SRINIVAS UNIVERSITY

INSTITUTE OF ENGINEERING AND TECHNOLOGY

MUKKA, SURATHKAL, MANGALORE-574146

MAJOR PROJECT REPORT

ON

"CLOUD BASED E-LEARNING PLATFORM"

Submitted in the partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

CLOUD TECHNOLOGY AND INFORMATION SECURITY

Submitted By,

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Under the Guidance of

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2022-2023

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CERTIFICATE

This is to certify that the project entitled "**CLOUD BASED E-LEARNING PLATFORM**" is a bonafide work carried out by *Anjali Upadhyaya, Ridhisha Alva* bearing the *1SU19CI007, 1SU19CI015* in the partial fulfillment of **Bachelor of Technology** in **Cloud Technology and Information Security** of the **Srinivas University Institute of Engineering and Technology** during the year **2022-2023.** It is certified that all corrections/suggestions indicated for internal assessment have been in corporated in the report deposited in the department library. The internship report has been approved as it satisfies the academic requirements in respect of internship work prescribed for the said degree.

Name & Signature of the Guide   Name & Signature of the H.O.D

Mr. Daniel Francis Selvaraj   **Mr. Daniel Francis Selvaraj**

Signature of the Dean

Dr. Thomas Pinto

Dean, SUIET, Mukka

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Name of the Examiners   Signature with date

1._____   ----------------------------------

DECLARATION

We, **Anjali Upadhyaya, Ridhisha Alva** the student of eighth semester, **B.Tech** in Cloud Technology and Information Security, Srinivas University, Mukka, hereby declare that the project entitled "**CLOUD BASED E-LEARNING PLATFORM**" has been successfully completed by me in partial fulfillment of the requirements for the award of degree in **Bachelor of Technology in Cloud Technology and Information Security of Srinivas University Institute of Engineering and Technology** and no part of it has been submitted for the award of degree or diploma in any university or institution previously.

Date: _____

Place: Mukka

ACKNOWLEDGEMENT

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Anjali Upadhyaya

Ridhisha Alva

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ABSTRACT

With the advancement of technology, e-learning has become a popular method of delivering educational content. Cloud computing, on the other hand, has revolutionized the way computing resources are provisioned, managed, and accessed. This project report explores the integration of e-learning with cloud computing to create a robust and scalable learning environment.

In this project report, we begin by providing an overview of cloud computing and its benefits for e-learning. Cloud computing offers on-demand access to a pool of computing resources, such as virtual machines, storage, and databases, which can be utilized to support e-learning platforms.

We then delve into the architecture of an e-learning system based on cloud computing. This includes the different components and their functionalities, such as the front-end interface, the application layer, and the cloud infrastructure. We also discuss the advantages of using cloud-based infrastructure for e-learning, such as scalability, reliability, and cost-effectiveness.

1. <u>INTRODUCTION</u>

1.1 The Domain

Cloud computing is a rapidly growing domain in the field of technology and information systems. It refers to the delivery of computing resources over the internet, allowing users to access and utilize a wide range of services and applications without the need for on-premises infrastructure.

In the cloud computing domain, various types of services are offered, including:

1. Infrastructure as a Service (IaaS): This service provides virtualized computing resources such as virtual machines, storage, and networks. Users can manage and control these resources while avoiding the need for physical hardware.

2. Platform as a Service (PaaS): PaaS provides a platform for developing, running, and managing applications without the complexity of infrastructure management. It offers a complete development and deployment environment, including tools, libraries, and frameworks.

3. Software as a Service (SaaS): SaaS delivers software applications over the internet on a subscription basis. Users can access and use these applications through a web browser without the need for local installation or maintenance.

Cloud computing offers several key advantages:

1. Scalability: Cloud services can scale up or down based on demand, allowing organizations to easily adjust their computing resources to match their needs. This flexibility ensures optimal resource allocation and cost-efficiency.

2. Cost Savings: By eliminating the need for on-premises hardware and infrastructure, organizations can significantly reduce their capital and operational expenses. Cloud computing services often follow a pay-as-you-go model, where users only pay for the resources they consume.

3. Accessibility and Mobility: Cloud services can be accessed from anywhere with an internet connection, enabling users to work remotely and access their applications and data on various devices.

4. Reliability and Redundancy: Cloud providers typically have robust infrastructure with multiple data centers, ensuring high availability and redundancy. This minimizes the risk of data loss or service disruptions.

However, there are also some considerations and challenges in the cloud computing domain:

1. Security and Privacy: Storing data and applications in the cloud raises concerns about data security, privacy, and compliance with regulations. Organizations must implement proper security measures, encryption, and access controls to protect sensitive information.

2. Connectivity and Reliance on the Internet: Cloud services depend on internet connectivity, and any disruptions can impact accessibility and

productivity. Organizations must have reliable internet connections and contingency plans for potential outages.

3. Vendor Lock-In: Moving applications and data to the cloud can create dependencies on specific cloud providers and their proprietary technologies. This can limit flexibility and make it challenging to switch providers in the future.

4. Data Transfer and Bandwidth Costs: Transferring large amounts of data to and from the cloud can incur additional costs and require sufficient bandwidth. Organizations need to consider these factors when planning their cloud computing strategies.

The cloud computing domain continues to evolve, with advancements in technologies such as serverless computing, edge computing, and hybrid cloud architectures. These innovations provide even more options and possibilities for organizations to leverage cloud services and optimize their IT infrastructure.

1.2 The Problem

In this final project, you have created a highly available (HA), scalable and fault-tolerant deployment of the WordPress application. We deployed the WordPress application in such a way that the application server, load balancer and database will scale independently of one another. We also deploy the application's components like the webserver and database into two availability zones to distribute it and guard against failure of the anyone availability zone. The WordPress application will be deployed in a stateless fashion so that we can add or remove web application servers in response to the requests flowing into the system. Finally, we create a CloudFront distribution as CDN and change the configuration of WordPress.

1.3 The Technology

AMAZON WEB SERVICES

Amazon Web Services, Inc. (AWS) is a subsidiary of Amazon that provides on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered pay-as-you-go basis. These cloud computing web services provide distributed computing processing capacity and software tools via AWS server farms. One of these services is Amazon Elastic Compute Cloud (EC2), which allows users to have at their disposal a virtual cluster of computers, available all the time, through the Internet. AWS's virtual computers emulate most of the attributes of a real computer, including hardware central processing units (CPUs) and graphics processing units (GPUs) for processing; local/RAM memory; hard-disk/SSD storage; a choice of operating systems; networking; and pre-loaded application software such as web servers, databases, and customer relationship management (CRM).

Scalability: AWS offers elastic computing resources, allowing e-learning platforms to scale their infrastructure up or down based on demand. This flexibility ensures that the platform can handle varying levels of traffic and accommodate a growing user base without any disruptions.

Reliability: AWS operates on a global infrastructure that is designed to deliver high availability and uptime. Its data centers are distributed across different regions, providing redundancy and ensuring that the e-learning platform remains accessible even in the event of hardware failures or natural disasters.

Cost-Effectiveness: With AWS, e-learning platforms can optimize their infrastructure costs. AWS offers a pay-as-you-go pricing model, allowing organizations to pay only for the resources they consume. Additionally,

AWS provides various cost management tools to monitor and control spending, ensuring cost efficiency.

Security: AWS implements robust security measures to protect the data and applications hosted on its platform. It offers features such as encryption, identity and access management, and network security controls, ensuring that e-learning platforms can maintain the confidentiality, integrity, and availability of their content and user information.

2. <u>SYSTEM ANALYSIS</u>

2.1 Literature Review

CLOUD COMPUTING

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WORDPRESS

WordPress is a popular and widely used content management system (CMS) that enables users to create and manage websites and blogs with ease. It was initially developed as a blogging platform but has evolved into a versatile CMS that powers a significant portion of the internet. WordPress offers a user-friendly interface, a wide range of themes and plugins, and extensive customization options, making it suitable for various types of websites.

Features and Benefits of WordPress:

- User-Friendly Interface: WordPress provides a user-friendly interface, allowing users with little to no technical knowledge to create and manage their websites easily. Its intuitive dashboard and editor make it simple to add and edit content, manage media files, and customize the website's appearance.

- Customization Options: WordPress offers a vast library of themes and templates that can be easily customized to match the website's branding and design requirements. Users can also extend the functionality of their websites by installing plugins, which provide additional features such as contact forms, e-commerce capabilities, SEO optimization, and more.

- Flexibility and Scalability: WordPress is highly flexible and can be used to build various types of websites, including blogs, business websites, e-commerce stores, portfolios, and community forums. It can handle websites of all sizes and scales, from small personal blogs to large enterprise websites with high traffic volumes.

- SEO-Friendly: WordPress is designed with search engine optimization (SEO) in mind. It offers various built-in features and plugins that help optimize website content, meta tags, URLs, and

other SEO elements. This makes it easier for websites built on WordPress to rank well in search engine results and attract organic traffic.

- Active Community and Support: WordPress has a large and active community of developers, designers, and users who contribute to its continuous improvement. The community provides support, resources, and forums where users can seek assistance, share knowledge, and stay updated with the latest trends and best practices in website development.

WordPress Plugins and Themes:

- Plugins: WordPress offers a vast repository of free and premium plugins that extend the functionality of a website. Plugins can add features such as social media integration, security enhancements, caching for improved performance, backup and restore capabilities, and much more. Users can also develop custom plugins to meet specific requirements.

- Themes: WordPress themes control the overall design and layout of a website. There is a wide range of free and premium themes available, catering to various industries and website types. Themes can be customized to match specific branding requirements and can be easily switched or updated without affecting the website's content.

WordPress Security:

WordPress takes security seriously and offers several features and best practices to ensure website security. It regularly releases updates and patches to address vulnerabilities, and users are encouraged to keep their WordPress installations, themes, and plugins up to date. Additionally, users can implement security plugins, use strong

passwords, enable two-factor authentication, and follow other security practices to enhance the security of their WordPress websites.

WordPress Hosting:

WordPress can be installed and hosted on various platforms, including shared hosting, virtual private servers (VPS), dedicated servers, and cloud hosting. There are hosting providers that specialize in WordPress hosting and offer optimized environments, automatic backups, security features, and specialized support for WordPress users.

WordPress is a powerful and versatile CMS that empowers users to create and manage websites with ease. Its user-friendly interface, customization options, scalability, and extensive plugin ecosystem make it a popular choice for individuals, businesses, and organizations. By leveraging WordPress, users can build professional and feature-rich websites without extensive technical expertise.

AMAZON WEB SERVICES(AWS)

Amazon Web Services (AWS) is a comprehensive cloud computing platform provided by Amazon.com. It offers a wide range of cloud services and tools that enable businesses and organizations to build, deploy, and manage their applications and infrastructure in a flexible and scalable manner. AWS provides a global infrastructure, advanced security features, and a pay-as-you-go pricing model, making it a popular choice for businesses of all sizes.

Key AWS Services and Offerings:

- Compute Services: AWS provides various compute services to meet different application requirements. Amazon Elastic Compute Cloud (EC2) offers virtual servers in the cloud, allowing users to scale their compute resources as needed. AWS Lambda enables serverless computing, where users can run code without provisioning or managing servers.

- Storage and Database Services: AWS offers scalable and durable storage solutions. Amazon Simple Storage Service (S3) provides object storage for storing and retrieving data from anywhere on the web. Amazon Elastic Block Store (EBS) offers persistent block-level storage for EC2 instances. For databases, AWS provides Amazon Relational Database Service (RDS) for managed relational databases, Amazon DynamoDB for NoSQL databases, and Amazon Aurora for a high-performance and scalable relational database.

- Networking and Content Delivery: AWS provides networking services to enable secure and scalable communication between resources. Amazon Virtual Private Cloud (VPC) allows users to create isolated virtual networks. Amazon CloudFront is a content delivery network (CDN) that accelerates the delivery of content to users worldwide.

- Security and Identity: AWS offers a range of security services and tools to protect resources and data. AWS Identity and Access Management (IAM) allows fine-grained control over user access and permissions. AWS Key Management Service (KMS) enables secure key storage and management. AWS Shield provides DDoS (Distributed Denial of Service) protection, while AWS Web Application Firewall (WAF) helps protect web applications from common web exploits.

- Analytics and Machine Learning: AWS provides services for analytics and machine learning. Amazon Redshift offers a fully managed data warehousing service for analytics and reporting. Amazon Athena allows querying data directly from S3 using SQL. AWS Glue is an extract, transform, and load (ETL) service for data preparation. For machine learning, AWS offers Amazon SageMaker for building, training, and deploying machine learning models, and Amazon Rekognition for image and video analysis.

- Management and Monitoring: AWS provides services for managing and monitoring resources. AWS CloudWatch allows monitoring and logging of various AWS resources and applications. AWS CloudFormation enables infrastructure provisioning and management through code. AWS Systems Manager provides a centralized view and control of AWS resources.

Benefits of AWS:

- Scalability and Elasticity: AWS allows users to scale their resources up or down based on demand, ensuring that applications can handle varying workloads effectively.

- Cost-Effectiveness: AWS follows a pay-as-you-go pricing model, where users only pay for the resources they consume. This flexibility helps optimize costs by eliminating the need for large upfront investments in hardware.

- Reliability and Availability: AWS offers a highly reliable and globally distributed infrastructure. With data centers across different regions, AWS ensures high availability and fault tolerance, minimizing downtime and disruptions.

- Security: AWS has extensive security measures in place to protect data and resources. It offers robust identity and access

management, encryption, and compliance certifications to ensure the confidentiality, integrity, and availability of data.

- Global Reach: AWS operates in multiple geographic regions worldwide, allowing businesses to deploy their applications closer to end-users,

2.2 Existing System

Udemy, coursera etc..

Front-end Development: The user interface and user experience (UI/UX) of the platforms are built using HTML, CSS, and JavaScript. These technologies help in creating the layout, styling, and interactivity of the web pages. Additionally, front-end frameworks and libraries like React, Angular, or Vue.js may be used to streamline development and enhance user interactions.

Back-end Development: The platforms require server-side logic to handle user authentication, database interactions, and content delivery. Back-end development can be accomplished using programming languages such as Python, Ruby, Java, or Node.js. These languages are commonly used to build the server-side components, APIs, and web services.

Database Management: Platforms like Udemy and Coursera handle large amounts of data, including course content, user profiles, progress tracking, and more. Databases like MySQL, PostgreSQL, MongoDB, or other relational and NoSQL databases are utilized for efficient storage and retrieval of data. Database management is crucial for handling user information, course details, and tracking user progress.

Content Management Systems: Online learning platforms often have content management systems (CMS) that allow instructors and administrators to create and manage courses. CMS frameworks like Django, WordPress, or custom-built systems are used to handle course creation, editing, organization, and publishing features.

Payment Integration: Online learning platforms require payment integration to facilitate course enrollment and payments. Payment

gateways like Stripe, PayPal, or custom-built payment systems are integrated to securely handle financial transactions.

Cloud Infrastructure: Scalability and reliability are crucial for platforms like Udemy and Coursera. Cloud computing platforms such as Amazon Web Services (AWS), Google Cloud Platform (GCP), or Microsoft Azure may be utilized to host the infrastructure, store data, and ensure high availability and performance.

Content Delivery Networks (CDNs): CDNs are used to deliver content efficiently to users across the globe. CDNs like Cloudflare or Akamai help optimize content delivery, reduce latency, and handle high traffic loads.

2.3 Proposed System

In our project we developed E-learning web application with the help of WordPress and then we deployed it with the help of AWS services like Amazon CloudFront, ELB, VPC, RDS, S3, EC2, AMI, Amazon LEX, internet gateway, Amazon Cognito

Amazon EC2 (Elastic Compute Cloud) to provision virtual servers that will host our application backend and frontend. EC2 provides scalable compute capacity, allowing us to adjust resources based on demand.

Amazon S3 (Simple Storage Service) to store and manage static content like course materials, documents, videos, and images. S3 provides scalable object storage with high durability and availability.

A database to store user data, course information, and other application-related data. We used Amazon RDS (Relational Database Service) to set up a managed database like MySQL.

Implemented user authentication and authorization using Amazon Cognito. Cognito provides user sign-up, sign-in, and user management capabilities, allowing us to secure our e-learning platform.

Utilized Amazon CloudFront to deliver your e-learning content globally with low latency. CloudFront is a content delivery network (CDN) that caches and distributes content from edge locations worldwide.

Designed our platform to be scalable and highly available by leveraging AWS Auto Scaling and Elastic Load Balancing. These services automatically adjust resources and distribute traffic to handle varying loads.

Created a VPC to define the network boundaries for our e-learning platform. A VPC allows you to logically isolate your resources, such as

EC2 instances and RDS databases, from other AWS customers' resources.

Configured security groups and network access control lists (ACLs) to control inbound and outbound traffic to our e-learning platform. Security groups are associated with individual instances, while network ACLs operate at the subnet level, providing an additional layer of security.

Enabled internet connectivity for our e-learning platform, attach an internet gateway to your VPC. This allows resources within the VPC to communicate with the internet, facilitating student access to the platform.

2.4 Hardware and Software Specifications

- AWS services
- 512 MB memory
- 512 Bandwidth
- 20 GB SSD Disk
- 1 Virtual CPU
- Laptop or computer
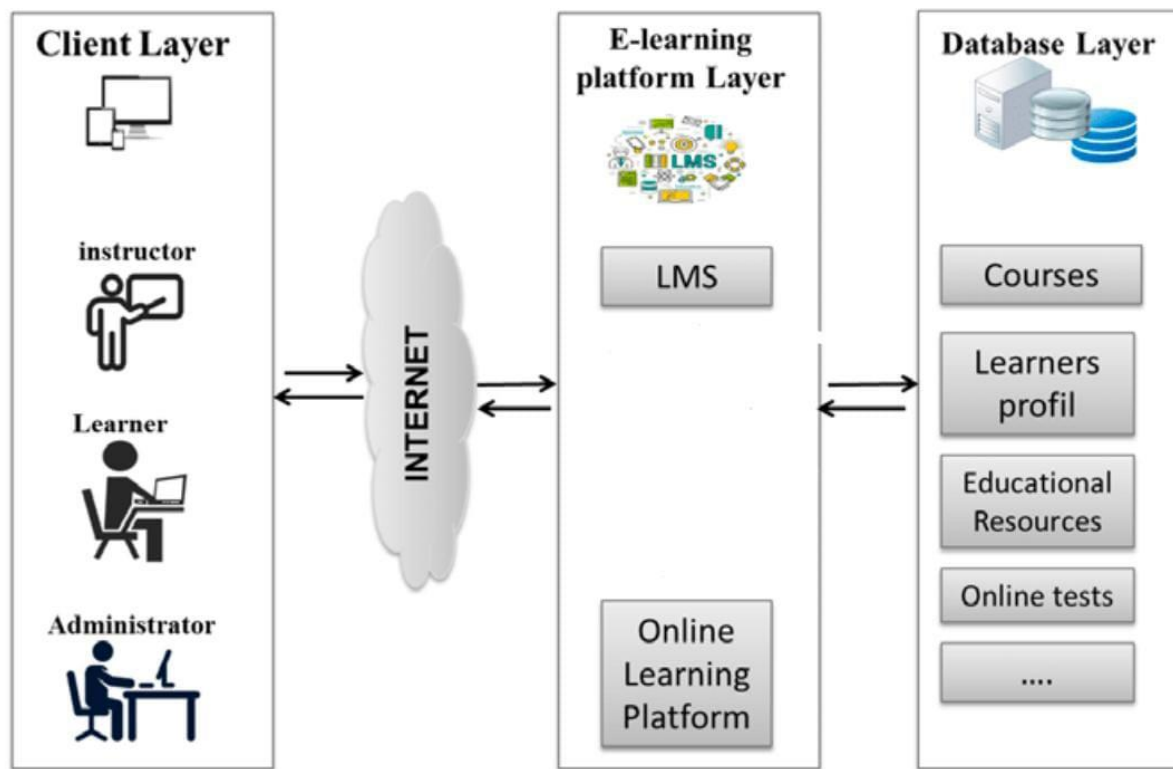- Web Browser

3. <u>SYSTEM DESIGN</u>

3.1 Module Description

- Course Management System: A course management system is a section which is provided for accessing the course contents in various formats, manages student enrolment, and monitors the performance of a student.

- Student Portal: Student portals involve the information on courses offered, transcripts, exam schedules, department contact numbers, timetables, and email programs. It is generally used to describe the login page in which students can enter the name of the user and password to access educational program for the organization and other learning materials.

- Online Assignment Tool: Assignment tool permits the students for submitting the tasks online and their online feedback can be observed. It allows for setting up a location for every student to present an assignment. It is structured for both individual student and group's submission. Students can submit a wide range of file types and links for web-based items. It is an effective method to deploy, receive, and digitally grade assignments for the student.
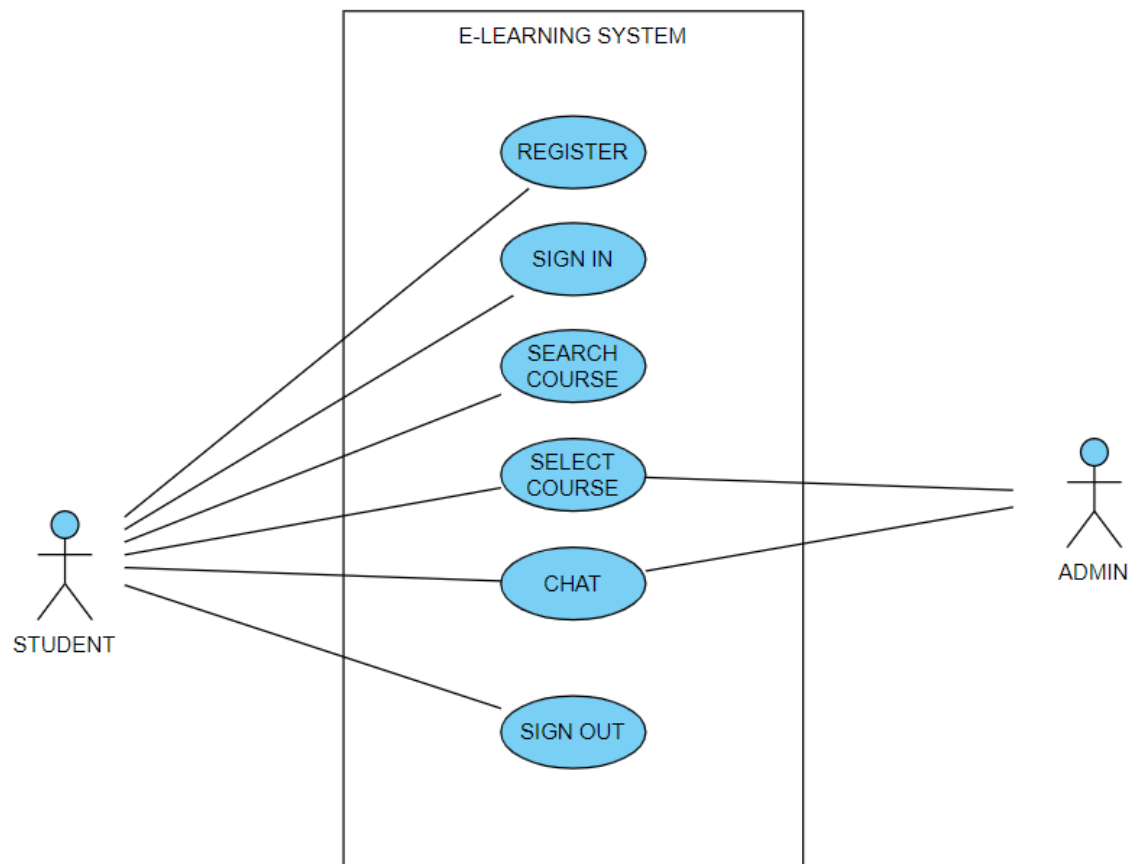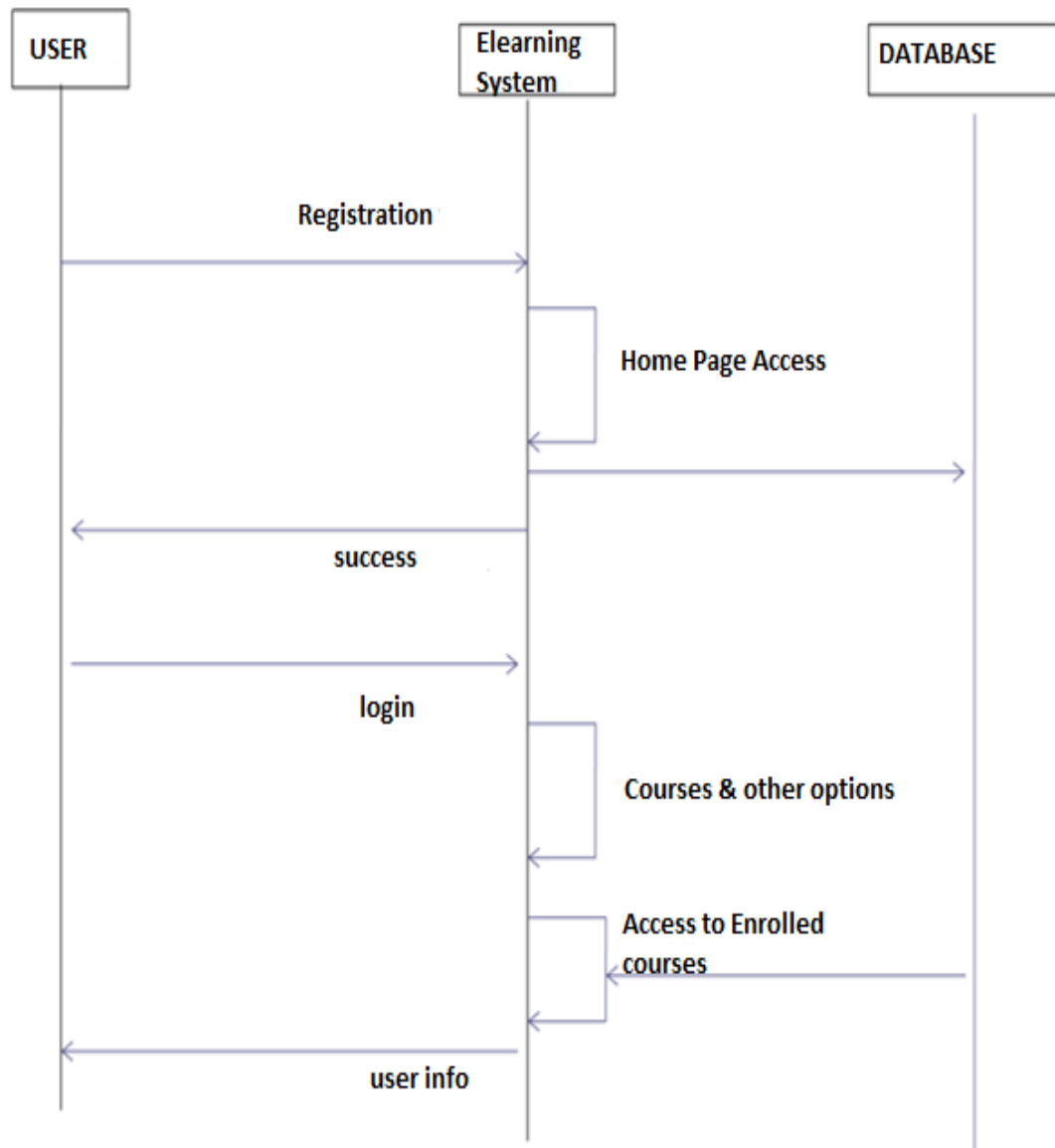
3.2 Architecture Diagram
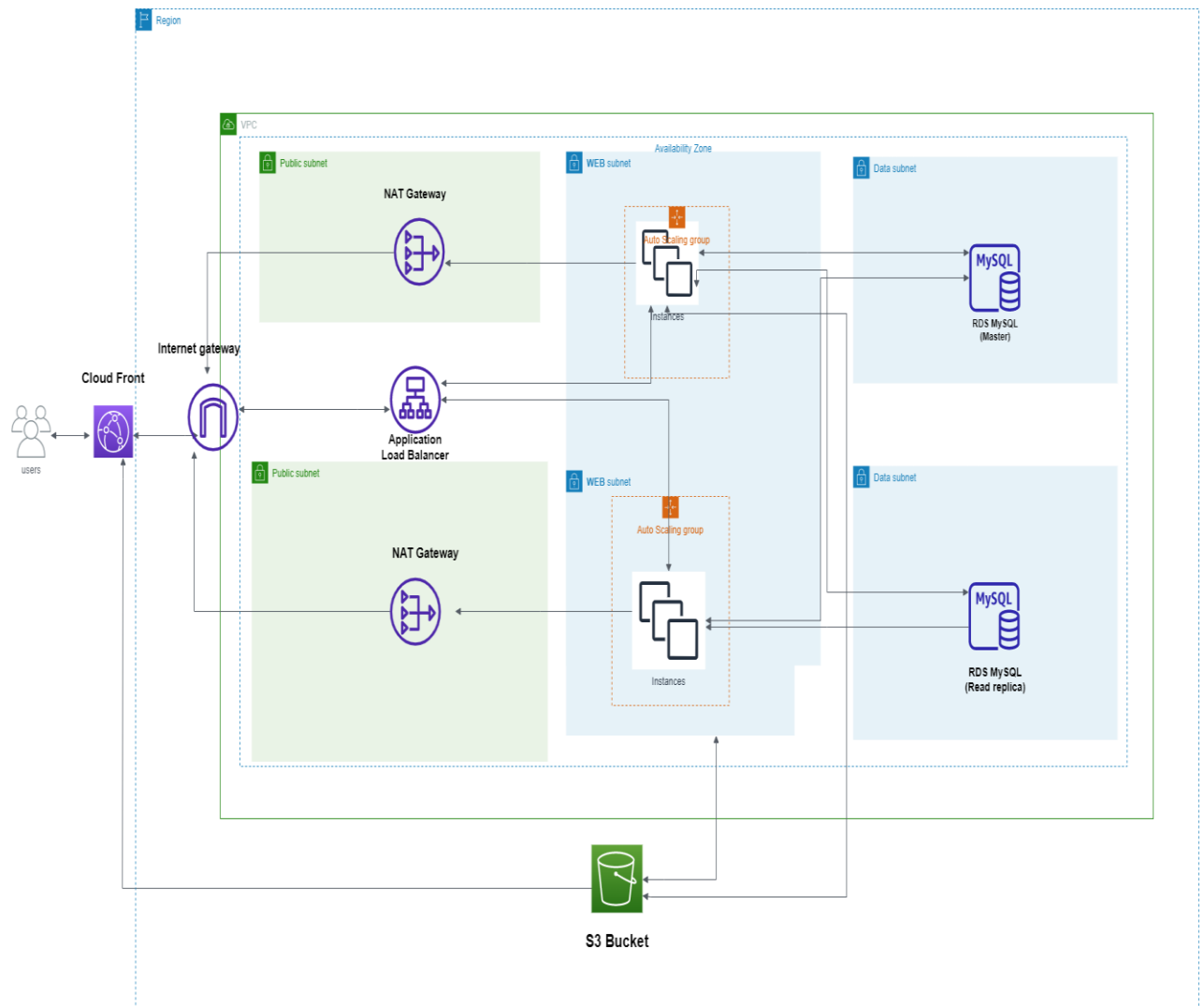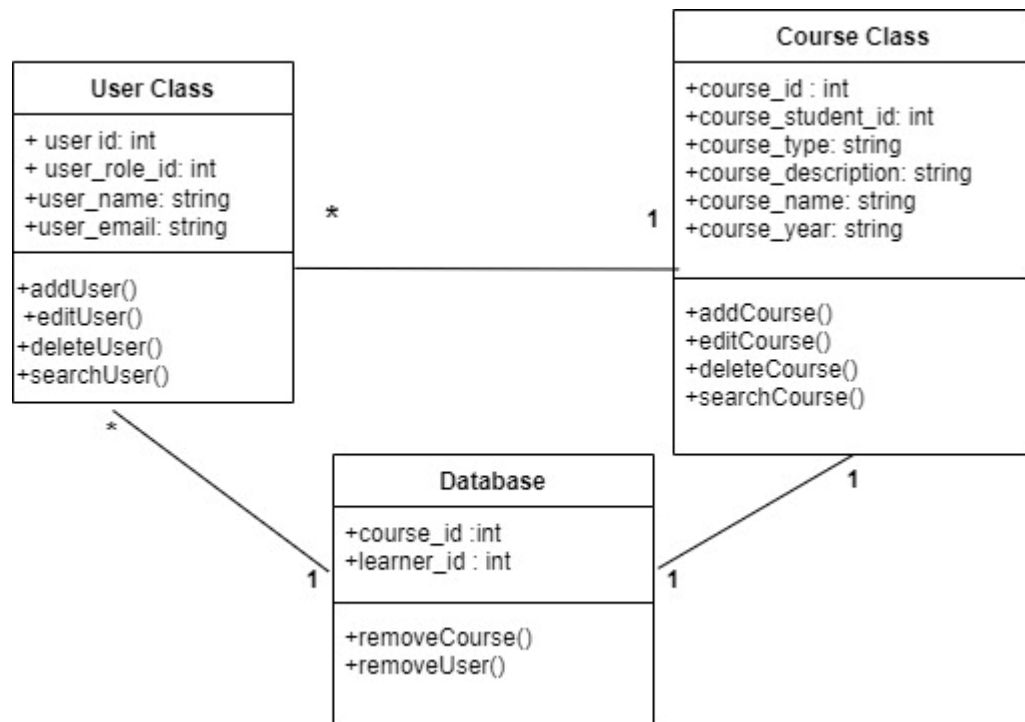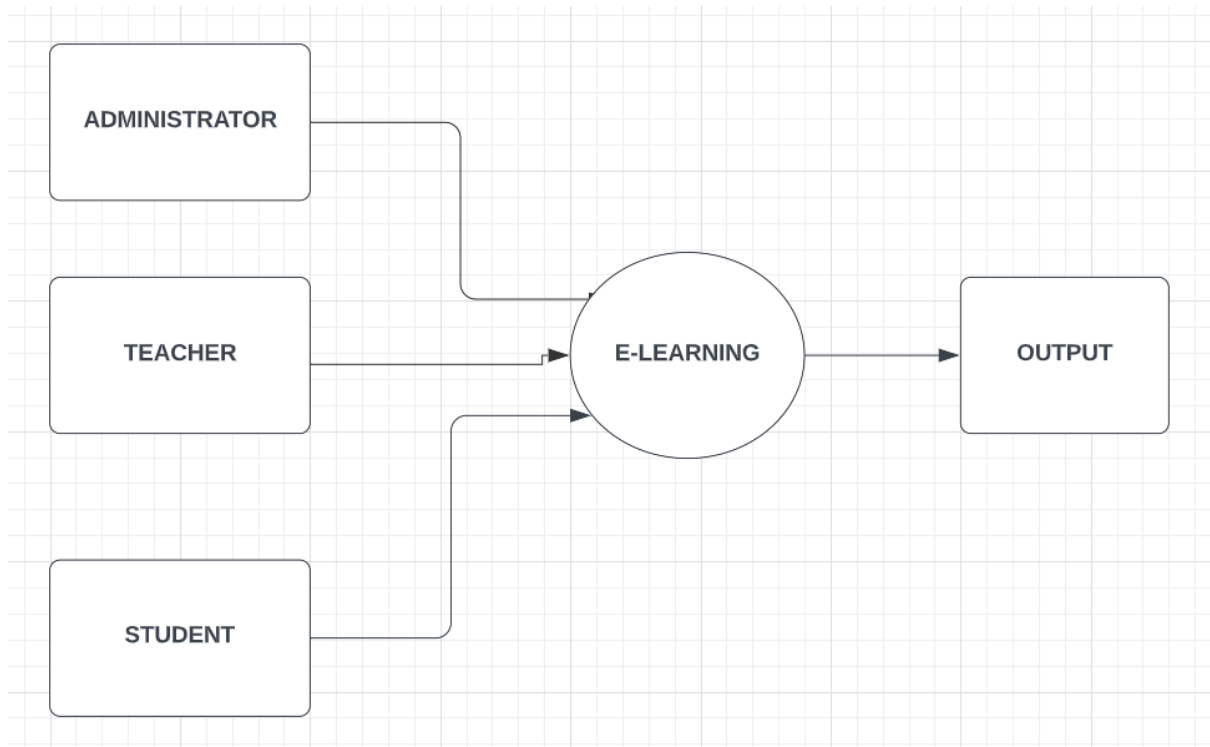
3.3 Working Diagram

3.4 Use case diagram

3.5 SEQUENCE DIAGRAM

```
   USER              Elearning              DATABASE
                      System

         Registration
   ──────────────────────►
                          ┌──┐
                          │  │ Home Page Access
                          │  │
                          └──◄
                          ──────────────────────►
   ◄──────────────────────
         success

   ──────────────────────►
         login
                          ┌──┐
                          │  │ Courses & other options
                          │  │
                          └──◄
                          ┌──┐ Access to Enrolled
                          │  ◄ courses
                          └──◄
   ◄──────────────────────
         user info
```

3.6 CLASS DIAGRAM

User Class

+ user id: int
+ user_role_id: int
+user_name: string
+user_email: string

+addUser()
+editUser()
+deleteUser()
+searchUser()

Course Class

+course_id : int
+course_student_id: int
+course_type: string
+course_description: string
+course_name: string
+course_year: string

+addCourse()
+editCourse()
+deleteCourse()
+searchCourse()

Database

+course_id :int
+learner_id : int

+removeCourse()
+removeUser()

*   1

*   1

1   1

3.7 DATA FLOW DIAGRAM

4. <u>IMPLEMENTATION</u>

1. Open Amazon Management Console

2. Open amazon S3 service

3. Create S3 bucket to store materials related to courses.

4. Create A VPC
   - Name the VPC
   - Create an Internet gateway.
   - Attach Internet Gateway with VPC
   - Create 2 subnets.
   - Create public route table.
   - Attach one subnet with route table

5. Launch an EC2 instance inside a public subnet where you will deploy the WordPress website.
   - Visit the EC2 console and click Launch Instances
   - In Choose an Amazon Machine Image (AMI) page, select Amazon Wordpress image from AWS marketplace,
   - In Choose an Instance Type page, select t2.micro
   - Click Next: Configure Instance Details button
   - In Configure Instance Details page
   - For Network, select the VPC you have created in the last STEP
   - For Subnet, select PublicSubnet1

- Click Next: Add Storage → Next: Add Tags
- For Assign a security group, select Create a new Security Group
- For the Security group name, enter public-instance-sg
- In the pre-created rule,For Source, select My IP, your IP will be auto-detected, and click Review and Launch → Launch
- Select Create a new key pair, Enter the Key pair name and click Download key pair
- Finally, Launch the instance

6. launch MySQL database in a private subnet
- Visit RDS console, click Create Database
- For Engine options, select MySQL
- For Templates, select Free tier,
- In Settings section,
- For DB identifier, enter wordpress,
- For Credentials Settings, enter your Master username and Master password(for example: #12345678aA)
- In Connectivity section,
- For Virtual private cloud (VPC), select Vpc, you created in last time
- Click Additional connectivity configuration to show more configuration
- For Public access, select No
- For VPC security group, select Create new and enter db-sg in New VPC security group name
- Scroll down and click Additional configuration,

- For Initial database name, enter wordpress,
- Finally, click Create database

7. Modify security group of RDS and EC2 instance
   - Visit EC2 dashboard, select public-instance-sg
   - Click Edit inbound rules button
   - Click Add rule, For Type, select MYSQL/Aurora,
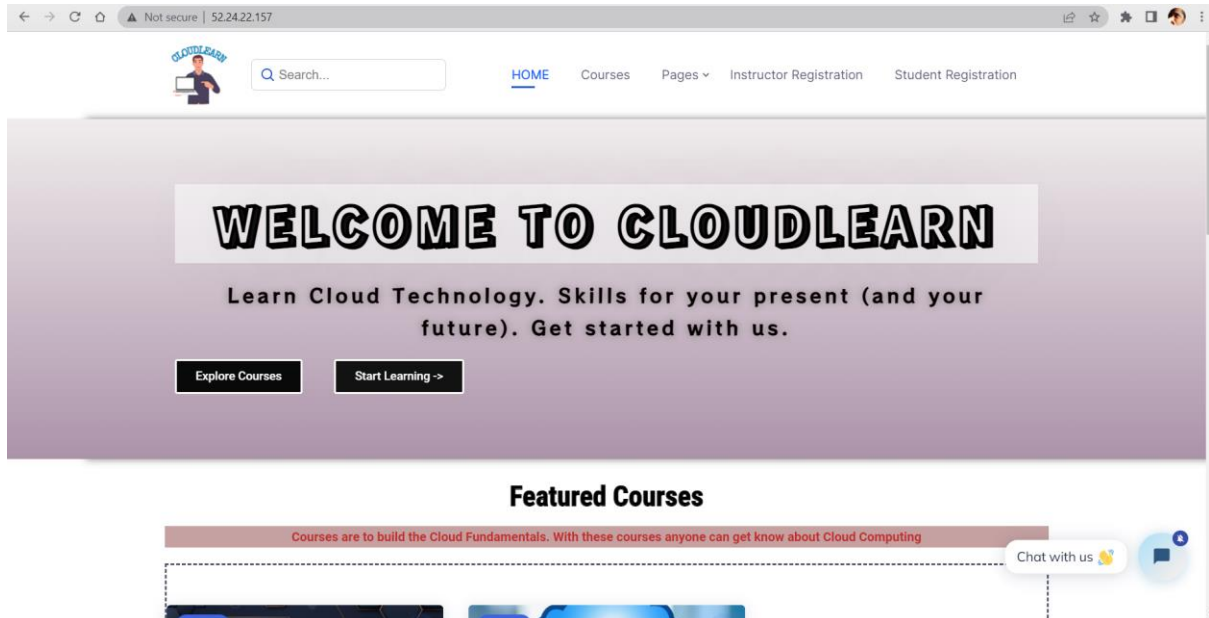   - For Source, select custom and find the db-sg, and click Save rules
   - Click Add rule, For Type, select HTTP,
   - For Source, select My IP , and click Save rules
   - Visit Security Groups page, select db-sg,
   - Click Edit inbound rules button
   - Click Add rule, For Type, select MYSQL/Aurora,
   - For Source, select custom and find the public-instance-sg, and click Save Rules

8. Set Up the Wordpess Environment
   - Visit EC2 console,
   - Connect to instance
   - Create a E-learning website in wordpress
   - Setup RDS database connection using plugins for student registration
   - Add courses
   - Create dashboard, home page etc for the website.

9. Set up Elastic Load Balancers for the website to handle load.

10. Setup Cloudfront.

Home page

Home Page after Sign Up

Courses Menu

Pages menu

For existing user, Student Registration will look like below

Student Registration

You are already logged in

For any query contact

aupadhya2001@gmail.com

Quick links

Contact us

About us

Chat with us 👋

Enrolled Course will look like below

If user need updates about courses, or any queries they have they can find options below of home page.
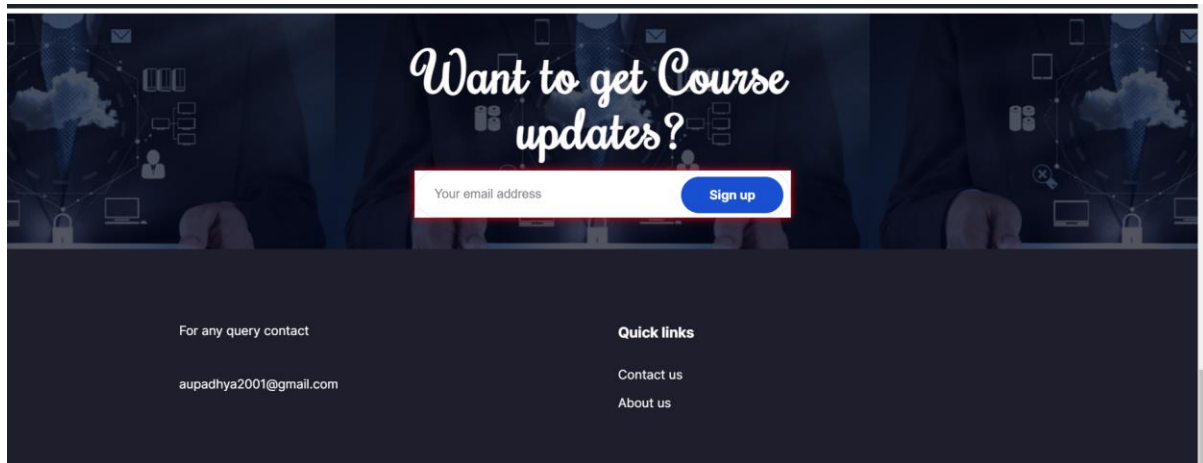
This is how we developed our Cloud Based E-learning Platform Through AWS

5. MOTIVATION TO IMPLEMENT

- To provide E-learning platform for the students

- Providing free cloud courses

- Availability

- Time management

- To help students to gain more knowledge in cloud technology.

6. CONCLUSION

E-learning has become a popular way of learning, and this project focused on developing a dynamic e-learning portal using WordPress through Amazon Web Services (AWS).

The literature survey explored the existing literature on e-learning, WordPress, and the technologies used in this project.

The literature revealed that e-learning is a growing market, and WordPress is an ideal platform for building e-learning portals.

Additionally, AWS offer several services that are essential for building an e-learning portal.

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