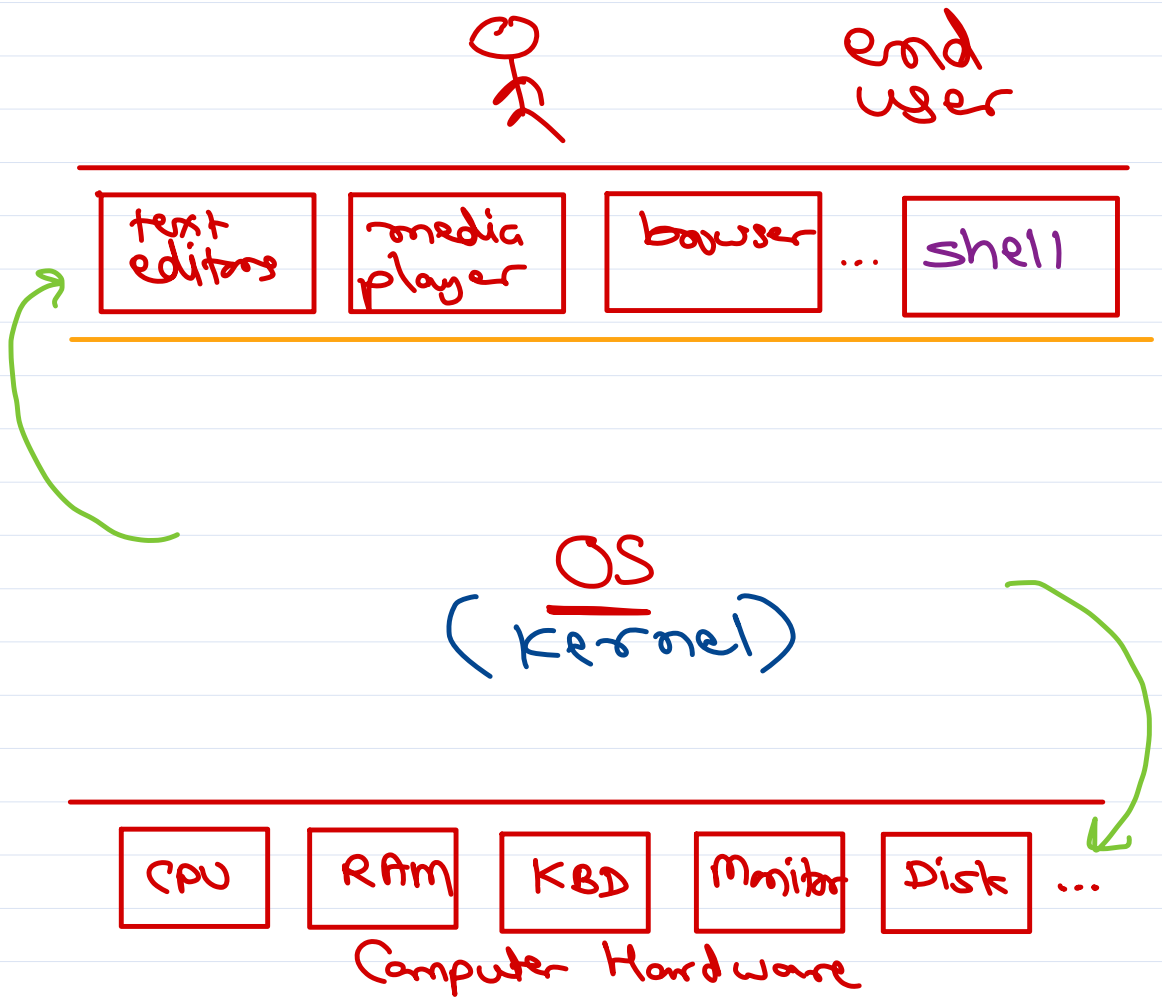


Operating System Concepts

Sunbeam Infotech

What is OS?



1. end user → OS → hardware
2. applns → OS → hardware
3. Control program
4. resource manager
5. CD/DVD
   = Core OS
   + applications
   + utilities
6. Kernel = Core OS

OS functions

1. process mgmt
2. CPU scheduling
3. memory mgmt
4. file & io mgmt
5. hardware abstraction

must

6. networking
7. security & protection
8. user interfacing

optional

Process

```
int n1=123; <- data
int n2; <- bss
int main() {
    pf("Hello");
    return 0;
}
```

(sectioned binary)

a.out

- exe header
  - magic number
  - addr of entry pt
  - info of all sections
- text
- data | bss
- rodata
- Sym table

PE / ELF

loader

RAM

process

- stack
- heap
- data + bss
- rodata
- text

user space

kernel space

PCB

→ a.k.a. uarea (UNIX)

→ a.k.a. task_struct (Linux)

Sym table:

* info about vars & fns (global & static)
  - name
  - addr
  - size
  - section
  - flags

cmd > objdump -t a.out

PCB

1. pid
2. exit status
3. Sched info
   - state
   - time
   - priority
4. Files info
   - stdin (0)
   - stdout (1)
   - stderr (2)
   - ...
5. IPC info
6. mem info
   - base/limit
   - Page table
7. Kernel stack
8. Exec. ctx.

File

UNIX Philosophy: ① Files have spaces and Process have lives.
② Everything is file.

File = data + meta data
(contents) (information)
↓ ↓
data blocks file control block
a.k.a. inode (unix)

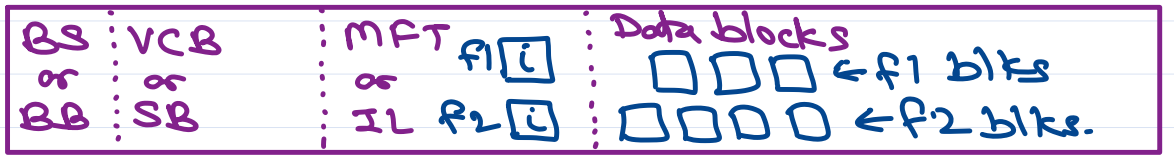
FCB/inode Contains

① type → file types
- – regular
- d directory
- l link
- p pipe
- s socket
- c char device
- b block device
  - → byte by byte data tx eg. kbd,..
  - → block by block data tx eg. storage devices,...
    - sector (512 bytes).

② name*
③ user/group+
④ permissions
⑤ size
⑥ links+
⑦ timestamps
⑧ info about data blocks

*not in unix
+ in unix

FileSystem: Way of organizing files on storage device



← disk partition →

① Boot block / Boot Sector:
- Bootstrap program, Bootloader,...

② Super Block / Volume Control Block:
- info of whole part i.e. label, blksize,
- total num of data block, num of free blocks and info of free blocks.

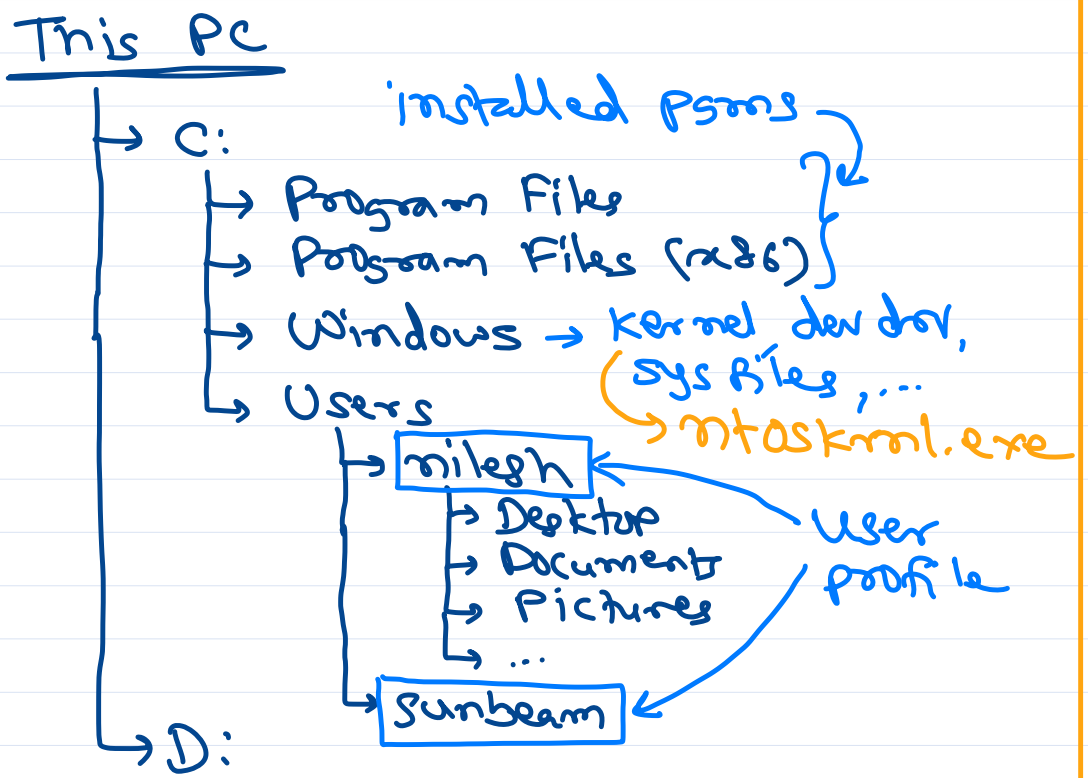
③ inode list / master file table:
- FCB/inodes of all files.

④ data blocks:
- data blocks of all files.

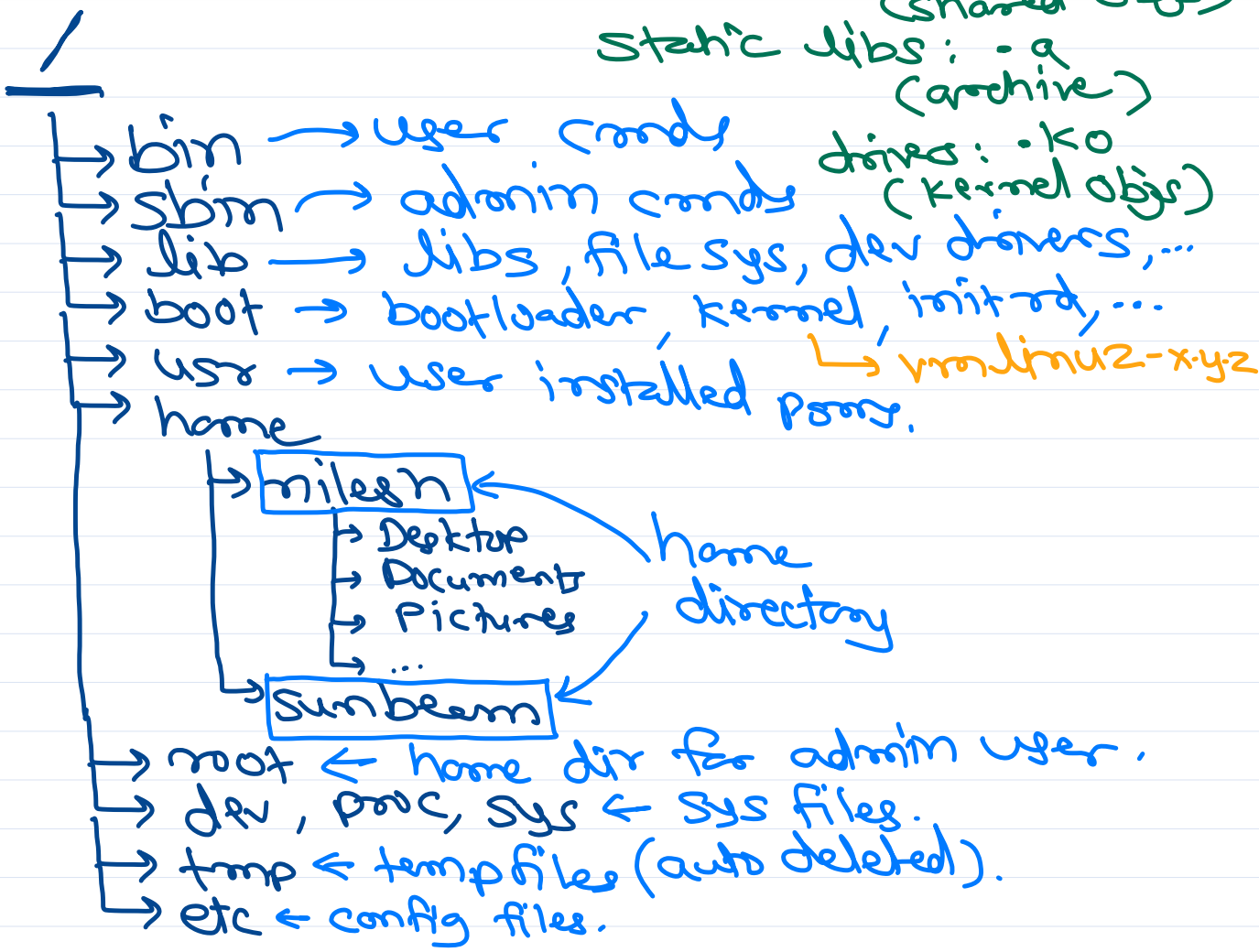
FS is created while format:
- DOS/Win → format cmd.
- Linux → mkfs cmd.

File System Hierarchy

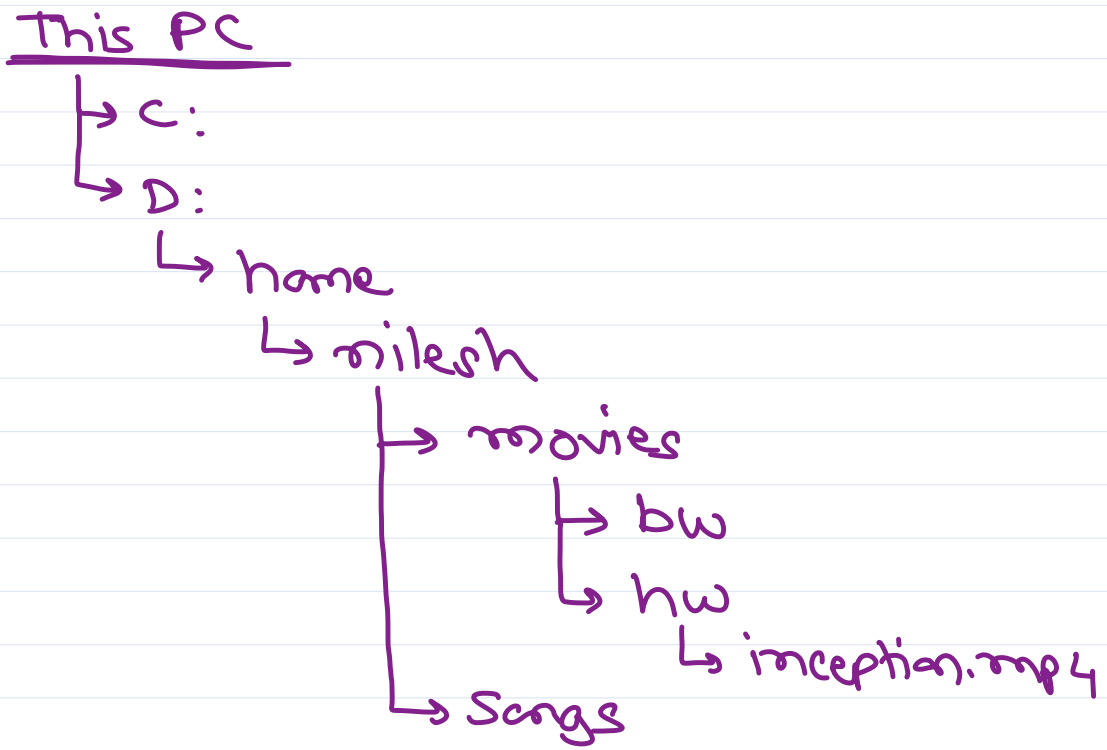
Windows file hierarchy



Linux file hierarchy



Absolute vs Relative path



This PC: D:\home\nilesh\movies\hw\inception.mp4 ← absolute path / full path start with drive letter.

nilesh: movies\hw\inception.mp4

hw: inception.mp4

songs: ..\movies\hw\inception.mp4

← relative path w.r.t. current directory

Absolute vs Relative path

/home/nilesh/movies/hw/inception.mp4 ← absolute path / full path start with /.

nilesh: movies/hw/inception.mp4

hw: inception.mp4

songs: ../movies/hw/inception.mp4

} ← relative path w.r.t. current directory

User interfacing

OS → UI is given by a special program.
called as "shell".
shell a.k.a. command interpreter.
end user → cmds → shell → kernel.

shell types:
① GUI → Graphical UI
② CLI/CUI → Commandline/ Console UI.

GNU (recursive acronym)
- UNIX
- Not
- GNU

gnu.org
- Linux
- GNOME
- cmds → grep, ...

Windows

- GUI → explorer.exe
- CLI → cmd.exe, powershell.exe

Linux

- GUI standards → GNOME, KDE, XFCE, ...
- CLI → bash, ksh, csh, zsh, ...

```
termind> echo $SHELL
```

Thank you!

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