Software Requirements Specification (SRS) Document

ClassGuard: Automated Classroom Attendance System Using CCTV

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1. Introduction

1.1 Purpose

This Software Requirements Specification (SRS) document provides a comprehensive description of the automated classroom attendance system. It outlines the system's functionalities, requirements, and constraints to guide the development and ensure a clear understanding of the project's scope.

1.2 Document Conventions

1.3 Intended Audience and Reading Suggestions

This document is intended for various stakeholders involved in the development, deployment, and maintenance of the automated classroom attendance system. The primary audience includes:

- Development Team
- Project Managers
- Teachers and Instructors
- Students
- Administrators

To gain a comprehensive understanding of the system, readers are encouraged to review all sections of this document. Specific sections may be of interest to different stakeholders. Developers will focus on technical requirements, while teachers and students may concentrate on user interface and functionality descriptions.

1.4 Product Scope

The product scope encompasses the automated classroom attendance system, which is designed to automate the process of recording student attendance in educational institutions. This system uses existing CCTV infrastructure, integrates with class timetables, uses facial recognition technology, and provides web-based portals for teachers and students to manage attendance records and view class schedules. The

system aims to enhance accuracy, efficiency, and security in attendance management while reducing the administrative burden on teachers.

2. Overall Description

2.1 Product Perspective

ClassGuard is a web-based automated classroom attendance system that uses existing CCTV infrastructure to record student attendance while reducing the burden accurately and efficiently on both teachers and students. The system is targeted at educational institutions of all sizes, from primary schools to universities.

2.2 Product Functions

ClassGuard supplies the following key functions:

- Real-time attendance tracking using facial recognition technology
- Integration with class timetables to ensure accurate class-wise attendance tracking
- Dedicated portals for teachers and students to access attendance data and schedules
- Flexible configuration options to meet the specific needs of different educational institutions

2.3 User Classes and Characteristics

The primary user classes of ClassGuard are:

- Teachers and instructors
- Students
- Administrators

Teachers and instructors use ClassGuard to take attendance, view attendance reports, and manage exceptions. Students use ClassGuard to view their own attendance records, check timetables, and request attendance corrections. Administrators use ClassGuard to configure the system, generate reports, and oversee the overall attendance management process.

2.4 Operating Environment

ClassGuard is a web-based system that can be accessed from any device with a web browser. The system is designed to be scalable and can be deployed in a variety of environments, from small schools with a single classroom to large universities with hundreds of classrooms.

2.5 Design and Implementation Constraints

The following design and implementation constraints apply to ClassGuard:

- The system must be able to operate in real time to accurately track student attendance.
- The system must be robust and capable of handling variations in lighting, student appearances, and camera angles.
- The system must be secure to protect student privacy and prevent unauthorized access to data.
- The system must be user-friendly and easy to use for teachers, students, and administrators.

2.6 User Documentation

Comprehensive user documentation will be provided for ClassGuard, including user guides, FAQs, and training materials. The documentation will be designed to help users of all skill levels get the most out of the system.

3. External Interface Requirements

3.1 User Interfaces

ClassGuard will provide web-based portals for teachers, students, and administrators to access the system. The portals should be designed to be user-friendly and easy to navigate. The following key features should be included in the user interfaces:

- Teacher Portal:
    - Ability to view attendance records for all classes
    - Ability to generate attendance reports
    - Ability to manage exceptions (e.g., late arrivals, early dismissals)
- Student Portal:
    - Ability to view their own attendance records
    - Ability to check class timetables
    - Ability to request attendance corrections
- Administrator Portal:
    - Ability to configure the system
    - Ability to generate reports for all users
    - Ability to oversee the overall attendance management process

3.2 Hardware Interfaces

ClassGuard will interface with CCTV cameras to detect and recognize student faces. The CCTV cameras should be properly configured and calibrated to ensure accurate attendance tracking.

3.3 Software Interfaces

ClassGuard may need to interface with the school's existing student information system (SIS) to retrieve student data. The specific software interfaces required will depend on the specific SIS in use.

If the school is using SAP Portal, ClassGuard can interface with it through a web service or a database interface.

- Web service interface:
    - ClassGuard would consume an SAP web service that exposes the attendance data that ClassGuard needs.
- Database interface:
    - ClassGuard would directly connect to the SAP database and query the attendance data.

The specific method that is chosen will depend on the specific configuration of the SAP system and the school's requirements.

If the school is using SAP's standard attendance recording functionality, ClassGuard can import the attendance data from an Excel spreadsheet. This is a simple and straightforward method, but it is important to note that it will require manual intervention to generate the Excel spreadsheet and import it into ClassGuard.

3.4 Communications Interfaces

ClassGuard will need to communicate with the following systems:

- CCTV cameras: To receive video feeds
- Student information system (SIS): To retrieve student data

4. System Features

ClassGuard provides the following system features:

- **Real-time attendance tracking using facial recognition technology:** ClassGuard can detect and recognize student faces in real time, allowing teachers to take attendance quickly and accurately without having to manually check names. This saves teachers time and allows them to focus on teaching.

- **Integration with class timetables**: ClassGuard can be integrated with class timetables to ensure accurate class-wise attendance tracking. This helps teachers identify students who are frequently absent or late to class.
- **Dedicated portals for teachers and students:** ClassGuard provide dedicated portals for teachers and students to access attendance data and schedules. Teachers can use the portal

to view attendance reports, generate reports, and manage exceptions. Students can use the portal to view their own attendance records, check class timetables, and request attendance corrections.

- **Flexible configuration options:** ClassGuard provides flexible configuration options to meet the specific needs of different educational institutions. For example, schools can configure the system to allow for late arrivals, early dismissals, and excused absences.
- **Customizable attendance rules**: ClassGuard allows schools to customize attendance rules to meet their specific needs. For example, schools can set different attendance thresholds for different classes, grade levels, or student groups.
- **Automated attendance reporting:** ClassGuard generates comprehensive attendance reports that provide teachers and administrators with insights into student attendance patterns. This information can be used to identify students who need additional support and improve the school's overall attendance rate.
- **Real-time alerts and notifications:** ClassGuard can send real-time alerts and notifications to teachers and administrators if a student is absent or late to class. This allows teachers to quickly intervene and provide support to students who are struggling.

5. Modules

5.1 Teacher Portal

Overview:

The Teacher Portal in ClassGuard serves as a centralized platform for teachers to efficiently manage attendance, generate reports, and address attendance exceptions. It is designed to streamline the attendance-taking process and provide valuable insights into student attendance patterns.

Features:

1. Take Attendance:
    a. Utilize a live video feed from the classroom CCTV camera to efficiently take attendance and mark students as present.
2. Generate Attendance Reports:
    a. Access various attendance reports, including class-wise, student-wise, and late arrival/early dismissal reports, to identify attendance trends.
3. Manage Attendance Exceptions:
    a. Review and manage pending attendance exceptions, approving or rejecting requests for corrections submitted by students.
4. Study Streak Analytics:
    a. Monitor and analyze Study Streak data to understand attendance trends within the class and encourage consistent student participation.
5. Real-time Alerts:
    a. Receive real-time alerts and notifications for absent or late students, enabling quick intervention and support.

5.2 Student Portal

Overview:

The Student Portal in ClassGuard provides students with a personalized and user-friendly interface to manage their attendance records, view class schedules, and engage with attendance-related features. It aims to empower students with insights into their attendance patterns and streamline communication with teachers.

Features:

1. View Attendance Records: Access a detailed list of attendance records for each class, including dates, attendance status, and any recorded exceptions.
2. Request Attendance Corrections: Initiate requests for corrections to attendance records in cases of discrepancies, allowing students to address any inaccuracies promptly.
3. View Class Timetables: Access a comprehensive view of class timetables, providing information on class names, teachers, and scheduled times.
4. Study Streak Tracker: Monitor and engage with the Study Streak feature to motivate and track consecutive days of attendance, earning virtual badges and recognition.
5. Personalized Notifications: Receive timely notifications regarding attendance, upcoming classes, and study streak milestones.

5.3 Admin Portal

Overview:

The Admin Portal in ClassGuard serves as the control center for system configuration, user management, and overall attendance reporting. Administrators have the tools to customize system settings, generate comprehensive reports, and oversee the implementation of attendance policies.

Features:

1. Configure the System: Access the system configuration page to customize settings, including attendance thresholds, late arrival policies, and excused absence policies.
2. Generate Comprehensive Reports: Utilize the reporting page to generate a variety of reports, such as school-wide attendance reports, class-wise reports, and student-wise reports.
3. Manage Users: Navigate the user management page to add, edit, or delete users. Assign users to specific roles such as teacher, student, or administrator.
4. Attendance Policy Customization: Customize attendance rules and policies to accommodate the unique needs of the educational institution, ensuring flexibility and alignment with institutional goals.
5. System Scalability Controls: Implement controls for system scalability, allowing adjustments to accommodate educational institutions of various sizes.

6. User Persona

6.1 Teacher Portal

- Use Case 1: Take attendance

    - The teacher enters the classroom and logs into the ClassGuard teacher portal. The portal displays a live video feed from the classroom CCTV camera. The teacher uses the portal to identify students and mark them as present.
- Use Case 2: View attendance reports
    - The teacher logs into the ClassGuard teacher portal and navigates to the attendance reports page. The portal displays a variety of reports, such as class-wise attendance reports, student-wise attendance reports, and late arrival/early dismissal reports. The teacher can use these reports to identify students who are frequently absent or late to class.
- Use Case 3: Manage attendance exceptions
    - The teacher logs into the ClassGuard teacher portal and navigates to the attendance exceptions page. The portal displays a list of all pending attendance exceptions. The teacher can review and approve or reject these exceptions.

6.2 Student Portal

- Use Case 1: View attendance records
    - The student logs into the ClassGuard student portal and navigates to the attendance records page. The portal shows a list of all the student's attendance records, including class-wise and student-wise. The student can use this information to track their own attendance and identify any areas where they need to improve.
- Use Case 2: Request attendance corrections
    - The student logs into the ClassGuard student portal and navigates to the attendance request corrections page. The portal allows the student to request corrections to their attendance records, such as if they were marked as absent but were present.
- Use Case 3: View class timetables
    - The student logs into the ClassGuard student portal and navigates to the class timetables page. The portal shows a list of all the student's classes, including the class name, teacher name, and class time. The students can use this information to plan their day and ensure they are on time for all their classes.

6.3 Administrator Portal

- Use Case 1: Configure the system
    - The administrator logs into the ClassGuard administrator portal and navigates to the system configuration page. The portal allows the administrator to configure various settings, such as attendance thresholds, late arrival/early dismissal policies, and excused absence policies.
- Use Case 2: Generate reports
    - The administrator logs into the ClassGuard administrator portal and navigates to the reports page. The portal allows the administrator to generate a variety of reports, such as school-wide attendance reports, class-wise attendance reports, and student-wise attendance reports. The administrator can use these reports to track attendance trends and identify areas where improvement is needed.
- Use Case 3: Manage users
    - The administrator logs into the ClassGuard administrator portal and navigates to the user management page. The portal allows the administrator to add, edit, and delete users. The administrator can also assign users to different roles, such as teacher, student, or administrator.

7. Nonfunctional Requirements

- **Performance**: ClassGuard must be able to handle a large number of concurrent users and generate attendance reports quickly and efficiently.
- **Scalability**: ClassGuard must be scalable to meet the needs of schools of all sizes.
- **Reliability**: ClassGuard must be reliable and stable and must be able to operate without errors.
- **Security**: ClassGuard must implement appropriate security measures to protect student data from unauthorized access, use, disclosure, disruption, modification, or destruction.
- **Usability**: ClassGuard must be easy to use and navigate for both teachers and students.
- **Safety**: ClassGuard must be designed and implemented in a safe and secure manner. The system must be able to protect student privacy and prevent unauthorized access to data.
- **Software Quality Attributes**: ClassGuard must be easy to use and navigate for both teachers and students. The system must be reliable and stable.
- **Business Rules**: ClassGuard must be able to accommodate different attendance policies and schedules. The system must be able to generate reports that meet the specific needs of the school.

8. Database Design

8.1 Entity Table

- Teacher: This entity represents a teacher in the school. The primary key of the table is TeacherID.
- Student: This entity represents a student in the school. The primary key of the table is StudentID.
- Course: This entity represents a course that is offered at the school. The primary key of the table is CourseID.
- Image: This entity represents an image of a student that is captured by a CCTV camera. The primary key of the table is ImageID.
- CCTV Camera: This entity represents a CCTV camera that is used to capture images of students. The primary key of the table is CameraID

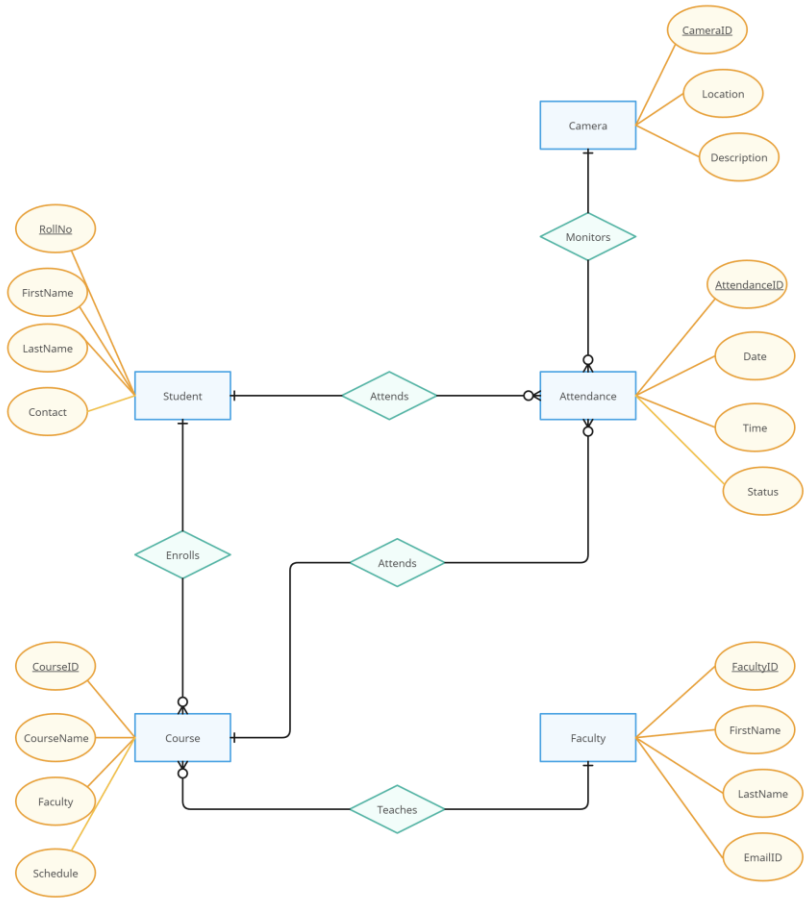
Entity	**Primary Key**	**Attributes**
Teacher	TeacherID	FirstName, LastName, DateOfBirth, ContactInfo
Student	StudentID	FirstName, LastName, DateOfBirth, Address
Course	CourseID	CourseName, CourseDescription
Image	ImageID	ImagePath, Timestamp
CCTV Camera	CameraID	CameraLocation, CameraModel
Attendance	StudentID, TeacherID, CourseID, ImageID, Timestamp	

8.2 Entity Relations

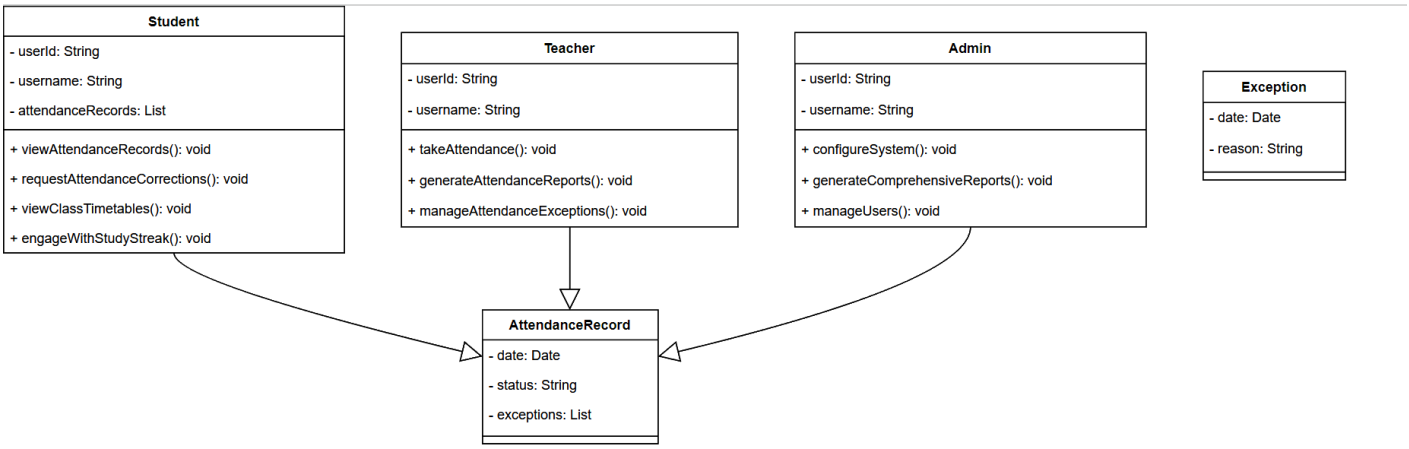
- Attendance: This relationship represents the attendance of a student in a course. It is a many-to-many relationship between the Student and Course entities. The Attendance table has three foreign keys: StudentID, TeacherID, and CourseID.

- CapturedBy: This relationship represents the image of a student that is captured by a CCTV camera. It is a one-to-one relationship between the Image and CCTV Camera entities. The Image table has a foreign key, CameraID.

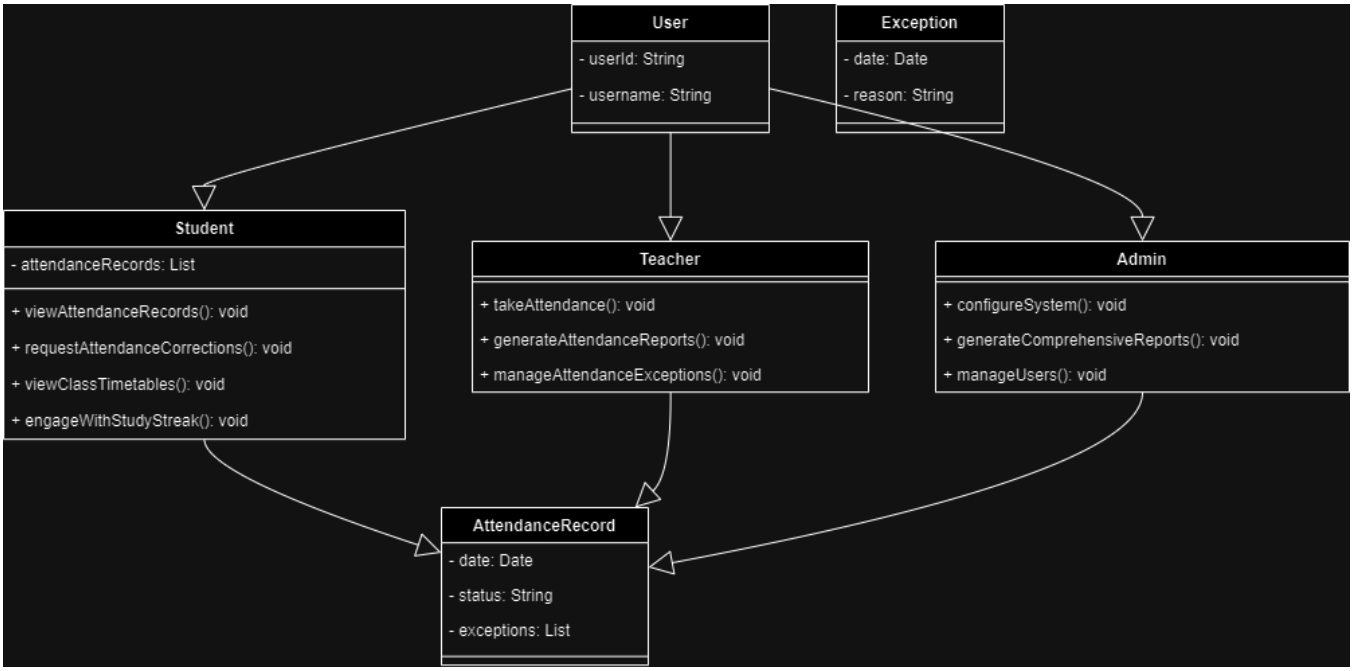
8.3 ERD



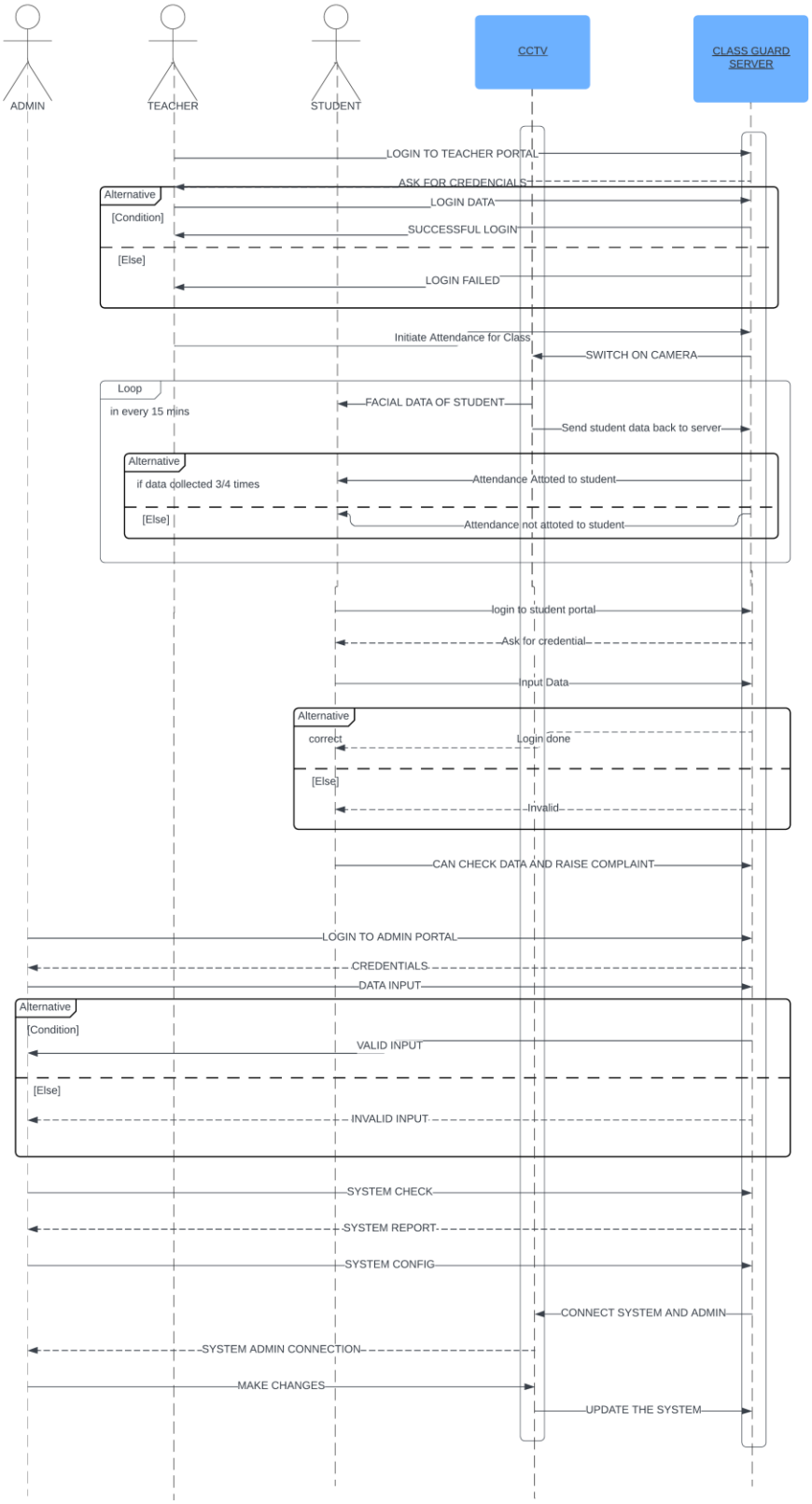
8.4 UML Diagram



8.5 Usecase Diagram



8.6 Sequence Diagram


ADMIN
TEACHER
STUDENT
CCTV
CLASS GUARD SERVER
LOGIN TO TEACHER PORTAL
ASK FOR CREDENCIALS
Alternative
[Condition]
LOGIN DATA
SUCCESSFUL LOGIN
[Else]
LOGIN FAILED
Initiate Attendance for Class
SWITCH ON CAMERA
Loop
in every 15 mins
FACIAL DATA OF STUDENT
Send student data back to server
Alternative
if data collected 3/4 times
Attendance Attoted to student
[Else]
Attendance not attoted to student
login to student portal
Ask for credential
Input Data
Alternative
correct
Login done
[Else]
Invalid
CAN CHECK DATA AND RAISE COMPLAINT
LOGIN TO ADMIN PORTAL
CREDENTIALS
DATA INPUT
Alternative
[Condition]
VALID INPUT
[Else]
INVALID INPUT
SYSTEM CHECK
SYSTEM REPORT
SYSTEM CONFIG
CONNECT SYSTEM AND ADMIN
SYSTEM ADMIN CONNECTION
MAKE CHANGES
UPDATE THE SYSTEM

9 Prototyping

9.1 Student Portal