

# Storage

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**Student Engagement &  
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# Storage

**Objective:** *Compare and Contrast Storage Types.*

As we wrap up our look at the inner workings of a computer, let's take a deeper dive into the different types of storage used by computer systems. We've already discussed how computers need other types of storage for various purposes. There are two major categories of storage: volatile storage and non-volatile storage. In this lesson, we'll learn everything we need to know about the following topics:

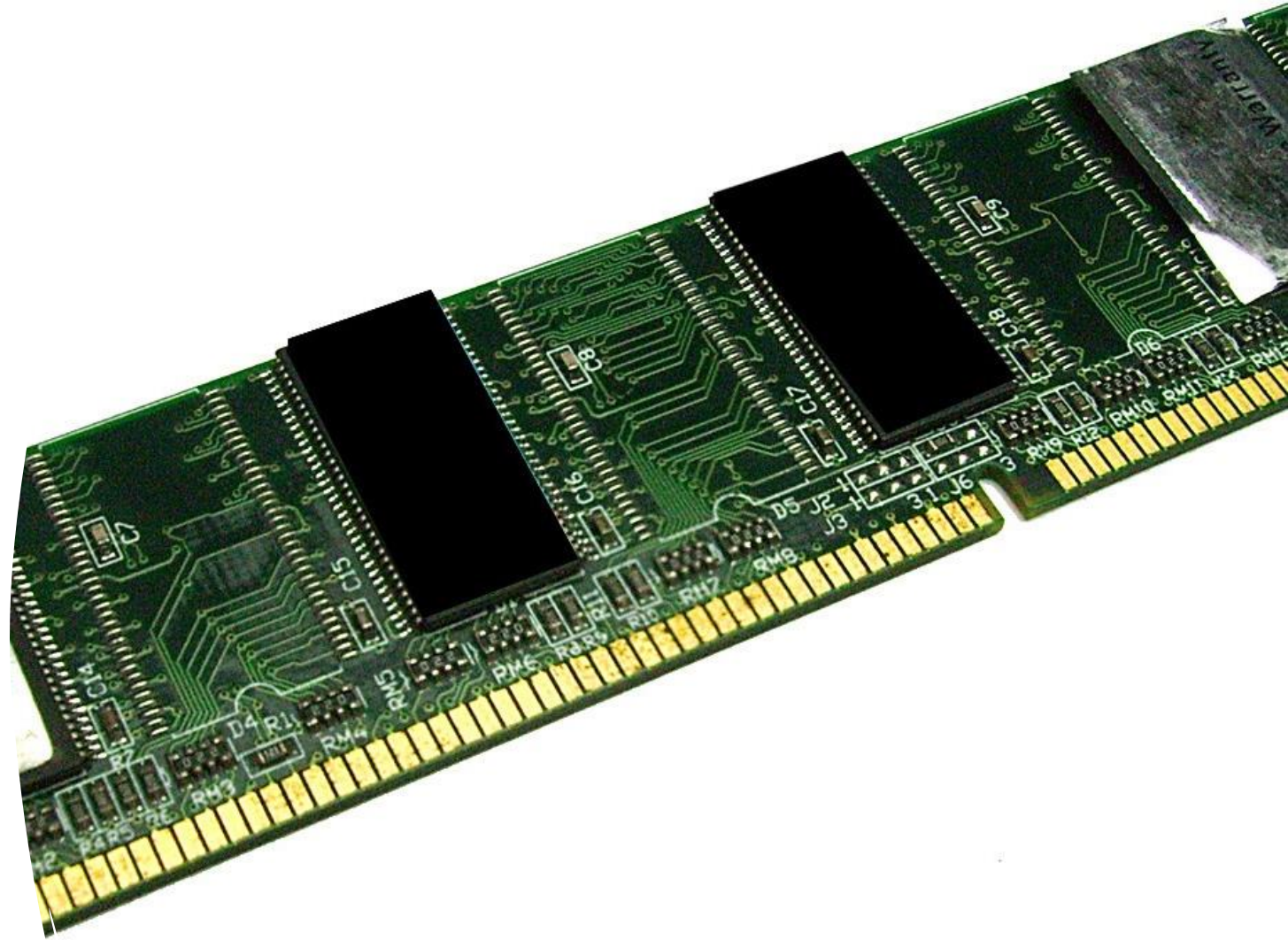
- Volatile Vs Non-volatile
- Local Storage Types
- Local Networking Storage Types
- Cloud storage service



# Volatile Storage

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Volatile storage is storage that is designed to be temporary. The most common example of volatile storage is the random-access memory RAM on the computer's motherboard. RAM is high-speed, but it's also relatively expensive. Ram contains all the data that a computer is actively working with. However, it is volatile storage, so the RAM contents are only there once the computer is turned on. If you turn it off, the contents of the RAM are erased when you turn it back on again. A typical desktop or laptop computer might have 8 to 32 gigabytes of RAM, but more powerful computers and services may have hundreds of gigabytes of RAM.





# Non-Volatile storage

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Nonvolatile stores are just a fancy way to say permanent storage. Nonvolatile storage comes in many different forms, but the common characteristic they share is that once you write something to nonvolatile storage, it stays there until you delete it, even if you turn off the power.

We measure nonvolatile storage devices in two ways. First, we measure the total storage capacity of the device in bytes and the different multiples of bytes that you learned about earlier. It's common for a typical computer to have hard drives or solid-state drives that can store 500 GB, 1 TB, or more data. Second, we measured the speed at which storage devices can store and retrieve data. We measure this using a unit called input-output operations per second (IOPS).





# Magnetic Hard Drives

Some non-volatile storage is local to a computer system. We've already talked about the use of magnetic hard disk drives HDD. Magnetic drives provide inexpensive stores that are relatively slow. Magnetic hard drives contain platters of magnetic material that spin around very quickly inside the computer, where a head reads and writes magnetic charges to the disk. For this reason, magnetic hard drives are also commonly known as spinning disk drives.

# Solid State Drives

Solid-state drives (SSDs) are a modern replacement for magnetic drives. Instead of using spinning magnetic disks, they use stored electric charges and have no moving parts. This makes solid-state drives less likely to break and allows them to work more quickly than magnetic drives, but those benefits come with cost. Solid state drives are more expensive than magnetic drives.





# USB Flash Drives

Flash drives use the same technology as solid-state drives but in a removable form. Flash drives are fairly inexpensive, but they have limited storage capacity when compared to solid-state drives.



# Secure Digital Drives

SD cards are a proprietary format of flash drives and have the distinctive appearance shown here. These cards are primarily used as storage for cameras, tablet computers, and other portable devices due to their small size.





# Optical Drives

Optical drives use lasers to edge data onto removable disk that may be stored separately from the computer system.

- Compact discs (CDs) were the original optical storage meteor. Allowing the storage is up to 680 megabytes of data on a single disk.
- Digital video discs (DVDs) increase the density of storage allowing the storage of up to 17 gigabytes of data on a single disk
- Blu-ray discs (BDs) have the highest capacity of any optical format, allowing the storage of up to 128 gigabytes of data on a single disk.





# Optical Drives

There are different Types of each of these optical media:

- Read only disk are recorded at the factory and users may not change the data stored on them.
- Recordable disk allows users to write data to them, but that data is then permanently stored on the disk and may not be erased or modified.
- Rewritable disk are erasable and may be reused after recording data on them.



# Optical Drives

- When optical drives read and write data to disk, they spin the disk rapidly in the drive and use a laser to read and write data. Therefore, optical drives, like HDDs, are examples of spinning disc media.

	Compact Disc	Digital Video Disc	Blu-Ray Disc
<b>Read Only</b>	CD-ROM	DVD	BD-ROM
<b>Recordable</b>	CD-R	DVD-R	BD-R
<b>Rewritable</b>	CD-RW	DVD-RW	RW

# Enterprise Storage Services

Organizations generally don't want to manage large quantities of removable media or store data on drives attached to individual computers. Instead, they offer centralized enterprise storage services that store data in a single location where it can be accessed by many different users.





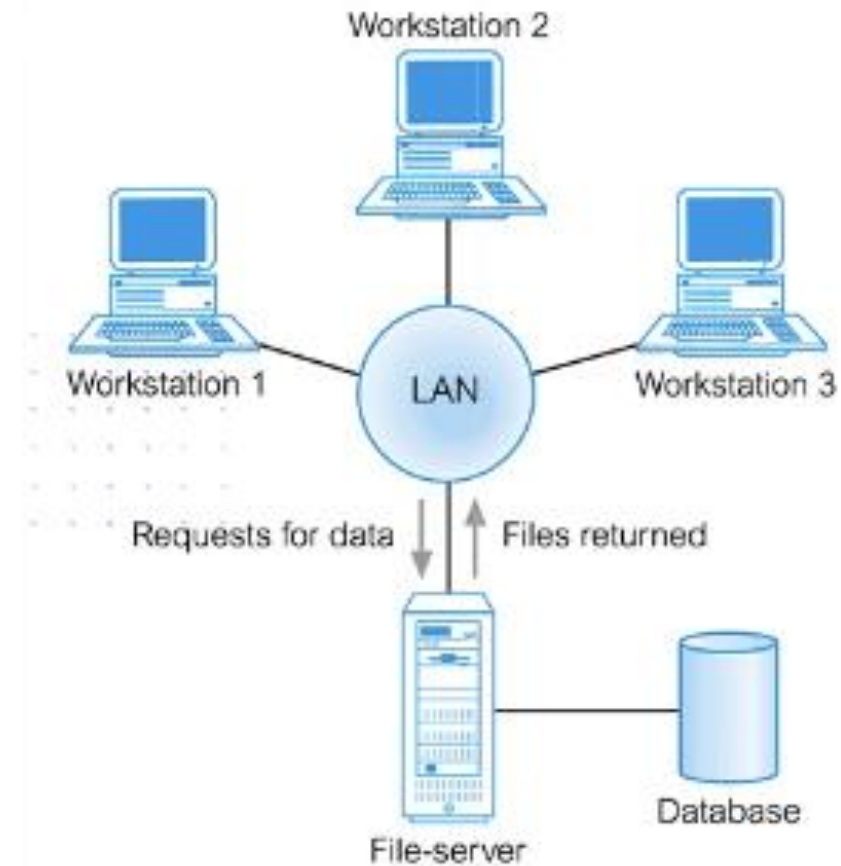


# Cloud Storage

Today, cloud storage services allow organizations to outsource storage using services provided by a vendor who manages those storage resources and makes them available to users wherever they reside.

# File Servers

Businesses that choose not to use cloud services may operate their own centralized storage services that meet the needs of their employees. They often do this by running a file server, which is just a computer with a lot of storage installed. The file server sits on the network, and users can access it from their computers.







# Network-attached storage (NAS) ...

- systems are self-contained file servers that plug directly into a network to provide users with access to shared storage space.

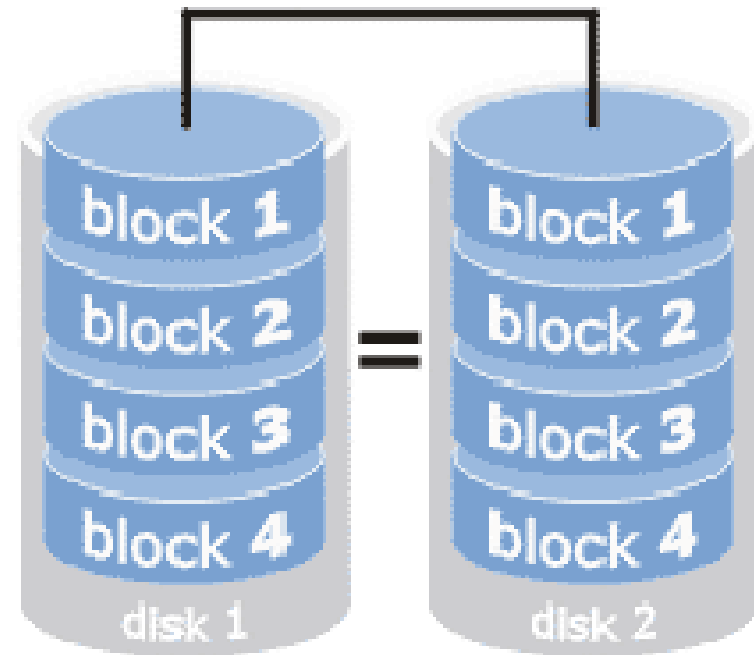
# RAID

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File servers and other enterprise storage services use a technology called redundant array of inexpensive disk (RAID) to protect against disk failures. The general idea behind raid technology is that the server or NAS array writes the same data to multiple disks so that if a single disk fails, the data may still be retrieved.

## RAID 1

mirroring



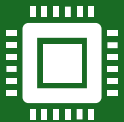


# Remember this:

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Volatile storage, such as RAM, retains its contents only while a device is powered on. Nonvolatile storage, such as HDDs, SSDs, and flash drives, retains contents permanently until the data is intentionally deleted or overwritten.



Hard drives may be either magnetic hard drive discs (HDDs), which use spinning disks, or solid-state drives (SSDs), which have no moving parts.



Optical media may be used to store data on a removable disk. Common optical media formats include CDs, DVDs, and Blu-ray discs.

# Practice Question 1

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- **Practice Question 1**

- you are operating a computer system that will work near a medical device that uses strong magnetic fields to image body parts. What type of storage is most likely to be damaged by the presence of these magnetic fields?

- A. HDD
- B. DVD
- C. SSD
- D. CD

*To answer this question, you need to know which storage media uses magnetic fields to store data. Magnetic hard drives (HDDs) do this and would likely be damaged by the medical devices.*

*Solid-state drives (SSDs) use electricity, rather than magnetism, to store data and would be less likely to be damaged.*

*Compact discs (CDs) and digital video disc( DVDs) store data in optical form, which the presence of a magnetic field would not damage.*

- **The correct answer is A: HDD**

# Practice Question 2

Which of the following storage options is an example of volatile storage?

- A. NAS
- B. Flash
- C. BD-RW
- D. RAM

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Volatile storage is storage that loses its data when it is powered off. Random access memory (RAM) is temporary storage used by a computer to store data that is currently in use and loses its data when powered off. Therefore, RAM is an example of volatile storage. Network-attached storage, NAS flash drives, and Blu-ray discs all retain data when power is removed. All of these are examples of nonvolatile storage. The correct answer is D: RAM



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