UNIT - III: Virtualization & Cloud Programming Models

Syllabus: Virtualization, Programming Models for Cloud Computing: MapReduce, Cloud Haskell, Software Development in Cloud.

Multiple Choice Questions (MCQs)

1. What technology enables a single physical CPU to appear as multiple virtual devices, allowing resource segregation in data centers?

   a) Service-Oriented Architecture

   b) Virtualization

   c) Web 2.0

   d) Pervasive Nodes

   - **Answer:** b) Virtualization

2. Which software component sits directly on the bare-metal hardware of a host server to spin up and manage guest virtual machines?

   a) Type-2 Hypervisor

   b) Type-1 Hypervisor

   c) Native Web Application

   d) MapReduce Framework

   - **Answer:** b) Type-1 Hypervisor

3. What type of virtualization abstracts the underlying operating system kernel, creating isolated user-space instances (like Docker) rather than full hardware machines?

   a) Network Virtualization

   b) Storage Virtualization

   c) OS-level / Container Virtualization

   d) Hardware Emulation

   - **Answer:** c) OS-level / Container Virtualization

4. In Google's MapReduce programming model, what is the primary function of the "Map" step?

   a) To aggregate all final numeric values into a single summary output

   b) To process input data and generate intermediate key-value pairs

c) To route packets across data center switches

d) To initialize Cloud Haskell instances

- **Answer:** b) To process input data and generate intermediate key-value pairs

5. In MapReduce, what happens immediately during the "Shuffle and Sort" phase?

   a) Raw files are deleted from the distributed filesystem

   b) Intermediate data keys are grouped together before reaching the Reducer

   c) The master node powers down to save green energy

   d) Code compilation is executed

   - **Answer:** b) Intermediate data keys are grouped together before reaching the Reducer

6. What is Cloud Haskell?

   a) A structural deployment framework for physical switches

   b) A functional programming extension designed for writing distributed, concurrent, and fault-tolerant cloud software

   c) A proprietary type of Type-2 hypervisor

   d) A green database used for reducing hardware footprint

   - **Answer:** b) A functional programming extension designed for writing distributed, concurrent, and fault-tolerant cloud software

7. Why is functional programming (like Cloud Haskell) advantageous for cloud-scale computing?

   a) It avoids the use of networks entirely

   b) It minimizes state side-effects, making concurrent and parallel processing safer across clusters

   c) It is a non-compiled script language specialized for Web 1.0

   d) It does not require virtualized infrastructure

   - **Answer:** b) It minimizes state side-effects, making concurrent and parallel processing safer across clusters

8. Software Development in the Cloud typically relies on which practice to automatically compile, test, and deploy code changes directly to cloud servers?

   a) Manual Tape Archiving

   b) Continuous Integration and Continuous Deployment (CI/CD) pipelines

c) High Correlation Mapping Scale

d) Isolated Local Unit Monoliths

- **Answer:** b) Continuous Integration and Continuous Deployment (CI/CD) pipelines

9. Which form of virtualization combines physical storage devices from multiple network storage arrays into what appears to be a single storage unit?

   a) CPU Virtualization

   b) Storage Virtualization

   c) Application Virtualization

   d) Memory Virtualization

   - **Answer:** b) Storage Virtualization

10. What is a major environmental benefit of aggressive server virtualization in data centers?

    a) Increases reliance on single-tenant desktop rigs

    b) Decreases overall physical hardware sprawl and idle power drain, promoting green IT

    c) Eliminates the need for transport layer protocols

    d) Eliminates data center network issues completely

    - **Answer:** b) Decreases overall physical hardware sprawl and idle power drain, promoting green IT

Fill in the Blanks

1. _____ is the foundational technology of cloud computing that allows multiple Operating Systems to run concurrently on one physical host.
   - **Answer:** Virtualization
2. A _____ (also known as a Virtual Machine Monitor) is the specialized software that creates and runs virtual machines.
   - **Answer:** Hypervisor
3. Hosted hypervisors that run on top of an existing, conventional consumer operating system are classified as _____ hypervisors.
   - **Answer:** Type-2

4. _____ is a popular cloud programming model designed by Google to process massive data sets using a parallel, distributed algorithm across clusters.
    - **Answer:** MapReduce
5. In MapReduce, the _____ phase takes the intermediate key-value collections and processes them to generate a consolidated final output.
    - **Answer:** Reduce
6. _____ brings pure functional programming paradigms to distributed computing environments, prioritizing immutable states.
    - **Answer:** Cloud Haskell
7. Designing, building, and deploying applications natively within remote web platforms is referred to as _____.
    - **Answer:** Software Development in Cloud
8. Traditional software development relied on localized environments, whereas cloud development shifts logic directly to remote _____ spaces.
    - **Answer:** Cloud-native (or Virtualized)
9. Virtualization helps meet global _____ Goals by maximizing resource utilization and reducing carbon footprints.
    - **Answer:** Sustainable Development (or SDG)
10. The capability to migrate a running virtual machine from one physical host to another with near-zero downtime is called _____ migration.
    - **Answer:** Live