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CC615x

Cloud Infrastructure

Week 3: Cloud Infrastructure – Storage Part 1

Objectives

In this week's lesson, you will learn:

Storage Types and Protocols	Direct Attached Storage in the Cloud
<ul style="list-style-type: none">• What is Block Storage?• What is File Storage?• What is Object Storage?	<ul style="list-style-type: none">• Direct Attached Storage for Servers• Storage for Containers and Server-less Compute

Objectives

In this week's lesson, you will learn:

Block Storage in the Cloud	File Storage in the Cloud	Cloud Object Storage
<ul style="list-style-type: none">• SAN-based Block Storage• Snapshots and Backup	<ul style="list-style-type: none">• NAS-based File Storage	<ul style="list-style-type: none">• Object Storage structure• Object Storage Advantages and Disadvantages• Content Delivery Network



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Storage Types and Protocols



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What is Block Storage?

- At the device level, computer storage devices persist sequences of bytes in blocks of various sizes and locations within the device. Such storage is called *block storage*. A hard drive, or solid state storage device (SSD) is a block storage device.
- Storage devices may be physically attached to computer servers (Direct Attached Storage, or DAS), or they may be attached to servers over a network.
- You can read and write data in the storage blocks by using access protocols which define access operations. Hard drives or SSD physically attached to a server are usually accessed using protocols such as SATA (Serial AT Attachment), USB (Universal Serial Bus), or SCSI (Small Computer System Interface).
- For network-attached block level devices, a popular protocol is iSCSI (Internet SCSI). Networks connecting storage devices are usually dedicated super-fast fiber-optic networks called Storage Area Networks (SAN).

What is File Storage?

- Accessing storage at the block level is mundane, and it is used for specialized access like fast backup or databases.
- For humans and applications, another protocol is used on top of block-level protocol, which implements the abstraction of files and folders. These file-level protocols are used for both direct attached storage (FAT or NTFS are used in Windows), and networked storage (NFS, SMB).
- Networked storage devices with file-level access are called NAS devices (Network Attached Storage).



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What is Object Storage?

- In recent years, another type of storage started gaining popularity, especially for cloud applications, called Object Storage. Its protocols implement a different abstraction: data objects, stored in object containers which cannot be nested like file folders.
- Object storage protocols implement features needed for today's internet and cloud applications. Objects can easily store unstructured data, like photos, videos, or music. They can be replicated in various Internet-connected locations for fault tolerance and easy remote access. Object repositories can be highly scalable, as storage devices can be added at locations. This fits well with horizontal scaling cloud paradigm.



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Direct Attached Storage in the Cloud

Direct Attached Storage for Servers

- Physical servers hosting virtual servers in the cloud have hard disks or SSD drives attached to them. Most cloud vendors share storage on these drives among virtual machines running on the host and call it an instance, or local, storage. The drives are block devices, on which the operating systems of virtual servers can create and mount file systems. The cost of DAS storage is included in the cost of the virtual server.
- DAS storage has the fastest access times, but when used with virtual servers it may be short-lived. It is intended for short-term, temporary use. Unless backed up in more permanent storage, data stored in instance storage can be lost when the virtual server is stopped or relocated.
- Bare metal servers can, of course, have attached disks, and the customer who owns the bare metal server has full control over these disks. Some bare-metal cloud providers allow multiple attached disks in RAID (Redundant Array of Independent Disks) configurations, to provide fault-tolerance and optimized access.



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Storage for Containers and Server-less Compute

- Similar to virtual server instance storage, containers can have shared fragments of the host machine file system on attached storage made available to them. By default, this storage is part of their isolated namespace, not accessible to other containers. The data is lost when the container is terminated unless it is backed up. Containers can also request access to file folders that can be shared with other containers.
- Server-less compute code by default does not have access to any infrastructure on which it is running. Cloud vendors usually make some virtual storage available to server-less code, but it is ephemeral and goes away when the code finishes.



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