Bahria University, Islamabad

Department of Software Engineering

Cloud Computing - Lab (Spring-2026)

Teacher: Engr. Salman Zafar

Student : Lotfullah Muslimwal

Enrollment : 01-131232-039

Lab Journal: 01

Date: 01/29/2026

Task No:	Task Wise Marks		Documentation Marks		Total Marks (20)
	Assigned	Obtained	Assigned	Obtained	
1	3		5		
2	3				
3	3				
4	3				
5	3				

Comments:

Signature

LAB

Cloud Computing Lab – Lab 1

Foundations of Cloud Computing

Lab Introduction

This lab serves as the foundation for the entire Cloud Computing Lab course. Before working with tools such as Docker, CI/CD pipelines, serverless platforms, and cloud databases, it is critical that all students develop a strong conceptual understanding of cloud computing principles.

This lab is intentionally conceptual. It aligns all of you to a common baseline so that upcoming hands-on labs can be conducted at a professional pace.

Lab Objectives

- Understand the fundamentals of cloud computing.
- Differentiate between traditional computing and cloud computing.
- Understand virtualization and containerization concepts.
- Understand what containers are and why Docker is used.
- Understand the concept of cloud models.

Section 1: Traditional Computing vs Cloud Computing

Questions

1. Define traditional computing.

    - **Answer:** Traditional computing means using computers that process data in 0s and 1s, step by step. It's like a super-fast calculator following strict rules.

2. Define cloud computing.

    - **Answer:** Cloud computing is using the internet to access and store data, software, and services instead of relying only on our own computer. It's like renting powerful computers and storage online so you can use them anytime, anywhere.

3. List three limitations of traditional computing.

    - **Limited scalability** – You need more physical hardware to handle bigger tasks.
    - **High cost** – Buying and maintaining servers and machines can be expensive.
    - **Restricted accessibility** – Data and programs are tied to specific devices, so you can't easily access them anywhere.

4. How does cloud computing reduce upfront costs?

    - **Answer:** Cloud computing cuts upfront cost because you don't buy servers or infrastructure you just pay for resources on demand.

5. Give two real-world examples where cloud computing is preferred.

- **Netflix Streaming**: Netflix runs its entire video streaming service on cloud platforms like AWS. This lets them deliver movies and shows to millions of users worldwide without owning massive server farms themselves.
- **Global Software Development**: Tech companies use cloud services (AWS, Azure, Google Cloud) to host code, run testing pipelines, and deploy apps globally, enabling teams across different countries to collaborate seamlessly

Section 2: Virtualization Concepts

Questions

6. What is virtualization?

- **Answer:** Virtualization is the technique of creating multiple simulated environments or virtual machines on a single physical system. It abstracts hardware resources so they can be shared efficiently

7. What problem did virtualization solve?

- **Answer:** It solved the issue of underutilized hardware by allowing multiple operating systems and applications to run on the same machine, improving efficiency and reducing cost.

8. What is a hypervisor?

- **Answer:** A hypervisor is the software layer that manages virtualization. It allocates hardware resources to each virtual machine and ensures isolation between them.

9. Why are virtual machines resource-heavy?

- **Answer:** Virtual machines are resource heavy because each VM requires its own full operating system stack and dedicated slices of CPU, memory, and storage, which adds overhead compared to lightweight alternatives like containers.

Section 3: Containerization Concepts

Questions

10. What is a container?

- **Answer:** A container is a lightweight, portable package that bundles an application with its dependencies, running on a shared OS kernel.

11. How is a container different from a virtual machine?

- **Answer:** Unlike virtual machines, containers don't need a full operating system for each instance they share the host OS, making them more efficient.

12. Why are containers faster than virtual machines?

- **Answer:** Containers are faster because they skip the heavy OS boot process and use fewer resources, starting almost instantly.

13. Why do cloud platforms prefer containers?

- **Answer:** Cloud platforms prefer containers since they scale quickly, optimize resource usage, and make deploying apps across environments seamless.

Section 4: Introduction to Docker

Questions

14. What is Docker?

- **Answer:** Docker is a platform that lets you build, package, and run applications inside lightweight containers.

15. What is a Docker image?

- **Answer:** A Docker image is a snapshot that contains the application code, libraries, and dependencies needed to run.

16. What is a Docker container?

- **Answer:** A Docker container is the running instance of an image, isolated but sharing the host OS kernel.

17. Why are Docker images immutable?

- **Answer:** Docker images are immutable to ensure consistency—once built, they don't change, guaranteeing reliable deployments.

18. How does Docker help in cloud deployments?

- **Answer:** Docker simplifies cloud deployments by making apps portable, scalable, and easy to run across different environments.

Section 5: Cloud Service Models

Questions

19. Define IaaS, PaaS, and SaaS.

- **IaaS (Infrastructure as a Service):** Provides virtualized hardware resources like servers, storage, and networking.
- **PaaS (Platform as a Service):** Offers a ready-to-use environment with tools and frameworks to build and deploy apps.
- **SaaS (Software as a Service):** Delivers complete applications over the internet, ready for end-users.

20. Who manages the infrastructure in each model?

- **IaaS (Infrastructure as a Service):** Provides virtualized hardware resources like servers, storage, and networking.

- **PaaS (Platform as a Service):** Offers a ready-to-use environment with tools and frameworks to build and deploy apps.
- **SaaS (Software as a Service):** Delivers complete applications over the internet, ready for end-users.

21. Which model provides the most control?

- **Answer:** IaaS provides the most control since developers can configure OS, middleware, and applications on top of the infrastructure.

22. Which model is easiest for developers and why?

- **Answer:** PaaS is easiest because it abstracts infrastructure and OS management, letting developers focus purely on writing and deploying code.

Reflection Questions

23. Why is conceptual understanding important before hands-on cloud labs?

- **Answer:** It's important because knowing the concepts helps you understand *why* you're doing something, not just *how*. This prevents mistakes and makes hands-on practice more meaningful.

24. Which concept was most new to you in this lab?

- **Answer:** For many, virtualization or containers are the newest—since they change how we think about running apps compared to traditional servers.

25. How do containers simplify cloud deployments?

- **Answer:** Containers simplify deployments by packaging apps with dependencies, ensuring consistency across environments and enabling fast scaling.

26. What skills do you think a cloud engineer must have?
    - **Answer:** A cloud engineer needs strong knowledge of cloud platforms (AWS, Azure, GCP), networking, security, automation tools, and container orchestration like Kubernetes.

Lab Submission:

Submit the document by answering all questions mentioned above. Understanding all these concepts is the key.