JUNE 15, 2024EduCloud 

Cloud Computing Project Presentation

BY TEAM 1



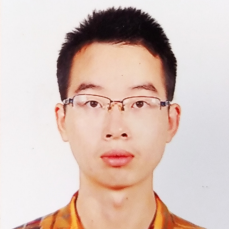
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Project Overview

Objective 

Provide an efficient, user-friendly course registration and account management

system targeting the education sector for students, staff, and administrators.

Background

With the rise of online education, schools need an efficient and secure system to

manage user accounts and course registrations.

Target Audience

• Students

• Educational staff

• Administrators







Login Functionality

• Account Sign-Up: Supports creating accounts with distinct roles for students, staff, and administrators with specific access privileges.

• Role-Specific Login: Secure login system supporting multiple user roles with role-specific dashboards and permissions. 



Key Functionalities

Logout 

Functionality

• Secure Session 

Termination: Ensures user

sessions are securely 

terminated to prevent

unauthorized access. 

Course Registration 

System

• Manual Course Registration:

Allows users to register for courses

through a dropdown list,

simplifying the registration

process.

• Future Improvements: Plans for

API integrations and a more

advanced user interface.





Notification

System

• Secure Messaging and Notification Channels: Securely transmit

notifications and messages to

prevent interception and

unauthorized access.

• Data Protection in Notifications:

Ensure that sensitive information

included in notifications is

protected and only accessible to 

intended recipients



System 

Architecture

Includes web server, API gateway, authentication service, course management service, notification service, and database services.

Microservices 

Architecture

1.Auth Service: Manages authentication, uses Amazon RDS for user data.

2.Course Upload Service: Stores course data in DocumentDB and Amazon S3.

3.Course Search and Registration Service: Uses ElasticSearch for search, stores data in relational databases and Cassandra, utilizes cache for performance.

4.Notification Service: Sends notifications using Kafka for event-driven communication.



Architecture Design Overview

04

03

Cloud

02 

01

Design 

Topology

1. User task flow diagram from login to course registration and logout.

2.Service interaction sequence diagrams.

Deployment

1. Uses AWS services (EC2, RDS, DocumentDB, S3). 2.Managed by

Kubernetes for high availability and 

automatic scaling.



Design

Architecture Topology





UML



User Task Flow Diagram



Design Architecture Topology



Estimating Cloud Resources

Compute Resources

• 3 Web server instances (AWS EC2 

r5.large) for handling frontend and

API gateway

• 13 microservice instances (AWS

EC2 r5.large) for running various

microservices

Network Resources 

2 Load Balancers (AWS

Network Load Balancers)



Storage Resources

• RDS: 25GB for Auth service 

• MongoDB: 10GB for Course Upload service

• Amazon S3: 500GB for storing course materials • RDS: 50GB for Course Registration service

• Cassandra: 50GB for Course Registration service • ElastiCache: 1 instance (AWS ElastiCache

cache.r5.large)

Additional Resources

1 Message Queue (Kafka) for inter-service

communication



Orchestration with Kubernetes

• Web Application Deployment

Purpose: Manages three replicas to ensure high availability and robustness against failures. *File: web-deployment.yaml*

• Database Deployment

Purpose: Maintains a single, persistent database pod to guarantee data integrity and continuous availability.

*File: db-deployment.yaml*

• Web Service Configuration

Function: Directs traffic to web pods and facilitates external access via ingress, ensuring seamless connectivity.

*File: web-service.yaml*

**

**Security and Compliance Strategies - Security Measures -

Authentication

and Authorization

• Multi-Factor Authentication (MFA) • Role-Based Access Control (RBAC)

02 

Secure Development Practices

• Code Review and Testing • Vulnerability Management

04 





01



Data Encryption

• Encryption in Transit (TLS) • Encryption at Rest (AES-256)



03

Network Security

• Firewalls 

• Intrusion Detection and Prevention Systems (IDPS)

Security and Compliance Strategies- Compliance Strategies - 

Frameworks Data Privacy Accessibility

Regulatory

• FERPA (Family

Educational Rights and

Privacy Act)

• GDPR (General Data

Protection Regulation)

• CCPA (California

Consumer Privacy Act)



• Student Data Protection • Data Retention Policies

Compliance

• Student Data Protection • Data Retention Policies





Course Management System

Application-Specific

01 Security Measures

• Secure Registration and Drop Processes

• Scheduling and Timetable

Management Security

Our application-specific security measures

Grading System

02 • Secure Submission and Review

Mechanisms

• Plagiarism Detection and Reporting Security

Notification System

are designed to ensure the confidentiality, integrity, and availability of critical educational data.

By implementing robust security protocols for

03

• Secure Messaging and Notification Channels

• Data Protection in Notifications Analytics System

the course management, grading, notification, and analytics systems, we ensure that all user interactions and data transactions are secure and compliant with

• Secure Data Aggregation and Analysis • Capacity Planning Security Measures



04

industry standards.

This holistic approach to security helps protect sensitive information and enhances the overall trust and reliability of the system.

Implementation Plan

Security Policies

Develop and enforce security policies defining the security requirements and procedures for the application.



Training and

Awareness Programs

Regularly conduct training and awareness programs to

promote security best practices and compliance.

Monitoring and Improvement

Implement continuous monitoring and improvement processes to ensure the application remains secure and compliant with evolving regulations and threats. 



Question and

Answer...





Thanks For 

Your Listening!

BY TEAM 1



