**Module : Virtualization And Storage Management .**

**1. What is Virtualization and Virtualization Type?**

* **Virtualization**: Virtualization is a technology that creates a virtual version of physical hardware, storage, network, or operating systems. It enables multiple virtual systems to run on a single physical system, maximizing resource utilization and flexibility.
* **Types of Virtualization**:
  + **Hardware Virtualization**: Abstracting physical hardware resources for running virtual machines.
  + **Desktop Virtualization**: Virtualizing desktop environments for remote access.
  + **Network Virtualization**: Combining hardware and software network resources into a virtual network.
  + **Storage Virtualization**: Pooling multiple physical storage devices into a single logical storage unit.
  + **Application Virtualization**: Running applications in a virtualized environment, independent of the underlying system.

**2. Types of Hypervisors and How to Manage Them?**

* **Types of Hypervisors**:
  + **Type 1 (Bare Metal)**: Runs directly on the physical hardware. Examples: VMware ESXi, Microsoft Hyper-V, XenServer.
  + **Type 2 (Hosted)**: Runs on top of an operating system. Examples: VMware Workstation, VirtualBox.
* **How to Manage Hypervisors**:
  + **Type 1**: Managed via specialized management tools like vCenter (for VMware), Hyper-V Manager (for Microsoft Hyper-V), or XenCenter (for XenServer).
  + **Type 2**: Managed via the host OS using the hypervisor's GUI or CLI tools.

**3. Roles of Virtualization in Cloud Computing**

* **Efficient Resource Utilization**: Virtualization allows cloud providers to maximize hardware usage by running multiple virtual machines on a single physical server.
* **Scalability**: Virtualization enables dynamic allocation of resources to meet demand.
* **Cost-Effectiveness**: Reduces hardware costs and energy consumption.
* **Disaster Recovery**: Virtualized environments can be replicated or restored easily.
* **Isolation**: Ensures secure and isolated environments for tenants in cloud setups.

**4. What is a Container?**

* **Container**: A lightweight, standalone executable package that includes everything needed to run a piece of software, including code, runtime, libraries, and dependencies. Unlike virtual machines, containers share the host OS kernel and are more resource-efficient.
  + Example: Docker, Kubernetes.

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

* **High Availability (HA)**: Ensures continuous operation by minimizing downtime through clustering, failover systems, or redundant components.
* **Live Migration**: The process of moving a running virtual machine from one physical host to another without interrupting its operation. It ensures uptime during maintenance or hardware upgrades.

**6. Storage Configuration – Describe Block Storage, File Storage, and Object Storage**

* **Block Storage**: Provides raw storage blocks accessed over a network (e.g., iSCSI, Fibre Channel). Common in databases and transactional systems.
* **File Storage**: Stores data in a hierarchical structure with folders (e.g., NAS). Suitable for shared storage and file access.
* **Object Storage**: Stores data as objects with metadata and unique identifiers. Used in cloud storage for unstructured data like media files.
  + **DAS (Direct-Attached Storage)**: Directly connected to a server or workstation (e.g., internal disks, external drives).
  + **NAS (Network-Attached Storage)**: File-based storage connected via a network, accessed like a shared drive.
  + **SAN (Storage Area Network)**: High-speed network providing block-level storage to servers.

**7. Describe Storage Allocation and Provisioning**

* **Storage Allocation**: Assigning physical or logical storage resources to applications or users.
* **Storage Provisioning**:
  + **Thick Provisioning**: Pre-allocates storage capacity, ensuring resources are always available.
  + **Thin Provisioning**: Allocates storage dynamically, saving unused capacity for future use.

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