Lab 09

Task 1

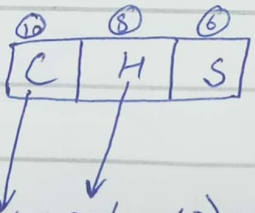
⇒ D/w spinning disk & SSD

Features	Spinning disk (HDD)	Solid state disk (SSD)
→ Storage Medium	Magnetic disks	Flash memory
→ Cost per Gigabyte	Lower cost per gigabyte	Higher cost per gigabyte
→ Reliability	Lower reliability due to moving parts	Higher reliability
→ Noise	Noisier due to moving parts	Virtually silent
→ Speed	It is not faster	SSD is faster

⇒ Logical Block addressing

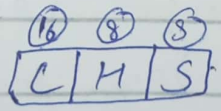
LBA is a scheme used for specifying location of blocks of data (normally 512 bytes or 1 sector) stored in HDD.

i. 24 bit LBA



Max disk space support = (1024 x 256 x 63) x 512 = 7.8GiB

ii 28 bit LBA



Max disk size support = (65536 x 16 x 255) x 512 = 127.5GiB

⇒ Hard disk Interface

A hard disk interface is the method by which a HDD communicates with a computer system

Important HDD Interfaces

→ ATA/PATA/IDE

- → Data transfer rates (8 - 100 MB/s)
- → cable length (40 cm)
- → connector (16 pins)
- → max 2 devices attached with a single port.
- → Not hot pluggable

→ SATA

- → Data transfer rates (150 - 3Gb/s)
- → cable length (1 m)
- → connector (7 pins)
- → Hot pluggable

→ SCSI

- → Data transfer rates (4 - 320 MB/s)
- → cable length (6 m)
- → Connector vary from 8 - 68 pins
- → 15 devices attached with a single port
- → Hot pluggable

→ SAS

→ data transfer rates (3GB/s)

→ 128 devices attached/connected to the port.

⇒ Explain how reading & writing of a CHS disk perform

1- OS send block address to disk controller

2- Disk controller convert this linear address called LBA to appropriate CHS address & proceeds as follows

a- Motor attributes to the head assembly moves the head to specific cylinder

b- Switch ON the specific head

c- Disk platters rotates until the specific sector comes under the head.

d- The data on the sector is read & placed in a disk buffer to be read by the OS kernel

Seek Time	Rotational Delay
→ Time take by read/write head to reach to a specific track	Time it takes for the disk to rotate until the desired sector is under read/write head
→ (normally 5ms to 12ms)	7200 rpm

Describe how the mapping of CHS to LBA reduces seek time

→ LBA allows for more efficient data placement on the disk, reducing the need for frequent head movements.

→ Modern disks use ZBR to store more data on outer tracks, which have a higher linear velocity.

→ Disk controller can optimize seek operations by scheduling requests and minimizing head movement.

CHS ⟷ LBA Mapping

Cylinder	Head	Sector	LBA
0	0	1	0
0	0	2	1
≡	≡	≡	≡
0	0	63	62
0	1	1	63
0	1	2	64
≡	≡	≡	≡
0	1	63	125
0	2	1	126
0	2	2	127
≡	≡	≡	≡
0	15	63	1007
≡	≡	≡	≡
15	15	63	16127

→ Cylinder changing after a very long time so it is very rare there is a file located on 2 cylinder at time normally file located on the sector so it is rare to cylinder. This scheme reduces the seek time.

Task 2:

⇒ Five advantages of partitioning of your hard disk.

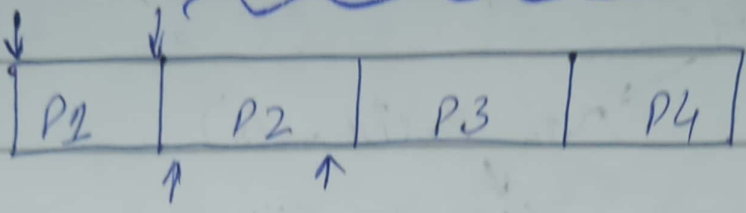
i- Better organization of data
ii- Multiple file system
iii- No crossing of partition limit
iv- Implement quotas
v- Read only partition

⇒ D/w primary partition & logical partition

Primary Partition	Logical partition
→ A primary partition is directly accessible partition on HDD or SSD	A logical partition is a partition that resides within an extended partition.
→ A maximum of four primary partitions can be created on hard disk	An extended partition can hold multiple logical partitions

Partition Table

Suppose 4 Partitions



A Partition Table is maintained on hard disk drive, it is a structure which manages info about different partitions of a hard disk drive.

i- mBR (master boot record)
ii- GPT (Globally unique table)
iii- APM (Apple partition map)
iv- BSD
v- Sun
vi- SGI

Tools

i- fdisk
ii- gdisk
iii- parted
iv- gparted
v- cfdisk
vi- sfdisk

cmd show partition
→ partx --show /dev/sda

⇒ shell cmd to boot signature

sudo dd if=/dev/sda bs=512 count=1 | tail -c 2 | hexdump -C

⇒ shell cmd to display bootloader

sudo dd if=/dev/sda bs=512 count=1 | head -c 446 | hexdump -C

⇒ shell cmd to display 1st partition type

sudo fdisk -l /dev/sda | grep "^/dev/sda1"

⇒ Five different partition type

→ Linux Filesystem (ext4) : 83
→ Linux Swap : 82
→ EFI System partition : EF
→ Window NTFS : 07
→ Linux LVM : 8E

⇒ Use fdisk cmd to create two primary & six logical

→ sudo fdisk /dev/sda
  → press n for new partition
  → P for primary
  → e for extended (container for logical partitions)
  → we give size by using +size.

Task 3

⇒ File System

File System is a piece of code that provides an abstraction to the users as well as to the programs to organize their files without the knowledge of the working of the disk platter the heads the tracks and the sectors.

→ File System is just a Library system

Journaling file system

A journaling file system is a type of file system that keep tracks of changes that are about to be made to files or metadata in a special area called journal.

Name the functionalities that a good file sys

i- Create files
ii - Delete files
iii - Moving files
iv - Access files
v - Persistance
vi - Security

⇒ cmd to display the list of currently loaded file.

→ lsmod |grep -i fs / lsblk /dev/sda

⇒ max and minimu file support

File System	Maximum file size	Maximum partition Type
ext3	2TB	2TB
ext4	16TB	1EB
vfat	4GB	2TB
NTFS	16EB	256TB
ZFS	16EB	256TB

⇒ shell command to display name type,....

lsblk -o name,type,fstype,parttype,size,mode /dev/sda

⇒ shell command to assign "pucit9" and then undo

assign → sudo e2label /dev/sda1 pucit9

undo → sudo e2label /dev/sda1 ""

⇒ format the second partition

format → sudo mkfs.ntfs /dev/sdb2

confirm → lsblk -f /dev/sdb2