Iteration 01

Subject: Software Engineering (CS-3009)
Project Name: Smart Home Security & Monitoring System
Group: 18-B
Group Members:

- Fahad Jameel (i210394)
- Shaffin Imam (i212963)
- Ahmed Javeed (i221067)

Deliverable: Assignment 2 – Iteration-1 (RE Phase)
Submission Date: March 22th, 2025

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1. Introduction

1.1 Purpose

This Software Requirements Specification (SRS) document specifies the requirements for the Smart Home Security & Monitoring System. It details both the functional and non-functional requirements and serves as the reference for the design, development, and validation of the system for Iteration-1 (Requirements Engineering Phase).

1.2 Document Conventions

- **Priority Levels:** High (H), Medium (M), Low (L)
- **Requirement IDs:** Prefixed with "REQ-" followed by a unique number.
- **Diagrams:** Provided as separate image files and referenced here.

1.3 Intended Audience and Reading Suggestions

This document is intended for:

- **Developers:** To understand the detailed functional requirements and design constraints.
- **Testers:** To base test cases on the defined functional requirements.
- **Project Managers & Stakeholders:** To review system scope, priorities, and progress. Readers are suggested to first review the Introduction and Overall Description before delving into the detailed requirements and design sections.

1.4 Product Scope

The Smart Home Security & Monitoring System provides homeowners with a flexible, cost-effective way to secure and monitor their homes. It integrates various sensors, cameras, and smart devices, enabling real-time alerts, remote control, and detailed activity logs. The system is designed to be user-friendly and easily integrated with existing alarm services.

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2. Overall Description

2.1 Product Perspective

The product is a new, standalone system that integrates with IoT sensors (motion, door/window, cameras) and third-party alarm services. It will complement existing home automation systems and is designed with modularity in mind for future expansion.

2.2 Product Functions

- **User Management:** Registration, login, and profile management
- **Sensor Configuration:** Adding sensors (motion, door/window) and configuring device settings
- **Real-Time Monitoring:** Live camera feeds, push notifications, and activity logs
- **Remote Control:** Arm/disarm system remotely, schedule device operations
- **Integration:** Connect with third-party alarm services and smart devices

2.3 User Classes and Characteristics

- **Homeowners:** Primary users with full access to system functionalities
- **Family Members/Guests:** Limited access as assigned by the homeowner
- **System Administrators:** Responsible for maintenance, updates, and security oversight

2.4 Operating Environment

- **Hardware:** IoT sensors, smart cameras, smart locks
- **Software:** Mobile application (iOS/Android), web dashboard, backend server
- **Network:** Internet and local network connectivity for sensor communication

2.5 Design and Implementation Constraints

- **Integration:** Must seamlessly interface with third-party alarm systems.
- **Hardware:** Limited memory and power on IoT devices require optimized code.
- **Security:** Strong authentication and encryption protocols are mandatory.

2.6 User Documentation

- User Manual (online and PDF format)
- Quick-start Guide and Video Tutorials
- FAQs and Troubleshooting Guide on the website

2.7 Assumptions and Dependencies

- Availability of reliable internet connectivity

- Third-party APIs for alarm service integration are stable and documented
- Homeowners have basic technical literacy to manage mobile apps

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3. External Interface Requirements

3.1 User Interfaces

The system includes:

- **Mobile App:** Simplified UI for on-the-go monitoring and control
- **Web Dashboard:** Detailed interface for configuration and system status review
- **Interactive Alerts:** Push notifications and SMS/email alerts for immediate updates

3.2 Hardware Interfaces

- **Sensors and Cameras:** Communication via Wi-Fi/Zigbee protocols
- **Smart Devices:** Integration with smart locks and lighting systems via proprietary APIs

3.3 Software Interfaces

- **Third-Party Alarm Systems:** RESTful API integration
- **Database:** SQL/NoSQL backend for storing user profiles, sensor data, and logs
- **Cloud Services:** For real-time alerts and video storage

3.4 Communications Interfaces

- **Network Protocols:** HTTP/HTTPS for web services, MQTT for sensor data transmission
- **Data Formats:** JSON for data exchange between devices and server

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4. System Features

For Iteration-1, the focus is on key features that provide a foundation for the system. The following selected user stories from the project backlog will be implemented:

Feature 1: User Registration and Login

- **Description & Priority:**
  Allow new users to create an account and existing users to securely log in (High).
- **Sub User Stories:**

    - **User Registration:** As a new homeowner, I want to register my account to access the system.
    - **User Login:** As a returning user, I want to log in to manage my home security.
- **Functional Requirements:**
    - REQ-101: The system shall allow a new user to register with a valid email and password.
    - REQ-102: The system shall validate credentials during login and display an error message on failure.

Feature 2: Remote Arm/Disarm

- **Description & Priority:**
  Enable users to arm or disarm their security system remotely (High).
- **Sub User Stories:**
    - **Arm/Disarm System:** As a homeowner, I want to control the system remotely for added flexibility.
- **Functional Requirements:**
    - REQ-201: The system shall allow remote arming/disarming via the mobile app.
    - REQ-202: The system shall confirm the action and update the system status in real time.

Feature 3: Live Camera Feed and Notifications

- **Description & Priority:**
  Provide real-time video streaming and alerts in case of anomalies (Medium).
- **Sub User Stories:**
    - **Live Camera Feed:** As a homeowner, I want to view a live camera feed for instant monitoring.
    - **Push Notifications:** As a homeowner, I want to receive immediate alerts for unusual activities.
- **Functional Requirements:**
    - REQ-301: The system shall stream live video from cameras to the mobile app.
    - REQ-302: The system shall send push notifications for predefined events.

Additional features and sub-stories like sensor configuration, activity logs, can be incorporated in future iterations.

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5. Other Nonfunctional Requirements

5.1 Performance Requirements

- The system shall process user requests within 2 seconds under normal operating conditions.
- Live video streaming latency should not exceed 3 seconds.

5.2 Safety Requirements

- The system shall include fail-safe mechanisms to avoid false alarms in emergency scenarios.
- Regular system health checks must be performed to ensure device functionality.

5.3 Security Requirements

- User data must be stored using encryption.
- All communications between devices and servers must be secured via HTTPS.
- Multi-factor authentication (MFA) is recommended for user login.

5.4 Software Quality Attributes

- **Usability:** Intuitive UI for both novice and experienced users.
- **Maintainability:** Modular design for easier updates and bug fixes.
- **Reliability:** The system must have 99.9% uptime.
- **Scalability:** Must support an increasing number of devices and users without performance degradation.

5.5 Business Rules

- Only registered homeowners and authorized users can access sensitive features (e.g., live feed, remote control).
- System alerts and actions must comply with local security and privacy regulations.

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6. Sprint Backlog (Iteration-1)

6.1 Module Selected for Sprint

Module Name: User Management and Security Control

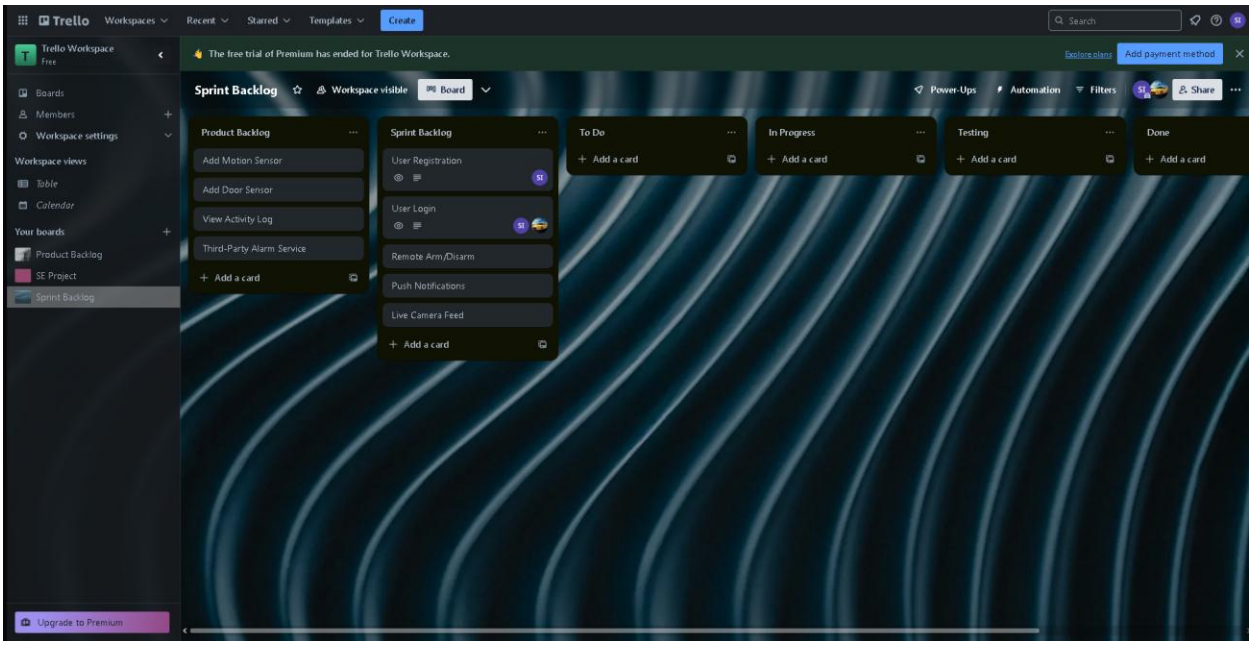
6.2 Selected User Stories for Sprint 1

- **User Registration & Login:**
  - Implement registration and login functionality (REQ-101, REQ-102).
- **Remote Arm/Disarm:**
  - Enable users to arm/disarm the system remotely (REQ-201, REQ-202).
- **Live Camera Feed & Notifications:**
  - Integrate live streaming and push notification functionality (REQ-301, REQ-302).

6.3 Sub User Stories and Tasks

- **User Registration:**
  - Task 1: Design registration UI screen.
  - Task 2: Develop backend registration API.
  - Task 3: Implement input validation and error handling.
- **User Login:**
  - Task 1: Design login screen.
  - Task 2: Develop login API with session management.
- **Remote Arm/Disarm:**
  - Task 1: Create UI controls for arming/disarming.
  - Task 2: Integrate system status update.
- **Live Camera Feed & Notifications:**
  - Task 1: Develop live streaming interface.
  - Task 2: Configure push notifications and event triggers.

6.4 Trello Board Snapshots


Trello
Workspaces
Recent
Starred
Templates
Create
Search
Trello Workspace
Free
The free trial of Premium has ended for Trello Workspace.
Explore plans
Add payment method
Boards
Members
Workspace settings
Workspace views
Table
Calendar
Your boards
Product Backlog
SE Project
Sprint Backlog
Upgrade to Premium
Sprint Backlog
Workspace visible
Board
Power-Ups
Automation
Filters
Share
Product Backlog
Add Motion Sensor
Add Door Sensor
View Activity Log
Third-Party Alarm Service
Add a card
Sprint Backlog
User Registration
User Login
Remote Arm/Disarm
Push Notifications
Live Camera Feed
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To Do
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In Progress
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Testing
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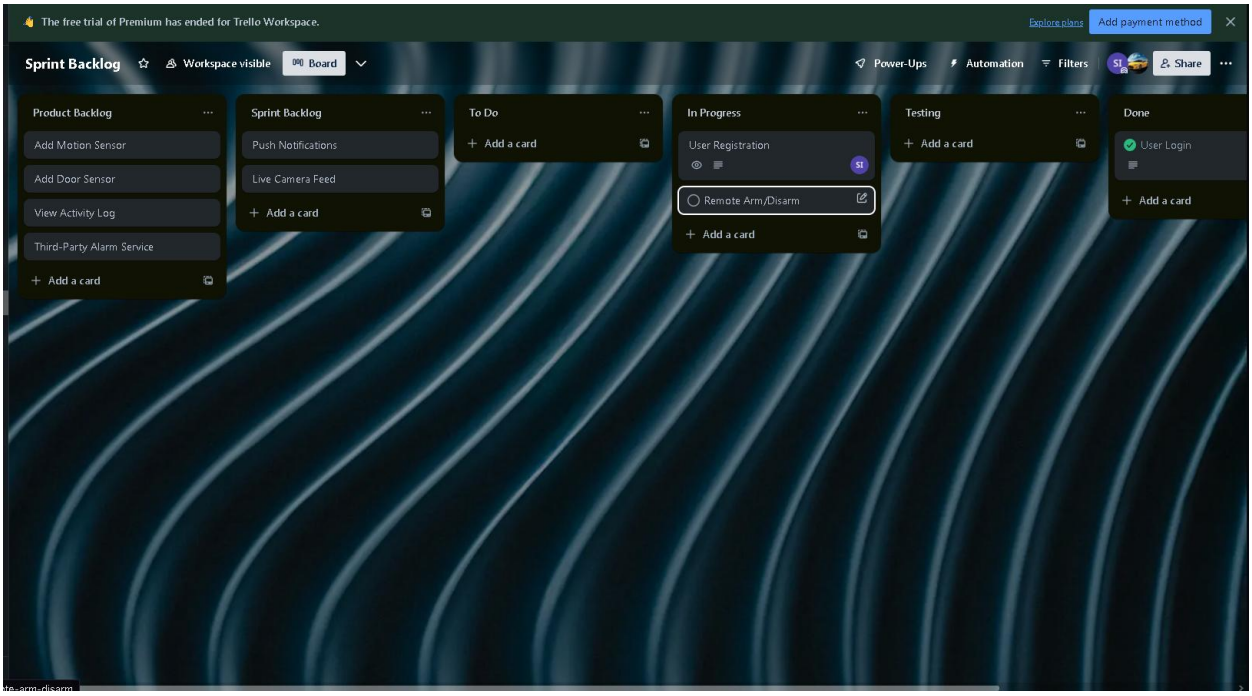
The free trial of Premium has ended for Trello Workspace.
Explore plans
Add payment method
Sprint Backlog
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Board
Power-Ups
Automation
Filters
Share
Product Backlog
Add Motion Sensor
Add Door Sensor
View Activity Log
Third-Party Alarm Service
Add a card
Sprint Backlog
Push Notifications
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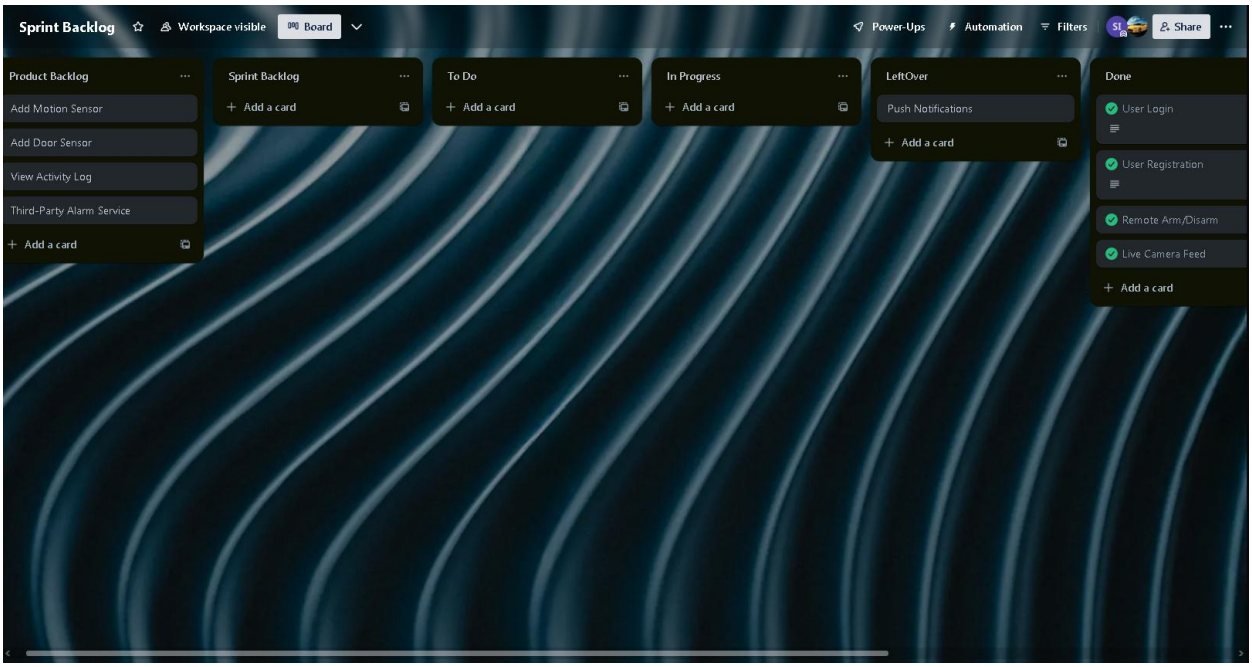

6.6 GitHub Repository

Link: https://github.com/Fahad-Jameel/SmartHomeSecurity

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7. Requirements

The detailed requirements for Iteration-1 are captured below.

7.1 Functional Requirements

- **Registration and Login:**
  - REQ-101: User registration with email and password.
  - REQ-102: Secure login with error messaging.
- **Remote Control:**
  - REQ-201: Remote arming/disarming functionality via the app.
  - REQ-202: Real-time status updates after control actions.
- **Live Streaming and Alerts:**
  - REQ-301: Live streaming of camera feeds.
  - REQ-302: Push notifications for system events.

7.2 Non-functional Requirements

- **Performance:** Fast response time (≤ 2 seconds) for user actions.

- **Security:** End-to-end encryption for all data transmissions.
- **Reliability:** System uptime of 99.9% with robust error handling.
- **Usability:** User-friendly interface with minimal learning curve.

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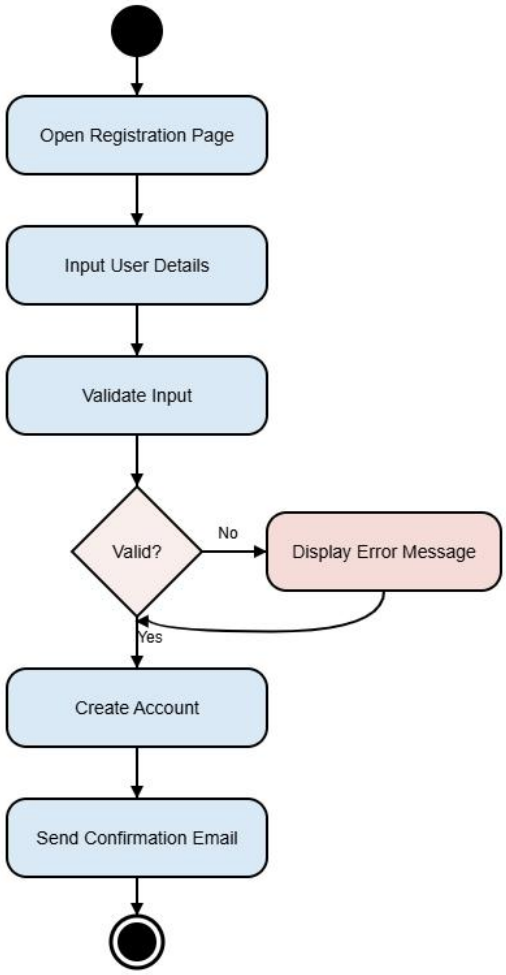
8. Design

This section includes a description of the system diagrams.

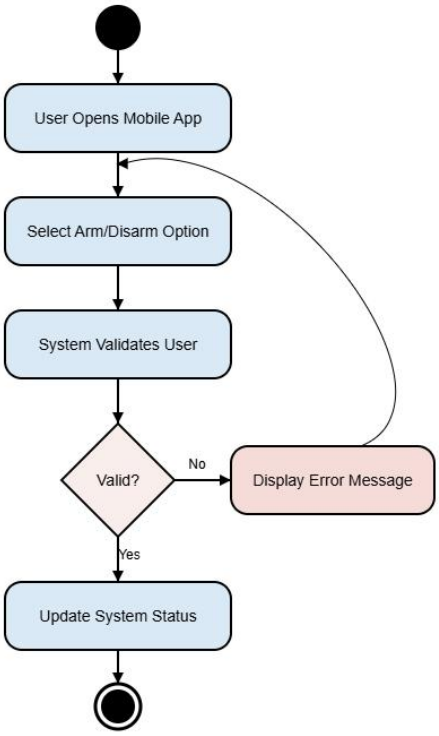
8.1 Activity Diagrams

Processes Covered:

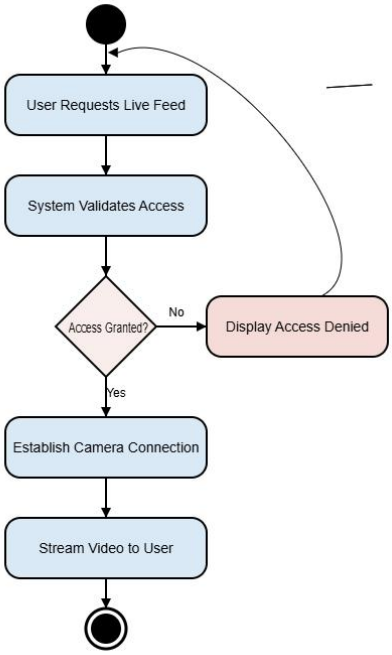
- **User Registration Process:**



- **Remote Arm/Disarm Process:**



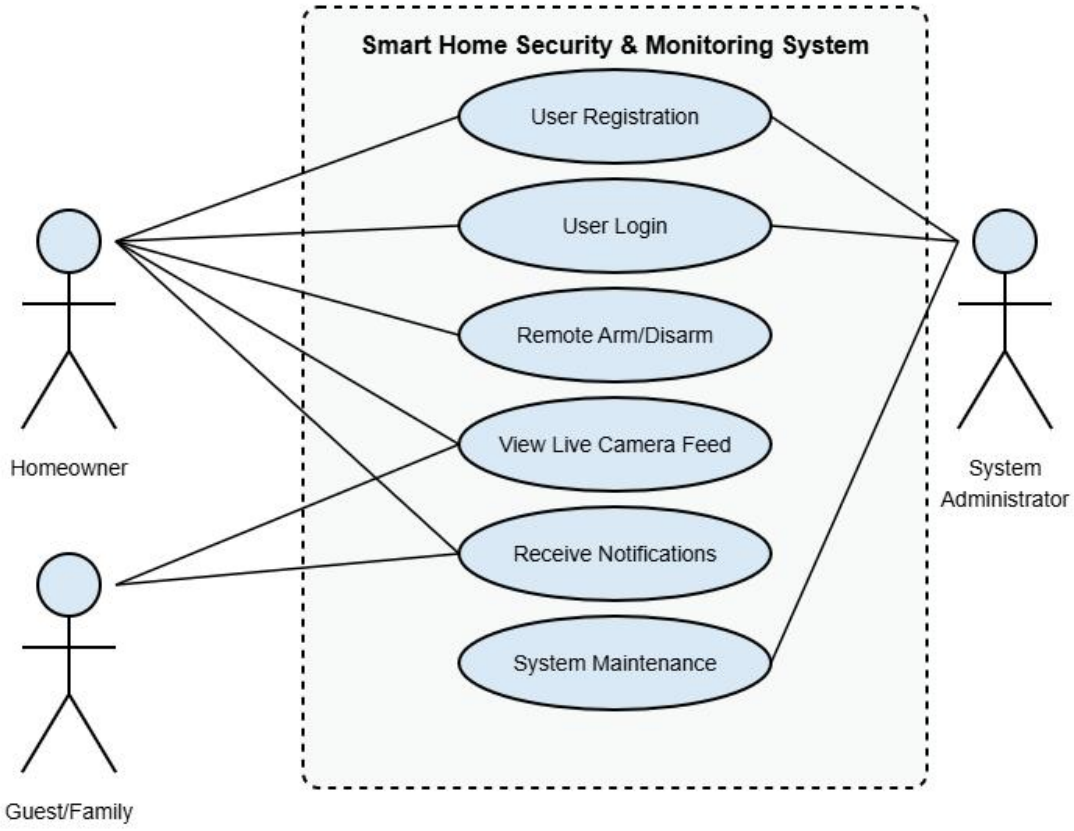
- **Live Camera Feed Process:**



8.2 Use Case Diagram

The diagram represents the interactions between the following actors and the system:

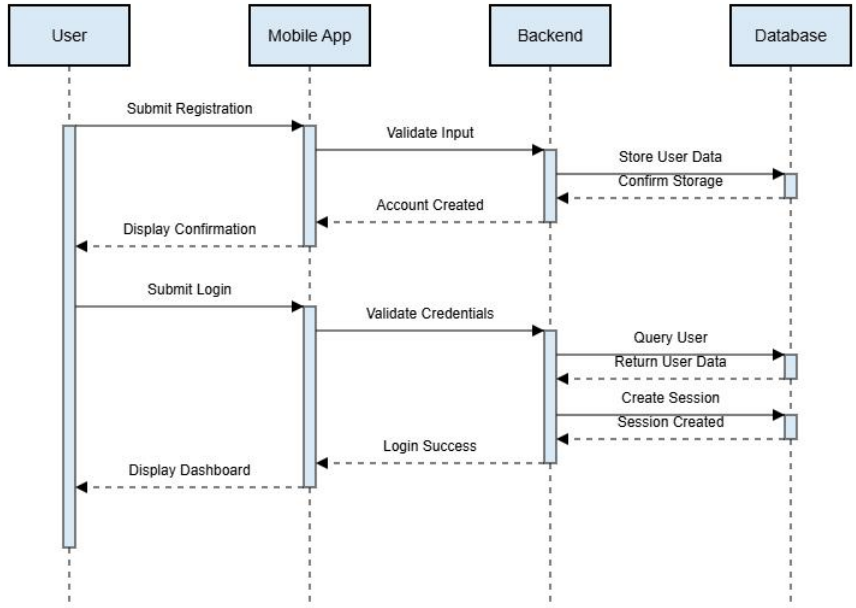
- Homeowner (Primary actor)
- Guest/Family Member (Secondary actor with limited access)
- System Administrator (For maintenance and security monitoring)



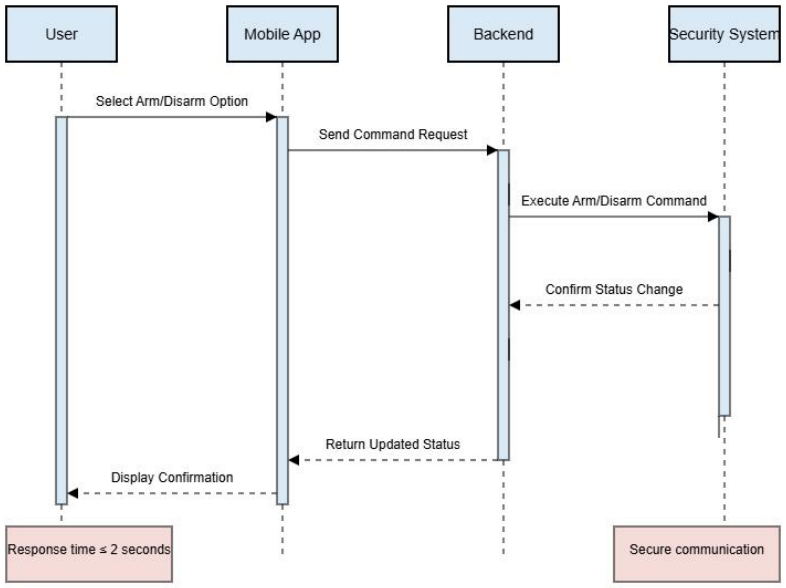
8.3 Sequence Diagrams

Sequence diagrams for key activities:

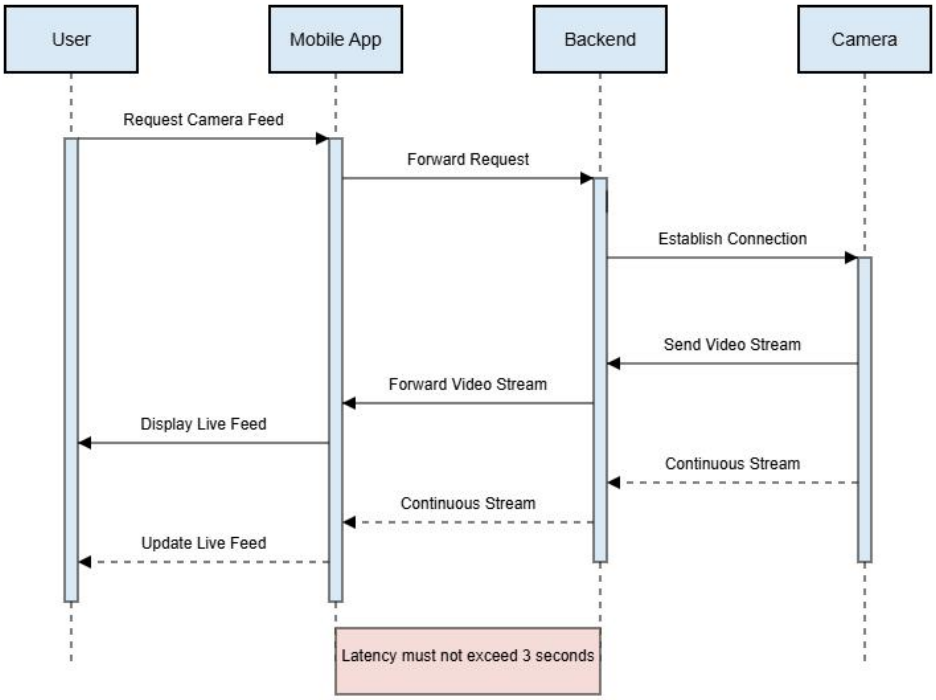
- **Registration/Login Sequence:**



- **Remote Arm/Disarm Sequence:**



- **Live Feed Sequence:**

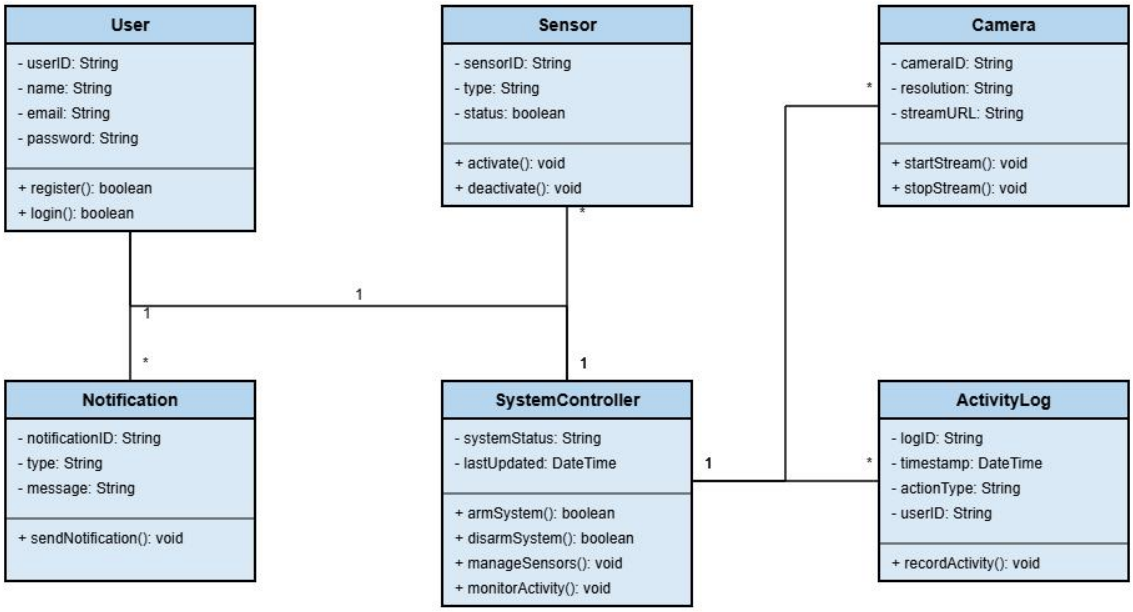


8.4 Class Diagram

A class diagram includes the following classes:

- **User:** Attributes (userID, name, email, password), Methods (register(), login(), updateProfile())
- **Sensor:** Attributes (sensorID, type, status), Methods (activate(), deactivate(), updateStatus())
- **Camera:** Attributes (cameraID, resolution, streamURL), Methods (startStream(), stopStream())
- **Notification:** Attributes (notificationID, type, message), Methods (sendNotification())
- **SystemController:** Manages user sessions, sensor status, and device integrations.

Smart Home Security System - Class Diagram



9. Appendices

Appendix A: Glossary

- **IoT:** Internet of Things
- **MFA:** Multi-Factor Authentication
- **API:** Application Programming Interface

Appendix C: To Be Determined (TBD) List

- TBD-1: Finalize integration details with third-party alarm services.
- TBD-2: Performance testing criteria for live video streaming.