Assignment: Cloud Computing Case Study – Online Learning Platform

- Vighnesh Brahme

Case Study Description

A startup plans to build an online learning platform with the following requirements:

- User traffic fluctuates significantly (high during exams, low otherwise)
- Fast deployment and quicker time-to-market are critical
- Limited initial budget
- Platform includes **video streaming, user authentication, quizzes, and analytics**

Based on the above scenario, answer the following questions.

Section A: Understanding the Need for Cloud

Q1. Explain why cloud computing is suitable for the given startup. Mention key reasons and relate them to the case study.

Answer:

Cloud computing is ideal for the startup due to its **flexibility, scalability, and cost-effectiveness**, which align perfectly with the platform's needs.

Key Reasons:

1. **Elastic Scalability:**
   User traffic fluctuates heavily (high during exams, low otherwise). Cloud platforms can automatically scale resources up or down using services like *auto-scaling groups* or *load balancers*, ensuring performance during peak times and cost savings during off-peak times.

2. **Cost Efficiency:**
   The startup has a *limited initial budget*. With cloud computing, it can avoid large upfront infrastructure costs and only pay for the resources used ("pay-as-you-go" model).

3. **Faster Deployment:**
   Cloud environments enable rapid setup through preconfigured services, automation, and templates. This supports *quick time-to-market*—critical for startups.

4. **Global Accessibility:**
   Cloud platforms provide high availability and global reach, allowing students to access video lectures and quizzes from anywhere.

5. **Built-in Reliability and Backup:**
   Cloud providers offer redundancy, automated backups, and recovery mechanisms, ensuring minimal downtime and data loss.

Thus, cloud computing is ideal of the given startup's requirements.

Section B: Cloud Deployment Model Analysis

Q2. Choosing the Cloud Type:

Which cloud type would you recommend for this startup?

- Public Cloud
- Private Cloud
- Hybrid Cloud

Justify your choice based on:

- Cost
- Scalability
- Security
- Operational overhead

Answer: It should be **Public Cloud** due to following reasons:

1. **Cost**: Public clouds (like AWS, Azure, or Google Cloud) offer a pay-as-you-go model—ideal for startups with budget constraints. No capital expenditure for hardware.

2. **Scalability**: Public clouds offer virtually unlimited scalability using on-demand resources and auto-scaling services.
3. **Security**: Though shared infrastructure, public clouds provide strong built-in security measures (encryption, IAM, firewalls). Suitable for a startup with moderate security needs.
4. **Operational Overhead**: Low overhead — the provider manages infrastructure and updates, allowing the startup to focus on application development.

Hence, **Public Cloud** provides the best balance between cost, speed, and scalability for the initial phase.

Q3. Business Growth Scenario

After two years, the startup:

- Handles sensitive student data
- Partners with universities
- Requires higher compliance and control

a) Would you continue with the same cloud type?

Answer: No.

b) If not, which cloud type would you suggest and why?

Answer: I recommend to switch to **Hybrid Cloud** because of the following reasons:

- **Compliance & Control:** Sensitive student data can be stored on a *private cloud* for better control and compliance (e.g., GDPR, FERPA).
- **Scalability:** Public cloud can still be used for non-sensitive workloads such as video streaming or content delivery.
- **Cost Efficiency:** Hybrid architecture reduces costs by keeping mission-critical data private while leveraging the public cloud's scalability for other tasks.

Thus, a **Hybrid Cloud** provides a balance between *security, compliance,* and *cost efficiency*.

Section C: Cloud Service Model Evaluation

Q 4) Choosing the Service Model

Which cloud service model is most suitable for developing this platform?

Answer: The most suitable cloud service model for developing this platform is **Platform as a Service (PaaS)** because of the following reasons**:**

- PaaS provides a managed environment for developing, testing, and deploying applications quickly.
- The startup can focus on *application logic (videos, quizzes, analytics)* while the cloud provider manages servers, databases, and runtime environments.
- Enables *faster time-to-market* with integrated tools (CI/CD, APIs, analytics).

Explain why the other service models are less suitable for this use case.

Answer: The other service models have there limitations for this use case which are as follows:

- **IaaS**: Provides raw infrastructure. The startup would still need to manage OS, runtime, and scaling—adding complexity and slowing deployment.
- **SaaS**: Meant for ready-to-use applications. The startup is *building* a custom platform, not just using one. SaaS wouldn't allow enough customization or control.

Hence, **PaaS** offers the right balance between control, speed, and reduced management effort.

Q5. Shared Responsibility Model

For the selected service model, specify who is responsible (Cloud Provider or User) for managing the following:

- Infrastructure
- Operating System
- Application code
- Scaling
- Security patches

Answer:

Component	Responsibility
Infrastructure (servers, networking, storage)	Cloud Provider
Operating System & Runtime	Cloud Provider
Application Code	User (Startup)
Scaling (auto-scaling, load balancing)	Shared — provider automates scaling features, user configures policies
Security Patches (OS level)	Cloud Provider (application-level patches remain user's responsibility)

Section D: Scalability & Performance

Q6. Handling Fluctuating Traffic

Explain how cloud computing helps the platform handle:

- Sudden spikes in user traffic
- Reduced traffic during off-peak periods

Mention relevant cloud features in your answer.

Answer: Cloud computing offers *elastic scalability* to adapt resources automatically to traffic changes.

- **Sudden Spikes:**
  Auto-scaling adds more compute instances or containers during high traffic (e.g., during exams). Load balancers distribute traffic efficiently.
- **Reduced Traffic:**
  When usage drops, resources scale down automatically, minimizing costs.

Relevant Cloud Features:

- Auto Scaling Groups (AWS Auto Scaling / Azure Scale Sets)
- Load Balancers (Elastic Load Balancing)

- Content Delivery Network (CDN) for video streaming
- Serverless Functions (e.g., AWS Lambda) for cost-efficient backend tasks

Thus, using above features cloud computing helps the platform handle traffic changes.

Section E: Cost Optimization

Q7. Cost Management in Cloud

a) Explain how the pay-as-you-go pricing model benefits this startup.

The pay-as-you-go pricing model benefits this startup due to following reasons:

1. **No Upfront Investment:**
   The startup avoids purchasing servers or networking equipment.
2. **Cost Flexibility:**
   Only pays for actual usage — e.g., more cost during exam periods, less during off-season.
3. **Scalable Billing:**
   Automatically adjusts costs based on resource consumption, helping manage unpredictable workloads.
4. **Improved Budget Control:**
   Cloud platforms provide cost monitoring tools (AWS Cost Explorer, Azure Cost Management) for transparency and optimization.