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Introduction to Storage Concepts

Objectives

After completing this lesson, you should be able to explain:

- The need for storage
- Local storage
- Cloud storage
- Block storage
- Object storage
- Ephemeral storage

What Is Storage?

- Retention of data to retrieve when needed
  - This data can be modified, deleted, updated, and so on.
- Storage options:
  - Local
  - Cloud

- Storage is hugely important in computing, especially now because you generate more content than ever.
- The consumers are able to retrieve, modify, erase, update, and save their data either locally or via the cloud.
  - Saving data locally—personal computer or local network—has been the traditional form for storing data.
  - However, nowadays, cloud storage is gaining popularity due to the increase of mobile devices, wireless technology, application development and new state-of-the-art enterprise computing resources.

What Differentiates Cloud Storage from Local Storage?

- Local Storage
  - Personal: PC stand alone
    - Physical backups, access from one place, storage limitation
  - Business: servers, databases, files, and so on
- Cloud Storage
  - Personal: PC, mobile device, web browser
    - Automatic backups, access from anywhere, unlimited storage
  - Business: servers, databases, files, and so on

- Local storage still remains the traditional form for storing data.
  - At home, users still save their data (such as documents, photos, music, videos, and so on) on their PCs. For users who make backups, most use external drives as their storage device. Although these items are stored locally, there are some storage providers who take user data and upload it to the cloud—for online services.
  - Businesses may use a local network to share, modify, and store data. They store data on their local server, and then perform periodic backups.
- Cloud storage is useful for both individuals and organizations.
  - Users can access data from just about anywhere, and on multiple platforms including mobile devices.
  - It does not matter if the PC's hard drive crashes or a mobile device is lost or damaged. The data can be securely retrieved to a new device by logging in to the cloud storage service.
  - Cloud storage is a great solution for businesses interested in paying for what they use. By subscribing to a cloud storage service, customers pay for the storage capacity that is currently needed. As a customer's business grows, they can increase their storage capacity. Cloud storage also allows interaction with databases as well as making the data available for other computing operations. Cloud storage service providers keep multiple copies of data uploaded by a customer.

Local Storage

- Forms of local storage:
  - Internal hard drive
  - External hard drive
  - Solid State Drive (SSD)
  - USB Drive or flash drive
  - Network Attached Storage (NAS)
  - Optical Drive (CD/DVD)
- Universal facts about local storage devices:
  - Capacity limitation
  - Prone to damage

Local storage is found in many forms including:

- **Internal hard drive:** Found in every computer. Today, many computers have the option to upgrade to a solid state drive for an additional fee.
- **External hard drives:** Used to perform backups or expand storage capacity
- **Solid State Drive (SSD):** Does not have any moving parts; it is able to input/output data faster than traditional hard drives and uses less power
- **USB Drive:** Also known as a flash drive or jump drive. Like the SSD, these are small devices, and are portable and efficient. Unlike the SSD, flash drives are rather inexpensive and very practical for everyday use.
- **Network Attached Storage (NAS):** Is very popular in the workforce. This allows for multiple networked computers to retrieve and save data on storage devices.
- **Optical Drive (CD/DVD):** Are used to store data ranging from basic data files up to music and movies. Soon the optical drive will become obsolete because of revolutionary cloud storage and wireless technology.

The two well-known facts about all local storage devices:

- The user could exceed the storage capacity
- The hard drive will stop working eventually

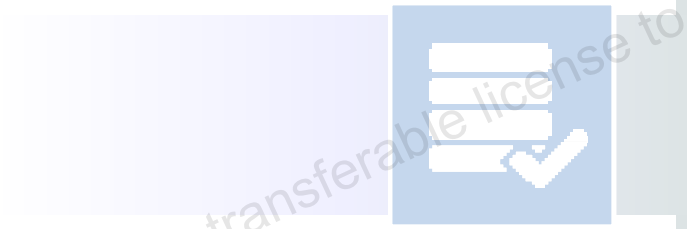
Cloud Storage

- Main features:
  - Accessible from anywhere
  - Secure
  - Scalable
  - Automatic backups
- Characteristics:
  - Requires Internet connectivity
  - Flexibility to use REST API or other interfaces
  - Options to replicate data to a different location

- Cloud storage accompanied with cloud computing is gaining huge popularity today.
  - Mobile accessibility is a large component of cloud storage.
  - It helps users and organizations (from anywhere) to gain access to data found anywhere in the world.
  - Data is encrypted, keeping it secured when stored accessed.
  - Individual consumers and organizations can go up or down depending on how much storage capacity they need.
  - Cloud storage keeps backups for all the data housed. The backups are distributed throughout different datacenters assuring data security—disaster recovery is no problem.
- Other characteristics include:
  - Internet connectivity is required.
  - You have the flexibility to use REST API or other interfaces.
  - Cloud storage provides the option to replicate data in different locations.

What Are the Different Types of Cloud Storage?

- Public Cloud Storage
- Personal Cloud Storage
- Hybrid Cloud Storage



- **Public Cloud Storage:** Cloud storage resources, maintenance, and management are part of the storage provider's own data center. Customers' data centers and the cloud provider's data center are completely separate.
- **Personal Cloud Storage:** This is intended mostly for individual use. Personal cloud storage is part of the public cloud, except that this service provides mobile friendly features such as content sharing and data synchronization.
- **Hybrid Cloud Storage:** This is a combination of both private and public cloud storage.

So, Which Is Better: Local Storage or Cloud Storage?

- Local Storage
  - **Pros:** Faster, secured
  - **Cons:** Capacity limitation, subject to failure, no automatic backup
- Cloud Storage
  - **Pros:** Accessibility, automatic backups, scalability, synchronization, security, zero maintenance
  - **Cons:** Transfer speed bandwidth-dependent; Internet connectivity required

Both local storage and cloud storage have advantages and disadvantages.

- For local storage, some of the advantages include faster speed and secured connectivity. Some of the disadvantages include limited space; sooner or later the physical disk will fail; and there are no automatic backups.
- The main advantages of cloud storage include being able to access your data from anywhere; automatic backups performed periodically; ability to increase and decrease storage capacity as needed; and that maintenance is done by the cloud provider, not the user. Some disadvantages of cloud storage are that the user must have an Internet connection to access their data, and the transfer speed depends on bandwidth.

What Are the Different Types of Storage?

Main storage types:

- **Block Storage:** Traditional
- **Object Storage:** Trending
- **Ephemeral:** Temporary

- There are three main types of storage in the physical component.
  - Block storage is the traditional form of storing data.
  - Object storage is gaining popularity due to modern technology and mobile devices.
  - Ephemeral storage exists only temporarily.

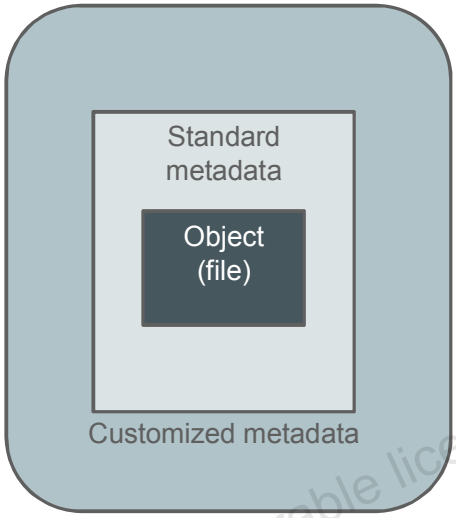
Tell Me About Block Storage

- Traditional
  - This storage is in the form of hard drives, optical discs (CDs), and so on.
  - Such physical storage is virtualized in the form of storage volumes and attached to virtual machines.
- File System Structure
- Limited metadata
- Network storage
- Cloud interactivity

- Block storage is a type of data storage used on physical hard drives. Chunks of 1's and 0's are put together to form a file.
- This has been the traditional form of data storage for many years.
- Data is stored and found in the form of file structure. This means that users have to specifically locate the file path and open or execute it.
- Block storage has limited metadata (such as the file name, date created, date modified, date accessed, file size, and so on).
- Large chunks of data can be saved through network storage.
- Cloud storage providers also use block storage on their servers to perform backups and provide cloud services.

Tell Me About Object Storage

- Customizable metadata
- Single layer storage
- Cloud interactivity
- Modern and Trending



- Object storage (or object-based storage) stores and manages data as objects.
- An object is a data file that uses metadata to better describe its characteristics, as well as letting the management system know where this file can be found in the storage pool. If the file is moved, then the location metadata gets updated.
- This metadata is customizable according to the needs of the applications or users.
  - Example: A photo has basic characteristics, such as filename and date created; however, custom metadata allows users or applications to specify additional properties such as the location where the photo was taken, the category, and so on. Then the photos can be retrieved based on location or category information.
- Unlike block storage, object storage is stored in the form of a single layer. The user does not need to specify the file path because its location is part of the metadata.
- This is a very attractive solution in cloud computing. It allows users to upload and access data from computer and mobile devices. The user is able to later retrieve data based on specific searches or filtering data using metadata parameters.

Tell Me About Ephemeral Storage

- Used in cloud computing
  - Virtual Machines
  - Instant accessibility to data

- Ephemeral is defined as *lasting for very short time*.
- Ephemeral storage is mainly used in cloud computing.
- The storage is persistent during the lifetime of a virtual machine. When a virtual machine is terminated, the ephemeral storage disappears as well.
- This is a good option if users need to process huge data files. Hundreds of gigs of original data can be held on ephemeral storage.

Storage: The Big Picture

- Computing ecosystem
- Storage working stand alone
- Storage types team up
- Achieve better results

- Regardless of what activity is being performed, storage is essential.
- Although block storage is the most common form, object storage is quickly becoming popular especially in cloud computing contexts.
- The whole computing ecosystem benefits from one form of storage or another. Businesses may use specific types of storage for specific purposes. Additionally, they may use a combination of storage types to increase performance and improve customer experience.

Quiz

Storage is defined as retention of data to retrieve when needed.

a. True
b. False

Quiz

Which of the following is not part of local storage?

a. Solid State Drive (SSD)
b. Object storage
c. Network attached storage
d. Optical Drive (CD/DVD)
e. None of the above

Quiz

Block storage exists only temporarily and ephemeral is storage in form of 1's and 0's.

a. True
b. False

Quiz

Which of the following storage exists only temporarily?

a. Block storage
b. Object storage
c. Ephemeral storage
d. None of the above

Quiz

Object-based storage is mainly used in:

a. Cloud storage
b. Regular PC storage
c. External hard drives
d. All of the above
e. None of the above

Summary

In this lesson, you should have learned how to explain:

- The need for storage
- Local storage
- Cloud storage
- Block storage
- Object storage
- Ephemeral storage