Virtualization:

Creating a virtual version of a device or resource, such as a server, storage device, network or even an operating system when the framework divides the resource into one or more execution environments.

Some of the virtualization softwares are:

- VMWare
- Red Hat
- Microsoft Hyper-V
- Citrix Xenserver

VMWare Virtualization:

- VMWare is a software based representation of a physical computer.
- Each virtual machine runs its own operating system and behaves like an independent computer, even though it is running on a portion of the actual underlying hardware.
- VMWare is the Type-1 hypervisor, which is also known as “Bare Metal”.

Hypervisor:

- A hypervisor or Virtual Machine Monitor(VMM) is a computer software or hardware that creates and runs virtual machines.
- It allows multiple Guest OS to run on a single host system at the same time.

Types of Hypervisors:

Type-1 : Bare Metal:

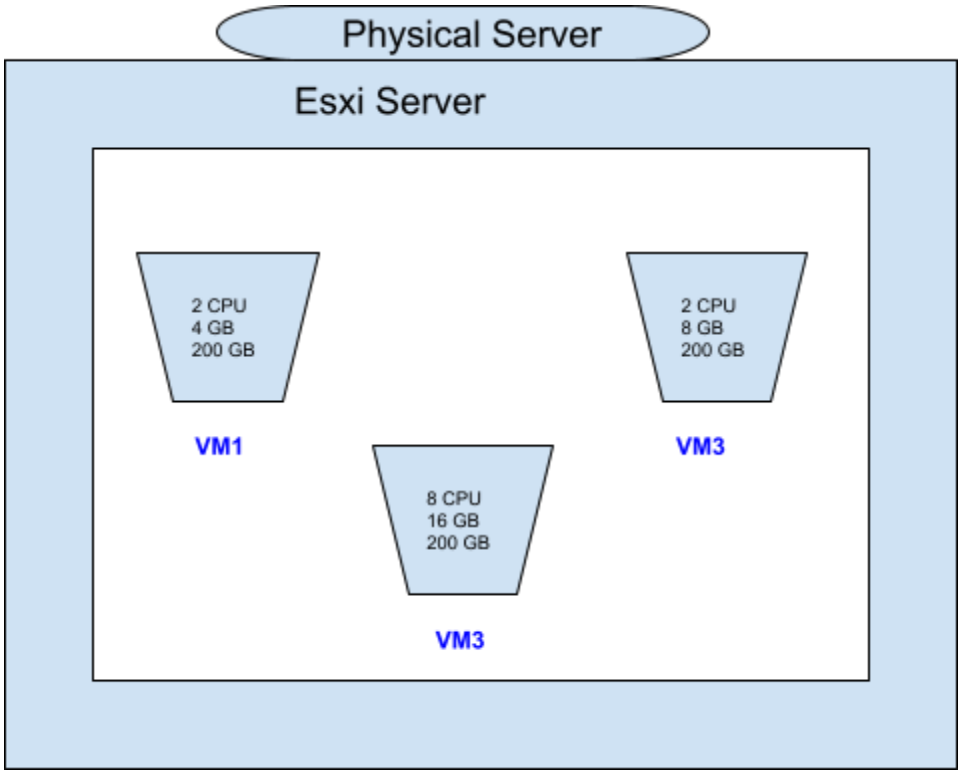
- This hypervisor runs directly on the underlying host system and does not require any base server operating system.
- It has direct access to hardware resources(CPU, memory, storage & Network).
- Pro: There is no involvement of third party resources, so it empowers the security.
- Examples: VMWare ESXi, Citrix Xenserver, Microsoft Hyper-V

Type-2 : Hosted Hypervisor:

- This hypervisor runs as an application in a host system and the software is installed on an operating system.
- Examples: Oracle Virtual Box, VMware Workstation etc,.

VMWare vSphere ESXi Server:

ESXi server is the hypervisor which runs virtual machines.



Snapshot:

A snapshot **preserves the state and data of a virtual machine at a specific point in time**. The state includes the virtual machine's power state (for example, powered-on, powered-off, suspended). The data includes all of the files that make up the virtual machine.
Snapshots are often used in storage systems to **enhance data protection and efficiency** and were originally created to solve several data backup problems, including recovering corrupted data, backing up large amounts of data, and increasing application performance while a backup is in process.

Cloud Storage:

Through cloud storage, the provider securely stores, manages, and maintains the storage servers, infrastructure, and network to ensure you have access to the data when you need it at virtually unlimited scale, and with elastic capacity.
Advantages of cloud storage:

1. Cost Effectiveness
2. Increase Agility
3. Faster Deployment
4. Business continuity

Types of cloud storage:

Unstructured data: includes photos, videos, audio files, web content, sensor data and ML files.

File storage

File-based storage or file storage is widely used among applications and stores data in a hierarchical folder and file format. This type of storage is often known as a network-attached storage (NAS) server with common file level protocols of Server Message Block (SMB) used in Windows instances and Network File System (NFS) found in Linux.

Block storage

Enterprise applications like databases or enterprise resource planning (ERP) systems often require dedicated, low-latency storage for each host. This is analogous to direct-attached storage (DAS) or a storage area network (SAN). In this case, you can use a cloud storage service that stores data in the form of blocks. Each block has its own unique identifier for quick storage and retrieval.

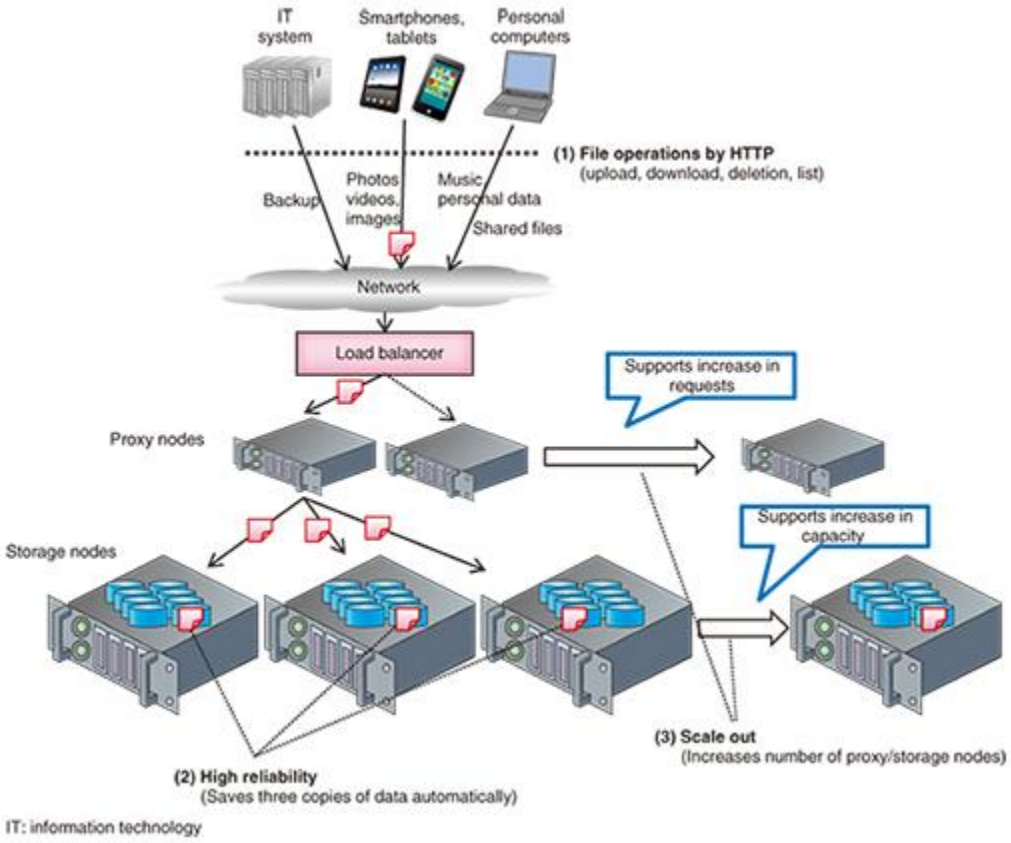
Object Storage:

Object storage is a storage architecture for large stores of unstructured data. Objects store data in the format it arrives in and makes it possible to customize metadata in ways that make the data easier to access and analyze. Instead of being organized in files or folder hierarchies, objects are kept in secure buckets that deliver virtually unlimited scalability. It is also less costly to store large data volumes.

- Object-based storage has emerged as the preferred method for data archiving and backup. It offers a level of scalability not possible with traditional file- or block-based storage.

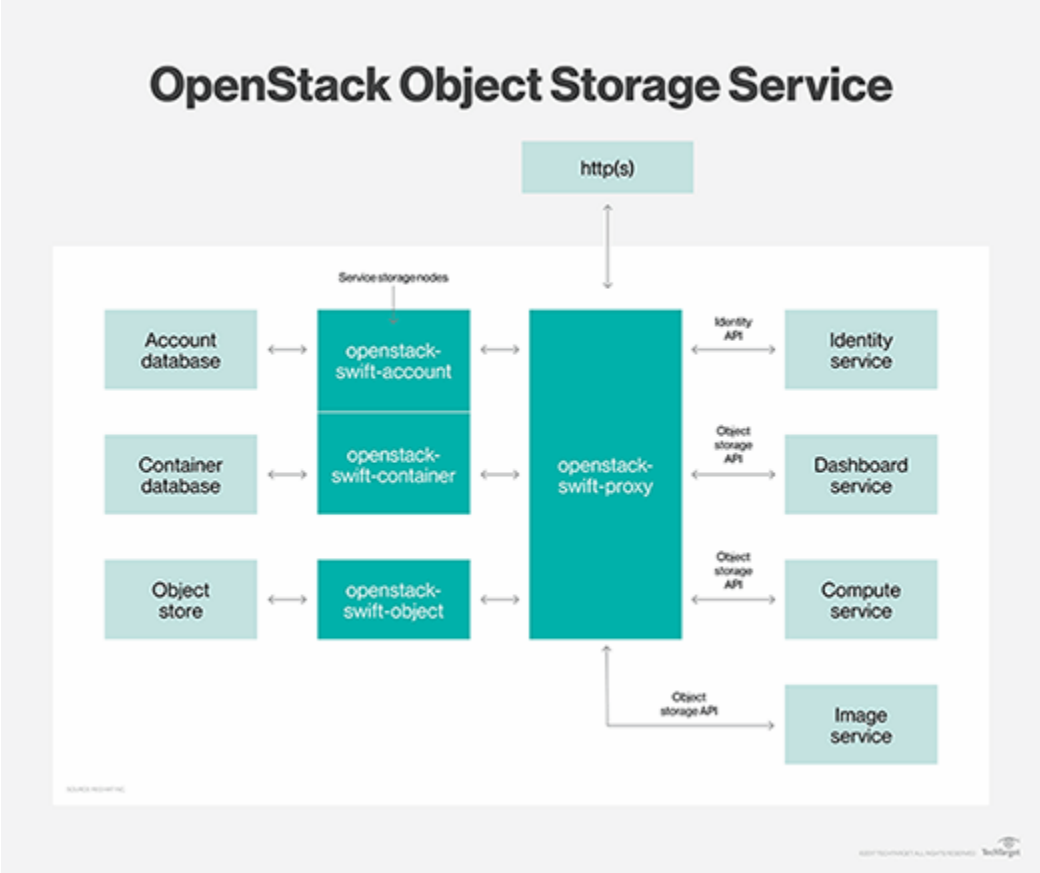
- With object-based storage, you can store and manage data volumes on the order of terabytes (TBs), petabytes (PBs), and even greater.
- There are no folders, directories, or complex hierarchies as in a file-based system.
- Each object is a simple, self-contained repository that includes the data, metadata (descriptive information associated with an object), and a unique identifying ID number (instead of a file name and file path).

OpenStack Swift :



- OpenStack Swift is a distributed object storage system designed to scale from a single machine to thousands of servers.
- It is software that allows for storage and retrieval of data via a simple API.
- Openstack swift is used to backup and archive unstructured data, such as documents, images, audio and video files, emails and virtual machine images.
- It is used for redundant, scalable data storage using clusters of standardized servers.
- *Cluster: Group of nodes hosted on virtual machines and connected within a virtual private cloud.*

- **Comparison of swift with cinder**: We cannot attach the single cinder to two or more virtual machines at the same time. We could only connect the single cinder volume to any virtual machine, one at a time. Cinder is great for application data, whereas swift is greater for data backup.
- **Benefit of swift**: Unlimited storage: There is a limit for only the number of nodes used not for storage.



Components of Swift:

1. Objects: The data itself is an object.
2. Accounts and containers:
    - Each account and container are individual SQLite databases.
    - An account database contains the list of containers.
    - A container database contains the list of objects.
    - These two are very important to keep track of object data locations effectively.
3. Zones:

- A zone could be a single drive or group of drives.
- Zones are configured to isolate failure boundaries.

4. Partitions:
    - Partition is a collection of stored data.
    - This includes account databases, container databases and objects.
    - System replicators and object uploads and downloads operate on partitions.
5. Rings:
    - Map logical names of data to locations on particular disks.
6. Proxy server:
    - Proxy servers handle all of the incoming API requests.
    - Once a proxy server receives a request, it determines the storage node based on the object's URL.
    - A minimum of two proxy servers should be deployed, if one fails, the other takes over.

Linux commands utilized during the installation of multi node swift:

S.No	Command	Description
1	echo $?	Return the code of the last executed command. The last command executed is success when it returns zero. Otherwise not.
2	yum	It is used to install new packages, remove old packages and perform queries on the installed packages.
3	reboot	This command is used to restart a system from its existing state, which we call as reboot.
4	hostnamectl	We can see the status of the hostname and can change the hostname as well using this command. Syntax to change the hostname:

		hostnamectl set-hostname new_hostname --static
5	setenforce	SELinux is very similar to Windows firewalls. We can change the mode of SELinux by using various commands. From these, setenforce is used to disable the SELinux (it neither enforcing nor printing warnings).
6	systemctl	Systemctl is a Linux command-line utility used to control and manage systemd and services.
7	hostname	To know the hostname of the current Linux environment
8	ssh	The ssh command provides a secure encrypted connection between two hosts over an insecure network.
9	rpm	RPM is a command-line utility for managing packages on Unix/Linux systems. It allows you to install, query, update, verify and remove RPM packages.
10	lsblk	lsblk is used to display details about block devices and these block devices(Except ram disk) are basically those files that represent devices connected to the pc
11	mkfs	The mkfs command makes a new file system on a specified device. The mkfs command initializes the volume label, file system label, and startup block
12	mkdir	Used to create a single or multiple directories in a Linux machine.
13	echo	To append text into a file
14	mount -a	The mount command allows users to mount, i.e., attach additional child file systems to a particular mount point on the currently accessible file system.
15	chown	The chown command changes the owner of the file or directory specified by the File or Directory

		parameter to the user specified by the Owner parameter.
17	useradd	Used to add new username
18	time	To know the time consumed to execute a particular command
19	cat	To display the content present in the file