



**Strathmore**  
UNIVERSITY

SCHOOL OF COMPUTING AND ENGINEERING SCIENCES (SCES)  
BACHELOR OF SCIENCE IN COMPUTER NETWORKS AND CYBER SECURITY  
END-OF-SEMESTER EXAMINATION  
CNS4105 & CLOUD COMPUTING AND SECURITY

DATE: 25/7/2023

Time: 2 Hours

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**Instructions**

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

**Question One [30 Marks]**

- A.** Cloud computing brings open issues regarding the security and privacy of outsourced data. Due to its dynamic abstraction and scalability, applications and data outsourced to the cloud have unlimited security boundaries and infrastructure. However, the issue of privacy and security will continue to grow because cloud databases usually contain important sensitive information. Using relevant examples, discuss how the following cloud vulnerabilities and threats may affect the confidence level in adopting the cloud.

**[15 Marks]**

- i.** Immoral use and abuse of cloud computing
  - ii.** Malicious insider attackers
  - iii.** Vulnerable programming interfaces
  - iv.** Data leakage and loss
  - v.** Distributed technology vulnerabilities
  - vi.** Services and account hijacking
  - vii.** Anonymous profile threat
- B.** An efficient and bespoke load-balancing algorithm should include different metrics that are relevant to the application it supports. Consider the design of the interactive three-tier web application load-balancing algorithm in Figure 1. Discuss the following areas of improvement in relation to the load-balancing algorithm and architecture. **[12 Marks]**

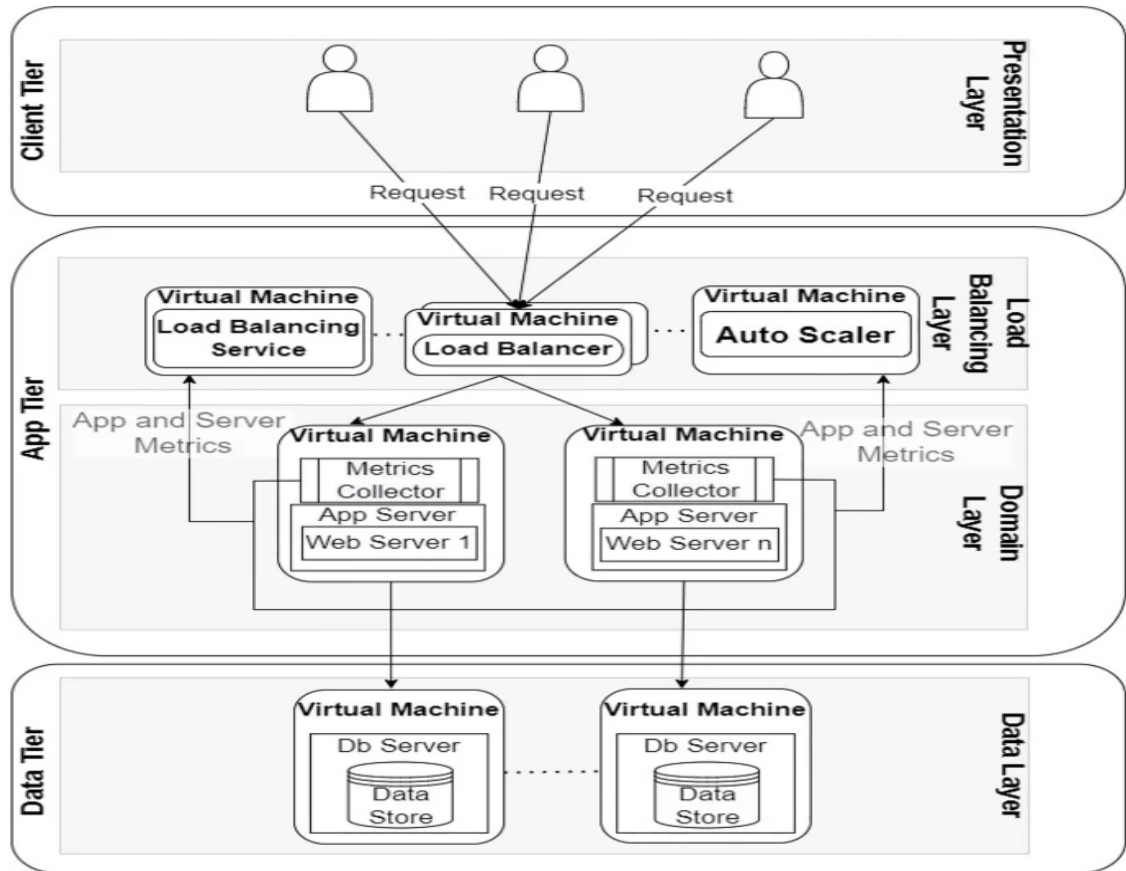


Figure 1: Load Balancing Layered Architecture

- i. Scalability
  - ii. Fault Tolerance
  - iii. Reduced Overhead and Latency
  - iv. Server Metrics
- C. Provide common examples of the cloud deployment models – Platform as a Service, Software as a Service, and Infrastructure as a Service. **[3 Marks]**

**Question Two [15 Marks]**

- A. Consider the cloud deployment in Figure 2 below and answer the questions that follow.

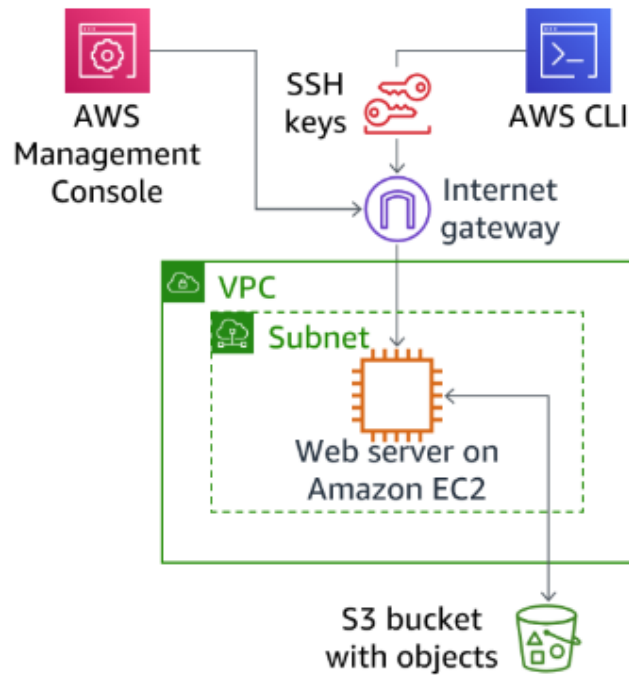


Figure 2: AWS VPC

- i. Explain any three responsibilities of the customer and two responsibilities of the cloud provider in a shared responsibility model in regard to cloud service provisioning. [10 Marks]
- ii. Explain any five managed services organizations (MSO) provided by the cloud providers. Use Amazon Web Services as your example. [5 Marks]

**Question Three [15 Marks]**

- A. Explain any four levels of virtualization implementation. [7 Marks]  
Common virtualization layers include the instruction set architecture (ISA) level, hardware level, operating system level, library support level, and application level.

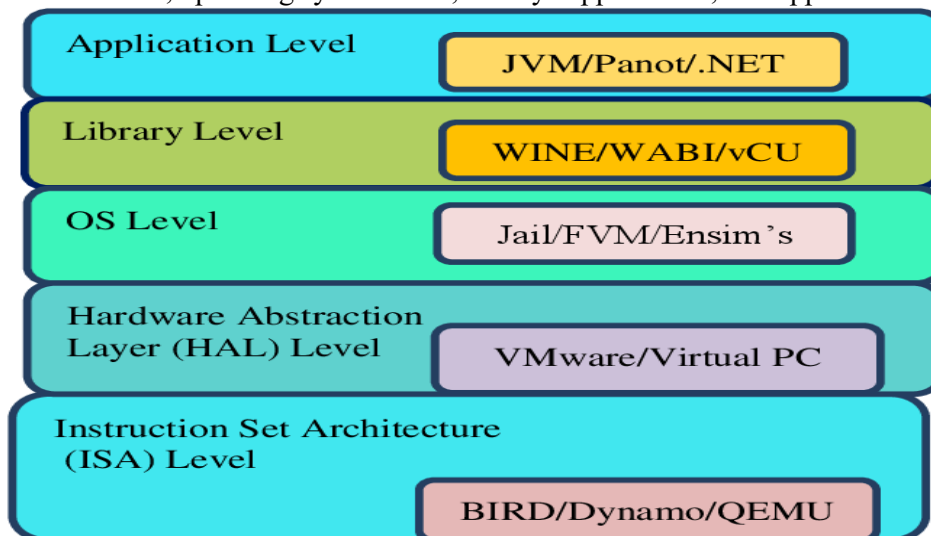


Fig. 2: Implementation Levels of Virtualization.

B. Discuss any four essential characteristics of cloud computing. [8 Marks]

**Question Four [15 Marks]**

A. Consider the AWS Identity and Access Management (IAM) deployment in Figure 3. Explain any four IAM role characteristics. [8 Marks]

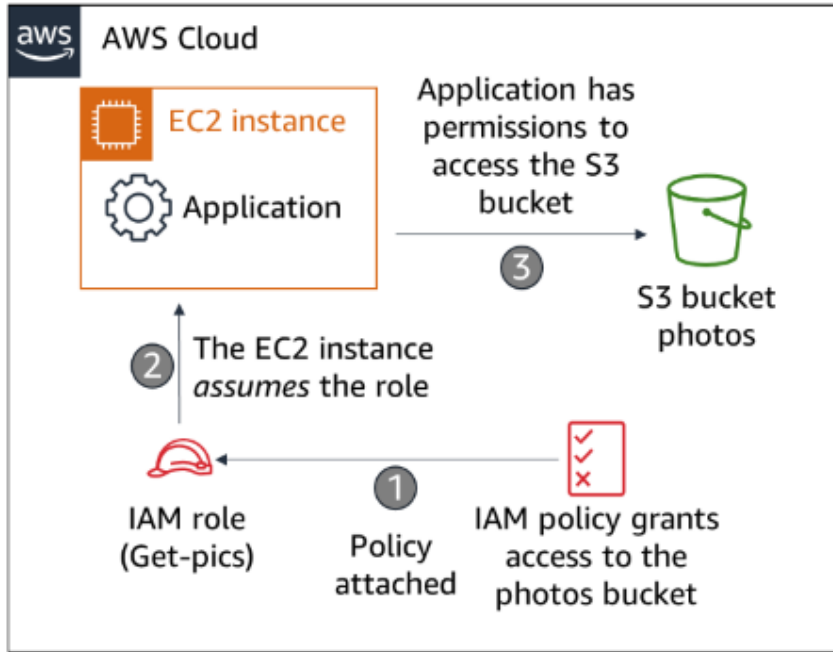


Figure 3: IAM Deployment

B. Figure 4 below illustrates the Cloud server-side encryption. Explain the three types of S3 server-side encryption offered by Amazon Web Services. [7 Marks]

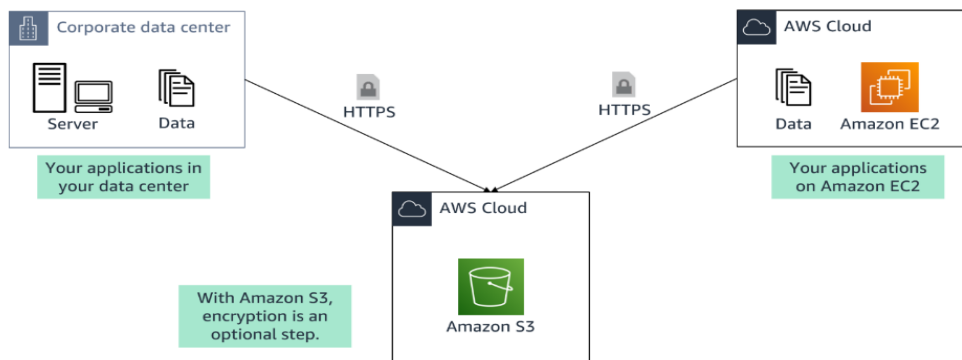


Figure 4: Server-Side Encryption

**Question Five [15 Marks]**

A. Incident recognition and response is a set of information security policies and procedures that you can use to identify, contain, and eliminate cyberattacks. It also enables an organization to quickly detect and halt attacks as well as helps to minimize damage and prevent future attacks. Using practical examples, clearly explain Phase 1: Discovery and Recognition and Phase 2: Resolution and Recovery of the incident management in cloud management. [7 Marks]

- B. Figure 5 below illustrates a three-tier web application cloud infrastructure based on AWS cloud provider. Explain how should the cloud provider offer protection of the data, compute resources and secure the network. **[8 Marks]**

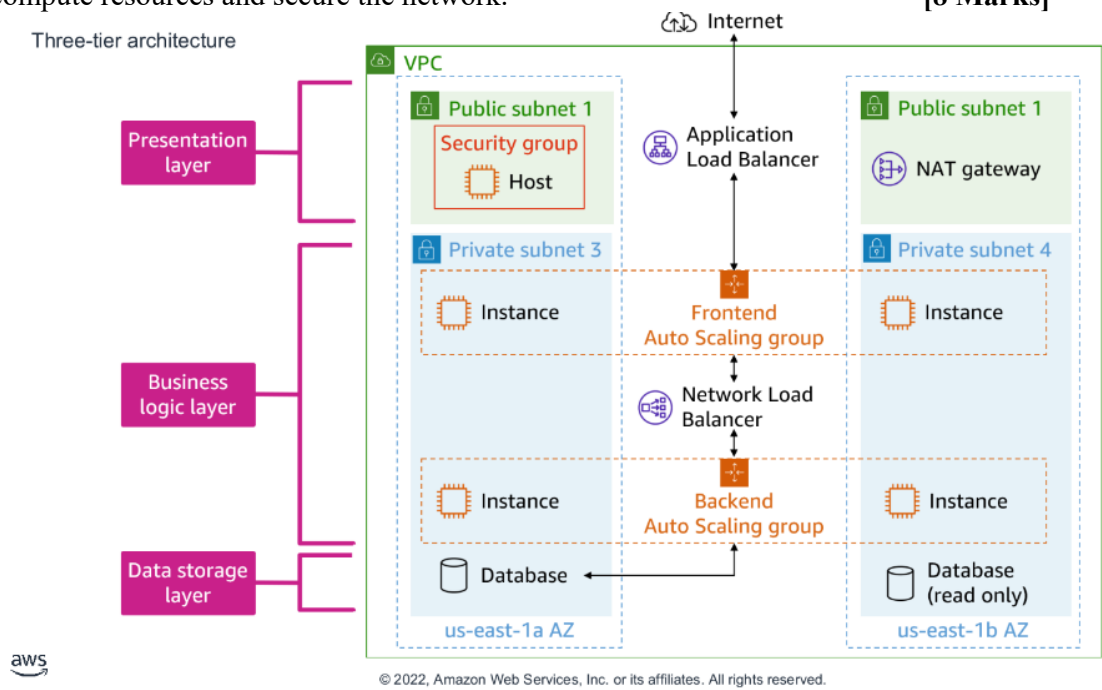


Figure 5: Three-Tier Web Application Infrastructure