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Assignment

Module -2: Virtualization and Storage

1. What is Virtualization and its Types?

Answer - Virtualization

Virtualization is a technology that allows one physical computer (server) to run multiple virtual machines (VMs) at the same time. Each virtual machine works like a separate computer with its own operating system, applications, and resources.

Virtualization helps in better utilization of hardware, reduces cost, and increases efficiency.

Types of Virtualization

1. **Server Virtualization**

- Multiple virtual servers run on a single physical server.
- Most common type used in data centers.

2. Operating System Virtualization
   - Multiple OS environments run on the same OS kernel.
   - Example: Containers.
3. Storage Virtualization
   - Combines physical storage from multiple devices into one virtual storage pool.
4. Network Virtualization
   - Creates virtual networks from physical network resources.
5. Desktop Virtualization
   - User desktops are hosted on a central server and accessed remotely.

2. Types of Hypervisor and How to Manage Them

Answer - Hypervisor

A hypervisor is software that creates and manages virtual machines by allocating hardware resources like CPU, memory, and storage.

Types of Hypervisor

1. Type-1 Hypervisor (Bare Metal)

- **Installed directly on physical hardware.**
- **High performance and secure.**

Examples: VMware ESXi, Microsoft Hyper-V, Xen

Management:

- **Managed using centralized tools like web consoles or management servers.**
- **Used in data centers and cloud platforms.**

2. Type-2 Hypervisor (Hosted)

- **Runs on top of an existing operating system.**
- **Suitable for testing and learning.**

Examples: VMware Workstation, VirtualBox

Management:

- **Managed through GUI software installed on the host OS.**
- **Simple to use but less powerful.**

3. Role of Virtualization in Cloud Computing

Answer - Virtualization is the foundation of cloud computing. Its main roles are:

1. **Resource Sharing**
    - **Multiple users share the same physical hardware securely.**
2. **Scalability**
    - **Virtual machines can be created or removed easily.**

3. **Cost Reduction**
    - **Reduces hardware, power, and maintenance costs.**
4. **Isolation**
    - **Each VM runs independently, improving security.**
5. **Disaster Recovery**
    - **Easy backup, restore, and migration of virtual machines.**

4. What is a Container?

Answer - A container is a lightweight virtualization technology that packages an application and its dependencies together so it can run consistently in any environment.

Unlike virtual machines, containers share the host operating system kernel, making them faster and more efficient.

Key Features of Containers

- **Lightweight**
- **Fast startup**
- **Portable**
- **Uses fewer resources**

Example: Docker containers

5. What is High Availability and Live Migration in Virtualization?

Answer - High Availability (HA)

High Availability ensures that applications and services remain available even if a server fails.

- **If one VM or server fails, another automatically takes over.**
- **Minimizes downtime.**

Used in: Banking systems, cloud services, critical applications.

Live Migration

Live migration allows a running virtual machine to move from one physical server to another without shutting down.

Benefits:

- **No service interruption**
- **Used during maintenance**
- **Improves load balancing**

6. Storage configuration –describe block storage, file storage and object storage--- DAS NAS and SAN

Answer - Block Storage

- **Data is stored in fixed-size blocks.**
- **High performance.**
- **Used in databases and virtual machines.**

Example: SAN storage

File Storage

- **Data stored in files and folders.**

- Easy to access and share.

Example: NAS storage

Object Storage

- Data stored as objects with metadata.
- Highly scalable.
- Used for backups and multimedia data.

Example: Cloud storage services

Storage Types

DAS (Direct Attached Storage)

- Storage directly connected to a computer.
- Simple and low cost.
- Limited scalability.

NAS (Network Attached Storage)

- Storage connected over a network.
- File-based access.

- **Easy sharing among users.**

SAN (Storage Area Network)

- **High-speed network-based storage.**
- **Block-level access.**
- **Used in enterprise environments.**

7. Describe Storage Allocation and Provisioning

Answer - Storage Allocation

Storage allocation is the process of assigning storage space to users, applications, or virtual machines.

- **Ensures efficient use of storage resources**
- **Prevents over-usage**

Storage Provisioning

Storage provisioning is the creation and configuration of storage resources before assigning them.

Types of Provisioning

1. **Thick Provisioning**
    - **Storage space allocated in advance.**
2. **Thin Provisioning**
    - **Storage allocated only when required.**