

Operating System lab 9

Task1(1)

Feature	Spinning Disk (HDD)	Solid-State Disk (SSD)
Technology	Mechanical (spinning platters)	Electronic (flash memory)
Speed	Slower (100-200 MB/s)	Faster (up to 5000 MB/s for NVMe)
Durability	Prone to mechanical failure	More durable (no moving parts)
Noise	Noisy (due to moving parts)	Silent (no moving parts)
Power Consumption	Higher power usage	Lower power usage
Capacity	Larger capacity (up to 16 TB+)	Smaller capacity (up to 2 TB or more)
Cost	Lower cost per GB	Higher cost per GB
Lifespan	Can wear out over time due to moving parts	Limited by write cycles, but lasts longer in normal use
Use Cases	Large storage, cost-effective	Fast performance, portable devices

Task1(2)

Define Logical Block addressing? What is the maximum disk size support on a 24 bit LBA and on a 28 bit LBA?

Answer:

Logical Block Addressing (LBA) is a method for specifying the location of data on a disk using a linear address instead of physical cylinder, head, and sector numbers.

24-bit LBA supports a maximum disk size of 16 GB (2^{32} sectors \times 512 bytes per sector).

28-bit LBA supports a maximum disk size of 128 GB (2^2 sectors \times 512 bytes per sector).

Task1(3)

A hard disk interface refers to the connection standard between the hard disk drive (HDD) and the computer system, allowing data transfer and communication.

Key HDD Interfaces:

IDE (Integrated Drive Electronics): Older interface, commonly used in personal computers, supports slower data transfer speeds (up to 133 MB/s).

SATA (Serial ATA): Faster interface, widely used in modern systems, offering speeds from 150 MB/s to 600 MB/s, with smaller cables and improved power efficiency.

SCSI (Small Computer System Interface): Used in high-performance servers, supports faster data transfer and multiple devices on a single bus.

SAS (Serial Attached SCSI): An improved version of SCSI, offering higher speeds (up to 12 Gb/s), reliability, and scalability for enterprise environments.

Task1(4)

In a CHS (Cylinder-Head-Sector) disk, data is read and written by positioning the read/write head over the correct cylinder and sector, and then accessing the data as the disk spins. Seek time is the time it takes for the head to move to the correct cylinder, while rotational delay is the time it takes for the desired sector to rotate

under the head. Mapping CHS to LBA (Logical Block Addressing) eliminates the need for manually tracking cylinder, head, and sector, simplifying disk addressing. LBA allows more efficient disk scheduling and minimizes seek time by reducing unnecessary head movements. This leads to faster data access and improved performance.

Task2(1)

- 1: Improved organization
- 2: Better performance
- 3: Data safety
- 4: Easy backups
- 5: Multiple operating systems

Task2(2)

Primary Partition:

- 1.A primary partition is a main partition that can be used to boot an operating system.
- 2.The disk can have up to 4 primary partitions (on MBR disks).
- 3.It directly occupies a section of the disk and is used for system or data storage.

Logical Partition:

- 1.A logical partition exists within an extended partition, which is a special type of partition that acts as a container.
- 2.There can be multiple logical partitions inside one extended partition (limited by the system, but typically up to 128 on modern systems).
- 3.It is used when you need more than four partitions on a disk, as you cannot have more than four primary partitions on a disk.

Task2(3)

Task2(4)

```
sudo dd if=/dev/sda of=/tmp/mbr.bin bs=512 count=1 && hexdump -C /tmp/mbr.bin | head -n 20
```

Task2(5)

```
sudo dd if=/dev/sda bs=512 count=1 | hexdump -C | head -n 20
```

Task2(6)

```
sudo fdisk -l /dev/sda | grep "^/dev/sda1" | awk '{print $5}'
```

Task2(7)

Linux - 83

Windows NTFS - 7

FAT32 - 0B

Linux Swap - 82

EFI System Partition - EF

task2(8)

```
sudo fdisk /dev/sda
```

```
sudo mkfs.ext4 /dev/sda1 # Format primary partition 1
```

```
sudo mkfs.ext4 /dev/sda2 # Format primary partition 2
```

```
sudo mkfs.ext4 /dev/sda5 # Format logical partition 1
sudo mkfs.ext4 /dev/sda6 # Format logical partition 2
sudo mkfs.ext4 /dev/sda7 # Format logical partition 3
sudo mkfs.ext4 /dev/sda8 # Format logical partition 4
sudo mkfs.ext4 /dev/sda9 # Format logical partition 5
sudo mkfs.ext4 /dev/sda10 # Format logical partition 6
```

```
sudo mount /dev/sda1 /mnt/primary1
sudo mount /dev/sda2 /mnt/primary2
sudo mount /dev/sda5 /mnt/logical1
sudo mount /dev/sda6 /mnt/logical2
sudo mount /dev/sda7 /mnt/logical3
sudo mount /dev/sda8 /mnt/logical4
sudo mount /dev/sda9 /mnt/logical5
sudo mount /dev/sda10 /mnt/logical6
```

Task3(1)

File System:

A file system is a method or structure used by an operating system to organize, store, retrieve, and manage data on storage devices like hard drives, SSDs, or other media. It defines how data is stored in files and how files are organized in directories, ensuring efficient access, modification, and management of data.

Journaling File System:

A journaling file system is a type of file system that keeps a log or "journal" of changes made to files or directories before those changes are actually written to disk. This helps in recovering data after a system crash or unexpected power failure, ensuring data integrity and minimizing file system corruption.

Functionalities of a Good File System:

- Efficiency
- Organization
- Integrity
- Security
- Concurrency
- Scalability
- Reliability
- Performance
- Metadata
- Recovery

Task3(2)

```
lsmod | grep -i fs
cat /proc/filesystems
```

```
ext4          500000 1
xfs           900000 1
btrfs        1200000 1
vfat          20000 1
nfs           300000 1
```

Task3(3)

ext3:

Max File Size: 2TB
Max Partition Size: 16TB

ext4:

Max File Size: 16TB
Max Partition Size: 1EB

vfat:

Max File Size: 4GB
Max Partition Size: 2TB

ntfs:

Max File Size: 16TB
Max Partition Size: 256TB

zfs:

Max File Size: 16EB
Max Partition Size: 256ZB

Task3(4)

snapshot

COMMAND:

sudo lsblk -o NAME,TYPE,FSTYPE,PARTTYPE,SIZE,MODE

NAME: Represents the device or partition.

TYPE: Specifies whether it's a full disk or a partition.

FSTYPE: Tells us the filesystem type used on that partition.

PARTTYPE: Describes the type of partition (e.g., Linux, swap).

SIZE: The size of the disk or partition.

MODE: Shows the access permissions (e.g., rw indicates read-write access).

Task3(5)

snapshot

Task3(6)

snapshot