

Assignment No.02

Cloud Computing Case Study – Online Learning Platform

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Section A: Understanding the Need for Cloud

Q1. Explain why cloud computing is suitable for the given startup

Cloud computing is highly suitable for the given startup due to its **flexibility, cost efficiency, scalability, and rapid deployment capabilities**, which align perfectly with the platform's business and technical requirements.

- **Handling Fluctuating User Traffic**

The platform experiences high traffic during exams and low usage otherwise. Cloud computing allows **dynamic scaling**, ensuring resources automatically increase during peak loads and reduce during off-peak periods, avoiding over-provisioning.

- **Fast Deployment & Time-to-Market**

Cloud services provide ready-to-use infrastructure and platforms, enabling **rapid application development and deployment**, which is crucial for startups aiming to launch quickly.

- **Limited Initial Budget**

Cloud follows a **pay-as-you-go model**, eliminating the need for heavy upfront investments in servers, data centers, and maintenance.

- **Support for Modern Application Features**

Cloud platforms natively support **video streaming, authentication services, analytics, and databases**, making them ideal for an online learning ecosystem.

Section B: Cloud Deployment Model Analysis

Q2. Choosing the Cloud Type

a) **Recommended Cloud Type** : I will recommended **Public Cloud**

b) **Justification** :

The **Public Cloud** is the most suitable deployment model for the startup as it effectively supports the needs of an early-stage online learning platform in terms of cost, scalability, security, and operational efficiency.

- **Cost Efficiency:** Eliminates capital expenditure on hardware and infrastructure. The pay-as-you-go model ensures affordability for startups with limited budgets.
- **Scalability:** Provides on-demand and automatic scaling to handle sudden traffic spikes during exam periods without impacting performance.
- **Security:** Offers built-in security features such as encryption, Identity and Access Management (IAM), firewalls, and compliance with industry standards.
- **Operational Overhead:** Infrastructure maintenance, updates, and management are handled by the cloud provider, allowing the startup to focus on application development and innovation.

Conclusion

The **Public Cloud** offers the ideal balance of **cost efficiency, scalability, security, and minimal operational effort**, making it the best choice for an early-stage startup targeting rapid growth and faster time-to-market.

Q3. Business Growth Scenario

a) Would you continue with the same cloud type? → No

As the platform grows and starts handling sensitive academic and institutional data, a purely public cloud may not provide sufficient control, data privacy, and compliance.

b) Recommended Cloud Type and Justification → I will recommended - **Hybrid Cloud**

Reasons:

- **Enhanced Data Security and Control:**
Sensitive student and university data can be stored in a private cloud to ensure higher security and better control.
- **Scalability and Performance:**
The public cloud can be used for scalable workloads such as video streaming, online exams, and analytics.
- **Regulatory Compliance:**
Supports compliance with educational data protection standards and institutional governance requirements.
- **Operational Flexibility:**
Enables efficient workload distribution while maintaining performance, security, and cost optimization.

Conclusion

A **Hybrid Cloud** provides the right balance of **security, compliance, scalability, and flexibility**, making it the most suitable deployment model as the startup evolves into an enterprise-level online learning platform.

Section C: Cloud Service Model Evaluation

Q4. Choosing the Service Model

a) Most Suitable Cloud Service Model . → Platform as a Service (PaaS)

Platform as a Service (PaaS) is the most appropriate service model for developing the online learning platform as it enables rapid application development while reducing operational complexity. PaaS provides a ready-to-use development environment, allowing the startup to focus on application features instead of infrastructure management.

Why PaaS is Ideal:

- **Faster Application Development:** Provides pre-configured development tools, frameworks, and runtime environments, accelerating development and deployment.
- **Reduced Operational Effort:** Server provisioning, operating system management, and routine maintenance are handled by the cloud provider.

b) Why Other Service Models Are Less Suitable

Service Model	Limitation
IaaS	Requires the startup to manage operating systems, security patches, and infrastructure, increasing operational overhead
SaaS	Offers limited customization and does not support building a tailored, proprietary online learning platform

Q5. Shared Responsibility Model (PaaS)

In the **Platform as a Service (PaaS)** model, responsibilities are shared between the **cloud service provider** and the **user (startup)** as follows:

Component	Responsibility
Infrastructure	Cloud Provider
Operating System	Cloud Provider
Application Code	User (Startup)
Scaling	Cloud Provider (automatic scaling)
Security Patches	Cloud Provider (platform-level)

Conclusion : PaaS provides the optimal balance between **development speed, scalability, and operational efficiency**, making it the most effective service model for building and managing the online learning platform.

Section D: Scalability & Performance

Q6. Handling Fluctuating Traffic

Cloud computing enables the online learning platform to efficiently manage fluctuating user traffic through the following features:

- **Auto-Scaling:**
Automatically increases computing resources during peak periods such as exams and reduces them during off-peak hours, ensuring optimal performance and cost efficiency.
- **Load Balancing:**
Distributes incoming user traffic evenly across multiple servers to prevent system overload and maintain high availability.
- **Elastic Resource Allocation:**
Allows resources to be provisioned or released in real time based on user demand.
- **Content Delivery Network (CDN):**
Enhances video streaming performance by delivering content from geographically closer servers, reducing latency.

Conclusion : These cloud capabilities ensure **consistent performance, high availability, and efficient resource utilization**, even during sudden traffic fluctuations.

Section E: Cost Optimization

Q7. Cost Management in Cloud

Cloud computing enables effective cost management through flexible pricing and efficient resource utilization.

- **Pay-As-You-Go Pricing Model :** The startup pays only for the resources it actually uses, avoiding unnecessary expenses during low-traffic periods.
- **No Upfront Capital Investment :** Eliminates the need for purchasing and maintaining physical servers, reducing initial setup costs.
- **Cost Efficiency During Off-Peak Usage :** Resources can be scaled down automatically during non-exam periods, minimizing operational expenses.
- **Budget Control and Forecasting :** Usage-based billing provides better visibility into costs, helping the startup manage budgets more effectively.

Conclusion : The cloud's pay-as-you-go pricing model ensures **cost efficiency, financial flexibility, and optimal resource utilization**, making it ideal for startups with limited budgets and variable workloads