**CLOUD COMPUTING**

**Module 2**

1**.** Virtualization is a technique, which allows to share single physical instance of an application or resource among multiple organizations or tenants. It does so by assigning a logical name to a physical resource and providing a pointer to that physical resource when demanded.

Types of virtualization:

**Server Virtualization**: This technique allows multiple virtual servers (or virtual machines) to run on a single physical server. [It optimizes hardware utilization and simplifies server management](https://www.bing.com/aclick?ld=e8RPmVIzgbT4zdHKN7Xp-TjDVUCUwRdiSWR5u7Xk3xcQ4kRrxcnJn13aCw6ILVcqXz7m7egaX-RvfuJOTYbIKLiVQDPmCMSTW1nHoY4H-X0f8SeL5wXQZZLE9xmB37fas4U1bFsNZqunhdjxFwe1hNeMJ_fc_dgbLaVJyIawfp0rw5hOjB&u=&rlid=7efe7086550d1fb1ccd816363f7b0f33).

**Storage Virtualization**: Here, storage resources are abstracted and managed centrally. [It enables efficient storage allocation, scalability, and data redundancy](https://www.bing.com/aclick?ld=e8RPmVIzgbT4zdHKN7Xp-TjDVUCUwRdiSWR5u7Xk3xcQ4kRrxcnJn13aCw6ILVcqXz7m7egaX-RvfuJOTYbIKLiVQDPmCMSTW1nHoY4H-X0f8SeL5wXQZZLE9xmB37fas4U1bFsNZqunhdjxFwe1hNeMJ_fc_dgbLaVJyIawfp0rw5hOjB&u=&rlid=7efe7086550d1fb1ccd816363f7b0f33).

**Network Virtualization**: This type abstracts and logically separates networks. [It allows for flexible network configurations and efficient resource utilization](https://www.bing.com/aclick?ld=e8RPmVIzgbT4zdHKN7Xp-TjDVUCUwRdiSWR5u7Xk3xcQ4kRrxcnJn13aCw6ILVcqXz7m7egaX-RvfuJOTYbIKLiVQDPmCMSTW1nHoY4H-X0f8SeL5wXQZZLE9xmB37fas4U1bFsNZqunhdjxFwe1hNeMJ_fc_dgbLaVJyIawfp0rw5hOjB&u=&rlid=7efe7086550d1fb1ccd816363f7b0f33).

**Desktop Virtualization**: Also known as Virtual Desktop Infrastructure (VDI), it provides remote access to desktop environments. [Users can access their desktops from various devices](https://bing.com/search?q=types+of+virtualization+in+cloud+computing).

**Application Virtualization**: Applications are abstracted from the underlying operating system. [Users can run applications without worrying about compatibility issues or conflicts](https://www.bing.com/aclick?ld=e8RPmVIzgbT4zdHKN7Xp-TjDVUCUwRdiSWR5u7Xk3xcQ4kRrxcnJn13aCw6ILVcqXz7m7egaX-RvfuJOTYbIKLiVQDPmCMSTW1nHoY4H-X0f8SeL5wXQZZLE9xmB37fas4U1bFsNZqunhdjxFwe1hNeMJ_fc_dgbLaVJyIawfp0rw5hOjB&u=&rlid=7efe7086550d1fb1ccd816363f7b0f33).

2. There are two main types of hypervisors:

Type 1 Hypervisor:

-Also known as a bare-metal hypervisor.

-Runs directly on the physical hardware without an underlying operating system.

-Provides high performance and efficiency.

Type 2 Hypervisor:

-Also called a hosted hypervisor.

-Runs on top of an existing operating system.

-Easier to set up but may have slightly lower performance.

Managing Hypervisors:

Ecosystem: Look for good documentation and technical support.

Management Tools: Ensure comprehensive tools for provisioning, maintenance, auditing, and cleanup.

Live Migration: Allows moving VMs between hypervisors without stopping them.

[Cost Considerations: Evaluate licensing costs and scalabilit](https://www.ibm.com/topics/hypervisors)y.

3.Role of Virtulization:

**Resource Optimization**: Virtualization allows creating virtual machines (VMs) on a single physical server. [This efficient use of hardware resources maximizes computing capacity and reduces costs](https://www.bing.com/aclick?ld=e8VYC611jS0i2dRrNMNi9XTDVUCUztrjzK7iGSKISejizpmtC7-FYpog-hfZU_Dv3Q2bXb7Syw_hPj2Fe_RBkbMTA4VeVb7jfKSXVe9s2npH9JnU51c8Kq1XwiW7o7zUTaon6IFPrZ0Rv8zyHXOjltfJiLddznzjrozzC28zM92X2T7CRI&u=&rlid=47ce512651ae188af2b237963a643b46).

**Isolation and Security**: VMs are isolated from each other, enhancing security. If one VM fails, it doesn’t affect others. [This isolation is vital in multi-tenant cloud environments](https://aws.amazon.com/what-is/virtualization/).

**Dynamic Scaling**: Cloud providers can dynamically allocate resources based on demand. [Virtualization enables seamless scaling up or down without disrupting services](https://www.bing.com/aclick?ld=e8VYC611jS0i2dRrNMNi9XTDVUCUztrjzK7iGSKISejizpmtC7-FYpog-hfZU_Dv3Q2bXb7Syw_hPj2Fe_RBkbMTA4VeVb7jfKSXVe9s2npH9JnU51c8Kq1XwiW7o7zUTaon6IFPrZ0Rv8zyHXOjltfJiLddznzjrozzC28zM92X2T7CRI&u=&rlid=47ce512651ae188af2b237963a643b46).

**Server Consolidation**: Multiple VMs share a physical server, reducing the number of physical machines needed. [This consolidation optimizes data center space and power consumption](https://aws.amazon.com/what-is/virtualization/).

**Testing and Development**: Developers can create VMs for testing and development without affecting production systems. [It speeds up application development](https://www.bing.com/aclick?ld=e8VYC611jS0i2dRrNMNi9XTDVUCUztrjzK7iGSKISejizpmtC7-FYpog-hfZU_Dv3Q2bXb7Syw_hPj2Fe_RBkbMTA4VeVb7jfKSXVe9s2npH9JnU51c8Kq1XwiW7o7zUTaon6IFPrZ0Rv8zyHXOjltfJiLddznzjrozzC28zM92X2T7CRI&u=&rlid=47ce512651ae188af2b237963a643b46)

4.  Containers are lightweight packages of software that encapsulate all the necessary elements to run in any environment. They virtualize the operating system and can run anywhere—from private data centers to the public cloud.

5. High availability ensures that systems remain accessible and resilient to failures, minimizing downtime.

Live migration allows moving a running virtual machine (VM) or application between different physical machines without disconnecting clients or applications.

6. Block storage divides data into fixed-sized blocks and stores them on block devices (such as hard drives or SSDs). These blocks are accessed using low-level block-level protocols.

 File storage organizes data into files and directories, similar to how files are stored on a local computer. It uses shared files accessible over a network.

Object storage divides data into separate, self-contained units (objects) stored in a flat environment. Objects include metadata for processing and usability.

**DAS (Direct-Attached Storage)**: Primarily uses hard drives with sectors.

**NAS (Network-Attached Storage)**: Uses shared files accessible over a network.

**SAN (Storage Area Network)**: Utilizes block storage and specialized protocols like Fibre Channel and IP.

7. Storage allocation refers to the process of assigning storage resources (such as disk space) to users, applications, or data.

Storage Provisioning:

Efficient allocation of storage resources (e.g., SAN) in cloud environments.