Cloud Computing - Lab One

Question 1:

Check if your processor supports Intel/AMD virtualization technology. Enable Intel virtualization technology in BIOS if possible.

Answer:

Yes, my processor supports AMD Virtualization technology. AMD Virtualization is already enabled in the BIOS settings, allowing my laptop to use virtualization capabilities essential for cloud computing.

Question 2:

The cloud is almost everywhere in our lives now. What do you think are the fundamental reasons behind its success? Name three pros and three cons of cloud.

Answer:

The fundamental reasons for the success of the cloud are:

Easily Scalable: Cloud computing offers almost unlimited scalability, allowing businesses to easily adjust their resource usage based on the current needs of their application. This scalability ensures that users of the cloud can expand their operations without the limitations of investing in physical servers/infrastructure.

Cost-Effectiveness: The cloud uses a pay as you go model, which means users of cloud computing only pay for the resources they use. This approach eliminates the need for massive expenditure on servers and reduces the costs associated with maintaining and upgrading them. The pay as you go model also prevents wasted resources like storage and hardware and can cut down on the number of staff needed to manage these backend services.

Accessibility: With cloud services, users can access data and applications from anywhere in the world. This facilitates global team collaboration and increases flexibility in work practices.

Three Pros of Cloud Computing:

1. **Flexibility and Scalability**: As mentioned, cloud computing offers almost unlimited scalability, allowing businesses to easily increase or decrease resources based on the demand of their services.

2. **Cost Reduction**: It significantly reduces the upfront cost of building and maintaining IT infrastructure. Businesses pay only for what they use, which can lead to substantial cost savings.

3. **Remote Access and Collaboration**: Cloud computing enables remote access, facilitating collaboration among teams and increasing productivity, especially today where remote work is becoming increasingly common

Three Cons of Cloud Computing:

1. Security and Privacy Concerns: Storing data and important files on external service providers always opens up risks. Despite the high security standards, there's always a risk of data breaches and other cyber-attacks.

2. Dependence on Network Connectivity: Cloud services are dependent on an internet connection. Any disruption with this connection can prevent access to data and services, impacting businesses and their users.

3. Potential for Vendor Lock-In: Another con of cloud computing is the risk of vendor lock-in. This can happen when a customer becomes dependent on a single cloud provider, making it difficult and costly to switch to another provider in the future. This dependence can limit flexibility and may lead to higher costs or poorer services as the customer has fewer alternatives.

Question 3:

What is the primary function of a hypervisor in virtualization?

Answer:

The primary function of a hypervisor in virtualization is to manage virtual machines (VMs) by abstracting (using) the hardware of the host machine and allocating resources to each VM.

A hypervisor essentially acts as a virtual platform on which multiple operating systems and applications can share a single hardware host in a secure and efficient way.

A hypervisor performs several key roles:

- **Resource Allocation**: It allocates physical resources like CPU, memory, and storage to each virtual machine based on their needs.

- **Isolation**: The hypervisor ensures that each VM operates in isolation, meaning that the processes in one VM do not affect those in another. This is crucial for security and keeping the stability of each VM.

- **Creation and Management of VMs**: It allows for the creation, modification, and deletion of virtual machines. This includes configuring each VMs hardware specifications.

- **Hardware Abstraction**: By abstracting the underlying hardware, the hypervisor enables virtual machines to run on different types of physical hardware without needing to be configured specifically for each type.

- **Efficient Use of Resources**: Hypervisors help in optimizing the use of hardware resources by allowing multiple VMs to share the same physical resources effectively.

- **Performance Monitoring**: It monitors the performance of virtual machines and can dynamically allocate more resources to a VM if required.

Question 4:

What is a virtual machine (VM)?

Answer:

A Virtual Machine (VM) is the software emulation of a physical computer. It runs in an isolated environment within a host computer, but acts like a separate physical machine. The physical computer that runs the VM is known as the "host" computer, while the VM is referred to as the "guest". The host machine can run multiple VMs simultaneously (run multiple OS concurrently).

Here are some **key** aspects of a virtual machine:

Emulation of Hardware: A VM emulates a physical computer's hardware, including CPU, memory, hard drives, network interfaces, etc. This allows the VM to run its own operating system and applications as if it were a real computer.

Hypervisor: This is the software layer that allows multiple operating systems to share a hardware host. It manages the VMs, giving resources like CPU time, memory, and disk space from the host system to each VM.

Isolation: Each VM is isolated from others, meaning that software within a VM can't interfere with the host system or other VMs. This makes VMs secure and stable environments for testing new applications, running different operating systems, or for server consolidation.

Resource Allocation: VMs share the physical resources of the host machine, such as CPU, memory, and storage. The hypervisor is responsible for distributing these resources among the VMs, so they don't interfere with each other.

Question 5:

What are the benefits of using virtual machines?

Answer:

Below are some of the key benefits of VMs:

Security: Each VM operates in an isolated environment from the host system and other VMs. This isolation ensures that issues within one VM, such as security vulnerabilities like malware, do not affect the other systems. It also means that testing and development can be carried out safely without risking the integrity of other systems.

Cost Savings: Virtual machines allow for the efficient use of physical hardware resources. By running multiple VMs on a single physical server, organizations can combine their resources, reducing the need for physical hardware and lowering costs related to hardware, maintenance, and energy consumption.

Flexibility and Scalability: VMs are very flexible and scalable. They can be easily created, modified, and moved across different host machines without the need for physical configuration. This flexibility allows for easy scaling of applications and services in response to changing demands. It also simplifies the management of IT resources, enabling quick deployment of new applications and services.

Simplified Backup and Recovery: Due to their encapsulation, virtual machines can be backed up more easily than physical servers. Entire VMs can be quickly restored, which simplifies the processes of data backup and disaster recovery. This is crucial for maintaining operations in case of system failures, data loss, or other disruptive events.

Question 6:

List five use cases of virtual machines.

Answer:

Software Development and Testing: VMs provide developers with isolated environments where they can develop, test, and debug applications without affecting the host system or other environments. This isolation ensures that any software changes or errors do not impact critical systems.

Merging Server Roles: Businesses can use VMs to merge multiple server roles onto fewer physical machines. This not only saves on hardware costs but also reduces the space, power, and cooling requirements in data centers.

Run Legacy Software: VMs can be used to run outdated operating systems and applications that are not compatible with current hardware or software. This is particularly useful for businesses that need to access or maintain legacy software for operational reasons.

Desktop Virtualization: VMs allow for desktop virtualization, where a centralized server hosts individual desktop environments. This setup enables users to access their personal desktop remotely from any location, providing flexibility and potentially enhancing security.

Disaster Recovery: VMs can be rapidly cloned, backed up, and restored, making them ideal for disaster recovery plans. They ensure that critical systems can be quickly brought back online in the event of a hardware failure, or data loss.

Question 7:

In virtualization, what is the guest operating system?

a) The main operating system running on the physical machine

~~b) The operating system installed on a virtual machine~~

c) The operating system running on a remote server

d) The operating system running on a mobile device

Answer:

In virtualization, the guest operating system is:

b) The operating system installed on a virtual machine

This is the operating system that runs inside a virtual machine, as opposed to the host operating system which runs directly on the physical hardware and hosts the virtual machines.

Question 8:

What does virtual machine isolation mean?

a) Virtual machines can communicate directly with the physical hardware.

b) Virtual machines share the same resources and cannot be isolated.

~~c) Virtual machines run independently and are isolated from each other and the host system.~~

d) Virtual machines can only be accessed locally.

Answer:

Virtual machine isolation means:

c) Virtual machines run independently and are isolated from each other and the host system.

This isolation ensures that the processes, data, and other activities within one virtual machine do not interfere with or impact the host system or other virtual machines running on the same physical hardware.

Question 9:

What is the benefit of virtual machine portability?

a) It allows virtual machines to communicate with each other easily.

b) It ensures faster boot times for virtual machines.

~~c) It allows virtual machines to be moved between different physical machines with compatible hypervisors.~~

d) It reduces the need for hardware virtualization.

Answer:

The benefit of virtual machine portability is:

c) It allows virtual machines to be moved between different physical machines with compatible hypervisors.

This portability feature is particularly useful for load balancing, disaster recovery, and maintenance, as it allows for the flexible migration of VMs across different physical hosts without requiring much reconfiguration.

Question 10:

What is the purpose of cloning a virtual machine?

Answer:

Below are the key reasons for cloning a virtual machine:

Quick Duplication for Testing or Development: Cloning allows for the quick creation of an identical copy of a virtual machine. This is especially useful in development and testing environments, where a stable and consistent configuration is needed across multiple instances.

Template for VM Deployments: A cloned VM can act as a template for deploying multiple VMs with a similar configuration. This saves time and effort in setting up new VMs from scratch.

Backup and Recovery: Cloning a VM can serve as a means of backup. In case of issues with the original VM, the clone can be used to restore services quickly.

Educational and Training Purposes: In educational settings, clones of a configured VM can be distributed to students or staff, ensuring that everyone has an identical setup to work with.