Cloud and Computer Architecture – Assignment 2

Deploying a Microservice on AWS/Azure

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## Background

The term “Cloud Services” describes delivery of a wide range of computing services provided across the internet such as storage, processing resources, databases, networking, and software tools. These services are provided by Cloud service providers, such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform, and are typically billed on a pay-as-you-go basis.

## Purpose

The purpose of this report is to summarize the activities undertaken to demonstrate an understanding of Cloud Services and Microservices by deploying a simple microservice on a Cloud platform. The report will provide a detailed explanation of the processes involved in setting up and configuring a virtual system instance, along with the steps taken to add required functionality which enables routine operations to be performed using the system.

## Discussion

#### Cloud Services

Cloud services play a crucial role in modern computing for several key reasons:

Cost-effectiveness:

* Reduces the need for upfront investment in hardware and software.
* Operates on a pay-as-you-go model, ensuring businesses only pay for what they use.

Scalability and Flexibility:

* Resources can be scaled to suit business demand.
* Ideal for businesses with varying workloads and priorities.

Security:

* Cloud providers incorporate robust security measures, including encryption, access controls, and are compliant to relevant global standards (e.g., ISO27001, SOC 2).

Rapid Deployment:

* Cloud solutions using Platform as a Service (PaaS) provide ready-to-use environments for faster development and deployment.

Reliability and Availability:

* Cloud providers offer high availability through redundancy, failover systems, and distributed data centres.
* Disaster recovery and backup solutions are often built-in to the deployed Cloud resources.

**Benefits of Cloud Computing**

Accessibility and Mobility

* Cloud computing allows users to access data and applications from anywhere, on any device, enabling employees, clients, and customers to have up-to-date information.

Cost Savings

* Reduces the need for expensive hardware, software, and IT infrastructure, as resources are rented from cloud providers on a pay-as-you-go basis.

Centralised Security

* Data backups are centralised, reducing the risk of data loss and ensuring data restoration in the event of a failure or disaster.

High Performance and Reliability

* Cloud platforms improve performance through increased input/output operations per second (IOPS) and high availability via distributed infrastructure.
* Providers ensure 24/7 reliability with redundant systems and advanced technologies to minimize downtime and data loss.

Disaster Recovery and Business Continuity

* Cloud storage safeguards critical data and applications from hardware malfunctions, natural disasters, or other unforeseen circumstances.

**Challenges of Cloud Computing**

Data Security and Privacy

* Protecting sensitive data on the cloud requires robust authentication, encryption, and access controls. Threats like data breaches, identity theft, and malware can erode user trust and harm business reputation. High-speed data transfers also increase the risk of leaks.

Multi-Cloud Complexity

* Using multiple cloud providers or hybrid cloud strategies introduces management challenges due to varying architectures and tools. This increases complexity and operational overhead for IT teams.

Performance Issues

* Latency, inefficient load balancing, and fault tolerance issues can degrade user experience and impact profits. Optimised systems are essential for maintaining consistent performance.

Network Dependence

* Cloud operations rely heavily on stable, high-speed internet. Bandwidth limitations or outages can disrupt workflows, particularly for smaller companies.

Learning Curve

* Teams may require training to adapt to cloud platforms, especially if they are required to use advanced tools and services.

#### Microservices

Microservices are an architectural and organisational approach to software development where applications are composed of small, independent services that communicate over well-defined APIs. Each service is designed to perform a specific function, and they are loosely coupled, allowing for independent development, deployment, and scaling.

Microservices architecture is important because it enables faster releases, greater agility, scalability, and improved team productivity. By decoupling services, businesses can respond to changing demands quickly and maintain routine operations efficiently. This architecture not only addresses the challenges of existing monolithic systems but also allows organisations to build modern, adaptable solutions that support future development.

#### Setting Up a Cloud Account and Instance

An instance represents a virtualised computing resource that operates as if it were a standalone physical machine. It provides scalable computing power, allowing users to run applications, host websites, perform data processing, or execute other tasks typically performed by physical servers. Instances are based on a core set of compute, storage, database, and networking services. Instances provide a versatile platform for running web applications, APIs, data processing models, and high-performance computing tasks like simulations and 3D rendering.

The importance of instances lies in their scalability, cost efficiency, and flexibility of service. Using virtual instances reduces necessity for the physical infrastructure usually required for routine business requirements or continuous computational research.

o Explain the steps to set up a cloud service account (e.g., AWS or Azure).

o Describe the instance setup (e.g., operating system used, Linux version).

o No need to recreate your account. Just explain what is required when creating account and instance.

o You can create a second instance to show those steps.

5. Using Linux Commands During Deployment:

o Use and demonstrate the following commands with appropriate

explanations:

▪ cat: Display the contents of a file.

▪ grep: Search for a specific string within a file.

▪ sudo: Execute a command with superuser privileges.

▪ mkdir: Create directories.

▪ cd: Navigate through directories.

▪ vim: Edit files using the Vim editor.

▪ yum: Install packages on a Linux-based system (e.g., yum

install java).

o Provide examples of how each command was used during the

deployment process.

6. Installation of Java and Database on the Instance:

o Demonstrate the installation of Java and a database (e.g., MySQL

or PostgreSQL) using yum.

o Provide commands and explain the setup process.

o Do this part in the second instance in case you don’t want to miss

any work previously done in your main instance.

7. Database Creation:

o Describe how the database communicates with your service.

o Provide details of any configurations required.

o Create a new database to demonstrate this process

8. Demonstrating Cloud Storage:

o Show how to create and use cloud storage.

o Upload a file (e.g., a static website) to the storage bucket and

demonstrate its availability (do not use the lab files)

9. Uploading and Running a .jar File:

o Upload a .jar file to the cloud storage bucket.

o Explain how you set up the rc.local file to run the .jar

automatically upon instance restart.

10. Using Postman:

o Demonstrate the use of Postman to interact with your deployed

microservice via GET and POST requests.

o Show that the .jar file runs automatically after restarting the

instance.

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